ORIGINAL TO GENERAL FILES

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

OFFICE OF DESIGN POLICY & SUPPORT
INTERDEPARTMENTAL CORRESPONDENCE

FILE P.I. # 0009875
Jeff Davis County
GDOT District 5 - Jesup
SR 19/US 23 @ SR 135 Connector
Roundabout – No Build

OFFICE Design Policy & Support

DATE October 9, 2013

FROM for Brent Story, State Design Policy Engineer

TO SEE DISTRIBUTION

SUBJECT **APPROVED CONCEPT REPORT**

Attached is the approved Limited Scope Concept Report for the above subject project.

Attachment

DISTRIBUTION:

Bobby Hilliard, Program Control Administrator
Genetha Rice-Singleton, State Program Delivery Engineer
Glenn Bowman, State Environmental Administrator
Cindy VanDyke, State Transportation Planning Administrator
Kathy Zahul, State Traffic Engineer
Angela Robinson, Financial Management Administrator
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Dallory Rozier, District Utilities Engineer
Matt Bennett, Project Manager
Rick Hardenbrook, District Traffic Operations Manager
BOARD MEMBER - 12th Congressional District

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
LIMITED SCOPE PROJECT CONCEPT REPORT

Project Type:	Roundabout	P.I. Number:	0009875
GDOT District:	District 5	County:	Jeff Davis
Federal Route Number:	US 23	State Route Number:	SR 19/SR 135 CONN

This project was originally programmed as a roundabout project at the intersection of SR 19/US 23 and SR 135 Connector located in Jeff Davis County near the City of Hazlehurst, Georgia. The Roundabout feasibility study recommended an all way stop control intersection upgrade as the preferred improvement type for this intersection. This concept report is to document the Roundabout no-build design decision.

Submitted for approval:

C. Andy Guy — 8-16-13
State Roadway Design Engineer — DATE

J. M. Hill — 9/4/2013
GDOT Project Manager — DATE

Derrett Rice. RM — 8/29/2013
State Program Delivery Engineer — DATE

Recommendation for approval:

* Kathy Zahul / KLP — 9-24-13
State Traffic Engineer — DATE

* Recommendation on file

The concept as presented herein and submitted for approval is consistent with that which is included in the Regional Transportation Plan (RTP) and/or the State Transportation Improvement Program (STIP).

Cynthia L. Vanke — 9-6-13
State Transportation Planning Administrator — DATE

Approval:

Concur: K Joe Carpenter — 9/30/13
GDOT Director of Engineering — DATE

Approve: [illegible] — 10/7/13
GDOT Chief Engineer — DATE

PROJECT LOCATION

PLANNING & BACKGROUND DATA

Project Justification Statement:

The proposed project will enhance safety and improve operational efficiency at the T-intersection of SR 19/US 23 and SR 135 Conn in Jeff Davis County, GA. In Georgia, nearly a third of fatal crashes occur at intersections making intersection safety a focus area for the Georgia Department of Transportation. Nationally intersection crashes account for 40% of all reported crashes and approximately 20% of traffic fatalities. Of those fatalities, nearly 50% are the result of angle collisions. Angle collisions are often high speed, high impact crashes which often result in serious injuries or fatalities.

SR 19/US 23 is a three lane rural minor arterial with a posted speed limit of 50 mph and an AADT of 6,050 vehicles per day. SR 135 Conn is a two lane rural minor arterial with a posted speed limit of 30 mph and an AADT of 5,630 vehicles per day. Currently, the T-intersection is stop controlled on SR 135 Conn with a right turn lane on westbound approach and a right turn lane on the southbound approach.

Crash data from 2006-2010 indicated that 19 crashes occurred at this intersection resulting in 19 total injuries. Of those crashes 68% were angle collisions accounting for 100% of the injuries.

Description of the proposed project:

This project was originally programmed as a roundabout project at the intersection of SR 19/US 23 and SR 135 Connector located in Jeff Davis County near the City of Hazlehurst, Georgia. The Roundabout feasibility study recommended an all way stop control intersection upgrade as the preferred improvement type for this intersection. This concept report is to document the Roundabout no-build design decision.

Federal Oversight: ☒ Exempt ☐ State Funded ☐ Other

MPO: N/A MPO Project ID: N/A

Regional Commission: Heart of Georgia RC RC Project ID: N/A

Congressional District(s): 12

Projected Traffic: ADT
SR 19 / US 23 (2-Way): Current Year (2012): 6000 Open Year (2016): 6200 Design Year (2036): 7600
SR 135 CONN (2-Way): Current Year (2012): 6000 Open Year (2016): 6200 Design Year (2036): 7600

Traffic Projections Performed by: GDOT OFFICE OF PLANNING

Functional Classification (SR 19 / US 23): Rural Minor Arterial
Functional Classification (SR 135 CONN): Rural Minor Arterial

Is this a 3R (Resurfacing, Restoration, & Rehabilitation) Project? ☒ No ☐ Yes

Will Context Sensitive Solutions procedures be utilized? ☒ No ☐ Yes

DESIGN AND STRUCTURAL DATA

SR 19 / US 23

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**3**	**N/A**	**N/A**
- **Lane Width(s)**	**12'**	**12'**	**N/A**
- **Median Width & Type**	**TWLTL 14'**	**N/A**	**N/A**
- **Outside Shoulder or Border Area Width**	**8'**	**16'**	**N/A**
Inside Shoulder Width	**N/A**	**N/A**	**N/A**
- **Sidewalks**	**None**	**5'**	**N/A**
- **Posted Speed**	**45**		**N/A**
- **Design Speed**	**N/A**	**N/A**	**N/A**
- **Min Horizontal Curve Radius**	**No Curves**	**711**	**N/A**
Superelevation Rate	**N/A**	**4%**	**N/A**
Access Control	**Permitted**	**Permitted**	**N/A**
Right-of-Way Width	**100'**	**N/A**	**N/A**

*According to current GDOT design policy if applicable

SR 135 Connector

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**2**	**N/A**	**N/A**
- **Lane Width(s)**	**12'**	**12'**	**N/A**
- **Median Width & Type**	**None**	**N/A**	**N/A**
- **Outside Shoulder or Border Area Width**	**C&G only**	**16'**	**N/A**
Inside Shoulder Width	**N/A**	**N/A**	**N/A**
- **Sidewalks**	**None**	**5'**	**N/A**
- **Posted Speed**	**50**		**N/A**
- **Design Speed**	**N/A**	**N/A**	**N/A**
- **Min Horizontal Curve Radius**	**No Curves**	**926**	**N/A**
Superelevation Rate	**N/A**	**4%**	**N/A**
Access Control	**Permitted**	**Permitted**	**N/A**
Right-of-Way Width	**60'**	**N/A**	**N/A**

*According to current GDOT design policy if applicable

Major Interchanges/Intersections: None

Utility Involvements: None

Public Interest Determination Policy and Procedure recommended (Utilities)? ☒ No ☐ Yes

SUE Required: ☒ No ☐ Yes

Railroad Involvement: None

Complete Streets - Bicycle, Pedestrian, and/or Transit Warrants:

Warrants met: ☒ None ☐ Bicycle ☐ Pedestrian ☐ Transit

Right-of-Way:

Required Right-of-Way anticipated: ☒ No ☐ Yes ☐ Undetermined

Easements anticipated: ☒ None ☐ Temporary ☐ Permanent ☐ Utility ☐ Other

Transportation Management Plan [TMP] Required: ☒ No ☐ Yes

If Yes: Project classified as: ☐ Non-Significant ☐ Significant

TMP Components Anticipated: ☐ TTC ☐ TO ☐ PI

Design Exceptions to FHWA/AASHTO controlling criteria anticipated: None

Design Variances to GDOT Standard Criteria anticipated: None

PROJECT RESPONSIBILITIES

Project Activities:

Project Activity	Party Responsible for Performing Task(s)
Concept Development	GDOT Roadway Design
Design	N/A
Right-of-Way Acquisition	N/A
Utility Relocation	N/A
Letting to Contract	N/A
Construction Supervision	N/A
Providing Material Pits	N/A
Providing Detours	N/A
Environmental Studies, Documents, and Permits	N/A
Environmental Mitigation	N/A
Construction Inspection & Materials Testing	N/A

Lighting required: ☒ No ☐ Yes

Other projects in the area:

PI 0001810 SR 19 / US 23 overpass at Norfolk-Southern Railroad grade crossing. New construction.
PI M004595 SR 135 CONN from SR 19 to 0.01 mile east of SR 135 in Hazlehurst. Maintenance.

Other coordination to date: Email correspondence among Design Policy and Support, Roadway Design, District 5 Traffic Operations, Office of Program Delivery, and Traffic Operations all agree with the findings of the feasibility study to proceed with the recommended all-way stop control intersection upgrade.

Project Cost Estimate and Funding Responsibilities:

	Breakdown of PE	ROW	Reimbursable Utility	CST*	Environmental Mitigation	Total Cost
By Whom	GDOT	N/A	N/A	N/A	N/A	
$ Amount	250,000.00	N/A	N/A	N/A	N/A	250,000.000
Date of Estimate	2/23/2010	N/A	N/A	N/A	N/A	

*CST Cost includes: Construction, Engineering and Inspection, and Liquid AC Cost Adjustment.

ALTERNATIVES

Preferred Alternative: No Build			
Estimated Property Impacts:	**N/A**	**Estimated Construction Cost:**	**N/A**
Estimated ROW Cost:	**N/A**	**Estimated CST Time:**	**N/A**

Rationale:

The intersection of SR 19 / US 23 and SR 135 Connector will operate at an acceptable level of service in the design year as an all way stop control. All way stop control and a Roundabout offer similar safety benefits when compared to side street stop control. Based on the analysis of operation and safety, an all-way stop control is expected to provide similar benefits to a roundabout while costing significantly less. See attached roundabout feasibility study for details.

The no build recommendation refers specifically to not building a roundabout at this location under this project. As a result of coordination throughout concept development it is recommended the intersection be upgraded to an all way stop control by district maintenance forces. Therefore this project can be deleted from the program.

Alternative 1: Single lane Roundabout			
Estimated Property Impacts:	**3**	**Estimated Construction Cost:**	**1,058,732.97**
Estimated ROW Cost:	**130,000**	**Estimated CST Time:**	**12 months**
Rationale: See No Build Rationale above			

Attachments:

1. Feasibility Study including:
    a. Crash summaries
    b. Capacity analysis summary
    c. Alternate sketches
2. Cost Estimates
    a. Construction
    b. Right of Way
3. Traffic Diagrams
4. Traffic Engineering Study
5. Highway Safety Manual Crash Reduction Analysis

Roundabout Feasibility Study

State Road 19 and 135 Intersection

Jeff Davis County, Georgia

February 4, 2013

Prepared for:
Georgia Department of Transportation
By:

MTJ ENGINEERING

Planning. Traffic Analysis.
Design, Public Outreach

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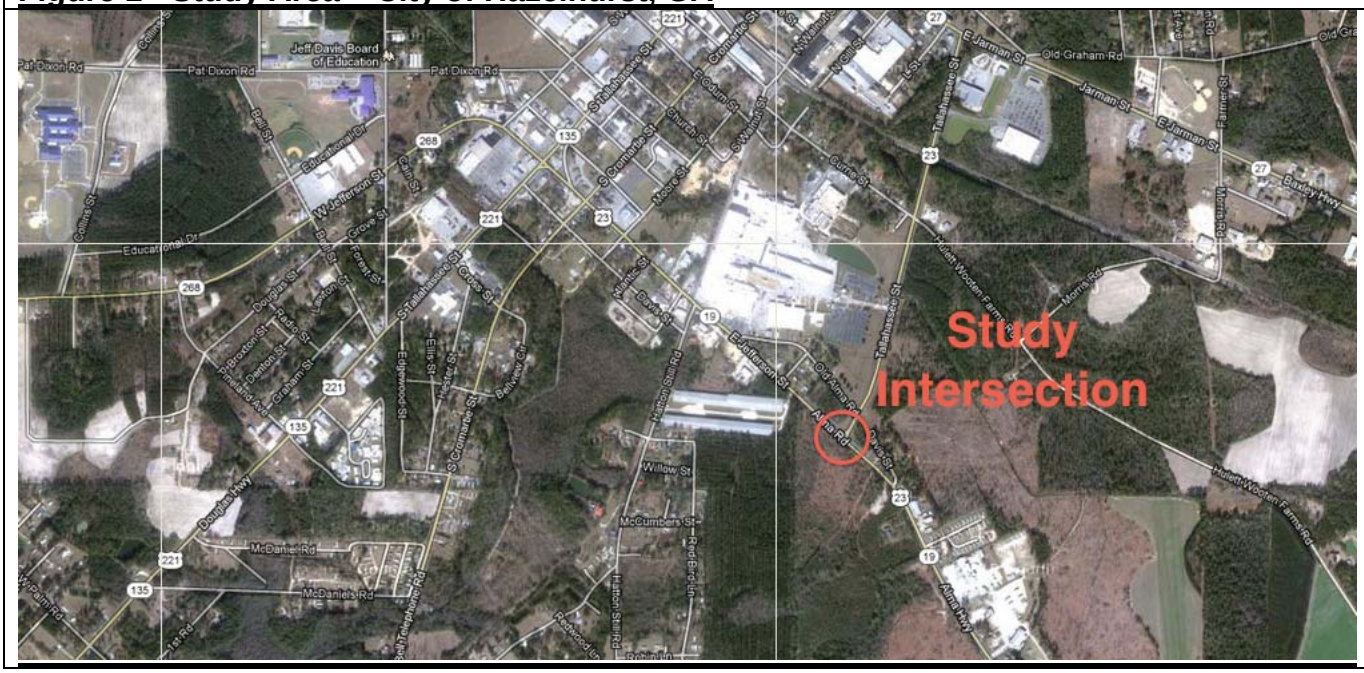
8.2.2. Roundabout Feasibility Studies

Introduction

As requested by the Georgia Department of Transportation (GDOT), MTJ Engineering, LLC (MTJ) has completed a Feasibility Study consistent with GDOT Design Policy Manual (DPM) section 8.2.2. for the intersection SR 19 / SR 135CONN intersection located in Jeff Davis County, GA near the City of Hazelhurst, GA. See vicinity map below in Figure #1.

Figure 1 - Study Area – City of Hazelhurst, GA



Consistent with GDOT DPM Section 8.2.2 this Feasibility Study builds upon the previous GDOT Planning Level Assessment (PLA) that was completed by GDOT in Jan 2011 and provides more detailed study with the objective of determining a preferred improvement recommendation that may then proceed to a preliminary design stage of a project.

We have performed an engineering analysis of the existing safety performance and a traffic operations analysis for the current condition as a side street stop controlled intersection, an all-way stop control and a modern roundabout intersection control alternative.

The scope of this feasibility study is based upon the level of analysis performed in the previous PLA work, the availability of base mapping, complexity of the proposed roundabout (in this case a single-lane roundabout), and other factors which includes the significant history of injury crashes at this intersection. Due to the proven safety benefits of a single lane roundabout

application in this context a detailed cost comparison of the roundabout to other viable alternatives is not currently part of this feasibility analysis considering the greater reduction in injuries that will be expected with a roundabout. However, this can be added as necessary.

Based on the results of this feasibility analysis, we have concluded that either a single-lane roundabout or an all-way stop (AWSC) may be implemented at this intersection to improve the existing safety deficiencies and to provide acceptable long-term operations.

Section 1: Project Background

As part of this work effort we have reviewed the following pertinent previous documents prepared as part of GDOT policy for modern roundabout study and implementation:

1) Project Support For Roundabout Consideration Letter by Robert T. McCall GDOT District Traffic Engineer dated September 9th 2010

    a. This document indicates that based on the declining level of service at the subject intersection it has been identified as a candidate for a roundabout.

    b. This document stipulates that Jeff Davis County agree to:
        i. The full cost of electric energy used for lighting
        ii. All maintenance costs associated with landscaping of the intersection

    c. Indication of Roundabout Support from Jeff Davis County agreeing to the terms above dated Sept 15th 2010.

2) Planning Level Assessment (PLA) prepared by District 5 Traffic Operations dated Jan 10th 2011.

    a. This traffic study recommends a single-lane roundabout be installed at this intersection.

Additional and / or new data provided for this feasibility study includes:

- Updated Long-Range traffic data for 2012, 2016 and 2036 (AADT and Peak Hour turning movements for am/pm)
- Crash data for the years 2007-2011

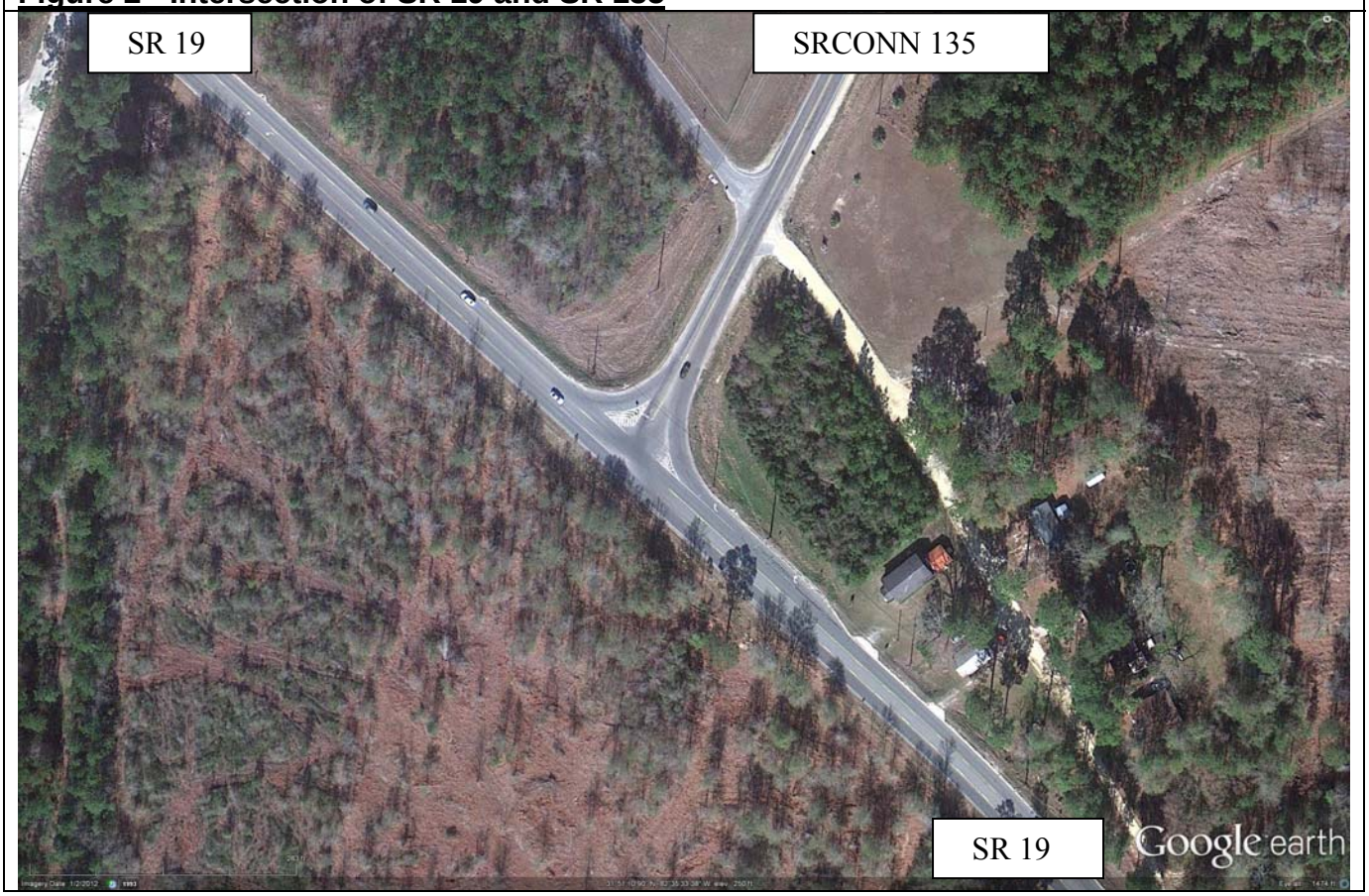
Existing Conditions

The side street (bottom of the "T") is SR 135CONN (Tallahassee Street) which is stop controlled has dedicated left and right turn lanes. The existing 3-Leged "T" intersection has a 15 degree skew.

SR 19 (Jefferson Street) is free flow condition and includes a dedicated left turn lane developed from the continuous left turn only lane (third lane) for the southern movement and a dedicated right turn only lane under yield control for the north movement. SR 19 (Jefferson) is posted at 45 mph and SRCONN 135 (Tallahassee Street) is posted at 50 mph. There are no pedestrian facilities currently present and no pedestrians are recorded in the count data provided.

Existing residential land uses are present along the south leg of SR 19 on the east side of the road. Please see the intersection below in Figure #2.

Figure 2 - Intersection of SR 19 and SR 135



Section 2: Safety Assessment

We've reviewed the updated crash data for the years 2005 through 2011.The 2005-2011 crash data shows 15 total crashes, with 9 (60%) being injury, and 6 (40%) non-injury.

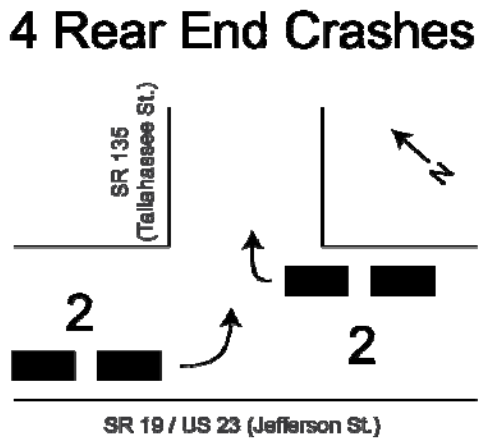
11 (73%) of the crashes were angle crashes. Of these 8 were higher speed right angle crashes involving SB SR 19 left turns conflicting with NB SR 19 vehicles. These types of crashes are prone to create injuries and the crash data reviewed reflects this. The remaining 4 (27%) of crashes were rear end crashes with two from WB and two from EB movements. Please see crash diagram and data shown graphically below in Figure 3.

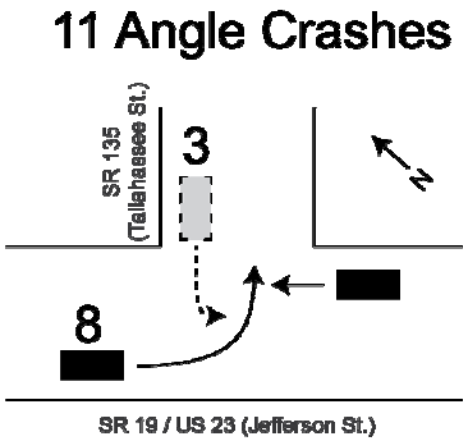
The predominant crash type is the 90 degree angle crash caused by the SB SR 19 left turning vehicle being hit by the NB SR 19 thru movement. This is consistent with left turning drivers misjudging the available gap required to safely make this left turn in front of the higher speed thru traffic. It does not appear as though there are any stopping or other sight distance issues caused by horizontal or vertical roadway design elements that may be attributed to these crashes.

Figure 3 - Crash Data 2005-2011

SR 135 and SR 19 Crash Summary (2007-2011)

		Type			Severity		
Year	**Total Crashes**	**Angle**	**Rear End**	**Left Turns**	**Property Damage Only**	**Injury**	**Fatal**
2007	4	4	0	4	0	3	0
2008	4	2	2	1	3	1	0
2009	4	2	2	2	2	3	0
2010	1	1	0	1	0	1	0
2011	2	2	0	2	1	1	0
Total	15	11	4	10	6	9	0





Section 3: Alternate Sketches

Two viable intersection improvement alternatives have been identified to improve the existing safety performance and they include:

- All-way stop control with median channelization
- Modern roundabout intersection

Based on these sketch alternative intersection improvement and control alternatives we have conducted a traffic engineering assessment and evaluation (both qualitatively and quantitatively) with the objective to determine a preferred alternative that can then move to a preliminary design stage.

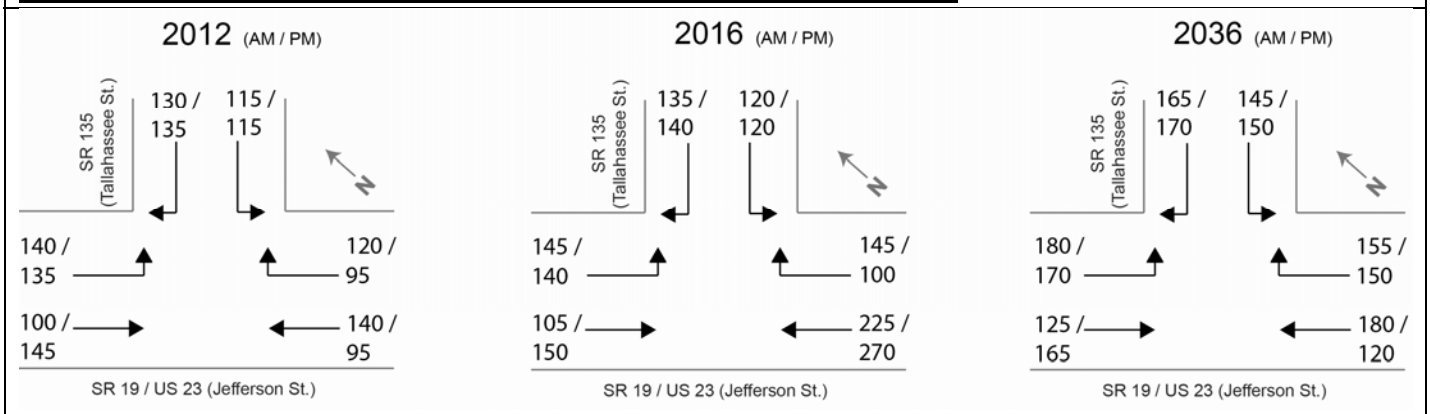
Figure 4 - All-Way Stop Alternative Sketch (single-lane approaches)	**Figure 5 - Roundabout Alternative Sketch (original sketch as part of PLA)**

Section 4: Traffic Engineering Assessment

The previous GDOT traffic study analyzed the 2010 traffic counts and found the side street stop controlled approach experiencing an average of 24 seconds of delay (LOS C). As traffic volumes increase into the future this will continue to degrade and this is reflected in the analysis shown below (The left turn movement from the stop sign at is the critical movement).

We have evaluated the proposed alternatives based on the following traffic projections shown below in Figure 6:

Figure 6 - Traffic Peak Hour Traffic Turning Movement Counts



Side Street Stop Control – Long Range (TWSC)

As shown below delay is expected to continue to degrade under the existing control conditions and as volumes increase crashes are expected to correspondingly increase. Therefore the existing side street stop condition is not a viable alternative and is not part of further analysis or comparisons.

TWSC Analysis
2036 AM - Left Turn 40.2 (LOS E)
2036 PM - Left Turn 30.4 (LOS D)

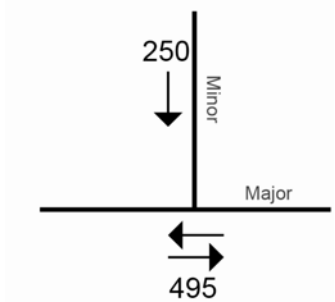
Multi-Way Stop Control analysis (AWSC)

According the MUTCD Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist including where the need to control left turn conflicts exists, which is the case for this intersection. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

Based on the procedures outlined in the 2009 Manual on Uniform Traffic Control Devices (MUTCD) the installation of multi-way stop control is warranted at this location based on 2012 traffic volumes using minimum vehicular volumes see Figure 7 to the right.

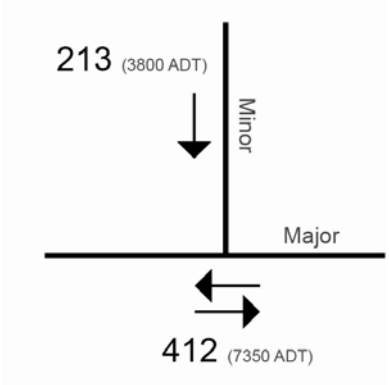
The all-way stop will provide adequate LOS with its current lane-use assignment and this analysis is shown below.

Figure 7: 2012- Multi-Way Stop Warrant (MUTCD 2009)



All Way Stop Warrant				
Min. Volume			100%	Threshold Met? (Y/N)
Major			300	Y
Minor			200	Y

Figure 8 – 2036 Signal Warrant #1
8TH Highest Hourly Volume MUTCD 2009
ADT x 5.6% (as per GDOT)



Warrant 1				
Min. Volume	70%	Threshold Met? (Y/N)	100%	Threshold Met? (Y/N)
Major	350	Y	500	N
Minor	105	Y	150	Y

AWSC Analysis (multi-lane approaches)
2012 AM – 11 sec LOS B
2012 PM – 10 sec LOS A

2036 AM – 12 sec LOS B
2036 PM – 11 sec LOS B

AWSC Analysis (single-lane approaches GDOT preferred geometry)
2012 AM – 12 sec LOS B
2012 PM – 10 sec LOS A

2036 AM – 17 sec LOS C
2036 PM – 14 sec LOS B

LOS	Signalized Intersection	Un-signalized Intersection
A	≤10 sec	≤10 sec
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	≥80 sec	≥50 sec

According the MUTCD all-way stops are often used as an interim solution until such time as a signalized intersection may be warranted.

In this case based on the long-range 2036 volumes a signalized intersection may be warranted in the long-range future.

We have analyzed signal warrants based on the criteria set forth in MUTCD 2009. The community of Hazelhurst has a population of less than 5,000 and the intersecting roads have posted speeds greater than 40 mph therefore we have evaluated Warrant #1 using the less restrictive 70% volume threshold values and the 100% volume thresholds. Signal Warrant 1 is met for the 70% threshold on the 2036 long range traffic and is shown to the right in Figure 8.

According the MUTCD all-way stops can mitigate the types of angle crashes that are occurring at this intersection. However, given that this would be an all-way stop with multiple entry lanes, the expected safety benefit will be reduced compared to a single lane entry all-way stop.

Roundabout Capacity Analysis

Based on the PM 2036 Peak Design year traffic flows we have conducted a capacity analysis of a single-lane roundabout using Rodel v1.60 using both the empirical capacity model (Kimbers equations) as well as the HCM 2010 capacity equations. In addition we have also utilized the GDOT Roundabout capacity analysis spread sheet tool v2.1.

All three capacity analysis procedures estimate less than 10s of delay on the 2036 flows which equates to LOS A. The single lane roundabout has significant reserve capacity beyond the 20 year design life.

Results output are attached separately in Appendix A.

Section 5: Cost Comparison

Construction Costs: This feasibility study recommends raised medians (curbed channelization) be constructed in the ‘all-way’ stop alternative approaches to optimize safety benefits given the higher speeds of the main-line traffic and rural context of the roadways/intersection.

To what extent the safety is benefits are reduced without the channelization is difficult to quantify using available statistics. However, qualitatively the probability of an angle crash (injury producing crash) will be higher without the channelization. It is noted that there are other proven safety treatments that may be implemented to improve the safety at this intersection and they include; rumble strips and or flashing warning beacons on approaches.

Its noted that we have not included a do nothing alternative in this cost comparison as improvements are necessary to improve the existing safety performance.

Preliminary planning level estimates of cost have been developed for the two viable alternatives[1]:

Roundabout	$1,000,000
AWSC	$100,000

The roundabout alternative is estimated to cost approximately 10 times the cost of the AWSC intersection improvement.

Delay Costs: Peak hour or daily vehicular delay can be converted to a Cost to the travelling public and can then be utilized as a variable in a benefit cost analysis. However, in the case where the operational analysis between competing viable alternatives shows that each alternative provides good or very good levels of service in the future design year horizon this measure of effectiveness becomes much less pertinent and applicable.

And in this case for the operational analysis for both alternatives shows good to very good levels-of-service (LOS) for the 20-year design horizon and therefore 'costs' associated with delay have not been incorporated.

Section 6: Alternative Selection Summary:

According to the FHWA roundabouts offer significant safety benefits over TWSC intersections. Research of U.S. roundabouts has identified average crash reductions of 44.2% for all crashes and 81.8% for injury crashes have been observed when converting TWSC intersections to roundabouts.[2] Injury reductions were found to range between 68% and 87%, depending on the setting (urban, rural, suburban) and whether the roundabout was single-lane or multi-lane. It is of significance that higher crash reductions were observed in rural settings where total crash reductions were found to be 71.5% and injury crashes were reduced by 87.3%.

The FHWA concludes that well designed modern roundabouts offer an effective solution to traffic problems at TWSC intersections with heavy left turns from the major route because they provide more favorable treatment to left turns than other control modes. T-intersections are especially good candidates in this category because they tend to have higher left turning volumes.[3]

[1] GDOT Provided Preliminary Planning Level Estimate of Construction Costs

[3] FHWA Roundabout Guide 2010 - NCHRP 672

In addition the FHWA Roundabout Guide discusses that when an intersection meets the MUTCD warrants for an All-Way Stop (AWSC), roundabouts *become an especially attractive solution* because of their:

- Higher capacities
- Lower delays expected

"Roundabouts can be expected to always offer better operational performance for vehicles than AWSC, given the same traffic conditions".[2]

A substantial part of the operational benefit of a roundabout compared to an all-way stop intersection is obtained during the off-peak periods because the restrictive stop control applies for the entire 24 hour day. This intersection has a substantial percentage of left turns and therefore the delay will be lower for the roundabout as compared to either stop signs or signals for 24 hours of the day, 365 days a year for the life of the project. Both the AWSC and Roundabout alternative provide very good vehicular operations based on the future 20-year design horizon.

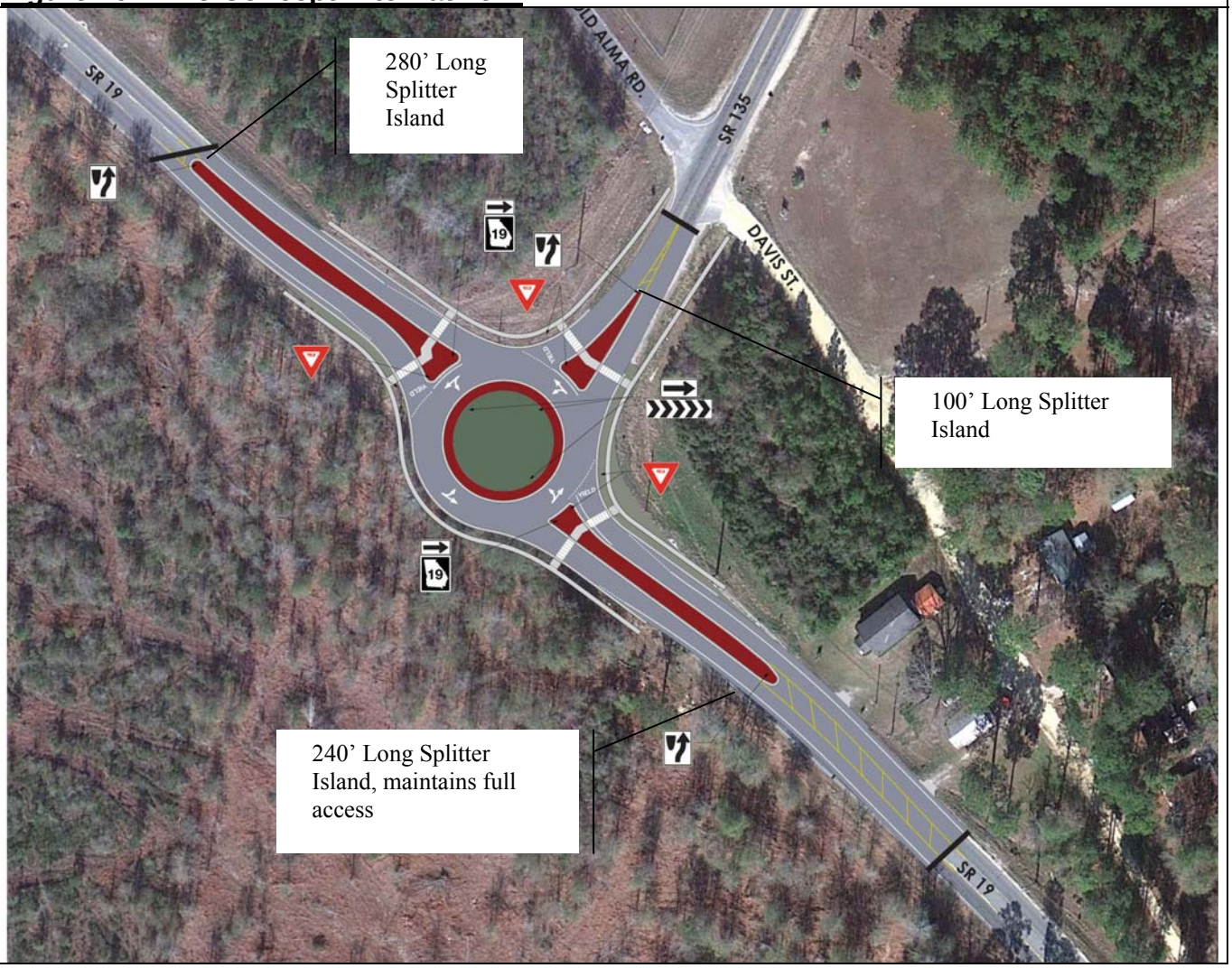
However from the perspective of the cost / benefit comparison the additional costs associated with the modern roundabout installation makes it diffecult to justify when the operational analysis of the AWSC alternative shows very good levels-of-service for the long-range design year traffic flows.

Section 7: Conceptual Roundabout Design:

Please see below Concept Design Alternatives A and B in Figures 10 and 11 respectively. In addition these designs are attached separately in 11x17 format.

Concept Alternative A is 160' in diameter and has been shifted north-westerly to remove the existing skew, provide adequate visibility, optimize approach alignments, and not impact existing residential uses.

Figure 10 - MTJ Concept Alternative A



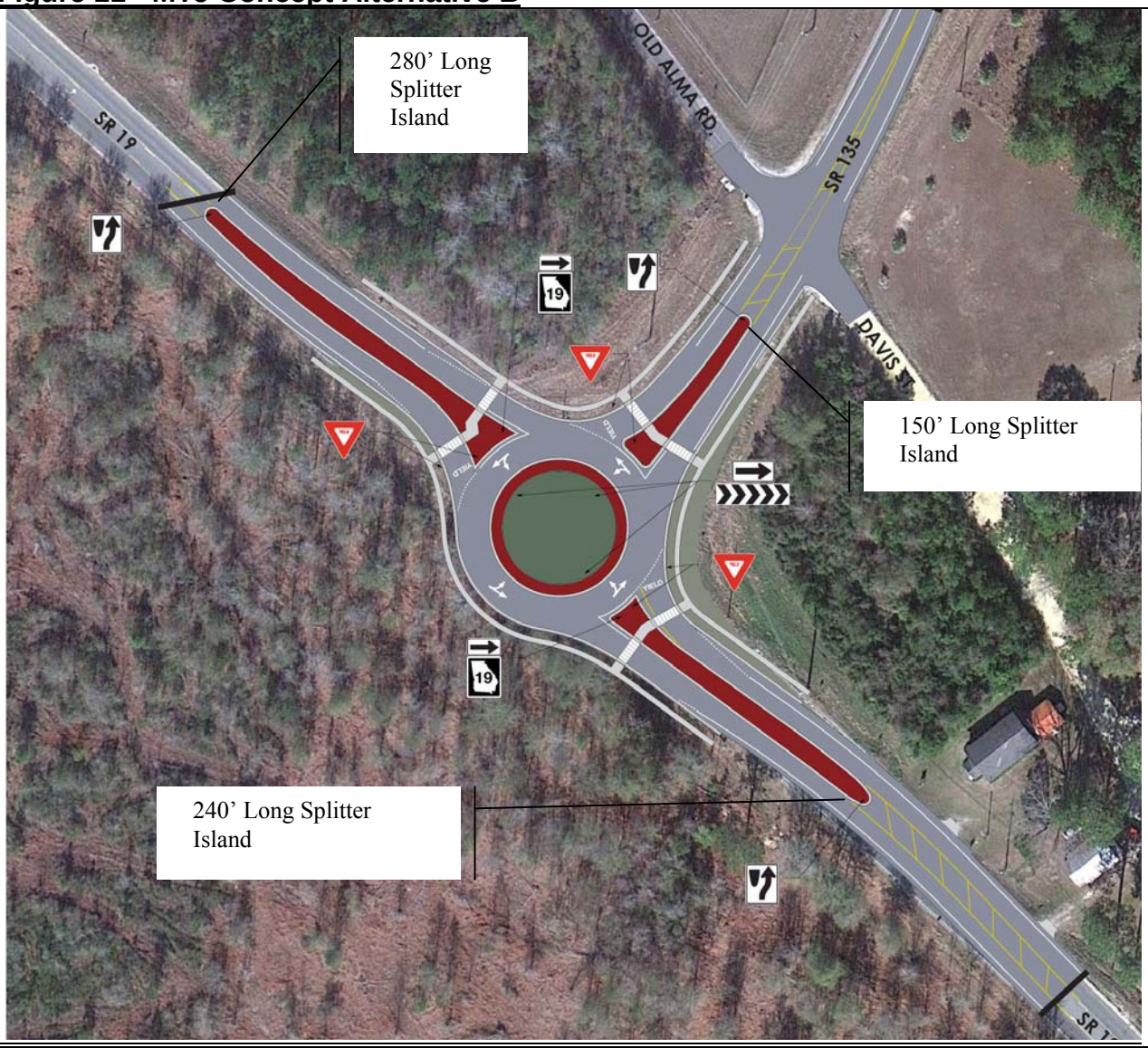
- 160' ICD
- Shifted north-westerly and placed to
- Provide adequate visibility and approach alignments
- Remove the existing skew to
- Minimize ROW impacts to existing developed land.

Concept Alternative B (below) is also 160' in diameter and is similar in all respects to Alternative A except for these differences:

- Alt B extends the SR 135 legs splitter island length by 50' for a total of 150'
    - The longer splitter-islands channelization improves visibility for this high speed approach.
    - Is shifted slightly to the north along the SR 19 alignment

.

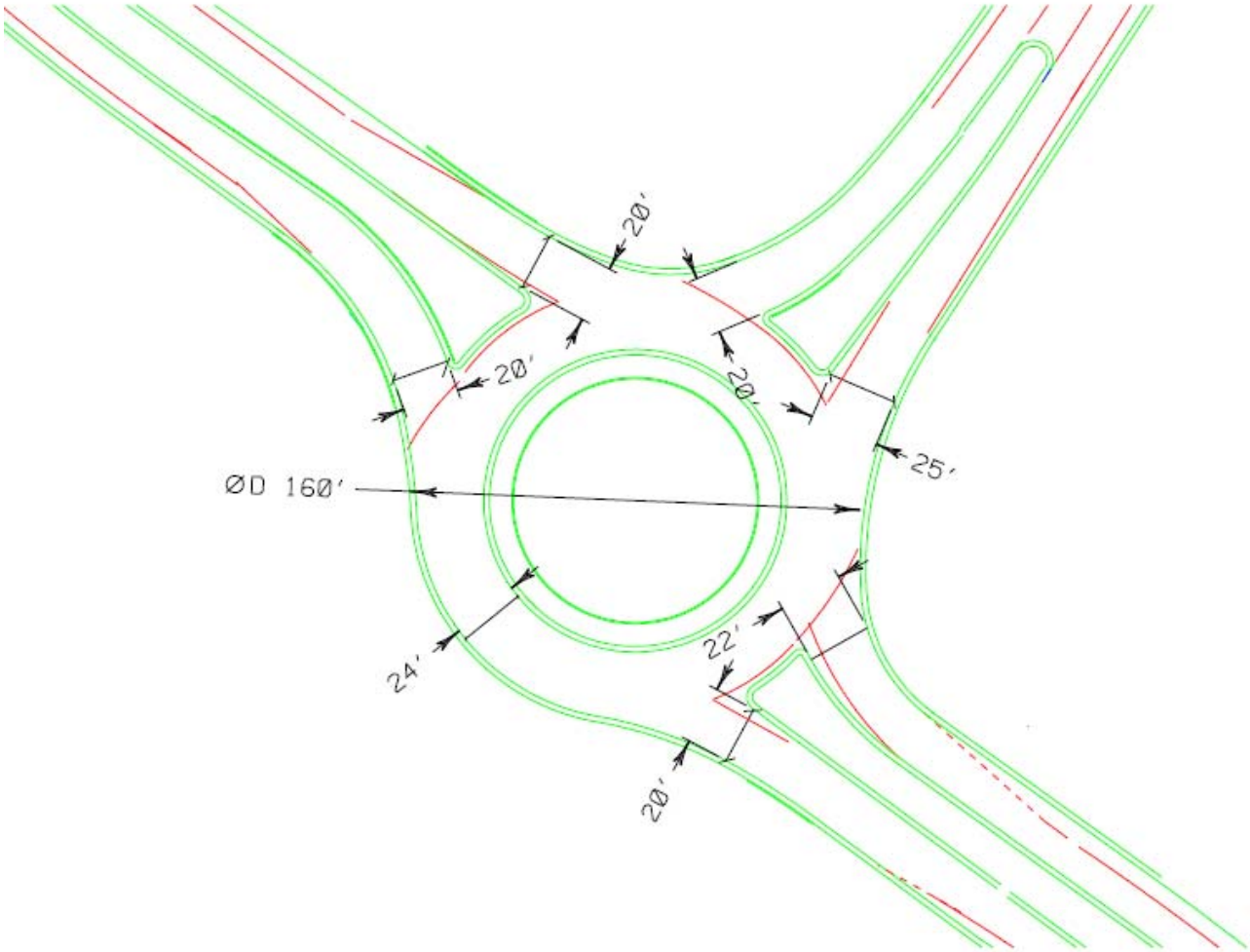
Figure 11 - MTJ Concept Alternative B



Geometric and performance checks

A list of the criteria used to develop the roundabout and its key dimensions are provided below in the following sections. This includes: (1) inscribed diameter; (2) entry and exit widths (3) circulatory, roadway widths, fastest path, design vehicle swept paths for WB-67, and stopping sight distance requirements for approaches.

Figure 12 - Key Dimensions

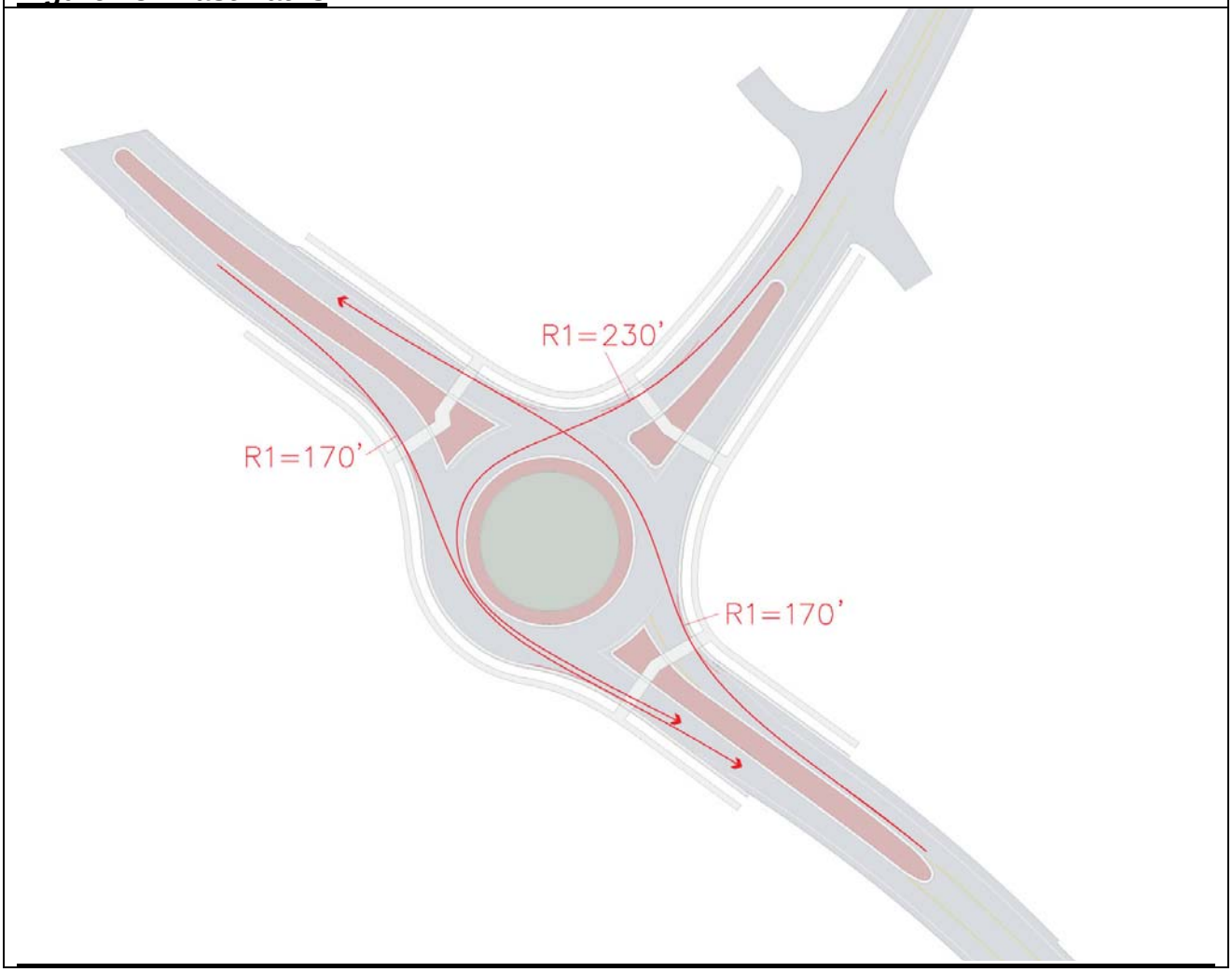


Stopping Sight Distance: The stopping sight distance needed for the following design speeds are: 45 mph = 400 feet, 50 mph = 475' (however, this may need slight revision based on GDOT specific policy).

There doesn't appear, based on available base mapping, to be any grade or physical structures that would preclude meeting stopping sight distance for this intersection.

Fast-Path criteria construct and calculations are shown below.

Figure 13 - Fast Paths



Fast Path Speed Calculations:

Radius 1 (FT)	170		**Radius 1 (FT)**	230
Super (FT/FT)	0.02		**Super (FT/FT)**	0.02
Side Friction Factor (f)	0.2		**Side Friction Factor (f)**	0.2
Max Speed (mph)	23.7		**Max Speed (mph)**	27.5

The Fast-Path criteria comply with FHWA guidance for theoretical fast path speeds. It is important to note that Fastest Path criteria aka deflection is based on UK and other roundabout safety research and is a proxy or measurement criteria to achieve slowing of vehicles. The calculated speeds are not desirable or expected normal operating speed but rather theoretical speeds representing a quantitative measure of safety. Other important issues for safety on high speed roundabouts may include length of splitter islands to induce channelization principles as well as landscaping of the central island to provide a “terminal vista” to ensure driver expectancy principles are adhered to.

Truck and Freight Accommodations

The MTJ concept roundabout is designed to accommodate the WB-67 design truck within all curbs and utilizes a truck apron for the rear wheels. Please see the WB-67 turning templates shown below in Figure 14 and are also attached separately in 11x 17 plan view.

Figure 14 - WB-67 Truck Turning Templates (Auto-Turn V8)

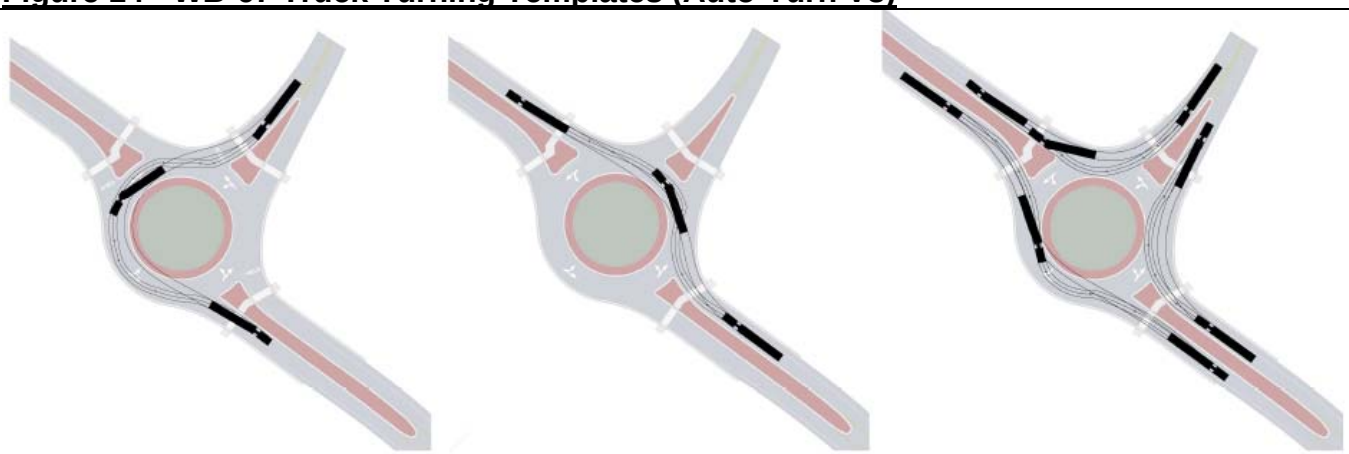
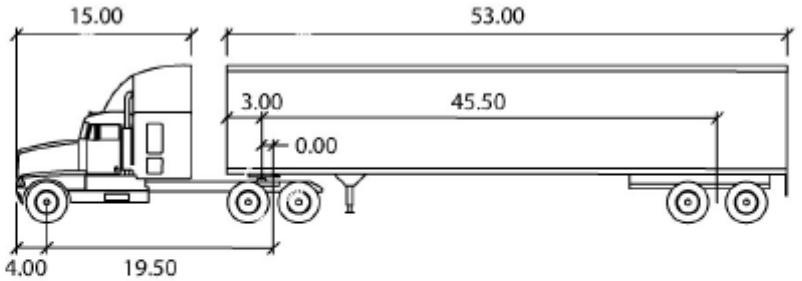


Figure 15 - WB-67 Profile



WB-67 feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		

Over Size/Over Weight Freight:

The preliminary design effort will need to investigate available freight and trucking information / records to determine if there is history of large freight movements including if existing or proposed industry needs in the area or region may indicate a need for providing accommodations for large freight movements exceeding the WB-67 envelope.

It is not anticipated that accommodating large freight movements will change the concept if these movements are maintained along the thru movement direction along SR 19.

Preliminary and Final design effort will need to incorporates decisions and information pertaining to OS/OW freight needs.

Section 8: Recommendations

This study has evaluated the feasibility of installing a modern roundabout or an AWSC with channelization (along with other low cost safety improvements such as rumble strips and or flashing beacons) at the SR 19 / SR 135 existing two-way stop intersection to improve the safety performance located in Jeff Davis County GA near the City of Hazelhurst.

- The existing safety performance of the TWSC intersection is poor and requires intersection improvements to mitigate current safety deficiencies:
    - The existing intersection had 9 (60% of total) reported injuries between 2004-2011

- Under its existing two-way stop control, the side street stop controlled leg of the SR 19 SR 135 intersection is currently operating at LOS C and operations will degrade further as traffic volumes increase into the future 2036 traffic conditions.

- The traffic operational analysis shows the intersection:
    - Currently meets All-Way Stop (AWSC) Warrants based on 2012 traffic volumes.
    - Will meet the eight hour signal warrants on the long-range projected 2036 traffic flows (70% values).

- Installing a roundabout is expected to reduce the number of injuries at the intersection by 90% or more.
    - According the FHWA properly designed modern roundabouts are an excellent safety measure at high speed intersections.

- In terms of the type of collisions reduced, a roundabout is most effective in reducing angle and left-turn collisions.

- Available literature shows that an all-way stop (AWSC) with channelization has the potential to also improve the intersection's existing poor safety record through reduced speeds for all approaches. The AWSC operational analysis shows improved operations for the existing side street stop control leg of the intersection and maintains good LOS for all approaches based on near-term and the long-range 20-year traffic projections.

Conclusion

Based upon the operational and safetey analysis of this intersection, we have concluded that either a roundabout or the recommended AWSC improvements are appropriate improvement solutions to address the existing safety and long-term operational performance issues at the intersection of SR 19 / SR 135 (existing two-way stop intersection) located in Jeff Davis County GA near the City of Hazelhurst

The AWSC was determined to be the preferred improvement type for this intersection based on the following conclusions:

- Predicted to mitigate the existing safety deficiences
- Provides acceptable operations thru the 20-year design life
- Costs approximately 1/10th the cost of the roundabout

Appendix A

Capacity Analysis, 2036

a. Two-Way Stop Controlled

b. All-Way Stop Controlled

i. Single Lane Approaches

ii. Multi-Lane Approaches

c. Roundabout

i. GDOT Analysis Tool

ii. Rodel (Empirical Capacity Model)

iii. Rodel (HCM 2010 Capacity Model)

Intersection	
Intersection Delay (sec/veh):	9.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	170	165	180	155	150	170
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	150			150	0	25
Median Width		12	12		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles(%)	6	6	6	6	6	6
Movement Flow Rate	193	187	205	176	170	193
Number of Lanes	1	1	1	1	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	381	0	0	0	867	191
Stage 1	-	-	-	-	293	-
Stage 2	-	-	-	-	574	-
Follow-up Headway	2.254	-	-	-	3.554	3.354
Pot Capacity-1 Maneuver	1156	-	-	-	318	841
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	556	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1156	-	-	-	265	841
Mov Capacity-2 Maneuver	-	-	-	-	265	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	463	-

Approach	EB	WB	SB
HCM Control Delay (s)	4.4	0	24.5
HCM LOS	A	A	C

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					265	841
HCM Control Delay (s)	8.738	-	-	-	40.2	10.6
HCM Lane VC Ratio	0.167	-	-	-	0.643	0.23
HCM Lane LOS	A	-	-	-	E	B
HCM 95th Percentile Queue (veh)	0.599	-	-	-	4.033	0.885

Intersection	
Intersection Delay (sec/veh):	8.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	180	125	120	150	145	165
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	150			150	0	25
Median Width		12	12		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles(%)	6	6	6	6	6	6
Movement Flow Rate	205	142	136	170	165	187
Number of Lanes	1	1	1	1	1	1

Major/Minor		Major 1	Major 2			
Conflicting Flow Rate - All	306	0	0	0	773	153
Stage 1	-	-	-	-	221	-
Stage 2	-	-	-	-	552	-
Follow-up Headway	2.254	-	-	-	3.554	3.354
Pot Capacity-1 Maneuver	1232	-	-	-	362	883
Stage 1	-	-	-	-	806	-
Stage 2	-	-	-	-	569	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1232	-	-	-	302	883
Mov Capacity-2 Maneuver	-	-	-	-	302	-
Stage 1	-	-	-	-	806	-
Stage 2	-	-	-	-	474	-

Approach	EB	WB	SB
HCM Control Delay (s)	5	0	19.6
HCM LOS	A	A	C

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					302	883
HCM Control Delay (s)	8.503	-	-	-	30.4	10.2
HCM Lane VC Ratio	0.166	-	-	-	0.546	0.212
HCM Lane LOS	A	-	-	-	D	B
HCM 95th Percentile Queue (veh)	0.594	-	-	-	3.057	0.801

Intersection	
Intersection Delay, s/veh	14.2
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	180	125	120	150	145	165
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	6	6	6	6	6	6
Mvmt Flow	205	142	136	170	165	187
Number of Lanes	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	15.1	12.5	14.8
HCM LOS	C	B	B

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	59%	0%	47%
Vol Thru, %	41%	44%	0%
Vol Right, %	0%	56%	53%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	305	270	310
LT Vol	125	120	0
Through Vol	0	150	165
RT Vol	180	0	145
Lane Flow Rate	347	307	352
Geometry Grp	1	1	1
Degree of Util (X)	0.54	0.448	0.538
Departure Headway (Hd)	5.614	5.252	5.495
Convergence, Y/N	Yes	Yes	Yes
Cap	641	684	655
Service Time	3.66	3.299	3.539
HCM Lane V/C Ratio	0.541	0.449	0.537
HCM Control Delay	15.1	12.5	14.8
HCM Lane LOS	C	B	B
HCM 95th-tile Q	3.2	2.3	3.2

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	16.9
Intersection LOS	C

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	170	165	180	155	150	170
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	6	6	6	6	6	6
Mvmt Flow	193	187	205	176	170	193
Number of Lanes	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	17.9	15.9	16.8
HCM LOS	C	C	C

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	51%	0%	47%
Vol Thru, %	49%	54%	0%
Vol Right, %	0%	46%	53%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	335	335	320
LT Vol	165	180	0
Through Vol	0	155	170
RT Vol	170	0	150
Lane Flow Rate	381	381	364
Geometry Grp	1	1	1
Degree of Util (X)	0.616	0.579	0.586
Departure Headway (Hd)	5.826	5.479	5.801
Convergence, Y/N	Yes	Yes	Yes
Cap	617	655	618
Service Time	3.89	3.544	3.865
HCM Lane V/C Ratio	0.618	0.582	0.589
HCM Control Delay	17.9	15.9	16.8
HCM Lane LOS	C	C	C
HCM 95th-tile Q	4.2	3.7	3.8

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	11
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	140	100	95	120	115	130
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	6	6	6	6	6	6
Mvmt Flow	159	114	108	136	131	148
Number of Lanes	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	11.5	10.1	11.2
HCM LOS	B	B	B

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	58%	0%	47%
Vol Thru, %	42%	44%	0%
Vol Right, %	0%	56%	53%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	240	215	245
LT Vol	100	95	0
Through Vol	0	120	130
RT Vol	140	0	115
Lane Flow Rate	273	244	278
Geometry Grp	1	1	1
Degree of Util (X)	0.388	0.321	0.386
Departure Headway (Hd)	5.122	4.731	4.993
Convergence, Y/N	Yes	Yes	Yes
Cap	695	753	713
Service Time	3.202	2.813	3.076
HCM Lane V/C Ratio	0.393	0.324	0.39
HCM Control Delay	11.5	10.1	11.2
HCM Lane LOS	B	B	B
HCM 95th-tile Q	1.8	1.4	1.8

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	135	145	140	120	115	135
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	6	6	6	6	6	6
Mvmt Flow	153	165	159	136	131	153
Number of Lanes	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	13	11.5	12.2
HCM LOS	B	B	B

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	48%	0%	46%
Vol Thru, %	52%	54%	0%
Vol Right, %	0%	46%	54%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	280	260	250
LT Vol	145	140	0
Through Vol	0	120	135
RT Vol	135	0	115
Lane Flow Rate	318	295	284
Geometry Grp	1	1	1
Degree of Util (X)	0.47	0.41	0.42
Departure Headway (Hd)	5.319	5	5.327
Convergence, Y/N	Yes	Yes	Yes
Cap	678	721	676
Service Time	3.344	3.027	3.355
HCM Lane V/C Ratio	0.469	0.409	0.42
HCM Control Delay	13	11.5	12.2
HCM Lane LOS	B	B	B
HCM 95th-tile Q	2.5	2	2.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay (sec/veh)	12.2
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	170	165	180	155	150	170
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles(%)	6	6	6	6	6	6
Movement Flow Rate	193	187	205	176	170	193
Number of Lanes	1	1	1	1	1	1

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	2
HCM Control Delay	12.7	11.6	12.3
HCM LOS	B	B	B

Lane	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	100%	0%	0%	0%
Volume Right (%)	0%	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	170	165	180	155	150	170
Left Turning Volume	0	165	180	0	0	0
Through Volume	0	0	0	155	0	170
Right Turning Volume	170	0	0	0	150	0
Lane Flow Rate	193	188	205	176	170	193
Geometry Group	7	7	7	7	7	7
Degree of Utilization, X	0.363	0.326	0.359	0.274	0.337	0.316
Departure Headway, Hd	6.773	6.265	6.312	5.6	7.109	5.894
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	531	574	569	639	506	609
Service Time	4.52	4.012	4.059	3.347	4.853	3.637
HCM Lane V/C Ratio	0.363	0.328	0.36	0.275	0.336	0.317
HCM Control Delay	13.4	12	12.6	10.5	13.4	11.4
HCM Lane LOS	B	B	B	B	B	B
HCM 95th Percentile Queue	1.7	1.5	1.7	1.1	1.5	1.4

Intersection	
Intersection Delay (sec/veh)	11.4
Intersection LOS	B

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	180	125	120	150	145	165
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles(%)	6	6	6	6	6	6
Movement Flow Rate	205	142	136	170	165	187
Number of Lanes	1	1	1	1	1	1

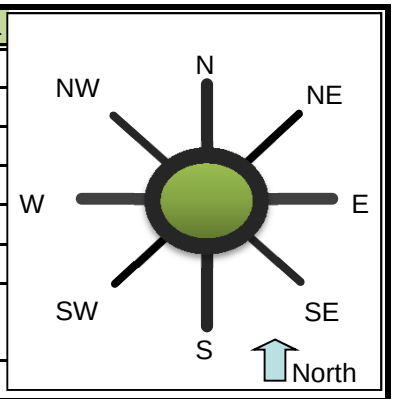
Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	2	2	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	2	0	2
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	2	2
HCM Control Delay	12.2	10.4	11.6
HCM LOS	B	B	B

Lane	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Volume Left (%)	100%	0%	0%	0%	100%	0%
Volume Thru (%)	0%	100%	100%	0%	0%	0%
Volume Right (%)	0%	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	180	125	120	150	145	165
Left Turning Volume	0	125	120	0	0	0
Through Volume	0	0	0	150	0	165
Right Turning Volume	180	0	0	0	145	0
Lane Flow Rate	205	142	136	170	165	188
Geometry Group	7	7	7	7	7	7
Degree of Utilization, X	0.374	0.24	0.234	0.259	0.313	0.294
Departure Headway, Hd	6.586	6.078	6.179	5.468	6.849	5.637
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	546	591	581	656	526	638
Service Time	4.32	3.813	3.915	3.204	4.583	3.371
HCM Lane V/C Ratio	0.375	0.24	0.234	0.259	0.314	0.295
HCM Control Delay	13.2	10.7	10.8	10.1	12.7	10.7
HCM Lane LOS	B	B	B	B	B	B
HCM 95th Percentile Queue	1.8	0.9	0.9	1	1.4	1.2

General & Site Information

v2.1

Analyst:	MTJ
Agency/Co:	MTJ Engineering
Date:	11/12/2012
Project or PI#:	Hazelhurst GA
Year, Peak Hour:	2036 AM
County/District:	
Intersection Name:	SR 135 / SR 19



Volumes		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph			165		180			
Exit	NE (2), vph								
Legs	E (3), vph	180				155			
(TO)	SE (4), vph								
	S (5), vph	125		145					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	305	0	310	0	335	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	95%	100%	95%	100%	95%	100%
% Heavy Vehicles	5%	0%	5%	0%	5%	0%	5%	0%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians **(ped/hr)**	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	0.952	1.000	0.952	1.000	0.952	1.000	1.000	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	188	0	205	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	205	0	0	0	177	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	143	0	165	0	0	0	0	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	0	0	0	0	0	0	0
Entry flow, pcu/h	348	0	354	0	382	0	0	0
Conflicting flow, pcu/h	165	0	205	0	205	0	0	0

Roundabout Type	Standard Single Lane or Urban Compact
Enter type here…	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	912	NA	876	NA	876	NA	NA	NA
Entry Flow Rates, vph	332	NA	337	NA	364	NA	NA	NA
V/C ratio	**0.36**		**0.38**		**0.42**			
Control Delay, s/veh	**8**		**9**		**9**			
LOS	A		A		A			
95th % Queue (ft)	**44**		**48**		**54**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1112	NA	1077	NA	1077	NA	NA	NA
Entry Flow Rates, vph	332	NA	337	NA	364	NA	NA	NA
V/C ratio	**0.31**		**0.33**		**0.35**			
Control Delay, sec/pcu	**6**		**7**		**7**			
LOS	A		A		A			
95th % Queue (ft)	**35**		**38**		**43**			

Notes: v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

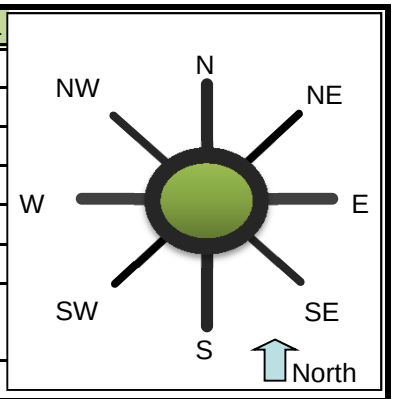
Bypass Lane Merge Point Analysis (if applicable)

Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
F_{ped}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr						
Conflicting Flow, pcu/hr						
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph						
Flow Rates of Exiting Traffic, vph						
V/C ratio						
Control Delay, s/veh						
LOS						
95th % Queue (ft)						
Approach w/Bypass Delay, s/veh						
Approach w/Bypass LOS						

General & Site Information

v2.1

Analyst:	MTJ
Agency/Co:	MTJ Engineering
Date:	11/12/2012
Project or PI#:	Hazelhurst GA
Year, Peak Hour:	2036 PM
County/District:	
Intersection Name:	SR 135 / SR 19



Volumes

		Entry Legs (FROM)							
		N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
	N (1), vph			170		120			
Exit	NE (2), vph								
Legs	E (3), vph	170				150			
(TO)	SE (4), vph								
	S (5), vph	165		150					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	335	0	320	0	270	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	95%	100%	95%	100%	95%	100%
% Heavy Vehicles	5%	0%	5%	0%	5%	0%	5%	0%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
# of Pedestrians **(ped/hr)**	0	0	0	0	0	0	0	0
PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
F_{HV}	0.952	1.000	0.952	1.000	0.952	1.000	1.000	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	194	0	137	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	194	0	0	0	171	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	188	0	171	0	0	0	0	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	0	0	0	0	0	0	0
Entry flow, pcu/h	382	0	365	0	308	0	0	0
Conflicting flow, pcu/h	171	0	137	0	194	0	0	0

Roundabout Type	Standard Single Lane or Urban Compact
Enter type here…	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	907	NA	938	NA	886	NA	NA	NA
Entry Flow Rates, vph	364	NA	348	NA	293	NA	NA	NA
V/C ratio	**0.40**		**0.37**		**0.33**			
Control Delay, s/veh	**9**		**8**		**8**			
LOS	A		A		A			
95th % Queue (ft)	**51**		**45**		**38**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1107	NA	1138	NA	1087	NA	NA	NA
Entry Flow Rates, vph	364	NA	348	NA	293	NA	NA	NA
V/C ratio	**0.35**		**0.32**		**0.28**			
Control Delay, sec/pcu	**7**		**6**		**6**			
LOS	A		A		A			
95th % Queue (ft)	**41**		**37**		**31**			

Notes: v2.1

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (if applicable)

Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Does the bypass have a dedicated receiving lane?						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
F_{ped}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow, pcu/hr						
Conflicting Flow, pcu/hr						
Bypass Lane Results (HCM 2010 Model)						
Entry Capacity of Bypass, vph						
Flow Rates of Exiting Traffic, vph						
V/C ratio						
Control Delay, s/veh						
LOS						
95th % Queue (ft)						
Approach w/Bypass Delay, s/veh						
Approach w/Bypass LOS						

Project: Hazlehurst GA 2036

Scheme name: PM

Control Data

Option	Setting	Option	Setting
Capacity Model	HCM	Mode	Mode2 - Full Geometry
Queue Model	HCM	Delay Model	HCM
Flows	Peak Hour Factor	Time Slice	7.5 minutes
Delay	Queuing	Light / Dark	Light

Geometry Data for HCM

Leg	Approach Geometry		
	Leg Name	Bearing	Lanes
1	NB SR 19	0	1
2	WB SR 135	120	1
3	SB SR 19	240	1

Leg	Number of Lanes		
	Entry	Circ	Exit
1	1	1	1
2	1	1	1
3	1	1	1

Leg	Opp Circ lanes	Lane Headways		Lane Headways		Opp Exit lanes	Bypass Headways	
		tf	tc	tf	tc		tf	tc
1	1			3.186	5.193			
2	1			3.186	5.193			
3	1			3.186	5.193			

Leg	Entry Capacity Mods	
	-+ Cap (v/h)	Xwalk Fact
1	0	1.000
2	0	1.000
3	0	1.000

Flow Modifiers and Flow Data

Leg	Leg Name	Flow Modifiers	
		%Truck	Factor
1	NB SR 19	6.0	1.00
2	WB SR 135	8.0	1.00
3	SB SR 19	6.0	1.00

Leg	Arrival Turning Flows (veh/hr)			
	U-Turn	Exit-2	Exit-1	Bypass
1	0	100	100	0
2	0	100	100	0
3	0	100	100	0

Leg	Entry Lane Props		Bypass Capacity Modifiers			PHF per leg
	Lane	Lane	Type	Cap -+	XWalkFact	
1	0.00	1.00	None	0	1.000	0.90
2	0.00	1.00	None	0	1.000	0.90
3	0.00	1.00	None	0	1.000	0.90

Model Results

Global performance

Leg	Leg Name	Global Performance				
		Parameter	Units	Entries	Bypasses	Total
1	NB SR 19	Arrive Flows	veh/hr	600		600
2	WB SR 135	Capacity	veh/hr	5714		8282
3	SB SR 19	Average Delay	sec/veh	4.79		4.79

Entry Queues and Delays (60min)

Leg	Flow Rate (veh/hr)			Opp Rate (veh/hr)		Capacity Rate (veh/hr)			Ave VCR			Ave Delays (sec/veh)				95% Queues (veh)			LOS A-F			
	Lane	Lane	Bypass	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Leg	Lane	Lane	Bypass	Ln	Ln	Bp	Leg
1		200		100			959			0.209			4.7		4.7		0.8			A		A
2		200		100			941			0.213			4.9		4.9		0.8			A		A
3		200		100			957			0.209			4.8		4.8		0.8			A		A

Entry Queues and Delays (Peak 15min)

Leg	Flow Rate (veh/hr)			Opp Rate (veh/hr)		Capacity Rate (veh/hr)			Ave VCR			Ave Delays (sec/veh)				95% Queues (veh)			LOS A-F			
	Lane	Lane	Bypass	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Leg	Lane	Lane	Bypass	Ln	Ln	Bp	Leg
1		222		111			947			0.234			5.0		5.0		0.9			A		A
2		222		111			930			0.239			5.1		5.1		0.9			A		A
3		222		111			945			0.235			5.0		5.0		0.9			A		A

Scheme Notes

(none)

Project: Hazlehurst GA 2036

Scheme name: PM

Control Data

Option	Setting	Option	Setting
Capacity Model	HCM	Mode	Mode2 - Full Geometry
Queue Model	HCM	Delay Model	HCM
Flows	Peak Hour Factor	Time Slice	7.5 minutes
Delay	Queuing	Light / Dark	Light

Geometry Data for HCM

Leg	Approach Geometry		
	Leg Name	Bearing	Lanes
1	NB SR 19	0	1
2	WB SR 135	120	1
3	SB SR 19	240	1

Leg	Number of Lanes		
	Entry	Circ	Exit
1	1	1	1
2	1	1	1
3	1	1	1

Leg	Opp Circ lanes	Lane Headways		Lane Headways		Opp Exit lanes	Bypass Headways	
		tf	tc	tf	tc		tf	tc
1	1			3.186	5.193			
2	1			3.186	5.193			
3	1			3.186	5.193			

Leg	Entry Capacity Mods	
	-+ Cap (v/h)	Xwalk Fact
1	0	1.000
2	0	1.000
3	0	1.000

Flow Modifiers and Flow Data

Leg	Leg Name	Flow Modifiers	
		%Truck	Factor
1	NB SR 19	6.0	1.00
2	WB SR 135	8.0	1.00
3	SB SR 19	6.0	1.00

Leg	Arrival Turning Flows (veh/hr)			
	U-Turn	Exit-2	Exit-1	Bypass
1	0	120	150	0
2	0	150	170	0
3	0	170	165	0

Leg	Entry Lane Props		Bypass Capacity Modifiers			PHF per leg
	Lane	Lane	Type	Cap -+	XWalkFact	
1	0.00	1.00	None	0	1.000	0.90
2	0.00	1.00	None	0	1.000	0.90
3	0.00	1.00	None	0	1.000	0.90

Model Results

Global performance

Leg	Leg Name	Global Performance				
		Parameter	Units	Entries	Bypasses	Total
1	NB SR 19	Arrive Flows	veh/hr	925		925
2	WB SR 135	Capacity	veh/hr	5437		7724
3	SB SR 19	Average Delay	sec/veh	6.04		6.04

Entry Queues and Delays (60min)

Leg	Flow Rate (veh/hr)			Opp Rate (veh/hr)		Capacity Rate (veh/hr)			Ave VCR			Ave Delays (sec/veh)				95% Queues (veh)			LOS A-F			
	Lane	Lane	Bypass	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Leg	Lane	Lane	Bypass	Ln	Ln	Bp	Leg
1		270		170			890			0.303			5.8		5.8		1.3			A		A
2		320		120			922			0.347			6.0		6.0		1.6			A		A
3		335		150			907			0.370			6.3		6.3		1.7			A		A

Entry Queues and Delays (Peak 15min)

Leg	Flow Rate (veh/hr)			Opp Rate (veh/hr)		Capacity Rate (veh/hr)			Ave VCR			Ave Delays (sec/veh)				95% Queues (veh)			LOS A-F			
	Lane	Lane	Bypass	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Leg	Lane	Lane	Bypass	Ln	Ln	Bp	Leg
1		300		189			873			0.344			6.3		6.3		1.5			A		A
2		356		133			909			0.392			6.5		6.5		1.9			A		A
3		372		167			890			0.418			6.9		6.9		2.1			A		A

Scheme Notes

(none)

Project: Hazlehurst GA 2036

Scheme name: PM

Control Data

Option	Setting	Option	Setting
Capacity Model	HCM	Mode	Mode2 - Full Geometry
Queue Model	HCM	Delay Model	HCM
Flows	Peak Hour Factor	Time Slice	7.5 minutes
Delay	Queuing	Light / Dark	Light

Geometry Data for HCM

Leg	Approach Geometry		
	Leg Name	Bearing	Lanes
1	Albert Avenue	0	1
2	Brian Close	120	1
3	Colin Crescent	240	1

Leg	Number of Lanes		
	Entry	Circ	Exit
1	1	1	1
2	1	1	1
3	1	1	1

Leg	Opp Circ lanes	Lane Headways		Lane Headways		Opp Exit lanes	Bypass Headways	
		tf	tc	tf	tc		tf	tc
1	1			3.186	5.193			
2	1			3.186	5.193			
3	1			3.186	5.193			

Leg	Entry Capacity Mods	
	-+ Cap (v/h)	Xwalk Fact
1	0	1.000
2	0	1.000
3	0	1.000

Flow Modifiers and Flow Data

Leg	Leg Name	Flow Modifiers	
		%Truck	Factor
1	Albert Avenue	5.0	1.00
2	Brian Close	5.0	1.00
3	Colin Crescent	5.0	1.00

Leg	Arrival Turning Flows (veh/hr)			
	U-Turn	Exit-2	Exit-1	Bypass
1	0	155	180	0
2	0	150	170	0
3	0	170	165	0

Leg	Entry Lane Props		Bypass Capacity Modifiers			PHF per leg
	Lane	Lane	Type	Cap -+	XWalkFact	
1	0.00	1.00	None	0	1.000	0.90
2	0.00	1.00	None	0	1.000	0.90
3	0.00	1.00	None	0	1.000	0.90

Model Results

Global performance

Leg	Leg Name	Global Performance				
		Parameter	Units	Entries	Bypasses	Total
1	Albert Avenue	Arrive Flows	veh/hr	990		990
2	Brian Close	Capacity	veh/hr	5466		7749
3	Colin Crescent	Average Delay	sec/veh	6.20		6.20

Entry Queues and Delays (60min)

Leg	Flow Rate (veh/hr)			Opp Rate (veh/hr)		Capacity Rate (veh/hr)			Ave VCR			Ave Delays (sec/veh)				95% Queues (veh)			LOS A-F			
	Lane	Lane	Bypass	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Leg	Lane	Lane	Bypass	Ln	Ln	Bp	Leg
1		335		170			900			0.372			6.4		6.4		1.8			A		A
2		320		155			914			0.350			6.1		6.1		1.6			A		A
3		335		150			919			0.365			6.2		6.2		1.7			A		A

Entry Queues and Delays (Peak 15min)

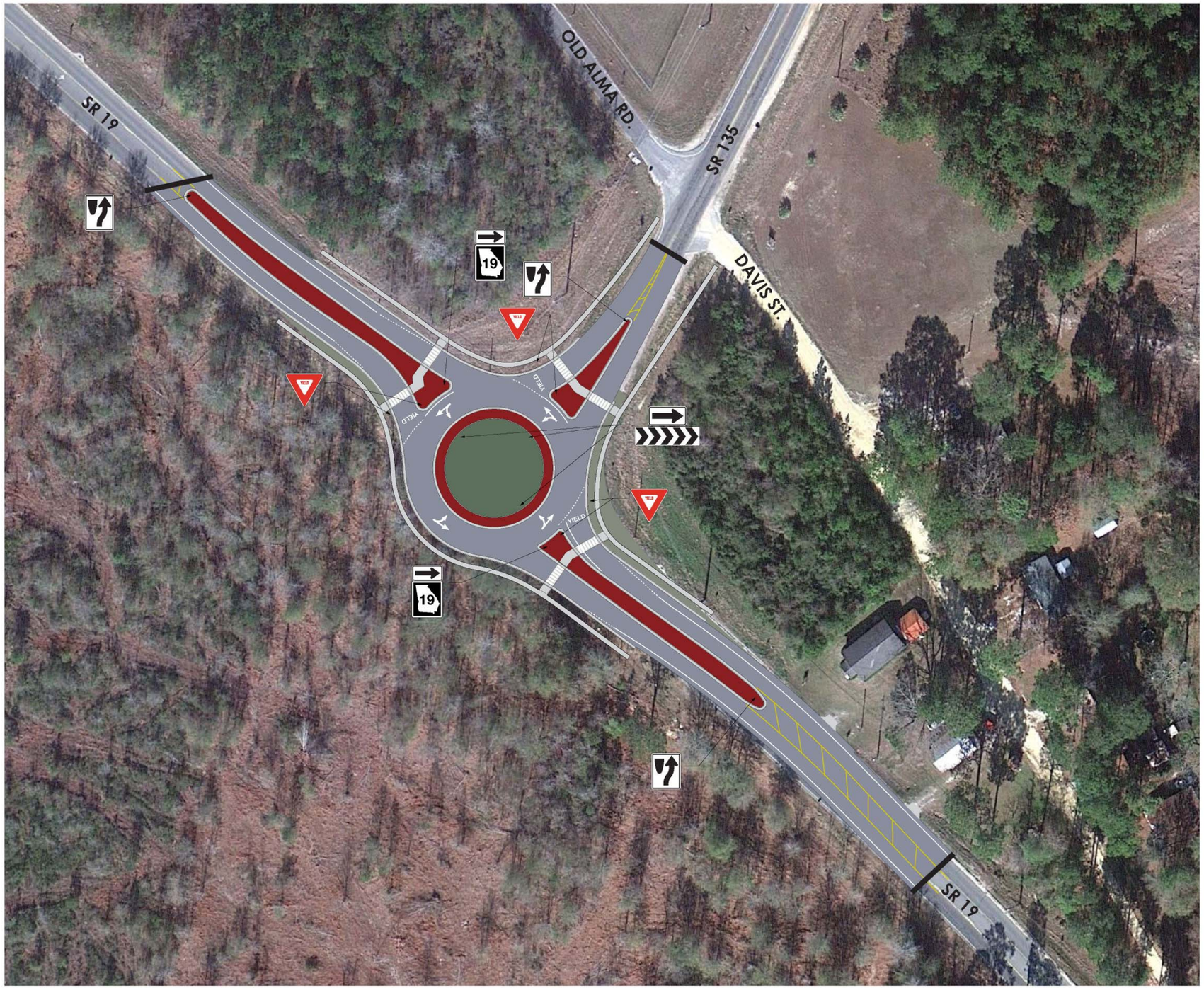
Leg	Flow Rate (veh/hr)			Opp Rate (veh/hr)		Capacity Rate (veh/hr)			Ave VCR			Ave Delays (sec/veh)				95% Queues (veh)			LOS A-F			
	Lane	Lane	Bypass	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Lane	Lane	Bypass	Leg	Lane	Lane	Bypass	Ln	Ln	Bp	Leg
1		372		189			883			0.421			7.0		7.0		2.1			A		A
2		356		172			898			0.396			6.6		6.6		1.9			A		A
3		372		167			903			0.412			6.7		6.7		2.0			A		A

Scheme Notes

(none)

Appendix B

Drawings (“11x17” Format)



SR19 & SR135

HAZELHURST, GEORGIA

11.30.2012

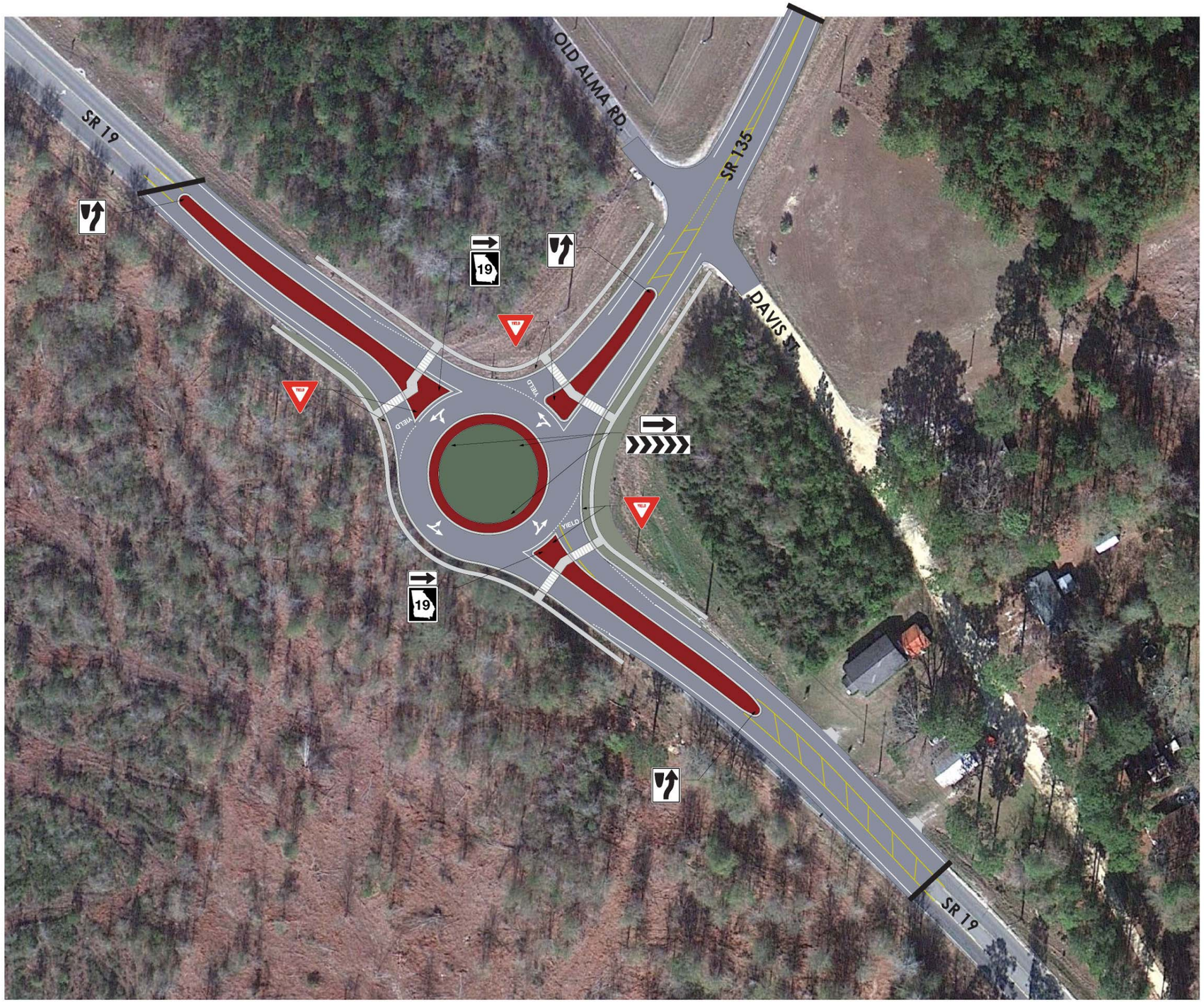
ROUNDABOUT ALTERNATIVE A

MTJ ENGINEERING

313 PRICE PLACE #5
MADISON, WI 53705

PH| 608.238.5000
FX| 866.846.5552
EM| INFO@MTJENGINEERING.COM

WB| WWW.MTJENGINEERING.COM



SR19 & SR135

HAZELHURST, GEORGIA

11.30.2012

ROUNDABOUT ALTERNATIVE B

MTJ ENGINEERING
313 PRICE PLACE #5
MADISON, WI 53705
PH| 608.238.5000
FX| 866.846.5552
EM| INFO@MTJENGINEERING.COM
WB| WWW.MTJENGINEERING.COM

SR19 & SR135

HAZELHURST, GEORGIA

11.30.2012

ALL-WAY STOP ALTERNATIVE

MTJ ENGINEERING
313 PRICE PLACE #5
MADISON, WI 53705
PH| 608.238.5000
FX| 866.846.5552
EM| INFO@MTJENGINEERING.COM
WB| WWW.MTJENGINEERING.COM

PROJ. NO.: CSBRG-0007-00(054)
P.I. NO. 0007054
DATE: 10/22/2012

Base Construction Cost		$	967,581.14
E & I	5%	$	48,379.06
Construction Contingency	0	$	-
Subtotal Construction Cost		$	1,015,960.20
Liquid AC Adjustment (50 % cap)		$	42,772.77
Total Construction Cost		**$**	**1,058,732.97**

PROJ. NO.	N/A	CALL NO.
P.I. NO.	0009875	
DATE	10/22/2012	

INDEX (TYPE)	**DATE**	**INDEX**
REG. UNLEADED	Oct-12	$ 3.595
DIESEL		$ 4.019
LIQUID AC		$ 571.00

Link to Fuel and AC Index:
http://www.dot.ga.gov/doingbusiness/Materials/Pages/asphaltcementindex.aspx

LIQUID AC ADJUSTMENTS

PA=[((APM-APL)/APL)]xTMTxAPL

Asphalt

Price Adjustment (PA)			**42037.02**	**$**	**42,037.02**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$ 913.60		
Monthly Asphalt Cement Price month project let (APL)			$ 571.00		
Total Monthly Tonnage of asphalt cement (TMT)			122.7		

ASPHALT	**Tons**	**%AC**	**AC ton**
Leveling		5.0%	0
12.5 OGFC		5.0%	0
12.5 mm		5.0%	0
9.5 mm SP	484	5.0%	24.2
25 mm SP	1182	5.0%	59.1
19 mm SP	788	5.0%	39.4
	2454		**122.7**

BITUMINOUS TACK COAT

Price Adjustment (PA)			**$ 735.75**	**$**	**735.75**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$ 913.60		
Monthly Asphalt Cement Price month project let (APL)			$ 571.00		
Total Monthly Tonnage of asphalt cement (TMT)			2.147550461		

Bitum Tack Gals	gals/ton	tons
500	232.8234	2.14755046

BITUMINOUS TACK COAT (surface treatment)

Price Adjustment (PA)			**0**	**$**	**-**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$ 913.60		
Monthly Asphalt Cement Price month project let (APL)			$ 571.00		
Total Monthly Tonnage of asphalt cement (TMT)			0		

Bitum Tack	SY	Gals/SY	Gals	gals/ton	tons
Single Surf. Trmt.		0.20	0	232.8234	0
Double Surf.Trmt.		0.44	0	232.8234	0
Triple Surf. Trmt		0.71	0	232.8234	0
					0

TOTAL LIQUID AC ADJUSTMENT	**$**	**42,772.77**

DETAILED COST ESTIMATE

Georgia Department of Transportation

Job: 0009875

JOB NUMBER *0009875* **FED/STATE PROJECT NUMBER**

SPEC YEAR: *01*

DESCRIPTION: *SR19 / US23 AT SR 135 CONNECTOR JEFF DAVIS COUNTY ROUNDABOUT*

ITEMS FOR JOB 0009875

0010 - ROADWAY

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0280	150-1000	1.000	LS	$50,000.00000	TRAFFIC CONTROL - 0009875	$50,000.00
0045	210-0100	1.000	LS	$200,000.00000	GRADING COMPLETE - 0009875	$200,000.00
0020	310-1101	4835.000	TN	$18.74975	GR AGGR BASE CRS, INCL MATL	$90,655.04
0005	402-3103	484.000	TN	$72.33854	REC AC 9.5 MM SP,TPII,GP2, INCL BM & H L	$35,011.85
0015	402-3121	1182.000	TN	$74.83401	RECYL AC 25MM SP,GP1/2,BM&HL	$88,453.80
0010	402-3190	788.000	TN	$82.36067	RECYL AC 19 MM SP,GP 1 OR 2 ,INC BM&HL	$64,900.21
0014	413-1000	500.000	GL	$3.32328	BITUM TACK COAT	$1,661.64
0035	439-0022	603.000	SY	$66.00000	PLN PC CONC PVMT CL3 10" THK	$39,798.00
0025	441-0104	1762.000	SY	$30.27927	CONC SIDEWALK, 4 IN	$53,352.07
0030	441-0740	530.000	SY	$26.17138	CONC MEDIAN, 4 IN	$13,870.83
0060	441-5008	245.000	LF	$15.84000	CONC HEADER CURB, 6 IN, TP 7	$3,880.80
0055	441-5025	360.000	LF	$14.90000	CONC HEADER CURB, 4", TP 9	$5,364.00
0050	441-6222	3820.000	LF	$14.07889	CONC CURB & GUTTER/ 8"X30"TP2	$53,781.36
					SUBTOTAL FOR ROADWAY:	**$700,729.60**

0020 - DRAINAGE

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0085	441-0301	5.000	EA	$1,741.96875	CONC SPILLWAY, TP 1	$8,709.84
0070	550-1180	600.000	LF	$26.91145	STM DR PIPE 18",H 1-10	$16,146.87
0075	550-2180	50.000	LF	$27.35573	SIDE DR PIPE 18",H 1-10	$1,367.79
0080	550-4218	5.000	EA	$485.84445	FLARED END SECT 18 IN, ST DR	$2,429.22
0065	668-2100	10.000	EA	$1,782.57043	DROP INLET, GP 1	$17,825.70
					SUBTOTAL FOR DRAINAGE:	**$46,479.42**

0030 - EROSION CONTROL PERMANENT

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0155	603-2182	25.000	SY	$51.57489	STN DUMPED RIP RAP, TP 3, 24"	$1,289.37
0160	603-7000	25.000	SY	$2.97231	PLASTIC FILTER FABRIC	$74.31
0090	700-6910	3.000	AC	$491.46186	PERMANENT GRASSING	$1,474.39
0095	700-7000	9.000	TN	$54.26100	AGRICULTURAL LIME	$488.35
0100	700-8000	6.000	TN	$430.60549	FERTILIZER MIXED GRADE	$2,583.63
0105	700-8100	300.000	LB	$2.21899	FERTILIZER NITROGEN CONTENT	$665.70
0165	716-2000	50.000	SY	$1.59322	EROSION CONTROL MATS, SLOPES	$79.66
					SUBTOTAL FOR EROSION CONTROL PERMANENT:	**$6,655.41**

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DETAILED COST ESTIMATE

Georgia Department of Transportation

Job: 0009875

0040 - EROSION CONTROL TEMPORARY

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0110	163-0232	2.000	AC	$207.35014	TEMPORARY GRASSING	$414.70
0115	163-0240	65.000	TN	$213.25434	MULCH	$13,861.53
0120	163-0300	3.000	EA	$1,201.38567	CONSTRUCTION EXIT	$3,604.16
0195	163-0503	2.000	EA	$355.18105	CONSTR AND REMOVE SILT CONTROL GATE,TP 3	$710.36
0175	163-0527	20.000	EA	$226.72472	CNST/REM RIP RAP CKDM,STN P RIPRAP/SN BG	$4,534.49
0190	163-0528	1500.000	LF	$3.45487	CONSTR AND REM FAB CK DAM -TP C SLT FN	$5,182.31
0170	163-0529	100.000	LF	$3.68362	CNST/REM TEMP SED BAR OR BLD STRW CK DM	$368.36
0135	163-0550	10.000	EA	$150.58150	CONS & REM INLET SEDIMENT TRAP	$1,505.82
0130	165-0030	1600.000	LF	$0.70121	MAINT OF TEMP SILT FENCE, TP C	$1,121.94
0180	165-0041	1700.000	LF	$1.06447	MAINT OF CHECK DAMS - ALL TYPES	$1,809.60
0205	165-0071	50.000	LF	$3.02855	MAINT OF SEDIMENT BARRIER - BALED STRAW	$151.43
0200	165-0087	2.000	EA	$111.38174	MAINT OF SILT CONTROL GATE, TP 3	$222.76
0185	165-0101	3.000	EA	$452.93946	MAINT OF CONST EXIT	$1,358.82
0140	165-0105	10.000	EA	$49.60920	MAINT OF INLET SEDIMENT TRAP	$496.09
0145	167-1000	3.000	EA	$228.40549	WATER QUALITY MONITORING AND SAMPLING	$685.22
0150	167-1500	12.000	MO	$649.96609	WATER QUALITY INSPECTIONS	$7,799.59
0125	171-0030	3200.000	LF	$2.79017	TEMPORARY SILT FENCE, TYPE C	$8,928.54
					SUBTOTAL FOR EROSION CONTROL TEMPORARY:	**$52,755.72**

0050 - LANDSCAPE

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0210	700-9300	1410.000	SY	$3.76676	SOD	$5,311.13
0215	702-0212	3.000	EA	$291.00000	CRATAEGUS VIRIDIS - 0009875	$873.00
0220	702-0469	82.000	EA	$33.00000	ILEX VOMITORIA SCHILLINGS - 0009875	$2,706.00
0225	702-9005	38.000	LB	$80.00000	SPRING APPLICATION FERTILIZER	$3,040.00
0230	702-9025	403.000	SY	$20.00000	LANDSCAPE MULCH	$8,060.00
					SUBTOTAL FOR LANDSCAPE:	**$19,990.13**

0060 - SIGNING & MARKING

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0245	636-1020	84.000	SF	$14.65688	HWY SGN,TP1MAT,REFL SH TP3	$1,231.18
0240	636-1033	27.000	SF	$20.42681	HWY SIGNS, TP1MAT,REFL SH TP 9	$551.52
0235	636-2070	126.000	LF	$7.25426	GALV STEEL POSTS, TP 7	$914.04
0250	653-0130	6.000	EA	$88.09395	THERM PVMT MARK, ARROW, TP 3	$528.56
0260	653-1501	5400.000	LF	$0.49695	THERMO SOLID TRAF ST 5 IN, WHI	$2,683.53
0255	653-1502	1000.000	LF	$0.73815	THERMO SOLID TRAF ST, 5 IN YEL	$738.15
0265	653-1704	66.000	LF	$5.20611	THERM SOLID TRAF STRIPE,24",WH	$343.60
0270	653-1804	210.000	LF	$2.04896	THERM SOLID TRAF STRIPE, 8",WH	$430.28
					SUBTOTAL FOR SIGNING & MARKING:	**$7,420.86**

0070 - LIGHTING

Line Number	ITEM	QUANTITY	UNITS	PRICE	DESCRIPTION	AMOUNT
0275	682-9030	1.000	LS	$133,550.00000	LIGHTING SYSTEM CONCEPT LEVEL EST.	$133,550.00
					SUBTOTAL FOR LIGHTING:	**$133,550.00**

TOTALS FOR JOB 0009875

ITEMS COST:	**$967,581.14**
COST GROUP COST:	**$0.00**
ESTIMATED COST:	**$967,581.14**
CONTINGENCY PERCENT:	**0.00**
ENGINEERING AND INSPECTION:	**0.05**
ESTIMATED COST WITH CONTINGENCY AND E&I:	**$1,015,960.20**

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GEORGIA DEPARTMENT OF TRANSPORTATION
PRELIMINARY ROW COST ESTIMATE SUMMARY

Date: 12/17/2012 Project: 0009875
Revised: County: Jeff Davis
PI: 0009875

Description: Roundabout
Project Termini: Roundabout

Existing ROW: Varies
Parcels: 3 Required ROW: Varies

Land and Improvements		$52,500.00
Proximity Damage	*$0.00*	
Consequential Damage	*$0.00*	
Cost to Cures	*$0.00*	
Trade Fixtures	*$0.00*	
Improvements	*$15,000.00*	
Valuation Services		$3,000.00
Legal Services		$39,525.00
Relocation		$6,000.00
Demolition		$0.00
Administrative		$28,500.00
TOTAL ESTIMATED COSTS		$129,525.00
TOTAL ESTIMATED COSTS (ROUNDED)		***$130,000.00***

Preparation Credits	Hours	Signature

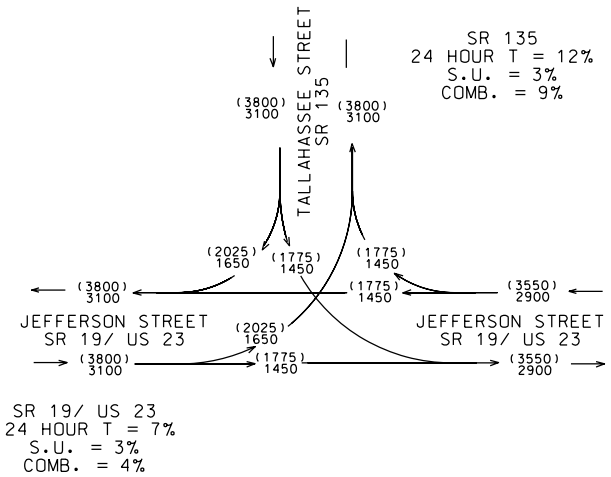
Prepared By: Lashonne Alexander CG#: 286999 12/17/2012
Approved By: [illegible] CG#: 286999 12/17/2012

NOTE: No Market Appreciation is included in this Preliminary Cost Estimate

allsop

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NO BUILD
2036 ADT = (000)
2016 ADT = 000



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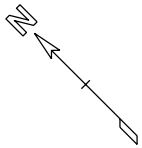
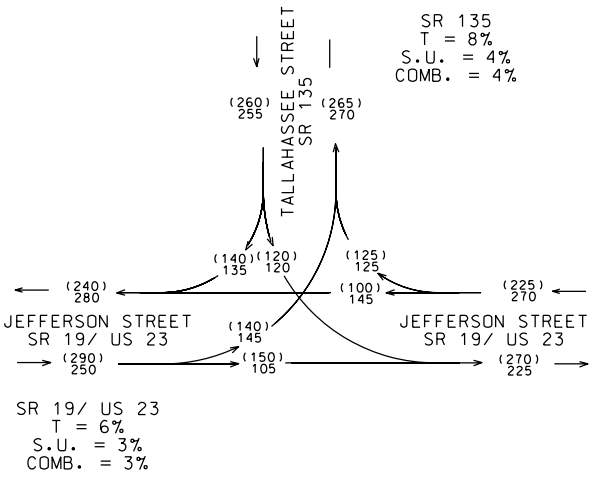
2016 PM DHV = (000)
2016 AM DHV = 000

JEFF DAVIS COUNTY





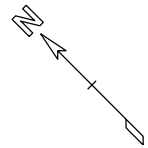
P.I.# 0009875
JEFF DAVIS COUNTY
SR-19/ US 23
AT
SR 135 CONNECTOR

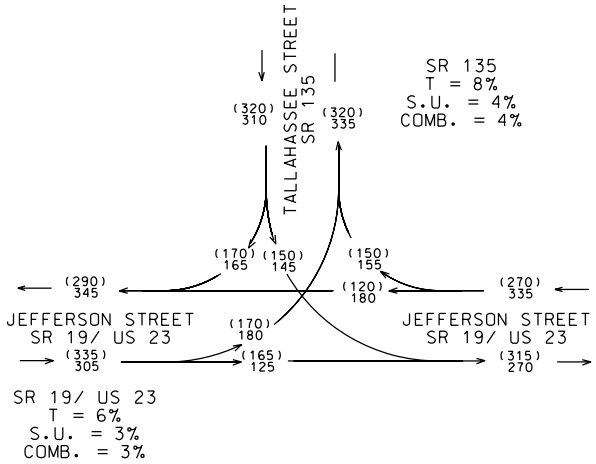
DRF
10/12

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

NO BUILD
2036 PM DHV = (000)
2036 AM DHV = 000

JEFF DAVIS COUNTY



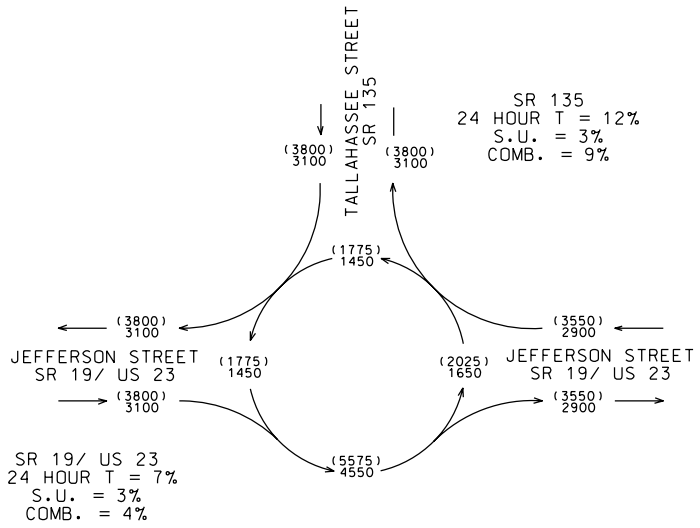


P.I.# 0009875
JEFF DAVIS COUNTY
SR-19/ US 23
AT
SR 135 CONNECTOR

DRF
10/12

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

BUILD
2036 ADT = (000)
2016 ADT = 000



BUILD
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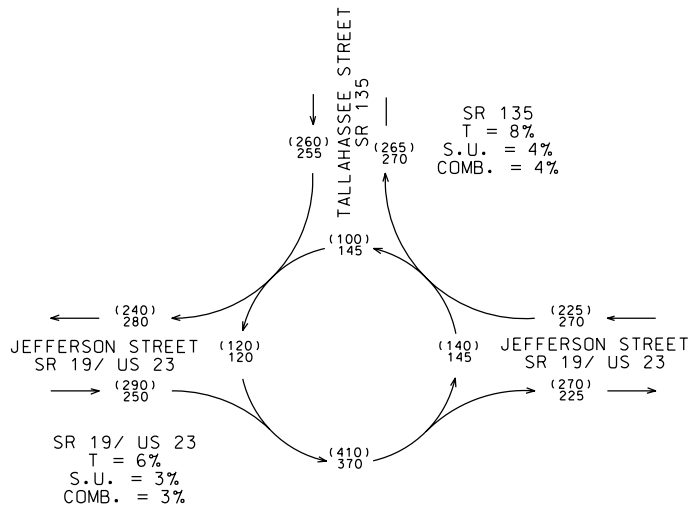
2016 AM DHV = 000

JEFF DAVIS COUNTY



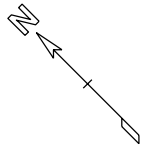
P.I.# 0009875
JEFF DAVIS COUNTY
SR-19/ US 23
AT
SR 135 CONNECTOR

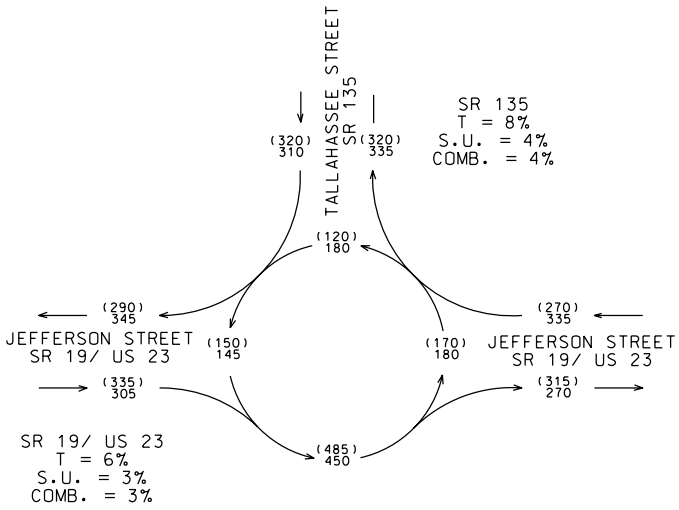
DRF
10/12

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

BUILD
2036 PM DHV = (000)
2036 AM DHV = 000

JEFF DAVIS COUNTY



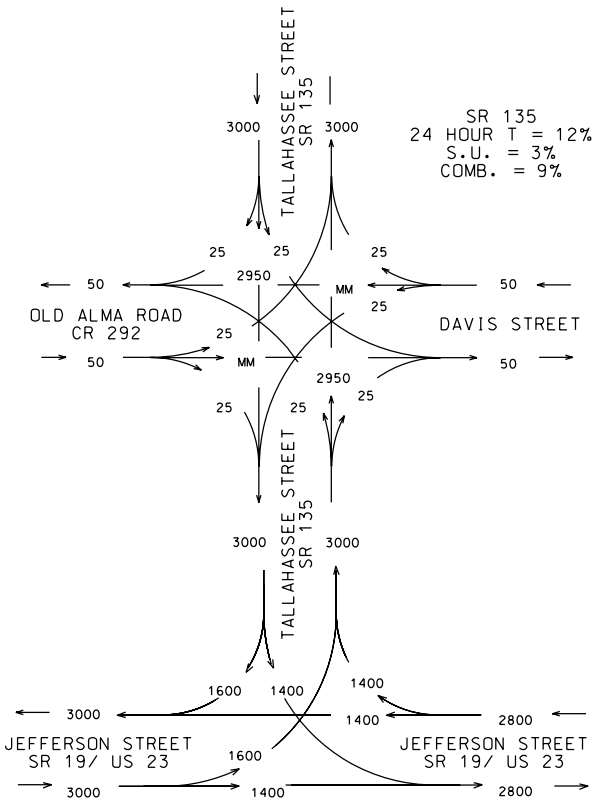


P.I.# 0009875
JEFF DAVIS COUNTY
SR-19/ US 23
AT
SR 135 CONNECTOR

DRF
10/12

GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE OF PLANNING

2012 ADT



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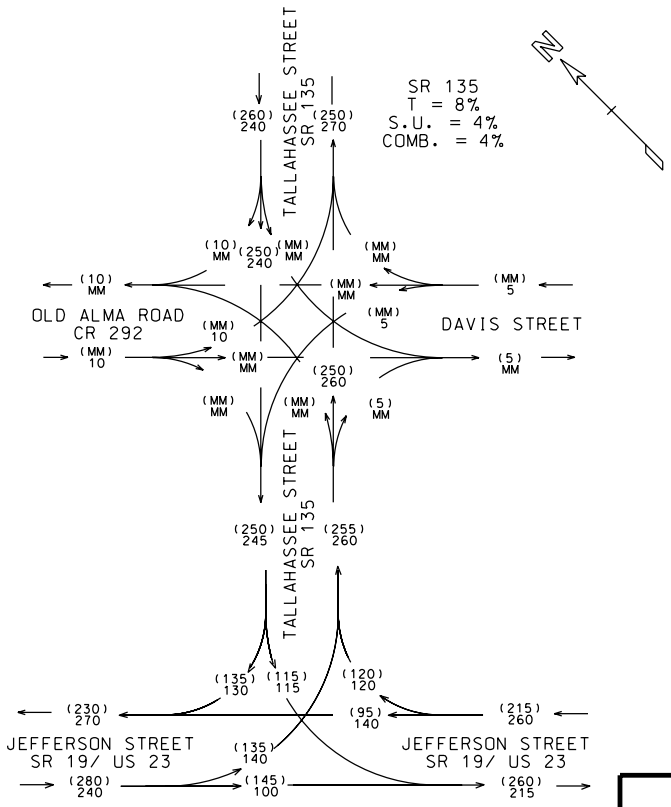
2012 AM DHV = 000

JEFF DAVIS COUNTY



P.I.# 0009875
JEFF DAVIS COUNTY
SR-19/ US 23
AT
SR 135 CONNECTOR

DRF
10/12

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENTAL CORRESPONDENCE

FILE: **P.I. 0009875**
SR 19 AT SR 135 CONN
JEFF DAVIS COUNTY

OFFICE: Jesup, Georgia

DATE: January 10, 2011

FROM: Anthony(Tony) J. Collins, District Engineer RTM

TO: Kathy Zahul, P.E., State Traffic Engineer
Atlanta, Georgia

ATTN: **Paul Denard, EIT, Traffic Design Engineer, TMC**

SUBJECT: **TRAFFIC ENGINEERING STUDY (Roundabout Evaluation)**

Enclosed, please find a Traffic Engineering Study along with a Roundabout Analysis for the above referenced location. This office is recommending that a Single Lane Roundabout be installed under the existing Safety Project (P.I. 0009875).

If you should have any questions or comments, please contact, Neil Dubberly of this office at (912) 427-1907.

RTM:REH:END

Enclosure

C: Matthew McKenzie, Area Engineer, Baxley
Scott Zehngraff, P.E., General Operations Mgr-TMC. W/Attachments
Jesup Files

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INDICATION OF ROUNDABOUT SUPPORT

To the Georgia Department of Transportation:

Attn: State Traffic Engineer
935 E. Confederate Ave, Building 24
Atlanta, GA 30316

Location

The BOARD of COMMISSIONERS in JEFF DAVIS County supports the consideration of a roundabout at the location specified below.

Local Street Names: LARRY CONTOS BLVD. at ALMA RD.

State/County Route Numbers: SR 19 at SR 135CO

Associated Conditions

The undersigned agrees to participate in the following maintenance of the intersection in the event that the roundabout is selected as the preferred concept alternative:

- The full and entire cost of the electric energy used for any lighting installed and the maintenance thereof (if needed)
- Any maintenance costs associated with the landscaping as approved by the local government and the Georgia Department of Transportation (after construction is complete)

We agree to participate in a formal Local Government Lighting Project Agreement during the preliminary design phase. This indication of support is submitted and all of the conditions are hereby agreed to. The undersigned are duly authorized to execute this agreement.

This is the 15 day of SEPTEMBER, 20 10

By: [signature]

Title: INTERIM COUNTY ADMINISTRATOR

Attest:

Sherri Lytle
Clerk

TRAFFIC ENGINEERING STUDY/ ROUNDABOUT EVALUATION
P.I. 0009875
SR 19 AT SR 135CONN
JEFF DAVIS COUNTY

Keeping Georgia on the Move

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
January 10, 2011
M.P. 10.81

Prepared by

District 5
Traffic Operations

TRAFFIC ENGINEERING STUDY
SR 19 AT SR 135CONN
JEFF DAVIS COUNTY

STUDY LOCATION

The intersection of State Route (SR) 19 at SR 135CONN in Jeff Davis County has been examined for a proposed Roundabout Improvement Project. This intersection is located along SR 19, 0.90 miles South of SR 27. For the purposes of this report, SR 19 has a North/South orientation and SR 135CONN has an East/West orientation. (See attached site map and adjacent signalized intersection map).

REASON FOR INVESTIGATION

The Department has investigated this location to determine if a Roundabout could be constructed to improve the traffic flow and overall safety of the study intersection.

TOPOGRAPHY

At the study location, SR 19 is a two lane roadway. The Northbound approach has a dedicated right turn lane and one thru lane. The Southbound approach of SR 19 forms a T-Intersection with SR 135CONN and SR 19 Northbound. SR 19 Southbound has a dedicated left turn lane and a right turn slip.

SR 135CONN is a two lane roadway with a dedicated left turn lane and a thru lane at the study intersection. The thru lane is 14 feet in width and the left turn lane is 12 feet in width.

Intersection sight distance was measured using a driver's eye height of 42" and a vehicle height of 42" per ASHTO guidelines. Sight distance measurements are shown below.

SR 19 Southbound approach looking West on SR 135CONN	**1500ft.**
SR 19 Southbound approach looking East on SR 19	**1050ft.**

There is no development in any quadrant at the intersection of SR 19 and SR 135CONN.

TRAFFIC ENGINEERING STUDY
SR 19 AT SR 135CONN
JEFF DAVIS COUNTY

EXISTING TRAFFIC CONTROL

SR 19 Northbound and SR 135CONN Eastbound carries free flow traffic at its intersection with SR 19 Southbound. SR 19 Southbound left turn lane is controlled by a stop sign and stop bar. SR 19 Southbound right turn slip is controlled by a yield sign.

VEHICLE VOLUME HISTORY

Table 1- AADT for SR 19 and SR 135CONN		
YEAR	SR 19 (TC#0178)	SR 135CO (TC#0181)
2008	3,700	5,670
2007	3,850	6,640
2006	3,590	6,430
2005	4,240	6,520

P/P OR PROTECTED ONLY PHASING DOCUMENTATION

This product analysis yields the following for SR 135CONN Eastbound left turn:

AM Peak hour- 155 left turns X 299 opposing through/right turn vehicles = 46,345
Midday Peak Hour-190 turns X 133 opposing through/right turn vehicles = 25,270
PM Peak Hour- 217 left turns X 332 opposing through/right turn vehicles = 72,044

TRAFFIC ENGINEERING STUDY
SR 19 AT SR 135CONN
JEFF DAVIS COUNTY

VEHICLUAR SPEEDS

The posted speed limit for the Northbound approach of SR 19 IS 45 MPH. The posted speed limit for the Southbound approach of SR 19 IS 50 MPH. The posted speed limit for the Eastbound approach of SR 135CONN is 45 MPH.

PEDESTRIAN MOVEMENTS

During the peak hour traffic counts, no pedestrians were recorded crossing any approach of the intersection. There are no sidewalks or crosswalks present at the study intersection.

PARKING

On-street parking is not permitted along SR 19 or SR 135CONN in the vicinity of the intersection.

COLLISION HISTORY

Collision data was available for the study intersection between the time period of September 2004 to November 2009. A total of 17 collisions were reported. Below see the type of accident.

CRASHES	2009	2008	2007	2006	2005	2004
RIGHT ANGLE		1	1			
LEFT TURN	2	1	3	2	1	
REAR END	2	2				1
HEAD ON						
SIDESWIPE					1	
OTHER						

(See attached collision diagram)

TRAFFIC ENGINEERING STUDY
SR 19 AT SR 135CONN
JEFF DAVIS COUNTY

MUTCD SIGNAL WARRANT ANALYSIS

A traffic signal warrant analysis was performed for the intersection of SR 19 and SR 135CONN using the criteria provided in the Manual on Uniform Traffic Control Devices MUTCD, 2009 Edition. The data for the study was imported into the PC WARRANTS program for analysis and justification.
(See attached PC Warrants Analysis)

OTHER INFORMATION

A Preliminary sketch of the proposed Roundabout is included in this study.

A Highway Capacity Analysis was performed using HCS+. The analysis was performed for the existing operation. (See Attached Analysis).

A Roundabout analysis was run for the study intersection using GDOT Roundabout Analysis Tool v1.3 (See Attached Analysis)

CONCLUSIONS

An examination of traffic volumes and collision experience indicates that none of the MUTCD signal warrants are satisfied at this intersection using 100% values.

Of the 17 collisions reported 9 are Left turn crashes. 12 of the reported crashes would be correctable by the installation of a Roundabout.

There is a high volume of Left Turning Vehicles on SR 135 Conn EB and SR 19 SB. (See Attached Volume Counts)

The Highway Capacity Analysis for the existing operation shows an approach LOS of "C" for the Westbound approach (SR19 SB) at the study intersection.

The GDOT Roundabout Analysis Tool shows a LOS "A" for all approaches.

TRAFFIC ENGINEERING STUDY
SR19 AT SR135 CONN
JEFF DAVIS COUNTY

RECOMMENDATIONS

Based on an analysis of traffic data, collision experience and intersection operations. The following action is recommended.

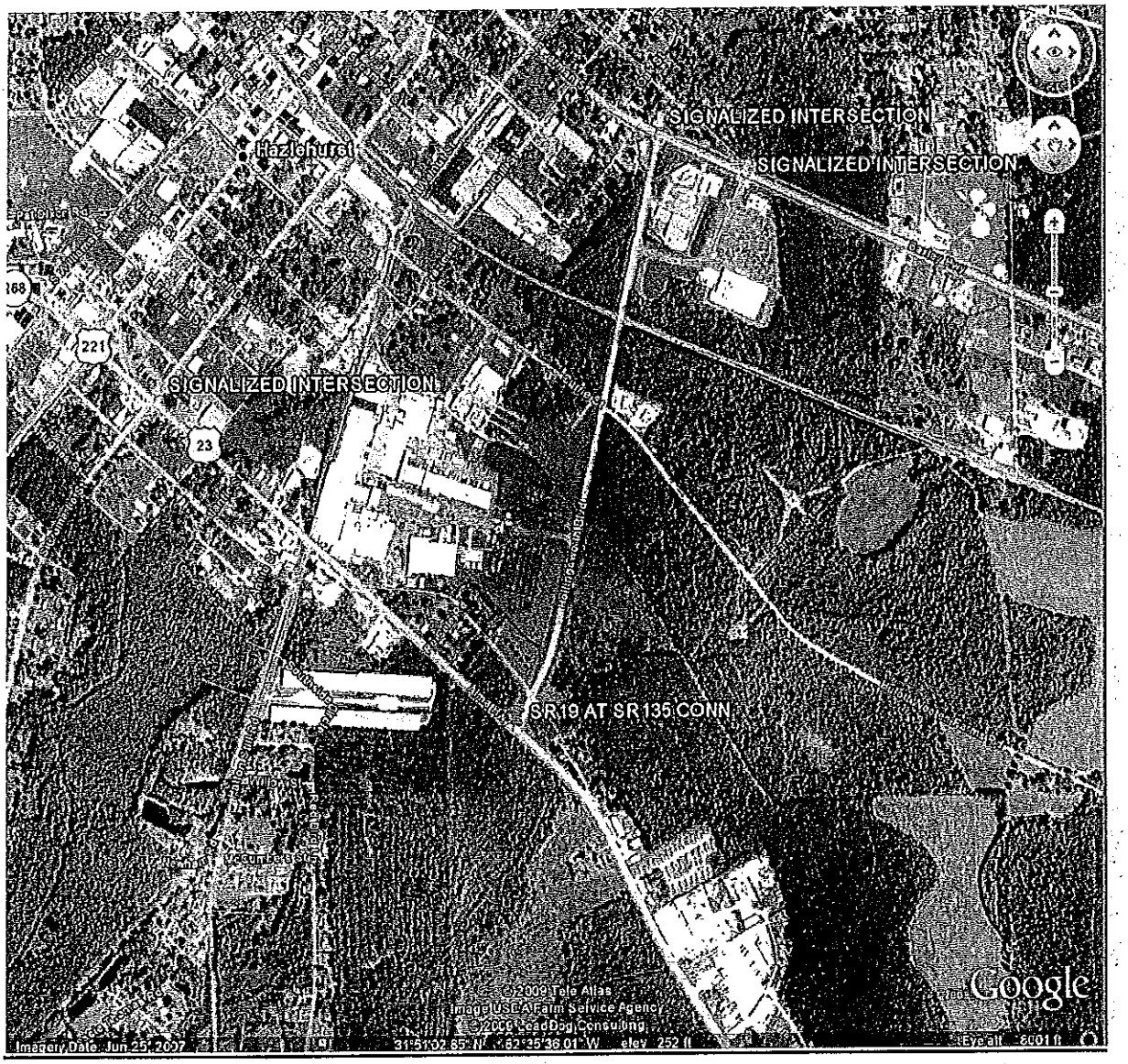
- **It is recommended that a Single Lane Roundabout be installed at the study intersection.**
- **It is recommended that the Single Lane Roundabout be installed under GDOT Safety Project P.I. #0009875**

RECOMMENDED BY: _____ *DATE:* 1-14-11
District Traffic Engineer

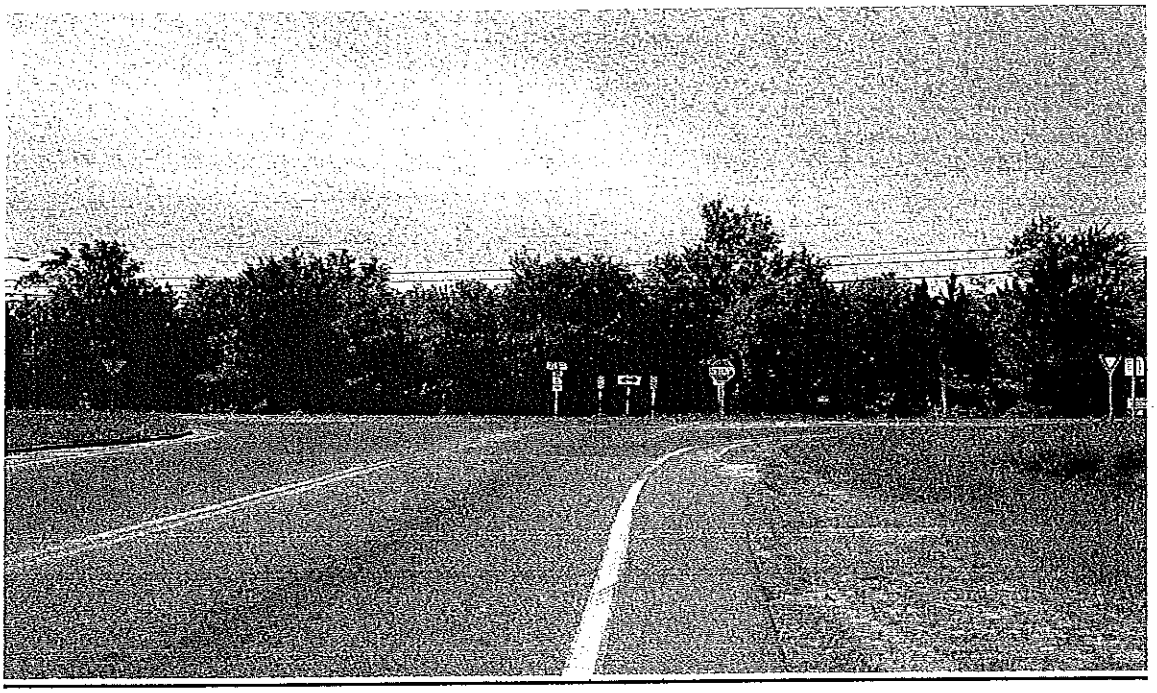
RECOMMENDED BY: _____ *DATE:* _____
State Traffic Engineer

RECOMMENDED BY: _____ *DATE:* _____
Director of Operations

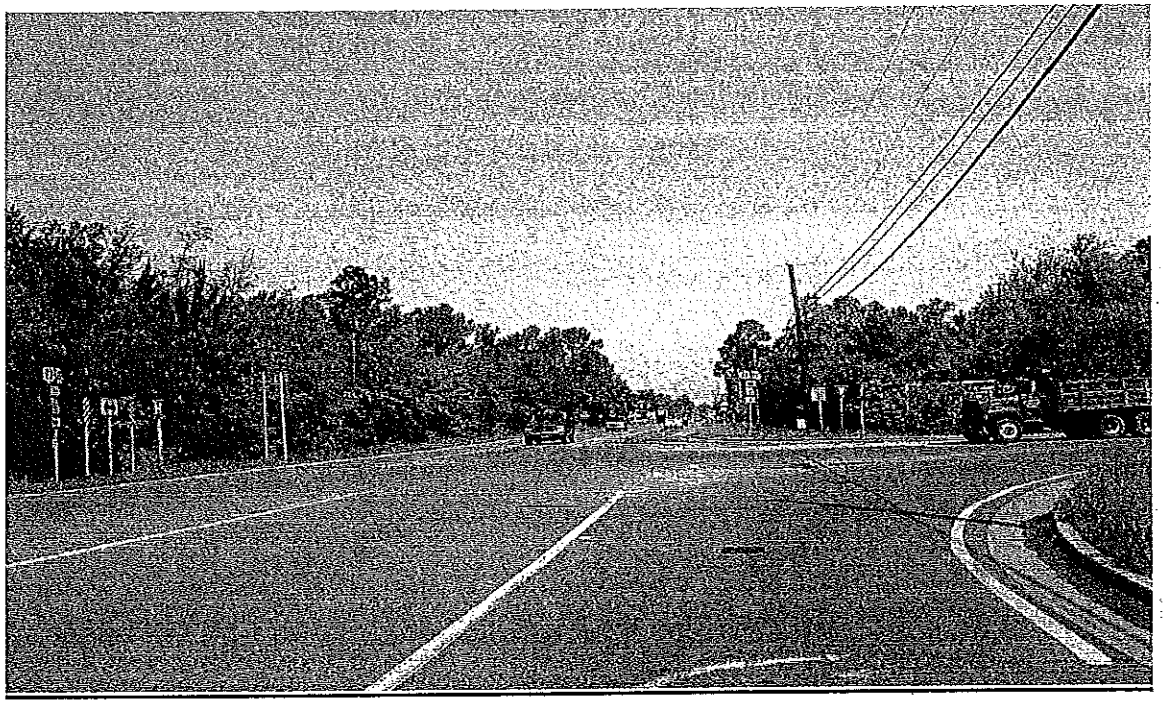
SITE/SIGNALIZED INTERSECTION MAP



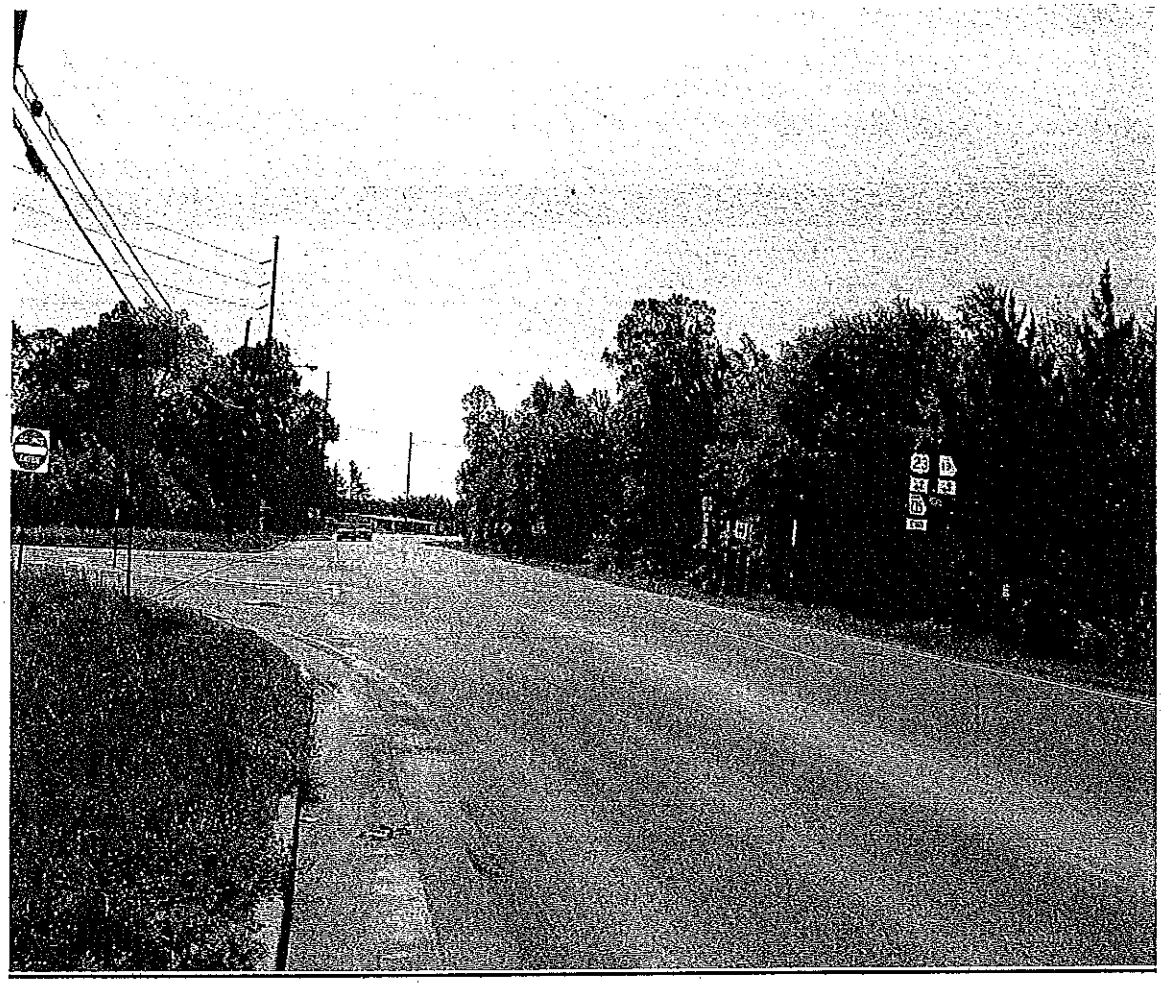
SR19 AT SR135 CONN
STUDY INTERSECTION



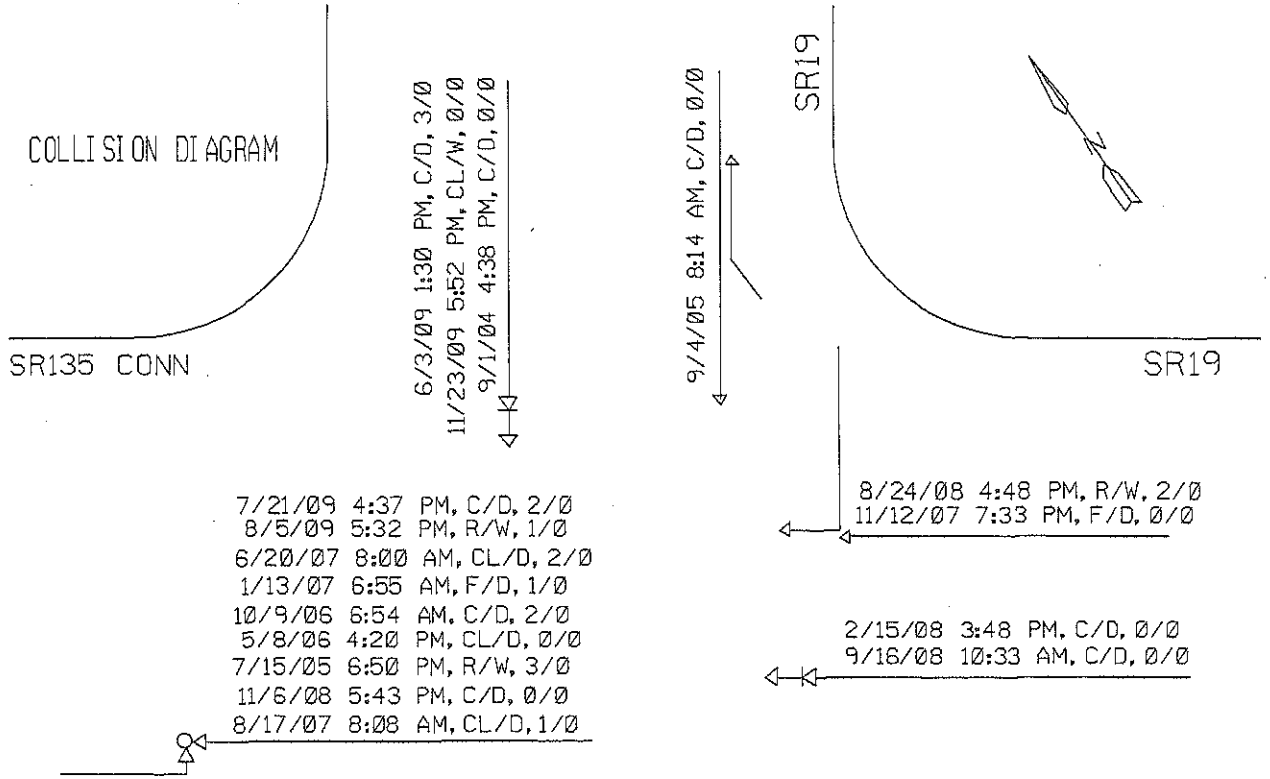
SR19 SOUTHBOUND APPROACH AT SR135 CONN



SR19 NORTHBOUND APPROACH AT SR135 CONN



SR135 CONN EASTBOUND APPROACH AT SR19



TIME OF DAY	NO. ACC.
6 AM - 10 AM	5
10 AM - 4 PM	3
4 PM - 7 PM	8
7 PM - 12 MID	1
12 MID - 6 AM	0
TOTAL	17

DIR. OF APPROACH	NO. VEH.
NORTH	1
SOUTH	9
EAST	9
WEST	15
TOTAL	34

WEATHER	NO. ACC'S.
CLEAR	8
CLOUDY	4
RAIN	3
FOG	2
SNOW	0
TOTAL	17

TYPE ACCIDENT	NO. ACC'S.
SIDESWIPE	3
REAR END	5
RT. ANGLE	0
LEFT TURN	9
OTHER	0
TOTAL	17

PAVEMENT	NO. ACC'S.
DRY	13
WET	4
ICY	0
TOTAL	17

ACCIDENT SEVERITY	NO. ACC'S.
FATAL	0
NON FATAL	17
PROP. DAM.	0
TOTAL	17

TIME OF YEAR	NO. ACC'S.
WINTER DEC-FEB	2
SPRING MAR-MAY	1
SUMMER JUNE-AUG	7
FALL SEPT-NOV	7
TOTAL	17

TYPE OF VEHICLE	NO. VEH.
PASS. CARS	N/A
TRUCKS	N/A
OTHER	N/A
TOTAL	N/A

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
REAR END COLLISION
HEAD ON COLLISION
RIGHT ANGLE COLLISION
LEFT TURN COLLISION
SIDESWIPE
OUT OF CONTROL
BACKING REAR END
FATAL ACCIDENT
PERSONAL INJURY
PROPERTY DAMAGE

INTERSECTION SR19 AT SR135 CONN

COUNTY JEFF DAVIS CITY N/A DIST 5

PERIOD 62 MONTHS FROM SEPT 2004 TO NOV 2009

...\Collison Diagram.dgn 10/25/2010 9:38:08 AM ndubberly

Z:\MISC SIGNAGE.dgn 1/10/2011 11:22:41 AM ndubberly

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 6506	Begin: 11/18/2010 05:00 AM	End: 11/18/2010 06:00 PM
Street: SR19	Lane: SB RTL	Hours: 13:00
State: GA	Oper: DUB	Period: 60
City: N/A	Posted: 50	Raw Count: 1343
County: JEFF DAVIS	AADT Factor: 1	AADT Count: 2479

NC97 Date & Time Range	Count	Avg Speed	Temp	Wet/Dry
11/18/2010				
[05:00 AM-06:00 AM]	12	13 mph	46 F	Dry
[06:00 AM-07:00 AM]	37	15 mph	46 F	Dry
[07:00 AM-08:00 AM]	94	15 mph	50 F	Dry
[08:00 AM-09:00 AM]	100	15 mph	62 F	Dry
[09:00 AM-10:00 AM]	87	15 mph	74 F	Dry
[10:00 AM-11:00 AM]	77	16 mph	85 F	Dry
[11:00 AM-12:00 PM]	112	16 mph	93 F	Dry
[12:00 PM-01:00 PM]	114	20 mph	97 F	Dry
[01:00 PM-02:00 PM]	132	16 mph	97 F	Dry
[02:00 PM-03:00 PM]	110	17 mph	95 F	Dry
[03:00 PM-04:00 PM]	144	17 mph	82 F	Dry
[04:00 PM-05:00 PM]	177	18 mph	76 F	Dry
[05:00 PM-06:00 PM]	147	18 mph	68 F	Dry

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 3174	Begin: 11/18/2010 05:00 AM	End: 11/18/2010 06:00 PM
Street: SR 19	Lane: SB LTL	Hours: 13:00
State: GA	Oper: DUB	Period: 60
City: N/A	Posted: 50	Raw Count: 918
County: JEFF DAVIS	AADT Factor: 1	AADT Count: 1695

NC97 Date & Time Range	Count	Avg Speed	Temp	Wet/Dry
11/18/2010				
[05:00 AM-06:00 AM]	44	17 mph	46 F	Dry
[06:00 AM-07:00 AM]	33	16 mph	44 F	Dry
[07:00 AM-08:00 AM]	59	18 mph	48 F	Dry
[08:00 AM-09:00 AM]	62	19 mph	62 F	Dry
[09:00 AM-10:00 AM]	48	13 mph	74 F	Dry
[10:00 AM-11:00 AM]	66	17 mph	82 F	Dry
[11:00 AM-12:00 PM]	61	19 mph	91 F	Dry
[12:00 PM-01:00 PM]	72	12 mph	95 F	Dry
[01:00 PM-02:00 PM]	78	16 mph	95 F	Dry
[02:00 PM-03:00 PM]	68	18 mph	93 F	Dry
[03:00 PM-04:00 PM]	101	23 mph	87 F	Dry
[04:00 PM-05:00 PM]	105	22 mph	76 F	Dry
[05:00 PM-06:00 PM]	121	20 mph	70 F	Dry

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 8493	Begin: 11/18/2010 05:00 AM	End: 11/18/2010 06:00 PM
Street: SR 19	Lane: NB RTL	Hours: 13:00
State: GA	Oper: DUB	Period: 60
City: N/A	Posted: 45	Raw Count: 2032
County: JEFF DAVIS	AADT Factor: 1	AADT Count: 3751

NC97 Date & Time Range	Count	Avg Speed	Temp	Wet/Dry
11/18/2010				
[05:00 AM-06:00 AM]	38	19 mph	46 F	Dry
[06:00 AM-07:00 AM]	185	18 mph	44 F	Dry
[07:00 AM-08:00 AM]	135	21 mph	48 F	Dry
[08:00 AM-09:00 AM]	107	19 mph	58 F	Dry
[09:00 AM-10:00 AM]	303	18 mph	74 F	Dry
[10:00 AM-11:00 AM]	63	26 mph	85 F	Dry
[11:00 AM-12:00 PM]	135	33 mph	91 F	Dry
[12:00 PM-01:00 PM]	40	18 mph	97 F	Dry
[01:00 PM-02:00 PM]	291	22 mph	97 F	Dry
[02:00 PM-03:00 PM]	155	21 mph	95 F	Dry
[03:00 PM-04:00 PM]	247	24 mph	80 F	Dry
[04:00 PM-05:00 PM]	113	26 mph	74 F	Dry
[05:00 PM-06:00 PM]	220	23 mph	66 F	Dry

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 6523	Begin: 11/18/2010 05:00 AM	End: 11/18/2010 06:00 PM
Street: SR 19	Lane: NB THRU	Hours: 13:00
State: GA	Oper: DUB	Period: 60
City: N/A	Posted: 45	Raw Count: 1081
County: JEFF DAVIS	AADT Factor: 1	AADT Count: 1996

NC97 Date & Time Range	Count	Avg Speed	Temp	Wet/Dry
11/18/2010				
[05:00 AM-06:00 AM]	14	43 mph	44 F	Dry
[06:00 AM-07:00 AM]	46	47 mph	44 F	Dry
[07:00 AM-08:00 AM]	164	46 mph	46 F	Dry
[08:00 AM-09:00 AM]	75	46 mph	58 F	Dry
[09:00 AM-10:00 AM]	69	45 mph	70 F	Dry
[10:00 AM-11:00 AM]	57	46 mph	80 F	Dry
[11:00 AM-12:00 PM]	81	46 mph	89 F	Dry
[12:00 PM-01:00 PM]	93	46 mph	91 F	Dry
[01:00 PM-02:00 PM]	69	46 mph	85 F	Dry
[02:00 PM-03:00 PM]	108	46 mph	76 F	Dry
[03:00 PM-04:00 PM]	85	44 mph	72 F	Dry
[04:00 PM-05:00 PM]	122	45 mph	68 F	Dry
[05:00 PM-06:00 PM]	98	44 mph	62 F	Dry

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 8348	Begin: 11/18/2010 05:00 AM	End: 11/18/2010 06:00 PM
Street: SR 135CONN	Lane: EB LTL	Hours: 13:00
State: GA	Oper: DUB	Period: 60
City: N/A	Posted: 45	Raw Count: 1816
County: JEFF DAVIS	AADT Factor: 1	AADT Count: 3353

NC97 Date & Time Range	Count	Avg Speed	Temp	Wet/Dry
11/18/2010				
[05:00 AM-06:00 AM]	47	18 mph	44 F	Dry
[06:00 AM-07:00 AM]	77	18 mph	44 F	Dry
[07:00 AM-08:00 AM]	155	17 mph	48 F	Dry
[08:00 AM-09:00 AM]	117	18 mph	58 F	Dry
[09:00 AM-10:00 AM]	116	18 mph	72 F	Dry
[10:00 AM-11:00 AM]	139	19 mph	83 F	Dry
[11:00 AM-12:00 PM]	133	18 mph	91 F	Dry
[12:00 PM-01:00 PM]	190	19 mph	95 F	Dry
[01:00 PM-02:00 PM]	126	18 mph	97 F	Dry
[02:00 PM-03:00 PM]	131	18 mph	87 F	Dry
[03:00 PM-04:00 PM]	217	18 mph	76 F	Dry
[04:00 PM-05:00 PM]	179	18 mph	70 F	Dry
[05:00 PM-06:00 PM]	189	18 mph	64 F	Dry

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 8425	Begin: 11/18/2010 05:00 AM	End: 11/18/2010 06:00 PM
Street: SR 135CONN	Lane: EB THRU	Hours: 13:00
State: GA	Oper: DUB	Period: 60
City: N/A	Posted: 45	Raw Count: 1078
County: JEFF DAVIS	AADT Factor: 1	AADT Count: 1990

NC97 Date & Time Range	Count	Avg Speed	Temp	Wet/Dry
11/18/2010				
[05:00 AM-06:00 AM]	18	46 mph	42 F	Dry
[06:00 AM-07:00 AM]	41	43 mph	42 F	Dry
[07:00 AM-08:00 AM]	67	47 mph	44 F	Dry
[08:00 AM-09:00 AM]	66	47 mph	58 F	Dry
[09:00 AM-10:00 AM]	67	46 mph	72 F	Dry
[10:00 AM-11:00 AM]	57	46 mph	82 F	Dry
[11:00 AM-12:00 PM]	90	44 mph	91 F	Dry
[12:00 PM-01:00 PM]	83	44 mph	95 F	Dry
[01:00 PM-02:00 PM]	82	46 mph	76 F	Dry
[02:00 PM-03:00 PM]	87	45 mph	72 F	Dry
[03:00 PM-04:00 PM]	126	45 mph	68 F	Dry
[04:00 PM-05:00 PM]	145	43 mph	64 F	Dry
[05:00 PM-06:00 PM]	149	44 mph	58 F	Dry

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: N/A
Street: SR 19

A study of vehicle traffic was conducted with HI-STAR unit number 8493. The study was done in the NB RTL lane on SR 19 in N/A, GA in JEFF DAVIS county. The study began on 11/18/2010 at 05:00 AM and concluded on 11/18/2010 at 06:00 PM, lasting a total of 13 hours. Data was recorded in 60 minute time periods. The total recorded volume of traffic showed 2,032 vehicles passed through the location with a peak volume of 303 on 11/18/2010 at 09:00 AM and a minimum volume of 38 on 11/18/2010 at 05:00 AM. The AADT Count for this study was 3,751.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 >
0	12	929	539	300	77	3	3	63	2	0	0	1	0	1

At least half of the vehicles were traveling in the 20 - 24 mph range or a lower speed. The average speed for all classified vehicles was 22 mph with 3.47 percent exceeding the posted speed of 45 mph. The HI-STAR found 0.10 percent of the total vehicles were traveling in excess of 55 mph. The mode speed for this traffic study was 15 mph and the 85th percentile was 27.68 mph.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0 to 20	21 to 27	28 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 >
1541	107	185	73	10	4	2	8

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 1,648 which represents 85.40 percent of the total classified vehicles. The number of Small Trucks in the study was 185 which represents 9.60 percent of the total classified vehicles. The number of Trucks/Buses in the study was 73 which represents 3.80 percent of the total classified vehicles. The number of Tractor Trailers in the study was 24 which represents 1.20 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 11/18/2010 at 09:00 AM the average headway between the vehicles was 11.84 seconds. The slowest traffic period was on 11/18/2010 at 05:00 AM. During this slowest period, the average headway was 92.31 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 44 and 97 degrees Fahrenheit. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: N/A
Street: SR 19

A study of vehicle traffic was conducted with HI-STAR unit number 6523. The study was done in the NB THRU lane on SR 19 in N/A, GA in JEFF DAVIS county. The study began on 11/18/2010 at 05:00 AM and concluded on 11/18/2010 at 06:00 PM, lasting a total of 13 hours. Data was recorded in 60 minute time periods. The total recorded volume of traffic showed 1,081 vehicles passed through the location with a peak volume of 164 on 11/18/2010 at 07:00 AM and a minimum volume of 14 on 11/18/2010 at 05:00 AM. The AADT Count for this study was 1,996.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 >
0	8	5	9	23	38	106	314	316	168	65	16	8	3	2

At least half of the vehicles were traveling in the 45 - 49 mph range or a lower speed. The average speed for all classified vehicles was 45 mph with 53.4 percent exceeding the posted speed of 45 mph. The HI-STAR found 8.70 percent of the total vehicles were traveling in excess of 55 mph. The mode speed for this traffic study was 45 mph and the 85th percentile was 52.97 mph.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0 to 20	21 to 27	28 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 >
987	41	32	4	8	6	3	0

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 1,028 which represents 95.10 percent of the total classified vehicles. The number of Small Trucks in the study was 32 which represents 3.00 percent of the total classified vehicles. The number of Trucks/Buses in the study was 4 which represents 0.40 percent of the total classified vehicles. The number of Tractor Trailers in the study was 17 which represents 1.60 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 11/18/2010 at 07:00 AM the average headway between the vehicles was 21.82 seconds. The slowest traffic period was on 11/18/2010 at 05:00 AM. During this slowest period, the average headway was 240.0 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 44 and 91 degrees Fahrenheit. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: N/A
Street: SR19

A study of vehicle traffic was conducted with HI-STAR unit number 6506. The study was done in the SB RTL lane on SR19 in N/A, GA in JEFF DAVIS county. The study began on 11/18/2010 at 05:00 AM and concluded on 11/18/2010 at 06:00 PM, lasting a total of 13 hours. Data was recorded in 60 minute time periods. The total recorded volume of traffic showed 1,343 vehicles passed through the location with a peak volume of 177 on 11/18/2010 at 04:00 PM and a minimum volume of 12 on 11/18/2010 at 05:00 AM. The AADT Count for this study was 2,479.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 >
0	528	389	84	35	12	13	8	2	7	2	0	2	1	1

At least half of the vehicles were traveling in the 15 - 19 mph range or a lower speed. The average speed for all classified vehicles was 17 mph with 1.20 percent exceeding the posted speed of 50 mph. The HI-STAR found 0.55 percent of the total vehicles were traveling in excess of 55 mph. The mode speed for this traffic study was 10 mph and the 85th percentile was 20.26 mph.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0 to 20	21 to 27	28 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 >
957	79	37	7	1	0	1	2

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 1,036 which represents 95.60 percent of the total classified vehicles. The number of Small Trucks in the study was 37 which represents 3.40 percent of the total classified vehicles. The number of Trucks/Buses in the study was 7 which represents 0.60 percent of the total classified vehicles. The number of Tractor Trailers in the study was 4 which represents 0.40 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 11/18/2010 at 04:00 PM the average headway between the vehicles was 20.22 seconds. The slowest traffic period was on 11/18/2010 at 05:00 AM. During this slowest period, the average headway was 276.92 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 46 and 97 degrees Fahrenheit. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: N/A
Street: SR 19

A study of vehicle traffic was conducted with HI-STAR unit number 3174. The study was done in the SB LTL lane on SR 19 in N/A, GA in JEFF DAVIS county. The study began on 11/18/2010 at 05:00 AM and concluded on 11/18/2010 at 06:00 PM, lasting a total of 13 hours. Data was recorded in 60 minute time periods. The total recorded volume of traffic showed 918 vehicles passed through the location with a peak volume of 121 on 11/18/2010 at 05:00 PM and a minimum volume of 33 on 11/18/2010 at 06:00 AM. The AADT Count for this study was 1,695.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 >
0	250	177	59	80	27	2	10	1	1	0	0	1	1	0

At least half of the vehicles were traveling in the 15 - 19 mph range or a lower speed. The average speed for all classified vehicles was 19 mph with 0.49 percent exceeding the posted speed of 50 mph. The HI-STAR found 0.33 percent of the total vehicles were traveling in excess of 55 mph. The mode speed for this traffic study was 10 mph and the 85th percentile was 26.98 mph.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0 to 20	21 to 27	28 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 >
546	26	24	6	4	3	0	0

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 572 which represents 93.90 percent of the total classified vehicles. The number of Small Trucks in the study was 24 which represents 3.90 percent of the total classified vehicles. The number of Trucks/Buses in the study was 6 which represents 1.00 percent of the total classified vehicles. The number of Tractor Trailers in the study was 7 which represents 1.10 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 11/18/2010 at 05:00 PM the average headway between the vehicles was 29.51 seconds. The slowest traffic period was on 11/18/2010 at 06:00 AM. During this slowest period, the average headway was 105.88 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 44 and 95 degrees Fahrenheit. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: N/A
Street: SR 135CONN

A study of vehicle traffic was conducted with HI-STAR unit number 8425. The study was done in the EB THRU lane on SR 135CONN in N/A, GA in JEFF DAVIS county. The study began on 11/18/2010 at 05:00 AM and concluded on 11/18/2010 at 06:00 PM, lasting a total of 13 hours. Data was recorded in 60 minute time periods. The total recorded volume of traffic showed 1,078 vehicles passed through the location with a peak volume of 149 on 11/18/2010 at 05:00 PM and a minimum volume of 18 on 11/18/2010 at 05:00 AM. The AADT Count for this study was 1,990.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 >
0	15	6	10	12	32	137	295	343	162	50	9	3	3	1

At least half of the vehicles were traveling in the 45 - 49 mph range or a lower speed. The average speed for all classified vehicles was 45 mph with 52.9 percent exceeding the posted speed of 45 mph. The HI-STAR found 6.12 percent of the total vehicles were traveling in excess of 55 mph. The mode speed for this traffic study was 45 mph and the 85th percentile was 52.05 mph.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0 to 20	21 to 27	28 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 >
988	36	26	9	9	7	3	0

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 1,024 which represents 95.00 percent of the total classified vehicles. The number of Small Trucks in the study was 26 which represents 2.40 percent of the total classified vehicles. The number of Trucks/Buses in the study was 9 which represents 0.80 percent of the total classified vehicles. The number of Tractor Trailers in the study was 19 which represents 1.80 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 11/18/2010 at 05:00 PM the average headway between the vehicles was 24.0 seconds. The slowest traffic period was on 11/18/2010 at 05:00 AM. During this slowest period, the average headway was 189.47 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 42 and 95 degrees Fahrenheit. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

Nu-Metrics Traffic Analyzer Study
Computer Generated Summary Report
City: N/A
Street: SR 135CONN

A study of vehicle traffic was conducted with HI-STAR unit number 8348. The study was done in the EB LTL lane on SR 135CONN in N/A, GA in JEFF DAVIS county. The study began on 11/18/2010 at 05:00 AM and concluded on 11/18/2010 at 06:00 PM, lasting a total of 13 hours. Data was recorded in 60 minute time periods. The total recorded volume of traffic showed 1,816 vehicles passed through the location with a peak volume of 217 on 11/18/2010 at 03:00 PM and a minimum volume of 47 on 11/18/2010 at 05:00 AM. The AADT Count for this study was 3,353.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin.

Chart 1

0 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 >
0	363	999	279	36	22	6	4	1	3	3	0	3	0	0

At least half of the vehicles were traveling in the 15 - 19 mph range or a lower speed. The average speed for all classified vehicles was 18 mph with 0.58 percent exceeding the posted speed of 45 mph. The HI-STAR found 0.35 percent of the total vehicles were traveling in excess of 55 mph. The mode speed for this traffic study was 15 mph and the 85th percentile was 21.78 mph.

CLASSIFICATION

Chart 2 lists the values of the eight classification bins and the total traffic volume accumulated for each bin.

Chart 2

0 to 20	21 to 27	28 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 >
1569	98	38	11	3	0	0	0

Most of the vehicles classified during the study were Passenger Cars. The number of Passenger Cars in the study was 1,667 which represents 97.00 percent of the total classified vehicles. The number of Small Trucks in the study was 38 which represents 2.20 percent of the total classified vehicles. The number of Trucks/Buses in the study was 11 which represents 0.60 percent of the total classified vehicles. The number of Tractor Trailers in the study was 3 which represents 0.20 percent of the total classified vehicles.

HEADWAY

During the peak time period, on 11/18/2010 at 03:00 PM the average headway between the vehicles was 16.51 seconds. The slowest traffic period was on 11/18/2010 at 05:00 AM. During this slowest period, the average headway was 75.0 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 44 and 97 degrees Fahrenheit. The HI-STAR determined that the roadway surface was Dry 100.00 percent of the time.

GEORGIA DEPARTMENT OF TRANSPORTATION
DISTRICT 5
TRAFFIC OPERATIONS

Signal Warrants - Summary

Major Street Approaches

Northbound: **SR 19**
Number of Lanes: **1**
Approach Speed: **45**
Total Approach Volume: **1,067**

Southbound: **SR 19**
Number of Lanes: **1**
Approach Speed: **50**
Total Approach Volume: **874**

Minor Street Approaches

Eastbound: **SR 135CO**
Number of Lanes: **1**

Total Approach Volume: **2,829**

Warrant Summary (Urban values apply.)

Warrant 1 - Eight Hour Vehicular Volumes ..... **Not Satisfied**

Warrant 1A - Minimum Vehicular Volume ..... **Not Satisfied**
Required volumes reached for 0 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic ..... **Not Satisfied**
Required volumes reached for 0 hours, 8 are needed

Warrant 1 A&B - Combination of Warrants ..... **Not Satisfied**
Required volumes reached for 0 hours, 8 are needed

Warrant 2 - Four Hour Volumes ..... **Not Satisfied**
Number of hours (0) volumes exceed minimum < minimum required (4).

Warrant 3 - Peak Hour ..... **Not Satisfied**

Warrant 3A - Peak Hour Delay ..... **Not Satisfied**
Total approach volumes and delays on minor street do not exceed minimums for any hour.

Warrant 3B - Peak Hour Volumes ..... **Not Satisfied**
Volumes do not exceed minimums for any hour.

Warrant 4 - Pedestrian Volumes ..... **Not Satisfied**
Required 4 Hr pedestrian volume reached for 0 hour(s) and the single hour volume for 0 hour(s)

Warrant 5 - School Crossing ..... **Not Satisfied**
Number of gaps > .0 seconds (0) exceeds the number of minutes in the crossing period (0).

Warrant 6 - Coordinated Signal System ..... **Not Satisfied**
No adjacent coordinated signals are present

Warrant 7 - Crash Experience ..... **Not Satisfied**
Number of accidents (4) is less than minimum (5). Volume minimums are not met.

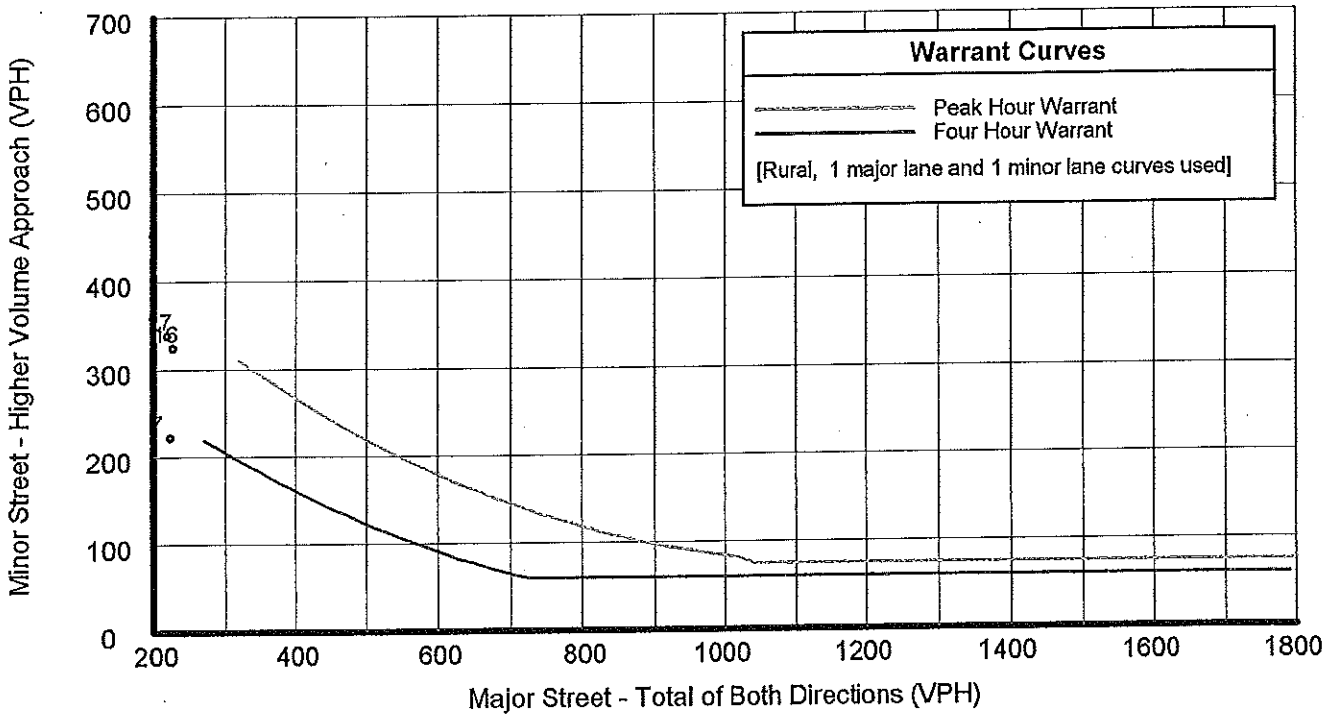
Warrant 8 - Roadway Network ..... **Not Satisfied**
Major Route conditions not met. No volume requirement met.

GEORGIA DEPARTMENT OF TRANSPORTATION

DISTRICT 5

TRAFFIC OPERATIONS

Signal Warrants - Summary



Analysis of 8-Hour Volume Warrants:

Hour	Major	Higher Minor		War-1A			War-1B			War-1A&B		
Begin	Total	Vol	Dir	Major Crit	Minor Crit	Meets?	Major Crit	Minor Crit	Meets?	Major Crit	Minor Crit	Meets?
00:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
01:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
02:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
03:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
04:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
05:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
06:00	79	118	EB	500-No	150-No	---	750-No	75-Yes	Minor	750-No	150-No	---
07:00	223	222	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
08:00	137	183	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
09:00	117	183	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
10:00	123	196	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
11:00	142	223	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
12:00	165	273	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
13:00	147	208	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
14:00	176	218	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
15:00	186	343	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
16:00	227	324	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
17:00	219	338	EB	500-No	150-Yes	Minor	750-No	75-Yes	Minor	750-No	150-Yes	Minor
18:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
19:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
20:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
21:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
22:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---
23:00	0	0	EB	500-No	150-No	---	750-No	75-No	---	750-No	150-No	---

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GDOT	Intersection	SR19 AT SR135CONN
Agency/Co.	D5	Jurisdiction	
Date Performed	1/7/2011	Analysis Year	2010
Analysis Time Period	1700 HRS		

Project Description 0009875

East/West Street: SR 135CONN	North/South Street: SR 19
Intersection Orientation: North-South	Study Period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street	Northbound SR19			Southbound SR135 CONN		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		98	220	189	149	
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR (veh/h)	0	111	250	214	169	0
Percent Heavy Vehicles	0	--	--	3	--	--
Median Type	Undivided					
RT Channelized			1			1
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound SR19 SB		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				121		147
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR (veh/h)	0	0	0	137	0	167
Percent Heavy Vehicles	6	5	5	6	0	5
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			1			1
Lanes	0	0	0	1	0	1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (veh/h)		214	137		167			
C (m) (veh/h)		1473	338		934			
v/c		0.15	0.41		0.18			
95% queue length		0.51	2.00		0.65			
Control Delay (s/veh)		7.9	22.9		9.7			
LOS		A	C		A			
Approach Delay (s/veh)	--	--	15.6					
Approach LOS	--	--	C					

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TWO-WAY STOP CONTROL SUMMARY

Analyst: GDOT
Agency/Co.: D5
Date Performed: 1/7/2011
Analysis Time Period: 1700 HRS
Intersection: SR19 AT SR135CONN
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2010
Project ID: 0009875
East/West Street: SR 135CONN
North/South Street: SR 19
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		98	220	189	149	
Peak-Hour Factor, PHF		0.88	0.88	0.88	0.88	
Hourly Flow Rate, HFR		111	250	214	169	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			Yes			
Lanes		1	1		1	1
Configuration		T	R		L	T
Upstream Signal?		No				No

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	121		147			
Peak Hour Factor, PHF	0.88		0.88			
Hourly Flow Rate, HFR	137		167			
Percent Heavy Vehicles	6		5			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		214	137		167			
C(m) (vph)		1473	338		934			
v/c		0.15	0.41		0.18			
95% queue length		0.51	2.00		0.65			
Control Delay		7.9	22.9		9.7			
LOS		A	C		A			
Approach Delay				15.6				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.21

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: GDOT
Agency/Co.: D5
Date Performed: 1/7/2011
Analysis Time Period: 1700 HRS
Intersection: SR19 AT SR135CONN
Jurisdiction:
Units: U. S. Customary
Analysis Year: 2010
Project ID: 0009875
East/West Street: SR 135CONN
North/South Street: SR 19
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		98	220	189	149	
Peak-Hour Factor, PHF		0.88	0.88	0.88	0.88	
Peak-15 Minute Volume		28	62	54	42	
Hourly Flow Rate, HFR		111	250	214	169	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?			Yes			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	121		147			
Peak Hour Factor, PHF	0.88		0.88			
Peak-15 Minute Volume	34		42			
Hourly Flow Rate, HFR	137		167			
Percent Heavy Vehicles	6		5			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?			Yes			
Lanes	1		1			
Configuration	L		R			

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement		1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)			4.1	7.1		6.2			
t(c,hv)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)			3	6		5			
t(c,g)				0.20	0.20	0.10	0.20	0.20	0.10
Grade/100				0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)			0.00	0.70		0.00			
t(c,T):	1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c)	1-stage		4.1	6.5		6.3			
	2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3	6		5			
t(f)		2.2	3.6		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
Arrival Type
Effective Green, g (sec)
Cycle Length, C (sec)
Rp (from Exhibit 16-11)
Proportion vehicles arriving on green P
g(q1)
g(q2)
g(q)

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		111	708		111			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	111	
Potential Capacity	934	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	934	
Probability of Queue free St.	0.82	1.00

Step 2: LT from Major St.	4	1
Conflicting Flows	111	
Potential Capacity	1473	
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1473	
Probability of Queue free St.	0.85	1.00
Maj L-Shared Prob Q free St.		

Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.85	0.85
Movement Capacity		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10
Conflicting Flows	708	
Potential Capacity	395	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.85
Maj. L, Min T Adj. Imp Factor.		0.89
Cap. Adj. factor due to Impeding mvmnt	0.85	0.73
Movement Capacity	338	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.85	0.85
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	708	
Potential Capacity	395	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.85
Maj. L, Min T Adj. Imp Factor.		0.89
Cap. Adj. factor due to Impeding mvmnt	0.85	0.73
Movement Capacity	338	
Results for Two-stage process:		
a		
y		
C t	338	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	137		167			
Movement Capacity (vph)	338		934			
Shared Lane Capacity (vph)						

Worksheet 9-Computation of ffect of Flared Minor Street pproaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	338		934			
Volume	137		167			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		214	137		167			
C(m) (vph)		1473	338		934			
v/c		0.15	0.41		0.18			
95% queue length		0.51	2.00		0.65			
Control Delay		7.9	22.9		9.7			
LOS		A	C		A			
Approach Delay				15.6				
Approach LOS				C				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.85
v(i1), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(i1), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		7.9
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

Welcome to GDOT's Roundabout Analysis Tool. This tool is designed for the user to determine the functionality of a proposed roundabout. The analysis is based on NCHRP Report 572 and the FHWA's Roundabout Design Guide (2000) standards. Please read the notes in the **Instructions** tab before using the spreadsheet.

Analyst:	ND
Agency/Company:	GDOT/TRAFFIC OPS
Date:	1/4/2011
Project Name or PI#:	0009875
Year, Peak Period:	2010, 1700 Hrs
County/District:	JEFF DAVIS/DISTRICT 5
Intersection:	SR19 AT SR135CONN

Insert Project Information Here in the BLUE SPACE. This information is linked to the Single Lane and Multi Lane Worksheets.

Roundabout Considerations Worksheet

Roundabouts may not operate well if there is too much traffic entering the intersection or if the percentage of traffic on the major road is too high. Candidate intersections shall be analyzed to determine whether a roundabout will perform acceptably. Shown below are thresholds to determine if a roundabout capacity analysis is required:

# of circulatory lanes	ADTs (current/ build year)	% traffic on Major Road
Single Lane	less than 25,000	less than 90%
Multi-Lane	less than 45,000	less than 90%

Other things to consider when evaluating roundabouts as an alternative are Right of Way, sight distance, environmental impacts, and access to adjacent properties.

Volume Information (for Analysis Time Period)

1 Enter the Major/Minor Street ADT Volumes in the Chart below:

	Volumes	Split
Major Street	5,670	61%
Minor Street	3,700	39%
Total volumes	9,370	

Proximity to Other Intersections

2 How close is the nearest signal (miles or feet)? 0.73 mi | 0 '

3 Is the proposed intersection located within a coordinated signal network? NO

Go up to next section...

Proposed Design Configuration Chart

Directions for this Section only: *(see Instructions Tab for other sections)*

1. Select the type of roundabout you are analyzing:
2. Key in the number of approaches and the street names at the proposed intersections.
3. Complete the Approach Characteristics Chart:
   a. Select the Street Name from the pulldown menu for each approach leg
   b. Select the Lane Type for each entry apporach lane
      **The first box is the inner lane, the second box is the outer lane*
   c. Select Yes or No if a right turn bypass will be added to each approach leg

Roundabout Characteristics

Roundabout Type:	Single Lane
# of Approaches:	3
Name of Streets:	SR 19
	SR 135CONN

Chart Key:

Single Lane	Street Name	
	All	
	Bypass?	
Multi-lane	Street Name	
	Inner Ln	Outer Ln
	Bypass?	

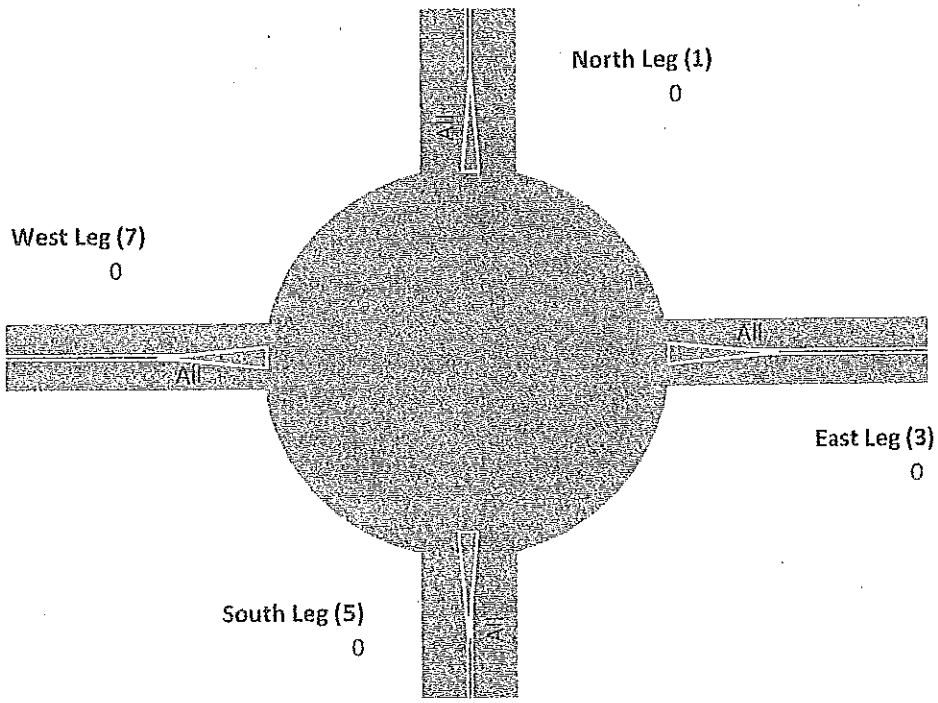
Approach Leg Characteristics:

	North Leg (1)	NE Leg (2)	East Leg (3)	SE Leg (4)
Street Name:		SR 19		SR 19
Entry Lane Config	All	Right only	All	Right only
Bypass to Adj Leg?	No	No	No	No
	South Leg (5)	SW Leg (6)	West Leg (7)	NW Leg (8)
Street Name:				SR 135CONN
Entry Lane Config	All	All	All	Right only
Bypass to Adj Leg?	No			No

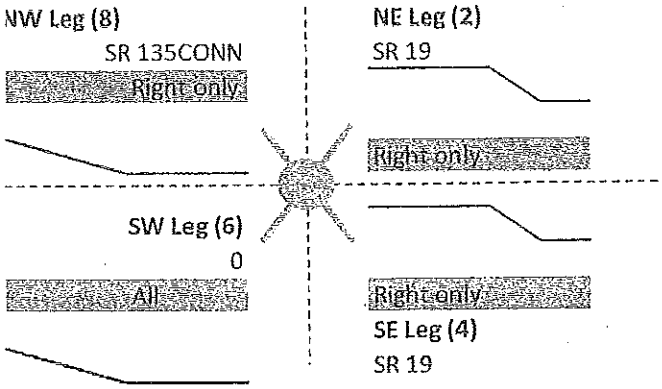
Additio

[redacted]

Preliminary Roundabout Rendering**



ıal Legs



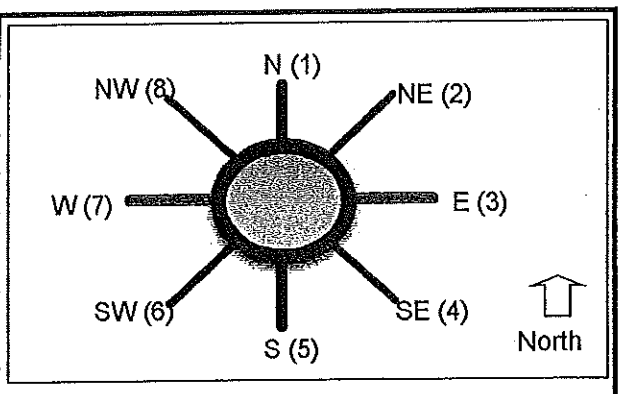
***Note*
This roundabout sketch does not include the secondary cardinal direction legs due to restrictions in the Excel software. For complex roundabouts, a separate sketch is recommended by the designer.

Roundabout Analysis Tool
Single Lane

1/10/2011
Version 1.3

General & Site Information

Analyst:	ND
Agency/Company:	GDOT/TRAFFIC OPS
Date:	1/4/2011
Project Name or PI#:	0009875
Year, Peak Hour:	2010, 1700 Hrs
County/District:	JEFF DAVIS/DISTRICT 5
Intersection:	SR19 AT SR135CONN



Volumes

		Entry Legs (FROM) N (1)	NE (2)	E (3)	SE (4)	S (5)	SW (6)	W (7)	NW (8)
Exit Legs (TO)	N (1), vph								
	NE (2), vph				220				189
	E (3), vph								
	SE (4), vph		121						149
	S (5), vph								
	SW (6), vph								
	W (7), vph								
	NW (8), vph		147		98				
Output	Total Vehicles	0	268	0	318	0	0	0	338

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	100%	91%	100%	90%	100%	100%	100%	98%
% SU/ Bus	0%	5%	0%	6%	0%	0%	0%	1%
% Trucks/ Combin.	0%	4%	0%	4%	0%	0%	0%	1%
% Bicycle	0%	0%	0%	0%	0%	0%	0%	0%
PHF	*88.00*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*
F_{HV}	1.000	0.939	1.000	0.935	1.000	1.000	1.000	0.985

Entry/Conflicting Flows	N	NE	E	SE	S	SW	W	NW
Flow to Leg # N (1), pcu/h	0	0	0	0	0	0	0	0
NE (2), pcu/h	0	0	0	268	0	0	0	218
E (3), pcu/h	0	0	0	0	0	0	0	0
SE (4), pcu/h	0	146	0	0	0	0	0	172
S (5), pcu/h	0	0	0	0	0	0	0	0
SW (6), pcu/h	0	0	0	0	0	0	0	0
W (7), pcu/h	0	0	0	0	0	0	0	0
NW (8), pcu/h	0	178	0	119	0	0	0	0
Entry flow, pcu/h	0	324	0	387	0	0	0	390
Conflicting flow, pcu/h	0	119	0	218	0	0	0	146

Roundabout Type	Standard Single Lane or Urban Compact
Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness

NCHRP-572 Model	N	NE	E	SE	S	SW	W	NW
Entry Capacity, pcu/h	NA	1003	NA	909	NA	NA	NA	976
V/C ratio		**0.32**		**0.43**				**0.40**
Control Delay, sec/pcu		**5**		**7**				**6**
LOS		A		A				A
95th % Queue (ft)		**38**		**58**				**49**

UK Model**	N	NE	E	SE	S	SW	W	NW
Entry Capacity, pcu/h	NA	1147	NA	1093	NA	NA	NA	1132
V/C ratio		**0.28**		**0.35**				**0.34**
Control Delay, sec/pcu		**4**		**5**				**5**
LOS		A		A				A
95th % Queue (ft)		**31**		**43**				**39**

Notes:

Unit Legend:
vph = vehicles per hour
PHF = peak hour factor
F_{HV} = heavy vehicle factor
pcu = passenger car unit

Bypass Lane Merge Point Analysis (If applicable)

Bypass Characteristics	Bypass #1	Bypass #2	Bypass #3	Bypass #4	Bypass #5	Bypass #6
Select Entry Leg from Bypass (FROM)						
Select Exit Leg for Bypass (TO)						
Volumes						
Right Turn Volume removed from Entry Leg						
Volume Characteristics (for entry leg)						
PHF						
F_{HV}						
NOTE: Volume Characteristics for Exit Leg are already taken into account						
Entry/Conflicting Flows						
Entry Flow						
Conflicting Flow						
Bypass Lane Results (NCHRP-572 Model)						
Entry Capacity at bypass mergepoint, pcu/hr						
V/C ratio						
Control Delay, sec/pcu						
LOS						
95th % Queue (ft)						

PI 0009875 Jeff Davis County

Proposed Concept Report for an All Way Stop Control intersection

The Highway Safety Manual (HSM) has been referenced for the availability of a Predictive Method analysis using a Safety Performance Function (SPF) with associated Crash Modification Factors (CMF) to provide a predicted average crash frequency. The proposed intersection work on this project recommends an all way stop control intersection upgrade. There is no HSM SPF available for intersections with stop control on all legs, thus a HSM Predictive Method analysis is not available.