

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

---

**OFFICE OF DESIGN POLICY & SUPPORT  
INTERDEPARTMENTAL CORRESPONDENCE**

**FILE** P.I. # 0008375 **OFFICE** Design Policy & Support  
CSSFT-0008-00(375)  
Douglas County  
GDOT District 7 - Metro Atlanta **DATE** September 13, 2012  
SR 8/US 78 @ CR 268 Intersection Impr.

**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:**

Bobby Hilliard, Program Control Administrator  
Genetha Rice-Singleton, State Program Delivery Engineer  
Glenn Bowman, State Environmental Administrator  
Cindy VanDyke, State Transportation Planning Administrator  
Kathy Zahul, State Traffic Engineer  
Angela Robinson, Financial Management Administrator  
Lisa Myers, State Project Review Engineer  
Charles "Chuck" Hasty, State Materials Engineer  
Jeff Baker, State Utilities Engineer  
Ken Thompson, Statewide Location Bureau Chief  
Rachel Brown, District Engineer  
Scott Lee, District Preconstruction Engineer  
Jonathan Walker, District Utilities Engineer  
Perry Black, Project Manager  
BOARD MEMBER - 3rd Congressional District

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA

Office of Program Delivery

PROJECT CONCEPT REPORT

Project Number: CSSFT-0008-00(375)

County: Douglas

P. I. Number: 0008375

Federal Route Number: 78

State Route Number: 8

SR 8/US 78 at Mann Road/Mason Creek Road and  
at Post Road Intersection Improvements

Submitted for approval:

DATE 12/22/2011

Eric J. Rickert 12/22/2011  
Eric J. Rickert, Gresham, Smith & Partners

DATE 1/3/2012

Bobby Hubbard  
Office Head (Program Delivery)

DATE 1/3/2012

Perry Black 1/3/2012  
Project Manager

Recommendation for approval:

DATE \_\_\_\_\_

\_\_\_\_\_  
Program Control Administrator

DATE 2/9/12

GLENN BOWMAN\*/EKP  
State Environmental Administrator

DATE \_\_\_\_\_

\_\_\_\_\_  
State Traffic Engineer

DATE 2/6/12

LISA MYERS\*/EKP  
Project Review Engineer

DATE 2/6/12

PATRICK ALLEN\*/EKP  
For State Utilities Engineer

DATE 2/14/12

JONATHAN WALKER\*/EKP  
District Engineer/ District Utilities Engineer

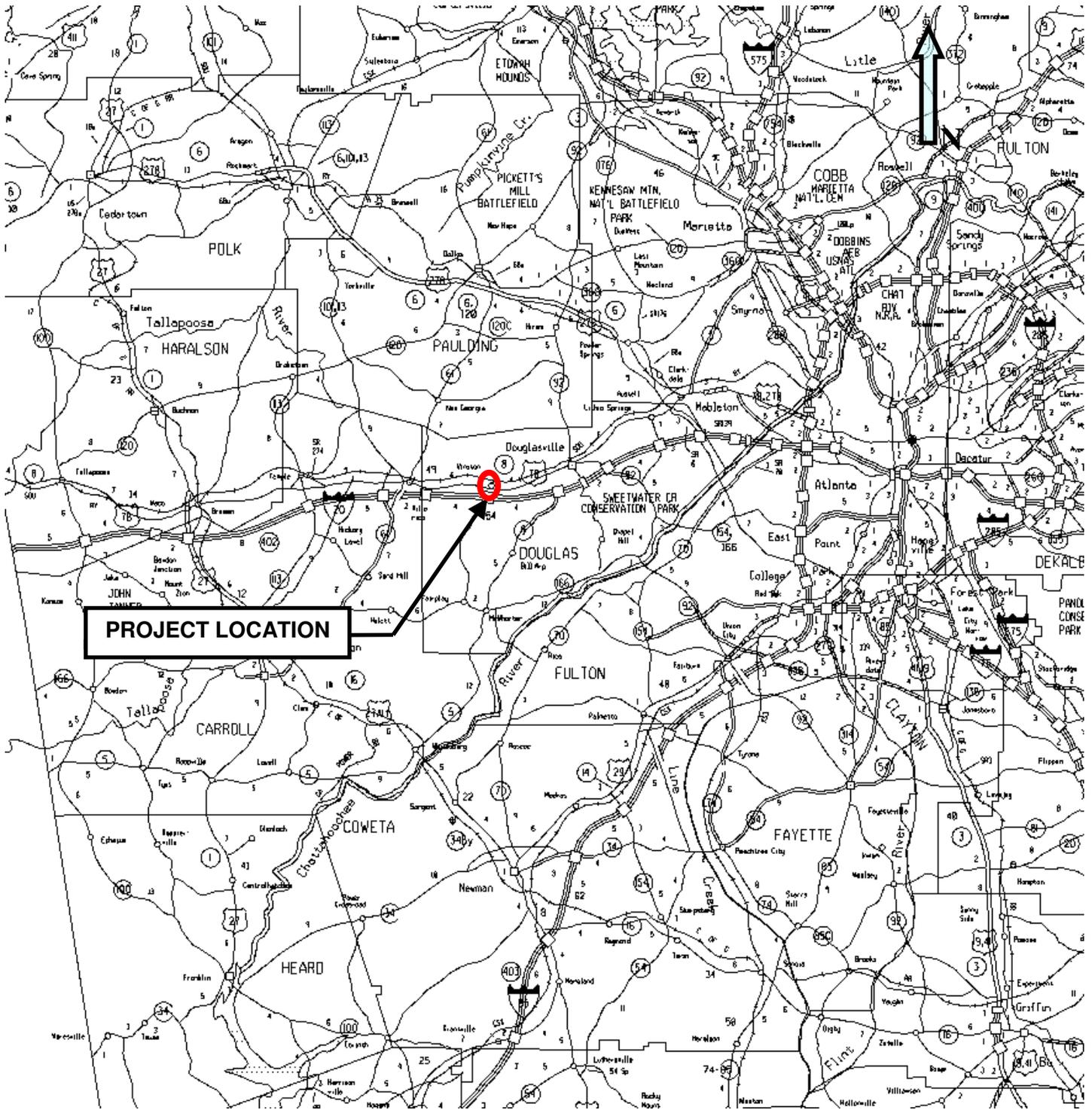
DATE \_\_\_\_\_

\_\_\_\_\_  
State Transportation Financial Management Administrator

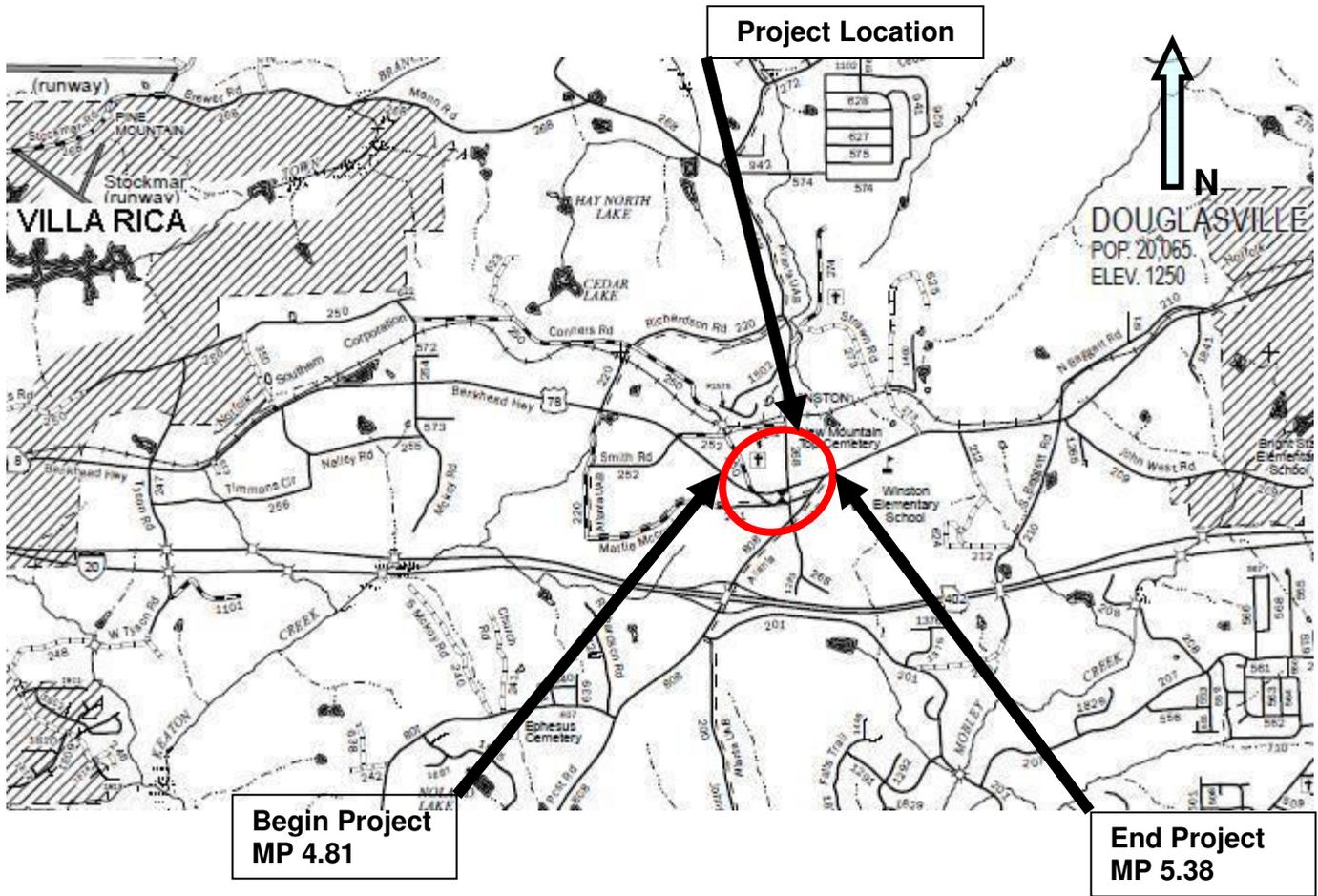
The concept as presented herein and submitted for approval is consistent with that which is included in the Regional Transportation Program (RTP) and/or the State Transportation Improvement Program (STIP).

DATE 2-8-12

Cynthia A. Vandevoort  
State Transportation Planning Administrator



*Project Overview Map*



*Project Location Map*

### **Need and Purpose:**

The roadways of Bankhead Highway (US 78/SR 8), Mann Road, Post Road, Mason Creek Road, and Conners Road converge in close proximity to each other within the Winston community in Douglas County. These intersecting roadways result in the existing and anticipated traffic and operational issues as follows:

- The Bankhead Highway (US 78/SR 8) intersection with Mann Road and Mason Creek Road has had 91 crashes over the last six years with 89% of these being angle crashes. The intersection currently operates at a level of service C/C for the AM/PM peak hours, and the 2035 future no-build anticipated level of service is F/F for the AM/PM peak hours.
- The Bankhead Highway (US 78/SR 8) intersection with Conners Road has had 32 crashes over the last six years with 53% of these being rear end crashes and 28% as angle crashes.
- The Bankhead Highway (US 78/SR 8) intersection with Post Road has had 20 crashes over the last six years with 70% of these being rear end crashes and 15% as angle crashes.
- The intersection of Mason Creek Road and Post Road has had 12 crashes over the last six years with 58% of these being angle crashes. The intersection currently operates at a level of service C/C for the AM/PM peak hours, and the 2035 future no-build anticipated level of service is F/F for the AM/PM peak hours.

The need exists to improve the above intersections to address the rear end and angle crashes and to improve the level of service at the intersection of Bankhead Highway with Mann Road and Mason Creek Road and the intersection of Mason Creek Road and Post Road.

The purpose of the proposed project is to reduce the crash frequency and severity at the above intersections and improve the operation of the intersections. A more detailed Need and Purpose that is supported by historical crash data, level of service (LOS) analyses, and traffic volumes is included as an attachment.

### **Description of the proposed project:**

The project begins on Bankhead Highway (US78/ SR 8) just west of the intersection with Conners Road at MP 4.81 and ends just east of the present Post Road intersection at MP 5.38 for a total project length of 0.57 miles. The entire project is located within Douglas County and the unincorporated community of Winston. The project is also 3.5 miles east of the City of Villa Rica and 2.5 miles west of the City of Douglasville. The project limits on Post Road begin approximately 430 ft south of the intersection with Mason Creek Road. The project limits on Mann Road begin at the intersection with Bankhead Highway and ends 700 ft to the north.

The project proposes improving the intersecting roadway network of Bankhead Highway (US 78/ SR8), Post Road, Mann Road, Conners Road, Mattie McCoy Lane, and Mason Creek Road within the unincorporated Winston community. This will entail intersection improvements as well as consolidating traffic movements into a single through east-west route and north-south route to simplify driving movements and eliminate conflict points.

- Bankhead Highway (US 78/SR 8) will be improved with left and right turn lanes in the westbound and eastbound directions at a proposed signalized intersection with Mann Road and Mason Creek Road. A westbound right turn lane will also be added at a new tee-intersection with the northern portion of Conners Road. The vertical geometry of Bankhead Highway will be upgraded throughout the project to comply with current AASHTO stopping sight distance guidance.
- Mann Road will be improved with a southbound left turn lane at the intersection with Bankhead Highway. Its vertical geometry will also be upgraded throughout the project to comply with current AASHTO stopping sight distance guidance.

- The southern portion of Post Road would be reconfigured to tie directly into the northern portion of Mason Creek Road to convey the majority of traffic movements. The southern portion of Mason Creek Road would be realigned to intersect perpendicularly with this new connection and the portion of Post Road north of this location will be stubbed with a cul-de-sac and accessed from the southern portion of Post Road. The existing intersection of the northern portion of Post Road with Bankhead Highway will be altered to have a 70 degree intersection skew and to have right in/right out access only.
- The northern portion of Mason Creek Road will be improved with northbound right and left turn lanes at the intersection with Bankhead Highway. A two-way left turn lane is also proposed on Mason Creek Road from south of Bankhead Highway to the intersection of the southern portions of Mason Creek Road and Post Road. Urban border areas will also be added to both sides of the roadway to improve pedestrian connectivity. Finally, the vertical geometry of Mason Creek Road will be upgraded to comply with current AASHTO stopping sight distance guidance.
- Conners Road presently crosses Bankhead Highway at a sub-standard intersection skew prior to traversing south to intersect with Mattie McCoy Lane, Mann Road, and Post Road. The northern portion of Conners Road would be realigned from its present alignment to terminate into Bankhead Highway at a perpendicular angle. The southern portion between Bankhead Highway and Mattie McCoy Lane would be eliminated and the remaining southern portion of Conners Road would be reconfigured to tie directly into Mattie McCoy Lane.

**Is the project located in a PM 2.5 Non-attainment area?**      X   Yes           No

**Is the project located in an Ozone Non-attainment area?**      X   Yes           No

*(The proposed project is exempt from conformity due to the potential reduction of crash frequency and severity. Also, the project Need and Purpose does not increase capacity to the roadway network.)*

**PDP Classification:**    Major           Minor   X  

**Federal Oversight:** Full Oversight ( ), Exempt(**X**), State Funded ( ), or Other ( )

**Functional Classification:** Bankhead Hwy (US 78/SR 8) - Urban Minor Arterial  
 Post Road and Mason Creek Rd (between Post Road and Bankhead Hwy)- Rural Major Collector  
 Mann Road, Mattie McCoy Lane, Mason Creek Road (south of Post Road) and Conners Road – Rural Local

**U. S. Route Number(s):** 78                      **State Route Number(s):** 8

**Traffic (AADT):**

Roadway Segment	2011 Existing Year ADT	2015 Base Year ADT	2035 Design Year ADT
Bankhead Highway (US 78/SR 8)	9,300	9,800	14,400
Post Road	8,150	8,600	12,800
Mann Road	4,200	4,400	6,600
Conners Road	1,350	1,450	2,150
Mason Creek Road	4,200	4,400	6,600

**Existing design features:**

• Typical Section:

Bankhead Highway (US 78/ SR 8)	Two 12 ft wide travel lanes and rural shoulders (2 ft paved).
Post Road, Mann Road, and Conners Road (north of Bankhead Hwy.)	Two 11 ft wide travel lanes and rural shoulders
Conners Road (south of Bankhead Hwy.), Mattie McCoy Lane, and Mason Creek Road	Two 10 ft wide travel lanes and rural shoulders

• Posted Speed:

Bankhead Highway (US 78/ SR 8)	45 mph
Post Road	45 mph
Mann Road, Conners Road, Mattie McCoy Lane and Mason Creek Road	35 mph

Minimum radius for curve:

Bankhead Highway (US 78/ SR 8)	1070 ft
Post Road	1350 ft
Mann Road	750 ft
Conners Road	600 ft
Mattie McCoy Lane and Mason Creek Road	N/A (tangent)

• Maximum super-elevation rate for curve:

Bankhead Highway (US 78/ SR 8)	6.4 %
Post Road	4.0 %
Mann Road	4.6 %
Conners Road	4.5 %
Mattie McCoy Lane and Mason Creek Road	N/A

• Maximum grade:

Bankhead Highway (US 78/ SR 8)	6.0%
Post Road	4.3%
Mann Road	8.6%
Conners Road	4.5%
Mattie McCoy Lane	5.9%
Mason Creek Road	4.3%
Driveways	14.0%

- Width of right of way:
 

80 ft - Bankhead Highway (SR 8/US 78) and Post Road
Varies from 40 ft to 60 ft - Conners Road
40 ft – Mann Road and Mattie McCoy Lane

- Major structures: None
- Major interchanges or intersections along the project: Intersection of Bankhead Highway (US 78/ SR 8) with Mann Road and intersection of Bankhead Highway (US 78/ SR 8) with Post Road
- The existing roadway is entirely within Douglas County. The project begins on Bankhead Highway (US 78/SR 8) at MP 4.81 and ends at MP 5.38 for a total project length of 0.57 miles
- Designated bike routes: None

**Proposed Design Features:**

- Proposed typical sections:

Bankhead Highway (SR 8/US 78)	Two 12-ft wide travel lanes, 12-ft wide left and right turn lanes at select locations, and 8-ft rural shoulders (4-ft paved)
Post Road (South of Mason Creek Road) and Mann Road	Two 12-ft wide travel lanes, 12-ft wide left and right turn lanes at select locations and 8-ft rural shoulders (4-ft paved)
Mason Creek Road (between Post Road and Bankhead Hwy/SR 8/US 78)	Two 12-ft wide travel lanes, 12-ft wide left and right turn lanes at select locations and 10-ft urban border areas with 30” curb & gutter and 5-ft sidewalk
Conners Road (north of Bankhead Hwy.)	Two 11-ft wide travel lanes and 8-ft rural shoulders (2-ft paved)
Conners Road (south of Bankhead Hwy.), Mattie McCoy Lane, and Mason Creek Road (south of Post Road)	Two 10-ft wide travel lanes and 8-ft rural shoulders (2-ft paved)

- Proposed design speed:
 

Bankhead Highway (SR 8/US 78) - Mainline	45 mph
Post Road and Mason Creek Road (between Post Road and Bankhead Hwy. ) - Side Roads	45 mph
Mann Road, and Mattie McCoy Lane - Side Roads	35 mph
Conners Road (both portions and Mason Creek Road (South of Post Road) - Side Roads	25 mph**

\*\* Proposed improvements are adjacent to stop condition

- Proposed maximum grade Bankhead Highway (Mainline): 6.0%
- Maximum grade allowable Bankhead Highway (Mainline): 7.0%

- Proposed maximum grade (Side roads):

Post Road, Mason Creek Road (between Post Road and Bankhead Hwy.) and Mann Road	4.9%
Conners Road (North of Bankhead Hwy.)	2.0%
Conners Road (South of Bankhead Hwy.), Mattie McCoy Lane, and Mason Creek Road (South of Post Road)-	6.9%

- Maximum grade allowable (Side roads):

Post Road and Mason Creek Road (between Post Road and Bankhead Hwy.)	8.0%
Conners Road (North of Bankhead Hwy.), Mattie McCoy Lane, and Mann Road- (Side Roads)	10.0%
Conners Road (South of Bankhead Hwy.) and Mason Creek Road (South of Post Road)- (Side Roads)	11.0%

- Proposed maximum grade driveway: 11.0%
- Proposed minimum radius of curve Bankhead Highway (Mainline): 1200 ft

- Proposed minimum radius of curve (Side roads):

Post Road and Mason Creek Road (between Post Road and Bankhead Hwy.)	711 ft
Mattie McCoy Lane	2000 ft
Mann Road	4100 ft
Conners Road (North of Bankhead Hwy.)	400 ft
Conners Road (South of Bankhead Hwy.) and Mason Creek Road (South of Post Road)	150 ft

- Minimum radius allowable Bankhead Highway (Mainline): 643 ft

- Minimum radius allowable (Side roads):

Post Road and Mason Creek Road (between Post Road and Bankhead Hwy.)	711 ft
Conners Road (North of Bankhead Hwy.), Mann Road, and Mattie McCoy Lane	340 ft
Conners Road (South of Bankhead Hwy.) and Mason Creek Road (South of Post Road)	144 ft

- Maximum allowable super-elevation rate (Mainline): 6.0%
- Maximum allowable super-elevation rate (Sideroads -except Post Road and Mason Creek Road between Post Road and Bankhead Hwy.): 6.0%
- Maximum allowable super-elevation rate (Sideroads -Post Road and Mason Creek Road between Post Road and Bankhead Hwy.): 4.0%
- Proposed maximum super-elevation rate Bankhead Highway (Mainline): 5.0%

- Proposed maximum super-elevation rate (Side roads):

Post Road (South of Mason Creek Rd.)	6.0%
Post Road and Mason Creek Road (between Post Road and Bankhead Hwy.)	4.0%
Conners Road (North of Bankhead Hwy.)	6.0%
Conners Road (South of Bankhead Hwy.), Mann Road, Mattie McCoy Lane, and Mason Creek Road (South of Post Road)	N/A (normal crown)

- Right-of-Way:

o Width:	Varies from 130 ft to 190 ft - Bankhead Highway (SR 8/US 78)
	Varies from 130 ft to 170 ft - Mann Road and Post Road
	Varies from 100 ft to 130 ft - Conners Road and Mattie McCoy Lane

o Easements: Temporary ( ), Permanent (X), Utility ( ), Other ( ).

o Type of access control: Full ( ), Partial ( ), By Permit (X), Other ( ).

o Number of parcels: 43 Number of displacements: 4

- Structures: None
- Major intersections, median openings and signal locations: A traffic signal is proposed at the intersection of Bankhead Highway, Mann Road, and Mason Creek Road
- Transportation Management Plan Anticipated: Yes ( ) No (X)

• Design Exceptions to controlling criteria:

	<u>UNDETERMINED</u>	<u>YES</u>	<u>NO</u>
HORIZONTAL ALIGNMENT:	( )	( )	(X)
LANE WIDTH:	( )	( )	(X)
SHOULDER WIDTH:	( )	( )	(X)
VERTICAL GRADES:	( )	( )	(X)
CROSS SLOPES:	( )	( )	(X)
STOPPING SIGHT DISTANCE:	( )	( )	(X)
SUPERELEVATION RATES:	( )	( )	(X)
VERTICAL ALIGNMENT:	( )	( )	(X)
SPEED DESIGN:	( )	( )	(X)
VERTICAL CLEARANCE:	( )	( )	(X)
BRIDGE WIDTH:	( )	( )	(X)
BRIDGE STRUCTURAL CAPACITY:	( )	( )	(X)
LATERAL OFFSET TO OBSTRUCTION:	( )	( )	(X)

• Design Variances: *None*

• Environmental concerns:

- o The Ellison House at the northwest corner of Connors Road and Mason Creek Road is an eligible historic resource.
- o The Waldrop Farm at the southeast corner of Bankhead Highway and Post Road is also an eligible historic resource.
- o US Dept of Fish and Wildlife coordination for FWCA on Stream #1.
- o Migratory bird species habitats are potentially impacted by the project.
- o An Underground Storage Tank is present on the southwest corner of the Bankhead Highway and Mason Creek Road intersection.

• Anticipated Level of environmental analysis:

- o Are Time Savings Procedures appropriate? Yes (X), No ( ),
- o Categorical exclusion anticipated (X),
- o Environmental Assessment/Finding of No Significant Impact anticipated (FONSI) ( ), or
- o Environmental Impact Statement (EIS) ( ).

• Utility involvements:

- o Atlanta Gas Light Company – Natural Gas
- o BellSouth – Telephone
- o Comcast of Georgia – Cable Television
- o Douglasville-Douglas Co. WSA – Water and Sewer
- o Georgia Power Co. Distribution – Electric
- o Greystone Power – Electric
- o Plantation Pipeline – Natural Gas

• Public Interest Determination Policy and Procedure Required? Yes ( ), No (X)

• VE Study Anticipated: Yes (X), No ( ),

A VE Study of this project was held on February 2, 2012. The responses to the recommendations made from the Value Engineering Study are included as an attachment. Upon implementation of VE Study recommendations, they will be incorporated into the project during the preliminary design phase.

**Project Cost Estimate and Funding Responsibilities:**

	<b>PE</b>	<b>ROW</b>	<b>UTILITY</b>	<b>CST</b>	<b>MITIGATION</b>
<b>By Whom</b>	GDOT	GDOT	GDOT	GDOT	N/A
<b>\$ amount</b>	<b>\$522,000</b>	<b>\$4,182,000.00</b>	<b>\$95,179.00</b>	<b>\$3,146,344.00</b>	<b>\$0.00</b>

*\*CST Cost includes: Construction, Engineering and Inspection, Fuel Cost Adjustment, and Asphalt Cement Cost Adjustment:*

**Project Activities Responsibilities:**

- o Design: GDOT /Consultant
- o Right-of-Way Acquisition: GDOT
- o Right-of-Way Funding: GDOT
- o Relocation of Utilities: GDOT
- o Letting to contract: GDOT
- o Supervision of construction: GDOT
- o Providing material pits: GDOT/ Contractor
- o Providing detours: N/A
- o Environmental Studies/Documents/Permits: GDOT /Consultant
- o Environmental Mitigation: GDOT

**Coordination**

- Initial concept meeting held on November 10, 2011 (*See attachments*)
- Local government comments. (*See initial concept meeting minutes in attachments*).
- PIOH meeting held on October 20, 2011 (*See attachments for comments and responses*)
- Other projects in the area:

<b>PI Number</b>	<b>Project Description</b>	<b>Project Schedule</b>
0006324	Mason Creek Road bridge replacement at Mobley Creek tributary	Under Construction
0003435	I-20 WB HOV lanes from Liberty Road to SR 5	Long Range

- Railroads: *None*
- Other coordination to date: *None*

**Other alternates considered:**

- The No Build Alternative was considered non-viable due to the anticipated future level of service of "F."
- A roundabout alternative at the Bankhead Highway (US 78/SR 8) intersection with Mann Road and realigned Mason Creek Road was considered non-viable. This was due to the 6% vertical grade of Bankhead Highway being too steep for adequate operation of such an intersection.

**Attachments:**

1. Detailed need and purpose with crash data, traffic volumes, and level of service (LOS) data
2. Detailed cost estimate
  - a. Construction including Engineering and Inspection.
  - b. Completed Fuel/Asphalt price adjustment form
  - c. Right of Way
  - d. Utilities
3. Project Concept Layout
4. Typical sections
5. Traffic diagrams
6. Capacity analysis
7. Initial concept meeting minutes on November 10, 2011
8. PIOH Summary of Comments and Responses
9. TE Study with traffic signal warrant analysis
10. Responses to VE Study recommendations

Concur: \_\_\_\_\_

Director of Engineering

Approve: \_\_\_\_\_

Chief Engineer

Date: 9/10/2012

**Detailed Need and Purpose:**

The roadways of Bankhead Highway (US 78/SR 8), Mann Road, Post Road, Mason Creek Road, and Conners Road converge in close proximity to each other within the Winston community in Douglas County. These intersecting roadways result in the existing and anticipated traffic and operational issues as follows:

- The Bankhead Highway (US 78/SR 8) intersection with Mann Road and Mason Creek Road has had 91 crashes over the last six years with 89% of these being angle crashes. The intersection currently operates at a level of service C/C for the AM/PM peak hours, and the 2035 future no-build anticipated level of service is F/F for the AM/PM peak hours.
- The Bankhead Highway (US 78/SR 8) intersection with Conners Road has had 32 crashes over the last six years with 53% of these being rear end crashes and 28% as angle crashes.
- The Bankhead Highway (US 78/SR 8) intersection with Post Road has had 20 crashes over the last six years with 70% of these being rear end crashes and 15% as angle crashes.
- The intersection of Mason Creek Road and Post Road has had 12 crashes over the last six years with 58% of these being angle crashes. The intersection currently operates at a level of service C/C for the AM/PM peak hours, and the 2035 future no-build anticipated level of service is F/F for the AM/PM peak hours.

The need exists to improve the above intersections to address the rear end and angle crashes and to improve the level of service at the intersection of Bankhead Highway with Mann Road and Mason Creek Road and the intersection of Mason Creek Road and Post Road.

The purpose of the proposed project is to reduce the crash frequency and severity at the above intersections and improve the operation of the intersections. The proposed project will improve the intersection of Bankhead Highway with Mann Road and Mason Creek Road by adding a traffic signal, left turn lanes in all four directions, and right turn lanes on Bankhead Highway and Mason Creek Road. These changes are anticipated to reduce angle crashes caused by left turning vehicles and improve the intersection's 2035 LOS to B/B. Proposed pedestrian facilities at the intersection are intended to provide pedestrians with improved crossings of travel lanes and accessibility to the business in the intersection's southwest corner.

The overlapping roadway network will also be consolidated into a single through east-west route (Bankhead Highway) and a single through north-south route (Post Road to Mason Creek Road to Mann Road) that converges at the aforementioned improved, signalized intersection and eliminates conflict points at other locations. The northern portion of Conners Road will be realigned from crossing Bankhead Highway at a substandard intersection skew to terminate directly into Bankhead Highway at a perpendicular angle. The portion of Conners Road south of Bankhead Highway to Mattie McCoy Lane will be removed. This resulting new intersection will also have a westbound right turn lane on Bankhead Highway. Post Road from the south end of the project will be realigned to tie directly into the northern portion of Mason Creek Road. The southern remnant of Mason Creek Road will then be rearranged to intersect perpendicularly into the realigned Post Road/Mason Creek Road. This realignment follows the majority of traffic movements and is anticipated to improve the intersection's 2035 LOS from F/F to C/C. This realignment, when included with Mann Road, will also create a continuous north-south through route for motorists leading to the existing Interstate 20 interchange on Post Road immediately south of the project. The northern portion of Mason Creek Road would also have a continuous two-way left turn lane up to Bankhead Highway and Mann Road. The northern remnant of Post Road will remain in place with a cul-de-sac on its southern end while its intersection with Bankhead Highway will be reconfigured to be right in/ right out. This intersection realignment of Post Road with Bankhead Highway combined with the divergence of through traffic to Mason Creek Road is anticipated to reduce rear end and angle crashes and improve its 2035 LOS from E/C to C/B.

*Background*

Bankhead Highway (US 78/SR 8), Mann Road, Post Road, Conners Road, Mattie McCoy Lane, and Mason Creek Road currently are two-lane roadways with rural grassed shoulders. Bankhead Highway is functionally classified as an urban minor arterial while Post Road is classified as a rural major collector. The remaining project side roads are classified as local roadways.

The land along the south side of Bankhead Highway within the project limits varies between a mix of commercial, light industrial, and agricultural properties. The land use elsewhere within the project limits is primarily residential.

*Crash Data*

The crash data along the sections of Bankhead Highway, Mann Road/Mason Creek Road, Mattie McCoy Lane, Conners Road and Post Road within the project limits was obtained for the period between January 1, 2004 and December 31, 2009. The crashes which were reported to have occurred along Bankhead Highway and Mann Road/Mason Creek Road roadways are summarized in Table 1 and Table 2.

**Table 1. Summary of Traffic Crash History along Bankhead Highway (SR8/US 78), MP 4.81 to 5.38**

Year	Accidents			Accidents Per 100 Million Vehicle Miles <sup>1</sup>		
	Total	Injury	Fatal	Total	Injury	Fatal
2004	19	11	1	1123 (490)	650 (123)	59.08 (1.29)
2005	16	6	0	945 (534)	355 (135)	0.00 (1.48)
2006	21	13	1	1241 (531)	768 (132)	59.08 (1.38)
2007	25	13	0	1477 (514)	768 (126)	0.00 (1.34)
2008	14	8	0	827 (471)	473 (116)	0.00 (1.33)
2009	23	15	0	1359 (463)	886 (114)	0.00 (1.05)
Total	118	66	2			
<b>Average</b>	<b>20</b>	<b>11</b>	<b>0.33</b>	<b>1182 (501)</b>	<b>650 (124)</b>	<b>19.69 (1.31)</b>

Note: (1) The number in parentheses represents the statewide average crash rates for Urban Minor Arterials

**Table 2. Summary of Traffic Crash History along Mann Road/ Mason Creek Road, MP 6.03 to 6.31**

Year	Accidents			Accidents Per 100 Million Vehicle Miles <sup>1</sup>		
	Total	Injury	Fatal	Total	Injury	Fatal
2004	5	1	1	3883 (189)	777 (60)	777 (1.55)
2005	8	5	0	6213 (150)	3883 (50)	0.00 (1.68)
2006	19	12	1	14755 (156)	9319 (54)	777 (2.00)
2007	22	12	0	17084 (168)	9319 (57)	0.00 (1.87)
2008	10	4	0	7766 (141)	3106 (46)	0.00 (1.45)
2009	23	14	0	17861 (118)	10872 (38)	0.00 (1.44)
<b>Total</b>	<b>87</b>	<b>48</b>	<b>2</b>			
<b>Average</b>	<b>15</b>	<b>8</b>	<b>0.33</b>	<b>11648 (154)</b>	<b>6213 (51)</b>	<b>259 (1.59)</b>

Note: (1) The number in parentheses represents the statewide average crash rates for Rural Local roadways

As shown in Table 1, there were a total of 118 crashes reported to have occurred along Bankhead Highway for the six (6) year period, which included 66 injury crashes and two fatal crashes. As shown in Table 2, there were a total of 87 crashes reported to have occurred along Mann Road/Mason Creek Road for the six (6) year period, which included 48 injury crashes and two fatal crashes.

The crashes were also summarized by intersection based on the reported crash data for the following intersections:

- Bankhead Highway and Conners Road
- Bankhead Highway and Mann Road/Mason Creek Road
- Bankhead Highway and Post Road
- Mason Creek Road and Conners Road
- Mason Creek Road and Post Road

The crashes that were reported to have occurred at the intersections within the project limits are summarized by type of collision in Tables 3 through Table 7.

**Table 3. Summary of Traffic Crash History at Bankhead Highway (SR8/US 78) and Conners Road Intersection**

Year	Manner of Collision					Total	Type of Accident		
	Angle	Head On	Rear End	Sideswipe	Other		PDO	Injury	Fatal
2004	0	0	1	1	0	2	1	1	0
2005	3	0	5	0	0	8	6	2	0
2006	4	0	2	1	0	7	4	3	0
2007	1	0	4	1	1	7	5	2	0
2008	1	1	4	0	1	7	5	2	0
2009	0	0	1	0	0	1	1	0	0
Total	9	1	17	3	2	32	22	10	0
Percentage	28.1%	3.1%	53.1%	9.4%	6.3%	100%	68.8%	31.3%	0.0%

As shown in Table 3, there were 32 total crashes at the Bankhead Highway and Conners Road intersection between 2004 and 2009. Table 3 indicates that the majority of the crashes recorded at this intersection were rear end crashes, which accounted for about 53% of the total number of crashes. Over 30% of the crashes that occurred at this intersection were injury crashes.

**Table 4. Summary of Traffic Crash History at Bankhead Highway (US 78/SR 8) and Mann Road/Mason Creek Road Intersection**

Year	Manner of Collision					Total	Type of Accident		
	Angle	Head On	Rear End	Sideswipe	Other		PDO	Injury	Fatal
2004	15	0	1	0	1	17	6	10	1
2005	10	0	1	1	0	12	6	6	0
2006	15	0	0	1	0	16	5	10	1
2007	16	1	1	0	0	18	7	11	0
2008	6	0	1	1	0	8	4	4	0
2009	19	0	0	1	0	20	6	14	0
Total	81	1	4	4	1	91	34	55	2
Percentage	89.0%	1.1%	4.4%	4.4%	1.1%	100%	37.4%	60.4%	2.2%

As shown in Table 4, there were 91 total crashes at the Bankhead Highway and Mann Road/Mason Creek Road intersection between 2004 and 2009. Table 4 indicates that the majority of the crashes recorded at this intersection were angle crashes, which accounted for about 89% of the total number of crashes. Over 60% of the crashes that occurred at this intersection were injury crashes. There were also two fatal crashes recorded at this intersection.

**Table 5. Summary of Traffic Crash History at Bankhead Highway  
(US 78/SR 8) and Post Road Intersection**

Year	Manner of Collision					Total	Type of Accident		
	Angle	Head On	Rear End	Sideswipe	Other		PDO	Injury	Fatal
2004	1	0	1	0	0	2	1	1	0
2005	0	1	1	0	0	2	2	0	0
2006	0	1	1	0	0	2	1	1	0
2007	1	0	5	0	1	7	5	2	0
2008	0	0	5	0	0	5	2	3	0
2009	1	0	1	0	0	2	1	1	0
Total	3	2	14	0	1	20	12	8	0
Percentage	15.0%	10.0%	70.0%	0.0%	5.0%	100%	60.0%	40.0%	0.0%

As shown in Table 5, there were 20 total crashes at the Bankhead Highway and Post Road intersection between 2004 and 2009. Table 5 indicates that the majority of the crashes recorded at this intersection were rear end crashes, which accounted for about 70% of the total number of crashes. Approximately 40% of the crashes that occurred at this intersection were injury crashes.

**Table 6. Summary of Traffic Crash History at Mason Creek  
Road and Conners Road Intersection**

Year	Manner of Collision					Total	Type of Accident		
	Angle	Head On	Rear End	Sideswipe	Other		PDO	Injury	Fatal
2004	1	0	0	0	0	1	0	1	0
2005	1	0	0	0	0	1	0	1	0
2006	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0
2009	0	0	1	0	0	1	1	0	0
Total	2	0	1	0	0	3	1	2	0
Percentage	66.7%	0.0%	33.3%	0.0%	0.0%	100%	33.3%	66.7%	0.0%

As shown in Table 6, there were 3 total crashes at the Mann Road/Mason Creek and Mattie McCoy Lane intersection between 2004 and 2009. Table 6 indicates that the majority of the crashes recorded at this intersection were angle crashes, which accounted for about 67% of the total number of crashes. Approximately 67% of the crashes that occurred at this intersection were injury crashes.

**Table 7. Summary of Traffic Crash History at Mason Creek Road and Post Road Intersection**

Year	Manner of Collision					Total	Type of Accident		
	Angle	Head On	Rear End	Sideswipe	Other		PDO	Injury	Fatal
2004	3	0	0	0	0	3	2	0	1
2005	0	0	1	0	0	1	0	1	0
2006	1	1	0	0	0	2	0	2	0
2007	2	1	1	0	0	4	3	1	0
2008	0	0	1	0	0	1	1	0	0
2009	1	0	0	0	0	1	1	0	0
<b>Total</b>	<b>7</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>7</b>	<b>4</b>	<b>1</b>
<b>Percentage</b>	<b>58.3%</b>	<b>16.7%</b>	<b>25.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>100%</b>	<b>58.3%</b>	<b>33.3%</b>	<b>8.3%</b>

As shown in Table 7, there were 12 total crashes at the Mann Road/Mason Creek and Post Road intersection between 2004 and 2009. Table 7 indicates that the majority of the crashes recorded at this intersection were angle crashes, which accounted for about 58% of the total number of crashes. Approximately 58% of the crashes that occurred at this intersection were injury crashes. There was also one fatal crash recorded at this intersection.

*Operational Analysis*

The A.M. and P.M. peak hour turning movement counts and 24-hour bi-directional counts were obtained at the major intersections and roadways within the study area by All Traffic Data, Inc. These “short-term” traffic counts were adjusted using day of the week, month of the year and axle adjustment factors to develop annual average daily traffic (AADT) volumes. The opening year for this project was assumed to be 2015 and the design year to be 2035. The design year was assumed to be 20 years from the opening year. The 2015 Opening Year and the 2035 Design Year AADT for the roadways where intersection improvements are proposed are presented on Table 8.

**Table 8. Existing Year, Base Year, and Design Year Annual Average Daily Traffic Volumes**

<b>Roadway Segment</b>	<b>2011 Existing Year ADT</b>	<b>2015 Base Year ADT</b>	<b>2035 Design Year ADT</b>
Bankhead Highway (US 78/SR 8)	9,300	9,800	14,400
Post Road	8,150	8,600	12,800
Mann Road	4,200	4,400	6,600
Conners Road	1,350	1,450	2,150
Mason Creek Road	4,200	4,400	6,600

The existing AM and PM peak hour turning movement volumes, existing AADT volumes, the design year AM and PM peak hour turning movement volumes and the opening year and design year AADT volumes are provided as an attachment (see attachment 5) with this report.

*Capacity Analysis and Intersection Levels of Service*

The existing and anticipated capacity analyses were conducted at the intersection to determine the operational characteristics based on the existing and future traffic conditions. The capacity analysis was conducted using

the methodologies outlined in the Highway Capacity manual (HCM) and the Synchro 8.0 software program. The results of the capacity analyses are summarized in Table 9.

**Table 9. Existing and Anticipated Intersection Levels of Service**

<b>Intersection</b>	<b>Traffic Control</b>	<b>Level of Service (AM/PM)</b>				
		<b>2011 Existing</b>	<b>2015 No Build</b>	<b>2015 Build</b>	<b>2035 No Build</b>	<b>2035 Build</b>
Bankhead Highway and Conners Road	Stop Control on Conners Rd	B/B	B/B	B/B	C/C	C/C
Bankhead Highway and Mann Road/Mason Creek Road	Stop Control / Traffic Signal <sup>1</sup>	C/C	C/C	B/B	F/F	B/B
Bankhead Highway and Post Road	Stop Control on Post Rd	B/B	C/B	B/B	E/C	C/B
Mason Creek Road and Conners Road	Stop Control on Conners Rd	B/B	C/B	C/C	C/C	E/D
Mason Creek Road and Post Road	Stop Control on Mason Creek Rd	C/C	C/C	B/B	F/F	C/C

Note: (1) Stop control on Mann Road/Mason Creek Road in the Existing and Future No Build scenarios and traffic signal control in the Future Build scenario.

# DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

-----  
INTERDEPARTMENT CORRESPONDENCE

**FILE** PROJECT No. CSSFT-0008-00(375), Douglas  
SR 8/US 78 at Mann Road/Mason Creek Road  
and at Post Road Intersection Improvements  
P.I. No. 0008375-

**OFFICE Program Delivery**

**DATE** 11/3/2011

**FROM** Bobby Hilliard, P.E., State Program Delivery Engineer

**TO** GDOT Contracts Administration

**SUBJECT REVISIONS TO PROGRAMMED COSTS**

PROJECT MANAGER Derrick Cameron

MNGT LET DATE 2/1/2014

MNGT R/W DATE 12/1/2012

**PROGRAMMED COST (TPro W/OUT INFLATION)**

**LAST ESTIMATE UPDATE**

CONSTRUCTION \$0,000,000.00

DATE N/A

RIGHT OF WAY \$0,000,000.00

DATE N/A

UTILITIES \$ N/A

DATE N/A

**REVISED COST ESTIMATES**

CONSTRUCTION\* \$3,146,343.66

RIGHT OF WAY \$4,182,000.00

UTILITIES\*\* \$95,179.00

\* Costs contain 5% Engineering and Inspection and 0% Construction Contingencies.

\*\* Costs contain 0% contingency.

**REASON FOR COST INCREASE** Revised concept based upon further development

**CONTINGENCY SUMMARY**

Construction Cost Estimate:	\$2,721,304.36	(Base Estimate)
Engineering and Inspection:	\$136,065.22	(Base Estimate x 5 %)
Construction Contingency:	\$0.00	(Base Estimate x 0 %) (The Construction Contingency is based on the Project Improvement Type in TPro.)
Total Liquid AC Adjustment (50% cap)	\$ 288,974.09	(From attached worksheet)
<b>Construction Total:</b>	<b>\$3,146,343.66</b>	
Utility Cost Estimate:	\$95,179.00	
Utility Contingency:	\$0.00	
<b>Utility Total:</b>	<b>\$95,179.00</b>	

**REIMBURSABLE UTILITY COST**

<u>Utility Owner</u>	<u>Reimbursable Costs</u>
Georgia Power Co.-Distribution	\$52,800.00
Greystone Power	\$25,000.00
Plantation Pipeline	\$17,379.00

Attachments

- 1.) PI #0008375 CES Output
- 2.) PI #0008375 Asphalt and Fuel Price Adjustment Spreadsheet
- 3.) PI #0008375 Right of Way Estimate
- 4.) PI #0008375 Utility Estimate

c: Genetha Rice-Singleton, State Program Control Administrator

## JOB ESTIMATE REPORT

DATE : 8/25/2011

JOB NUMBER : 0008375

SPEC YEAR: 01

DESCRIPTION: US 78/BANKHEAD HWY @MANN ROAD SAFETY IMPROVEMENT PROJECT

## ITEMS FOR GDOT PROJECT CSSFT-0008-00(375)

LINE	ITEM	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
5	150-1000	LS	TRAFFIC CONTROL - CSSFT-0008-00(375)	1	\$150,000.00	\$150,000.00
10	210-0100	LS	GRADING COMPLETE - CSSFT-0008-00(375)	1	\$800,000.00	\$800,000.00
15	310-5100	SY	GR AGGR BS CRS 10IN INCL MATL	30250	\$15.56	\$470,891.16
20	402-1812	TN	RECYL AC LEVELING,INC BM&HL	500	\$68.13	\$34,065.06
25	402-3130	TN	RECYL AC 12.5MM SP,GP2,BM&HL	2500	\$65.43	\$163,587.78
30	402-3190	TN	RECYL AC 19 MM SP,GP 1 OR 2 ,INC BM&HL	3350	\$61.69	\$206,671.48
35	402-3121	TN	RECYL AC 25MM SP,GP1/2,BM&HL	10000	\$55.28	\$552,815.80
40	413-1000	GL	BITUM TACK COAT	3000	\$2.10	\$6,308.97
45	441-0748	SY	CONC MEDIAN, 6 IN	200	\$43.98	\$8,796.62
49	441-0104	SY	CONC SIDEWALK, 4 IN	840	\$36.81	\$30,928.04
50	441-6216	LF	CONC CURB & GUTTER/ 8"X24"TP2	2060	\$11.06	\$22,785.12
55	550-1180	LF	STM DR PIPE 18",H 1-10	290	\$31.34	\$9,091.02
60	550-1240	LF	STM DR PIPE 24",H 1-10	1277	\$34.77	\$44,411.37
65	550-1360	LF	STM DR PIPE 36",H 1-10	100	\$61.75	\$6,175.20
70	550-2180	LF	SIDE DR PIPE 18",H 1-10	650	\$23.85	\$15,507.94
73	550-1300	LF	STM DR PIPE 30",H 1-10	166	\$47.08	\$7,816.31
74	550-3324	EA	SAFETY END SECTION 24",STD,4:1	1	\$941.06	\$941.06
79	550-3330	EA	SAFETY END SECTION 30",STD,4:1	2	\$1,654.64	\$3,309.29
84	550-4218	EA	FLARED END SECT 18 IN, ST DR	4	\$451.48	\$1,805.92
89	550-4224	EA	FLARED END SECT 24 IN, ST DR	5	\$533.80	\$2,669.01
94	550-4236	EA	FLARED END SECT 36 IN, ST DR	2	\$1,014.58	\$2,029.17
99	668-1100	EA	CATCH BASIN, GP 1	8	\$2,031.30	\$16,250.45
104	641-1200	LF	GUARDRAIL, TP W	1238	\$15.02	\$18,594.03
109	641-5001	EA	GUARDRAIL ANCHORAGE, TP 1	3	\$603.02	\$1,809.07
114	641-5012	EA	GUARDRAIL ANCHORAGE, TP 12	1	\$1,910.00	\$1,910.00
119	668-2100	EA	DROP INLET, GP 1	1	\$1,766.23	\$1,766.23
124	647-1000	LS	TRAF SIGNAL INSTALLATION NO - .	1	\$60,000.00	\$60,000.00
129	653-0120	EA	THERM PVMT MARK, ARROW, TP 2	27	\$66.33	\$1,791.14
134	653-1502	LF	THERMO SOLID TRAF ST, 5 IN YEL	10800	\$0.32	\$3,514.32
139	653-1804	LF	THERM SOLID TRAF STRIPE, 8",WH	1250	\$1.76	\$2,205.03
144	653-1501	LF	THERMO SOLID TRAF ST 5 IN, WHI	15650	\$0.31	\$4,925.52
149	653-3501	GLF	THERMO SKIP TRAF ST, 5 IN, WHI	1100	\$0.27	\$302.18
154	653-6004	SY	THERM TRAF STRIPING, WHITE	456	\$2.94	\$1,344.72
159	163-0232	AC	TEMPORARY GRASSING	5	\$117.48	\$587.43
164	163-0240	TN	MULCH	120	\$209.09	\$25,091.57
169	163-0300	EA	CONSTRUCTION EXIT	10	\$1,154.31	\$11,543.14
174	163-0520	LF	CONSTR AND REMOVE TEMP PIPE SLOPE DRAIN	140	\$13.52	\$1,894.06
179	165-0101	EA	MAINT OF CONST EXIT	10	\$514.82	\$5,148.28
184	165-0030	LF	MAINT OF TEMP SILT FENCE, TP C	1150	\$1.00	\$1,161.24
189	171-0030	LF	TEMPORARY SILT FENCE, TYPE C	2300	\$2.79	\$6,420.24
194	603-2181	SY	STN DUMPED RIP RAP, TP 3, 18"	100	\$41.23	\$4,123.11
199	603-7000	SY	PLASTIC FILTER FABRIC	100	\$4.10	\$410.37

JOB ESTIMATE REPORT

204	700-6910	AC	PERMANENT GRASSING	8	\$433.71	\$3,469.70
209	700-7000	TN	AGRICULTURAL LIME	8	\$29.57	\$236.63
214	700-7010	GL	LIQUID LIME	30	\$19.07	\$572.22
219	700-8000	TN	FERTILIZER MIXED GRADE	5	\$396.46	\$1,982.32
224	700-8100	LB	FERTILIZER NITROGEN CONTENT	420	\$1.93	\$814.67
229	716-2000	SY	EROSION CONTROL MATS, SLOPES	3170	\$0.89	\$2,830.37
-----						-----
ITEM TOTAL						\$2,721,304.35
INFLATED ITEM TOTAL						\$2,721,304.36
<b>TOTALS FOR JOB 0008375</b>						
-----						-----
ESTIMATED COST:						<b>\$2,721,304.36</b>
CONTINGENCY PERCENT ( 0%):						<b>\$0.00</b>
ESTIMATED TOTAL:						<b>\$2,721,304.36</b>
-----						-----

<b>PROJ. NO.</b>	CSSFT-0008-00(375)
<b>P.I. NO.</b>	0008375
<b>DATE</b>	8/25/2011

CALL NO.

<b>INDEX (TYPE)</b>	<b>DATE</b>	<b>INDEX</b>
REG. UNLEADED	Aug-11	\$ 3.714
DIESEL		\$ 3.959
LIQUID AC		\$ 580.00

Link to Fuel and AC Index:

<http://www.dot.ga.gov/doingbusiness/Materials/Pages/asphaltcementindex.aspx>

**LIQUID AC ADJUSTMENTS**

$PA = \left( \frac{APM - APL}{APL} \right) \times TMT \times APL$

**Asphalt**

Price Adjustment (PA)				<b>284490</b>	\$	<b>284,490.00</b>
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	\$	928.00		
Monthly Asphalt Cement Price month project let (APL)			\$	580.00		
Total Monthly Tonnage of asphalt cement (TMT)				<b>817.5</b>		

<b>ASPHALT</b>	<b>Tons</b>	<b>%AC</b>	<b>AC ton</b>
Leveling	500	5.0%	25
12.5 OGFC		5.0%	0
12.5 mm	2500	5.0%	125
9.5 mm SP		5.0%	0
25 mm SP	10000	5.0%	500
19 mm SP	3350	5.0%	167.5
	<b>16350</b>		<b>817.5</b>

**BITUMINOUS TACK COAT**

Price Adjustment (PA)				\$	<b>4,484.09</b>	\$	<b>4,484.09</b>
Monthly Asphalt Cement Price month placed (APM)	Max. Cap	60%	\$	928.00			
Monthly Asphalt Cement Price month project let (APL)			\$	580.00			
Total Monthly Tonnage of asphalt cement (TMT)							12.88530277

Bitum Tack

<b>Gals</b>	<b>gals/ton</b>	<b>tons</b>
3000	232.8234	12.8853028

PROJ. NO.

CSSFT-0008-00(375)

CALL NO.

P.I. NO.

0008375

DATE

8/25/2011

**BITUMINOUS TACK COAT (surface treatment)**

Price Adjustment (PA)						<b>0</b>	\$	-
Monthly Asphalt Cement Price month placed (APM)		Max. Cap	60%	\$	928.00			
Monthly Asphalt Cement Price month project let (APL)				\$	580.00			
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

<b>TOTAL LIQUID AC ADJUSTMENT</b>							\$	<b>288,974.09</b>
-----------------------------------	--	--	--	--	--	--	----	-------------------

**GEORGIA DEPARTMENT OF TRANSPORTATION  
PRELIMINARY ROW COST ESTIMATE SUMMARY**

Date: 11/3/2011 Project: CSSFT-0008-00(378)  
 Revised: County: Douglas  
 PI: 0008375

Description: SR 8/US 75 @ Mann Road  
 Project Termini: SR 8/US 75 @ Mann Road

Existing ROW: Varies  
 Required ROW: Varies

Parcels: 47

Land and Improvements \$2,916,225.00

Proximity Damage	\$0.00
Consequential Damage	\$0.00
Cost to Cures	\$0.00
Trade Fixtures	\$0.00
Improvements	\$1,515,000.00

Valuation Services \$95,625.00

Legal Services \$331,725.00

Relocation \$309,000.00

Demolition \$130,000.00

Administrative \$399,000.00

TOTAL ESTIMATED COSTS \$4,181,575.00

**TOTAL ESTIMATED COSTS (ROUNDED) \$4,182,000.00**

Preparation Credits	Hours	Signature

Prepared By: LaShone Alexander CG#: 286999 11/03/2011  
 Approved By: LaShone Alexander CG#: 286999 11/03/2011

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

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**INTERDEPARTMENT CORRESPONDENCE**

**FILE** CSSFT-0008-00(375), Douglas  
P.J. No. 0008375

**OFFICE** Chamblee

**FROM**  Jonathan Walker  
District Utilities Engineer

**DATE** August 30, 2011

**TO** Bobby Hilliard, State Program Delivery Engineer  
**ATTN** Perry Black

**SUBJECT** PRELIMINARY UTILITY COST (ESTIMATE)

As requested by your office, we are furnishing you with a Preliminary Utility Cost estimates for each utility with facilities potentially located within the project limits.

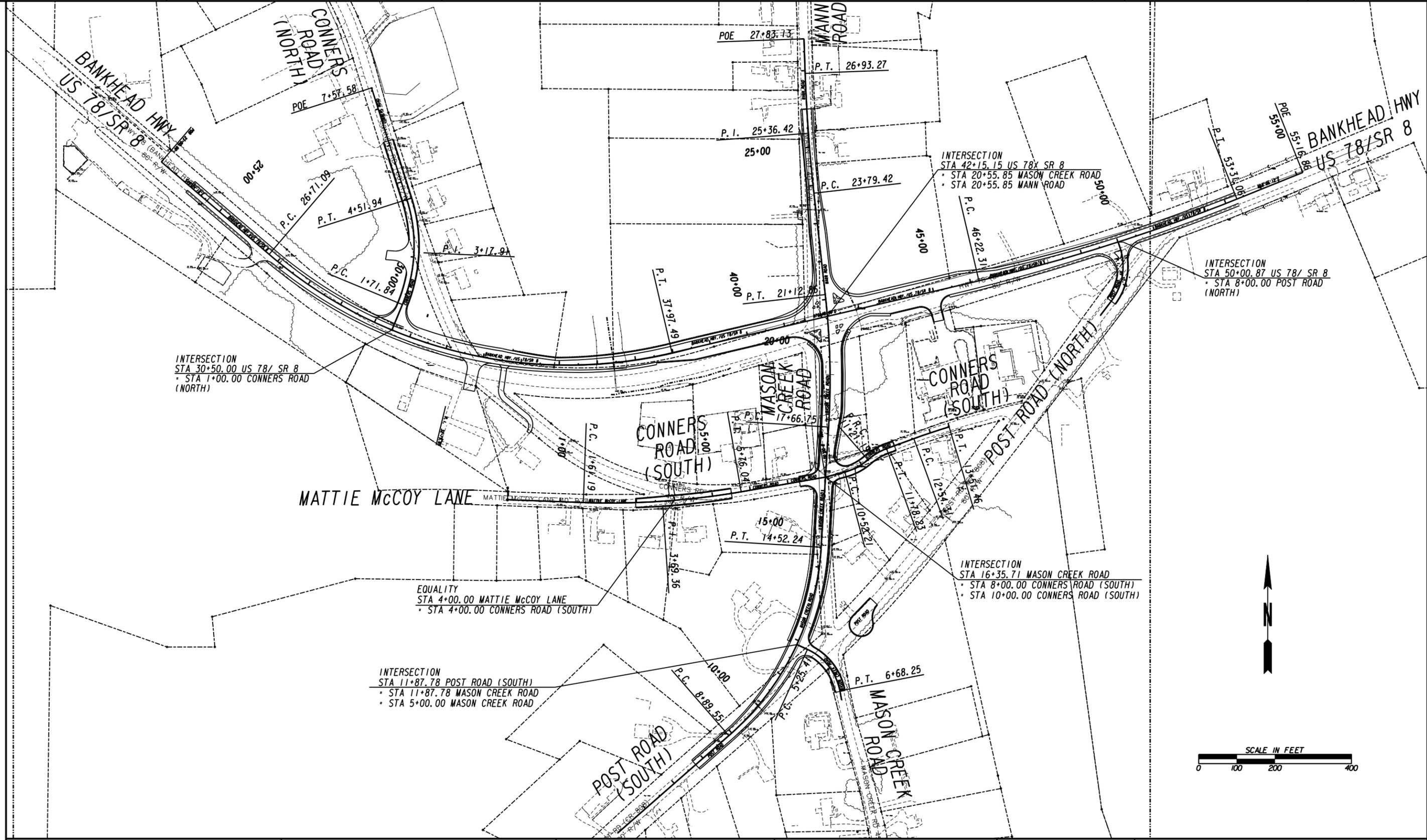
FACILITY OWNER	NON- REIMBURSABLE	REIMBURSABLE
Atlanta Gas Light Co.	\$11,150.00	
BellSouth	\$99,780.00	
Comcast of Georgia, Inc.	\$66,275.00	
Douglasville-Douglas Co. WSA	\$27,023.00	
Georgia Power Co. Dist.	\$37,200.00	\$52,800.00
Greystone Power	\$46,321.00	\$25,000.00
Plantation Pipeline		\$17,379.00
<b>Totals</b>	<b>\$287,749.00</b>	<b>\$95,179.00</b>

Total relocation cost for the above project is \$382,928.00.

If you have any questions, please contact Yulonda Pride-Foster at 770-986-1117.

BRP/JW/ypf

C: Jeff Baker, State Utilities Engineer;  
Angela Robinson, Office of Financial Management  
Mike Hill, Area Engineer



**GEORGIA**  
 DEPARTMENT  
 OF  
 TRANSPORTATION

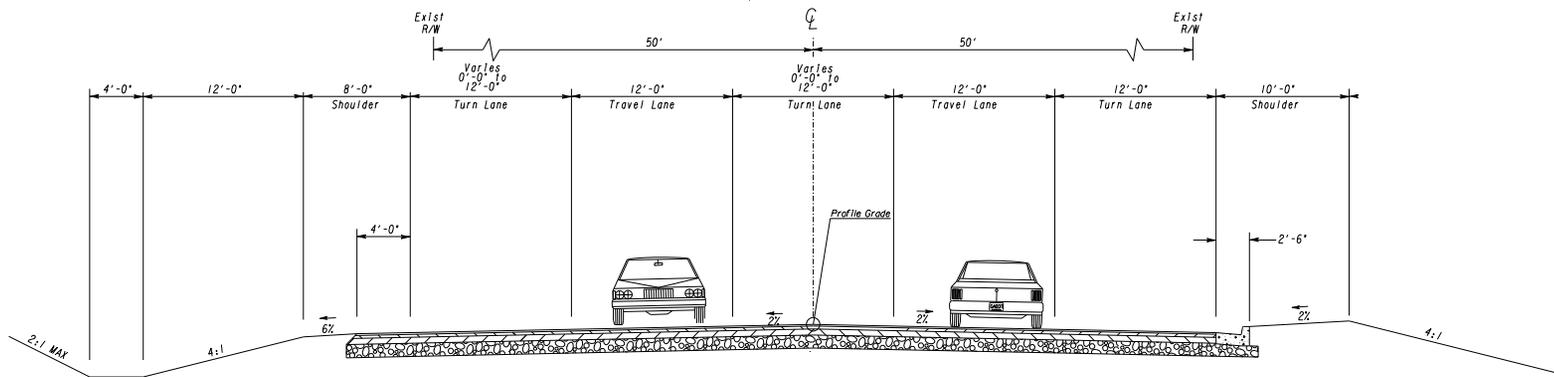


REVISION DATES

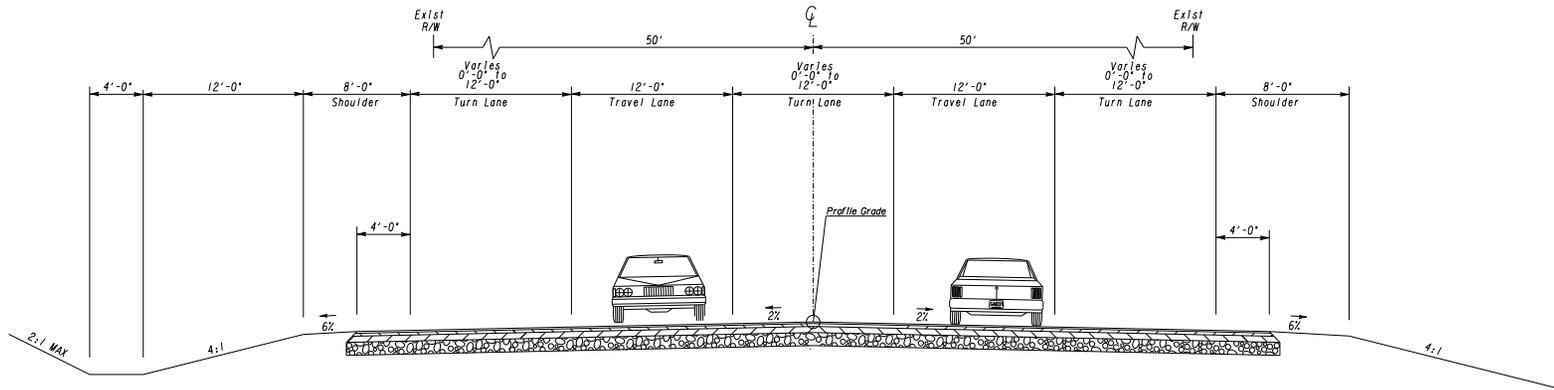
STATE OF GEORGIA  
 DEPARTMENT OF TRANSPORTATION  
 OFFICE: PROGRAM DELIVERY  
**CONCEPT DISPLAY**

PROJECT: CSSFT-0008-00(375)  
 COUNTY: DOUGLAS

DRAWING No.  
**101**



TYPICAL SECTION NO. 1  
 US78/SR 8/BANKHEAD HWY  
 AT MANN ROAD AND POST ROAD INTERSECTION  
 WITH CURB AND GUTTER ON  
 EB RIGHT TURN LANE



TYPICAL SECTION NO. 2  
 US78/BANKHEAD HWY  
 OUTSIDE OF MANN ROAD AND POST ROAD  
 INTERSECTION

NOT TO SCALE



GRESHAM  
 SMITH AND  
 PARTNERS

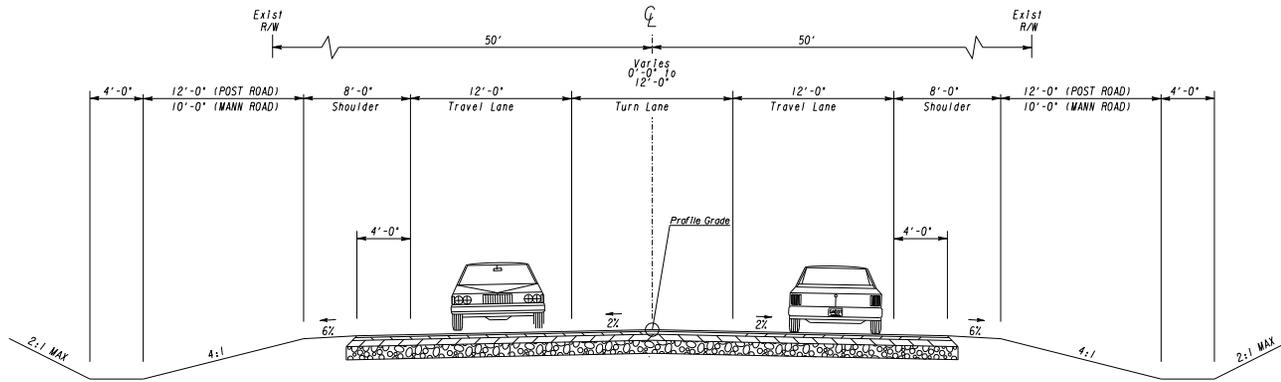
REVISION DATES


STATE OF GEORGIA  
 DEPARTMENT OF TRANSPORTATION  
 OFFICE: PROGRAM DELIVERY

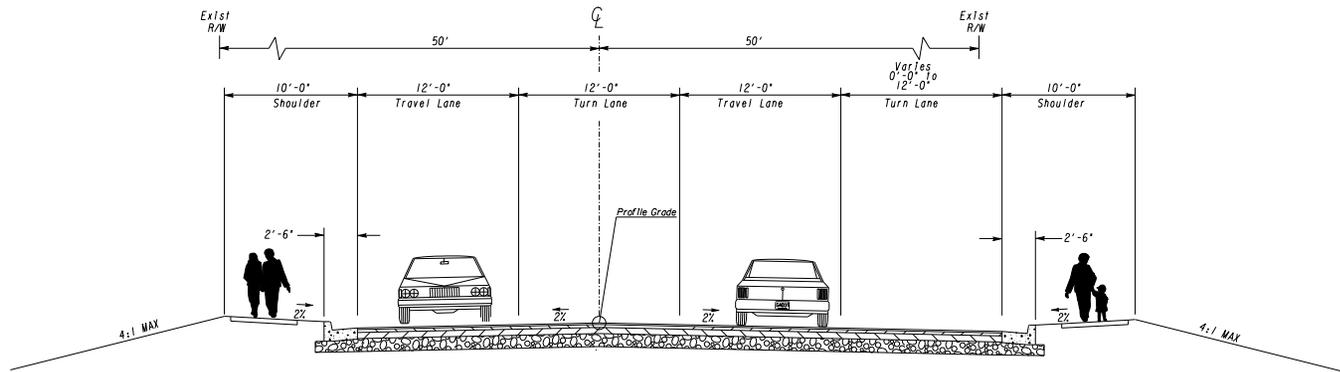
TYPICAL SECTIONS  
 BANKHEAD HWY/SR8 AT  
 MANN ROAD AND POST ROAD  
 INTERSECTION IMPROVEMENT PROJECT

DRAWING No.

COUNTY	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
DOUGLAS	GA	CSST-0008-001375		



TYPICAL SECTION NO. 3  
MANN ROAD &  
POST ROAD (SOUTH)



TYPICAL SECTION NO. 4  
MASON CREEK ROAD  
BETWEEN POST ROAD (SOUTH)  
INTERSECTION AND BANKHEAD HWY/  
SR8/ US 78 INTSECTION

NOT TO SCALE



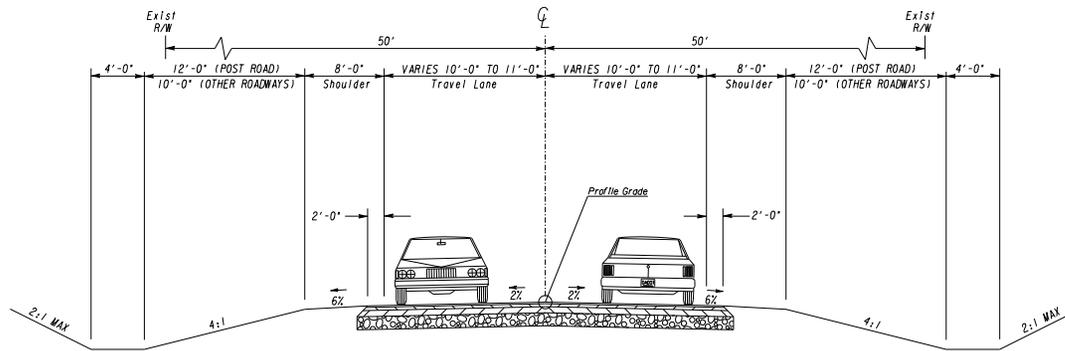
GRESHAM  
SMITH AND  
PARTNERS

REVISION DATES	

STATE OF GEORGIA  
DEPARTMENT OF TRANSPORTATION  
OFFICE: PROGRAM DELIVERY  
TYPICAL SECTIONS  
BANKHEAD HWY/SR8 AT  
MANN ROAD AND POST ROAD  
INTERSECTION IMPROVEMENT PROJECT

DRAWING No.

COUNTY	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
PICKENS	GA	CSST-0008-0013141		



TYPICAL SECTION NO. 5  
 CONNERS ROAD (NORTH AND SOUTH),  
 MATTIE MCCOY LANE,  
 POST ROAD (NORTH)  
 & MASON CREEK ROAD  
 SOUTH OF POST ROAD  
 INTERSECTION

NOT TO SCALE



GRESHAM  
 SMITH AND  
 PARTNERS

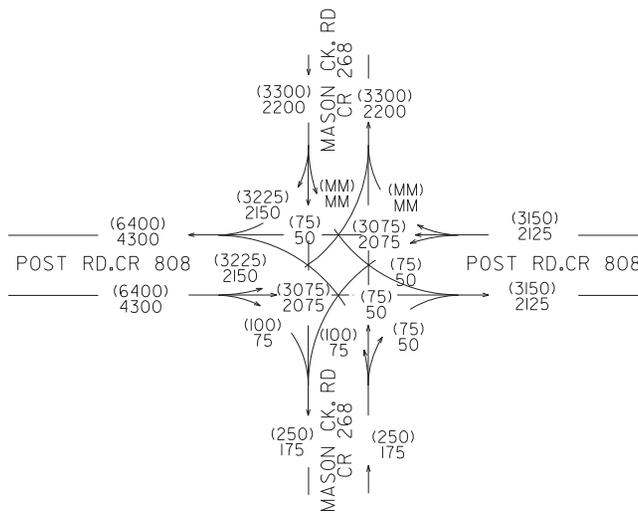
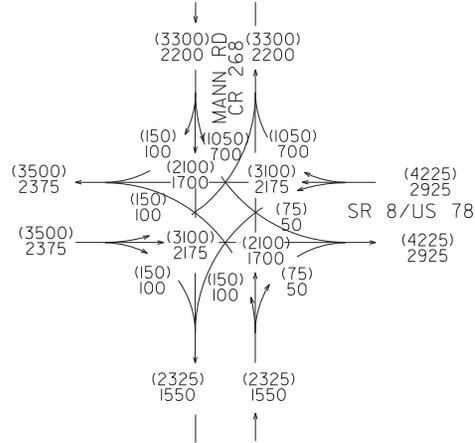
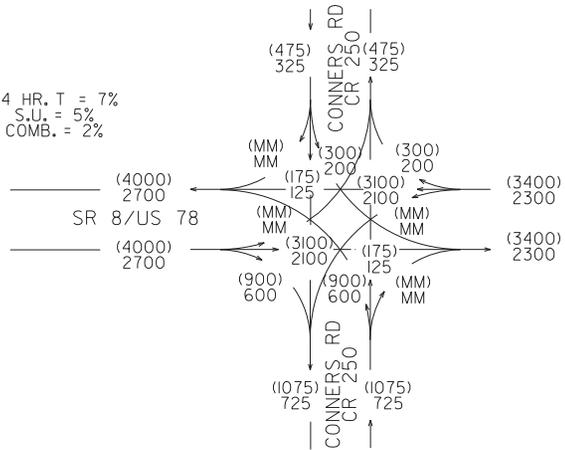
REVISION DATES


STATE OF GEORGIA  
 DEPARTMENT OF TRANSPORTATION  
 OFFICE: PROGRAM DELIVERY

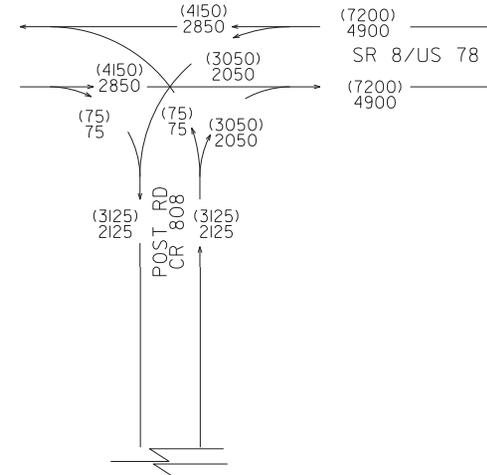
TYPICAL SECTIONS  
 US78/BANKHEAD HWY SAFETY  
 IMPROVEMENT PROJECT

DRAWING No.

24 HR. T = 7%  
S.U. = 5%  
COMB. = 2%



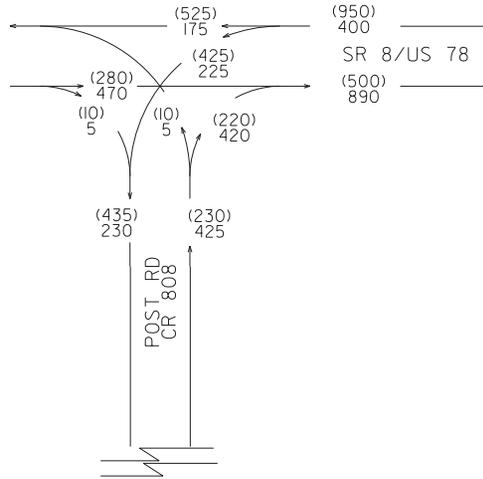
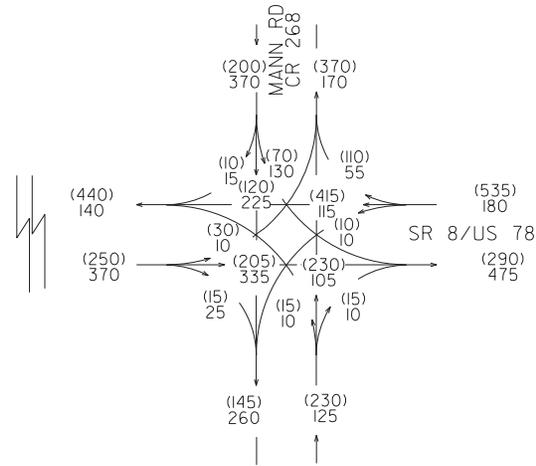
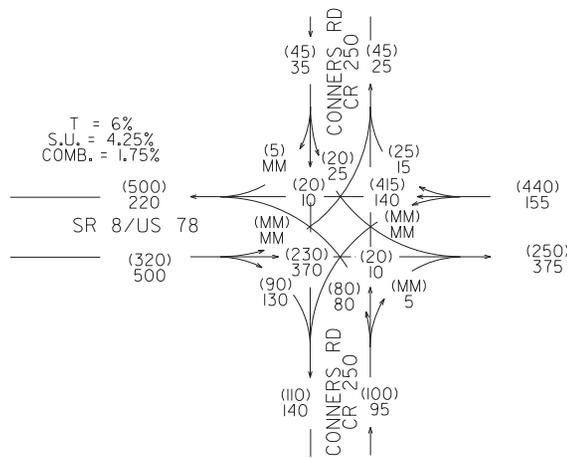
24 HR. T = 6%  
S.U. = 4.5%  
COMB. = 1.5%



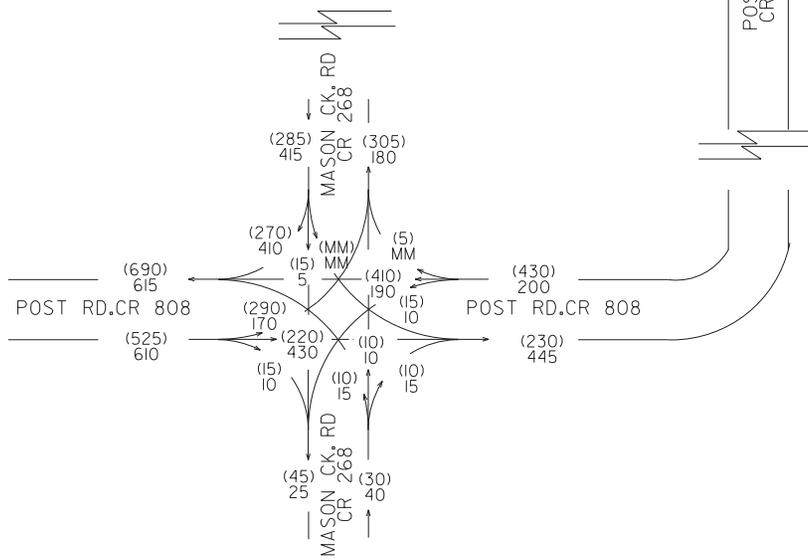
DOUGLAS COUNTY  
CITY OF WINSTON



CSSFT-0008-00(375)  
P.I.# 0008375  
DOUGLAS COUNTY  
SR 8/US 78  
2034 ADT = (000)  
2014 ADT = 000



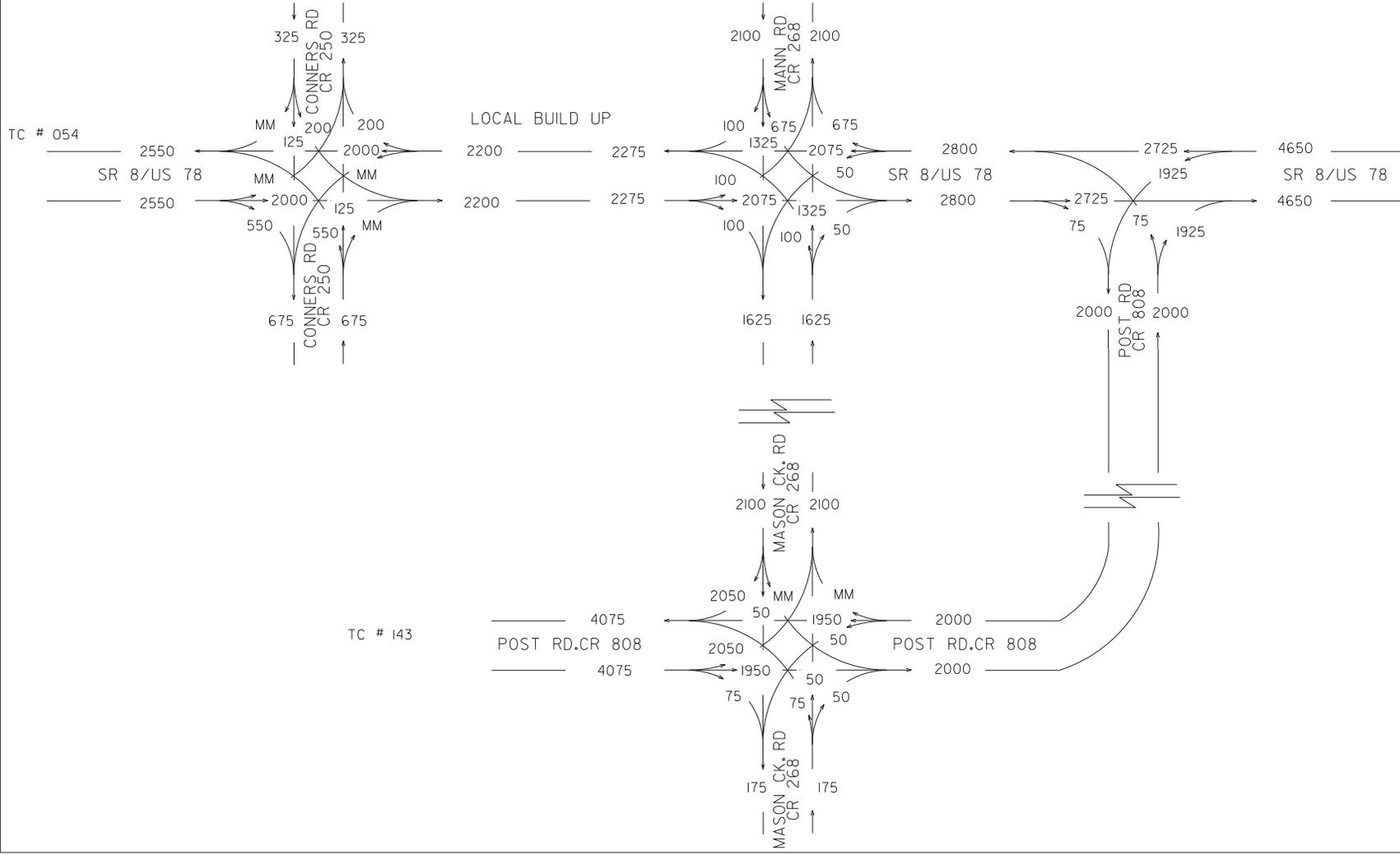
T = 5%  
S.U. = 3.75%  
COMB. = 1.25%



DOUGLAS COUNTY  
CITY OF WINSTON



CSSFT-0008-00(375)  
P.I.# 0008375  
DOUGLAS COUNTY  
SR 8/US 78  
2034 DHV PM = (000)  
2034 DHV AM = 000



DOUGLAS COUNTY  
CITY OF WINSTON



CSSFT-0008-00(375)  
P.I.# 0008375  
DOUGLAS COUNTY  
SR 8/US 78  
EXISTING 2011  
TRAFFIC

## **Intersection Capacity Analyses Worksheets**

**2011 Existing Year**

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	310	5	115	150	5	275
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	337	5	125	163	5	299
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			342		753	340
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			342		753	340
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			90		98	57
cM capacity (veh/h)			1195		333	694

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	342	288	304
Volume Left	0	125	5
Volume Right	5	0	299
cSH	1700	1195	680
Volume to Capacity	0.20	0.10	0.45
Queue Length 95th (ft)	0	9	58
Control Delay (s)	0.0	4.2	14.5
Lane LOS		A	B
Approach Delay (s)	0.0	4.2	14.5
Approach LOS			B

Intersection Summary			
Average Delay		6.0	
Intersection Capacity Utilization		58.2%	ICU Level of Service B
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	220	15	5	75	35	5	70	5	85	150	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	239	16	5	82	38	5	76	5	92	163	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	120			255			462	389	247	413	378	101
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	120			255			462	389	247	413	378	101
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			99	86	99	81	70	99
cM capacity (veh/h)	1444			1287			380	536	782	477	543	944

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	261	125	87	266
Volume Left	5	5	5	92
Volume Right	16	38	5	11
cSH	1444	1287	533	527
Volume to Capacity	0.00	0.00	0.16	0.51
Queue Length 95th (ft)	0	0	14	70
Control Delay (s)	0.2	0.4	13.1	18.6
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	0.4	13.1	18.6
Approach LOS			B	C

Intersection Summary			
Average Delay		8.4	
Intersection Capacity Utilization	40.8%		ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 3: Conners Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	245	85	0	90	10	55	5	5	15	5	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	266	92	0	98	11	60	5	5	16	5	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	109			359			418	421	312	424	462	103
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	109			359			418	421	312	424	462	103
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			89	99	99	97	99	100
cM capacity (veh/h)	1457			1178			533	518	719	525	491	941

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	359	109	71	22
Volume Left	0	0	60	16
Volume Right	92	11	5	0
cSH	1457	1178	543	516
Volume to Capacity	0.00	0.00	0.13	0.04
Queue Length 95th (ft)	0	0	11	3
Control Delay (s)	0.0	0.0	12.6	12.3
Lane LOS			B	B
Approach Delay (s)	0.0	0.0	12.6	12.3
Approach LOS			B	B

### Intersection Summary

Average Delay		2.1		
Intersection Capacity Utilization		28.9%	ICU Level of Service	A
Analysis Period (min)		15		

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	5	65	5	5	5	45	75	5	5	165	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	71	5	5	5	49	82	5	5	179	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	383	378	182	448	378	84	185			87		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	383	378	182	448	378	84	185			87		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	99	92	99	99	99	96			100		
cM capacity (veh/h)	543	526	850	453	526	964	1366			1484		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	82	16	136	190
Volume Left	5	5	49	5
Volume Right	71	5	5	5
cSH	788	583	1366	1484
Volume to Capacity	0.10	0.03	0.04	0.00
Queue Length 95th (ft)	9	2	3	0
Control Delay (s)	10.1	11.3	3.0	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	10.1	11.3	3.0	0.2
Approach LOS	B	B		

Intersection Summary			
Average Delay		3.4	
Intersection Capacity Utilization	30.7%		ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 5: Mason Creek Rd & Post Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	110	285	5	5	125	0	10	5	10	0	5	270
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	310	5	5	136	0	11	5	11	0	5	293
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	136			315			995	698	312	712	701	136
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	136			315			995	698	312	712	701	136
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	92			100			92	98	98	100	98	67
cM capacity (veh/h)	1424			1223			137	328	719	310	326	902

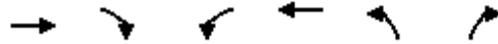
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	435	141	27	299
Volume Left	120	5	11	0
Volume Right	5	0	11	293
cSH	1424	1223	244	874
Volume to Capacity	0.08	0.00	0.11	0.34
Queue Length 95th (ft)	7	0	9	38
Control Delay (s)	2.7	0.3	21.6	11.2
Lane LOS	A	A	C	B
Approach Delay (s)	2.7	0.3	21.6	11.2
Approach LOS			C	B

Intersection Summary			
Average Delay		5.7	
Intersection Capacity Utilization	55.2%		ICU Level of Service
Analysis Period (min)		15	B

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	185	5	280	345	5	145
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	201	5	304	375	5	158
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			207		1188	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			207		1188	204
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			77		97	81
cM capacity (veh/h)			1341		158	827

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	207	679	163
Volume Left	0	304	5
Volume Right	5	0	158
cSH	1700	1341	724
Volume to Capacity	0.12	0.23	0.23
Queue Length 95th (ft)	0	22	22
Control Delay (s)	0.0	5.2	11.4
Lane LOS		A	B
Approach Delay (s)	0.0	5.2	11.4
Approach LOS			B

Intersection Summary			
Average Delay		5.1	
Intersection Capacity Utilization	62.9%		ICU Level of Service B
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	20	135	10	5	275	70	10	150	10	45	80	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	147	11	5	299	76	11	163	11	49	87	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	375			158			592	582	152	636	549	337
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	375			158			592	582	152	636	549	337
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	98			100			97	60	99	81	80	99
cM capacity (veh/h)	1162			1398			339	410	884	258	428	696

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	179	380	185	141
Volume Left	22	5	11	49
Volume Right	11	76	11	5
cSH	1162	1398	418	353
Volume to Capacity	0.02	0.00	0.44	0.40
Queue Length 95th (ft)	1	0	55	47
Control Delay (s)	1.1	0.1	20.3	21.8
Lane LOS	A	A	C	C
Approach Delay (s)	1.1	0.1	20.3	21.8
Approach LOS			C	C

Intersection Summary			
Average Delay		8.0	
Intersection Capacity Utilization	46.1%		ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 3: Conners Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	150	60	0	275	15	55	15	0	15	15	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	163	65	0	299	16	60	16	0	16	16	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	315			228			516	511	196	511	535	307
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	315			228			516	511	196	511	535	307
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			87	96	100	96	96	99
cM capacity (veh/h)	1223			1317			447	460	836	454	446	724

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	228	315	76	38
Volume Left	0	0	60	16
Volume Right	65	16	0	5
cSH	1223	1317	450	476
Volume to Capacity	0.00	0.00	0.17	0.08
Queue Length 95th (ft)	0	0	15	6
Control Delay (s)	0.0	0.0	14.6	13.2
Lane LOS			B	B
Approach Delay (s)	0.0	0.0	14.6	13.2
Approach LOS			B	B

Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization	28.7%		ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	5	45	5	5	5	65	145	5	5	90	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	49	5	5	5	71	158	5	5	98	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None				None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	421	416	101	465	416	160	103			163		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	421	416	101	465	416	160	103			163		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	99	95	99	99	99	95			100		
cM capacity (veh/h)	507	494	944	453	494	874	1464			1392		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	60	16	234	109
Volume Left	5	5	71	5
Volume Right	49	5	5	5
cSH	813	558	1464	1392
Volume to Capacity	0.07	0.03	0.05	0.00
Queue Length 95th (ft)	6	2	4	0
Control Delay (s)	9.8	11.6	2.6	0.4
Lane LOS	A	B	A	A
Approach Delay (s)	9.8	11.6	2.6	0.4
Approach LOS	A	B		

Intersection Summary			
Average Delay		3.4	
Intersection Capacity Utilization	28.3%		ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 5: Mason Creek Rd & Post Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	190	145	10	10	270	5	5	5	5	0	10	180
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	158	11	11	293	5	5	5	5	0	11	196
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	299			168			1095	897	163	902	899	296
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	299			168			1095	897	163	902	899	296
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	83			99			95	98	99	100	95	73
cM capacity (veh/h)	1240			1385			115	228	871	215	227	734

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	375	310	16	207
Volume Left	207	11	5	0
Volume Right	11	5	5	196
cSH	1240	1385	211	657
Volume to Capacity	0.17	0.01	0.08	0.31
Queue Length 95th (ft)	15	1	6	34
Control Delay (s)	5.4	0.3	23.5	13.0
Lane LOS	A	A	C	B
Approach Delay (s)	5.4	0.3	23.5	13.0
Approach LOS			C	B

Intersection Summary			
Average Delay		5.7	
Intersection Capacity Utilization	55.5%		ICU Level of Service
Analysis Period (min)	15		B

## **2015 Opening Year**

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	320	5	120	155	5	285
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	348	5	130	168	5	310
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			353		780	351
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			353		780	351
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			89		98	55
cM capacity (veh/h)			1184		319	684
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	353	299	315			
Volume Left	0	130	5			
Volume Right	5	0	310			
cSH	1700	1184	671			
Volume to Capacity	0.21	0.11	0.47			
Queue Length 95th (ft)	0	9	63			
Control Delay (s)	0.0	4.3	15.0			
Lane LOS		A	C			
Approach Delay (s)	0.0	4.3	15.0			
Approach LOS			C			
Intersection Summary						
Average Delay			6.2			
Intersection Capacity Utilization			59.9%	ICU Level of Service		B
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	225	15	5	80	35	5	70	5	90	155	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	245	16	5	87	38	5	76	5	98	168	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	125			261			476	399	253	424	389	106
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	125			261			476	399	253	424	389	106
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			99	86	99	79	69	99
cM capacity (veh/h)	1437			1281			366	528	776	468	536	937

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	266	130	87	277
Volume Left	5	5	5	98
Volume Right	16	38	5	11
cSH	1437	1281	524	518
Volume to Capacity	0.00	0.00	0.17	0.53
Queue Length 95th (ft)	0	0	15	78
Control Delay (s)	0.2	0.4	13.2	19.7
Lane LOS	A	A	B	C
Approach Delay (s)	0.2	0.4	13.2	19.7
Approach LOS			B	C

### Intersection Summary

Average Delay	8.8
Intersection Capacity Utilization	41.7%
ICU Level of Service	A
Analysis Period (min)	15

# HCM Unsignalized Intersection Capacity Analysis

## 3: Conners Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	250	90	0	95	10	55	5	5	15	5	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	272	98	0	103	11	60	5	5	16	5	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	114			370			432	435	321	438	478	109
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	114			370			432	435	321	438	478	109
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			89	99	99	97	99	100
cM capacity (veh/h)	1450			1167			522	509	711	514	480	934

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	370	114	71	22
Volume Left	0	0	60	16
Volume Right	98	11	5	0
cSH	1450	1167	532	505
Volume to Capacity	0.00	0.00	0.13	0.04
Queue Length 95th (ft)	0	0	11	3
Control Delay (s)	0.0	0.0	12.8	12.4
Lane LOS			B	B
Approach Delay (s)	0.0	0.0	12.8	12.4
Approach LOS			B	B

### Intersection Summary

Average Delay		2.0		
Intersection Capacity Utilization		29.5%	ICU Level of Service	A
Analysis Period (min)		15		

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	5	70	5	5	5	50	80	5	5	170	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	76	5	5	5	54	87	5	5	185	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	405	399	188	476	399	90	190			92		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	405	399	188	476	399	90	190			92		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	99	91	99	99	99	96			100		
cM capacity (veh/h)	524	509	844	430	509	957	1360			1477		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	87	16	147	196
Volume Left	5	5	54	5
Volume Right	76	5	5	5
cSH	782	563	1360	1477
Volume to Capacity	0.11	0.03	0.04	0.00
Queue Length 95th (ft)	9	2	3	0
Control Delay (s)	10.2	11.6	3.1	0.2
Lane LOS	B	B	A	A
Approach Delay (s)	10.2	11.6	3.1	0.2
Approach LOS	B	B		

Intersection Summary			
Average Delay		3.5	
Intersection Capacity Utilization	31.8%		ICU Level of Service
Analysis Period (min)	15		A

# HCM Unsignalized Intersection Capacity Analysis

## 5: Mason Creek Rd & Post Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	115	290	5	5	130	0	10	5	10	0	5	280
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	125	315	5	5	141	0	11	5	11	0	5	304
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	141			321			1027	720	318	734	723	141
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	141			321			1027	720	318	734	723	141
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	91			100			91	98	98	100	98	66
cM capacity (veh/h)	1417			1217			127	317	713	299	316	896

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	446	147	27	310
Volume Left	125	5	11	0
Volume Right	5	0	11	304
cSH	1417	1217	230	868
Volume to Capacity	0.09	0.00	0.12	0.36
Queue Length 95th (ft)	7	0	10	41
Control Delay (s)	2.8	0.3	22.8	11.4
Lane LOS	A	A	C	B
Approach Delay (s)	2.8	0.3	22.8	11.4
Approach LOS			C	B

Intersection Summary			
Average Delay		5.9	
Intersection Capacity Utilization	56.6%		ICU Level of Service
Analysis Period (min)	15		B

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	190	5	290	355	5	150
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	5	315	386	5	163
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			212		1226	209
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			212		1226	209
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			76		96	80
cM capacity (veh/h)			1335		148	821
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	212	701	168			
Volume Left	0	315	5			
Volume Right	5	0	163			
cSH	1700	1335	716			
Volume to Capacity	0.12	0.24	0.24			
Queue Length 95th (ft)	0	23	23			
Control Delay (s)	0.0	5.3	11.6			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.3	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			5.2			
Intersection Capacity Utilization			64.6%	ICU Level of Service		C
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	20	140	10	5	280	75	10	155	10	50	80	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	152	11	5	304	82	11	168	11	54	87	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	386			163			606	598	158	652	562	345
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	386			163			606	598	158	652	562	345
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	98			100			97	58	99	78	79	99
cM capacity (veh/h)	1151			1392			331	401	877	245	420	689

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	185	391	190	147
Volume Left	22	5	11	54
Volume Right	11	82	11	5
cSH	1151	1392	409	336
Volume to Capacity	0.02	0.00	0.47	0.44
Queue Length 95th (ft)	1	0	60	53
Control Delay (s)	1.1	0.1	21.2	23.7
Lane LOS	A	A	C	C
Approach Delay (s)	1.1	0.1	21.2	23.7
Approach LOS			C	C

Intersection Summary			
Average Delay		8.5	
Intersection Capacity Utilization	46.9%		ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 3: Conners Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	155	60	0	280	15	55	15	0	15	15	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	168	65	0	304	16	60	16	0	16	16	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	321			234			527	522	201	522	546	312
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	321			234			527	522	201	522	546	312
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			86	96	100	96	96	99
cM capacity (veh/h)	1217			1311			439	454	830	447	439	719

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	234	321	76	38
Volume Left	0	0	60	16
Volume Right	65	16	0	5
cSH	1217	1311	442	469
Volume to Capacity	0.00	0.00	0.17	0.08
Queue Length 95th (ft)	0	0	15	7
Control Delay (s)	0.0	0.0	14.8	13.4
Lane LOS			B	B
Approach Delay (s)	0.0	0.0	14.8	13.4
Approach LOS			B	B

### Intersection Summary

Average Delay		2.4		
Intersection Capacity Utilization		29.0%	ICU Level of Service	A
Analysis Period (min)		15		

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mann Rd & Conners Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	5	50	5	5	5	70	150	5	5	90	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	54	5	5	5	76	163	5	5	98	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	438	432	101	486	432	166	103			168		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	438	432	101	486	432	166	103			168		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	99	94	99	99	99	95			100		
cM capacity (veh/h)	493	482	944	434	482	868	1464			1385		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	65	16	245	109
Volume Left	5	5	76	5
Volume Right	54	5	5	5
cSH	817	542	1464	1385
Volume to Capacity	0.08	0.03	0.05	0.00
Queue Length 95th (ft)	6	2	4	0
Control Delay (s)	9.8	11.8	2.7	0.4
Lane LOS	A	B	A	A
Approach Delay (s)	9.8	11.8	2.7	0.4
Approach LOS	A	B		

Intersection Summary			
Average Delay		3.5	
Intersection Capacity Utilization	29.2%		ICU Level of Service
Analysis Period (min)	15		A

# HCM Unsignalized Intersection Capacity Analysis

## 5: Mann Rd & Post Rd

8/22/2011

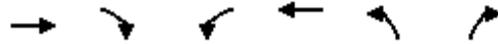


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	195	150	10	10	280	5	5	5	5	0	10	185
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	212	163	11	11	304	5	5	5	5	0	11	201
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	310			174			1128	924	168	929	927	307
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	310			174			1128	924	168	929	927	307
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	83			99			95	98	99	100	95	72
cM capacity (veh/h)	1228			1379			107	218	865	205	217	724
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	386	321	16	212								
Volume Left	212	11	5	0								
Volume Right	11	5	5	201								
cSH	1228	1379	199	646								
Volume to Capacity	0.17	0.01	0.08	0.33								
Queue Length 95th (ft)	16	1	7	36								
Control Delay (s)	5.4	0.3	24.7	13.3								
Lane LOS	A	A	C	B								
Approach Delay (s)	5.4	0.3	24.7	13.3								
Approach LOS			C	B								
<b>Intersection Summary</b>												
Average Delay			5.8									
Intersection Capacity Utilization			56.9%		ICU Level of Service				B			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕		↗
Volume (veh/h)	585	5	0	275	0	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	636	5	0	299	0	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	959					
pX, platoon unblocked			0.96		0.96	0.96
vC, conflicting volume			641		938	639
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			608		916	606
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	95
cM capacity (veh/h)			916		286	472

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	641	299	22
Volume Left	0	0	0
Volume Right	5	0	22
cSH	1700	1700	472
Volume to Capacity	0.38	0.18	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	13.0
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.0
Approach LOS			B

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	41.1%		ICU Level of Service A
Analysis Period (min)	15		

# HCM Signalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	220	110	125	75	35	70	70	275	90	155	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1703	1792	1524	1703	1792	1524	1703	1792	1524	1703	1776	
Flt Permitted	0.70	1.00	1.00	0.34	1.00	1.00	0.64	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	1261	1792	1524	615	1792	1524	1155	1792	1524	1268	1776	
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
Adj. Flow (vph)	5	239	120	136	82	38	76	76	299	98	168	11
RTOR Reduction (vph)	0	0	94	0	0	23	0	0	151	0	2	0
Lane Group Flow (vph)	5	239	26	136	82	15	76	76	148	98	177	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	14.2	14.2	14.2	25.4	25.4	25.4	32.8	32.8	32.8	32.8	32.8	32.8
Effective Green, g (s)	14.2	14.2	14.2	25.4	25.4	25.4	32.8	32.8	32.8	32.8	32.8	32.8
Actuated g/C Ratio	0.21	0.21	0.21	0.38	0.38	0.38	0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	270	384	327	354	688	585	572	888	755	628	880	
v/s Ratio Prot		c0.13		c0.04	0.05			0.04			c0.10	
v/s Ratio Perm	0.00		0.02	0.11		0.01	0.07		0.10	0.08		
v/c Ratio	0.02	0.62	0.08	0.38	0.12	0.02	0.13	0.09	0.20	0.16	0.20	
Uniform Delay, d1	20.5	23.6	20.8	14.2	13.2	12.7	9.0	8.8	9.3	9.1	9.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	3.1	0.1	0.7	0.1	0.0	0.5	0.2	0.6	0.5	0.5	
Delay (s)	20.5	26.7	20.9	14.9	13.3	12.7	9.5	9.0	9.9	9.7	9.9	
Level of Service	C	C	C	B	B	B	A	A	A	A	A	
Approach Delay (s)		24.7			14.1			9.7			9.8	
Approach LOS		C			B			A			A	

### Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	66.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 3: US 78/SR 8 & Conners Rd

8/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↗	↘	
Volume (veh/h)	0	340	150	15	20	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	370	163	16	22	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)			883			
pX, platoon unblocked						
vC, conflicting volume	179				533	163
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	179				533	163
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				96	100
cM capacity (veh/h)	1372				501	871

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	370	163	16	22
Volume Left	0	0	0	22
Volume Right	0	0	16	0
cSH	1372	1700	1700	501
Volume to Capacity	0.00	0.10	0.01	0.04
Queue Length 95th (ft)	0	0	0	3
Control Delay (s)	0.0	0.0	0.0	12.5
Lane LOS				B
Approach Delay (s)	0.0	0.0		12.5
Approach LOS				B

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		27.9%	ICU Level of Service A
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	5	23	5	5	10	20	375	5	5	337	53
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	5	25	5	5	11	22	408	5	5	366	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None				None
Median storage (veh)												
Upstream signal (ft)												382
pX, platoon unblocked	0.98	0.98	0.98	0.98	0.98		0.98					
vC, conflicting volume	871	862	395	859	889	410	424			413		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	858	850	373	846	877	410	403			413		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	83	98	96	98	98	98	98			100		
cM capacity (veh/h)	254	281	651	253	271	633	1113			1125		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	74	22	22	413	5	424						
Volume Left	43	5	22	0	5	0						
Volume Right	25	11	0	5	0	58						
cSH	323	370	1113	1700	1125	1700						
Volume to Capacity	0.23	0.06	0.02	0.24	0.00	0.25						
Queue Length 95th (ft)	22	5	1	0	0	0						
Control Delay (s)	19.4	15.3	8.3	0.0	8.2	0.0						
Lane LOS	C	C	A		A							
Approach Delay (s)	19.4	15.3	0.4		0.1							
Approach LOS	C	C										
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			35.8%	ICU Level of Service	A							
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 6: Post Rd & Mason Creek Rd

8/22/2011



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	10	380	30	5	400
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	11	413	33	5	435
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						929
pX, platoon unblocked						
vC, conflicting volume	875	429			446	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	875	429			446	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	97	98			100	
cM capacity (veh/h)	313	617			1094	

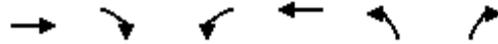
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	22	446	5	435
Volume Left	11	0	5	0
Volume Right	11	33	0	0
cSH	415	1700	1094	1700
Volume to Capacity	0.05	0.26	0.00	0.26
Queue Length 95th (ft)	4	0	0	0
Control Delay (s)	14.1	0.0	8.3	0.0
Lane LOS	B		A	
Approach Delay (s)	14.1	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay			0.4
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)			15

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩		↩
Volume (veh/h)	325	5	0	645	0	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	353	5	0	701	0	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	959					
pX, platoon unblocked						
vC, conflicting volume			359	1057	356	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			359	1057	356	
tC, single (s)			4.2	6.5	6.3	
tC, 2 stage (s)						
tF (s)			2.3	3.6	3.4	
p0 queue free %			100	100	98	
cM capacity (veh/h)			1178	245	679	

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	359	701	16
Volume Left	0	0	0
Volume Right	5	0	16
cSH	1700	1700	679
Volume to Capacity	0.21	0.41	0.02
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		37.3%	ICU Level of Service
Analysis Period (min)		15	A

# HCM Signalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	140	85	295	275	75	85	155	145	50	80	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1703	1792	1524	1703	1792	1524	1703	1792	1524	1703	1778	
Flt Permitted	0.58	1.00	1.00	0.45	1.00	1.00	0.70	1.00	1.00	0.65	1.00	
Satd. Flow (perm)	1035	1792	1524	807	1792	1524	1250	1792	1524	1167	1778	
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
Adj. Flow (vph)	22	152	92	321	299	82	92	168	158	54	87	5
RTOR Reduction (vph)	0	0	76	0	0	45	0	0	93	0	2	0
Lane Group Flow (vph)	22	152	16	321	299	37	92	168	65	54	90	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	10.6	10.6	10.6	27.8	27.8	27.8	25.2	25.2	25.2	25.2	25.2	
Effective Green, g (s)	10.6	10.6	10.6	27.8	27.8	27.8	25.2	25.2	25.2	25.2	25.2	
Actuated g/C Ratio	0.17	0.17	0.17	0.46	0.46	0.46	0.41	0.41	0.41	0.41	0.41	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	180	311	265	562	817	695	516	740	630	482	735	
v/s Ratio Prot		0.08		c0.12	0.17			c0.09			0.05	
v/s Ratio Perm	0.02		0.01	c0.14		0.02	0.07		0.04	0.05		
v/c Ratio	0.12	0.49	0.06	0.57	0.37	0.05	0.18	0.23	0.10	0.11	0.12	
Uniform Delay, d1	21.3	22.8	21.0	11.4	10.8	9.3	11.3	11.6	11.0	11.0	11.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	1.2	0.1	1.4	0.3	0.0	0.8	0.7	0.3	0.5	0.3	
Delay (s)	21.6	24.0	21.1	12.8	11.1	9.3	12.1	12.3	11.3	11.5	11.4	
Level of Service	C	C	C	B	B	A	B	B	B	B	B	
Approach Delay (s)		22.8			11.7			11.9			11.4	
Approach LOS		C			B			B			B	

### Intersection Summary

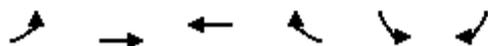
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	61.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 3: US 78/SR 8 & Conners Rd

8/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↗	↘	
Volume (veh/h)	0	215	335	30	30	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	234	364	33	33	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)			883			
pX, platoon unblocked						
vC, conflicting volume	397				598	364
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	397				598	364
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				93	99
cM capacity (veh/h)	1140				459	672

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	234	364	33	38
Volume Left	0	0	0	33
Volume Right	0	0	33	5
cSH	1140	1700	1700	481
Volume to Capacity	0.00	0.21	0.02	0.08
Queue Length 95th (ft)	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	13.1
Lane LOS				B
Approach Delay (s)	0.0	0.0		13.1
Approach LOS				B

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		27.6%	ICU Level of Service A
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	5	13	5	5	15	10	345	5	5	417	43
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	5	14	5	5	16	11	375	5	5	453	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None				None
Median storage (veh)												
Upstream signal (ft)												382
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	903	890	477	880	910	378	500			380		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	833	818	356	807	841	378	382			380		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	93	98	98	98	98	98	99			100		
cM capacity (veh/h)	241	270	608	251	261	660	1033			1156		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	36	27	11	380	5	500						
Volume Left	16	5	11	0	5	0						
Volume Right	14	16	0	5	0	47						
cSH	323	405	1033	1700	1156	1700						
Volume to Capacity	0.11	0.07	0.01	0.22	0.00	0.29						
Queue Length 95th (ft)	9	5	1	0	0	0						
Control Delay (s)	17.5	14.5	8.5	0.0	8.1	0.0						
Lane LOS	C	B	A		A							
Approach Delay (s)	17.5	14.5	0.2		0.1							
Approach LOS	C	B										
Intersection Summary												
Average Delay			1.2									
Intersection Capacity Utilization			35.0%	ICU Level of Service	A							
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 6: Post Rd & Mason Creek Rd

8/22/2011



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	15	330	25	10	475
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	16	359	27	11	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						929
pX, platoon unblocked						
vC, conflicting volume	910	372			386	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	910	372			386	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	98	98			99	
cM capacity (veh/h)	297	665			1151	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	22	386	11	516
Volume Left	5	0	11	0
Volume Right	16	27	0	0
cSH	508	1700	1151	1700
Volume to Capacity	0.04	0.23	0.01	0.30
Queue Length 95th (ft)	3	0	1	0
Control Delay (s)	12.4	0.0	8.2	0.0
Lane LOS	B		A	
Approach Delay (s)	12.4	0.0	0.2	
Approach LOS	B			

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		35.0%	ICU Level of Service
Analysis Period (min)		15	A

**2035 Design Year**

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	470	5	175	225	5	420
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	511	5	190	245	5	457
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			516		1139	514
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			516		1139	514
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			82		97	17
cM capacity (veh/h)			1029		178	553

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	516	435	462
Volume Left	0	190	5
Volume Right	5	0	457
cSH	1700	1029	540
Volume to Capacity	0.30	0.18	0.86
Queue Length 95th (ft)	0	17	229
Control Delay (s)	0.0	5.2	39.5
Lane LOS		A	E
Approach Delay (s)	0.0	5.2	39.5
Approach LOS			E

Intersection Summary			
Average Delay		14.5	
Intersection Capacity Utilization		82.8%	ICU Level of Service E
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	10	335	25	10	115	55	10	105	10	130	225	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	364	27	11	125	60	11	114	11	141	245	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	185			391			715	606	378	644	590	155
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	185			391			715	606	378	644	590	155
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			99			94	71	98	51	40	98
cM capacity (veh/h)	1366			1146			173	399	660	288	408	880

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	402	196	136	402
Volume Left	11	11	11	141
Volume Right	27	60	11	16
cSH	1366	1146	372	362
Volume to Capacity	0.01	0.01	0.37	1.11
Queue Length 95th (ft)	1	1	41	375
Control Delay (s)	0.3	0.5	20.2	114.2
Lane LOS	A	A	C	F
Approach Delay (s)	0.3	0.5	20.2	114.2
Approach LOS			C	F

### Intersection Summary

Average Delay	43.0
Intersection Capacity Utilization	55.5%
ICU Level of Service	B
Analysis Period (min)	15

# HCM Unsignalized Intersection Capacity Analysis

## 3: Conners Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	370	130	0	140	15	80	10	5	25	10	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	402	141	0	152	16	87	11	5	27	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	168			543			639	641	473	644	704	160
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	168			543			639	641	473	644	704	160
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			77	97	99	93	97	100
cM capacity (veh/h)	1385			1006			375	388	583	369	357	874

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	543	168	103	38
Volume Left	0	0	87	27
Volume Right	141	16	5	0
cSH	1385	1006	383	365
Volume to Capacity	0.00	0.00	0.27	0.10
Queue Length 95th (ft)	0	0	27	9
Control Delay (s)	0.0	0.0	17.8	16.0
Lane LOS			C	C
Approach Delay (s)	0.0	0.0	17.8	16.0
Approach LOS			C	C

### Intersection Summary

Average Delay		2.9		
Intersection Capacity Utilization		40.4%	ICU Level of Service	A
Analysis Period (min)		15		

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	5	100	10	5	5	70	115	10	5	250	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	109	11	5	5	76	125	11	5	272	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	576	573	274	679	571	130	277			136		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	576	573	274	679	571	130	277			136		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	99	86	96	99	99	94			100		
cM capacity (veh/h)	395	397	755	290	398	909	1263			1424		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	120	22	212	283
Volume Left	5	11	76	5
Volume Right	109	5	11	5
cSH	697	381	1263	1424
Volume to Capacity	0.17	0.06	0.06	0.00
Queue Length 95th (ft)	15	5	5	0
Control Delay (s)	11.2	15.0	3.2	0.2
Lane LOS	B	C	A	A
Approach Delay (s)	11.2	15.0	3.2	0.2
Approach LOS	B	C		

Intersection Summary			
Average Delay		3.8	
Intersection Capacity Utilization	41.0%		ICU Level of Service
Analysis Period (min)	15		A

# HCM Unsignalized Intersection Capacity Analysis

## 5: Mason Creek Rd & Post Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	170	430	10	10	190	0	15	10	15	0	5	410
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	185	467	11	11	207	0	16	11	16	0	5	446
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	207			478			1519	1071	473	1092	1076	207
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	207			478			1519	1071	473	1092	1076	207
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	86			99			57	94	97	100	97	46
cM capacity (veh/h)	1341			1063			38	185	583	156	184	824

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	663	217	43	451
Volume Left	185	11	16	0
Volume Right	11	0	16	446
cSH	1341	1063	84	791
Volume to Capacity	0.14	0.01	0.52	0.57
Queue Length 95th (ft)	12	1	56	92
Control Delay (s)	3.4	0.5	86.3	15.4
Lane LOS	A	A	F	C
Approach Delay (s)	3.4	0.5	86.3	15.4
Approach LOS			F	C

Intersection Summary			
Average Delay		9.5	
Intersection Capacity Utilization	78.8%		ICU Level of Service
Analysis Period (min)		15	D

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	280	10	425	525	10	220
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	304	11	462	571	11	239
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			315		1804	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			315		1804	310
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			62		79	67
cM capacity (veh/h)			1223		53	721

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	315	1033	250
Volume Left	0	462	11
Volume Right	11	0	239
cSH	1700	1223	466
Volume to Capacity	0.19	0.38	0.54
Queue Length 95th (ft)	0	45	78
Control Delay (s)	0.0	7.4	21.3
Lane LOS		A	C
Approach Delay (s)	0.0	7.4	21.3
Approach LOS			C

Intersection Summary			
Average Delay		8.1	
Intersection Capacity Utilization	90.7%		ICU Level of Service E
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	30	205	15	10	415	110	15	230	15	70	120	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	223	16	11	451	120	16	250	16	76	130	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	571			239			905	889	231	970	837	511
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	571			239			905	889	231	970	837	511
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	97			99			89	6	98	0	54	98
cM capacity (veh/h)	982			1305			155	267	798	37	286	555

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	272	582	283	217
Volume Left	33	11	16	76
Volume Right	16	120	16	11
cSH	982	1305	266	87
Volume to Capacity	0.03	0.01	1.06	2.51
Queue Length 95th (ft)	3	1	285	509
Control Delay (s)	1.4	0.2	114.3	788.8
Lane LOS	A	A	F	F
Approach Delay (s)	1.4	0.2	114.3	788.8
Approach LOS			F	F

Intersection Summary			
Average Delay		150.9	
Intersection Capacity Utilization		65.0%	ICU Level of Service C
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 3: Conners Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	0	230	90	0	415	25	80	20	0	20	20	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	250	98	0	451	27	87	22	0	22	22	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	478			348			780	777	299	774	812	465
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	478			348			780	777	299	774	812	465
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			70	93	100	93	93	99
cM capacity (veh/h)	1063			1189			289	323	731	295	308	589

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	348	478	109	49
Volume Left	0	0	87	22
Volume Right	98	27	0	5
cSH	1063	1189	295	319
Volume to Capacity	0.00	0.00	0.37	0.15
Queue Length 95th (ft)	0	0	41	13
Control Delay (s)	0.0	0.0	24.2	18.3
Lane LOS			C	C
Approach Delay (s)	0.0	0.0	24.2	18.3
Approach LOS			C	C

### Intersection Summary

Average Delay		3.6	
Intersection Capacity Utilization		39.4%	ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	5	70	10	5	5	100	220	10	5	135	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	76	11	5	5	109	239	11	5	147	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None				None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	630	628	149	701	625	245	152			250		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	630	628	149	701	625	245	152			250		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	98	99	91	96	99	99	92			100		
cM capacity (veh/h)	358	363	887	295	364	784	1404			1293		
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>	<b>SB 1</b>								
Volume Total	87	22	359	158								
Volume Left	5	11	109	5								
Volume Right	76	5	11	5								
cSH	750	370	1404	1293								
Volume to Capacity	0.12	0.06	0.08	0.00								
Queue Length 95th (ft)	10	5	6	0								
Control Delay (s)	10.4	15.3	2.8	0.3								
Lane LOS	B	C	A	A								
Approach Delay (s)	10.4	15.3	2.8	0.3								
Approach LOS	B	C										
<b>Intersection Summary</b>												
Average Delay			3.7									
Intersection Capacity Utilization			40.3%		ICU Level of Service				A			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 5: Mason Creek Rd & Post Rd

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	290	220	15	15	410	5	10	10	10	0	15	270
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	315	239	16	16	446	5	11	11	11	0	16	293
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	451			255			1660	1361	247	1375	1367	448
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	451			255			1660	1361	247	1375	1367	448
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	71			99			59	89	99	100	84	51
cM capacity (veh/h)	1089			1287			26	102	782	84	101	602

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	571	467	33	310
Volume Left	315	16	11	0
Volume Right	16	5	11	293
cSH	1089	1287	61	478
Volume to Capacity	0.29	0.01	0.53	0.65
Queue Length 95th (ft)	30	1	53	114
Control Delay (s)	6.8	0.4	117.2	25.4
Lane LOS	A	A	F	D
Approach Delay (s)	6.8	0.4	117.2	25.4
Approach LOS			F	D

### Intersection Summary

Average Delay		11.4		
Intersection Capacity Utilization		78.7%	ICU Level of Service	D
Analysis Period (min)		15		

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔		↔
Volume (veh/h)	860	5	0	400	0	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	935	5	0	435	0	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	959					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			940		1372	938
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			845		1351	842
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	89
cM capacity (veh/h)			662		139	306

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	940	435	33
Volume Left	0	0	0
Volume Right	5	0	33
cSH	1700	1700	306
Volume to Capacity	0.55	0.26	0.11
Queue Length 95th (ft)	0	0	9
Control Delay (s)	0.0	0.0	18.2
Lane LOS			C
Approach Delay (s)	0.0	0.0	18.2
Approach LOS			C

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		55.6%	ICU Level of Service B
Analysis Period (min)		15	

# HCM Signalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	330	165	185	110	55	105	105	405	130	225	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1703	1792	1524	1703	1792	1524	1703	1792	1524	1703	1776	
Flt Permitted	0.68	1.00	1.00	0.26	1.00	1.00	0.53	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	1219	1792	1524	457	1792	1524	954	1792	1524	1225	1776	
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
Adj. Flow (vph)	11	359	179	201	120	60	114	114	440	141	245	16
RTOR Reduction (vph)	0	0	129	0	0	31	0	0	260	0	2	0
Lane Group Flow (vph)	11	359	50	201	120	29	114	114	180	141	259	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	Perm	NA
Protected Phases		4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	20.2	20.2	20.2	34.6	34.6	34.6	29.4	29.4	29.4	29.4	29.4	29.4
Effective Green, g (s)	20.2	20.2	20.2	34.6	34.6	34.6	29.4	29.4	29.4	29.4	29.4	29.4
Actuated g/C Ratio	0.28	0.28	0.28	0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.41	0.41
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	503	428	400	861	732	390	732	622	500	725	
v/s Ratio Prot		c0.20		c0.07	0.07			0.06			c0.15	
v/s Ratio Perm	0.01		0.03	0.17		0.02	0.12		0.12	0.12		
v/c Ratio	0.03	0.71	0.12	0.50	0.14	0.04	0.29	0.16	0.29	0.28	0.36	
Uniform Delay, d1	18.8	23.3	19.3	12.5	10.4	9.9	14.3	13.5	14.3	14.2	14.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	4.8	0.1	1.0	0.1	0.0	1.9	0.5	1.2	1.4	1.4	
Delay (s)	18.8	28.1	19.4	13.5	10.5	9.9	16.2	13.9	15.5	15.7	16.1	
Level of Service	B	C	B	B	B	A	B	B	B	B	B	
Approach Delay (s)		25.1			12.0			15.3			16.0	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 3: US 78/SR 8 & Conners Rd

8/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↗	↘	
Volume (veh/h)	0	500	220	25	35	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	543	239	27	38	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)			883			
pX, platoon unblocked						
vC, conflicting volume	266				783	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	266				783	239
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				89	100
cM capacity (veh/h)	1275				357	790

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	543	239	27	38
Volume Left	0	0	0	38
Volume Right	0	0	27	0
cSH	1275	1700	1700	357
Volume to Capacity	0.00	0.14	0.02	0.11
Queue Length 95th (ft)	0	0	0	9
Control Delay (s)	0.0	0.0	0.0	16.3
Lane LOS				C
Approach Delay (s)	0.0	0.0		16.3
Approach LOS				C

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		36.3%	ICU Level of Service A
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Connors Rd

8/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	5	30	10	5	10	10	565	10	5	495	75
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	5	33	11	5	11	11	614	11	5	538	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												382
pX, platoon unblocked	0.88	0.88	0.88	0.88	0.88		0.88					
vC, conflicting volume	1239	1236	579	1226	1272	620	620			625		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1204	1201	455	1189	1241	620	501			625		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	67	97	94	92	96	98	99			99		
cM capacity (veh/h)	130	157	526	129	149	481	919			937		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	82	27	11	625	5	620						
Volume Left	43	11	11	0	5	0						
Volume Right	33	11	0	11	0	82						
cSH	190	189	919	1700	937	1700						
Volume to Capacity	0.43	0.14	0.01	0.37	0.01	0.36						
Queue Length 95th (ft)	49	12	1	0	0	0						
Control Delay (s)	37.6	27.2	9.0	0.0	8.9	0.0						
Lane LOS	E	D	A		A							
Approach Delay (s)	37.6	27.2	0.2		0.1							
Approach LOS	E	D										
Intersection Summary												
Average Delay			2.9									
Intersection Capacity Utilization			43.6%	ICU Level of Service		A						
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 6: Post Rd & Mason Creek Rd

8/22/2011



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	15	15	560	50	5	585
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	16	609	54	5	636
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						929
pX, platoon unblocked						
vC, conflicting volume	1283	636			663	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1283	636			663	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	91	97			99	
cM capacity (veh/h)	178	471			907	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	33	663	5	636
Volume Left	16	0	5	0
Volume Right	16	54	0	0
cSH	258	1700	907	1700
Volume to Capacity	0.13	0.39	0.01	0.37
Queue Length 95th (ft)	11	0	0	0
Control Delay (s)	21.0	0.0	9.0	0.0
Lane LOS	C		A	
Approach Delay (s)	21.0	0.0	0.1	
Approach LOS	C			

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		42.5%	ICU Level of Service
Analysis Period (min)		15	A

# HCM Unsignalized Intersection Capacity Analysis

## 1: Post Rd & US 78/SR 8

8/22/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩		↩
Volume (veh/h)	480	10	0	950	0	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	522	11	0	1033	0	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	959					
pX, platoon unblocked			0.99		0.99	0.99
vC, conflicting volume			533		1560	527
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			520		1561	514
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	96
cM capacity (veh/h)			1013		119	545

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	533	1033	22
Volume Left	0	0	0
Volume Right	11	0	22
cSH	1700	1700	545
Volume to Capacity	0.31	0.61	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	11.9
Lane LOS			B
Approach Delay (s)	0.0	0.0	11.9
Approach LOS			B

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		53.3%	ICU Level of Service
Analysis Period (min)		15	A

# HCM Signalized Intersection Capacity Analysis

## 2: Mason Creek Rd/Mann Rd & US 78/SR 8

8/22/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	205	125	435	405	110	125	230	215	70	120	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1703	1792	1524	1703	1792	1524	1703	1792	1524	1703	1771	
Flt Permitted	0.51	1.00	1.00	0.37	1.00	1.00	0.67	1.00	1.00	0.52	1.00	
Satd. Flow (perm)	910	1792	1524	662	1792	1524	1196	1792	1524	939	1771	
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
Adj. Flow (vph)	33	223	136	473	440	120	136	250	234	76	130	11
RTOR Reduction (vph)	0	0	107	0	0	55	0	0	156	0	3	0
Lane Group Flow (vph)	33	223	29	473	440	65	136	250	78	76	138	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	13.6	13.6	13.6	34.4	34.4	34.4	21.4	21.4	21.4	21.4	21.4	21.4
Effective Green, g (s)	13.6	13.6	13.6	34.4	34.4	34.4	21.4	21.4	21.4	21.4	21.4	21.4
Actuated g/C Ratio	0.21	0.21	0.21	0.54	0.54	0.54	0.34	0.34	0.34	0.34	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	194	382	325	631	966	822	401	601	511	315	594	
v/s Ratio Prot		0.12		c0.20	0.25			c0.14			0.08	
v/s Ratio Perm	0.04		0.02	c0.21		0.04	0.11		0.05	0.08		
v/c Ratio	0.17	0.58	0.09	0.75	0.46	0.08	0.34	0.42	0.15	0.24	0.23	
Uniform Delay, d1	20.5	22.6	20.1	10.1	9.0	7.1	15.9	16.4	14.9	15.3	15.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	2.3	0.1	4.9	0.3	0.0	2.3	2.1	0.6	1.8	0.9	
Delay (s)	20.9	24.8	20.3	14.9	9.3	7.1	18.2	18.5	15.5	17.1	16.2	
Level of Service	C	C	C	B	A	A	B	B	B	B	B	
Approach Delay (s)		22.9			11.6			17.3			16.5	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	63.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 3: US 78/SR 8 & Conners Rd

8/22/2011



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↗	↘	
Volume (veh/h)	0	320	495	45	40	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	348	538	49	43	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)			883			
pX, platoon unblocked	0.93				0.93	0.93
vC, conflicting volume	587				886	538
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	520				841	467
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				86	99
cM capacity (veh/h)	956				307	547

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	348	538	49	49
Volume Left	0	0	0	43
Volume Right	0	0	49	5
cSH	956	1700	1700	323
Volume to Capacity	0.00	0.32	0.03	0.15
Queue Length 95th (ft)	0	0	0	13
Control Delay (s)	0.0	0.0	0.0	18.1
Lane LOS				C
Approach Delay (s)	0.0	0.0		18.1
Approach LOS				C

Intersection Summary			
Average Delay		0.9	
Intersection Capacity Utilization		36.1%	ICU Level of Service A
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 4: Mason Creek Rd & Conners Rd

8/22/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	5	15	10	5	20	10	510	10	5	615	60
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	5	16	11	5	22	11	554	11	5	668	65
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None				None
Median storage (veh)												
Upstream signal (ft)												382
pX, platoon unblocked	0.82	0.82	0.82	0.82	0.82		0.82					
vC, conflicting volume	1312	1299	701	1280	1326	560	734			565		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1272	1256	530	1233	1289	560	569			565		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	85	96	96	90	96	96	99			99		
cM capacity (veh/h)	107	136	446	114	130	520	810			987		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	38	38	11	565	5	734						
Volume Left	16	11	11	0	5	0						
Volume Right	16	22	0	11	0	65						
cSH	166	213	810	1700	987	1700						
Volume to Capacity	0.23	0.18	0.01	0.33	0.01	0.43						
Queue Length 95th (ft)	21	16	1	0	0	0						
Control Delay (s)	33.1	25.5	9.5	0.0	8.7	0.0						
Lane LOS	D	D	A		A							
Approach Delay (s)	33.1	25.5	0.2		0.1							
Approach LOS	D	D										
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			46.0%	ICU Level of Service	A							
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 6: Post Rd & Mason Creek Rd

8/22/2011



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	25	490	35	15	695
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	27	533	38	16	755
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						929
pX, platoon unblocked	0.93					
vC, conflicting volume	1340	552			571	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1328	552			571	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	93	95			98	
cM capacity (veh/h)	154	526			982	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	38	571	16	755
Volume Left	11	0	16	0
Volume Right	27	38	0	0
cSH	311	1700	982	1700
Volume to Capacity	0.12	0.34	0.02	0.44
Queue Length 95th (ft)	10	0	1	0
Control Delay (s)	18.2	0.0	8.7	0.0
Lane LOS	C		A	
Approach Delay (s)	18.2	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		46.6%	ICU Level of Service A
Analysis Period (min)		15	



G R E S H A M  
S M I T H   A N D  
P A R T N E R S

November 16, 2011

## **MEETING MINUTES**

SR 8/US 78 at Mann Road/Mason Creek Road and  
at Post Road Intersection Improvement Concept  
CSSFT-0008-00(375), Douglas County, PI No. 0008375  
GS&P Project No. 26340.11

MEETING            November 10, 2011  
DATE:

PARTICIPANTS: Perry Black - Georgia Department of Transportation (GDOT), Office of  
Program Delivery  
Jun Birnkammer - Georgia Department of Transportation (GDOT), Office of  
Subsurface Utilities  
Jan Phelps - Georgia Department of Transportation (GDOT), Office of  
Subsurface Utilities  
Larry Bowman - Georgia Department of Transportation (GDOT), Office of  
Environmental Services  
Alania Stewart - Georgia Department of Transportation (GDOT), District 7  
Mike Lobdell - Georgia Department of Transportation (GDOT), District 7  
Randy Hulse - Douglas County Department of Transportation (DCDOT)  
Gary Westmoreland – Douglas County Department of Transportation  
(DCDOT)  
Keary Lord – Douglas County Department of Transportation (DCDOT)  
Jody Braswell - Gresham, Smith and Partners (GS&P)  
Eric Rickert - Gresham, Smith and Partners (GS&P)

DISCUSSION:     PROJECT TEAM CONCEPT MEETING

A meeting was held on November 10, 2011 for the Bankhead Highway (SR 8/US 78) at Mann Road/Mason Creek Road and at Post Road Intersection Improvement Concept, GDOT Project CSSFT-0008-00(375), within the Winston community of Douglas County.

GS&P began by discussing the design methodology used to create the findings in the draft concept report and the proposed improvements. GS&P then discussed the recommended concept layout for the project and reviewed the content of the draft concept report.

1. DCDOT questioned whether the driveway for the remaining parcel on the portion of Conners Road that is proposed to be eliminated between Bankhead Highway (US 78/ SR 8) and Mattie McCoy Lane could be tied directly into one of these adjacent roadways. DCDOT stated that such a realignment would allow the existing pavement within the eliminated section of Conners Road to be removed entirely. The design team agreed to consider this.
2. DCDOT requested that proposed 'right-in/right-out' intersection between Bankhead Highway and the northern remnant of Post Road be omitted. It was noted that this

**Design Services For The Built Environment**



PROJECT TEAM CONCEPT MEETING MINUTES  
SR 8/US 78 at Mann Road/Mason Creek Road and  
at Post Road Intersection Improvement Concept  
CSSFT-0008-00(375), Douglas County, PI No. 0008375  
GS&P Project No. 26340.11  
Page 2

- access was shown at the PIOH. The design team responded that they would consider this.
3. DCDOT requested that raised medians be investigated along Bankhead Highway and potentially along Mann Road in the vicinity of their intersection with Mason Creek Road. DCDOT anticipates significant traffic growth through the project area and believes that this would be a preferred access management feature as the area land use changes to commercial. The design team responded that they would consider the raised medians. If raised medians are added to the project, GDOT-Subsurface Utilities stated that they would need updated CAD files. GDOT-SUE noted design files would be provided no later than in time for a July 2012 PFPR.
  4. DCDOT stated the 'rural' functional classifications for many of roadways listed in the draft concept report will need to be reclassified by GDOT as 'urban' once the project is built. GDOT replied that this would be done by the GDOT Office of Transportation Data once the project is open to traffic.
  5. GDOT-Program Delivery and District 7 agreed that the project's B/C ration may need to be revised to include all crashes that have occurred within the project limits instead of just the Bankhead Highway intersection with Mann Road and Mason Creek Road. DCDOT noted that no crashes after 2009 had been included in the draft concept report as they have not yet been processed by GDOT. DCDOT said that they do have 2010-present crash data and offered to provide it for inclusion with the concept report. GS&P will request this data from DCDOT.
  6. GDOT-Program Delivery stated that a VE study may be needed if the right of way costs combined with the construction and utility costs exceed \$10,000,000. A project VE Study is presently scheduled for January 2012.
  7. A Public Interest Determination for utility relocation within the project was discussed among the participants. GDOT-District 7 Utilities was not present for the discussion. The design team recommended to GDOT-Program Delivery that a Public Interest Determination was not needed for this project due to relatively low utility costs (approx. \$300,000) and that the design included shifting of alignments that should aid in utility staging prior and during construction.
  8. Context sensitive solutions within the project were discussed among the participants. Examples of context sensitive solutions that have been incorporated into the present concept include urban border areas with curb and gutter on Mason Creek Road that preserve vegetation and multi-modal accommodations such as crosswalks and sidewalks. DCDOT stated that the roadways within the project are not listed as bicycle routes in the Douglas County Bicycle Plan.
  9. The commercial property in the southwest corner of the intersection of Bankhead Highway, Mann Road, and Mason Creek Road was discussed. The current access to the property is inadequate and unfortunately cannot be enhanced with the project improvements. The access is currently too close to the intersection and is suspected to contribute to the unsafe conditions that are currently present at the intersection. In addition to accessing the public right of way, the commercial interior site access is poor and it appears that the existing fuel pumps are on the right of way line. For these reasons the design team recommends the acquisition of this parcel.
  10. An alternative concept layout that was mentioned at the PIOH was discussed. This entailed extending Post Road from its current terminus with Bankhead Highway and connecting with Mann Road north of its present intersection with Bankhead Highway



PROJECT TEAM CONCEPT MEETING MINUTES  
SR 8/US 78 at Mann Road/Mason Creek Road and  
at Post Road Intersection Improvement Concept  
CSSFT-0008-00(375), Douglas County, PI No. 0008375  
GS&P Project No. 26340.11  
Page 3

and Mason Creek Road. This alternative was considered non-viable by the design team due to anticipated impacts to historic resources and environmental issues north of Bankhead Highway. DCDOT added that such an alignment may incur environmental justice issues as well.

11. The project utility costs mentioned in the draft concept report are incorrect. The amount should include just reimbursable utilities and should be corrected in the report and project cost estimate.
12. The other projects listing within the draft concept report should be revised as the Bankhead Highway milling and inlay project has been completed and the I-20 Park and Ride Lot at Interstate 20 is not under construction.

*This represents our understanding of the items discussed at this meeting. If you have any questions or comments concerning any of the information contained herein, please contact me.*

Prepared by: Eric Rickert, PE  
Project Engineer

Copy      File, Attendees



January 20, 2012

Charles R. Alford  
5690 Garden Circle  
Douglasville, GA 30135

Re: Project CSSFT-0008-00(375), Douglas County, P.I. No. 0008375, SR 8/US 78/Bankhead Highway intersection improvements with CR 268/Mann Road/Mason Creek Road and with CR 808/Post Road – Responses to Open House Comments

Dear Charles R. Alford,

Thank you for your comments concerning the proposed project referenced above. We appreciate your participation and all of the input that was received as a result of the October 20, 2011 Public Information Open House (PIOH). Every written comment received and verbal comment given to the court reporter at the PIOH will be made part of the official record of the project. On behalf of the Georgia Department of Transportation (GDOT), please accept our apologies for the delay in sending this response.

A total of 90 people attended the PIOH. Of the 29 respondents who formally commented, 20 were in support of the project, 0 were opposed, 3 were uncommitted, and 6 expressed conditional support.

The attendees of the PIOH and those persons sending in comments afterwards raised the following questions and concerns. The GDOT has prepared this one response letter that addresses all comments received so that everyone can be aware of the concerns raised and the responses given. Please find the comments summarized below (*in italics*) followed by our response.

- *These improvements are needed to increase driver and pedestrian safety.*
- *These improvements are needed and should happen sooner.*

Part of the purpose of this project is to reduce the crash and injury rates at these intersections. Concerning the project timeline, in order to secure federal funds for this important project, certain activities must be completed prior to other activities beginning. For example, all of the land for a project must be acquired before a construction contract can be advertised. We currently expect land acquisitions to begin next Fall and construction to begin in early 2014.

- *An alternative could be bringing Mann Road to Hwy 78 at Post Road and closing Mann Road at Hwy 78 with a cul-de-sac.*

This suggestion is appreciated. However, the realignment of Mann Road to intersect US 78/Bankhead Highway at Post Road would require more roadway to be constructed on new location and would increase potential environmental impacts. The proposed project as presented at the PIOH would utilize more of the existing roadway network thereby minimizing impacts to the environment and minimizing construction and right-of-way costs.

- *More consideration should be given to entering Post Road from Mason Creek due to school and bus traffic.*

Post Road will be realigned to Mason Creek Road, greatly improving access in the future. The remaining portion of Post Road will be accessed by Conners Road and US 78/Bankhead Highway.

- *Consider a caution light or stop light at Hwy 78 and Conners Road near New Mountain Top Baptist Church, and/or at Mason Creek and Post Road due to traffic and congestion.*

There is a proposed traffic signal at the realigned Post Road/Mann Road/Mason Creek Road at US 78/Bankhead Highway with this project. Additional traffic signals were considered; however, traffic signals are not warranted at the other locations studied.

- *The proposed project appears to be adding congestion to certain intersections/areas, such as Mason Creek and Post Road.*

It is anticipated the project would reduce congestion and simplify travel in the intersections.

- *Speed humps should be installed on Post Road.*

Speed humps are not applicable to Post Road based upon traffic speeds and volumes.

- *Include left turning lights.*

Left-turn arrows will be included in the traffic signal design.

- *The project is too large; a traffic light will solve the traffic problems.*

According to our analyses, the traffic signal alone would not address the other skewed intersection alignments and areas with limited sight distances. To reduce the crash and injury rates, we believe the proposed improvements are necessary and appropriate.

- *Leave northern remnant of Post Road open for local traffic (houses and post office).*

The intersection with Post Road will be left open to right-in, right-out traffic on US 78/Bankhead Highway. Access between US 78/Bankhead Highway westbound and Post Road would be available through Mason Creek Road and Conners Road.

- *The project should not take more right-of-way from my front yard.*
- *Concern of compensation from right-of-way acquisitions.*
- *Concerns of safety on personal property if proposed project is completed.*

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, and without appraiser inspections and reports having been performed, the GDOT Right-of-Way Office will send out letters under separate cover to those property owners who submitted comments regarding right-of-way acquisition processes and procedures. For additional information, please contact Eric Murray, State Right of Way Acquisition Manager at (404) 895-4976.

- *Would like a right turn lane installed for off ramp at I-20 and Post Road.*
- *Improvements needed on Ragan Road.*
- *Mason Creek needs paving.*

Although these suggestions are beyond the limits of this proposed project, the maintenance (paving) suggestion has been forwarded to appropriate personnel within Douglas County for further consideration. If there are additional questions regarding other projects currently planned or desired in the area, please visit the Atlanta Regional Commission's (ARC) website at [atlantaregional.com](http://atlantaregional.com) for more information on getting involved in the planning process. The ARC is the regional planning and intergovernmental coordination agency responsible for the 10-county area which includes Douglas County.

- *Add sign for church zone.*

The placement and location of the church and its driveways on Conners Road doesn't appear to justify a specialized sign.

- *HOT (High Occupancy Toll lanes) is a bad idea.*
- *Tax electric vehicles to cover for gas taxes they don't pay.*

These comments are beyond the scope of this project and have been forwarded to appropriate officials within GDOT and the State Road and Tollway Authority.

- *This will help recruit more industry to the area.*

This comment is appreciated; however, the proposed project is not anticipated to result in land use changes. The improved intersection is anticipated to benefit anyone using the intersection.

Again, thank you for your comments concerning this project. Should you have any further questions, comments, or concerns, please call the project manager, Perry Black, at (404) 631-1224 or the environmental analyst, Larry Bowman, at (404) 631-1362.

Sincerely,



Glenn Bowman, P.E.  
State Environmental Administrator

GB/LB/epei-jeb

cc: Perry Black, GDOT Project Manager  
Eric Murray, GDOT Right-of-Way Office  
Darryl Van Meter, GDOT State Innovative Program Delivery Engineer  
Bryant Poole, District Seven Engineer  
Randy Hulsey, Douglas County Department of Transportation Director  
Patrick Vu, State Road and Tollway Authority

Traffic Signal Warrant Analysis  
TE Study Level 3  
SR 8/Bankhead Hwy at Mann Rd  
Douglas County  
MP 5.17  
Work Order 1087-73



Department of Transportation  
State of Georgia  
January 2005  
Project Number - STP 0001713

Prepared by:

**GRICE**  
& ASSOCIATES

In association with:

**DWA**  
Day Wilburn Associates, Inc.

Two Midtown Plaza  
1349 West Peachtree Street, NE,  
Suite 1290  
Atlanta, Georgia 30309  
Phone (404) 577-6300  
Fax (404) 577-6310



**Traffic Signal Warrant Analysis – TE Study Level 3  
SR 8/Bankhead Hwy at Mann Rd  
Douglas County**

**TABLE OF CONTENTS**

<u>Title</u>	<u>Page</u>
<b>Study Location .....</b>	<b>1</b>
<b>Reason for Investigation.....</b>	<b>1</b>
<b>Topography .....</b>	<b>1</b>
<b>Existing Traffic Control .....</b>	<b>3</b>
<b>Vehicle Volume History.....</b>	<b>3</b>
<b>Queue Delay.....</b>	<b>4</b>
<b>Vehicular Speeds .....</b>	<b>4</b>
<b>Pedestrian Movements.....</b>	<b>4</b>
<b>Parking.....</b>	<b>4</b>
<b>Crash History .....</b>	<b>4</b>
<b>Adjacent Signalized Intersections .....</b>	<b>5</b>
<b>MUTCD Signal Warrant Analysis .....</b>	<b>5</b>
<b>Intersection Capacity Analysis .....</b>	<b>6</b>
<b>Evaluation of Post Road at SR 8 Intersection .....</b>	<b>7</b>
<b>Conclusions .....</b>	<b>10</b>
<b>Intersection Geometric Improvement Alternatives .....</b>	<b>12</b>
<b>Recommendations .....</b>	<b>14</b>
 <b>Appendices</b>	
Appendix A – Location Map .....	A-1
Appendix B – Photos of Study Intersection.....	B-1
Appendix C – Existing Conditions Diagram .....	C-1
Appendix D – Proposed Improvements/Concept Signal Plan .....	D-1
Appendix E – Peak Hour Turning Movement Counts.....	E-1
Appendix F – Collision Diagram.....	F-1
Appendix G – Signal Warrant Summary .....	G-1
Appendix H – Capacity Analysis Results.....	H-1
Appendix I – Traffic Volume Summary .....	I-1



# Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
1	Average Daily Traffic Volumes.....	3
2	Daily Intersection Approach Volumes by Direction .....	4
3	Signal Warrant Analysis Results – Existing Conditions.....	6
4	LOS for Unsignalized Intersection – Existing Conditions .....	7
5	Signal Warrant Analysis Results – Proposed Scenario.....	8
6	LOS for Unsignalized Intersection – Proposed Scenario .....	8
7	LOS for SR 8 at Mann Road – Signalized Analysis.....	9

## LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1	Location Map.....	A-1
2-6	Existing Conditions Diagrams .....	C-1
7-9	Utility Lines Location Diagrams .....	D-1
10	Proposed Alternative 1.....	D-4
11	Proposed Alternative 2.....	D-5
12	Concept Signal Plan.....	D-6
13-17	Peak Hour Turning Movement Counts .....	E-1
18-22	Collision Diagrams .....	F-1



# Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

## STUDY LOCATION

The intersection of SR 8/Bankhead Highway at Mann Road in Douglas County has been examined for signalization, geometry and alignment needs. In addition the following four adjacent intersections were analyzed for operational improvements.

- SR 8/Bankhead Highway at Conners Road
- SR 8/Bankhead Highway at Post Road
- Post Road at Mason Creek Road
- Mason Creek Road at Conners Road

The intersections are located approximately six (6) miles southwest of Douglasville, Georgia. (Please refer to Figure 1, the Site Location Map, in Appendix A.)

## REASON FOR INVESTIGATION

The Georgia Department of Transportation has requested that the intersection of SR 8/Bankhead Highway at Mann Road be investigated to determine if signalization, safety, or other operational improvements are warranted.

## TOPOGRAPHY

This section provides details on lane geometry, approach alignments, topography and intersection sight distances at each of the study intersections. Intersection sight distance was measured using a driver's eye height of 42" and a vehicle height of 42" per AASHTO guidelines. Sight distance measurements are shown on the existing conditions drawing in Appendix C. The required intersection sight distances for specific speed limits are specified in ASSHTO publication titled *Geometric Design of Highways and Streets*. The minimum intersection sight distances for speed limits of 35mph and 45mph are 385 feet and 495 feet respectively.

### **SR 8/ Bankhead Highway at Mann Road**

At the study location, SR 8 is a two-lane rural arterial roadway with 12-foot lanes on both the eastbound and westbound approaches. Northbound and southbound approaches on Mann Road have 10-foot and 11-foot approach lanes in the respective direction of travel. (See photos of the study area in Appendix B and Figure 2, Existing Conditions diagram in Appendix C.)

The intersection is located in north Douglas County, primarily surrounded by residences and farmlands. The intersection receives a sizable percentage of its volumes traveling to / from I-20 which is about 0.7 miles south of the intersection. Post Road provides access to SR 8 from I-20.

The southbound Mann Road approach rises onto a hill at the stop sign, leading to reduced visibility for the turning movements. The eastbound SR 8 approach has a horizontal curve that



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

level approximately 300 feet prior to the intersection with Mann Road. The sight distances at the intersection are adequate based on ASSHTO specification.

### **SR 8/ Bankhead Highway at Conners Road**

The intersection of Conners Road at SR 8 is about 900 feet west of the intersection of SR 8 and Mann Road. The northbound and southbound approach lanes are 10 feet wide on Conners Road and the eastbound and westbound approach lanes are 12 feet wide on SR 8. Conners Road intersects SR 8 right at the apex of the horizontal curve on SR 8. The sight distances from the minor approach are 332 feet and 462 feet and are less than the minimum requirement of 495 feet for a speed limit of 45mph. Trees and bushes in combination with the curvature and skew on SR 8 limit the intersection sight distance. Realignment of SR 8 to reduce curvature has been evaluated in this study. (See Figure 3, Existing Conditions diagram in Appendix C.)

### **SR 8/ Bankhead Highway at Post Road**

The intersection of Post Road at SR 8 was also studied for intersection alignment. Pictures of the intersection are provided in Appendix B. The existing conditions diagram is provided in Figure 4, Appendix C. The lane widths are 12 feet and 11 feet on SR 8 and Post Road respectively. The northbound Post Road approaches SR 8 at an acute angle. Thus, the northbound left turn and eastbound right turn movements are difficult to maneuver. Closing the access to SR 8 from Post Road has been evaluated as part of the study. The sight distance from the minor approach looking westwards is 417 feet which is less than the minimum requirement of 495 feet for speed limit of 45mph. The acute angle of the Post Road approach limits the intersection sight distance.

### **Mason Creek Road at Post Road**

The approach lanes at the plus intersection of Mason Creek Road and Post Road are 10 feet wide. The intersection is fairly level on all approaches. Appendix B provides pictures of the intersection while the intersection geometry is shown in Figure 5 of Appendix C. The sight distances at the intersection are adequate based on ASSHTO specification.

### **Conners Road at Mason Creek Road**

The southbound approach is 10 feet wide while the northbound approach is 11 feet wide on Mason Creek Road. The westbound and eastbound approaches on Conners Road are both 11 feet wide. (See photos of the intersection in Appendix B and Figure 6, Existing Conditions diagram in Appendix C.) There is clear visibility from both side street approaches until the next intersection looking southwards from the intersection. Looking northwards, the sight distances are 269 and 289 feet from the eastbound and westbound approaches respectively. Both these distances are less than the minimum requirement of 385 feet for speed limit of 35mph. The raising uphill on Mason Creek Road north of the intersection limits the intersection sight distance.



# Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

## EXISTING TRAFFIC CONTROL

SR 8 / Bankhead Highway has a free flow of traffic. However, the northbound and southbound movements on Mann Road are controlled by stop signs. Stop ahead signs are installed approximately 400 feet prior to the intersection on both the northbound and southbound approaches of Mann Road.

At the intersection of Conners Road at SR 8, the northbound and southbound approaches are stop controlled while the traffic on SR 8 is free-flowing. Eastbound and westbound approaches on Conners Road are stop controlled at the intersection of Mason Creek Road and Conners Road. Northbound traffic on Post Road is controlled with a stop sign at the intersection of SR 8 and Post Road. At the intersection of Post Road and Mason Creek Road, the traffic on Post is free-flowing while that on Mason Creek is controlled by a stop sign. These are illustrated in Figures 2 to 6 in Appendix C.

## VEHICLE VOLUME HISTORY

The most current vehicle volumes for SR 8 and Post Road are reflected in Table 1. Traffic Count (TC) station 54 is located on SR 8 approximately 1.5 miles west of its intersection with Mann Road. TC station 56 is located 1.2 miles east of the intersection of SR 8 and Mann road on SR 8; and TC station 143 is located on Post Road, approximately 0.2 miles south of the intersection of Mann Road and SR 8. These traffic volumes were obtained by researching the average daily traffic (ADT) recorded by the Georgia Department of Transportation (GDOT) Count Stations located in Douglas County.

<b>Table 1</b>							
<b>Average Daily Traffic Volumes</b>							
<b>ROADWAY</b>		<b>Average ADT</b>					
<b>Traffic Count Station</b>	<b>Name</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>
54	SR 8	4339	4350	4039	4180	4797	4783
56	SR 8	8659	9100	7626	8757	8829	11627
143	Post Rd.	5264	6000	6804	6743	6979	6989

Note: a – Traffic Count from GDOT database

Twenty-four hour approach tube counts were also collected at the intersection for the purpose of conducting the signal warrant analysis. The following table shows the approach volumes recorded in May 2004.



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

<b>Approach Direction</b>	<b>Daily Approach Volumes</b>
Northbound on Mann Road	1587
Southbound on Mann Road	2256
Eastbound on SR 8	2788
Westbound on SR 8	2881

Please refer to the peak hour turning movement counts (TMCs) for all of the five (5) intersections on Figures 13-17, Appendix E and the traffic count data in Appendix I.

### **QUEUE DELAY**

A queue delay study was performed for the intersection of SR 8 and Mann Road. The total approach stop delay was calculated for the AM, Midday, and PM peak periods. Approach delay was determined from the intersection delay study as shown in Appendix I. Analysis indicated the greatest vehicle approach delay was 1.33 vehicle hours and an average delay per vehicle was 31.53 seconds during the PM peak period (4:45 PM to 5:45 PM) on the northbound approach of Mann Road.

### **VEHICULAR SPEEDS**

The posted speed limits on SR 8 and Mann Road are 45 mph and 35 mph respectively. The posted speed limits on Mason Creek Road and Conners Road are 35 mph while that on Post Road is 45mph.

### **PEDESTRIAN MOVEMENTS**

No crosswalks or sidewalks are present at any of the five (5) intersections. No pedestrians or evidence of pedestrian activity were observed during field observations.

### **PARKING**

No on-street parking is permitted along SR 8 or Mann Road in the vicinity of the intersection.

### **CRASH HISTORY**

Crash data was obtained from Georgia Department of Transportation (GDOT) database for the years 2001, 2002 and 2003. It must be noted that the data for the year 2003 was incomplete at the



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

time this report was developed. The limited data for 2003 had recorded one crash at the intersection of Mason Creek Road with Post Road and no crashes at all of the other four intersections in the study. Data from year 2002 was hence used for analysis purposes. At the intersection of SR 8 and Mann Road, during the past two (2) years a total of thirty-two (32) crashes were reported. Twenty nine (29) of them were right-angle or left-turn with through crashes that are considered correctable through signalization. During the 12 month period in 2002, there were a total of seventeen (17) crashes, of which sixteen (16) were considered correctable by signalization.

At the intersections of Conners Road and SR 8, and Conners Road and Mason Creek Road, no crashes were reported during the years 2001 and 2002. There was one right-angle accident reported at the intersection of Post Road and Mason Creek Road in the year 2002. At the intersection of Post Road and SR 8, one right-angle and six (6) rear-end crashes were reported in 2001 and 2002. One rear-end fatal crash was reported in 2001 at this intersection. (Please refer to Figures 18-22, Collision Diagram, in Appendix F.)

### **ADJACENT SIGNALIZED INTERSECTIONS**

There are no signalized intersections along SR 8 and Mann Road within one mile of the intersection.

### **MUTCD SIGNAL WARRANT ANALYSIS**

Traffic signal warrant analysis was performed for the intersection of SR 8 at Mann Road using the criteria provided in the *Manual on Uniform Traffic Control Devices* (MUTCD) published by the Federal Highway Administration (FHWA) in 2000. According to the MUTCD, the investigation of the need for traffic control signals shall include an analysis of the applicable factors contained in the following traffic signal warrants and other factors related to existing operation and safety at the study location:

- Warrant 1 – Eight-Hour Peak Volume
- Warrant 2 – Four-Hour Vehicular Volume
- Warrant 3 – Peak Hour
- Warrant 4 – Pedestrian Volume
- Warrant 5 – School Crossing
- Warrant 6 – Coordinated Signal System
- Warrant 7 – Crash Experience
- Warrant 8 – Roadway Network

A traffic control signal should not be installed unless one or more of the above warrants are met. However, the satisfaction of a traffic signal warrant or warrants should not in itself require the installation of a traffic control signal.



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

This traffic signal warrant analysis evaluated actual traffic conditions to determine if they satisfy the minimum warrants established by the MUTCD. Additionally, it should be noted that Warrants 1, 2, and 3 are the vehicular volume warrants and are based on mainline traffic volumes, minor street traffic volumes, number of travel lanes, and mainline traffic speed. The results of the MUTCD signal warrant analysis are provided in Appendix G and summarized in Table 3.

The warrant analysis was run with the right-turn volume reductions for the minor approaches being applied. In terms of the proper allocation or reduction for right-turning volumes during warrant analysis, the procedure outlined in *NCHRP Report 457*, specifically Figure 2-11 (Minor-road right-turn volume reduction warrant check), was used as a guideline. Reductions made to the right-turn volumes are summarized in Appendix I.

<b>Warrant</b>	<b>Without Right-Turn Volume</b>	<b>Hrs. Met / Required</b>
1A	Not Met	4/8
1B	Not Met	1/8
1C	Not Met	N/A
2	Not Met	2/4
3A	Not Met	1/1
3B	Not Met	0/1
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	Not Met	16/5
8	N/A	N/A

As Table 3 shows, none of the MUTCD signal warrants were satisfied under current conditions. It must be noted that Warrant 7 is a combination of crashes and volumes from Warrants 1A and 1B. Warrant 7 is not met, as these volumes do not meet the required criteria, although the number of crashes (16) exceeds the minimum required number (5). Please refer to detailed warrant analysis reports in Appendix G.

### **INTERSECTION CAPACITY ANALYSIS**

The capacity and Level of Service (LOS) was based on analysis procedures provided in the *Highway Capacity Manual, Special Report 209*, published by the Transportation Research Board in 2000. The capacity was examined for unsignalized conditions. The analysis was performed for the following intersections –

- SR 8/Bankhead Highway at Mann Road



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

- SR 8/Bankhead Highway at Conners Road
- SR 8/Bankhead Highway at Post Road
- Post Road at Mason Creek Road
- Mason Creek Road at Conners Road

The results of the intersection capacity analysis are summarized in Table 4 and Appendix H and peak hour TMCs used in the analysis are shown in Appendix I.

<b>Table 4</b>			
<b>LOS for Unsignalized Intersections – Existing Condition</b>			
	Approach LOS (approach delay in seconds)		
	AM Peak	Midday Peak	PM Peak
<b>SR 8 at Mann Road</b>			
Northbound Mann Rd	B (14.7)	B (12.8)	C (21.8)
Southbound Mann Rd	C (19.0)	B (14.7)	C (22.6)
<b>SR 8 at Conners Road</b>			
Northbound Conners Rd	B (12.4)	B (12.3)	C (15.1)
Southbound Conners Rd	B (11.4)	B (11.7)	B (14.3)
<b>SR 8 at Post Road</b>			
Northbound Post Rd	C (16.6)	B (11.1)	B (11.9)
<b>Post Road at Mason Creek Road</b>			
Northbound Mason Creek Rd	D (30.8)	B (14.2)	D (30.8)
Southbound Mason Creek Rd	B (11.2)	A (9.7)	B (13.1)
<b>Mason Creek Road at Conners Road</b>			
Eastbound Conners Rd	A (9.6)	A (9.3)	A (9.7)
Westbound Conners Rd	B (10.5)	A (9.6)	B (11.5)

As the capacity analysis results show, all the five intersections experience LOS C or better during all three peaks except the northbound approach on Post Road at SR 8 intersection which operates at LOS D during the AM and PM peak periods.

### **EVALUATION OF POST ROAD AT SR 8 INTERSECTION**

To improve traffic operation within the study area, closure of the Post Road access to SR 8 has been examined. Traffic from I-20 uses Post Road to access SR 8 at an acute-angled intersection between the two roads. The option of closing the access to SR 8 from Post Road and re-directing traffic from I-20 via the intersection of Mann Road at SR 8 was evaluated. The traffic volumes



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

were re-distributed appropriately and the warrant and operational analysis were repeated for this scenario. Tables 5 and 6 provide the results from the analysis.

<b>Table 5</b>		
<b>Signal Warrant Analysis Results – Proposed Scenario</b>		
<b>Warrant</b>	<b>Without Right-Turn Volume</b>	<b>Hrs. Met / Required</b>
1A	Met	9/8
1B	Not Met	5/8
1C	Not Met	N/A
2	Met	6/4
3A	Not Met	5/1
3B	Met	3/1
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	Not Met	16/5
8	N/A	N/A

Table 5 shows that Warrants 1A, 2 and 3B of the MUTCD is met and hence the traffic signal warrants are satisfied under the proposed scenario of closing the access to SR 8 from Post Road and re-distributing the volumes. Please refer to detailed warrant analysis reports in Appendix G.

An operational analysis was performed for the intersections under the proposed conditions with the closure of Post Road access to SR 8 and the re-distributed volumes. Table 6 provides the summary of the unsignalized analysis that was performed.

<b>Table 6</b>			
<b>LOS for Unsignalized Intersections – Proposed Condition</b>			
	Approach LOS (approach delay in seconds)		
	AM Peak	Midday Peak	PM Peak
<b>SR 8 at Mann Road</b>			
Northbound Mann Rd	F (73.9)	C (17.3)	F (758.7)
Southbound Mann Rd	F (680.8)	E (37.2)	F (**)
<b>SR 8 at Connors Road</b>			
Northbound Connors Rd	B (12.4)	B (12.3)	C (15.1)
Southbound Connors Rd	B (11.4)	B (11.7)	B (14.3)
<b>Post Road at Mason Creek Road</b>			
Northbound Mason Creek Rd	F (91.9)	C (17.5)	C (23.7)
Southbound Mason Creek Rd	B (11.2)	A (9.6)	F (100.3)



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

Mason Creek Road at Conners Road			
Eastbound Conners Rd	B (11.9)	B (10.7)	B (13.7)
Westbound Conners Rd	C (16.7)	B (11.6)	C (16.7)

\*\* Excessive Delay

The intersections of SR 8 at Conners Road and Mason Creek Road at Conners Road continue to operate at LOS C or better under proposed road access closure. Both approaches on SR 8 at Mann Road fail during the AM and PM peak periods with very high delays on the approaches. The southbound approach at this intersection operates at LOS E during the midday peak. At the intersection of Post Road at Mason Creek Road, the northbound approach fails in the AM peak while the southbound approach fails during the PM peak period.

Since the signal warrants were met, the study intersection of SR 8 at Mann Road was also analyzed for signalized conditions. The LOS and delays were calculated with the re-distributed volumes for the AM, Midday and PM peak periods. Table 7 summarizes the LOS and delay values for the intersection during all three peak periods.

<b>Table 7</b>			
<b>LOS for SR 8 at Mann Road – Signalized Analysis</b>			
	Approach LOS (approach delay in seconds)		
	AM Peak	Midday Peak	PM Peak
<b>SR 8 at Mann Road</b>			
Eastbound SR 8	A (8.6)	A (7.9)	A (4.8)
Westbound SR 8	B (14.6)	B (13.3)	C (25.4)
Northbound Mann Rd	A (6.5)	A (5.3)	C (33.9)
Southbound Mann Rd	B (16.8)	B (10.4)	C (29.1)
<b>OVERALL</b>	<b>B (10.9)</b>	<b>A (9.9)</b>	<b>C (24.9)</b>

As shown in Table 7, all of the approaches operate at acceptable LOS levels (LOS C or better) during all three peak periods under signalized conditions.

In addition to examining the signalized intersection capacity analysis, the potential need for protected left-turn phases was also examined. The product of the left-turn and opposing through-volume was calculated as per the left turn signal phasing warrants product analysis described in “ITE Manual of Traffic Signal Design” that is used by GDOT.

This product analysis yields the following –



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

- Northbound approach :
  - AM peak hour – 16 left turns times 128 opposing vehicles equals 2,048
  - Midday peak hour – 11 left turns times 50 opposing vehicle equals 605
  - PM peak hour – 13 left turns times 83 opposing vehicle equals 1,079
- Southbound approach :
  - AM peak hour – 67 left turns times 66 opposing vehicles equals 4,422
  - Midday peak hour – 36 left turns times 52 opposing vehicle equals 1,872
  - PM peak hour – 39 left turns times 134 opposing vehicle equals 5,226
- Eastbound approach :
  - AM peak hour – 7 left turns times 104 opposing vehicles equals 728
  - Midday peak hour – 10 left turns times 192 opposing vehicle equals 1,920
  - PM peak hour – 14 left turns times 293 opposing vehicle equals 4,102
- Westbound approach :
  - AM peak hour – 4 left turns times 268 opposing vehicles equals 1,072
  - Midday peak hour – 8 left turns times 153 opposing vehicle equals 1,224
  - PM peak hour – 12 left turns times 159 opposing vehicle equals 1,908

The ITE criteria of 50,000 is not satisfied during all the peak periods. Based on these results, implementation of a protected left-turn phase is not recommended for any of the approaches.

### CONCLUSIONS

The following conclusions are based on the collected data, signal warrant analysis, intersection capacity analyses, and field observations for existing conditions:

- An examination of traffic volumes indicates that none of the applicable MUTCD signal warrant criteria are satisfied at the intersection of SR 8 and Mann Road under current condition.
- Unsignalized intersection LOS during the peak hours under current conditions is acceptable for the minor approaches (LOS D or better).



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

- Signal warrants 1A, 2, and 3 are met at the intersection of SR 8 and Mann Road, with the closure of the Post Road access to SR 8, and the subsequent redirection of traffic volumes to the intersections in the study area. Closure of Post Road would be accomplished by creating a cul-de-sac.
- The signalized LOS is acceptable for all three peak periods at the intersection of SR 8 at Mann Road.
- Improvements to the alignment of SR 8 should also be considered in order to improve the safety at intersections along the route. The existing curvilinear alignments of SR 8; the hilly and rolling nature of the area; and the land uses in the vicinity limit possible realignment alternatives.
- Two (2) alternative alignments have been developed (see Figures 10 and 11 in Appendix D) taking into consideration the closure of access to SR 8 from Post Road. The alignment alternatives were developed with consideration of design standards set forth in the *AASHTO Policy on Geometric Design of Highway and Streets (Fourth Edition, 2001)* and physical obstacles such as creeks and lakes.

The pros and cons of each of the alternatives are discussed in greater detail in the following sections. Both the alternatives will require significant right-of-way acquisition, modification of existing access points, and possible disturbance to environmentally sensitive areas. Detailed utility information for SR 8 is provided in Figures 7-9 in Appendix D.



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

### INTERSECTION GEOMETRIC IMPROVEMENT ALTERNATIVES

#### Alternative 1

Alternative 1 involves the realignment of SR 8 to intersect Conners Road and Mann Road, at approximately 590 feet and 260 feet north of the existing intersections respectively. The realignment would begin south of the intersection of SR 8 and Smith Road and end west of the intersection of SR 8 and Post Road, approximately 0.75 miles in length. This would allow for improved approach alignments at the intersections of Conners Road and Mann Road with SR 8. In addition Conners Road is also realigned to create a right angled intersection with SR 8. However it should be noted that the realignment of Conners Road would impact existing built-up areas. A schematic diagram of Alternative 1 is provided in Figure 10 in Appendix D. The intersection lane geometry for the re-aligned intersection of SR 8 with Conners Road and Mann Road remains the same as existing. Conners Road would remain under sign control with SR 8 having the free-flow movement, while the intersection of Mann Road and SR 8 would be signalized.

#### Pros

- Improves intersection alignment at both Conners Road and Mann Road.
- Improves intersection sight distances for approaching traffic.
- Better operation with improved turning radius.

#### Cons

- Requires additional pavement.
- Requires the greatest amount of right-of-way acquisition.
- Impacts neighborhoods in the area.
- Proximity to creeks may cause environmental impacts.
- Impacts church property.
- Direct access to existing development along SR 8 would be affected.
- Requires additional pavement and more cost when compared to Alternative 2.

#### Estimated Construction Cost

- The construction cost is estimated to be \$1,300,000\*.

\* The estimated construction cost is exclusive of the right of way acquisition costs.



## Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

### **Alternative 2**

Alternative 2 involves the realignment of SR 8 to create proposed intersections with Conners Road and Mann Road at approximately 260 feet and 60 feet north of the existing intersections. The realignment would begin approximately 1000 feet northwest of the existing intersection of SR 8 and Conners Road and end approximately at 250 feet west of the existing intersection of SR 8 and Mann Road. The length of this realignment alternative is approximately 0.3 miles. In addition Conners Road is also realigned to create a right angled intersection with SR 8. However it should be noted that the realignment of Conners Road would impact existing built-up areas. A schematic diagram of Alternative 2 is provided in Figure 11 in Appendix D. The intersection lane geometry for the re-aligned intersection of SR 8 with Conners Road and Mann Road remains the same as existing conditions. Conners Road would remain under sign control with SR 8 having the free-flow movement, while the intersection of Mann Road and SR 8 would be signalized.

#### **Pros**

- Requires the least amount of right-of-way acquisition.
- Improves intersection alignment at both Conners Road and Mann Road.
- Improves intersection sight distances for approaching traffic.

#### **Cons**

- Increases pavement area.
- Requires some amount of right-of-way acquisition.
- Direct access to existing development along SR 8 would be affected.
- Requires tighter curve along SR 8 when compared to Alternative 1.

#### **Estimated Construction Cost**

- The construction cost is estimated to be \$760,000\*.

\* The estimated construction cost is exclusive of the right of way acquisition costs.



# Traffic Signal Warrant Analysis – TE Study Level 3 SR 8/Bankhead Hwy at Mann Rd Douglas County

## RECOMMENDATIONS

Based on an analysis of traffic data, collision experience, intersection operations, and potential signalization needs, the following actions are recommended:

- Based on MUTCD signal warrant criteria, installation of a traffic signal is recommended at the intersection of SR 8 and Mann Road, if the Post Road access to SR 8 is to be closed.
- Based on discussion with district personnel, alternative one is recommended as the best suited improvement.

PREPARED BY: \_\_\_\_\_ DATE  
Grice & Associates, Inc.

RECOMMENDED BY: \_\_\_\_\_ DATE  
District Traffic Engineer

RECOMMENDED BY: \_\_\_\_\_ DATE  
State Traffic Safety and Design Engineer

APPROVED BY: \_\_\_\_\_ DATE  
Director of Operations



G R E S H A M  
S M I T H   A N D  
P A R T N E R S

April 20, 2012

Mr. Perry Black  
Project Manager, Office of Program Delivery  
Georgia Department of Transportation  
600 West Peachtree Street, 24<sup>th</sup> Floor  
Atlanta, Georgia 30308

**Subject: Value Engineering Study-Responses  
CSSFT-0008-00(375) Douglas County  
P.I. Number: 0008375  
SR 8/US78 @ Mason Creek Road and Post Road  
GS&P Project No. 26340.11**

Reference is made to the recommendations that were contained in the *Value Engineering Study Report –SR8/US 78 (Bankhead Highway) at Mann Road/ Mason Creek Road and at Post Road Intersection Improvements, Douglas County* dated February 2012 for the above referenced project. Our responses and recommendations are as follows:

- 1. Value Engineering Alternative No. A-1** -Reduce the radius of the horizontal curve at Conners Road from STA 1+00 to 3+00 and revise the profile on the north end to tie into the existing profile sooner.  
*Approval of the VE Alternative A-1 is recommended.*

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Grading	\$0.00		\$0.00	\$8,000.00		\$8,000.00
Paving	\$23,757.00		\$23,753.00	\$28,507.00		\$25,915.61
Right of Way	\$236,385.00		\$236,385.00	\$128,274.00		\$123,408.66
			<b>\$260,100.00</b>			<b>\$157,324.27</b>

- 2. Value Engineering Alternative No. A-2** - Eliminate the pavement replacement on Mattie McCoy Lane from STA 3+00 to 5+50.  
*Approval of VE Study Alternative A-2 is not recommended for the following reasons:*

- The proposed pavement replacement is intended to tie Mattie McCoy Lane directly into the southern remnant of Conners Road since the portion of Conners Road between this point and SR8/US78/Bankhead Highway is proposed to be eliminated. Mattie McCoy Lane presently intersects into Conners Road at a tee intersection with a very acute intersection skew and the through movement being on a horizontal curve.
- Having Mattie McCoy Lane, a local roadway posted for 35 mph, tie directly into Conners Road, which is also posted for 35 mph, as a through movement without the pavement replacement would create an alignment break of 4° 40'. However, the *GDOT Design Policy Manual*

recommends that the maximum horizontal alignment deflection without the use of a curve be limited to 0° 40' with a 35 mph design speed.

- Most of the improvements could be accomplished as an asphalt overlay with little full depth pavement. The right of way impacts result from the necessary shoulder and ditching improvements.

**3. Value Engineering Alternative No. A-4-** Move the alignment of Mason Creek Road from STA 16+00 to 27+00 further west, closer to the existing alignment

*Approval of VE Study Alternative A-4 is not recommended for the following reasons:*

- In order for Mann Road, which is located directly across the intersection with SR8/US78/Bankhead Highway from Mason Creek Road and within the above station ranges, to have vertical geometry that is compliant with AASHTO guidelines for its 35 mph posted speed limit and vertical grade breaks for a signalized intersection (2% maximum) that adhere to the *GDOT Design Policy Manual* guidelines, its profile grade will need to be raised as much as 7 ft within the project limits. Due to such a significant change in profile grade, the alignment will need to be offset in order to maintain traffic during construction.
- There is no improved parallel road in the immediate vicinity of this portion of Mann Road, so an off-site detour would not be feasible.

**4. Value Engineering Alternative No. A-6-** Reduce the radius on the corners of Bankhead Highway(US 78/ SR 8)/ Mason Creek Road down to 75 feet.

*Approval of VE Study Alternative A-6 is not recommended.*

- The resulting pedestrian island in the intersection's southeast corner would be so small with the 75 ft. radius that it would be impractical to provide a pedestrian traffic signal head, pedestrian ramps or cut-through openings from all three sidewalk directions.
- The use of these larger radii allow for pedestrian refuge in the intersection's northwest and southeast corner by having the raised islands. Without these raised islands, pedestrians crossing SR8/US78/Bankhead Highway, Mann Road or Mason Creek Road will have to traverse an additional lane.
- Some loss of right turn efficiency will be lost by changing the right turn movement from a 'yield' to a 'right turn on red' condition.

**5. Value Engineering Alternative No. A-7 –** Shorten the project limits on the west end of Bankhead Highway (US 78/ SR 8) from STA 24+00 to 26+00.

*Approval of the VE Alternative A-7 is partly recommended as follows:*

- Beginning at Sta. 26+71.09, a 1200 ft. radius horizontal curve is proposed for SR8/US78/Bankhead Highway. Using the former 55 mph design speed, the guidelines in the *2004 AASHTO Geometric Design of Highways and Streets* state that a 5.9% superelevation is needed for this curve. This would result in a superelevation runoff of 151 ft. with two thirds of this length (100 ft.) being on the adjacent tangents as per GDOT guidelines. A minimum tangent runoff length of 51 ft. would also be required on the tangent as per AASHTO guidance.
- Using a reduced 45 mph design speed, the guidelines in the *2004 AASHTO Geometric Design of Highways and Streets* state that a 5.0% superelevation could be used for this curve. This would result in a superelevation runoff of 111 ft. with two thirds of this length (75 ft.) being on the adjacent tangents as per GDOT guidelines. A minimum tangent runoff length of 45 ft. would also be required on the tangent as per AASHTO guidance. This would curtail the project to start at Sta. 25+50 instead of Sta. 24+00.
- If implemented as above, the above considerations would modify the cost/benefit for Alternative A-7 as follows:

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Paving	\$76,920.00		\$76,920.00	\$3,432.00		\$3,432.00
Erosion	\$3,050.00		\$3,050.00	\$972.00		\$972.00
Right of Way	\$0.00		\$0.00	\$48,939.16		\$48,939.16
Earthwork	\$4,441.00		\$4,441.00	\$4,146.12		\$4,146.12
Striping	\$252.00		\$252.00	\$321.00		\$321.00
			<b>\$84,663.00</b>			<b>\$57,810.28</b>

- 6. Value Engineering Alternative No. A-8** – Shorten the east end of the project on Bankhead Highway (US 78/ SR 8) from STA 53+31 to 52+00.  
*Approval of the VE Alternative A-8 is recommended.*

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Paving	\$50,382.00		\$50,382.00	\$2,262.00		\$2,262.00
Erosion	\$731.00		\$731.00	\$842.40		\$842.40
Right of Way	\$14,672.00		\$14,672.00	\$17,287.43		\$17,287.43
Earthwork	\$1,969.00		\$1,969.00	\$1,674.46		\$1,674.46
Striping	\$165.00		\$165.00	\$278.20		\$278.20
			<b>\$67,919.00</b>			<b>\$22,344.4</b>

- 7. Value Engineering Alternative No. A-10** – Move cul-de-sac further south on Post Road and flip the bulb to the north side to take advantage of existing right of way.  
*Approval of the VE Alternative A-10 is not recommended.*

- Moving the cul-de-sac further south along existing Post Road may create additional impacts for the BellSouth facility that is presently in the northeast corner of the intersection of Post Road and Mason Creek Road. This facility is located outside of the right of way on its own easement and would therefore be a non-reimbursable utility cost.
- Shifting the cul-de-sac further south along existing Post Road will place it in closer proximity to the southern portion of Mason Creek Road and realigned Post Road. Since these roadways are proposed to have rural shoulders, a barricade or some other divider will need to be placed behind the cul-de-sac to discourage motorists on the southern portions of Post Road and Mason Creek Road from driving over the shoulder to access the northern portion of Post Road in order to circumvent any cued traffic at the proposed intersection of Mason Creek Road with SR8/US78/Bankhead Highway or the southern portion of Conners Road.

- 8. Value Engineering Alternative No. P-1** – Revise the profile and alignment on Bankhead Highway (US 78/ SR 8) to account for a 45 mph design speed in lieu of the 55 mph design speed.  
*Approval of the VE Alternative P-1 is partly recommended as follows:*

- It is recommended that the proposed crest vertical curve on SR8/US78/Bankhead Highway from Sta. 44+12.48 to Sta. 51+42.48 with a K value of 114 be retained as currently shown on the plans. There is presently poor sight distance between the intersection of SR8/US78/Bankhead Highway, Mann Road and Mason Creek Road and approaching westbound motorists on SR 8. Therefore, this may potentially be a contributing factor for the crashes that have occurred at the intersection. According to officials from Douglas County and comments received at the PIOH, the average operating speeds of motorists along this portion of SR 8 are in excess of the 45 mph posted speed. Therefore, a crest vertical curve with a 'K value' in excess of the minimum value improves the operation of the proposed improved intersection.
- It is recommended that proposed sag vertical curve on SR8/US78/Bankhead Highway from Sta. 34+51.95 to Sta. 42+01.95 be revised to have a 'K value' closer to the revised 45 mph posted

speed. Since ‘K values’ for sag curves in 2004 AASHTO *Geometric Design of Highways and Streets* guidance are dictated more by headlight trajectories than line of sight, a reduced ‘K value’ based on a 45 mph design would have less impact on sight distance than a crest vertical curve. Further, this proposed sag curves on SR 8 traverses a relatively high fill area and would have a significant difference in elevation from the existing grade of SR 8, so the most savings in earthwork and right of way will be realized in this location by the 45 mph speed design.

- In order for SR8/US78/Bankhead Highway to have vertical geometry that is compliant with AASHTO guidelines for its 45 mph posted speed limit and to eliminate the hidden dip, its profile grade will need to be raised as much as 7 ft within the project limits. Due to such a significant change in profile grade, the alignment will need to be offset in order to maintain traffic during construction.
- If implemented as above, the above considerations would modify the cost/benefit for Alternative P-1 as follows:

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Grassing	\$0.00		\$0.00	\$217.39		\$150.00
Erosion Control Mats, Slopes	\$0.00		\$0.00	\$1,090.00		\$1090.00
Right of Way	\$44,702.00		\$44,702.00	\$57,926.51		\$60,210.00
Earthwork	\$16,914.00		\$16,914.00	\$7,700.00		\$13,160.00
Drainage Structures	\$0.00		\$0.00	\$2,479.00		\$2,479.00
			<b>\$61,616.00</b>			<b>\$72,166.70</b>

**9. Value Engineering Alternative No. ROW-1** – Use more slope easements and less permanent right of way. *Approval of the VE Alternative ROW-1 is partly recommended as follows:*

- According to the GDOT Office of Maintenance, all drainage structures and facilities such as ditches would need to be on permanent right of way (either right of way or permanent easement) and not temporary slope easement to ensure that they can be readily accessed by GDOT maintenance forces. Permanent right of way would still need to be used between the shoulder break points on all roadways.
- Relocated utilities within the GDOT right of way are typically placed between the construction limits and proposed right of way limit. However, relocated utilities can not be placed on temporary easement.
- The GDOT Office of Maintenance also prefers that other support structure such as fill slopes be placed on permanent right of way/easement. Otherwise, the fill slopes, etc. would revert to the adjacent property owners where they could potentially be altered (such as excavating a fill slope) that could have repercussions on the roadway.
- However, both the GDOT Office of Maintenance and Office of Right of Way were amicable to using permanent easement on the project outside of the proposed shoulder break points. Unlike slope easement, access is retained for maintenance concerns, but the cost can potentially be half than right of way. Therefore, it is recommended that permanent easement be purchased outside of the shoulder break point instead of temporary easement in the place of permanent right of way.
- If implemented as above, the above considerations would modify the cost/benefit for Alternative ROW-1 as follows:

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Right of Way	\$1,858,440.00		\$1,858,440.00	\$266,032.32		\$266,032.32
Easement		\$(1,115,064.00)	\$(1,115,064.00)		\$(133,016.16)	\$(133,016.16)
			<b>\$743,376.00</b>			<b>\$133,016.16</b>

**10. Value Engineering Alternative No. S-1** – Reduce the clear zone dimension to 24 feet and 18 feet for the 45 mph and 35 mph design sections, respectively.

*Approval of the VE Alternative S-1 is partly recommended as follows:*

- Based on utilizing a 45 mph design speed on SR8/US78/Bankhead Highway instead of a 55 mph speed, the clear zone on this roadway can be reduced to a 24 ft width. Based on guidance from the GDOT Office of Design Policy and Support, the 4:1 foreslope width will be reduced to a 12 ft width and a 4 ft wide ditch will be used instead of a 2 ft ditch in order to further reduce impacts and improve ditch hydraulics. Combined with an 8 ft wide shoulder (as per Alternative S-2 in the VE Study Report), this would attain the 24 ft clear zone for the reduced 45 mph design speed.
- For the 35 mph roadways, the foreslope width can be reduced 10 ft width which combined with the 8 ft wide shoulder and 2 ft wide ditch will have an overall width of 20 feet. It is not practical to use a 4:1 foreslope that is less than a 10 ft width when there are driveways with side drains present. A 10 ft. wide foreslope with a 4:1 grade produces a 2'-6" deep ditch, which is the minimum depth to accommodate an 18" diameter CMP side drain and a minimum one foot of cover (excluding the driveway pavement structure) as per GDOT Std. 1030D. Further, since most pavement structures are 1'-0" to 1'-6" deep, a shallow roadside ditch would have water from the ditch seeping into and potentially damaging the roadway subbase.
- If implemented as above, the above considerations would modify the cost/benefit for Alternative S-1 as follows:

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Earthwork				\$6,516.00		\$6,516.00
Grassing				\$217.39		\$217.39
Right of Way	\$203,800.00		\$203,800.00	\$212,535.48		\$212,535.48
			<b>\$203,800.00</b>			<b>\$219,268.87</b>

**11. Value Engineering Alternative No. S-2** – Use a 4-foot shoulder in lieu of 6.5 foot on Bankhead Highway (US 78/ SR 8).

*Approval of the VE Alternative S-2 is recommended.*

Category	Savings from VE Study Report			Engineer's Estimated Savings		
	Savings	Add'l Cost	Net	Savings	Add'l Cost	Net
Paving	\$82,110.00		\$82,110.00	\$63,320.00		\$63,320.00
Right of Way	\$48,668.00		\$48,668.00	\$116,187.84		\$116,187.84
Earthwork	\$4,806.00		\$4,806.00	\$115.50		\$115.50
			<b>\$135,584.00</b>			<b>\$173,867.39</b>

**12. Value Engineering Alternative No. S-6** – Change the 4:1 slopes to 2:1 and reduce the amount of right of way required

*Approval of the VE Alternative S-6 is not recommended.*

- A 2:1 foreslope is non-traversable which would require the use of guardrail with a shoulder that would have an additional 5'-6" width as per GDOT Std. 4052. For the placement of the GDOT Type 12 guardrail approach anchors, a shoulder with an additional 9 ft paved width would be necessary.
- In areas where a standard ditch is utilized, the amount of savings in earthwork or right of way versus the typical section discussed in VE Alternative S-1 would be negligible.
- The placement of guardrail is used to help protect motorists from adjacent potential roadside hazards or non-traversable areas as per the clear zone concept but the guardrail itself can potentially be a hazardous obstacle for a vehicle that leaves the roadway. The 2004 AASHTO

*Geometric Design of Highways and Streets* recommends as a first priority to “remove the obstacle or redesign it so it can be... traversed” and, if that is not possible, to “redirect a vehicle by shielding the obstacle by using an appropriate breakaway device”. The GDOT Design Policy Manual also follows this policy and states the following regarding the use of 2:1 slopes: “All front slopes (foreslopes) should be 4:1 or flatter, and no steeper than 2:1. GDOT discourages the use of 2:1 front slopes with guardrail unless economic constraints (construction costs, right of way impacts, or environmental impacts) outweigh the practicality of a 4:1 front slope”. Therefore, except on proposed high fill height locations where traversable slopes are impractical and guardrail would be utilized, such as the left side of SR8/US78/Bankhead Highway between Sta. 34+00 to Mann Road and the left side of Mann Road from Bankhead Highway to Sta. 25+50, the roadway slopes within the project are designed to be traversable based upon the above guidelines.

- 2:1 foreslopes are more difficult to maintain as they cannot be mowed from a tractor/lawnmower and are more susceptible to erosion. The guardrail itself and guardrail anchors would also need to be maintained from corrosion and vehicle impacts.