ORIGINAL TO GENERAL FILES

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

OFFICE OF DESIGN POLICY & SUPPORT
INTERDEPARTMENTAL CORRESPONDENCE

FILE P.I. # 0009950
Lumpkin County
GDOT District 1 - Gainesville
Roundabout: SR 9 at SR 60

OFFICE Design Policy & Support

DATE 8/24/2015

FROM for Brent Story, State Design Policy Engineer

TO SEE DISTRIBUTION

SUBJECT **APPROVED CONCEPT REPORT**

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

Attachment

DISTRIBUTION:

Glenn Bowman, Director of Engineering
Joe Carpenter, Director of P3/Program Delivery
Genetha Rice-Singleton, Assistant Director of P3/Program Delivery
Albert Shelby, State Program Delivery Engineer
Darryl VanMeter, State Innovative Delivery Engineer
Bobby Hilliard, Program Control Administrator
Cindy VanDyke, State Transportation Planning Administrator
Hiral Patel, State Environmental Administrator
Ben Rabun, State Bridge Engineer
Andrew Heath, State Traffic Engineer
Angela Robinson, Financial Management Administrator
Lisa Myers, State Project Review Engineer
Charles "Chuck" Hasty, State Materials Engineer
Lee Upkins, State Utilities Engineer
Richard Cobb, Statewide Location Bureau Chief
Andy Casey, State Roadway Design Engineer
Attn: Justin Lott, District Design Engineer
Ed David Adams, State Safety Program Manager
Brent Cook, District Engineer
Brandon Kirby, District Preconstruction Engineer
Robby Oliver, District Utilities Engineer
Dylan Curtis, Project Manager
BOARD MEMBER - 9th Congressional District

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
PROJECT CONCEPT REPORT

Project Type:	Roundabout-Safety	P.I. Number:	0009950
GDOT District:	1	County:	Lumpkin
Federal Route Number:	US 19	State Route Number:	9 & 60
Project Number:	N/A		

This project will enhance safety and improve operational efficiency at the intersection of SR 9 at SR 60 by replacing an existing Y- intersection with a roundabout.

Submitted for approval:

District Preconstruction Engineer, District One	3/18/15 Date
Albert V. Shelby III State Program Delivery Engineer	5-26-15 Date
BY PHM GDOT Project Manager	5/7/15 Date

Recommendation for approval:

* HIRAL PATEL State Environmental Administrator	7/23/2015 Date
* KEN WERHO for State Traffic Engineer	7/27/2015 Date
Project Review Engineer	Date
* JUN BIRNKAMMER for State Utilities Engineer	6/7/2015 Date
* BRANDON KIRBY for District Engineer	6/12/2015 Date
* BEN RABUN State Bridge Engineer	8/6/2015 Date

☐ MPO Area: This project is consistent with the MPO adopted Regional Transportation Plan (RTP)/Long Range Transportation Plan (LRTP).

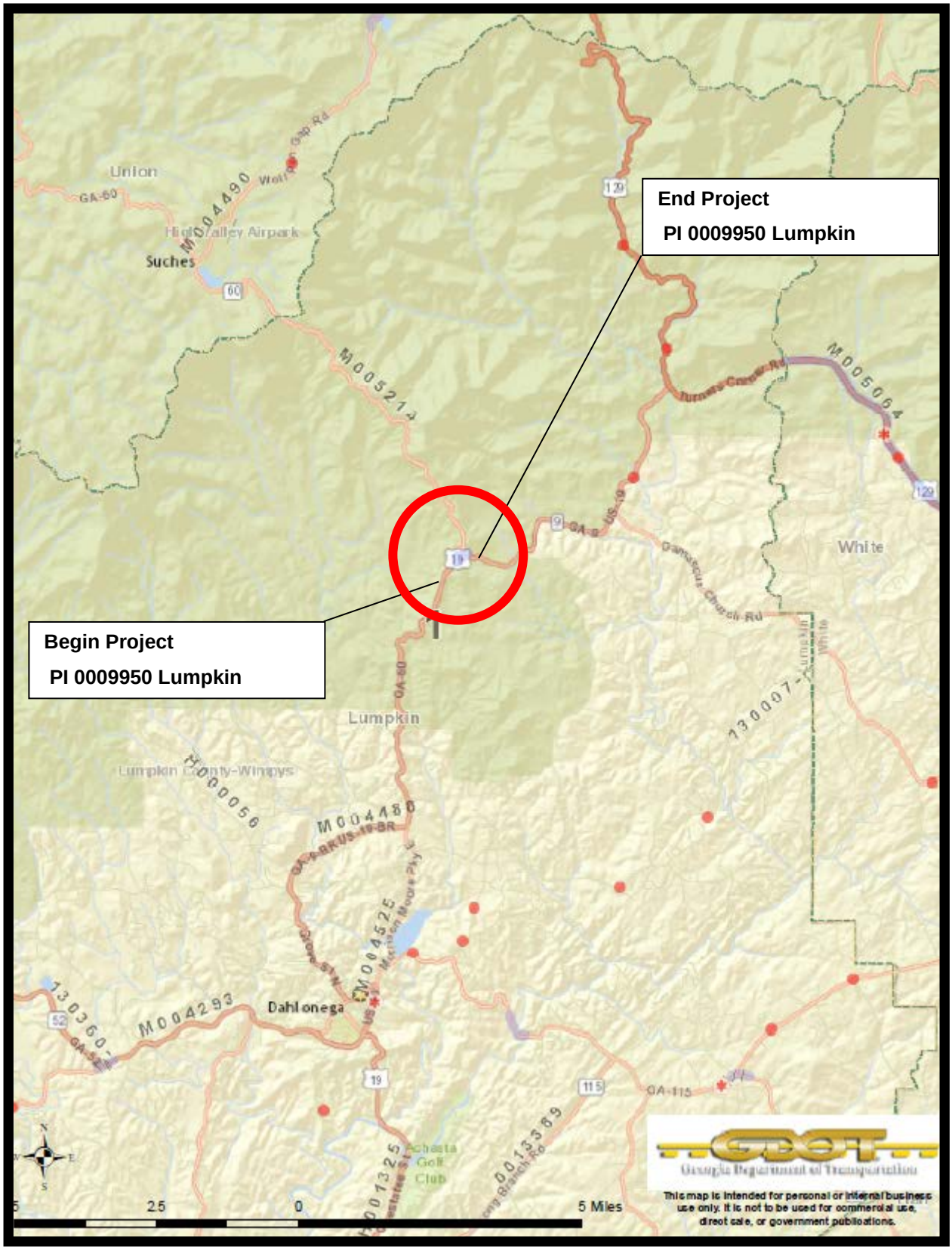
☒ Rural Area: This project is consistent with the goals outlined in the Statewide Transportation Plan (SWTP) and/or is included in the State Transportation Improvement Program (STIP).

* CYNTHIA L VANDIKE State Transportation Planning Administrator	6/5/2015 Date

* RECOMMENDATION ON FILE

Georgia Department of Transportation

PROJECT LOCATION MAP



PLANNING AND BACKGROUND

The location of this Safety Improvement Program project was identified by GDOT upper management as an intersection that would greatly benefit from the use of a roundabout to reduce the number of crashes.

Project Justification Statement (prepared by the Office of Traffic Operations):

The proposed project will enhance safety and improve operational efficiency at the intersection of SR 9 at SR 60 in Lumpkin County, Georgia. 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.

Roundabouts have been identified as one of nine proven countermeasures by the Federal Highway Administration (FHWA). The installation of roundabouts in comparison to traditional safety countermeasures such as traffic signals have resulted in a greater reduction in crash frequency and in many instances better operational efficiency. Roundabouts are generally navigated at slower speeds which correlate with lower impact, less severe crashes. A roundabout also presents fewer conflict points than a traditional intersection resulting in fewer collisions.

In the project area SR 9 is a two lane rural principal arterial with a posted limit of 45 mph and an ADT of 1550 vehicles per day. SR 60 is a two lane rural major collector with a posted speed limit of 35 mph and an ADT of 800 vehicles per day. Currently, the Y-intersection has slip lanes and is yield-controlled.

Crash data from 2004-2008 indicated that 28 crashes occurred at these intersections resulting in 11 total injuries. Of those crashes, 21% were angle collisions accounting for 27% of the injuries and the fatality. Studies have shown that the installation of a roundabout results in nearly 80% reduction in fatal and serious injury crashes and nearly 40% reduction in property damage crashes.

Existing conditions:

The project location is Stone Pile Gap in Lumpkin County which is about 8 miles north of the county seat, Dahlonega. The existing Y-intersection is formed by SR 60 and a turning roadway intersecting with US 19/SR 9 in a sharp curve section. CR 84 (Stone Pile Gap Road) also ties in to this intersection. All three roadways have an existing typical section that consists of a two-lane undivided roadway with variable-width, grassed shoulders. US 19/SR 9 is a rural principal arterial posted for 45 mph with two 12-foot lanes. SR 60 is a rural major collector posted for 35 mph with two 12-foot lanes. CR 84 is a rural minor collector with two 9-foot lanes. In accordance with Lumpkin County ordinance, the speed limit for CR 84 is 35 mph since the speed limit is not posted. Utilities at this location consist of Amicalola EMC overhead power lines and Windstream overhead telecommunication lines.

Other projects in the area:

M005214 – SR 60 from SR 9 to Union County Line: Resurfacing and maintenance project on 5.33 miles of SR 60 entirely in Lumpkin County and is programmed under Lump Sum Maintenance.

MPO: N/A - Project not in MPO **TIP #:** Not applicable

TIA Regional Commission: Georgia Mountains RC **RC Project ID** Not applicable

Congressional District(s): 9

Federal Oversight: ☐ PoDI ☒ Exempt ☐ State Funded ☐ Other

Projected Traffic: ADT 24 HR T: 6.5 %
Current Year (2013): 1550 Open Year (2018): 1800 Design Year (2038): 2650
Traffic Projections Performed by: GDOT Planning Office

Functional Classification (Mainline): Rural Principal Arterial

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

Warrants met: ☐ None ☒ Bicycle ☐ Pedestrian ☐ Transit

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

Pavement Evaluation and Recommendations

Preliminary Pavement Evaluation Summary Report Required? ☒ No ☐ Yes
Preliminary Pavement Type Selection Report Required? ☒ No ☐ Yes
Feasible Pavement Alternatives: ☒ HMA ☐ PCC ☐ HMA & PCC

DESIGN AND STRUCTURAL

Description of the proposed project:

This project, PI 0009950, is located entirely in Lumpkin County about 8 miles north of the county seat, Dahlonega. The project proposes to reconstruct the existing Y-intersection of US 19/SR 9 and SR 60 into a modern roundabout. CR 84 (Stone Pile Gap Road) also ties in to this intersection. Approximately 0.13 miles of US 19/SR 9 would be reconstructed.

The project will maintain the existing number of undivided travel lanes and posted speed limits. The proposed widths of travel lanes for US 19/SR 9 and SR 60 will remain the same as the existing widths – 12 feet. The travel lanes for CR 84 will be widened from its existing width of 9 feet to 11 feet in order to meet current standards for its roadway classification – rural collector. The shoulders of US 19/SR 9 and SR 60 will be modified to 8 feet wide with 6.5-foot paved. 6.5-foot paved shoulders were implemented due to SR 60 and the southern portion of US 19/SR 9 being part of a designated state bike route (Bike Route 90). CR 84 will have 8-foot shoulders with 2-foot paved. The typical section of the roundabout will have curb and gutter on the exterior edge of the 130-foot diameter circulatory roadway. It will include a 15-foot wide raised truck apron with mountable curb on the interior edge of the circulatory roadway. The center of the roundabout will be centered upon an existing historical and archeological feature – a large stone pile that is purportedly the grave site for a fabled Native American maiden named Trahlyta. The legs of the roundabout will feature raised splitter islands to provide speed control and a pedestrian refuge. The shoulders of the roundabout will be 10-feet wide with 5-foot sidewalks.

Major Structures:

Structure	Existing	Proposed
Retaining walls	There is one existing retaining wall at this location. It is located off of the right-of-way in the northwest corner of the intersection.	The existing retaining wall would be replaced with a 20-foot long MSE wall ranging in height from 7.6 feet to 10.6 feet that is adjacent to the shoulder break point of the northwest corner of the roundabout.
		A 207-foot long MSE wall ranging in height from 9 feet to 11.5 feet would be required on the left side (departing the intersection) of SR 60.

		A 233-foot long MSE wall ranging in height from 10 feet to 18.3 feet would be required on the right side (departing the intersection) of US 19/SR 9.
		A 121-foot long MSE wall ranging in height from 8.6 feet to 12.3 feet would be required on the left side (departing the intersection) of CR 84.
		A 588-foot long, variable-height soil nail wall with a maximum height of 21 feet and a Type 2C concrete side barrier would be required on SR 60 and US 19/SR 9 on the northeast corner of the intersection.

Mainline Design Features:

US 19/SR 9 at SR 60 – Stone Pile Gap [Rural primary arterial]

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**2**	**2**	**2**
- **Lane Width(s)**	**12 ft**	**12 ft**	**12 ft**
- **Median Width & Type**	**N/A**	**N/A**	**N/A**
- **Outside Shoulder or Border Area Width**	**Unpaved**	**8 ft (6.5 ft paved)**	**8 ft (6.5 ft paved)**
- **Outside Shoulder Slope**	**Variable**	**6%**	**6%**
- **Inside Shoulder Width**	**N/A**	**N/A**	**N/A**
- **Sidewalks**	**N/A**	**N/A**	**N/A**
- **Auxiliary Lanes**	**N/A**	**N/A**	**N/A**
- **Bike Lanes**	**N/A**	**4-ft**	**6.5 ft paved shldr**
Posted Speed	**45 mph**		**45 mph**
Design Speed	**45 mph**	**45 mph**	**45 mph**
Min Horizontal Curve Radius	**75.4 ft**	**643 ft**	**643 ft*** **
Maximum Superelevation Rate	**9.8%**	**6%**	**6%**
Maximum Grade [Mountainous]	**East leg: -4.4%** **South leg: +5.8%**	**7%**	**7%**
Access Control	**Partial**	**Partial**	**Partial**
Design Vehicle	**N/A**	**WB-40 or WB-62**	**WB-67** **
Pavement Type	**Asphaltic Conc.**	**N/A**	**Asphaltic Conc.**

*According to current GDOT design policy if applicable
**IAW GDOT Design Policy, WB-67 is the design vehicle for roundabout intersections
***Tie-in radius of 160 ft used on south leg and a 500 ft tie-in radius used for the east leg

Roundabout – Stone Pile Gap

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**N/A**	**1**	**1**
- **Lane Width(s)**	**N/A**	**16 ft to 20 ft**	**20-ft**
- **Inscribed Circle Diameter**	**N/A**	**130 ft to 150 ft**	**130 ft**
- **Central Island Diameter**	**N/A**	**N/A**	**60 ft**

- **Inside Shoulder Width/Truck Apron**	**N/A**	**Variable-width truck apron w/ header curb**	**15-ft truck apron w/ header curb**
- **Outside Shoulder or Border Area Width**	**N/A**	**12 ft**	**10 ft shoulder w/ curb & gutter & 2-ft buffer strip**
- **Outside Shoulder Slope**	**N/A**	**2%**	**2%**
- **Sidewalks/Multi-use Path**	**N/A**	**5 ft**	**5 ft**
- **Auxiliary Lanes**	**N/A**	**N/A**	**N/A**
- **Splitter Island Width & Type**	**N/A**	**6-ft min.width w/ raised island**	**8-ft min. width w/ 6-ft min. raised island**
- **Bike Lanes**	**N/A**	**N/A**	**N/A**
Posted Speed	**N/A**		**N/A**
Design Speed	**N/A**	**25 mph**	**20 mph**
Min Horizontal Curve Radius	**N/A**	**N/A**	**N/A**
Maximum Superelevation Rate	**N/A**	**2%**	**2%**
Maximum Grade	**N/A**	**6%**	**5.325%*** **
Access Control	**None**	**None**	**None**
Design Vehicle	**N/A**	**WB-67** **	**WB-67** **
Pavement Type	**Asphaltic Conc.**	**N/A**	**Asphaltic Conc.**

*According to current GDOT design policy if applicable
**IAW GDOT Design Policy, WB-67 is the design vehicle for roundabout intersections
***See NCHRP Report 672, Chapter 6.8.7.5 (Locating Roundabout on Grades)

Sideroad Design Features:

SR 60 [Rural major collector]

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**2**	**2**	**2**
- **Lane Width(s)**	**12 ft**	**12 ft**	**12 ft**
- **Median Width & Type**	**N/A**	**N/A**	**N/A**
- **Outside Shoulder or Border Area Width**	**Unpaved**	**8 ft (6.5 ft paved)**	**8 ft (6.5 ft paved)**
- **Outside Shoulder Slope**	**Variable**	**6%**	**6%**
- **Inside Shoulder Width**	**N/A**	**N/A**	**N/A**
- **Sidewalks**	**N/A**	**N/A**	**N/A**
- **Auxiliary Lanes**	**N/A**	**N/A**	**N/A**
- **Bike Lanes**	**N/A**	**4-ft**	**6.5-ft paved shldr**
Posted Speed	**35 mph**		**35 mph**
Design Speed	**35 mph**	**45 mph**	**35 mph**
Min Horizontal Curve Radius	**397.2 ft**	**643 ft**	**643 ft*** **
Maximum Superelevation Rate	**9.3%**	**6%**	**6%**
Maximum Grade [Mountainous]	**5.9%**	**10%**	**6.9%**
Access Control	**Partial**	**Partial**	**Partial**
Design Vehicle	**N/A**	**SU**	**WB-67** **
Pavement Type	**Asphaltic Conc.**	**N/A**	**Asphaltic Conc.**

*According to current GDOT design policy if applicable
**IAW GDOT Design Policy, WB-67 is the design vehicle for roundabout intersections
***Tie-in radius of 500 ft used

CR 84 – Stone Pile Gap Road [Rural minor collector]

Feature	Existing	Standard*	Proposed
Typical Section			
- **Number of Lanes**	**2**	**2**	**2**
- **Lane Width(s)**	**9 ft**	**11 ft**	**11 ft**
- **Median Width & Type**	**N/A**	**N/A**	**N/A**
- **Outside Shoulder or Border Area Width**	**Unpaved**	**8 ft (2 ft paved)**	**8 ft (2 ft paved)**
- **Outside Shoulder Slope**	**Variable**	**6%**	**6%**
- **Inside Shoulder Width**	**N/A**	**N/A**	**N/A**
- **Sidewalks**	**N/A**	**N/A**	**N/A**
- **Auxiliary Lanes**	**N/A**	**N/A**	**N/A**
- **Bike Lanes**	**N/A**	**N/A**	**N/A**
Posted Speed	**35 mph****	**N/A**	**15 mph*****
Design Speed	**N/A**	**45 mph**	**15 mph*****
Min Horizontal Curve Radius	**35**	**643 ft**	**30 ft******
Maximum Superelevation Rate	**Not available**	**6%**	**6%**
Maximum Grade [Mountainous]	**11.6%**	**10%**	**11.6%******
Access Control	**Partial**	**Partial**	**Partial**
Design Vehicle	**N/A**	**SU**	**SU**
Pavement Type	**Asphaltic Conc.**	**N/A**	**Asphaltic Conc.**

*According to current GDOT design policy if applicable

**In accordance with Lumpkin County ordinances, unposted roadways have a speed limit of 35 mph

***CR 84 is a very-low volume local road (Design ADT = 150). Although its current legal speed is 35 mph, 15 mph is recommended to be the posted speed due to the existing severe horizontal curvature and steep grades of the switchback approaching the intersection with US 19/SR 9.

****In accordance with Chapter 3 of the AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400), "Changes to roadway or roadside geometrics during such projects are generally recommended only when there is a documentable site-specific safety problem that can potentially be corrected by a roadway or roadside improvement." In the crash data report for this project in the years of 2009-2013, there were no reported accidents for CR 84.

Major Interchanges/Intersections: The only major intersection for this project is the Stone Pile Gap intersection itself. The intersection is a junction between US 19/SR 9, SR 60 and Stone Pile Gap Road (CR 84). SR 60 ties into US 19/ SR 9 in a sharp curve and its alignment is in line with the northbound tangent of the curve. Slip lanes allow vehicles to move from southbound US 19/ SR 9 to SR 60 and from SR 60 to either direction of US 19/SR 9. CR 84 ties into US 19/SR 9 from a westerly direction adjacent to where SR 60 ties in. The intersecting angles of SR 60 and CR 84 are approximately 90 degrees.

Lighting required: ☐ No ☒ Yes

Off-site Detours Anticipated: ☒ No ☐ Yes ☐ Undetermined

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:

FHWA/AASHTO Controlling Criteria	No	Undeter-mined	Yes	Appvl Date (if applicable)
1. Design Speed	☒	☐	☐	
2. Lane Width	☒	☐	☐	
3. Shoulder Width	☒	☐	☐	
4. Bridge Width	☒	☐	☐	
5. Horizontal Alignment*	☐	☒	☐	
6. Superelevation	☒	☐	☐	
7. Vertical Alignment**	☐	☐	☒	
8. Grade	☒	☐	☐	
9. Stopping Sight Distance	☒	☐	☐	
10. Cross Slope	☒	☐	☐	
11. Vertical Clearance	☒	☐	☐	
12. Lateral Offset to Obstruction	☒	☐	☐	
13. Bridge Structural Capacity	☒	☐	☐	

*Multiple curves tying proposed alignments into existing ones do not meet standard minimum radii
**Multiple vertical curves tying the roundabout legs into the roundabout do not meet standard k-values

Design Variances to GDOT Standard Criteria anticipated:

GDOT Standard Criteria	Reviewing Office	No	Undeter--mined	Yes	Appvl Date (if applicable)
1. Access Control/Median Openings	DP&S	☒	☐	☐	
2. Intersection Sight Distance	DP&S	☒	☐	☐	
3. Intersection Skew Angle	DP&S	☒	☐	☐	
4. Lateral Offset to Obstruction	DP&S	☒	☐	☐	
5. Rumble Strips	DP&S	☒	☐	☐	
6. Safety Edge	DP&S	☒	☐	☐	
7. Median Usage	DP&S	☒	☐	☐	
8. Roundabout Illumination Levels	DP&S	☒	☐	☐	
9. Complete Streets	DP&S	☒	☐	☐	
10. ADA & PROWAG	DP&S	☒	☐	☐	
11. GDOT Construction Standards	DP&S	☒	☐	☐	
12. GDOT Drainage Manual	DP&S	☒	☐	☐	
13. GDOT Bridge & Structural Manual	Bridges	☒	☐	☐	

VE Study anticipated: ☒ No ☐ Yes ☐ Completed – Date:

UTILITY AND PROPERTY

Temporary State Route needed: ☐ No ☒ Yes ☐ Undetermined

Railroad Involvement: Not applicable

Utility Involvements:

1) Windstream - Telecommunications
2) Amicalola EMC – Power

SUE Required: ☒ No ☐ Yes ☐ Undetermined

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

Right-of-Way (ROW): Existing width: 60-100 ft. Proposed width: 72-175 ft.

Required Right-of-Way anticipated: ☐ None ☒ Yes ☐ Undetermined
Easements anticipated: ☐ None ☒ Temporary ☐ Permanent ☐ Utility ☐ Other

Anticipated total number of impacted parcels:		6
Displacements anticipated:	Businesses:	6
	Residences:	0
	Other:	0
	Total Displacements:	0

Location and Design approval: ☐ Not Required ☒ Required

ROUNDABOUTS

Roundabout Lighting Agreement/Commitment Letter received: ☐ No ☒ Yes

Roundabout Planning Level Assessment: Not applicable

Roundabout Feasibility Study:

There was a total of five (5) build alternatives and one (1) no-build alternative analyzed to determine whether a roundabout intersection would be the optimal solution for the project location. Three (3) of the build alternatives were roundabouts and the other two (2) build alternatives were all-way stop designs with minor reconstruction of the existing intersection. All alternatives were analyzed for safety improvements, operational performance, impacts to the surrounding environment, construction staging and benefits-to-cost ratio. Based on the analyses conducted, it was determined that a 130-foot single-lane roundabout centered upon the existing intersection of SR 9 and SR 60 – Alternative 5 – would achieve the purpose of the project which is providing a safer intersection at a cost that is feasible.

The roundabout feasibility study is attached to this report for more detailed information.

Roundabout Peer Review Required: ☐ No ☒ Yes ☒ Completed – Date: 3/11/2015

CONTEXT SENSITIVE SOLUTIONS

Issues of Concern:

1. The stonepile located within the intersection has been deemed both a historical and archeological resource which cannot be relocated. This environmental resource will require NEPA coordination with local Native American tribes throughout the life of the project.

2. US 19/SR 9/ SR 60 is part of a state designated bike route – State Bike Route 90 – and does not currently have bike lanes at the project location.

3. This project location is in a scenic area near National Forest areas and nearby tourist attractions.

Context Sensitive Solutions Proposed:

1. The project will be designed to avoid impacting the stonepile. Also, project engineers and contractors will be informed of the extreme sensitivity of the stonepile to ensure prudent construction methods are implemented to avoid impacting the stonepile. Orange barrier fencing will be used to further highlight the sensitivity of this environmental resource.

2. Paved shoulders will be designed to provide bicyclists adequate space to travel more safely adjacent to motorized vehicle traffic.

3. Aesthetic options will be considered for items such as retaining walls and guardrail to allow the site to better blend in with its surroundings.

ENVIRONMENTAL & PERMITS

Anticipated Environmental Document:

GEPA: ☐ **NEPA:** ☒ CE ☐ EA/FONSI ☐ EIS

MS4 Permit Compliance – Is the project located in a MS4 area? ☒ No ☐ Yes

Environmental Permits/Variances/Commitments/Coordination anticipated:

Permit/ Variance/ Commitment/ Coordination Anticipated	No	Yes	Remarks
1. U.S. Coast Guard Permit	☒	☐	
2. Forest Service/Corps Land	☒	☐	Near Chattahoochee NF
3. CWA Section 404 Permit	☐	☒	Delineation will be conducted
4. Tennessee Valley Authority Permit	☒	☐	
5. Buffer Variance	☐	☒	Site visit w/ EPD may be needed
6. Coastal Zone Management Coordination	☒	☐	
7. NPDES	☐	☒	
8. FEMA	☒	☐	
9. Cemetery Permit	☒	☐	
10. Other Permits	☒	☐	
11. Other Commitments	☒	☐	Cherokee THPO may require
12. Other Coordination	☐	☒	Cherokee THPO and GA SHPO

Is a PAR required? ☒ No ☐ Yes ☐ Completed – Date:

Environmental Comments and Information:

NEPA/GEPA: This anticipated environmental document for this project is a Categorical Exclusion. The stone pile at the intersection – purported to be the gravesite of a local Native American maiden, Trahlyta – should be avoided.

Ecology: An ecology survey has been conducted and one buffered ephemeral stream (Cold Water Watershed) has been identified. Surveys for pink ladyslipper, and small whorled pogonia have been conducted. Surveys for Indiana bat and northern long-eared bat should be conducted between June and August.

History: Trahlyta's grave is located within the existing intersection. A revised Cultural Resource Report was submitted to OES on June 4, 2015. Concurrence from the SHPO is needed.

Archeology: Trahlyta's grave is located within the existing intersection. An archeologic survey was completed on January 23, 2014 and a Ground Penetrating Radar Survey was conducted in December 2014. A revised Cultural Resource Report was submitted to OES on June 4, 2015. Concurrence from the SHPO and the Cherokee THPO will be required.

Air Quality:

Is the project located in a PM 2.5 Non-attainment area? ☒ No ☐ Yes
Is the project located in an Ozone Non-attainment area? ☒ No ☐ Yes
Carbon Monoxide hotspot analysis: ☐ Required ☒ Not Required ☐ TBD

Noise Effects: A noise Type III assessment will be required. It is anticipated that no concurrence will be required.

Public Involvement: A PIOH presenting the two roundabout alternatives was held on March 4th, 2014. See attached PIOH Summary for additional information.

Major stakeholders:

1. Traveling public
2. Lumpkin County Government
3. United Keetoowah Band of Cherokee Indians in Oklahoma
4. Surrounding commercial property owners (i.e. R Ranch in the Mountains)
5. Bicyclists

CONSTRUCTION

Issues potentially affecting constructability/construction schedule:

There are a couple of issues that may affect the constructability and/or the construction schedule of this project. Staging of traffic may affect both since the corridor where traffic will be staged is narrow and located in a mountainous area, therefore, not allowing large portions to be constructed at any one time. This area is also more prone to ice and snowfall during the winter months compared to the rest of the state which could also delay the schedule.

Early Completion Incentives recommended for consideration: ☒ No ☐ Yes

COORDINATION, ACTIVITIES, RESPONSIBILITIES, AND COSTS

Initial Concept Meeting: Not applicable

Concept Meeting:

The Concept Meeting was held on November 13, 2013. The following items were discussed:

1. It was determined the existing utilities will need to be moved, but this does not pose an issue or risk as the design moves forward.
2. District Traffic Operations expressed concerns regarding sight distance of the proposed relocated location of Stone Pile Gap Road.
3. Due to this facility being a part of a State-designated bike route, Engineering Services recommended 10' sidewalks for bike usage.
4. Seeing the project is located in the mountains, it was discussed to reduce the footprint where feasible.
5. The team discussed and determined this project is not within the National Forest.
6. Public involvement should be implemented as soon as possible.
7. Bicyclists should be considered stakeholders for environmental purposes.
8. Because of the Georgia Historical Commission marker at this site, this site is deemed to be historically significant.
9. The site is also archaeologically significant due to the stone pile and possibly the marker itself.
10. Negotiations and coordination with several Native American tribes are part of the section 106 process and could affect the preferred design layout.

See attached Concept Meeting Minutes for additional information.

Other coordination to date: OES has conducted coordination with the Native American tribes that are stakeholders of the project.

Project Activity	Party Responsible for Performing Task(s)
Concept Development	District One Design
Design	District One Design
Right-of-Way Acquisition	District One Right-of-Way
Utility Relocation	District One Utilities/Utility Companies
Letting to Contract	Construction Bidding Administration
Construction Supervision	District One, Area 4
Providing Material Pits	Contractor
Providing Detours	N/A
Environmental Studies, Documents, & Permits	Gresham, Smith & Partners
Environmental Mitigation	Gresham, Smith & Partners
Construction Inspection & Materials Testing	District One, Area 4; Office of Materials (OMAT)

Project Cost Estimate Summary and Funding Responsibilities:

	Breakdown of PE	ROW	Reimbursable Utility	CST*	Environmental Mitigation	Total Cost
Funded By	GDOT	GDOT	GDOT	GDOT	GDOT	
$ Amount	$300,000	$631,000	$597,173	$2,746,613	$0	$4,274,786
Date of Estimate	1/24/2012	10/14/2014	10/14/2014	2/6/2015	2/6/2015	

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

ALTERNATIVES DISCUSSION

Alternative selection:

Preferred Alternative: Single-lane (130-foot diameter) Roundabout Centered on Stone Pile – Alternative 5			
Estimated Property Impacts:	6	**Estimated Total Cost:**	$4,274,786
Estimated ROW Cost:	$631,000	**Estimated CST Time:**	18 months
Rationale: This alternative was chosen due its implementation of a roundabout which is a FHWA-proven countermeasure to at-grade intersections that experience numerous severe crashes. It is the least costly of the three roundabout alternatives since it has a smaller project footprint than the other two roundabout alternatives. This smaller footprint also has less of an impact to the surrounding environment of the intersection than the other two roundabout alternatives. As with all the alternatives, great care was taken in designing this option to have no direct impacts to the stone pile at the center of the existing intersection because of its very sensitive nature.			

No-Build Alternative:			
Estimated Property Impacts:	0	**Estimated Total Cost:**	$300,000 (P.E.)
Estimated ROW Cost:	$0	**Estimated CST Time:**	None
Rationale: The no-build alternative was not chosen because the benefit-to-cost ratio of the preferred alternative (1.62) demonstrates that in spite of the cost, there is a greater benefit gained by modifying the existing intersection. The general consensus of attendees at the PIOH, who were all local to the area of the intersection, was that some type of improvement was needed at this intersection due to the severe geometry of the existing intersection. The deficiencies in the existing geometry, both horizontal and vertical, are contributing factors to crashes that occur here.			

Alternative 1: Single-lane (150-foot diameter) Roundabout Centered on Existing Stone Pile			
Estimated Property Impacts:	6	**Estimated Total Cost:**	$5,026,975
Estimated ROW Cost:	$631,000	**Estimated CST Time:**	18 months
Rationale: Although this alternative did meet the project justification of improving the safety of the existing intersection by using a roundabout, the cost of this alternative when compared with the preferred alternative is $752,189 greater. It also would have a larger project footprint than the preferred alternative which would result in greater impacts to the surrounding environment.			

Alternative 2: Single-lane Roundabout with Center Offset from Current Intersection			
Estimated Property Impacts:	6	**Estimated Total Cost:**	$5,269,635
Estimated ROW Cost:	$631,000	**Estimated CST Time:**	18 months
Rationale: Although this alternative did meet the project justification of improving the safety of the existing intersection by using a roundabout, the cost of this alternative when compared with the preferred alternative is $994,849 greater. It also would have a larger project footprint than the preferred alternative which would result in greater impacts to the surrounding environment.			

Alternative 3: All-way Stop (at current intersection)			
Estimated Property Impacts:	3	**Estimated Total Cost:**	$2,179,961
Estimated ROW Cost:	$315,500	**Estimated CST Time:**	12 months
Rationale: This alternative was analyzed in order to provide a lower cost alternative for improving the Stone Pile Gap intersection. However, it had the second lowest benefit-to-cost (B/C) ratio of 0.91. Bike lanes were determined to be infeasible for this alternative due to the sizable added cost of retaining walls required to build them. The implementation of this alternative without bike lanes would have required a variance since SR 9/SR 60 is a designated State Bike Route.			

Alternative 4: All-way Stop (offset from current intersection)			
Estimated Property Impacts:	3	**Estimated Total Cost:**	$2,284,286
Estimated ROW Cost:	$315,500	**Estimated CST Time:**	12 months
Rationale: This alternative was analyzed in order to provide a lower cost alternative for improving the Stone Pile Gap intersection. However, it had the lowest benefit-to-cost (B/C) ratio of 0.87. Bike lanes were determined to be infeasible for this alternative due to the sizable added cost of retaining walls required to build them. The implementation of this alternative without bike lanes would have required a variance since SR 9/SR 60 is a designated State Bike Route.			

Comments: N/A

LIST OF ATTACHMENTS/SUPPORTING DATA

1. Concept Layout
2. Typical sections
3. Detailed Cost Estimates
4. Crash summaries
5. Capacity analysis summary
6. Summary of TE Study and Signal Warrant Analysis
7. Roundabout Feasibility Study
    A. Traffic diagrams
    B. Two-way Stop Control Summary
    C. All-way Stop Control Summary

Georgia Department of Transportation

D. GDOT Roundabout Analysis Tool
E. HCS 2010 Roundabout Reports
F. SIDRA Reports
G. GDOT Roundabout Checklist
H. Stopping Sight Distance Diagram
I. Intersection Sight Distance Diagrams
J. Fastest Path Diagrams
K. Design Vehicle Turning Path Diagrams
L. Lighting agreement letter
M. Peer Review and responses

8. Minor Project Pavement Design Selection
9. HSM Crash Reduction Factor Calculation
10. Minutes of Concept meeting
11. PIOH Summary

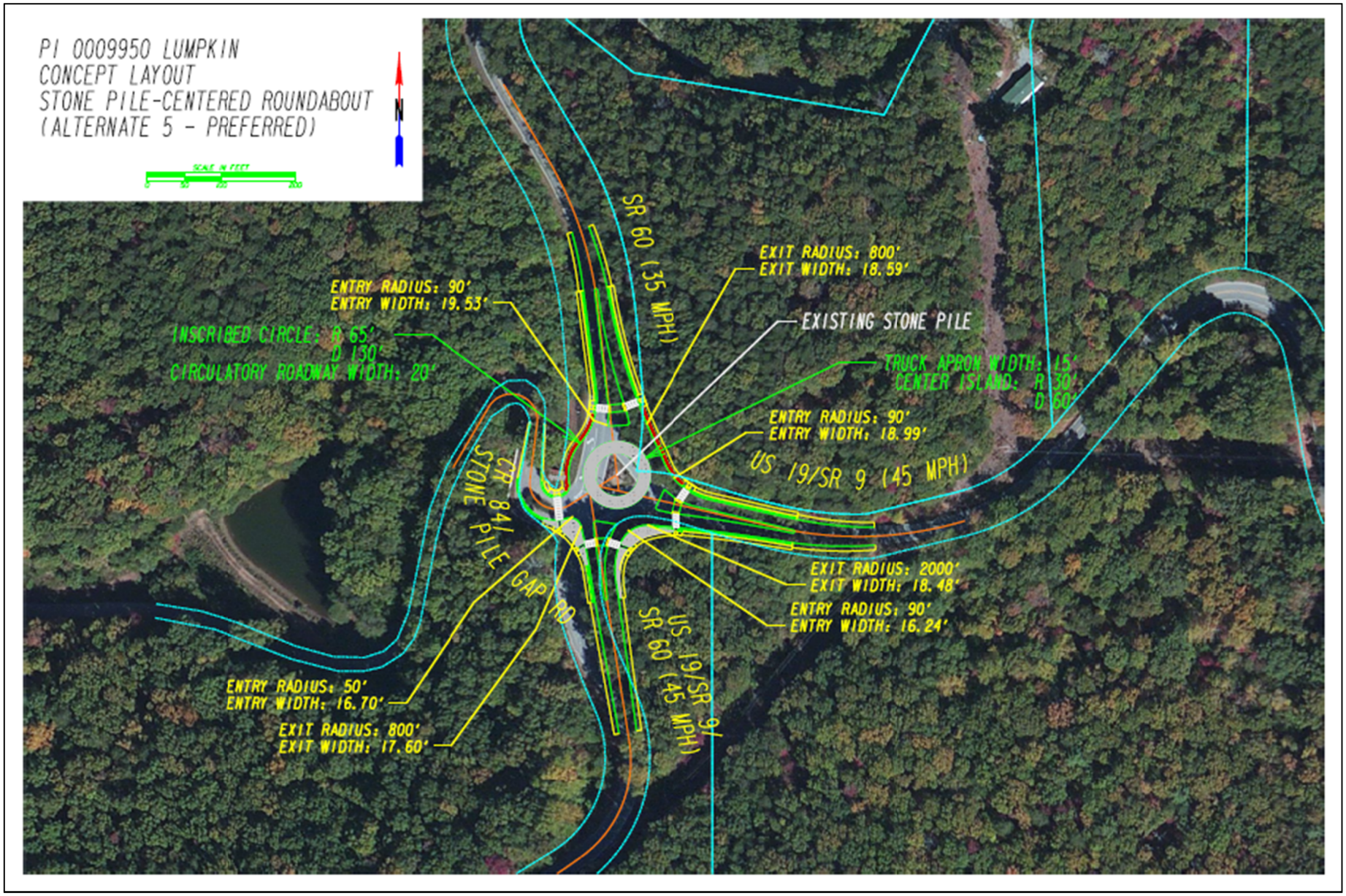
APPROVALS

Concur: _____
Director of Engineering

Approve: Margaret B. Pikle _____ 8.20.15
Chief Engineer Date

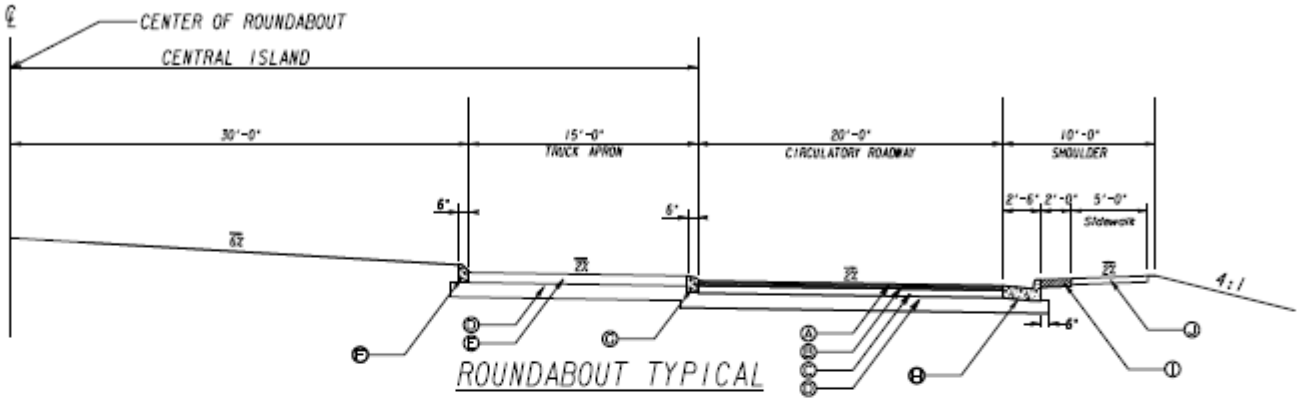
ATTACHMENT 1:

CONCEPT LAYOUT


PI 0009950 LUMPKIN
CONCEPT LAYOUT
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)
N
SCALE IN FEET
0
100
200
2000
SR 60 (35 MPH)
EXIT RADIUS: 800'
EXIT WIDTH: 18.59'
ENTRY RADIUS: 90'
ENTRY WIDTH: 19.53'
INSCRIBED CIRCLE: R 65'
D 130'
CIRCULATORY ROADWAY WIDTH: 20'
EXISTING STONE PILE
TRUCK APRON WIDTH: 15'
CENTER ISLAND: R 30'
D 60'
ENTRY RADIUS: 90'
ENTRY WIDTH: 18.99'
US 19/SR 9 (45 MPH)
CR 841
STONE PILE GAP RD
EXIT RADIUS: 2000'
EXIT WIDTH: 18.48'
ENTRY RADIUS: 90'
ENTRY WIDTH: 16.24'
US 19/SR 9
SR 60 (45 MPH)
ENTRY RADIUS: 50'
ENTRY WIDTH: 16.70'
EXIT RADIUS: 800'
EXIT WIDTH: 17.60'

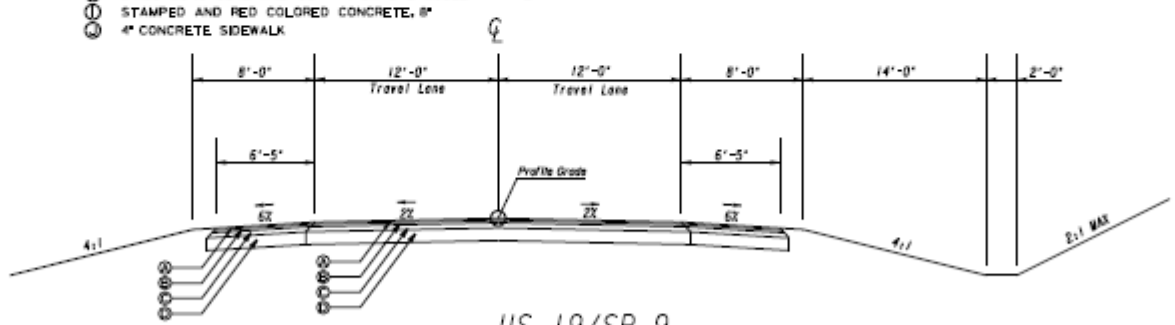
ATTACHMENT 2:

TYPICAL SECTIONS



ROUNDABOUT TYPICAL

- (A) RECYCLED ASPH CONC 9.5 mm SUPERPAVE, TYPE I GP 2 ONLY, INCL BITUM MATL & H LIME (135 LBS/SY)
- (B) RECYCLED ASPH CONC 19 mm SUPERPAVE, GP 1 OR 2 ONLY, INCL BITUM MATL & H LIME (220 LBS/SY)
- (C) RECYCLED ASPH CONC 25 mm SUPERPAVE, GP 1 OR 2 ONLY, INCL BITUM MATL & H LIME (330 LBS/SY)
- (D) 12" G.A.B.
- (E) 10" COLORED AND STAMPED CONCRETE
- (F) CONCRETE HEADER CURB GA. STD. 9032B, 6 INCH, TYPE 7
- (G) CONCRETE HEADER CURB GA. STD. 9032B, 4 INCH, TYPE 9
- (H) 8"X30" CONC. CURB AND GUTTER GA. STD. 9032B TYPE 2
- (I) STAMPED AND RED COLORED CONCRETE, 8"
- (J) 4" CONCRETE SIDEWALK



US 19/SR 9

GDOT DISTRICT 1

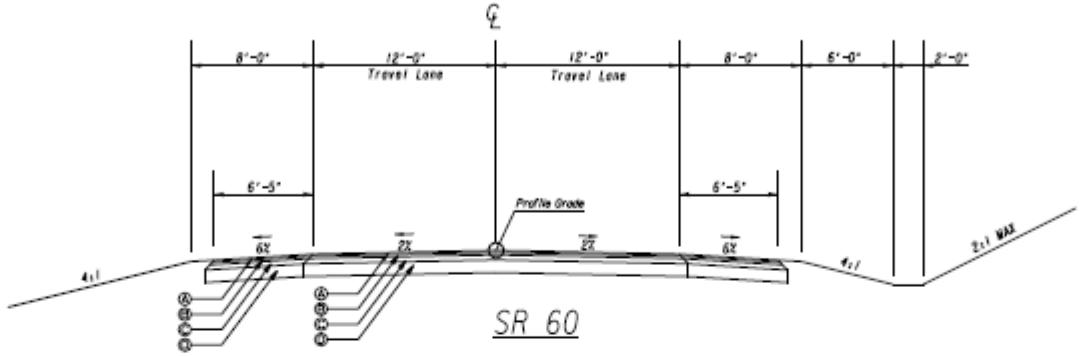
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: DISTRICT ONE DESIGN

TYPICAL SECTIONS

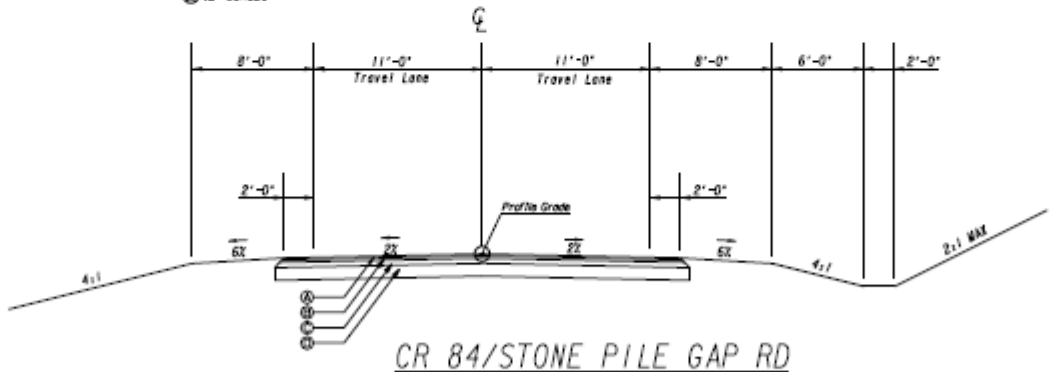
SR 9 @ SR 60
LUMPKIN

DRAWING NO. 05-001



SR 60

Ⓐ RECYCLED ASPH CONC 9.5 mm SUPERPAVE, TYPE I GP 2 ONLY, INCL BITUM MATL & H LIME (155 LBS/SY)
Ⓑ RECYCLED ASPH CONC 19 mm SUPERPAVE, GP 1 OR 2 ONLY, INCL BITUM MATL & H LIME (220 LBS/SY)
Ⓒ RECYCLED ASPH CONC 25 mm SUPERPAVE, GP 1 OR 2 ONLY, INCL BITUM MATL & H LIME (330 LBS/SY)
Ⓓ 12" G.A.B.



CR 84/STONE PILE GAP RD

GDOT DISTRICT 1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: DISTRICT ONE DESIGN
TYPICAL SECTIONS

SR 9 @ SR 60
LUMPKIN

05-002

ATTACHMENT 3:

DETAILED COST ESTIMATES

Stonepile-centered Roundabout - Alternate 5

Concept Cost Estimate
PI 0009950 Lumpkin

Item No.	Pay Item Description	Unit	Quantity	Rounded	Unit Price	Amount
150-1000	TRAFFIC CONTROL -	LS	1	1	75000	$75,000.00
163-0232	TEMPORARY GRASSING	AC	0.788488076	1	357.0324354	$357.03
163-0240	MULCH	TN	22.86615421	23	138.1591019	$3,177.66
163-0300	CONSTRUCTION EXIT	EA	4	4	1305.484802	$5,221.94
163-0520	CONSTRUCT AND REMOVE TEMPORARY PIPE SLOPE DRAIN	LF	342.7134	343	13.00968101	$4,462.32
163-0527	CONSTRUCT AND REMOVE RIP RAP CHECK DAMS, STONE PLAIN RIP RAP/SAND BAGS	EA	32	32	306.343176	$9,802.98
163-0528	CONSTRUCT AND REMOVE FABRIC CHECK DAM - TYPE C SILT FENCE	LF	668	668	3.250691603	$2,171.46
163-0529	CONSTRUCT AND REMOVE TEMPORARY SEDIMENT BARRIER OR BALED STRAW CHECK DAM	LF	968.8608	969	4.119283168	$3,991.59
163-0531	CONSTRUCT AND REMOVE SEDIMENT BASIN, TP 1, STA NO -	EA	1	1	11773.8904	$11,773.89
163-0541	CONSTRUCT AND REMOVE ROCK FILTER DAMS	EA	3	3	558.9117009	$1,676.74
163-0542	CONSTRUCT AND REMOVE STONE FILTER RING	EA	3	3	495.5794048	$1,486.74
163-0550	CONSTRUCT AND REMOVE INLET SEDIMENT TRAP	EA	9	9	159.3974641	$1,434.58
165-0030	MAINTENANCE OF TEMPORARY SILT FENCE, TP C	LF	1984.9269	1985	0.564022705	$1,119.59
165-0041	MAINTENANCE OF CHECK DAMS - ALL TYPES	LF	1180	1180	2.714357377	$3,202.94
165-0060	MAINTENANCE OF TEMPORARY SEDIMENT BASIN, STA NO -	EA	1	1	2115.264	$2,115.26
165-0071	MAINTENANCE OF SEDIMENT BARRIER - BALED STRAW	LF	968.8608	969	1.166752496	$1,130.58
165-0101	MAINTENANCE OF CONSTRUCTION EXIT	EA	4	4	588.8696701	$2,355.48
165-0105	MAINTENANCE OF INLET SEDIMENT TRAP	EA	9	9	43.75143212	$393.76
165-0110	MAINTENANCE OF ROCK FILTER DAM	EA	3	3	209.8972727	$629.69
165-0111	MAINTENANCE OF STONE FILTER RING	EA	3	3	185.839881	$557.52
167-1000	WATER QUALITY MONITORING AND SAMPLING	EA	6	6	258.6631379	$1,551.98
167-1500	WATER QUALITY INSPECTIONS	MO	24	24	550.1370824	$13,203.29
171-0030	TEMPORARY SILT FENCE, TYPE C	LF	1984.9269	1985	2.902454281	$5,761.37
201-1500	CLEARING & GRUBBING -	LS	1	1	250000	$250,000.00
205-0001	UNCLASS EXCAV	CY	14778.103	14779	4.463781959	$65,970.23
310-1101	GR AGGR BASE CRS, INCL MATL	TN	5587.53	5588	19.20509147	$107,318.05
318-3000	AGGR SURF CRS	TN	50	50	23.22537838	$1,161.27
402-1812	RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME	TN	241.2380104	242	72.97326672	$17,659.53
402-3103	RECYCLED ASPH CONC 9.5 MM SUPERPAVE, TYPE II, GP 2 ONLY, INCL BITUM MATL & H LIME	TN	374.1940278	375	72.51208934	$27,192.03
402-3121	RECYCLED ASPH CONC 25 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	TN	898.0656667	899	66.62355422	$59,894.58
402-3190	RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2,INCL BITUM MATL & H LIME	TN	598.7104444	599	71.41739323	$42,779.02
413-1000	BITUM TACK COAT	GL	816.4233333	817	2.520086942	$2,058.91
430-0180	PLAIN PC CONC PVMT, CL 1 CONC, 8 INCH THK	SY	50.94068889	51	25.61967183	$1,306.60
430-0200	PLAIN PC CONC PVMT, CL 1 CONC, 10 INCH THK	SY	570.1416	571	38.25	$21,840.75
432-5010	MILL ASPH CONC PVMT, VARIABLE DEPTH	SY	1037.644278	1038	1.02131585	$1,060.13
441-0104	CONC SIDEWALK, 4 IN	SY	680.4989222	681	27.60190652	$18,796.90
441-0301	CONC SPILLWAY, TP 1	EA	1	1	1583.578655	$1,583.58
441-0303	CONC SPILLWAY, TP 3	EA	1	1	1629.40125	$1,629.40
441-0748	CONCRETE MEDIAN, 6 IN	SY	563.1625889	564	46.72899519	$26,355.15
441-5008	CONCRETE HEADER CURB, 6 IN, TP 7	LF	188.4956	189	14.55173362	$2,750.28
441-5025	CONCRETE HEADER CURB, 4 IN, TP 9	LF	282.7433	283	13.48411415	$3,816.00
441-6222	CONC CURB & GUTTER, 8 IN X 30 IN, TP 2	LF	1055.6	1056	13.64626066	$14,410.45
500-3107	CLASS A CONCRETE, RETAINING WALL	CY	24.09831378	25	428.1946585	$10,704.87
500-3200	CLASS B CONCRETE	CY	0.334	1	368.4189093	$368.42
500-3800	CLASS A CONCRETE, INCL REINF STEEL	CY	5.26	6	910.1342328	$5,460.81
550-1180	STORM DRAIN PIPE, 18 IN, H 1-10	LF	472.3975	473	34.92728889	$16,520.61
550-4218	FLARED END SECTION 18 IN, STORM DRAIN	EA	1	1	593.204053	$593.20
576-1018	SLOPE DRAIN PIPE, 18 IN	LF	172.376	173	43.23491248	$7,479.64
603-2018	STN DUMPED RIP RAP, TP 1, 18 IN	SY	84.15681111	85	35.83901118	$3,046.32
603-2180	STN DUMPED RIP RAP, TP 3, 12 IN	SY	14.62008889	15	36.41394148	$546.21
603-7000	PLASTIC FILTER FABRIC	SY	98.7769	99	3.944926048	$390.55
615-1100	DIRECTIONAL BORE PIPE -	LF	660	660	9.779754601	$6,454.64
621-4023	CONCRETE SIDE BARRIER, TYPE 2C	LF	587.78	588	647.7549275	$380,879.90
627-1000	MSE WALL FACE, 0 - 10 FT HT, WALL NO -	SF	782.4690902	783	36.43151626	$28,525.88
627-1010	MSE WALL FACE, 10 - 20 FT HT, WALL NO -	SF	6913.904898	6914	32.33355571	$223,554.20
627-1160	TRAFFIC BARRIER H, WALL NO -	LF	580.3	581	206.3926093	$119,914.11
628-0100	PERMANENT SOIL-NAILED WALL, NO -	SF	9048.126035	9049	59.756164	$540,733.53
636-1020	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 3	SF	162	162	14.96784903	$2,424.79
636-1029	HIGHWAY SIGNS, TP 2 MATL, REFL SHEETING, TP 3	SF	83	83	25.321485	$2,101.68
636-1033	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 9	SF	34	34	17.77320094	$604.29
636-2070	GALV STEEL POSTS, TP 7	LF	339	339	6.465247129	$2,191.72
636-2080	GALV STEEL POSTS, TP 8	LF	136	136	8.614710062	$1,171.60
636-2090	GALV STEEL POSTS, TP 9	LF	30	30	7.857325657	$235.72
641-5001	GUARDRAIL ANCHORAGE, TP 1	EA	3	3	859.5588318	$2,578.68
641-5012	GUARDRAIL ANCHORAGE, TP 12	EA	3	3	2074.698096	$6,224.09
643-8200	BARRIER FENCE (ORANGE), 4 FT	LF	136.2366	137	1.43552018	$196.67
647-2120	PULL BOX, PB-2	EA	24	24	326.7575758	$7,842.18
653-0130	THERMOPLASTIC PVMT MARKING, ARROW, TP 3	EA	4	4	100.7449664	$402.98
653-0296	THERMOPLASTIC PVMT MARKING, WORD, TP 15	EA	4	4	181.12	$724.48
653-1501	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, WHITE	LF	2147.6	2148	0.469108995	$1,007.65
653-1502	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, YELLOW	LF	2586	2586	0.500028344	$1,293.07
653-1804	THERMOPLASTIC SOLID TRAF STRIPE, 8 IN, WHITE	LF	675.3	676	2.100548388	$1,419.97
653-1810	THERMOPLASTIC SOLID TRAF STRIPE, 10 IN, WHITE	LF	163.7	164	1.674062001	$274.55

Stonepile-centered Roundabout - Alternate 5

Concept Cost Estimate
PI 0009950 Lumpkin

653-4830	THERMOPLASTIC SKIP TRAF STRIPE, 18 IN, WHITE	GLF	153.4	154	0.59	$90.86
653-6006	THERMOPLASTIC TRAF STRIPING, YELLOW	SY	251.5421111	252	3.882997999	$978.52
654-1001	RAISED PVMT MARKERS TP 1	EA	67	67	4.235368336	$283.77
668-2100	DROP INLET, GP 1	EA	6	6	1896.870971	$11,381.23
668-4300	STORM SEWER MANHOLE, TP 1	EA	1	1	1912.176494	$1,912.18
668-5000	JUNCTION BOX	EA	2	2	1607.940208	$3,215.88
668-8011	SAFETY GRATE, TP 1	SF	39.747	40	45.23345336	$1,809.34
681-4220	LIGHTING STD, 40 FT MH, POST TOP	EA	12	12	4175.424857	$50,105.10
681-6366	LUMINAIRE, TP 3, 400 W, HP SODIUM	EA	48	48	813.25	$39,036.00
682-1505	CABLE, TP RHH/RHW, AWG NO 8	LF	6000	6000	0.753662778	$4,521.98
682-6222	CONDUIT, NONMETL, TP 2, 2 IN	LF	720	720	5.142216825	$3,702.40
682-6233	CONDUIT, NONMETL, TP 3, 2 IN	LF	1320	1320	5.671908526	$7,486.92
682-9000	MAIN SERVICE PICK UP POINT	LS	1	1	12063.80938	$12,063.81
682-9010	SVC POLE RISER	EA	1	1	5290	$5,290.00
700-6910	PERMANENT GRASSING	AC	1.576976152	2	1010.224877	$2,020.45
700-7000	AGRICULTURAL LIME	TN	6.30790461	7	78.57070841	$549.99
700-8000	FERTILIZER MIXED GRADE	TN	0.473092846	1	230.4443079	$230.44
700-8100	FERTILIZER NITROGEN CONTENT	LB	78.84880762	79	2.351299768	$185.75
711-0100	TURF REINFORCING MATTING, TP 1	SY	272.5710222	273	3.883529738	$1,060.20
716-2000	EROSION CONTROL MATS, SLOPES	SY	1001.248433	1002	0.987871668	$989.85
					Sub-total	$2,342,942.90
					E&I (5%)	$117,147.14
					Contingency (10%)	$246,009.00
					Fuel Adjustment	$40,513.27
					Total	$2,746,612.32

PROJ. NO.			CALL NO.
P.I. NO.	0009950		
DATE	10/10/2014		

INDEX (TYPE)	**DATE**	**INDEX**
REG. UNLEADED	Sep-14	$ 3.335
DIESEL		$ 3.765
LIQUID AC		$ 618.00

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)				**39212.1**	**$ 39,212.10**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	988.80	
Monthly Asphalt Cement Price month project let (APL)			$	618.00	
Total Monthly Tonnage of asphalt cement (TMT)				105.75	

ASPHALT	**Tons**	**%AC**	**AC ton**
Leveling	242	5.0%	12.1
12.5 OGFC		5.0%	0
12.5 mm		5.0%	0
9.5 mm SP	375	5.0%	18.75
25 mm SP	899	5.0%	44.95
19 mm SP	599	5.0%	29.95
	2115		**105.75**

BITUMINOUS TACK COAT

Price Adjustment (PA)			**$**	**1,301.17**	**$ 1,301.17**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	988.80	
Monthly Asphalt Cement Price month project let (APL)			$	618.00	
Total Monthly Tonnage of asphalt cement (TMT)				3.509097453	

Bitum Tack Gals	gals/ton	tons
817	232.8234	3.50909745

BITUMINOUS TACK COAT (surface treatment)

Price Adjustment (PA)				**0**	**$ -**
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	$	988.80	
Monthly Asphalt Cement Price month project let (APL)			$	618.00	
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 **$ 40,513.27**

GEORGIA DEPARTMENT OF TRANSPORTATION
PRELIMINARY ROW COST ESTIMATE SUMMARY

Date: 9/22/2014 Project: 0009950
Revised: County: Lumpkin County
PI: 0009950

Description: SR 9 @ SR 60
Project Termini: SR 9 @ SR 60

Existing ROW:
Parcels: 6 Required ROW:

Land and Improvements	$487,500.00
Proximity Damage	*$0.00*
Consequential Damage	*$0.00*
Cost to Cures	*$0.00*
Trade Fixtures	*$0.00*
Improvements	*$125,000.00*
Valuation Services	$37,500.00
Legal Services	$41,550.00
Relocation	$12,000.00
Demolition	$0.00
Administrative	$52,000.00
TOTAL ESTIMATED COSTS	$630,550.00
TOTAL ESTIMATED COSTS (ROUNDED)	***$631,000.00***

Preparation Credits	Hours	Signature

Prepared By: Lashone Alexander CG#: 286999 09/22/2014 (DATE)
Approved By: Lashone Alexander CG#: 286999 09/22/2014 (DATE)

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

allsop

DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE	PI 0009950, Lumpkin County PI No. 0009950 SR 9 @ SR 60 Stone Pile Gap Round About	OFFICE	GAINESVILLE
FROM	Neil Kantner, P.E., Distr. Utilities Eng.	DATE	9/18/2014

TO Albert Shelby, State Program Delivery Engineer
ATTEN Dylan Curtis, Project Manager

SUBJECT UPDATED PRELIMINARY UTILITY COST ESTIMATE

As requested by your office we are furnishing you with an Updated Preliminary Utility Cost estimate for the subject project.

FACILITY OWNER		NON-REIMBURSABLE		REIMBURSBLE
Amicalola EMC		$113,400		$23,100
Windstream Telephone		$0		$574,073

TOTALS	$113,400	$597,173
Total Non-Reimbursable Cost	$113,400	
Total Reimbursabe Cost		$597,173

** If the local gov't is granted utility aid

If you have any questions, please contact Neil Kantner at 770-531-5772.

NAK

C: Mike Bolden, State Utilities Engineer
Robert Mabry, Area Engineer
File

ATTACHMENT 4:

CRASH SUMMARIES

0009950 Crash Summaries

Crash Data Summary

SR 9 @ SR 60			
Year	**Crashes**	**Non-Fatal Injuries**	**Fatalities**
2009	0	0	0
2010	0	0	0
2011	2	5	0
2012	6	1	0
2013	2	2	0
Total	**10**	**8**	**0**

Crash Type Summary

SR 9 @ SR 60							
Crash Type	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**	**%**
Angle	0	0	2	5	0	**7**	**70.00%**
Head On	0	0	0	0	0	**0**	**0.00%**
Rear End	0	0	0	1	1	**2**	**20.00%**
Sideswipe	0	0	0	0	1	**1**	**10.00%**
Other	0	0	0	0	0	**0**	**0.00%**
Total	**0**	**0**	**2**	**6**	**2**	**10**	**100.00%**

Crash Type Compared with Non-Fatal Injuries and Fatalities

SR 9 @ SR 60						
	Crashes		**Non-Fatal Injuries**		**Fatalities**	
Crash Type	**#**	**%**	**#**	**%**	**#**	**%**
Angle	7	70.00%	6	75.00%	0	0.00%
Head On	0	0.00%	0	0.00%	0	0.00%
Rear End	2	20.00%	0	0.00%	0	0.00%
Sideswipe	1	10.00%	2	25.00%	0	0.00%
Other	0	0.00%	0	0.00%	0	0.00%
Total	**10**	**100.00%**	**8**	**100.00%**	**0**	**0.00%**

ATTACHMENT 5:

CAPACITY ANALYSIS SUMMARY

0009950 Capacity Analysis Summary

SR 9 @ SR 60, 2013 (Existing) Peak Hour Traffic Volumes, No-Build

Inter	US 19/SR9/SR60 NB			US 19/SR9 SB			SR 60 SB			CR 84		
-val	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt
AM	MM	25	20	35	5	5	5	20	MM	MM	5	MM
PM	MM	35	45	30	5	10	5	25	MM	MM	5	MM

SR 9 @ SR 60, 2018 (Base Year) Peak Hour Traffic Volumes, No-Build

Inter	US 19/SR9/SR60 NB			US 19/SR9 SB			SR 60 SB			CR 84		
-val	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt
AM	MM	30	25	40	5	5	5	25	MM	MM	5	MM
PM	MM	40	50	35	5	10	5	25	MM	MM	5	MM

SR 9 @ SR 60, 2038 (Design Year) Peak Hour Traffic Volumes, No-Build

Inter	US 19/SR9/SR60 NB			US 19/SR9 SB			SR 60 SB			CR 84		
-val	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt
AM	MM	45	35	60	10	10	10	35	MM	MM	10	MM
PM	MM	70	80	50	10	15	10	45	MM	MM	10	MM

No-build Analysis, Base Year (2018)

Base Year (2018)								
	AM				PM			
Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
SR 9 NB LT	0.02	7.4	A	1.1	0.03	7.4	A	1.5
SR 60 LT*	0.04	10.3	B	2.5	0.05	10.8	B	3.2
SR 60 RT*	0.00	8.5	A	0.0	0.00	8.5	A	0.0

No-build Analysis, Design Year (2038)

Design Year (2038)								
	AM				PM			
Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
SR 9 NB LT	0.03	7.5	A	1.7	0.05	7.5	A	2.9
SR 60 LT*	0.07	11.1	B	4.4	0.10	12.4	B	6.5
SR 60 RT*	0.00	8.7	A	0.0	0.00	8.6	A	0.0

Roundabout Analyses, Base Year (2018)

Base Year (2018)									
		AM				PM			
Analysis Method	Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
HCS 2010	SR 9 NB	0.06	4.01	A	3.8	0.10	4.37	A	5.7
	SR 9 SB	0.05	3.82	A	3.8	0.05	3.82	A	3.8
	SR 60	0.03	3.91	A	1.9	0.04	3.94	A	1.9
Roundabout Analysis Tool	SR 9 NB	0.06	4	A	5	0.10	4	A	9
	SR 9 SB	0.05	4	A	5	0.05	4	A	5
	SR 60	0.03	4	A	3	0.04	4	A	3
SIDRA	SR 9 NB	0.05	5.5	A	5.9	0.07	5.7	A	9.5
	SR 9 SB	0.05	12.0	B	5.8	0.05	11.4	B	6.0
	SR 60	0.03	7.7	A	3.8	0.04	7.3	A	4.4

Roundabout Analyses, Design Year (2038)

Design Year (2038)									
		AM				PM			
Analysis Method	Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
HCS 2010	SR 9 NB	0.09	4.32	A	5.7	0.16	5.12	A	11.4
	SR 9 SB	0.08	4.09	A	5.7	0.08	4.04	A	3.8
	SR 60	0.05	4.18	A	3.8	0.06	4.23	A	3.8
Roundabout Analysis Tool	SR 9 NB	0.09	4	A	8	0.17	5	A	16
	SR 9 SB	0.09	4	A	8	0.08	4	A	7
	SR 60	0.05	4	A	4	0.06	4	A	5
SIDRA	SR 9 NB	0.07	5.6	A	9.2	0.13	5.7	A	17.4
	SR 9 SB	0.08	11.9	B	9.7	0.08	11.7	B	9.6
	SR 60	0.05	8.8	A	6.0	0.06	8.1	A	7.4

All-way Stop Analysis, Base Year (2018) & Design Year (2038)

	Base Year (2018)				Design Year (2038)			
	AM		PM		AM		PM	
Leg	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
SR 9 NB	7.52	A	7.72	A	7.75	A	8.24	A
SR 9 SB	7.31	A	7.29	A	7.53	A	7.56	A
SR 60	7.46	A	7.57	A	7.69	A	7.92	A

SUMMARY OF ALTERNATE CAPACITY ANALYSES									
		2018 AM		2018 PM		2038 AM		2038 PM	
Alternate	Leg	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
No-Build	SR 9 NB	7.4	A	7.4	A	7.5	A	7.5	A
	SR 9 SB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	SR 60	10.3	B	10.8	B	11.1	B	12.4	B
Single-lane Roundabout (HCS 2010)	SR 9 NB	4.01	A	4.37	A	4.32	A	5.12	A
	SR 9 SB	3.82	A	3.82	A	4.09	A	4.04	A
	SR 60	3.91	A	3.94	A	4.18	A	4.23	A
Single-lane Roundabout (R.A.T.)	SR 9 NB	4	A	4	A	4	A	5	A
	SR 9 SB	4	A	4	A	4	A	4	A
	SR 60	4	A	4	A	4	A	4	A
Single-lane Roundabout (SIDRA)	SR 9 NB	5.5	A	5.7	A	5.6	A	5.7	A
	SR 9 SB	12.0	B	11.4	B	11.9	B	11.7	B
	SR 60	7.7	A	7.3	A	8.8	A	8.1	A
All-way Stop	SR 9 NB	7.52	A	7.72	A	7.75	A	8.24	A
	SR 9 SB	7.31	A	7.29	A	7.53	A	7.56	A
	SR 60	7.46	A	7.57	A	7.69	A	7.92	A

ATTACHMENT 6:

SUMMARY OF TE STUDY
AND
SIGNAL WARRANT ANALYSIS

TRAFFIC ENGINEERING REPORT

March 15, 2011

COUNTY: Lumpkin

LOCATION: Intersection of SR 9 and SR 60. SR 9 milepost is 19.90 and milepost 7.79 on SR 60. Intersection is also known as Stonepile Gap because of the stones located in the interior of the intersection.

REASON FOR INVESTIGATION:
To determine if an all way stop controlled intersection or roundabout could improve safety or operational efficiency.

TOPOGRAPHY:
The intersection is located in a rural area with a few residences nearby. SR 9 is a two-lane roadway generally running north-south. SR 60 begins at Hall County line and generally runs east-west. SR 60 runs common with SR 9 traveling north and departs from SR 9 at this intersection. Instead of being a traditional "T" intersection, as it approaches SR 9, SR 60 "forks" creating a large triangle island with a stone pile in the interior of the intersection. The island is approximately 50 feet long on each side.

VEHICLE VOLUMES:
The most current data reflects the average daily traffic for State Route 9 is 940 vehicles per day and 810 vehicles per day for SR 60.

EXISTING TRAFFIC CONTROL:
There are one stop sign and two yield signs to control this intersection. There is a stop sign at the eastern point of the triangle for the SR 60 to SR 9 northbound movement. There is a yield sign at the western corner for the SR 60 to SR 9/SR 60 southbound movements. The second yield sign is in the eastern corner for the SR 9 to SR 60 westbound movement.

SPEED LIMITS:
The posted speed limit on SR 9 is 45 mph and 35mph on SR 60.

OTHER INFORMATION:
To make this intersection operate as an all-way stop it would have to be controlled by three all way stops.

CONCLUSIONS:
The use of three all way stop controlled intersections is not the preferred alternative due to the delay it would introduce because all vehicles travelling through the intersection would be required to stop twice.

RECOMMENDATIONS:
It is recommended to install a roundabout at the intersection of SR 9 and SR 60 in Lumpkin County.

RECOMMENDED BY: _____ **DATE** 3-15-11
DISTRICT TRAFFIC ENGINEER

RECOMMENDED BY: _____ **DATE** _____
STATE TRAFFIC ENGINEER

RECOMMENDED BY: _____ **DATE** _____
DIRECTOR OF OPERATIONS

Georgia Department of Transportation

District 1 Traffic Operations

SR 9 @ SR 60 (Stone Pile Gap)

Signal Warrants - Summary

Major Street Approaches

Northbound: **SR 9 S/O Stone Pile Gap Rd**
Number of Lanes: **2**
Approach Speed: **0**
Total Approach Volume: **1,178**

Southbound: **SR 60 N/O SR 9**
Number of Lanes: **2**
Approach Speed: **0**
Total Approach Volume: **641**

Minor Street Approaches

Westbound: **SR 9 E/O SR 60**
Number of Lanes: **2**

Total Approach Volume: **642**

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 (12) meet minimum (5) but volumes do not.

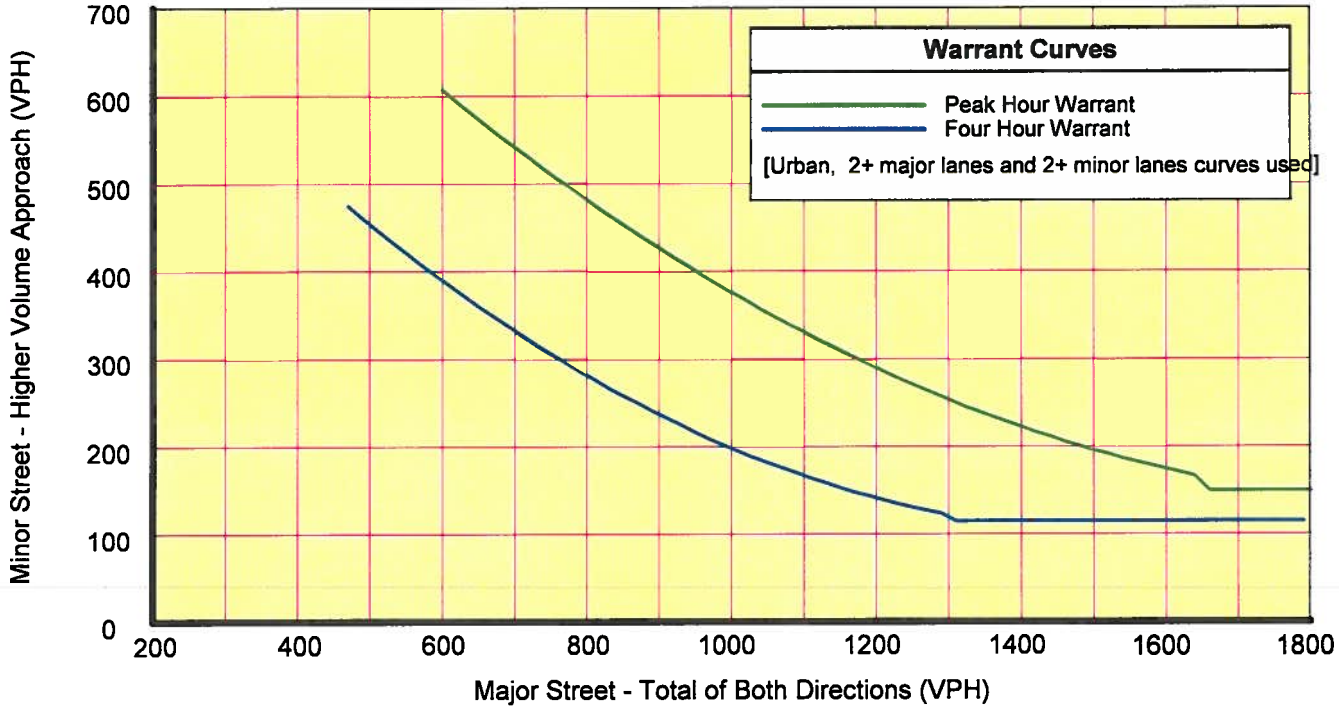
Warrant 8 - Roadway Network ..... Not Satisfied
Major Route conditions not met. No volume requirement met.

Georgia Department of Transportation

District 1 Traffic Operations

SR 9 @ SR 60 (Stone Pile Gap)

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	9	1	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
01:00	3	0	EB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
02:00	3	1	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
03:00	5	1	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
04:00	6	1	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
05:00	30	4	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
06:00	56	20	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
07:00	94	51	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
08:00	68	33	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
09:00	83	30	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
10:00	90	43	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
11:00	122	55	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
12:00	145	54	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
13:00	126	43	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
14:00	150	48	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
15:00	168	55	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
16:00	145	59	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
17:00	168	50	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
18:00	112	36	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
19:00	84	27	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
20:00	58	11	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
21:00	49	8	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
22:00	24	6	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---
23:00	21	5	WB	600-No	200-No	---	900-No	100-No	---	720-No	160-No	---

Georgia Department of Transportation

District One Traffic Operations

Intersection at SR 9/ US 19 & SR 60 (Stone Pile Gap)

Study Name :
Study Date : 11/08/07

Multi-Way Stop Warrant Report

Major Street Approaches

Northbound: **SR 9/US 19/SR 60**
Total Approach Volume: **1,178**
Approach Speed: **45**

Southbound: **SR 60**
Total Approach Volume: **638**
Approach Speed: **45**

Minor Street Approaches

Westbound: **SR 9/ US 19**
Total Approach Volume: **642**

Warrant Summary

Criteria A - Interim Measure ..... Not Evaluated
If traffic signals are justified, stop signs can be installed as an interim measure.

Criteria B - Crash Experience ..... Not Satisfied
Number of crashes (1) is less than the minimum required (5).

Criteria C - Minimum Volumes and Delays ..... Not Satisfied
Delay data not evaluated
Average of 8 highest hours does not meet volume criteria.

Criteria D - 80% of Volumes, Delays, and Crashes ..... Not Satisfied
Delay data not evaluated
Average of 8 highest hours does not meet volume criteria.

Analysis of 8-Hour Volume Warrants:

Time	Major Total	Major Avg	Minor Total	Minor Avg	Crit C			Crit D		
					Major Crit	Minor Crit	Meets?	Major Crit	Minor Crit	Meets?
17:00 - 18:00	168	142.0	50	50.0	210-No	140-No	No	240-No	160-No	No
15:00 - 16:00	168		55							
14:00 - 15:00	150		48							
16:00 - 17:00	145		59							
12:00 - 13:00	145		54							
13:00 - 14:00	126		43							
11:00 - 12:00	122		55							
18:00 - 19:00	112		36							
07:00 - 08:00	94		51							
10:00 - 11:00	90		43							
19:00 - 20:00	84		27							
09:00 - 10:00	83		30							
08:00 - 09:00	68		33							
20:00 - 21:00	58		11							
06:00 - 07:00	56		20							
21:00 - 22:00	49		8							
05:00 - 06:00	30		4							
22:00 - 23:00	24		6							
23:00 - 00:00	21		5							
00:00 - 01:00	9		1							
04:00 - 05:00	6		1							
02:00 - 03:00	3		1							
01:00 - 02:00	3		0							
03:00 - 04:00	2		1							

ATTACHMENT 7:

ROUNDABOUT FEASIBILITY STUDY

Roundabout Feasibility Study
P.I. 0009950
Lumpkin County
Stone Pile Gap

I. PROJECT BACKGROUND AND SITE CONDITIONS

The Office of Traffic Operations selected the intersection of State Route (SR) 9 and SR 60, also known as Stone Pile Gap, as a location that could improve its safety and operational performance by being reconstructed as a single-lane roundabout. This study evaluated several intersection options, including a roundabout and a no-build option, to determine which one would benefit this site the most.

Stone Pile Gap is located in Lumpkin County approximately 8 miles north of Dahlonega in a rural, mountainous location (see Figure 1 for a Vicinity Map and Figure 2 for an Aerial Photo of Existing Conditions). Although this intersection technically has four legs, it operates similarly to a three-legged, Y-intersection due to its unusual configuration. The mainline, SR 9, is a two-lane undivided rural principal arterial roadway with 12-foot lanes and grassed shoulders. It has a current posted speed of 45 mph. This route coincides with US 19 and SR 60 coming north towards the Stone Pile Gap intersection. The major side road, SR 60, is classified as a rural major collector and has the same typical section as SR 9. It has a current posted speed of 35 mph. The conjoined routes split at the intersection with SR 60 continuing northward and SR 9/US19 continuing in an eastward direction. Located in the center of the Stone Pile Gap intersection is an actual stone pile within a triangular gore section. The stone pile is surrounded by SR 9, SR 60 and a two-way slip lane that allows southbound SR 9 traffic to make right turns (yield-controlled) onto SR 60 and left turns (stop-controlled) from SR 60 onto SR 9. County Road (CR) 84, Stone Pile Gap Road, also ties into the intersection at approximately the same location that SR 60 intersects with SR 9. CR 84 is a two-lane undivided rural minor collector with 9-foot lanes. It operates more like a driveway at the intersection due to its very low traffic volume and its sharp curvature alignment near the intersection. Immediately leaving away from the intersection, CR 84's alignment goes into a sharp switchback to allow traffic to traverse a steep descent in a relatively short distance. The severe alignment near the intersection limits drivers to speeds of 15 mph or less. However, the legal speed limit determined by county ordinance for CR 84 is 35 mph.

In addition to the documented crash history—official crash data—at this site, many locals have reported to the District Traffic Operations Office their experience of near-crashes at the Stone Pile Gap intersection. The existing intersection of SR 9 and SR 60 has an awkward geometry that is confusing for those unfamiliar with its layout. This has contributed to many of the crashes and near-crashes at this site. SR 60 intersects with SR 9 in a sharp curve and at severe skews (~ 28° for southbound traffic and ~ 37° for northbound traffic). The existing sight distances for all legs of the intersection do not fully meet current criteria due to the surrounding mountainous topography and the stone pile located at the center of the intersection.

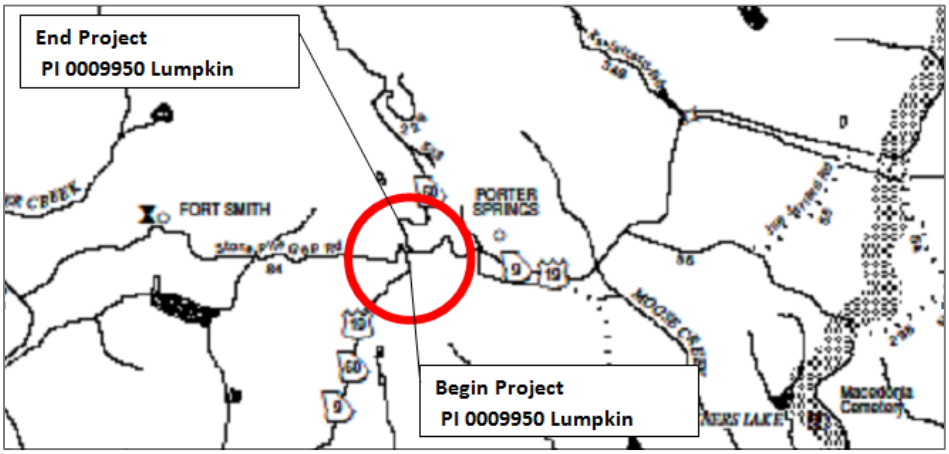


Figure 1: Vicinity Map: SR 9 @ SR 60 in Lumpkin County

Figure 2: Existing Conditions: SR 9 @ SR 60 in Lumpkin County

II. SAFETY ASESSMENT

Crash data for the years 2009 through 2013 was used to assess the safety of the existing Stone Pile Gap intersection. During that time period there was a total of ten (10) crashes, eight (8) non-fatal injuries and zero (0) fatalities (see Table 1). Seventy percent (70%) of the crashes were angle crashes (see Table 2) which contributed to seventy-five percent (75%) of the non-fatal injuries (see Table 3). Five (5) out of the six (6) angle crashes were a result of drivers traveling northbound on SR 9 that did not properly yield to SR 9 southbound vehicles while attempting to make a left turn onto SR 60.

SR 9 @ SR 60			
Year	**Crashes**	**Non-Fatal Injuries**	**Fatalities**
2009	0	0	0
2010	0	0	0
2011	2	5	0
2012	6	1	0
2013	2	2	0
Total	**10**	**8**	**0**

Table 1: Crash Data Summary

SR 9 @ SR 60							
Crash Type	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**	**%**
Angle	0	0	2	5	0	**7**	**70.00%**
Head On	0	0	0	0	0	**0**	**0.00%**
Rear End	0	0	0	1	1	**2**	**20.00%**
Sideswipe	0	0	0	0	1	**1**	**10.00%**
Other	0	0	0	0	0	**0**	**0.00%**
Total	**0**	**0**	**2**	**6**	**2**	**10**	**100.00%**

Table 2: Crash Type Summary

SR 9 @ SR 60						
	Crashes		**Non-Fatal Injuries**		**Fatalities**	
Crash Type	**#**	**%**	**#**	**%**	**#**	**%**
Angle	7	70.00%	6	75.00%	0	0.00%
Head On	0	0.00%	0	0.00%	0	0.00%
Rear End	2	20.00%	0	0.00%	0	0.00%
Sideswipe	1	10.00%	2	25.00%	0	0.00%
Other	0	0.00%	0	0.00%	0	0.00%
Total	**10**	**100.00%**	**8**	**100.00%**	**0**	**0.00%**

Table 3: Crash Type Compared with Non-Fatal Injuries and Fatalities

III. ALTERNATIVE SKETCHES

For this study, several alternates including a no-build option were analyzed to determine the best alternative for improving the safety and operation of the Stone Pile Gap intersection. There were three single-lane roundabout alternatives – two centered on the existing stone pile (Figures 3 & 7) and the third offset from the existing intersection (Figure 4). Two all-way stop alternatives were also proposed and are shown in Figures 5 & 6. The following sketches depict the build options that were considered.

Figure 3: Single-lane (150-foot) Roundabout Centered on Existing Stone Pile (Alternative 1)

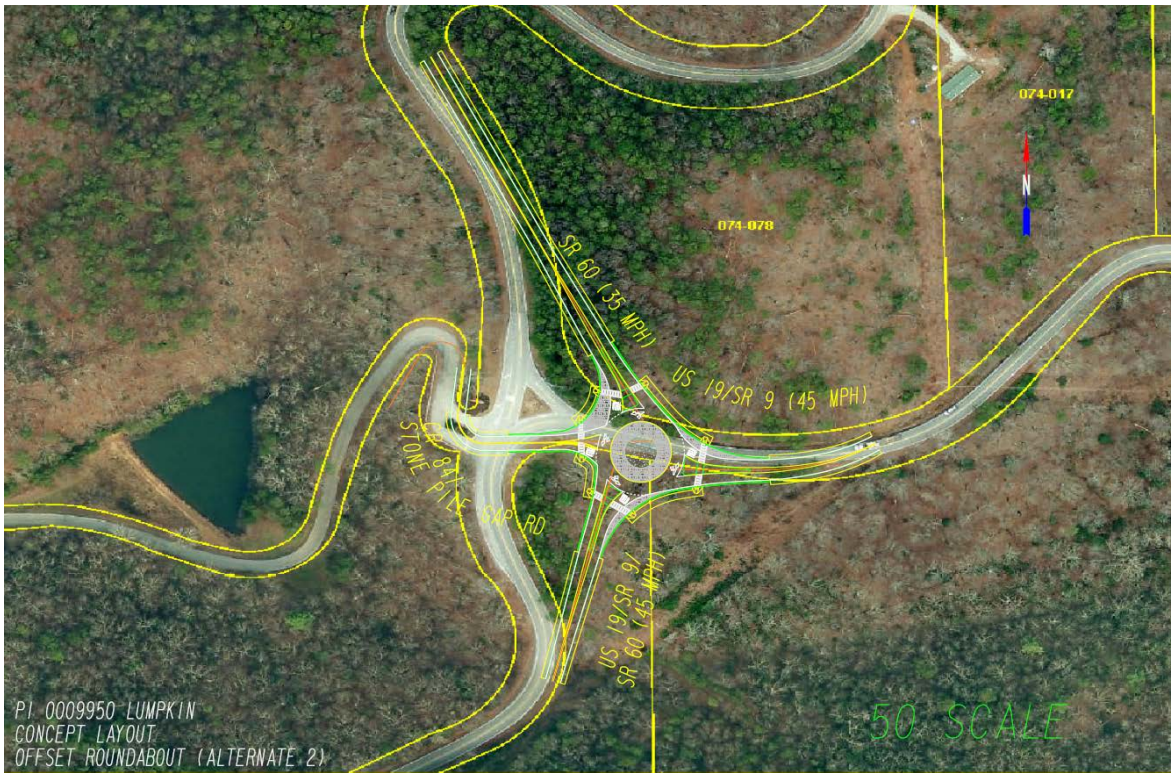


Figure 4: Single-lane (130-foot) Roundabout with Center Offset from Current Intersection (Alternative 2)

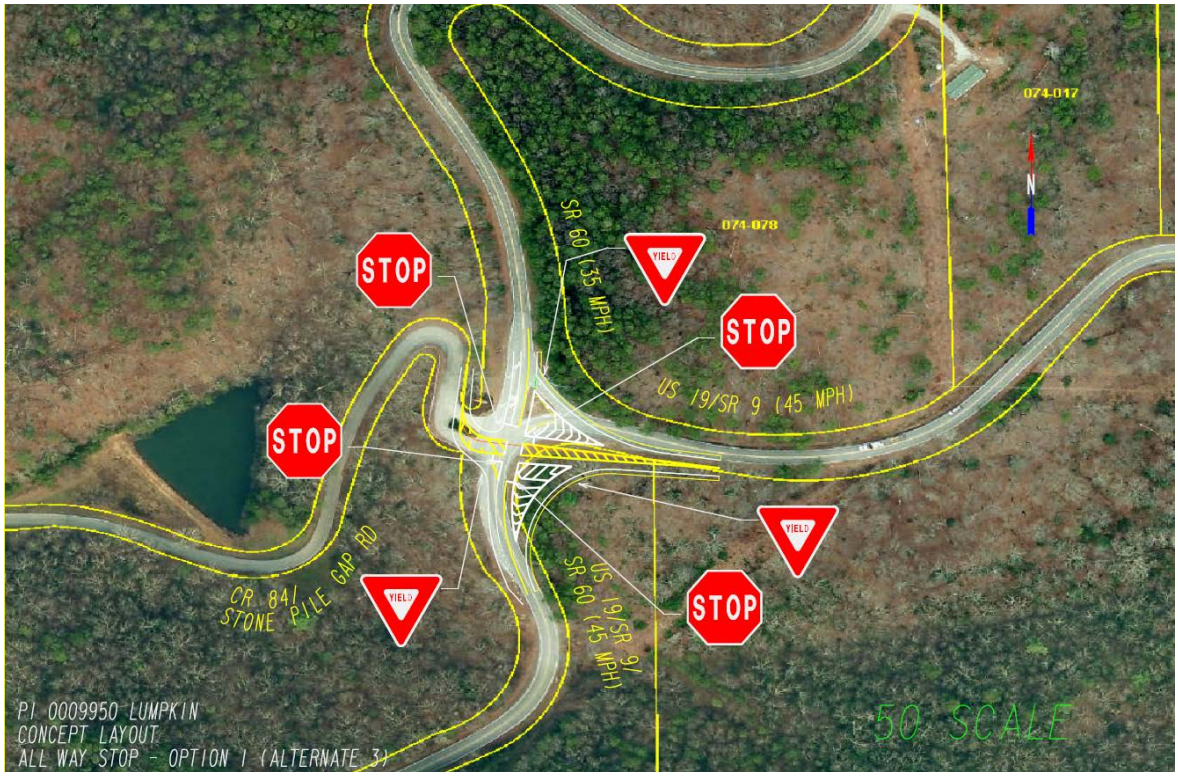


Figure 5: All-way Stop with Minor Re-alignment – Option 1 (Alternative 3)

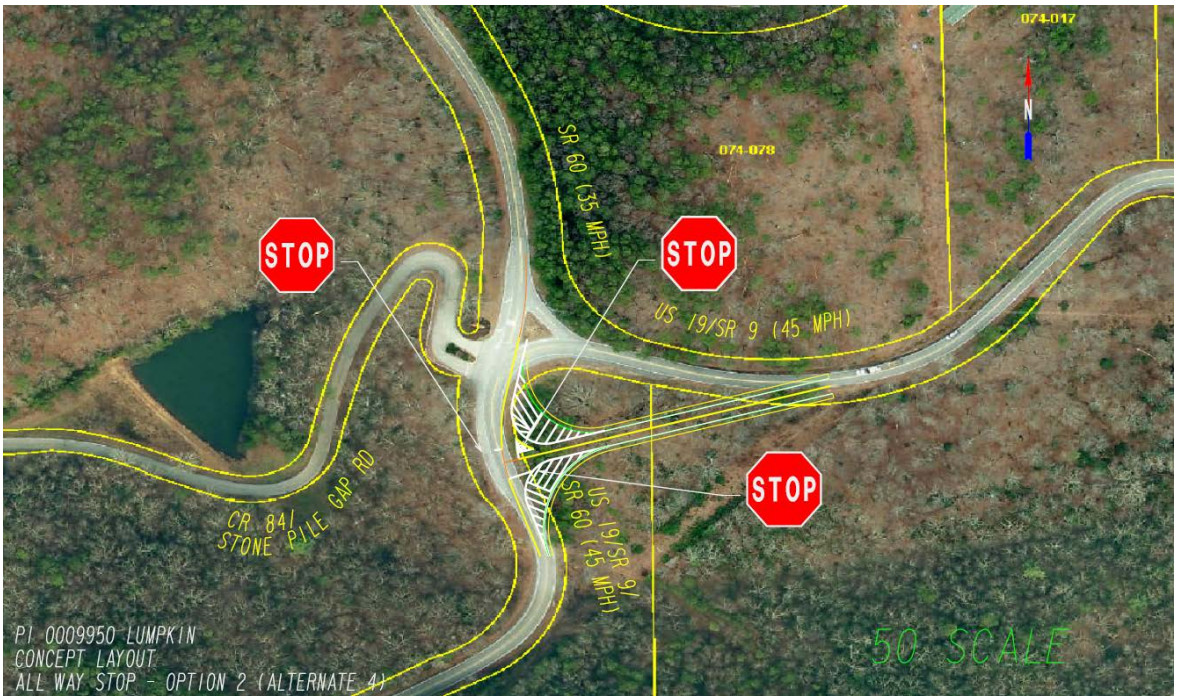


Figure 6: All-way Stop with Minor Re-alignment – Option 2 (Alternative 4)

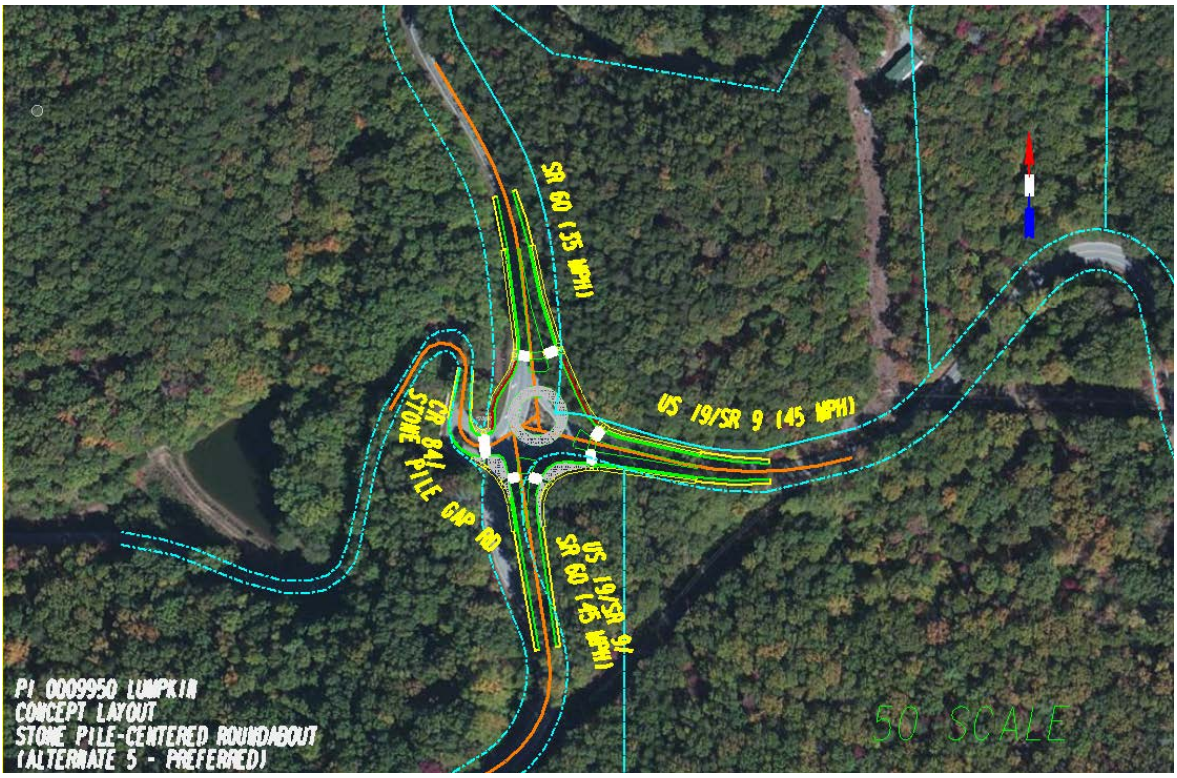


Figure 7: Single-lane (130-foot) Roundabout Centered on Existing Stone Pile (Alternative 5)

IV. OPERATIONAL ANALYSES

The operation of each alternative during peak hour traffic volumes for the opening and design years was analyzed using one or more methods. The tables and figures included in this section show the data that was used to analyze the alternatives and the resulting output. Tables 4, 5 and 6 provide a summary of the existing, base (2018) and design (2038) year peak hour traffic volumes. See Attachment "A" for the traffic diagrams.

Inter -val	US 19/SR9/SR60 NB			US 19/SR9 SB			SR 60 SB			CR 84		
	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt
AM	MM	25	20	35	5	5	5	20	MM	MM	5	MM
PM	MM	35	45	30	5	10	5	25	MM	MM	5	MM

Table 4: SR 9 @ SR 60, 2013 (Existing) Peak Hour Traffic Volumes, No-Build

Inter -val	US 19/SR9/SR60 NB			US 19/SR9 SB			SR 60 SB			CR 84		
	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt
AM	MM	30	25	40	5	5	5	25	MM	MM	5	MM
PM	MM	40	50	35	5	10	5	25	MM	MM	5	MM

Table 5: SR 9 @ SR 60, 2018 (Base Year) Peak Hour Traffic Volumes, No-Build

Inter -val	US 19/SR9/SR60 NB			US 19/SR9 SB			SR 60 SB			CR 84		
	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt	Lt	Thr	Rt
AM	MM	45	35	60	10	10	10	35	MM	MM	10	MM
PM	MM	70	80	50	10	15	10	45	MM	MM	10	MM

Table 6: SR 9 @ SR 60, 2038 (Design Year) Peak Hour Traffic Volumes, No-Build

No-Build Alternative

Operational analyses were performed for the no-build alternative using the HCS (Highway Capacity Software) 2010 program. The data was based on the 2018 and 2038 A.M. and P.M. peak hour volumes. (Attachment "B", Two-way Stop Control Summary, provides a summation of the HCS analysis report.) This alternative will have a nominal operational effect on the SR 60 leg. The left turning movement is impacted more than the right turning movement. The increase in delay for the left turning movement is 0.3 seconds/vehicle for both the A.M. and P.M. peak hours for the base year (2018) resulting in a reduction of LOS from A to B for the A.M. The increase in delay for the left turning movement for the design year (2038) A.M. is 1.1 seconds/vehicle and for the P.M. is 1.9 seconds/vehicle.

Base Year (2018)								
	AM				PM			
Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
SR 9 NB LT	0.02	7.4	A	1.1	0.03	7.4	A	1.5
SR 60 LT*	0.04	10.3	B	2.5	0.05	10.8	B	3.2
SR 60 RT*	0.00	8.5	A	0.0	0.00	8.5	A	0.0

***For the 2018 AM, the SR 60 approach delay was 10.3 seconds/vehicle and the approach LOS is B.**
For the 2018 PM, the SR 60 approach delay was 10.8 seconds/vehicle and the approach LOS is B.

Table 7: No-build Analysis, Base Year (2018)

Design Year (2038)								
	AM				PM			
Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
SR 9 NB LT	0.03	7.5	A	1.7	0.05	7.5	A	2.9
SR 60 LT*	0.07	11.1	B	4.4	0.10	12.4	B	6.5
SR 60 RT*	0.00	8.7	A	0.0	0.00	8.6	A	0.0

***For the 2038 AM, the SR 60 approach delay was 11.1 seconds/vehicle and the approach LOS is B.**
For the 2038 PM, the SR 60 approach delay was 12.4 seconds/vehicle and the approach LOS is B.

Table 8: No-build Analysis, Design Year (2038)

Single-lane Roundabout Alternatives

HCM 2010, the GDOT Roundabout Analysis Tool and SIDRA software were used to evaluate both roundabout alternatives. The results from HCM 2010 demonstrated a significant improvement in vehicle delay for the SR 60 leg of the intersection when compared with the delay from the no-build alternative. In the no-build alternative, the 2018 A.M. delay for SR 60 was 10.3 seconds/vehicle and the P.M. delay was 10.8 seconds/vehicle. Tables 9 & 10 below, provide the results of the roundabout analyses.

Base Year (2018)									
		AM				PM			
Analysis Method	Leg	V/C	Delay (s/veh)	LOS	95th % Queue (ft)	V/C	Delay (s/veh)	LOS	95th % Queue (ft)
HCS 2010	SR 9 NB	0.06	4.01	A	3.8	0.10	4.37	A	5.7
	SR 9 SB	0.05	3.82	A	3.8	0.05	3.82	A	3.8
	SR 60	0.03	3.91	A	1.9	0.04	3.94	A	1.9
Roundabout Analysis Tool	SR 9 NB	0.06	4	A	5	0.10	4	A	9
	SR 9 SB	0.05	4	A	5	0.05	4	A	5
	SR 60	0.03	4	A	3	0.04	4	A	3
SIDRA	SR 9 NB	0.05	5.5	A	5.9	0.07	5.7	A	9.5
	SR 9 SB	0.05	12.0	B	5.8	0.05	11.4	B	6.0
	SR 60	0.03	7.7	A	3.8	0.04	7.3	A	4.4

Table 9: Roundabout Analyses, Base Year (2018)

Design Year (2038)									
		AM				PM			
Analysis Method	**Leg**	**V/C**	**Delay (s/veh)**	**LOS**	**95th % Queue (ft)**	**V/C**	**Delay (s/veh)**	**LOS**	**95th % Queue (ft)**
HCS 2010	SR 9 NB	0.09	4.32	A	5.7	0.16	5.12	A	11.4
	SR 9 SB	0.08	4.09	A	5.7	0.08	4.04	A	3.8
	SR 60	0.05	4.18	A	3.8	0.06	4.23	A	3.8
Roundabout Analysis Tool	SR 9 NB	0.09	4	A	8	0.17	5	A	16
	SR 9 SB	0.09	4	A	8	0.08	4	A	7
	SR 60	0.05	4	A	4	0.06	4	A	5
SIDRA	SR 9 NB	0.07	5.6	A	9.2	0.13	5.7	A	17.4
	SR 9 SB	0.08	11.9	B	9.7	0.08	11.7	B	9.6
	SR 60	0.05	8.8	A	6.0	0.06	8.1	A	7.4

Table 10: Roundabout Analyses, Design Year (2038)

All-way Stop Control Alternative

Operational analyses were performed for the all-way stop control alternatives using the HCS (Highway Capacity Software) 2010 program. The data was based on the 2018 and 2038 A.M. and P.M. peak hour volumes. (Attachment "C", All-way Stop Control Summary, provides a summation of the HCS analysis report.) These alternatives will have a nominal operational effect on all legs of the intersection. All legs had less than a 1 second/vehicle delay increase even for the design year (2038) for both the A.M. and P.M. traffic. All legs and the entire intersection operated at LOS A for the existing, opening and design years.

	Base Year (2018)				Design Year (2038)			
	AM		PM		AM		PM	
Leg	**Delay (s/veh)**	**LOS**	**Delay (s/veh)**	**LOS**	**Delay (s/veh)**	**LOS**	**Delay (s/veh)**	**LOS**
SR 9 NB	7.52	A	7.72	A	7.75	A	8.24	A
SR 9 SB	7.31	A	7.29	A	7.53	A	7.56	A
SR 60	7.46	A	7.57	A	7.69	A	7.92	A

Table 11: All-way Stop Analysis, Base Year (2018) & Design Year (2038)

SUMMARY OF ALTERNATIVE ANALYSES									
		2018 AM		2018 PM		2038 AM		2038 PM	
Alternative	Leg	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
No-Build	SR 9 NB	7.4	A	7.4	A	7.5	A	7.5	A
	SR 9 SB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	SR 60	10.3	B	10.8	B	11.1	B	12.4	B
Single-lane Roundabout (HCS 2010)	SR 9 NB	4.01	A	4.37	A	4.32	A	5.12	A
	SR 9 SB	3.82	A	3.82	A	4.09	A	4.04	A
	SR 60	3.91	A	3.94	A	4.18	A	4.23	A
Single-lane Roundabout (R.A.T.)	SR 9 NB	4	A	4	A	4	A	5	A
	SR 9 SB	4	A	4	A	4	A	4	A
	SR 60	4	A	4	A	4	A	4	A
Single-lane Roundabout (SIDRA)	SR 9 NB	5.5	A	5.7	A	5.6	A	5.7	A
	SR 9 SB	12.0	B	11.4	B	11.9	B	11.7	B
	SR 60	7.7	A	7.3	A	8.8	A	8.1	A
All-way Stop	SR 9 NB	7.52	A	7.72	A	7.75	A	8.24	A
	SR 9 SB	7.31	A	7.29	A	7.53	A	7.56	A
	SR 60	7.46	A	7.57	A	7.69	A	7.92	A

Table 12: Summary of Alternative Analyses, Base Year (2018) & Design Year (2038)

V. COST COMPARSION

Alternate	Construction	Right of Way	Utility (reimbursable)	Total (minus P.E.)	B/C RATIO *
Alt 1: Roundabout (stone-pile-centered)	$3,498,801	$631,000	$597,173	$4,726,974	1.38
Alt 2: Roundabout (offset-centered)	$3,741,462	$631,000	$597,173	$4,969,635	1.32
Alt 3: All-way Stop (option 1)	$967,288	$315,500	$597,173	$1,879,961	0.91
Alt 4: All-way Stop (option 2)	$1,071,612	$315,500	$597,173	$1,984,285	0.87
Alt 5: Roundabout (stone-pile-centered)	$2,746,613	$631,000	$597,173	$3,974,786	1.62

*B/C Ratios include a PE cost of $300,000

Table 13: Cost Estimate Summary

VI. ALTERNATIVE SELECTION

A summary of the findings of this study are listed below:

- No-build option
  - Advantages
    - *Cost:* No construction costs
    - *Operational:* Very good Level of Service (LOS) ranging from A to B
  - Disadvantages
    - *Safety:* This intersection does not meet several current design criteria. These include horizontal geometry, clear zone widths and intersection sight distance criteria, which is a significant contributing factor to the high percentage of angle crashes at this location – vehicles traveling northbound on SR 9 onto SR 60. In addition to documented crashes, the District Traffic Operations office has received a high number of complaints about the hazards of this intersection
- Alternative 1 – Single-lane (150-foot) Roundabout Centered on Existing Stone Pile
  - Advantages
    - *Safety:* Roundabouts have proven to be safer intersections than typical at-grade intersections, especially in reducing fatal and injury crashes. Based on the Highway Safety Manual Crash Reduction Factor for converting an intersection with minor-road stop control to a modern roundabout, the predicted crash reduction is 25% - 33% fewer crashes for all severity crash types and a 9% - 17% reduction in all severity crashes with injuries.
    - *Operational:*
      - Reduced delay for SR 60 and SR 9 NB when compared with the no-build option
      - Allows vehicles to safely perform U-turn movements. This capability will be helpful to all vehicles, but especially for larger vehicles that due to the surrounding terrain have difficulty in finding safe locations to turn around
      - The roundabout options will be more pedestrian and bicycle friendly than the no-build and all-way stop options due to the sidewalk provided around it and the traffic calming effects of the roundabout design
    - *Cost:* This roundabout option costs $242,661 less than the offset roundabout option – Alternative 2. [See Cost Comparison table, section V]
    - *Environmental:*
      - There is less land disturbance - 0.9 acres less – required than the offset roundabout alternative
      - Roundabouts are generally more aesthetically pleasing than other types of intersections and may serve to better enhance the appearance of the area surrounding the existing stonepile. This intersection is in an area that many tourists use for access to nearby tourist destinations. This intersection also serves bicycling enthusiasts and motorcyclists
  - Disadvantages
    - *Safety:* This roundabout alternative requires a larger diameter – 150 ft – compared with 130 ft for the offset roundabout alternative. This can result in higher “fastest paths” and circulatory speeds when compared with the smaller diameter roundabout
    - *Operational:* SR 9 southbound traffic that did not previously experience delay would now experience some delay
    - *Cost:* All three roundabout alternatives are significantly higher than the all-way stop and no-build alternatives. This alternative has a B/C ratio of 1.38 as compared with 1.62 for the preferred alternative – Alternative 5, 130-foot stone

pile centered roundabout. [See Cost Comparison table, section V]

- *Design:* The CR 84—Stone Pile Gap Road—tie-in will require either an approved design exception from FHWA for not meeting intersection sight distance or it would need to be designed as a right-in/right-out intersection. A right-in/right-out option would reduce the usefulness of this intersection for users of CR 84 since most users are interested in moving northwards onto SR 9/US 19 which this option would eliminate. Tying CR 84 to the existing intersection was not considered feasible since this can only be done with an excessively steep profile grade and substandard horizontal geometry. Both of these deficiencies would require an approved design exception from FHWA

- Alternative 2 – Single-lane Roundabout with Center Offset from Current Intersection

  - Advantages
    - *Safety:*
      - Roundabouts have proven to be safer intersections than typical at-grade intersections, especially in reducing fatal and injury crashes. Based on the Highway Safety Manual Crash Reduction Factor for converting an intersection with minor-road stop control to a modern roundabout, the predicted crash reduction is 25% - 33% fewer crashes for all severity crash types and a 9% - 17% reduction in all severity crashes with injuries.
      - This roundabout alternative has a smaller diameter - 130-foot – than Alternative 1 which has a 150-foot diameter, while still allowing sufficient turning movements for WB-67 trucks. Smaller diameter roundabouts tend to have lower circulatory speeds when compared with larger diameter roundabouts
      - Unlike Alternative 1, tying CR 84—Stone Pile Gap Road—to the existing intersection can be accomplished without requiring a substandard design and with less impact to surrounding areas. This means much less grading, a significantly smaller retaining wall and therefore less costly to tie in CR 84 than Alternative 1
    - *Operational:*
      - Reduced delay for SR 60 and SR 9 northbound traffic when compared with the no-build option
      - Allows vehicles to safely perform U-turn movements. This capability will be helpful to all vehicles, but especially for larger vehicles that due to the surrounding terrain have difficulty in finding safe locations to turn around
      - The roundabout options will be more pedestrian and bicycle friendly than the no-build and all-way stop options. The sidewalk around the roundabout will allow pedestrians and less experienced bicyclists a designated path that is buffered from the adjacent roadway.
    - *Environmental:* Roundabouts are generally more aesthetically pleasing than other types of intersections and may serve to better enhance the appearance of the area surrounding the existing stonepile. This intersection is in an area that many tourists use for access to nearby tourist destinations. This intersection also serves bicycling enthusiasts and motorcyclists
    - *Staging:* The staging operations is less constrained by the stone-pile for this roundabout option when compared to Alternatives 1 and 5

  - Disadvantages
    - *Operational:* SR 9 southbound traffic that did not previously experience delay would now experience some delay
    - *Cost:* This alternative is significantly higher than the all-way stop, no-build and other roundabout alternatives. The benefit-to-cost (B/C) ratio for this alternative

is the lowest of the roundabout alternatives at 1.32. [See Cost Comparison table, section V]

- *Environmental:* There is more land disturbance – 0.9 acres more – required for this alternative when compared with the other roundabout alternative

- Alternative 3 – All-way Stop (Option 1)

  - Advantages
    - *Safety:* This alternative should reduce crashes when compared with the no-build alternative due to the improved stopping sight distance for all three legs and stop-controlled operation. However, quantifying this reduction using an all-way stop Crash Reduction Factor (CRF) was not possible due to this location not meeting all-way stop warrants. This option provided better stopping sight distance than its counterpart all-way stop alternative (Alternative 4)
    - *Operation*
      - This alternative provides better turning radii for large trucks making right turning movements than the other all-way stop alternative (Alternative 4)
      - The mainline will have one less intersecting point than Alternative 4 – offset all-way stop option – which should operate more smoothly than two successive three-legged intersections and provide drivers a more direct view of opposing traffic coming from CR 84 than Alternative 4
    - *Cost:* Significantly less construction costs than the roundabout alternatives – see Cost Comparison table, section V – and marginally less construction costs - $104,324 less – than the other all-way stop alternative (Alternative 4)
    - *Environmental:* There is less land disturbance required for this alternative when compared with the other all-way stop alternative (Alternative 4)

  - Disadvantages
    - *Operational:*
      - SR 9 southbound traffic that did not previously experience delay would now experience some delay and SR 9 northbound traffic would have a slightly increased delay
      - Left turns from SR 60 onto SR 9 and left turns making SR 9 southbound movements will be difficult for large trucks. To accommodate large trucks, the stop bars for the SR 9 westbound leg and SR 60 need to be placed further from the intersection than normal to avoid impacting conflicting vehicles
    - *Cost:* Adding additional width for a bike lane would make both all-way stop options infeasible because of costs due to grading challenges around the stone-pile. If implemented with bike lanes, the all-way stop alternatives would require much greater costs in order to build the retaining walls needed to widen enough for bike lanes. If a bike lane is not implemented, an approved GDOT variance would be required. The B/C ratio for this alternative (without the bike lanes) is 0.91 – the second worst of the five alternatives.
    - *Staging:* Staging this alternative will be more difficult than the other all-way stop alternative (Alternative 4) due to having more overlap with existing roadway. A “reclamation” paving method or use of a pilot vehicle to guide vehicles around the construction areas may be required
    - *Design:* To avoid a design exception for substandard horizontal alignment (minimum radius), the modified portion of alignment for SR 9 is created from a tangent pulled from an existing curve that does not meet current design standard. However, a deviation will most likely be needed to address the existing curve length which is already less than current curve length standard and will be further reduced in length

- Alternative 4 – All-way Stop (Option 2)

  - Advantages
    - *Safety:* This alternative should reduce crashes when compared with the no-build alternative. However, quantifying this reduction using an all-way stop Crash Reduction Factor (CRF) was not possible due to this location not meeting all-way stop warrants
    - *Operational:* Better left turning movements from SR 60 onto SR 9 and left turns continuing on SR 9 southbound than Alternative 3
    - *Cost:* Significantly less construction costs than the roundabout alternatives – see Cost Comparison table, section V
    - *Environmental:* Of the five build-alternatives, this one has the least chance of impacting the periphery of the stonepile during construction or normal day-to-day operations
    - *Staging:* Staging this alternative will be less difficult than the other all-way stop alternative (Alternative 3) due to less overlap with existing roadway. It is also the easiest to stage of all the "build" alternatives since the majority of the construction will be done off the current alignment

  - Disadvantages
    - *Safety:* This alternative has poorer stopping sight distance than its counterpart all-way stop alternative (Alternative 3)
    - *Operational:*
      - SR 9 southbound traffic that did not previously experience delay would now experience some delay and SR 9 northbound traffic would have a slightly increased delay
      - The mainline will have one more intersecting point than Alternative 3 – four-legged all-way stop option – creating two successive three-legged intersections rather than a single point intersection that would provide drivers a more direct view of opposing traffic coming from CR 84
      - This alternative provides worse turning radii for large trucks making right turning movements than the other all-way stop alternative (Alternative 3), especially near the stone-pile
    - *Cost:*
      - Since this option is located further off the existing roadway than Alternative 3, it will require more grading and larger and longer length retaining walls than Alternative 3. Therefore, it will be more costly than the other all-way stop option (Alternative 3) by $104,324. This alternative also has the worst B/C ratio of all five alternatives at 0.87.
      - Adding additional width for a bike lane would make both all-way stop options infeasible because of costs due to grading challenges around the stone-pile. If implemented with bike lanes, the all-way stop alternatives would require much greater costs in order to build the retaining walls needed to widen enough for bike lanes. If a bike lane is not implemented, an approved GDOT variance would be required
    - *Design:* To avoid a design exception for substandard horizontal alignment (minimum radius), the modified portion of alignment for SR 9 is created from a tangent pulled from an existing curve that does not meet the current design standard. However, a deviation will most likely be needed to address the existing curve length which is already less than the current curve length standard and will be further reduced in length

- Alternative 5 – Single-lane (130-foot) Roundabout Centered on Existing Stone Pile

  - Advantages
    - *Safety:*
      - Roundabouts have proven to be safer intersections than typical at-grade intersections, especially in reducing fatal and injury crashes. Based on the Highway Safety Manual Crash Reduction Factor for converting an intersection with minor-road stop control to a modern roundabout, the predicted crash reduction is 25% - 33% fewer crashes for all severity crash types and a 9% - 17% reduction in all severity crashes with injuries.
      - This roundabout alternative has a smaller diameter - 130-foot – than Alternative 1 which has a 150-foot diameter, while still allowing sufficient turning movements for WB-67 trucks. Smaller diameter roundabouts tend to have lower circulatory speeds when compared with larger diameter roundabouts
    - *Operational:*
      - Reduced delay for SR 60 and SR 9 northbound traffic when compared with the no-build option
      - Allows vehicles to safely perform U-turn movements. This capability will be helpful to all vehicles, but especially for larger vehicles that due to the surrounding terrain have difficulty in finding safe locations to turn around
      - The roundabout options will be more pedestrian and bicycle friendly than the no-build and all-way stop options. The sidewalk around the roundabout will allow pedestrians and less experienced bicyclists a designated path that is buffered from the adjacent roadway.
    - *Cost:* This roundabout option is the least costly of the roundabout alternatives and had the largest benefit-to-cost ratio. [See Cost Comparison table, section V]
    - *Environmental:*
      - Roundabouts are generally more aesthetically pleasing than other types of intersections and may serve to better enhance the appearance of the area surrounding the existing stonepile. This intersection is in an area that many tourists use for access to nearby tourist destinations. This intersection also serves bicycling enthusiasts and motorcyclists.
      - This roundabout alternative has the smallest footprint of the three roundabout alternatives

  - Disadvantages
    - *Operational:* SR 9 southbound traffic that did not previously experience delay would now experience some delay
    - *Cost:* All three roundabout alternatives are significantly higher than the all-way stop and no-build alternatives. This alternative has the highest B/C ratio of 1.62 as compared with 1.38 for the Alternative 1 and 1.32 for Alternative 2. [See Cost Comparison table, section V]

The main purpose of this project is to improve safety at the Stone Pile Gap intersection. Since roundabouts have proven to be safer than other types of at-grade intersections, a single-lane roundabout was chosen as the preferred alternative for improving the safety at this intersection. Specifically, the 130-foot single-lane roundabout centered on the existing stone pile – Alternative 5 – was chosen as the preferred alternative. This roundabout alternative was chosen over the other two roundabout alternatives – Alternatives 1 and 2 – due to it having the best benefit-to-cost ratio.

VII. CONCEPTUAL ROUNDABOUT DESIGN

(See Figure 7 for the concept level geometric layout)

The conceptual roundabout design consists of a four-legged, 130-foot diameter, single-lane roundabout that will be centered upon the stone pile of its namesake, Stone Pile Gap. The circulatory lane will be 20-feet wide with a 15-foot wide adjoining truck apron. The center of the roundabout will have a 60-foot diameter. The four legs of the roundabout will be comprised of SR 9 northbound, SR 9 southbound, SR 60 and CR 84. SR 9 northbound, SR 9 southbound and SR 60 will have a typical section consisting of two undivided 12-foot lanes and with 8-foot shoulders (6.5-foot paved). The typical section for Stone Pile Gap Road will consist of two undivided 11-foot lanes with 8-foot shoulders (2-foot paved).

The diameter of the roundabout was determined by the design vehicle (WB-67) swept paths. Due to the predicted low-volume of the intersection in the opening and design years, no bypass lanes or additional circulatory lanes were required.

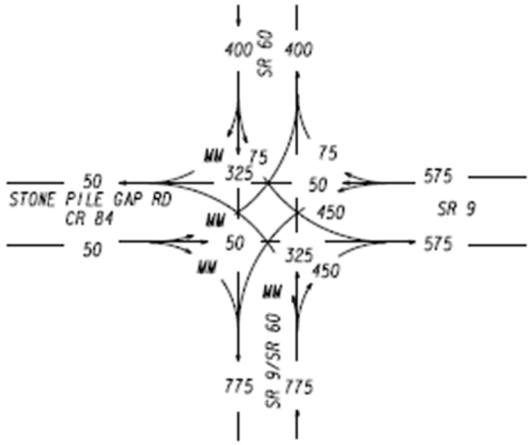
VIII. RECOMMENDATIONS

It is recommended that a 130-foot single-lane roundabout centered upon the stone pile of Stone Pile Gap be constructed. The conversion of the existing stop-/yield-controlled intersection to a roundabout should significantly reduce, if not eliminate, the angle crashes occurring between the left-turning SR 9 northbound traffic with SR 9 southbound traffic and the injuries associated with these crashes.

Ample coordination with the appropriate governing Native American tribes will need to be conducted to ensure proper measures are taken to avoid conflicts with the environmentally-sensitive nature of the stone pile.

ATTACHMENT A:

TRAFFIC DIAGRAMS



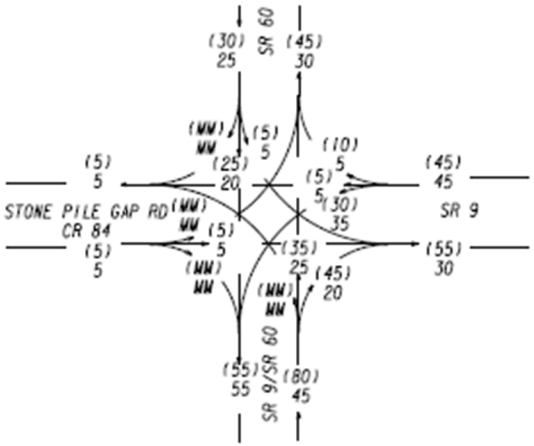
LUMPKIN COUNTY

N

PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2013 ADT EXISTING	SR 9 24 HOUR T- 6.5% SU- 5.5% COMB- 1%	SR 60 24 HOUR T- 6.5% SU- 3% COMB- 3.5%	REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PLANNING
TRAFFIC DIAGRAM

DRAWING No. 10-1



LUMPKIN COUNTY

N

PI# 0009950
LUMPKIN COUNTY
SR 9 @ SR 60

2013 PM DHV= (000)
2013 AM DHV= 000
EXISTING

SR 9

T= 5.5%
SU= 5.5%
COMB= 0%

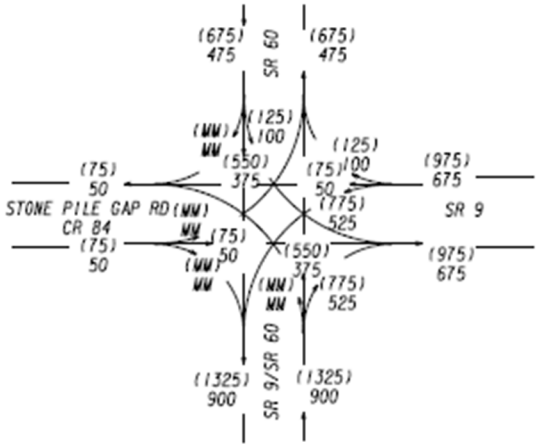
SR 60

T= 8%
SU= 4%
COMB= 4%

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PLANNING
TRAFFIC DIAGRAM

DRAWING No. 10-2



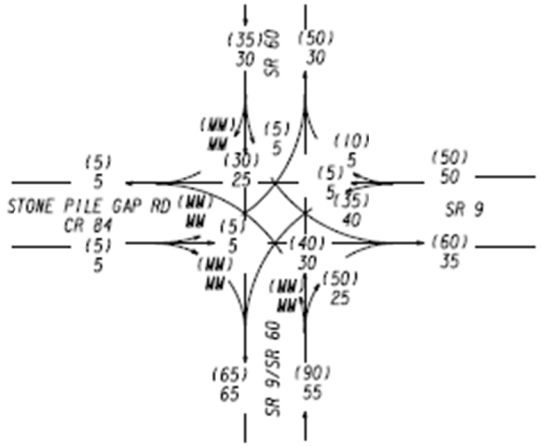
LUMPKIN COUNTY

N

PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2038 ADT- (000) 2018 ADT= 000 NO BUILD	SR 9 24 HOUR T- 6.5% SU- 5.5% COMB- 1%	SR 60 24 HOUR T- 6.5% SU- 3% COMB- 3.5%	REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PLANNING
TRAFFIC DIAGRAM

DRAWING No. 10-3



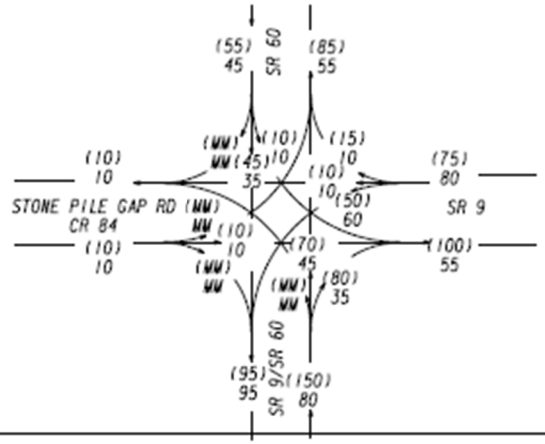
LUMPKIN COUNTY

N

PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2018 PM DHV= (000) 2018 AM DHV= 000 NO BUILD	SR 9 T= 5.5% SU= 5.5% COMB= 0%	SR 60 T= 8% SU= 4% COMB= 4%	REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PLANNING
TRAFFIC DIAGRAM

10-4



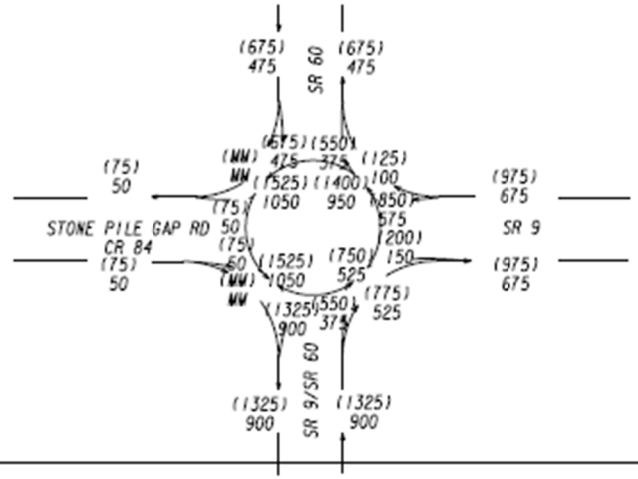
LUMPKIN
COUNTY

N

PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2038 PM DHV= (000) 2038 AM DHV= 000 NO BUILD	SR 9 T- 5.5% SU- 5.5% COMB- 0%	SR 60 T- 8% SU- 4% COMB- 4%	REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PLANNING
TRAFFIC DIAGRAM

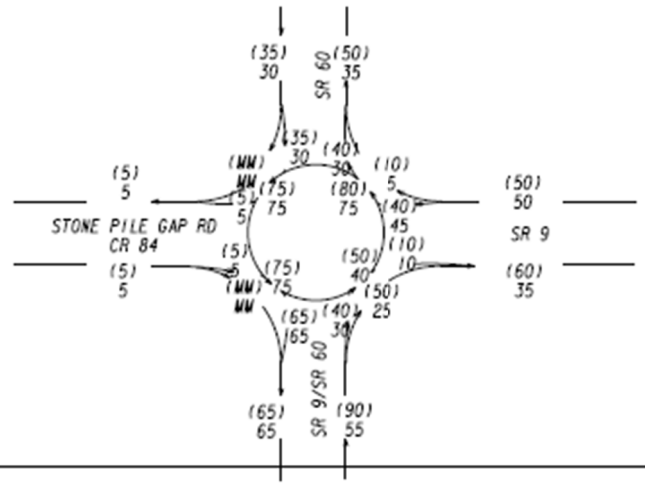
DRAWING NO. 10-5



LUMPKIN COUNTY

N

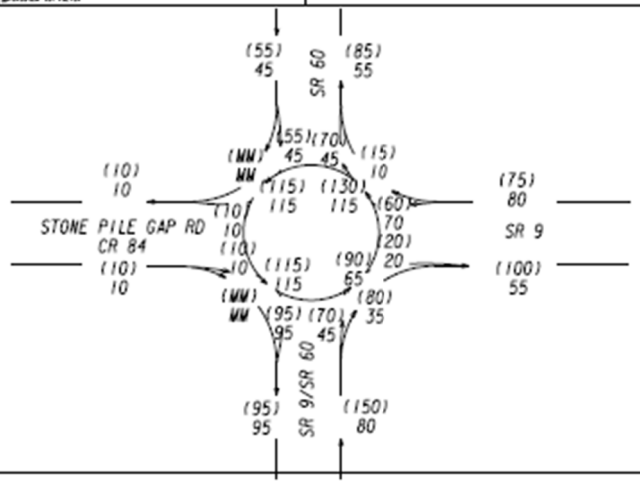
PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2038 ADT- (000) 2018 ADT= 000 BUILD	SR 9 24 HOUR T- 6.5% SU- 5.5% COMB- 1%	SR 60 24 HOUR T- 6.5% SU- 3% COMB- 3.5%	REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE, PLANNING TRAFFIC DIAGRAM DRAWING No. 10-6



LUMPKIN COUNTY

N

PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2018 PM DHV= (000) 2018 AM DHV= 000 BUILD	SR 9 T= 5.5% SU= 5.5% COMB= 0%	SR 60 T= 8% SU= 4% COMB= 4%	REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: PLANNING TRAFFIC DIAGRAM 10-7



LUMPKIN COUNTY

N

PI# 0009950 LUMPKIN COUNTY SR 9 @ SR 60	2038 DHV= (000) 2038 DHV= 000 BUILD	SR 9 T- 5.5% SU- 5.5% COMB- 0%	SR 60 T- 8% SU- 4% COMB- 4%	REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: PLANNING
TRAFFIC DIAGRAM

DRAWING No. 10-8

ATTACHMENT B:

TWO-WAY STOP CONTROL SUMMARY

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency/Co.		Jurisdiction	
Date Performed	*8/9/2013*	Analysis Year	*2013 AM (Existing)*
Analysis Time Period			

Project Description *0009950*

East/West Street: *SR60*	North/South Street: *SR9*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*25*	*20*			*40*	*5*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*25*	*20*	*0*	*0*	*40*	*5*
Percent Heavy Vehicles	*6*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*5*	*20*	*0*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*5*	*20*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*8*	*8*	*0*	*0*	*0*	*0*
Percent Grade (%)		*6*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*0*	*0*
Configuration	*LT*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*LT*		*R*
v (veh/h)	*25*					*25*		*0*
C (m) (veh/h)	*1538*					*745*		*1027*
v/c	*0.02*					*0.03*		*0.00*
95% queue length	*0.05*					*0.10*		*0.00*
Control Delay (s/veh)	*7.4*					*10.0*		*8.5*
LOS	*A*					*A*		*A*
Approach Delay (s/veh)	--	--				*10.0*		
Approach LOS	--	--				*A*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency/Co.		Jurisdiction	
Date Performed	*8/9/2013*	Analysis Year	*2013 PM (Existing)*
Analysis Time Period			

Project Description *0009950*

East/West Street: *SR60* | North/South Street: *SR9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*35*	*45*			*35*	*10*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*35*	*45*	*0*	*0*	*35*	*10*
Percent Heavy Vehicles	*6*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*5*	*25*	*0*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*5*	*25*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*8*	*8*	*0*	*0*	*0*	*0*
Percent Grade (%)		*6*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*0*	*0*
Configuration	*LT*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*LT*		*R*
v (veh/h)	*35*					*30*		*0*
C (m) (veh/h)	*1538*					*686*		*1030*
v/c	*0.02*					*0.04*		*0.00*
95% queue length	*0.07*					*0.14*		*0.00*
Control Delay (s/veh)	*7.4*					*10.5*		*8.5*
LOS	*A*					*B*		*A*
Approach Delay (s/veh)	--	--				*10.5*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency/Co.		Jurisdiction	
Date Performed	*8/9/2013*	Analysis Year	*2018 AM - NO BUILD*
Analysis Time Period			

Project Description *0009950*

East/West Street: *SR60*	North/South Street: *SR9*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*30*	*25*			*45*	*5*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*30*	*25*	*0*	*0*	*45*	*5*
Percent Heavy Vehicles	*6*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*5*	*25*	*0*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*5*	*25*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*8*	*8*	*0*	*0*	*0*	*0*
Percent Grade (%)		*6*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*0*	*0*
Configuration	*LT*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*LT*		*R*
v (veh/h)	*30*					*30*		*0*
C (m) (veh/h)	*1531*					*714*		*1018*
v/c	*0.02*					*0.04*		*0.00*
95% queue length	*0.06*					*0.13*		*0.00*
Control Delay (s/veh)	*7.4*					*10.3*		*8.5*
LOS	*A*					*B*		*A*
Approach Delay (s/veh)	--	--				*10.3*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency/Co.		Jurisdiction	
Date Performed	*8/9/2013*	Analysis Year	*2018 PM - No Build*
Analysis Time Period			

Project Description *0009950*

East/West Street: *SR60* | North/South Street: *SR9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*40*	*50*			*40*	*10*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*40*	*50*	*0*	*0*	*40*	*10*
Percent Heavy Vehicles	*6*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*5*	*30*	*0*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*5*	*30*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*8*	*8*	*0*	*0*	*0*	*0*
Percent Grade (%)		*6*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*0*	*0*
Configuration	*LT*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*LT*		*R*
v (veh/h)	*40*					*35*		*0*
C (m) (veh/h)	*1531*					*661*		*1023*
v/c	*0.03*					*0.05*		*0.00*
95% queue length	*0.08*					*0.17*		*0.00*
Control Delay (s/veh)	*7.4*					*10.8*		*8.5*
LOS	*A*					*B*		*A*
Approach Delay (s/veh)	--	--				*10.8*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency/Co.		Jurisdiction	
Date Performed	*8/9/2013*	Analysis Year	*2038 AM - No Build*
Analysis Time Period			

Project Description *0009950*

East/West Street: *SR60*	North/South Street: *SR9*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*45*	*35*			*70*	*10*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*45*	*35*	*0*	*0*	*70*	*10*
Percent Heavy Vehicles	*6*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*10*	*35*	*0*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*10*	*35*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*8*	*8*	*0*	*0*	*0*	*0*
Percent Grade (%)		*6*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*0*	*0*
Configuration	*LT*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*LT*		*R*
v (veh/h)	*45*					*45*		*0*
C (m) (veh/h)	*1493*					*638*		*980*
v/c	*0.03*					*0.07*		*0.00*
95% queue length	*0.09*					*0.23*		*0.00*
Control Delay (s/veh)	*7.5*					*11.1*		*8.7*
LOS	*A*					*B*		*A*
Approach Delay (s/veh)	--	--				*11.1*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency/Co.		Jurisdiction	
Date Performed	*8/9/2013*	Analysis Year	*2038 PM - No Build*
Analysis Time Period			

Project Description *0009950*

East/West Street: *SR60*	North/South Street: *SR9*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*70*	*80*			*60*	*15*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*70*	*80*	*0*	*0*	*60*	*15*
Percent Heavy Vehicles	*6*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*10*	*45*	*0*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*10*	*45*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*8*	*8*	*0*	*0*	*0*	*0*
Percent Grade (%)		*6*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*0*	*0*
Configuration	*LT*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*LT*		*R*
v (veh/h)	*70*					*55*		*0*
C (m) (veh/h)	*1499*					*540*		*990*
v/c	*0.05*					*0.10*		*0.00*
95% queue length	*0.15*					*0.34*		*0.00*
Control Delay (s/veh)	*7.5*					*12.4*		*8.6*
LOS	*A*					*B*		*A*
Approach Delay (s/veh)	--	--				*12.4*		
Approach LOS	--	--				*B*		

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ATTACHMENT C:

ALL-WAY STOP CONTROL SUMMARY

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	TAW
Agency/Co.	
Date Performed	8/8/2013
Analysis Time Period	

Site Information

Intersection	SR9 @ SR60
Jurisdiction	
Analysis Year	2013 AM (Existing)

Project ID 0009950 LUMPKIN

East/West Street: SR60 North/South Street: SR9

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	20	0	0	0	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	25	20	0	0	40	5
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT	R			LT		TR	
PHF	1.00	1.00			1.00		1.00	
Flow Rate (veh/h)	25	0			45		45	
% Heavy Vehicles	8	8			6		6	
No. Lanes	2		0		1		1	
Geometry Group	1				2		2	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2	0.0			0.6		0.0	
Prop. Right-Turns	0.0	0.0			0.0		0.1	
Prop. Heavy Vehicle	0.1	0.1			0.1		0.1	
hLT-adj	0.2	0.2			0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6			-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7			1.7	1.7	1.7	1.7
hadj, computed	0.2	0.1			0.2		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20			3.20		3.20	
x, initial	0.02	0.00			0.04		0.04	
hd, final value (s)	4.27	4.23			4.21		4.04	
x, final value	0.03	0.00			0.05		0.05	
Move-up time, m (s)	2.0				2.0		2.0	
Service Time, t_s (s)	2.3	2.2			2.2		2.0	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	275	0			295		295	
Delay (s/veh)	7.40	7.23			7.45		7.25	
LOS	A	A			A		A	
Approach: Delay (s/veh)	7.40				7.45		7.25	
LOS	A				A		A	
Intersection Delay (s/veh)	7.36							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	TAW
Agency/Co.	
Date Performed	8/8/2013
Analysis Time Period	

Site Information

Intersection	SR9 @ SR60
Jurisdiction	
Analysis Year	2013 PM (Existing)

Project ID 0009950 LUMPKIN

East/West Street: SR60 North/South Street: SR9

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	25	0	0	0	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	35	45	0	0	35	10
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT	R			LT		TR	
PHF	1.00	1.00			1.00		1.00	
Flow Rate (veh/h)	30	0			80		45	
% Heavy Vehicles	8	8			6		6	
No. Lanes	2		0		1		1	
Geometry Group	1				2		2	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2	0.0			0.4		0.0	
Prop. Right-Turns	0.0	0.0			0.0		0.2	
Prop. Heavy Vehicle	0.1	0.1			0.1		0.1	
hLT-adj	0.2	0.2			0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6			-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7			1.7	1.7	1.7	1.7
hadj, computed	0.2	0.1			0.2		-0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20			3.20		3.20	
x, initial	0.03	0.00			0.07		0.04	
hd, final value (s)	4.34	4.31			4.20		4.02	
x, final value	0.04	0.00			0.09		0.05	
Move-up time, m (s)	2.0				2.0		2.0	
Service Time, t_s (s)	2.3	2.3			2.2		2.0	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	280	0			330		295	
Delay (s/veh)	7.51	7.31			7.63		7.23	
LOS	A	A			A		A	
Approach: Delay (s/veh)	7.51				7.63		7.23	
LOS	A				A		A	
Intersection Delay (s/veh)	7.49							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	TAW
Agency/Co.	
Date Performed	8/8/2013
Analysis Time Period	

Site Information

Intersection	SR9 @ SR60
Jurisdiction	
Analysis Year	2018 AM (No Build)

Project ID 0009950 LUMPKIN

East/West Street: SR60 North/South Street: SR9

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	25	0	0	0	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	30	25	0	0	45	5
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT	R			LT		TR	
PHF	1.00	1.00			1.00		1.00	
Flow Rate (veh/h)	30	0			55		50	
% Heavy Vehicles	8	8			6		6	
No. Lanes	2		0		1		1	
Geometry Group	1				2		2	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2	0.0			0.5		0.0	
Prop. Right-Turns	0.0	0.0			0.0		0.1	
Prop. Heavy Vehicle	0.1	0.1			0.1		0.1	
hLT-adj	0.2	0.2			0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6			-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7			1.7	1.7	1.7	1.7
hadj, computed	0.2	0.1			0.2		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20			3.20		3.20	
x, initial	0.03	0.00			0.05		0.04	
hd, final value (s)	4.30	4.27			4.23		4.06	
x, final value	0.04	0.00			0.06		0.06	
Move-up time, m (s)	2.0				2.0		2.0	
Service Time, t_s (s)	2.3	2.3			2.2		2.1	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	280	0			305		300	
Delay (s/veh)	7.46	7.27			7.52		7.31	
LOS	A	A			A		A	
Approach: Delay (s/veh)	7.46				7.52		7.31	
LOS	A				A		A	
Intersection Delay (s/veh)	7.43							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	TAW
Agency/Co.	
Date Performed	8/8/2013
Analysis Time Period	

Site Information

Intersection	SR9 @ SR60
Jurisdiction	
Analysis Year	2018 PM (No Build)

Project ID 0009950 LUMPKIN

East/West Street: SR60 North/South Street: SR9

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	30	0	0	0	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	40	50	0	0	40	10
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT	R			LT		TR	
PHF	1.00	1.00			1.00		1.00	
Flow Rate (veh/h)	35	0			90		50	
% Heavy Vehicles	8	8			6		6	
No. Lanes	2		0		1		1	
Geometry Group	1				2		2	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1	0.0			0.4		0.0	
Prop. Right-Turns	0.0	0.0			0.0		0.2	
Prop. Heavy Vehicle	0.1	0.1			0.1		0.1	
hLT-adj	0.2	0.2			0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6			-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7			1.7	1.7	1.7	1.7
hadj, computed	0.2	0.1			0.2		-0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20			3.20		3.20	
x, initial	0.03	0.00			0.08		0.04	
hd, final value (s)	4.37	4.34			4.22		4.05	
x, final value	0.04	0.00			0.11		0.06	
Move-up time, m (s)	2.0				2.0		2.0	
Service Time, t_s (s)	2.4	2.3			2.2		2.1	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	285	0			340		300	
Delay (s/veh)	7.57	7.34			7.72		7.29	
LOS	A	A			A		A	
Approach: Delay (s/veh)	7.57				7.72		7.29	
LOS	A				A		A	
Intersection Delay (s/veh)	7.57							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	TAW
Agency/Co.	
Date Performed	8/8/2013
Analysis Time Period	

Site Information

Intersection	SR9 @ SR60
Jurisdiction	
Analysis Year	2038 AM (No Build)

Project ID 0009950 LUMPKIN

East/West Street: SR60 North/South Street: SR9

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	10	35	0	0	0	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	45	35	0	0	70	10
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT	R			LT		TR	
PHF	1.00	1.00			1.00		1.00	
Flow Rate (veh/h)	45	0			80		80	
% Heavy Vehicles	8	8			6		6	
No. Lanes	2		0		1		1	
Geometry Group	1				2		2	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2	0.0			0.6		0.0	
Prop. Right-Turns	0.0	0.0			0.0		0.1	
Prop. Heavy Vehicle	0.1	0.1			0.1		0.1	
hLT-adj	0.2	0.2			0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6			-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7			1.7	1.7	1.7	1.7
hadj, computed	0.2	0.1			0.2		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20			3.20		3.20	
x, initial	0.04	0.00			0.07		0.07	
hd, final value (s)	4.43	4.39			4.30		4.11	
x, final value	0.06	0.00			0.10		0.09	
Move-up time, m (s)	2.0				2.0		2.0	
Service Time, t_s (s)	2.4	2.4			2.3		2.1	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	295	0			330		330	
Delay (s/veh)	7.69	7.39			7.75		7.53	
LOS	A	A			A		A	
Approach: Delay (s/veh)	7.69				7.75		7.53	
LOS	A				A		A	
Intersection Delay (s/veh)	7.65							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	TAW
Agency/Co.	
Date Performed	8/8/2013
Analysis Time Period	

Site Information

Intersection	SR9 @ SR60
Jurisdiction	
Analysis Year	2038 PM (No Build)

Project ID 0009950 LUMPKIN

East/West Street: SR60 North/South Street: SR9

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	10	45	0	0	0	0
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	70	80	0	0	60	15
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LT	R			LT		TR	
PHF	1.00	1.00			1.00		1.00	
Flow Rate (veh/h)	55	0			150		75	
% Heavy Vehicles	8	8			6		6	
No. Lanes	2		0		1		1	
Geometry Group	1				2		2	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2	0.0			0.5		0.0	
Prop. Right-Turns	0.0	0.0			0.0		0.2	
Prop. Heavy Vehicle	0.1	0.1			0.1		0.1	
hLT-adj	0.2	0.2			0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6			-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7			1.7	1.7	1.7	1.7
hadj, computed	0.2	0.1			0.2		-0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20	3.20			3.20		3.20	
x, initial	0.05	0.00			0.13		0.07	
hd, final value (s)	4.57	4.54			4.30		4.17	
x, final value	0.07	0.00			0.18		0.09	
Move-up time, m (s)	2.0				2.0		2.0	
Service Time, t_s (s)	2.6	2.5			2.3		2.2	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	305	0			400		325	
Delay (s/veh)	7.92	7.54			8.24		7.56	
LOS	A	A			A		A	
Approach: Delay (s/veh)	7.92				8.24		7.56	
LOS	A				A		A	
Intersection Delay (s/veh)	8.00							
Intersection LOS	A							

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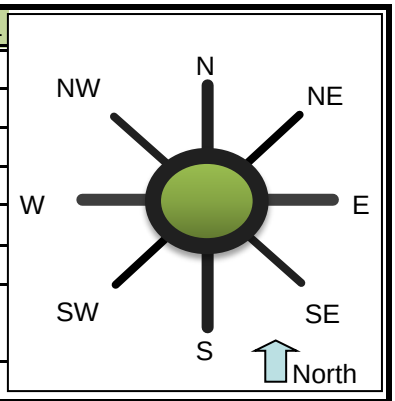
ATTACHMENT D:

GDOT ROUNDABOUT ANALYSIS TOOL

General & Site Information

v2.1

Analyst:	TAW
Agency/Co:	GDOT DISTRICT ONE DESIGN
Date:	8/13/2013
Project or PI#:	0009950
Year, Peak Hour:	2013 AM
County/District:	LUMPKIN/DISTRICT ONE
Intersection Name:	SR 9 @ SR 60



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			5		25			
	NE (2), vph								
	E (3), vph	5				25			
	SE (4), vph								
	S (5), vph	20		40					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	25	0	45	0	50	0	0	0

Volume Characteristics

	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	92%	100%	95%	100%	100%	100%
% Heavy Vehicles	6%	0%	8%	0%	6%	0%	0%	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}	0.948	1.000	0.926	1.000	0.948	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	6	0	29	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	6	0	0	0	29	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	23	0	47	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	29	0	53	0	57	0	0	0
Conflicting flow, pcu/h	47	0	29	0	6	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	1022	NA	1017	NA	1065	NA	NA	NA
Entry Flow Rates, vph	27	NA	49	NA	54	NA	NA	NA
V/C ratio	**0.03**		**0.05**		**0.05**			
Control Delay, s/veh	**4**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**2**		**4**		**4**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1217	NA	1206	NA	1258	NA	NA	NA
Entry Flow Rates, vph	27	NA	49	NA	54	NA	NA	NA
V/C ratio	**0.02**		**0.04**		**0.05**			
Control Delay, sec/pcu	**3**		**3**		**3**			
LOS	A		A		A			
95th % Queue (ft)	**2**		**4**		**4**			

Notes: v2.1

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

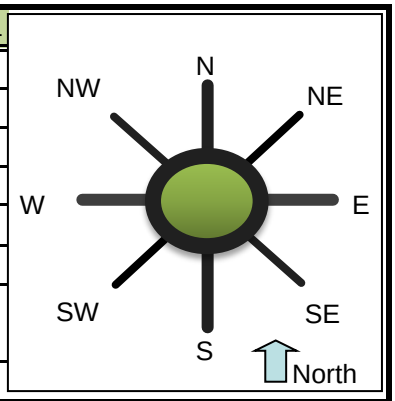
Bypass Lane Merge Point Analysis (if applicable)

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:	TAW
Agency/Co:	GDOT DISTRICT ONE DESIGN
Date:	8/13/2013
Project or PI#:	0009950
Year, Peak Hour:	2013 PM
County/District:	LUMPKIN/DISTRICT ONE
Intersection Name:	SR 9 @ SR 60



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			10		35			
	NE (2), vph								
	E (3), vph	5				50			
	SE (4), vph								
	S (5), vph	25		35					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	30	0	45	0	85	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	92%	100%	95%	100%	100%	100%
% Heavy Vehicles	6%	0%	8%	0%	6%	0%	0%	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}	0.948	1.000	0.926	1.000	0.948	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	12	0	40	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	6	0	0	0	57	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	29	0	41	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	34	0	53	0	97	0	0	0
Conflicting flow, pcu/h	41	0	40	0	6	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	1028	NA	1005	NA	1065	NA	NA	NA
Entry Flow Rates, vph	33	NA	49	NA	92	NA	NA	NA
V/C ratio	**0.03**		**0.05**		**0.09**			
Control Delay, s/veh	**4**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**3**		**4**		**7**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1223	NA	1195	NA	1258	NA	NA	NA
Entry Flow Rates, vph	33	NA	49	NA	92	NA	NA	NA
V/C ratio	**0.03**		**0.04**		**0.08**			
Control Delay, sec/pcu	**3**		**3**		**3**			
LOS	A		A		A			
95th % Queue (ft)	**2**		**4**		**7**			

Notes: v2.1

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

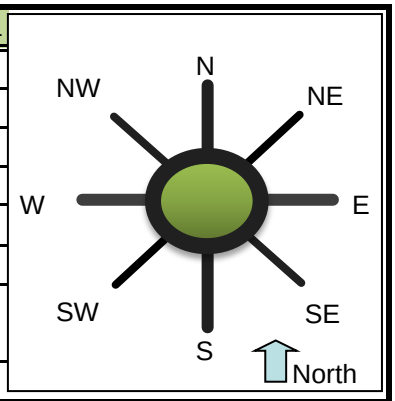
Bypass Lane Merge Point Analysis (if applicable)

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:	TAW
Agency/Co:	GDOT DISTRICT ONE DESIGN
Date:	8/13/2013
Project or PI#:	0009950
Year, Peak Hour:	2018 AM
County/District:	LUMPKIN/DISTRICT ONE
Intersection Name:	SR 9 @ SR 60



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			5		30			
	NE (2), vph								
	E (3), vph	10				30			
	SE (4), vph								
	S (5), vph	20		45					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	30	0	50	0	60	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	92%	100%	95%	100%	100%	100%
% Heavy Vehicles	6%	0%	8%	0%	6%	0%	0%	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}	0.948	1.000	0.926	1.000	0.948	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	6	0	34	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	11	0	0	0	34	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	23	0	53	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	34	0	59	0	69	0	0	0
Conflicting flow, pcu/h	53	0	34	0	11	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	1016	NA	1011	NA	1059	NA	NA	NA
Entry Flow Rates, vph	33	NA	54	NA	65	NA	NA	NA
V/C ratio	**0.03**		**0.05**		**0.06**			
Control Delay, s/veh	**4**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**3**		**5**		**5**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1211	NA	1201	NA	1252	NA	NA	NA
Entry Flow Rates, vph	33	NA	54	NA	65	NA	NA	NA
V/C ratio	**0.03**		**0.05**		**0.05**			
Control Delay, sec/pcu	**3**		**3**		**3**			
LOS	A		A		A			
95th % Queue (ft)	**2**		**4**		**5**			

Notes: v2.1

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

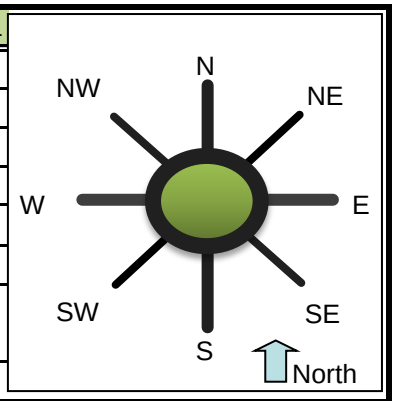
Bypass Lane Merge Point Analysis (if applicable)

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:	TAW
Agency/Co:	GDOT DISTRICT ONE DESIGN
Date:	8/13/2013
Project or PI#:	0009950
Year, Peak Hour:	2018 PM
County/District:	LUMPKIN/DISTRICT ONE
Intersection Name:	SR 9 @ SR 60



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			10		40			
	NE (2), vph								
	E (3), vph	10				55			
	SE (4), vph								
	S (5), vph	25		40					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	35	0	50	0	95	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	92%	100%	95%	100%	100%	100%
% Heavy Vehicles	6%	0%	8%	0%	6%	0%	0%	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}	0.948	1.000	0.926	1.000	0.948	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	12	0	46	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	11	0	0	0	63	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	29	0	47	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	40	0	59	0	109	0	0	0
Conflicting flow, pcu/h	47	0	46	0	11	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	1022	NA	999	NA	1059	NA	NA	NA
Entry Flow Rates, vph	38	NA	54	NA	103	NA	NA	NA
V/C ratio	**0.04**		**0.05**		**0.10**			
Control Delay, s/veh	**4**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**3**		**5**		**9**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1217	NA	1190	NA	1252	NA	NA	NA
Entry Flow Rates, vph	38	NA	54	NA	103	NA	NA	NA
V/C ratio	**0.03**		**0.05**		**0.09**			
Control Delay, sec/pcu	**3**		**3**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**3**		**4**		**8**			

Notes: v2.1

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

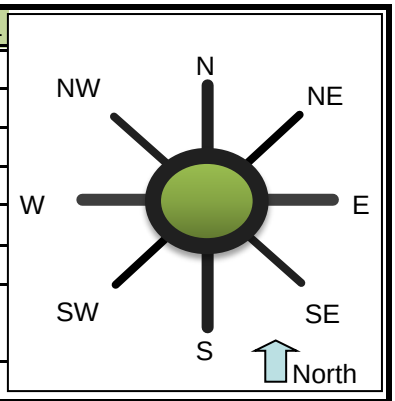
Bypass Lane Merge Point Analysis (if applicable)

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:	TAW
Agency/Co:	GDOT DISTRICT ONE DESIGN
Date:	8/13/2013
Project or PI#:	0009950
Year, Peak Hour:	2038 AM
County/District:	LUMPKIN/DISTRICT ONE
Intersection Name:	SR 9 @ SR 60



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			10		45			
	NE (2), vph								
	E (3), vph	20				40			
	SE (4), vph								
	S (5), vph	25		70					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	45	0	80	0	85	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	92%	100%	95%	100%	100%	100%
% Heavy Vehicles	6%	0%	8%	0%	6%	0%	0%	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}	0.948	1.000	0.926	1.000	0.948	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	12	0	52	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	23	0	0	0	46	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	29	0	82	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	52	0	94	0	97	0	0	0
Conflicting flow, pcu/h	82	0	52	0	23	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	987	NA	994	NA	1047	NA	NA	NA
Entry Flow Rates, vph	49	NA	87	NA	92	NA	NA	NA
V/C ratio	**0.05**		**0.09**		**0.09**			
Control Delay, s/veh	**4**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**4**		**8**		**8**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1183	NA	1184	NA	1241	NA	NA	NA
Entry Flow Rates, vph	49	NA	87	NA	92	NA	NA	NA
V/C ratio	**0.04**		**0.08**		**0.08**			
Control Delay, sec/pcu	**3**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**4**		**7**		**7**			

Notes: v2.1

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

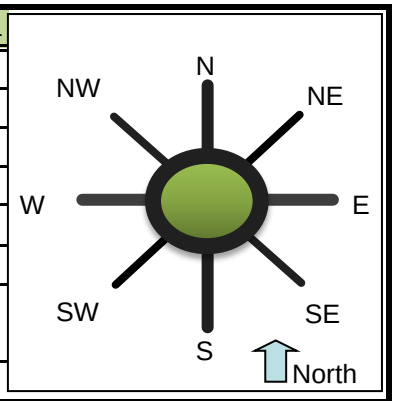
Bypass Lane Merge Point Analysis (if applicable)

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:	TAW
Agency/Co:	GDOT DISTRICT ONE DESIGN
Date:	8/13/2013
Project or PI#:	0009950
Year, Peak Hour:	2038 PM
County/District:	LUMPKIN/DISTRICT ONE
Intersection Name:	SR 9 @ SR 60



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			15		70			
	NE (2), vph								
	E (3), vph	20				90			
	SE (4), vph								
	S (5), vph	35		60					
	SW (6), vph								
	W (7), vph								
	NW (8), vph								
Output	Total Vehicles	55	0	75	0	160	0	0	0

Volume Characteristics	N	NE	E	SE	S	SW	W	NW
% Cars	95%	100%	92%	100%	95%	100%	100%	100%
% Heavy Vehicles	6%	0%	8%	0%	6%	0%	0%	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}	0.948	1.000	0.926	1.000	0.948	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	18	0	80	0	0	0
NE (2), pcu/h	0	0	0	0	0	0	0	0
E (3), pcu/h	23	0	0	0	103	0	0	0
SE (4), pcu/h	0	0	0	0	0	0	0	0
S (5), pcu/h	40	0	70	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	63	0	88	0	183	0	0	0
Conflicting flow, pcu/h	70	0	80	0	23	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	998	NA	966	NA	1047	NA	NA	NA
Entry Flow Rates, vph	60	NA	82	NA	174	NA	NA	NA
V/C ratio	**0.06**		**0.08**		**0.17**			
Control Delay, s/veh	**4**		**4**		**5**			
LOS	A		A		A			
95th % Queue (ft)	**5**		**7**		**16**			
Calibrated Model (future)	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Entry Capacity, vph	1194	NA	1157	NA	1241	NA	NA	NA
Entry Flow Rates, vph	60	NA	82	NA	174	NA	NA	NA
V/C ratio	**0.05**		**0.08**		**0.15**			
Control Delay, sec/pcu	**3**		**4**		**4**			
LOS	A		A		A			
95th % Queue (ft)	**4**		**7**		**14**			

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						

ATTACHMENT E:

HCS 2010 ROUNDABOUT REPORTS

ROUNDABOUT REPORT

General Information		Site Information	
Analyst	TAW	Intersection	SR9 @ SR60
Agency or Co.		E/W Street Name	SR60
Date Performed	8/9/2013	N/S Street Name	SR9
Time Period		Analysis Year	2018 AM (BUILD)
		Project ID	0009950 LUMPKIN

Project Description:

Volume Adjustment and Site Characteristics

	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes(N)	0	1	0		0	0	0		0	1	0		0	1	0	
Volume (V), veh/h		30	0	0				0		30	25	0		45	5	0
Heavy Veh. Adj. (f_{HV}), %	8	8	8	8	3	3	3	8	6	6	6	6	6	6	6	6
Peak Hour Factor (PHF)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
No. of Pedestrians Crossing Entry	0				0				0				0			

Critical and Follow-Up Headway Adjustment

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Circulating Flow (V_c), pc/h	52			35			35			0		
Exiting Flow (V_{ex}), pc/h	64			6			35			52		
Entry Flow (V_e), pc/h		35			55			64			58	
Entry Volume veh/h		32						60			55	

Capacity and v/c Ratios

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Capacity (c_{PCE}), pc/h		1073			1091			1091			1130	
Capacity (c), veh/h		994			0			1029			1066	
v/c Ratio (X)		0.03						0.06			0.05	

Delay and Level of Service

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9						4.0			3.8	
Lane LOS		A						A			A	
Lane 95% Queue		0.1						0.2			0.2	
Approach Delay, s/veh	3.91						4.01			3.82		
Approach LOS, s/veh	A						A			A		
Intersection Delay, s/veh	3.92											
Intersection LOS	A											

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ROUNDABOUT REPORT

General Information		Site Information	
Analyst	*TAW*	Intersection	*SR9 @ SR60*
Agency or Co.		E/W Street Name	*SR60*
Date Performed	*8/9/2013*	N/S Street Name	*SR9*
Time Period		Analysis Year	*2018 PM (BUILD)*
		Project ID	*0009950 LUMPKIN*

Project Description:

Volume Adjustment and Site Characteristics

	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes(N)	0	1	0		0	0	0		0	1	0		0	1	0	
Volume (V), veh/h		35	0	0				0		40	50	0		40	10	0
Heavy Veh. Adj. (f_{HV}), %	8	8	8	8	3	3	3	8	6	6	6	6	6	6	6	6
Peak Hour Factor (PHF)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
No. of Pedestrians Crossing Entry	0				0				0				0			

Critical and Follow-Up Headway Adjustment

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Circulating Flow (V_c), pc/h	46			46			41			0		
Exiting Flow (V_{ex}), pc/h	99			12			46			46		
Entry Flow (V_e), pc/h		41			55			104			58	
Entry Volume veh/h		38						98			55	

Capacity and v/c Ratios

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Capacity (c_{PCE}), pc/h		1079			1079			1085			1130	
Capacity (c), veh/h		999			0			1024			1066	
v/c Ratio (X)		0.04						0.10			0.05	

Delay and Level of Service

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9						4.4			3.8	
Lane LOS		A						A			A	
Lane 95% Queue		0.1						0.3			0.2	
Approach Delay, s/veh	3.94						4.37			3.82		
Approach LOS, s/veh	A						A			A		
Intersection Delay, s/veh	4.12											
Intersection LOS	A											

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ROUNDABOUT REPORT

General Information		Site Information	
Analyst	TAW	Intersection	SR9 @ SR60
Agency or Co.		E/W Street Name	SR60
Date Performed	8/9/2013	N/S Street Name	SR9
Time Period		Analysis Year	2038 AM (BUILD)
		Project ID	0009950 LUMPKIN

Project Description:

Volume Adjustment and Site Characteristics

	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes(N)	0	1	0		0	0	0		0	1	0		0	1	0	
Volume (V), veh/h		45	0	0				0		45	35	0		70	10	0
Heavy Veh. Adj. (f_{HV}), %	8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6
Peak Hour Factor (PHF)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
No. of Pedestrians Crossing Entry	0				0				0				0			

Critical and Follow-Up Headway Adjustment

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Circulating Flow (V_c), pc/h	81			52			53			0		
Exiting Flow (V_{ex}), pc/h	93			12			52			81		
Entry Flow (V_e), pc/h		53			88			92			93	
Entry Volume veh/h		49						87			88	

Capacity and v/c Ratios

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Capacity (c_{PCE}), pc/h		1042			1073			1072			1130	
Capacity (c), veh/h		965			0			1011			1066	
v/c Ratio (X)		0.05						0.09			0.08	

Delay and Level of Service

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.2						4.3			4.1	
Lane LOS		A						A			A	
Lane 95% Queue		0.2						0.3			0.3	
Approach Delay, s/veh	4.18						4.32			4.09		
Approach LOS, s/veh	A						A			A		
Intersection Delay, s/veh	4.20											
Intersection LOS	A											

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ROUNDABOUT REPORT

General Information		Site Information	
Analyst	TAW	Intersection	SR9 @ SR60
Agency or Co.		E/W Street Name	SR60
Date Performed	8/9/2013	N/S Street Name	SR9
Time Period		Analysis Year	2038 PM (BUILD)
		Project ID	0009950 LUMPKIN

Project Description:

Volume Adjustment and Site Characteristics

	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes(N)	0	1	0		0	0	0		0	1	0		0	1	0	
Volume (V), veh/h		55	0	0				0		70	80	0		60	15	0
Heavy Veh. Adj. (f_{HV}), %	8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6
Peak Hour Factor (PHF)	0.92	0.92	0.92	1.00	0.92	0.92	0.92	1.00	0.92	0.92	0.92	1.00	0.92	0.92	0.92	1.00
No. of Pedestrians Crossing Entry	0				0				0				0			

Critical and Follow-Up Headway Adjustment

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Circulating Flow (V_c), pc/h	69			81			65			0		
Exiting Flow (V_{ex}), pc/h	157			17			81			69		
Entry Flow (V_e), pc/h		65			81			173			86	
Entry Volume veh/h		60						163			81	

Capacity and v/c Ratios

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Capacity (c_{PCE}), pc/h		1055			1042			1059			1130	
Capacity (c), veh/h		977			0			999			1066	
v/c Ratio (X)		0.06						0.16			0.08	

Delay and Level of Service

	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.2						5.1			4.0	
Lane LOS		A						A			A	
Lane 95% Queue		0.2						0.6			0.2	
Approach Delay, s/veh	4.23						5.12			4.04		
Approach LOS, s/veh	A						A			A		
Intersection Delay, s/veh	4.66											
Intersection LOS	A											

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ATTACHMENT F:

SIDRA REPORTS

LANE SUMMARY

Site: 2018 AM

PI 0009950 Lumpkin
Stone Pile Gap
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US19/SR9 NB																
Lane 1	0	33	27	60	5.5	1272	P	100	5.5	LOS A	0.2	5.9	1600	–	0.0	0.0
Approach	0	33	27	60	5.5		0.047		5.5	LOS A	0.2	5.9				
East: US19/SR9 SB																
Lane 1	49	0	5	54	5.5	1147	P	100	12.0	LOS B	0.2	5.8	1600	–	0.0	0.0
Approach	49	0	5	54	5.5		0.047		12.0	LOS B	0.2	5.8				
North: SR60																
Lane 1	11	22	0	33	8.0	1071	P	100	7.7	LOS A	0.1	3.8	1600	–	0.0	0.0
Approach	11	22	0	33	8.0		0.030		7.7	LOS A	0.1	3.8				
Intersection				147	6.1		0.047		8.4	LOS A	0.2	5.9				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2018 PM

PI 0009950 Lumpkin
Stone Pile Gap
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US19/SR9 NB																
Lane 1	0	43	54	98	5.5	1317	P	100	5.7	LOS A	0.4	9.5	1600	–	0.0	0.0
Approach	0	43	54	98	5.5		0.074		5.7	LOS A	0.4	9.5				
East: US19/SR9 SB																
Lane 1	43	0	11	54	5.5	1112	P	100	11.4	LOS B	0.2	6.0	1600	–	0.0	0.0
Approach	43	0	11	54	5.5		0.049		11.4	LOS B	0.2	6.0				
North: SR60																
Lane 1	11	27	0	38	8.0	1077	P	100	7.3	LOS A	0.2	4.4	1600	–	0.0	0.0
Approach	11	27	0	38	8.0		0.035		7.3	LOS A	0.2	4.4				
Intersection				190	6.0		0.074		7.6	LOS A	0.4	9.5				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2038 AM

PI 0009950 Lumpkin
Stone Pile Gap
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US19/SR9 NB																
Lane 1	0	49	38	87	5.5	1228	P	100	5.6	LOS A	0.4	9.2	1600	–	0.0	0.0
Approach	0	49	38	87	5.5		0.071		5.6	LOS A	0.4	9.2				
East: US19/SR9 SB																
Lane 1	76	0	11	87	5.5	1131	P	100	11.9	LOS B	0.4	9.7	1600	–	0.0	0.0
Approach	76	0	11	87	5.5		0.077		11.9	LOS B	0.4	9.7				
North: SR60																
Lane 1	22	27	0	49	8.0	1036	P	100	8.8	LOS A	0.2	6.0	1600	–	0.0	0.0
Approach	22	27	0	49	8.0		0.047		8.8	LOS A	0.2	6.0				
Intersection				223	6.0		0.077		8.7	LOS A	0.4	9.7				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2038 PM

PI 0009950 Lumpkin
Stone Pile Gap
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US19/SR9 NB																
Lane 1	0	76	87	163	5.5	1283	P	100	5.7	LOS A	0.7	17.4	1600	–	0.0	0.0
Approach	0	76	87	163	5.5		0.127		5.7	LOS A	0.7	17.4				
East: US19/SR9 SB																
Lane 1	65	0	16	82	5.5	1065	P	100	11.7	LOS B	0.4	9.6	1600	–	0.0	0.0
Approach	65	0	16	82	5.5		0.077		11.7	LOS B	0.4	9.6				
North: SR60																
Lane 1	22	38	0	60	8.0	1048	P	100	8.1	LOS A	0.3	7.4	1600	–	0.0	0.0
Approach	22	38	0	60	8.0		0.057		8.1	LOS A	0.3	7.4				
Intersection				304	6.0		0.127		7.8	LOS A	0.7	17.4				

P: You need to Process this Site (F9) for this variable to be computed.

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

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ATTACHMENT G:

GDOT ROUNDABOUT CHECKLIST

GDOT ROUNDABOUT DESIGN CHECKLIST - CONCEPT DEVELOPMENT

Notes:

1) This checklist is specifically written for a standalone intersection project. Some minor adjustments may be needed for a consultant designed roundabout with respect to roles. For linear or interchange reconstruction projects much of the concept development effort can be accomplished during the preliminary design. Additional items should be added as necessary to define/document the design. The preparation of a roundabout design may be terminated at any time during the process, if a decision is made to eliminate a roundabout from further consideration. In this case, documentation should be organized and retained to support this decision.

2) This checklist includes work items which are specific to the roundabout project and does not include many items which would be common to all conventional intersection projects. The level of detail and timing of some tasks will vary with the complexities of the roundabout and site constraints.

3) The checklist is meant to combine certain categories of information and is not meant to reflect a precise sequence of performance. Any items which do not apply to a specific project can be marked as "N/A" (i.e. not applicable).

PI Number:	0009950	County:	Lumpkin
Design Phase Leader:	Teressa Walcott	Design Office:	GDOT - District One
Description:	SR 9 @ SR 60		

No.	Completed	Action By	Item	Commentary (Can modify text to replace with project specific info, will show in **bold** letters)
1. Operations - Planning Level Assessment - *See DPM section 8.2.1*				
1	N/A	N/A	Vicinity Map	*Map showing roadways within approximately 1 mile +/- of each direction from the roundabout.*
2	N/A	N/A	Intersection Layout	*Show layout of existing intersection including site constraints such as property, access buildings. A recent aerial photo from any source is sufficient.*
3	N/A	N/A	Letter of support from local government	*Letter of support is required from local government for project to proceed as a roundabout - See DPM figure 8.1.*
4	N/A	N/A	Crash history	*Send request to Norm Cressman of GDOT Crash Reporting Unit.*
5	N/A	N/A	Pedestrian and bike activity	*Estimate level of activity. Sources may include site inspection, local GDOT and government offices.*
6	N/A	N/A	Estimate current traffic volumes	*May obtain from GDOT transportation Data Viewer or TPAS.*
7	N/A	N/A	Estimate design year traffic volumes	*Important if significant growth is anticipated.*
8	N/A	N/A	Percent traffic on major roads	*Traffic volume entering roundabout from the major road should be no more than 90% of total volume entering the roundabout.*
9	N/A	N/A	Number of circulatory lanes	*Single lane - ADT < 25,000, Two-lane - ADT < 45,000. See exhibit 3-12 of NCHRP.*
10	N/A	N/A	Favorable conditions	*See section 8.2.1 Planning Level Assessments for list of conditions where roundabouts tend to be advantageous.*
11	N/A	N/A	Unfavorable conditions	*See section 8.2.1 Planning Level Assessments for list of conditions which may be unfavorable for roundabouts.*
12	N/A	N/A	Purpose of roundabout	*Clearly define what "need" the roundabout addresses.*
13	N/A	N/A	Roundabout sketch	*Hand drawn sketch showing location and configuration envisioned.*

PI Number:	0009950	County:	Lumpkin
Design Phase Leader:	Teressa Walcott	Design Office:	GDOT - District One
Description:	SR 9 @ SR 60		

No.	Completed	Action By	Item	Commentary (Can modify text to replace with project specific info, will show in **bold** letters)
2. Design - Gather information for Concept - *for existing intersection and for base & design years*				
1	4/26/13	DPL	Vicinity Map	*Map showing roadways within approximately 1 mile +/- of each direction from the roundabout.*
2	4/26/13	DPL	Approach Speeds	*Identify posted speeds for approach roadways - Obtain from existing speed limit signs or GDOT Transportation Data Viewer. For county and local roads it is recommended to contact the local district traffic operations office to request from local enforcement agency.*
3	N/A	N/A	Grades	*Generally not desirable to locate roundabouts with grades through the roundabout greater than 4%. Can continue with a roundabout but should consider truck volumes and potential for truck overturning.*
4	4/26/13	DPL	Functional Classification	*Identify for each approach roadway using GDOT Transportation Data Viewer. As a secondary source may use Office of Transportation Data functional classification maps.*
5	7/11/13	PM	Current year traffic volumes	*Send email request to Office of Planning (ADT and am/pm DHV), attn Abby Ebodaghe.*
6	7/11/13	PM	Base year traffic projections	*Be sure to obtain growth rates for traffic projections where evaluating capacity during interim years may be required.*
7	7/11/13	PM	Design year traffic projections	*Be sure to obtain growth rates for traffic projections where evaluating capacity during interim years may be required.*
8	N/A	N/A	Future projects	*Identify any planned roadway project in vicinity.*
9	5/22/13	DPL	Desirable LOS	*Refer to DPM Section 6.15, Summary of Design Criteria for Cross Section Elements.*
3. Design - Roundabout Feasibility Study, Part 1 - *Alternate comparison and selection*				
1	10/8/13	DPL	Intersection base map	*Show layout of existing intersection including site constraints such as right-of-way, access, buildings, and environmental resources. A recent aerial photo from any source is sufficient.*
2	7/12/13	D1 T.O.	Signal Warrant Study	*This will define whether or not a signal is a possible alternate and will be prepared by the local District Traffic Operations Office.*
3	10/8/13	DPL	Identify/sketch alternative intersection forms	*See DPM Section 8.2.2 - bullet for Section 3. Sketch to the level at which alternates can be adequately compared. May include single and multilane roundabout layouts.*
4	10/8/13	DPL	Safety assessment	*See DPM Section 8.2.2 - bullet for Section 2.*
5	10/8/13	DPL	Number of entry lanes for each approach leg	*May use turning movements to estimate of lane requirements at each entry. See exhibits 3-14 and 4-3 of NCHRP 672.*
6	10/8/13	DPL	Operational analyses	*See DPM Section 8.2.2 - bullet for Section 4.*
7	10/8/13	DPL	Cost comparison	*See DPM Section 8.2.2 - bullet for Section 5. Not required if roundabout is to address severe crash history.*
8	10/8/13	DPL	Select most favorable alternative	*See DPM Section 8.2.2 - bullet for Section 6. A tabulated comparison of alternates recommended.*

PI Number:	0009950	County:	Lumpkin
Design Phase Leader:	Teressa Walcott	Design Office:	GDOT - District One
Description:	SR 9 @ SR 60		

No.	Completed	Action By	Item	Commentary (Can modify text to replace with project specific info, will show in **bold** letters)
4. Design - Roundabout Feasibility Study, Part 2 - *Roundabout layout (as required to define footprint)*				
1	10/8/13	DPL	Design alternate roundabout layouts	*The identification of the most favorable layout may require the development and consideration of multiple roundabout layouts/locations.*
2	10/8/13	DPL	Identify likely impacts	*Identify potential conflicts with underground utilities and likely property and environmental resource impacts, etc.*
3	10/8/13	DPL	Fastest paths	*Document fastest paths on concept layouts, indicate speeds and speed differentials. (May require update during preliminary design for requirements to layout.)*
4	10/8/13	DPL	Design vehicle	*See DPM Section 8.3.2, Design Vehicle and Section 3.2. Greater consideration should be given to selecting a larger design vehicle - even if roundabout may be infrequently used by that size vehicle.*
5	10/8/13	DPL	Design vehicle swept path	*Document all movements. (May require update during preliminary design for requirements to layout.)*
6	10/8/13	DPL	Stopping sight distance	*Evaluate stopping sight distance to roundabout yield line, for each approach.*
7	N/A	N/A	Staging improvements	*If multilane is required in the design year evaluate whether or not a single-lane will be adequate through the base plan 10 years. If so, construct as a single lane which allows for future expansion to a multilane footprint without reconstruction.*
8	10/1/14	DPL	Finalize concept layout	*Prepare a concept layout of the proposed roundabout. May be CAD or hand drawn, but should be to scale. Should show central island, splitter islands, sidewalks, crosswalks and truck apron. Note or list dimensions for ICD, circulatory roadway width, truck apron widths, angles between approach centerlines. Will be helpful to include preliminary striping for multilane roundabouts. Show scale and North arrow.*
5. Design - Other information - *required for Concept Report*				
1	10/8/13	DPL	Typical section	*Required for concept reports.*
2	11/19/14	DPL	Construction sequencing	*Briefly describe expected staging for construction, e.g. built under traffic, off-site detour, new location…*
3	11/19/14	DPL	Lighting	*Include in cost estimate. Define if need is to address high speeds on approaches, pedestrian activity and if approaches are lighted.*
4	11/19/14	DPL	Landscaping requirements	*Include in cost estimate. Will normally be required. This is particularly the case for high speed approaches to enhance visibility of the roundabout from a distance.*
5	12/11/14	DPL	Pavement Type	*Will normally match major road pavement. Asphalt commonly provides for easier staging for construction at existing intersections.*
6. Design - Implement program of local government coordination and public involvement				
1	10/8/13	DPL	Presentation layouts	*Prepare exhibits for meetings.*
2	N/A	N/A	Meeting with local officials	*An initial meeting with local government officials (and their support of the roundabout) will be helpful in gaining support at a PIOH.*
3	3/4/14	DPL	Public outreach	*Required in most cases, often in the form of a PIOH. See DPM Section 8.2.5 Public Involvement for helpful advice regarding visual aids. This should occur after the feasibility study is complete.*

PI Number:	0009950	County:	Lumpkin
Design Phase Leader:	Teressa Walcott	Design Office:	GDOT - District One
Description:	SR 9 @ SR 60		

No.	Completed	Action By	Item	Commentary (Can modify text to replace with project specific info, will show in **bold** letters)
7. Complete quality assurance reviews - *occurs at previous points in the process*				
1	3/17/15	D1 DDE	QA review by design process	*Feasibility studies should be reviewed within the originating design office, in accordance with the Department's QC/QA manual (located on ROADS).*
2	8/30/13	SME	Informal review by GDOT roundabout SME	*Upon request, a GDOT SME will, (prior to peer review), perform an informal review of a feasibility study or any in-progress work products. Contact either Scott Zehngraff (szehngraff@dot.ga.gov) of the Office of Traffic Operations or Daniel Pass (dpass@dot.ga.gov) of the Office of Design Policy and Support.*
3	3/11/15	SME	Peer review by Consultant peer reviewer	*See Daniel Pass for a list of approved roundabout peer reviewers and a scope of work for a peer review task order. Peer review can be accomplished either in discrete events or incrementally from start of concept to letting. Should be completed prior to the concept team meeting where a complex roundabout is proposed. See DPM Section 8.2.3. Review of Feasibility Studies.*

Notes:

1) *Key objectives during concept development includes identifying the best solution that addresses the project need and defining a layout which best considers geometric, operational and other project-specific constraints. Defining an "accurate" footprint is particularly important for projects with significant site constraints and for roundabouts of greater complexity (complex roundabouts). Complex roundabouts include multilane roundabouts and single land roundabouts which addresses difficult conditions such as bad skews or significant geometric or operational constraints.*

2) *It should be recognized that unlike conventional intersection forms (e.g., signalization, stop control, etc.) the configuration and layout of a roundabout can be dramatically affected by the results of capacity, fastest path, and truck turning template studies and thus often requires higher level of engineering during the concept phase.*

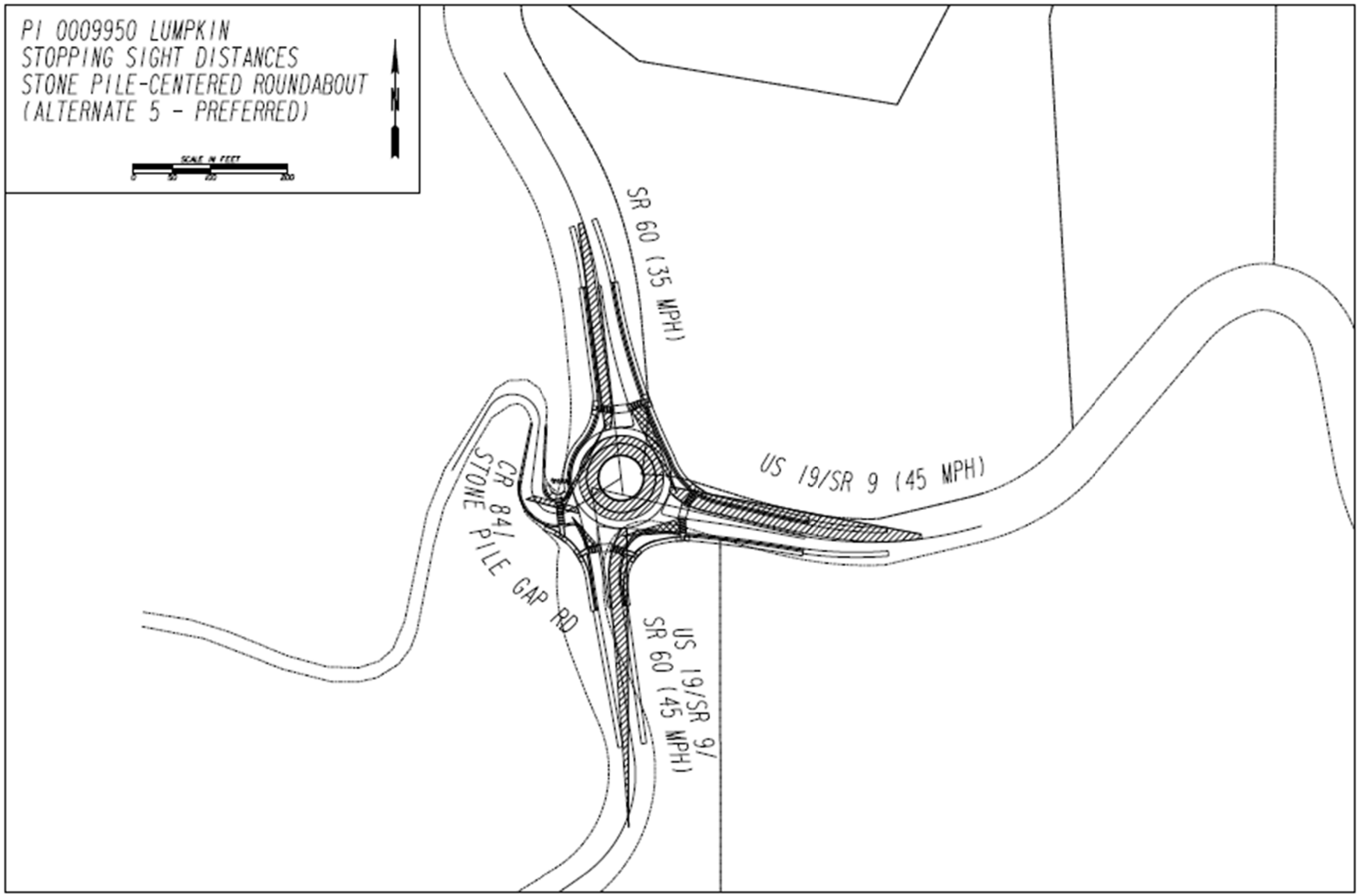
3) *Include a completed checklist with the submittal package to the peer reviewer and with submission of the concept report for review and approval. Any peer review recommended changes not implemented must be coordinated with the peer reviewer and/or the Office of Design Policy and Support. The peer review report should also be included in the concept report if any recommended changes are to be made after concept development. At minimum, make all changes which affect impacts, cost, required R/W, basic operation of the roundabout leg, elimination of a bypass lane, etc. prior to submitting the concept report for review and approval.*

List of Acronyms

SME - Subject Matter Expert
DPM - Design Policy Manual
ICD - Inscribed Diameter
TPAS - Traffic polling and Analysis System

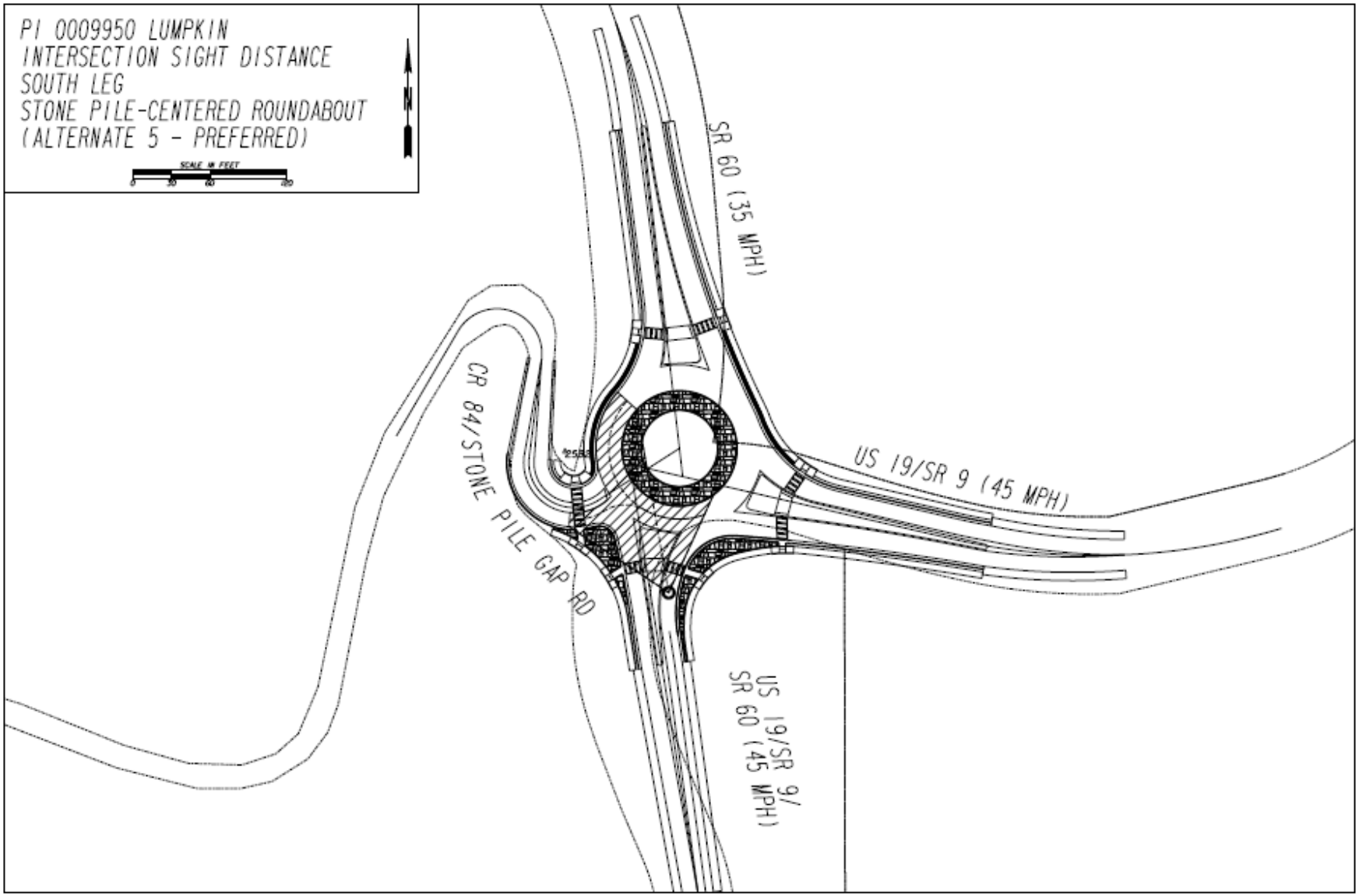
ATTACHMENT H:

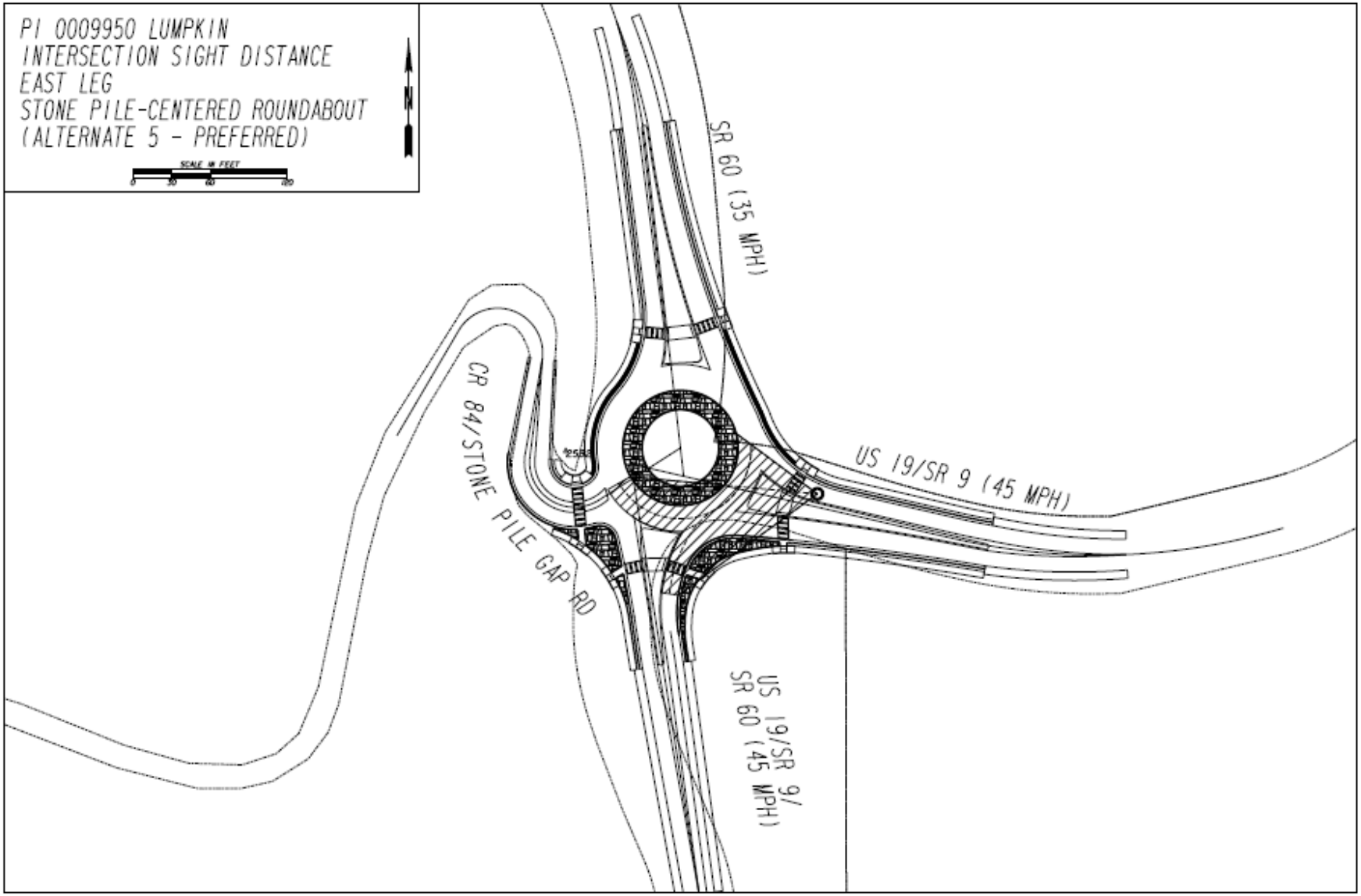
STOPPING SIGHT DISTANCE DIAGRAM

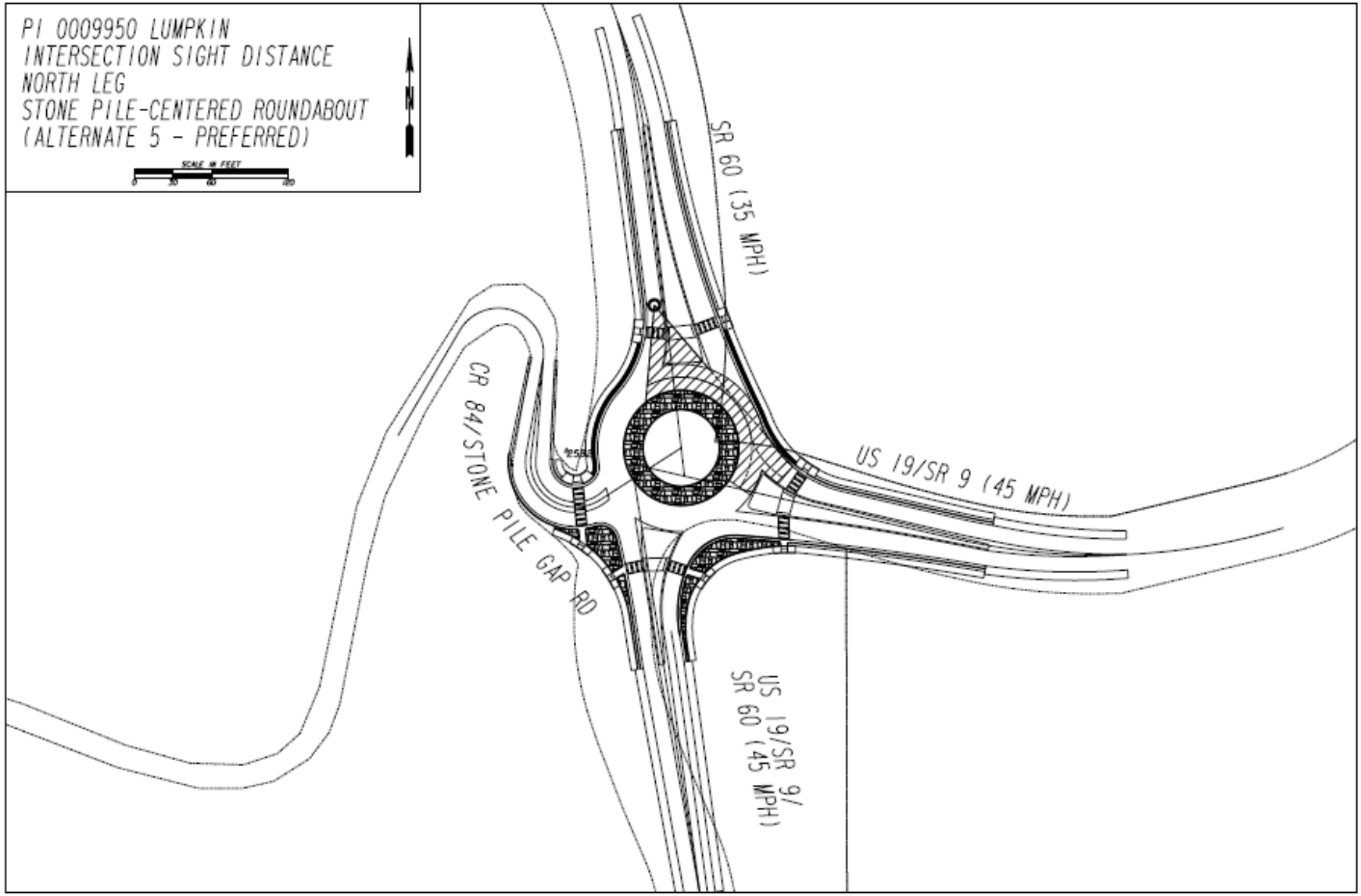

PI 0009950 LUMPKIN
STOPPING SIGHT DISTANCES
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)
N
SCALE IN FEET
0
50
100
200
SR 60 (35 MPH)
US 19/SR 9 (45 MPH)
CR 84/
STONE PILE GAP RD
US 19/SR 9/
SR 60 (45 MPH)

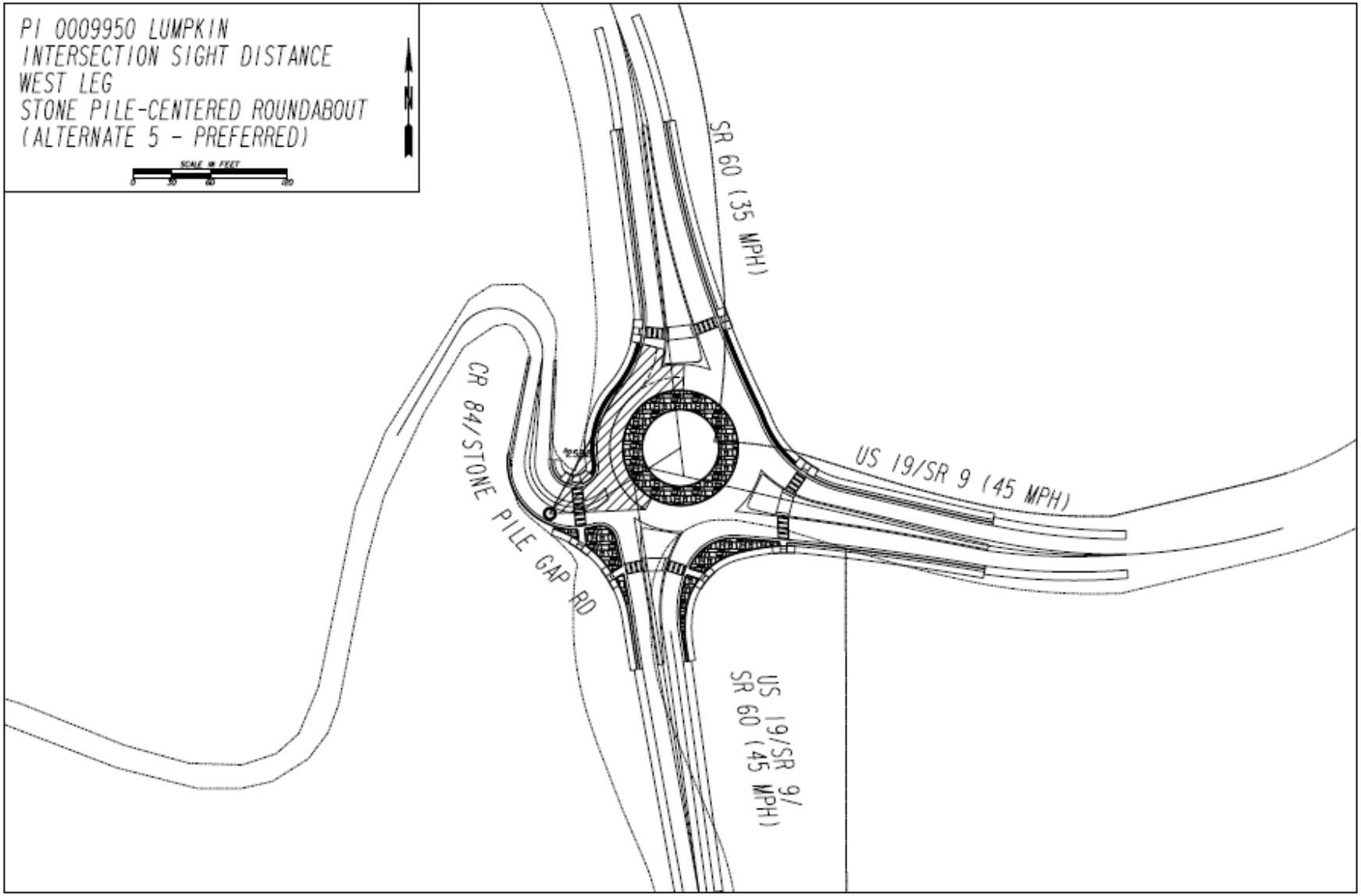
ATTACHMENT I:

INTERSECTION SIGHT DISTANCE DIAGRAMS


PI 0009950 LUMPKIN
INTERSECTION SIGHT DISTANCE
SOUTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)
N
SCALE IN FEET
0
30
60
120
SR 60 (35 MPH)
CR 84/STONE PILE GAP RD
US 19/SR 9 (45 MPH)
US 19/SR 9/
SR 60 (45 MPH)


PI 0009950 LUMPKIN
INTERSECTION SIGHT DISTANCE
EAST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)
SCALE IN FEET
0
30
60
120
N
SR 60 (35 MPH)
CR 84/STONE PILE GAP RD
US 19/SR 9 (45 MPH)
US 19/SR 9/
SR 60 (45 MPH)

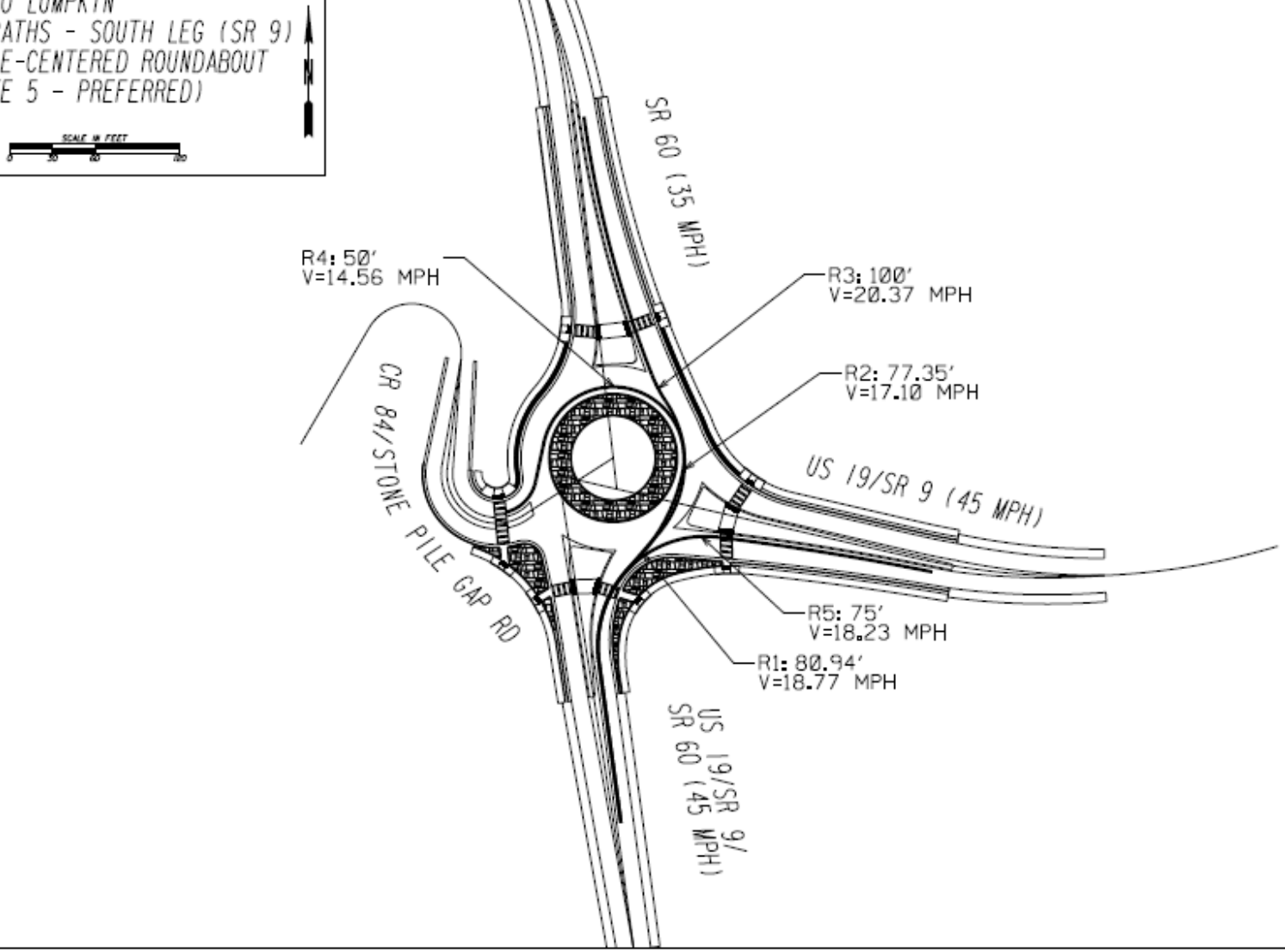

PI 0009950 LUMPKIN
INTERSECTION SIGHT DISTANCE
NORTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)
N
SCALE IN FEET
0
30
60
100
SR 60 (35 MPH)
CR 84/STONE PILE GAP RD
US 19/SR 9 (45 MPH)
US 19/SR 9/
SR 60 (45 MPH)


PI 0009950 LUMPKIN
INTERSECTION SIGHT DISTANCE
WEST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)
N
SCALE IN FEET
0
30
60
120
SR 60 (35 MPH)
US 19/SR 9 (45 MPH)
CR 84/STONE PILE GAP RD
US 19/SR 9/
SR 60 (45 MPH)

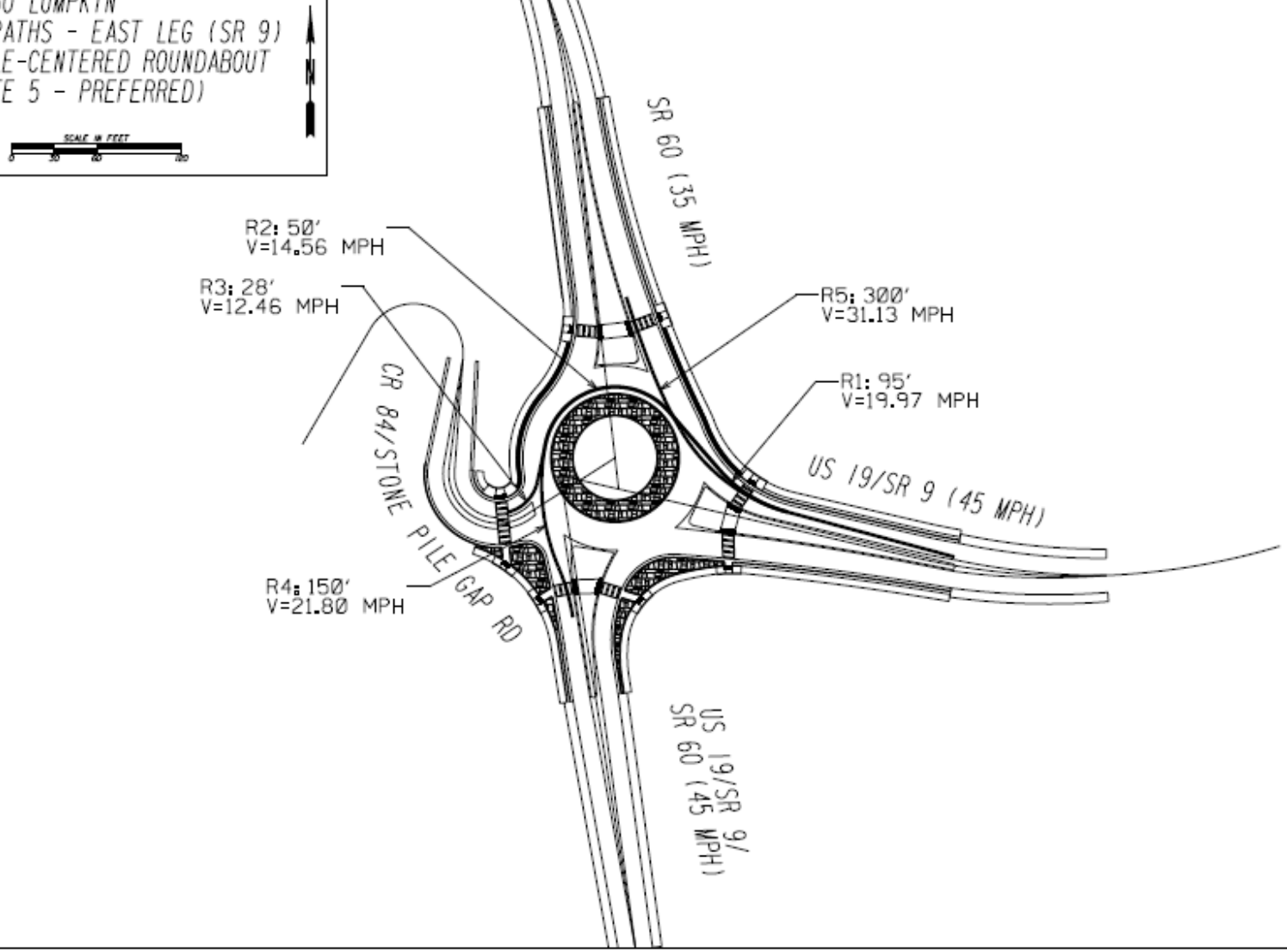
ATTACHMENT J:

FASTEST PATH DIAGRAMS

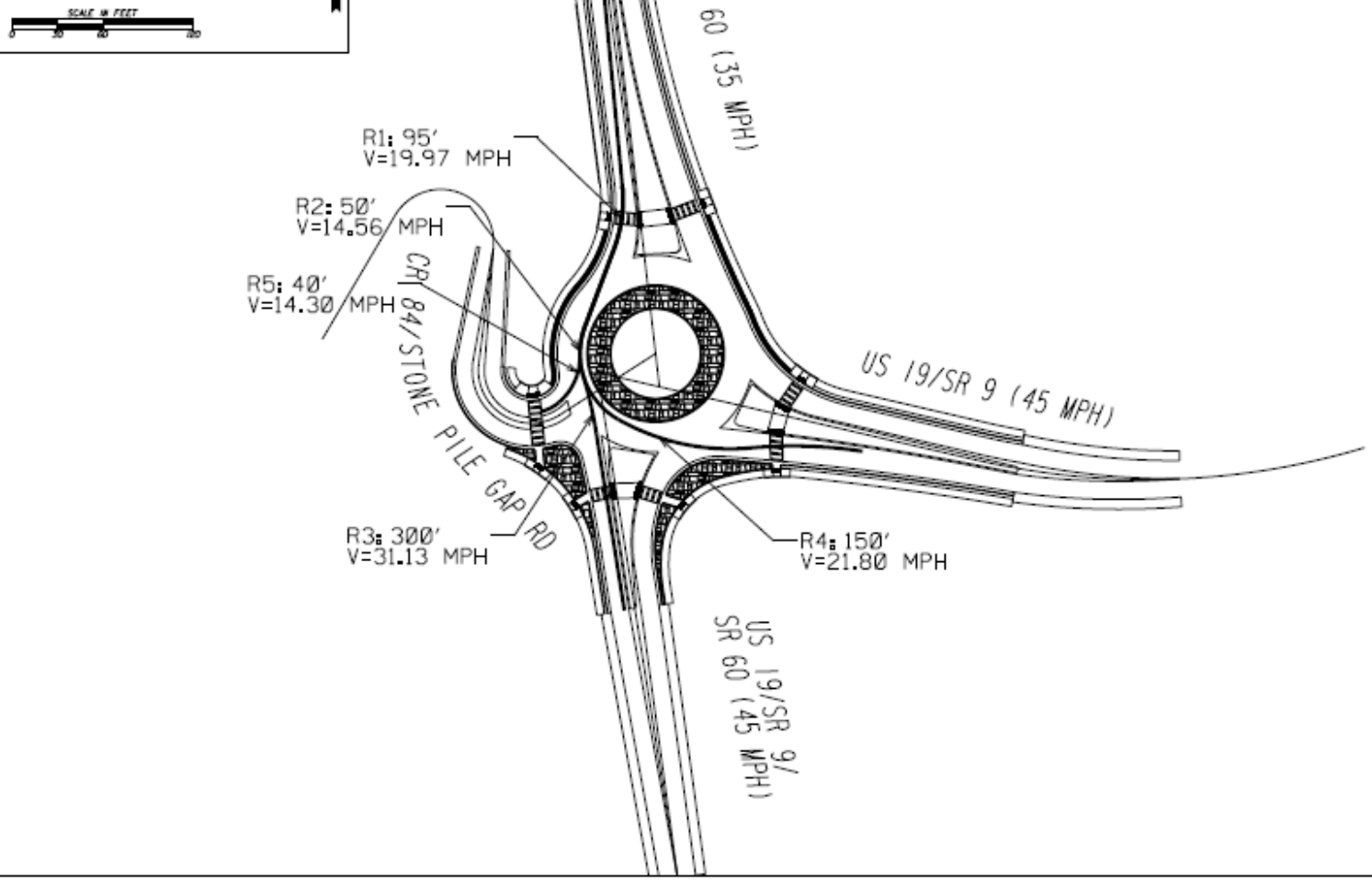
PI 0009950 LUMPKIN
FASTEST PATHS - SOUTH LEG (SR 9)
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



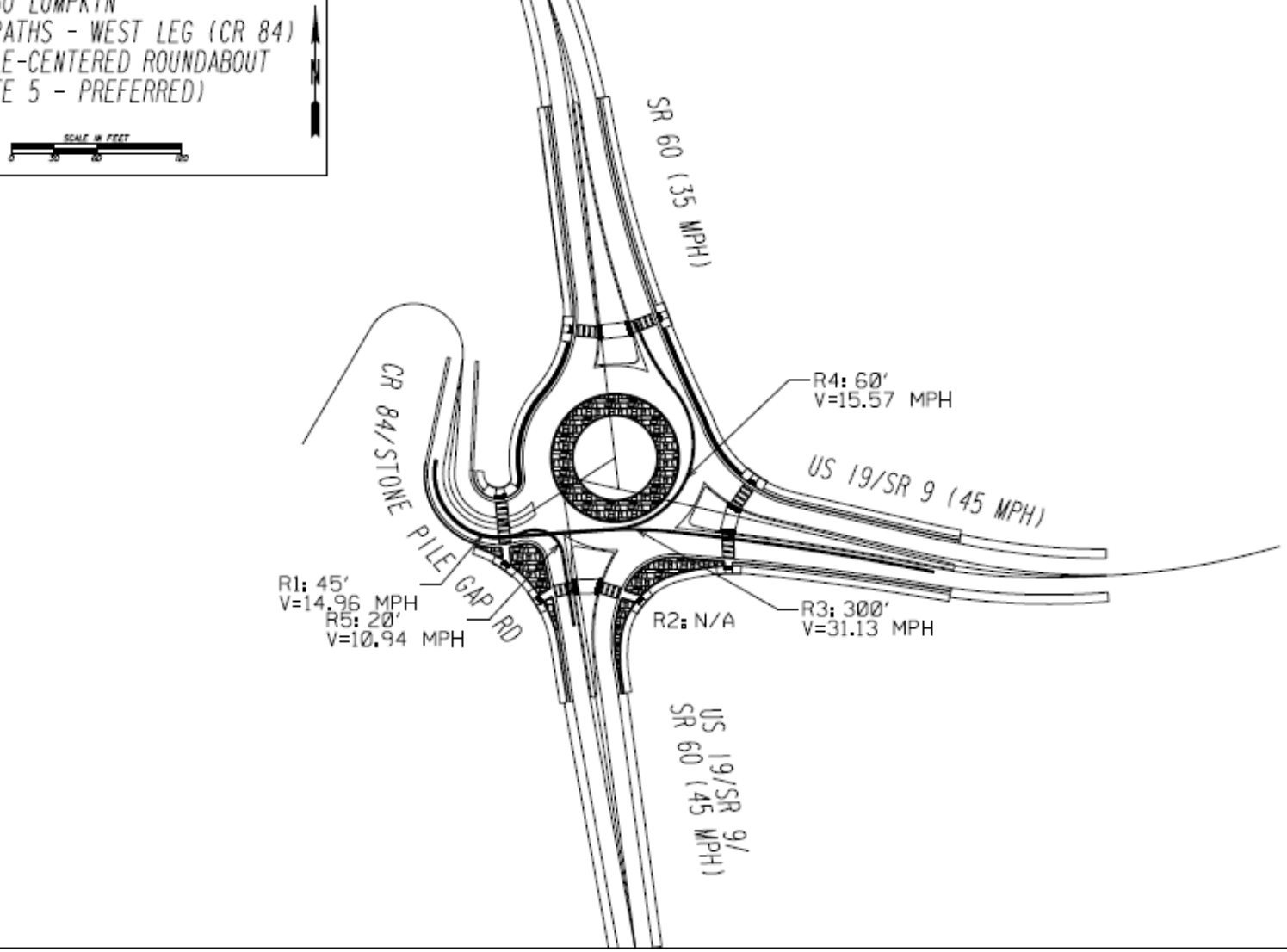
PI 0009950 LUMPKIN
FASTEST PATHS - EAST LEG (SR 9)
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



PI 0009950 LUMPKIN
FASTEST PATHS - NORTH LEG (SR 60)
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



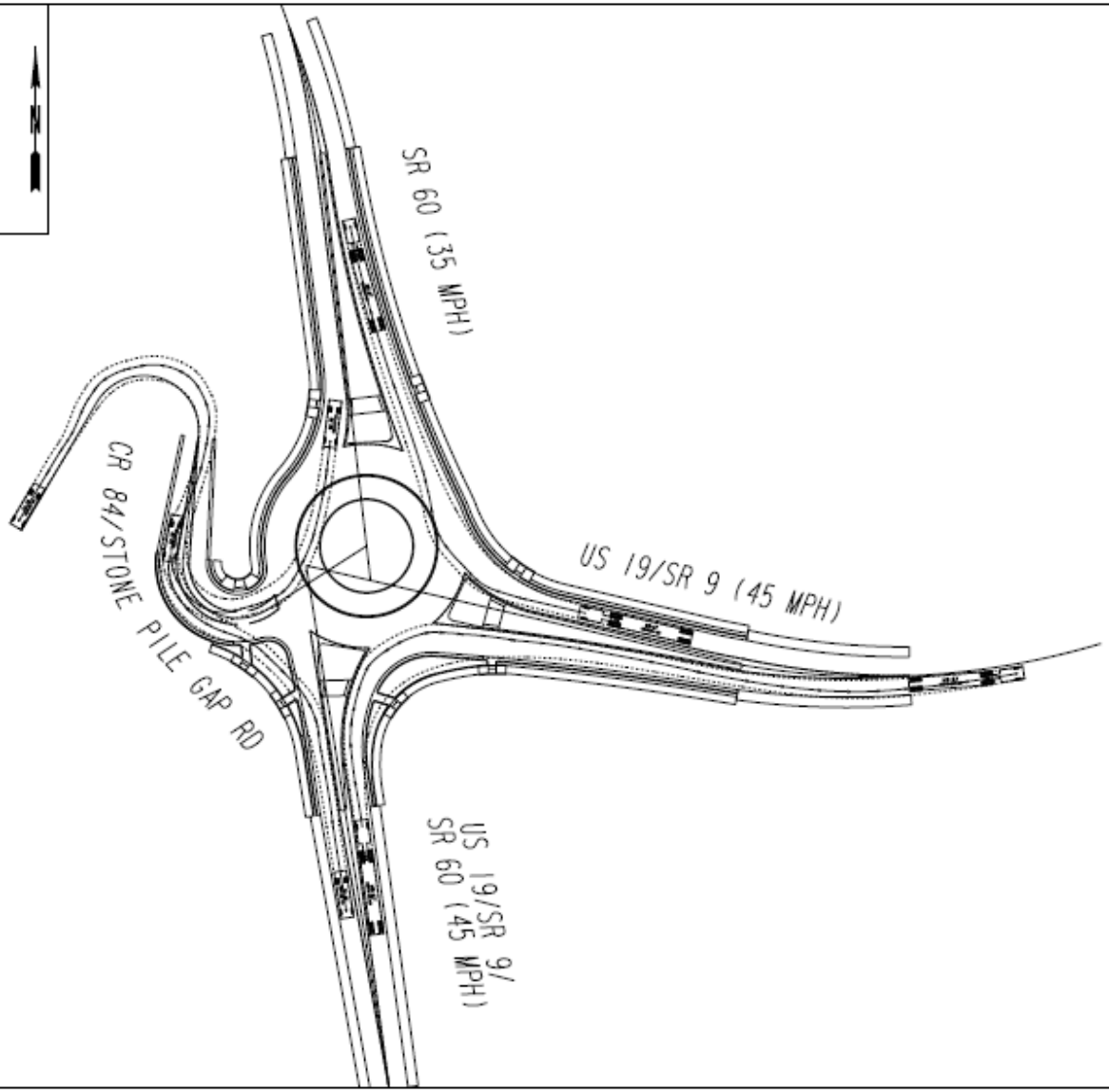
PI 0009950 LUMPKIN
FASTEST PATHS - WEST LEG (CR 84)
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



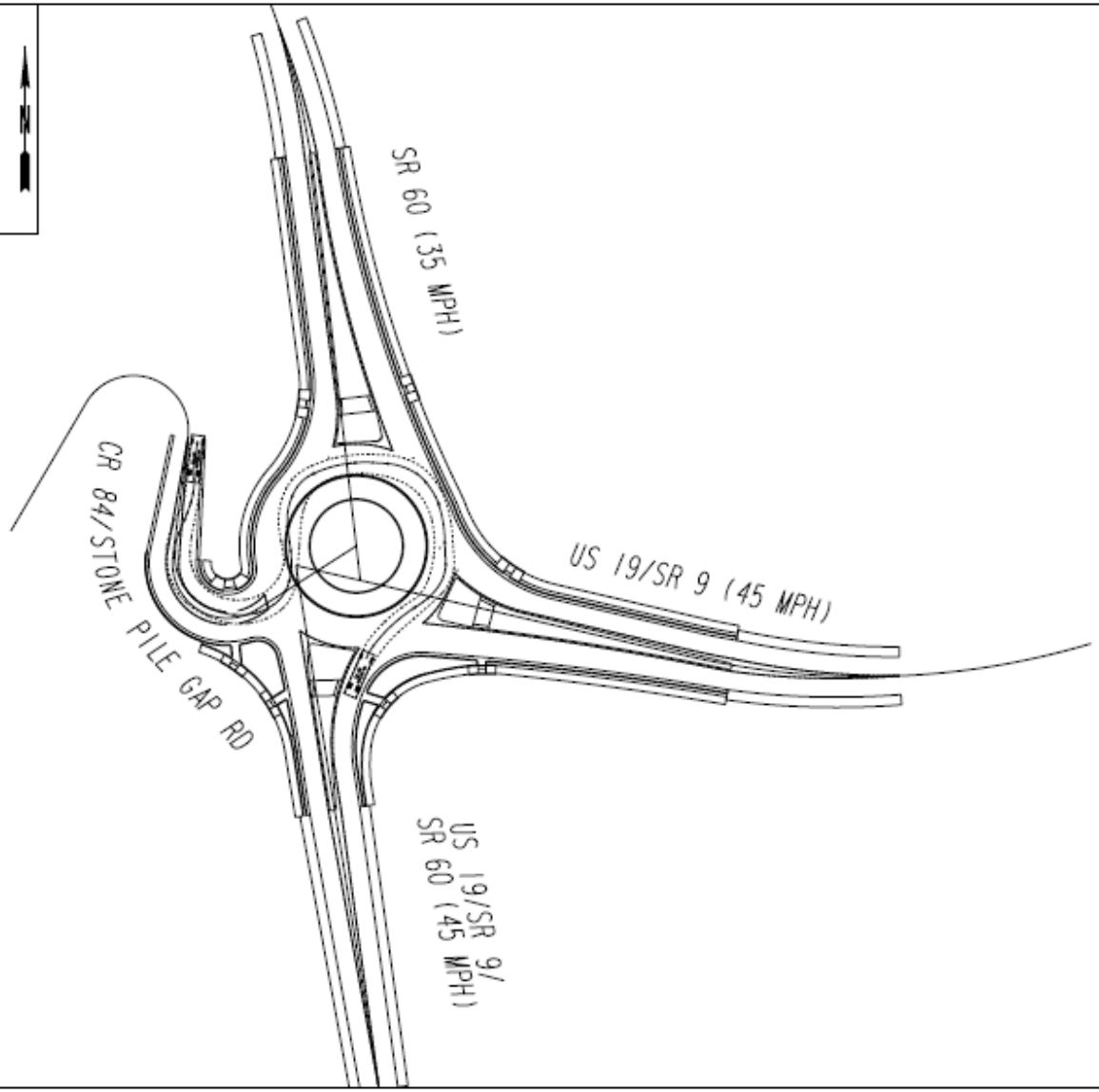
ATTACHMENT K:

DESIGN VEHICLE TURNING PATH DIAGRAMS

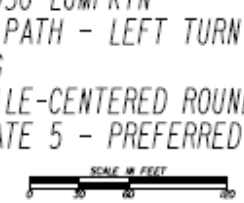
PI 0009950 LUMPKIN
TURNING PATHS - RIGHT TURNS
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)

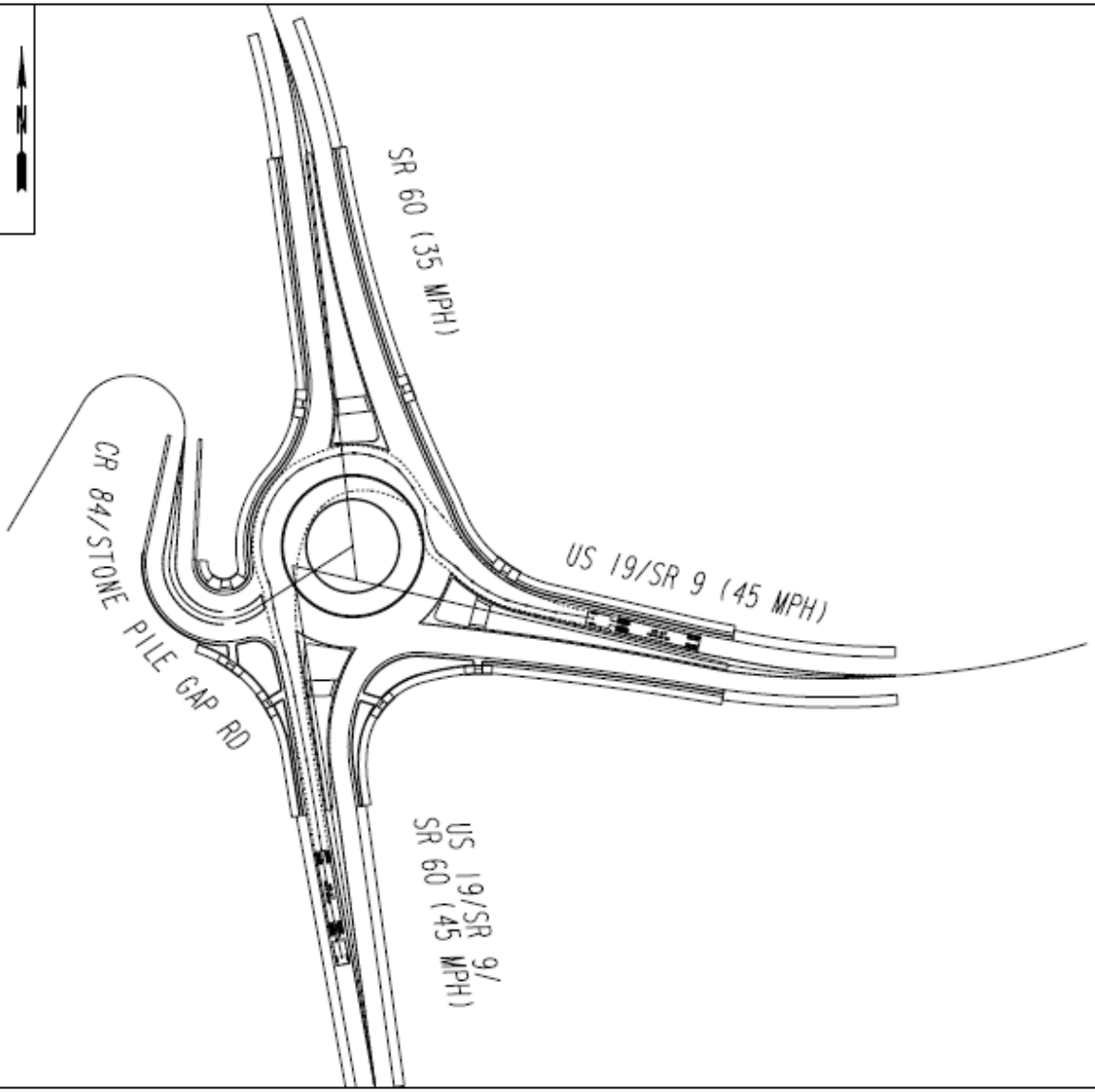


PI 0009950 LUMPKIN
TURNING PATH - LEFT TURN
SOUTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)

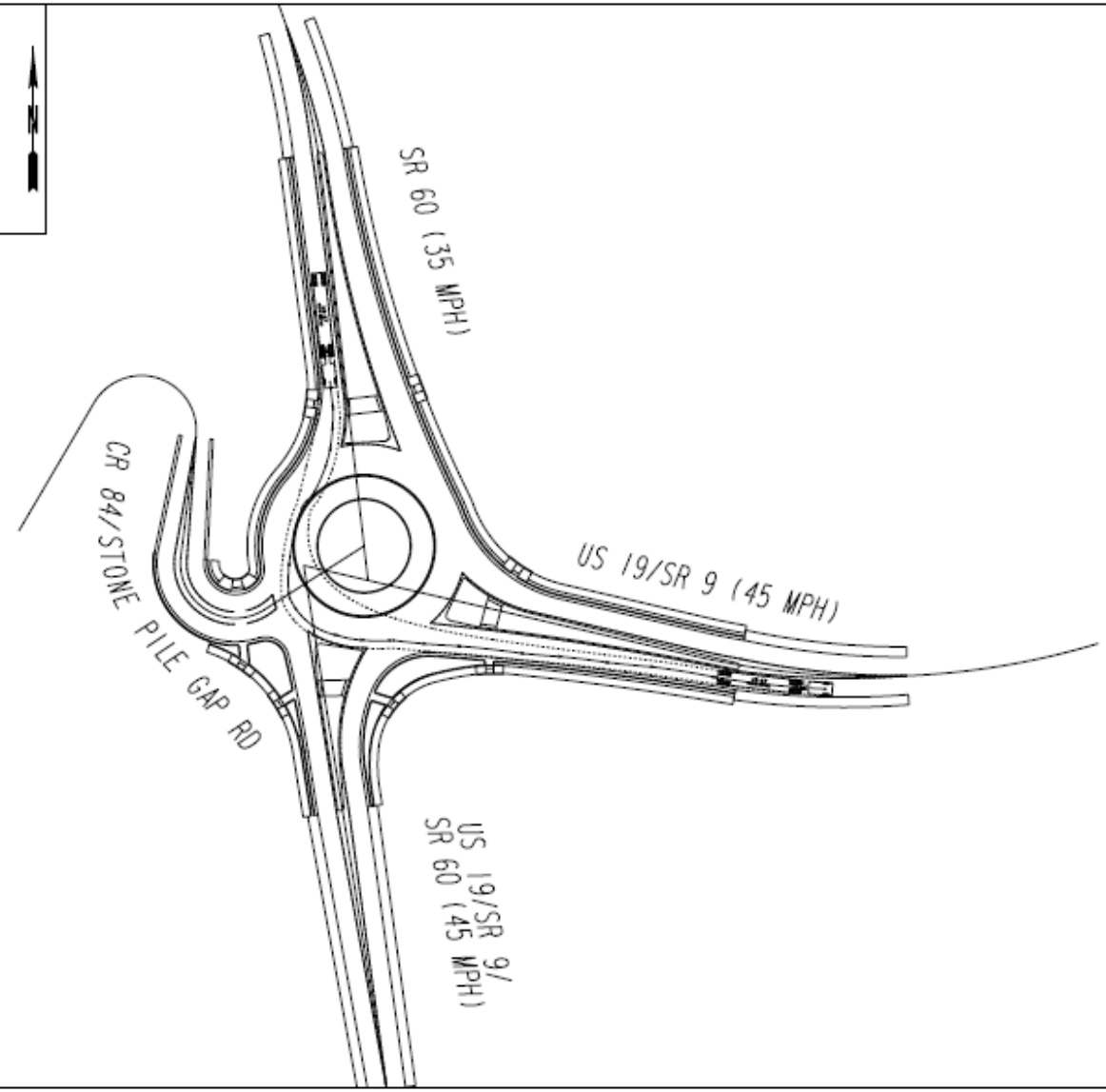


PI 0009950 LUMPKIN
TURNING PATH - LEFT TURN
EAST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)





PI 0009950 LUMPKIN
TURNING PATH - LEFT TURN
NORTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



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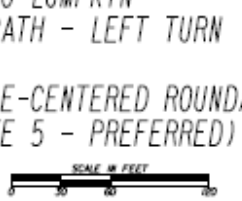
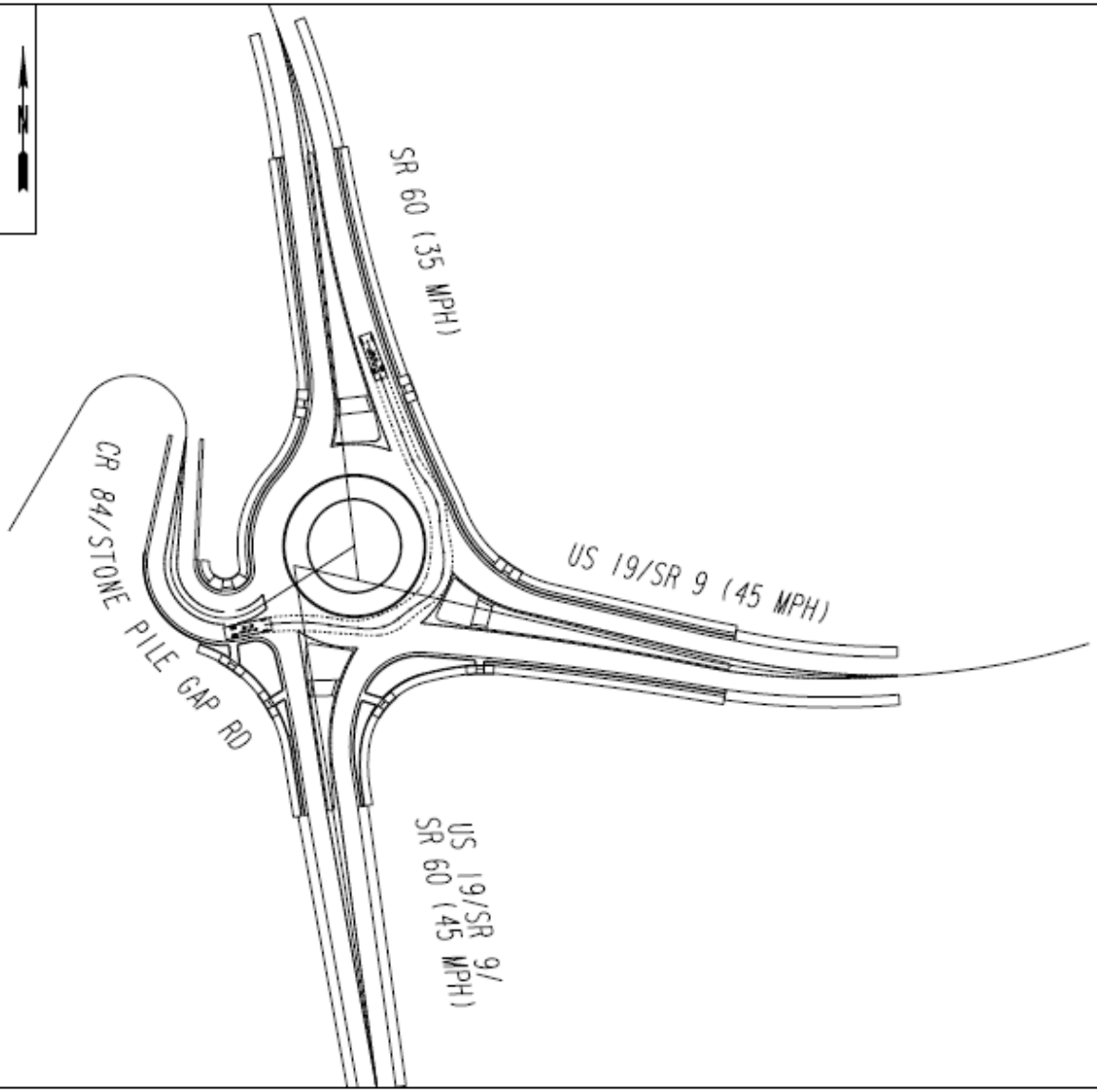
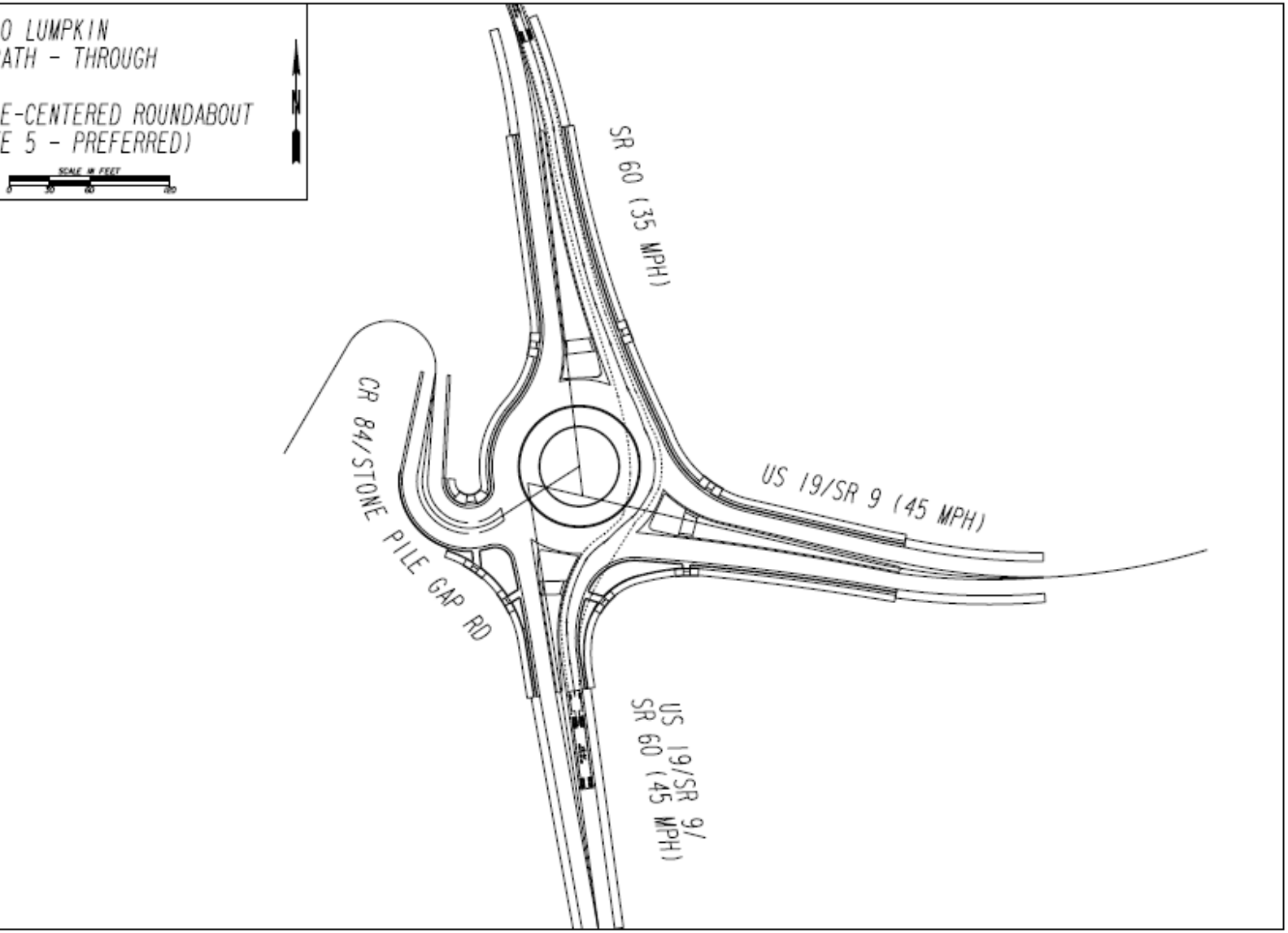
TURNING PATH - LEFT TURN
WEST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)





PI 0009950 LUMPKIN
TURNING PATH - THROUGH
SOUTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



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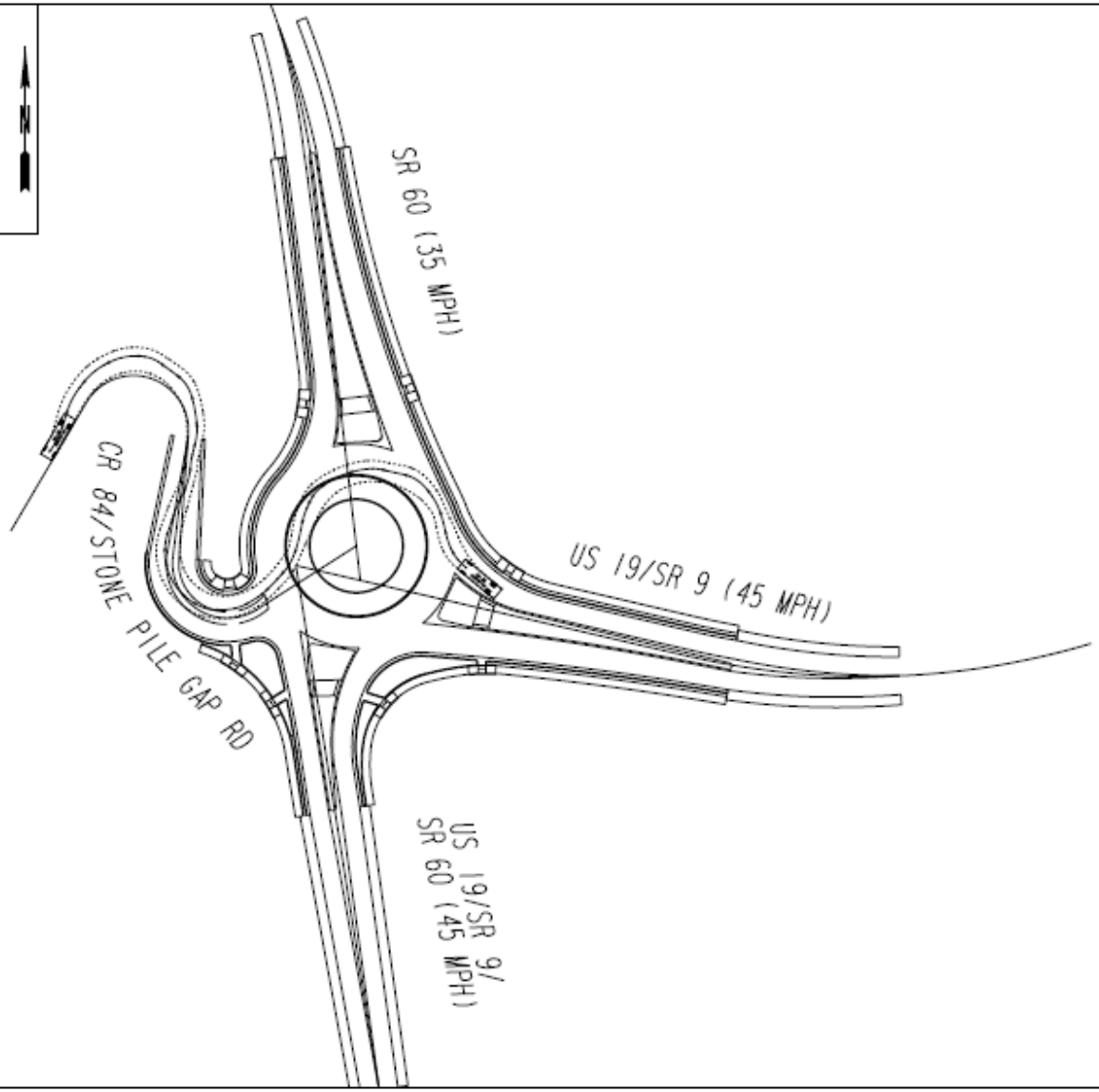
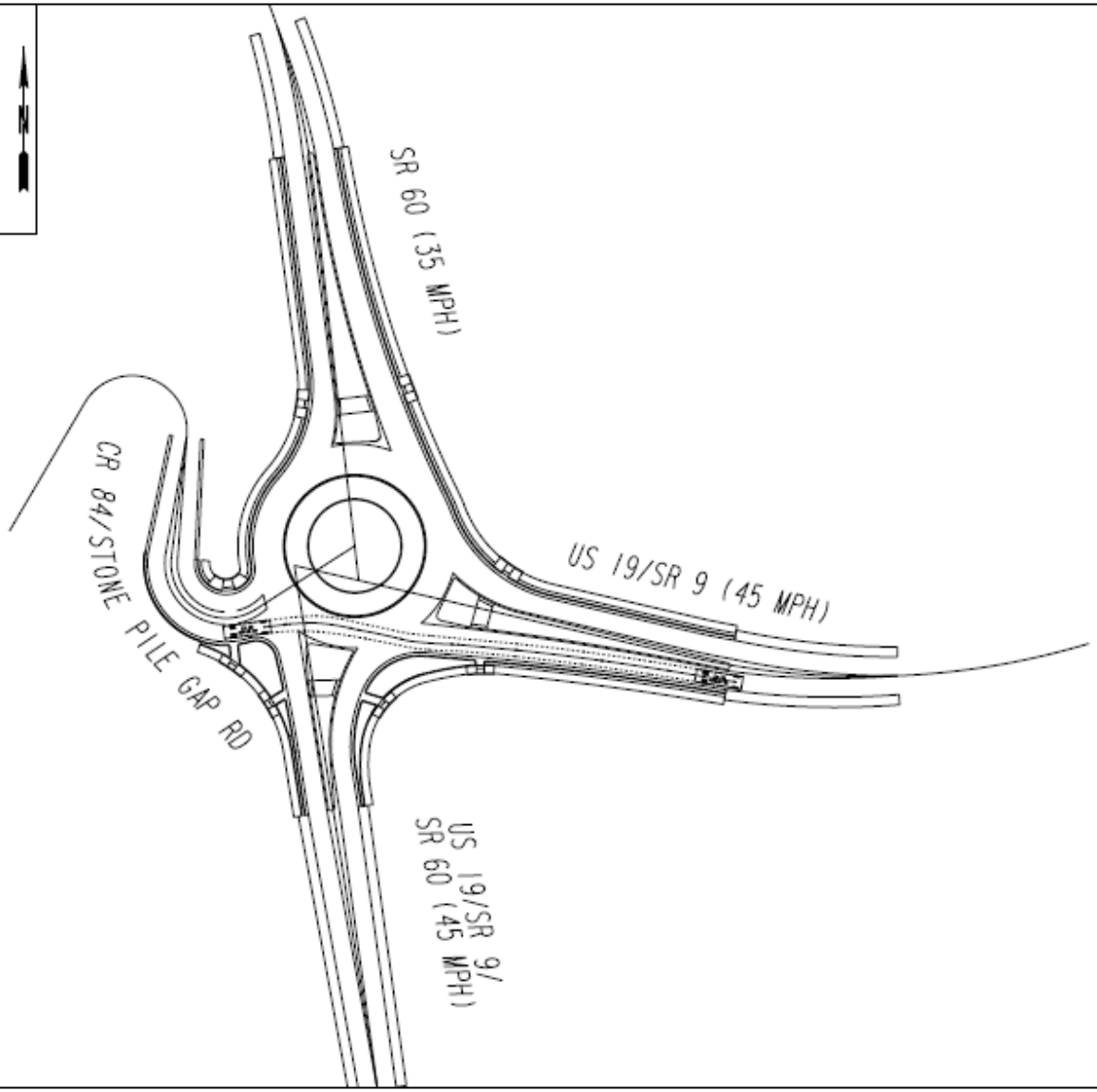
TURNING PATH - THROUGH
EAST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)

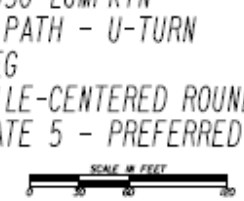


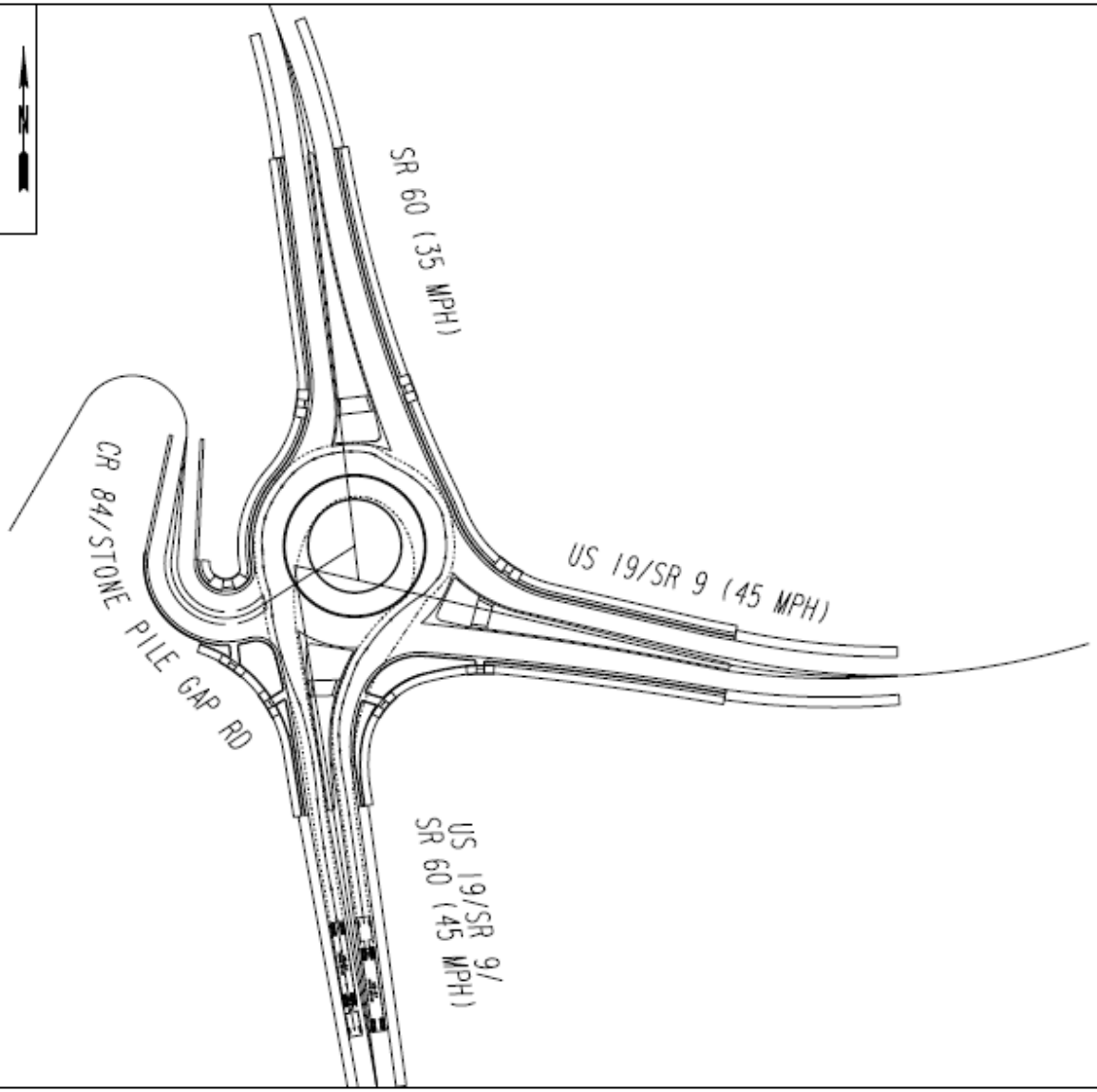
PI 0009950 LUMPKIN
TURNING PATH - THROUGH
NORTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)

PI 0009950 LUMPKIN
TURNING PATH - THROUGH
WEST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)

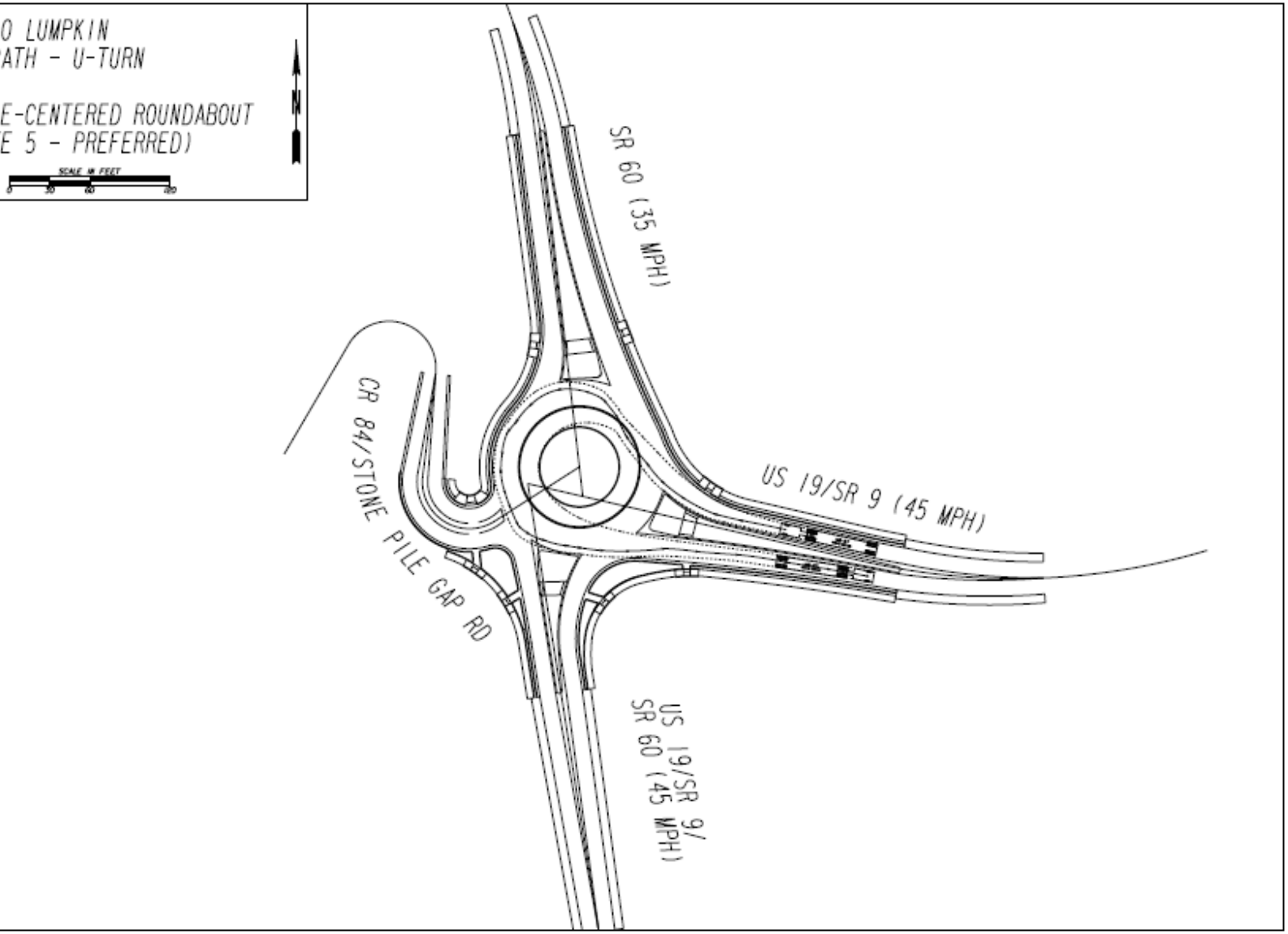


PI 0009950 LUMPKIN
TURNING PATH - U-TURN
SOUTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)

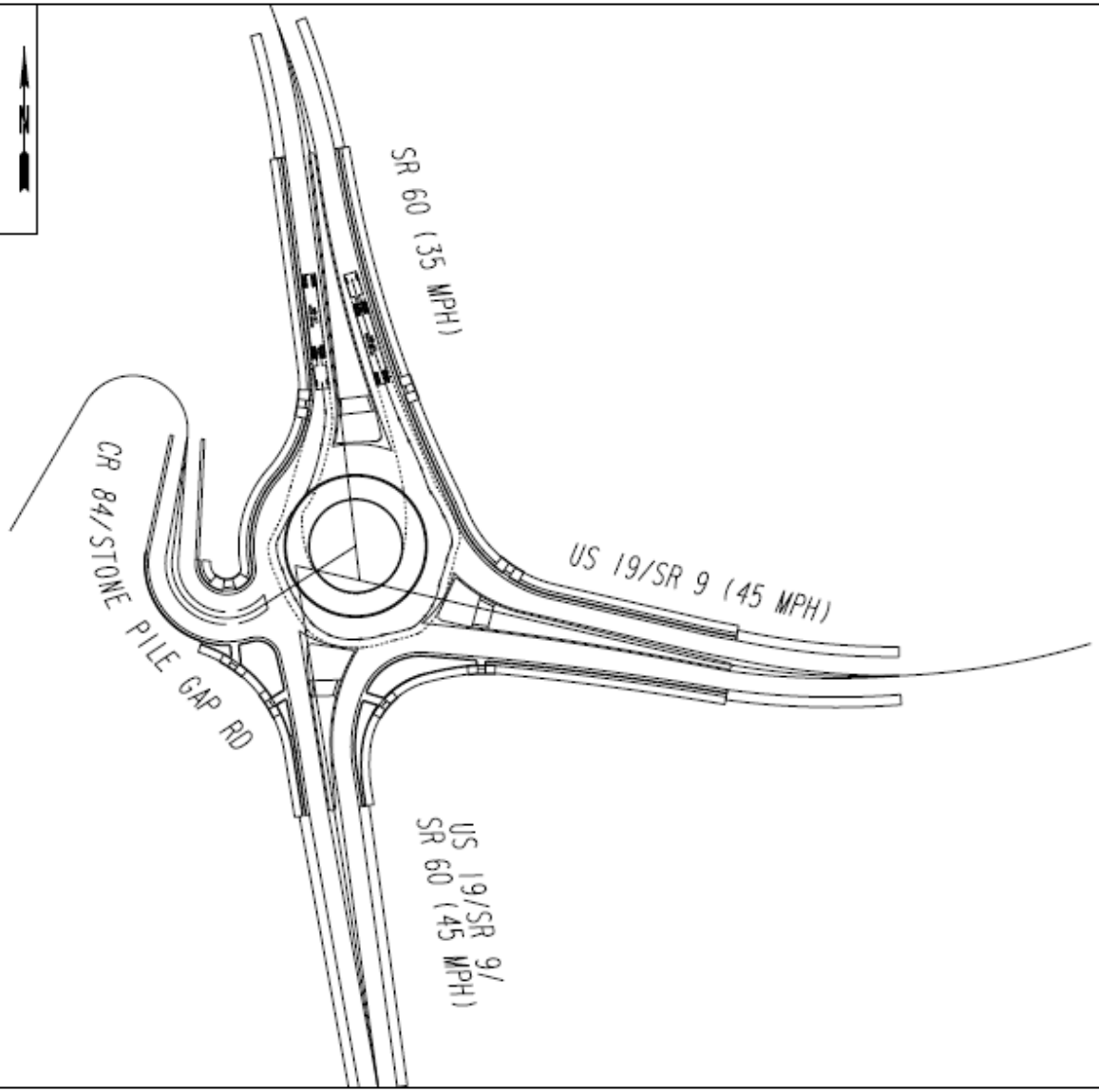




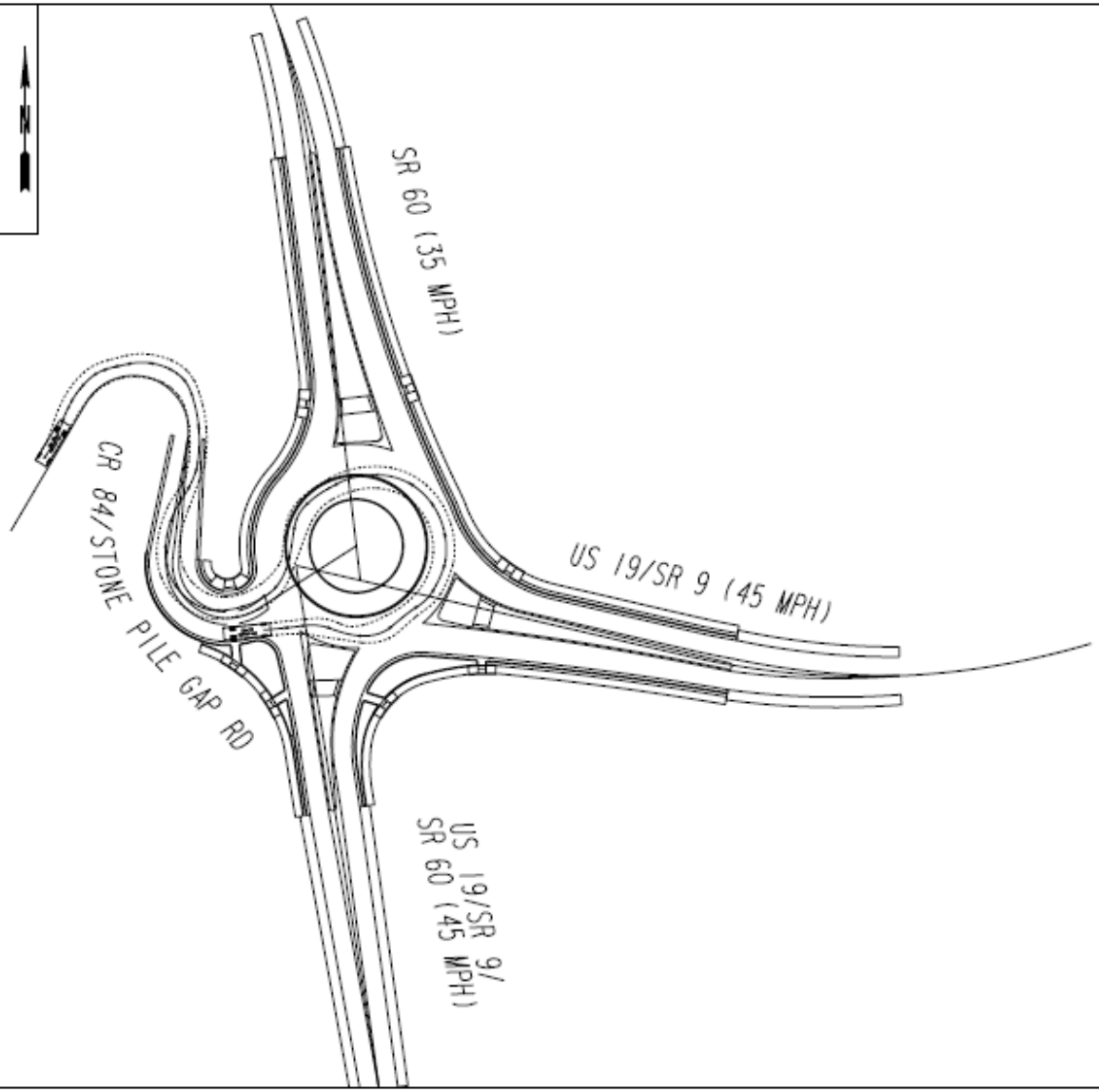
PI 0009950 LUMPKIN
TURNING PATH - U-TURN
EAST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



PI 0009950 LUMPKIN
TURNING PATH - U-TURN
NORTH LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



PI 0009950 LUMPKIN
TURNING PATH - U-TURN
WEST LEG
STONE PILE-CENTERED ROUNDABOUT
(ALTERNATE 5 - PREFERRED)



ATTACHMENT L:

LIGHTING AGREEMENT LETTER

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

Lumpkin County supports the consideration of a roundabout at the location specified below.

Local Street Names: _____ at _____

State/County Route Numbers: SR 9/US 19 at SR 60

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 22nd day of March, 20 11

Attest: Kathleen C Walker
Clerk

By: John Tolar

Title: Chairman

ATTACHMENT M:

PEER REVIEW & RESPONSES

March 11, 2015

Ms. Dylan Curtis
Georgia Department of Transportation
Office of Program Delivery
One Georgia Center
600 West Peachtree Street
Atlanta GA 30316

Dear Dylan:

Project PI #: 0009950, Lumpkin County

TPRO Description: SR 9 @ SR 60 "Stone Pile"

GHD Design Mentoring Review for McGee Partners, (Contract TOOPDES110125)

Under contract to McGee Partners, GHD Inc. provided incremental review and oversight of the roundabout design components of the above-captioned intersection conceptual design. This effort provided guidance to the GDOT design team, quality assurance and quality control reviews, pursuant to the GDOT task order.

Our review effort included overseeing development of a functional conceptual design. Through a series of phone consultation meetings we ensured that the design that we were reviewing would be functional for the site traffic and local constraints.

The undersigned is informally prequalified to perform roundabout design and reviews for GDOT. We are satisfied that the conceptual roundabout design is now 100% complete and based on the known site constraints requires no further adjustment to its horizontal geometry.

Under separate correspondence, the final horizontal design that we approve of was forwarded to Teressa Wolcott. This design should be advanced to the PFPR stage of the project development process. If changes to the horizontal geometry are required, we request a review of those changes to ensure that the operational outcomes intended by this current geometry are not compromised.

Sincerely,
GHD Inc.

Mark Lenters, P.E.

Principal

Cc: Tommy Crochet, McGee Partners

GHD Inc.
5325 Wall Street Suite 2305 Madison WI 53718 USA
T 1 608 249 4545 **F** 1 608 249 4402 **E** madison@ghd.com **W** www.ghd.com

ATTACHMENT 8:

MINOR PROJECT PAVEMENT DESIGN SELECTION

MINOR PROJECT PAVEMENT DESIGN

Project #: N/A
PI #: 0009950
County: Lumpkin

Criteria for Use of Minor Project Guidelines (Answer must be "Yes" to all questions)

1)	Non-interstate roadway requiring 20-year design life?	**Yes**
2)	Average Two-Way ADT ≤ 10,000 vehicles per day?	**Yes**
3)	24-hour truck percentage ≤ 10 %?	**Yes**
4)	Permitted pavement work within GDOT-owned ROW?	**Yes**

Calculation of Total Daily Loadings (or Daily ESALs)

1)	Initial Two-way ADT	1800
2)	Final Two-way ADT	2650
3)	24 -Hr Truck %	6.5%
4)	Directional Distribution %	50%
5)	LDF (Default)	1.0
6)	ESAL Factor (Default)	1.17

TDL = (Average One-Way ADT) * (LDF) * (24-Hr Trucks) * (18-Kip ESAL Factor)

TDL = 1112.5 * 1 * 0.065 * 1.17 = 84.60563 ≈ **85 VPD**

Pavement Design

1)	Soil Support Value	2.5	Obtained from "Georgia Map Showing Regional Factors (RF), Typical Soil Support Values (SSV) and 'k'-Values"
2)	Regional Factor	2.2	

MPG Section Code = A-12

Total Asphaltic Concrete Thickness……	**6.25**	**in**
9.5 mm SP, Type II…….……..…..	**1.25**	**in**
19 mm SP……	**2**	**in**
25 mm SP……..	**3**	**in**
GAB……	**12**	**in**
Total Subgrade Depth……	**18.25**	**in**

ATTACHMENT 9:

HIGHWAY SAFETY MANUAL
CRASH REDUCTION FACTOR CALCULATION

CRASH REDUCTION FACTORS
PI 0009950 Lumpkin

Obtained from Highway Safety Manual, Volume 3, Chapter 14

Treatment	Setting (Intersection Type)	Traffic Volume	Crash Type (Severity)	CMF	Std. Error
Convert intersection with minor-road stop control to modern roundabout	Rural (One lane)	Unspecified	All types (All Severities)	0.29	0.04
			All types (Injury)	0.13	0.04
Convert minor-road stop control to all-way stop control	Rural (MUTCD warrants are met)	**WARRANTS NOT MET**			

The **Crash Reduction Factors (CRFs)** for converting an intersection with minor-road stop control to a modern roundabout are:

Base Condition (stop-controlled intersection) Crash Modification Factor (CMF) = 1.00

All Severity Crash Types: Base CMF – Treatment CMF = 1.00 – 0.29 ±0.04 = **0.71 ±0.04**

All Severity Crash Types with Injury: Base CMF – Treatment CMF = 1.00 – 0.13 ±0.04 = **0.87 ±0.04**

ATTACHMENT 10:

MINUTES OF CONCEPT MEETINGS

MEETING MINUTES – Concept Team Meeting
PI 0009950, Lumpkin County
SR 9 @ SR 60

Meeting Date: 13 November 2013

Location: District 1 Office located at 2505 Athens Highway SE Gainesville, GA 30507

Attendees: *See the Attached Sign-In Sheet*

SUBJECT:

The purpose of the Concept Team meeting was to discuss the project schedule, need and purpose, proposed design criteria, potential right-of-way, environmental and utility impacts, review alternatives, and to discuss the public involvement. Derrick Cameron opened the meeting at 10:00 AM and began with the attendees introducing themselves. The meeting was turned over to Teressa Walcott to discuss the Concept Report. The following summarizes the meeting:

Project Identification:

Teressa Walcott gave an overview of the project which is to construct a roundabout at the intersection of US 19/SR 9 @ SR 60 in Lumpkin County. She also discussed the alternative design and the potential impacts.

The team discussed the following:

1. It was determined the existing utilities will need to moved, but this does not pose an issue or risk as the design moves forward.
2. District Traffic Operations expressed concerns regarding sight distance of the proposed relocated location of Stone Pile Gap Road.
3. Engineering Services recommended 10' sidewalks due to allow for bike usage.
4. Seeing the project is located in the mountains, it was discussed to reduce the footprint where feasible.
5. The team discussed and determined this project is not within the National Forest.
6. Public involvement should be implemented as soon as possible.
7. Bicyclists should be considered stakeholders for environmental purposes.

Environmental Issues/Concerns:

There is a Georgia Historical Commission marker placed at this site, therefore, this site is deemed to be historically significant and may possibly be deemed an archaeological site. The center of the roundabout will encircle an existing historical feature, a large stone pile that is purportedly a grave site for a fabled Native American maiden, Trahlyta. Negotiations and coordination with the several Native American Tribes can prove to be time consuming and potentially affect the proposed design layout.

The meeting was then concluded.

The meeting notes were compiled by Derrick Cameron

PI. 0009950 Lumpkin
Concept Meeting
Sign-in sheet

Name	Office/Org.	E-mail	Phone
Teressa Walcott	GDOT-D1 Design	twalcott@dot.ga.gov	770-531-5688
TED Amond	Amicalola Elect. Membership	TEDA@Amicalolaemc.com	770-893 8367
RAY Roberts	AMICALOLA EMC	ray r@amicalolaemc.com	770.893 8465
Derrick Cameron	Program Delivery	DCAMERON@DOT.GA.GOV	4046312
Aaron Caldwell	Gresham, Smith + Partners	aaron_caldwell@gspnet.com	678-518-388
Douglas Torres	GDOT-Engineering Services	dtorres@dot.ga.gov	404-895-476
Joel Cantoran	GDOT Engineering Services	jcantoran@dot.ga.gov	678 209 960
Nick Mullar	D1 Design	—	—
Samantha Henry	GDOT-ECB	sahenry@dot.ga.gov	404-859-7468
Rhonda Brady	GDOT-T. Ops		~~770 333 948~~
Lynn Pietak	EPET	lpietak@edwards-pitman.com	
Justin Lott	District 1 Design	jlott@dot.ga.gov	770-718-50
TONY PRITCHETT	AMEC DIST. UTILITIES	APRITCHETT@DOT.GA.GOV	770-532-551
LARRY ROBINSON	WINDSTREAM COMM	larry.robinson@WINDSTREAM.COM	706-867-3300
Siska Williams	GDOT Environmental	siwilliams@dot.ga.gov	404-631 1085
Sean Diehl	GDOT OES	sdiehl@dot.ga.gov	404-631-1197
CAROL COCHRAN	GDOT CONSTRUCTION	CCOCHRAN@DOT.GA.GOV	

ATTACHMENT 11:

PIOH SUMMARY

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE: P. I. No. 0009950

OFFICE: Environmental Services
DATE: March 19, 2014

FROM: Glenn Bowman, P.E., State Environmental Administrator
TO: Distribution Below

SUBJECT: Project 0009950, Lumpkin County, Summary of Comments Received During the Public Comment Period - SR 9 at SR 60

COMMENT TOTALS:

A total of 19 people attended the public information open house held for the subject project on March 4, 2014.

From those attending, 4 comment forms, 1 letter and 4 verbal statements were received. An additional 2 comments were received during the ten-day comment period following the public information open house, for a total of 11 comments. They are summarized as follows:

No. Opposed	No. In Support	Uncommitted	Conditional
1	8	1	1

MAJOR CONCERNS:

Roundabouts confuse people.
Preserving the stone pile.

OFFICIALS:

Officials attending included the following:
Charles Trammel - Lumpkin County Planning Department
Larry Reiter - Lumpkin County Planning Department

MEDIA:

None

DISPOSITION OF COMMENTS:

Gresham, Smith and Partners will respond to all comments on behalf of the Department of Transportation.

The GDOT offices below are asked to review the responses provided by the consultant for the comments in their section. The project manager will review all responses.

REVIEWING OFFICE	COMMENT #	NATURE OF COMMENT	PROPOSED RESPONSE
Design	2, 10	Request rumble strips be added to the intersection approaches.	Rumble strips will be added in the near future, when resources become available.
	3, 10	Support project. Concern for bicycle riders parking along roadway.	Parking will be restricted along the approaches to the proposed roundabout.
	5,	Concerned that the public will find roundabouts “strange”.	Several roundabouts are now in place in North Georgia. Signage will assist drivers navigating through the roundabout.

REVIEWING OFFICE	COMMENT #	NATURE OF COMMENT	PROPOSED RESPONSE
Right-of-Way			Land acquisition for transportation purposes is strictly governed by numerous state and federal laws and regulations. Since it is not appropriate to discuss individual impacts and compensation in this format, the GDOT Right-of-Way Office will send out letters under separate cover to those property owners who would be affected by land acquisition for the proposed project. For additional information, please contact at .

REVIEWING OFFICE	COMMENT #	NATURE OF COMMENT	PROPOSED RESPONSE
Traffic Operations			

REVIEWING OFFICE	COMMENT #	NATURE OF COMMENT	PROPOSED RESPONSE
Planning	6	Make improvements to the intersection at SR 60/SR 9/US 19 and Morrison Moore Parkway.	Thank you for your comment. Improvements to the intersection at SR 60/SR 9/US 19 and Morrison Moore Parkway are outside of the scope of this project.

REVIEWING OFFICE	COMMENT #	NATURE OF COMMENT	PROPOSED RESPONSE
Environment	5	Concerned that GDOT will not respect the stone pile.	The Department is coordinating with tribal governments concerning the stone pile and has no plans to remove or disturb it.

Attached is a complete transcript of the comments received during the comment period and a copy of the public information open house handout for review. **Your input on the proposed responses is required by** March 24, 2014. Please direct your comments via email to Aaron Caldwell (aaron_caldwell@gspnet.com) and copy Sean Diehl (sdiehl@dot.ga.gov), of this office.

If you have any questions about the comments, please either email or call Sean Diehl at (404) 631-1197.

GB/SD/ac

Attachments

DISTRIBUTION:
Ben Buchan, w/attachments
Russell R. McMurry, w/attachments
Derrick Cameron, w/attachments
District 1 Attn: Bayne Smith, w/attachments
Angela T. Alexander, w/attachments
Kathy Zahul, P.E., w/attachments
Howard (Phil) Copeland (Attn: Troy Byers), w/attachments