




**STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION**  
SUITE 1000, JAMES K. POLK BUILDING  
505 DEADERICK STREET  
NASHVILLE, TN 37243  
(615) 741-2208

**JOHN C. SCHROER**  
COMMISSIONER

**BILL HASLAM**  
GOVERNOR

**MEMORANDUM**

TO: Mr. Paul Degges, Deputy Commissioner and Chief Engineer

FROM:  Mr. Steve Allen, Strategic Transportation Investments Director

DATE: December 5, 2013

SUBJECT: **Road Safety Audit Review (RSAR), State Route 2 (Cummings Highway)  
From Interstate 24 WB Ramps (Log Mile 2.09) to State Route 38  
(Birmingham Highway, Log Mile 2.32)  
Hamilton County, PIN 118452.00**

This project was identified through the Tennessee Department of Transportation (TDOT) safety needs planning process. The section of State Route (SR) 2 from log mile 2.09 to log mile 2.32 is a four (4) lane divide urban minor arterial, with twelve (12) feet lane widths and shoulder widths varying from two (2) to ten (10) feet. SR 2 appears on the Highway Safety Improvement Program (HSIP) list and qualifies for Hazard Elimination Safety Program (HESP) funds, because the crash ratio (actual crash rate divided by critical crash rate) was 5.88 which is greater than 3.50, the current minimum threshold.

The total estimated cost of improvements listed in the report is \$2,551,000. Right-of-way acquisition is required. A lighting maintenance agreement is required (City of Chattanooga). No local match is required. These improvements will be let to contract.

If you should need any further information, please contact me at (615) 741-2208 or e-mail me at [Steve.Allen@tn.gov](mailto:Steve.Allen@tn.gov).  
SA/cb

**Attachment**

CC: Adetokunbo Omishakin, Jim Moore, Ray Rucker, Brad Freeze, Jerry Hatcher, Brian Hurst, Alan Wolfe, Karen Rennich (Chattanooga TPO), file

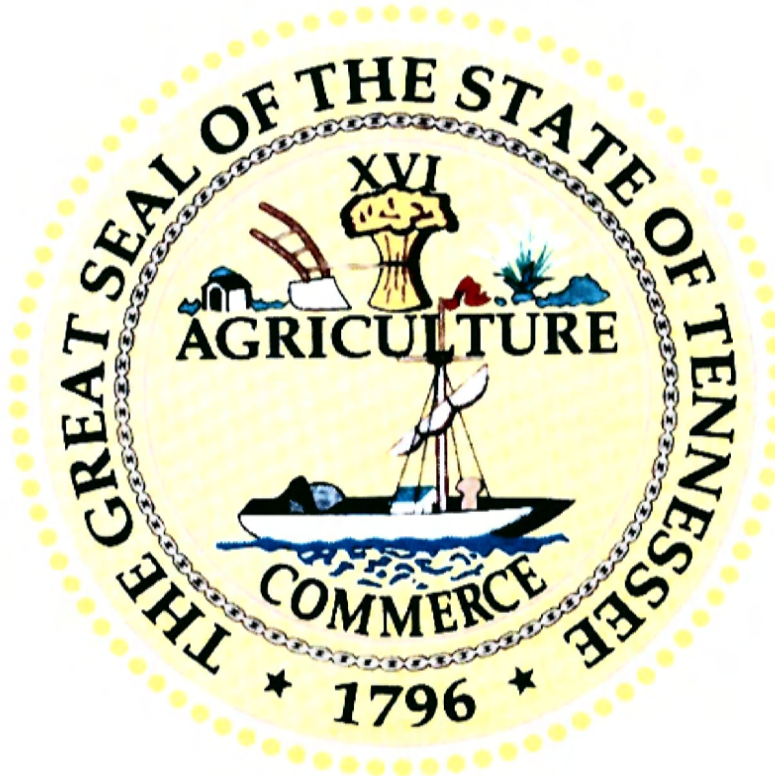
# ***ROAD SAFETY AUDIT REPORT***

## ***STATE ROUTE 2 (CUMMINGS HIGHWAY)***

***From Interstate 24 WB Ramps LM 2.09 to  
State Route 38 (Birmingham Highway, Log Mile 2.32)***

***HAMILTON COUNTY***

***PIN 118452.00***



***PREPARED BY***

***ARCADIS***

***For the***

***TENNESSEE DEPARTMENT OF TRANSPORTATION  
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION***

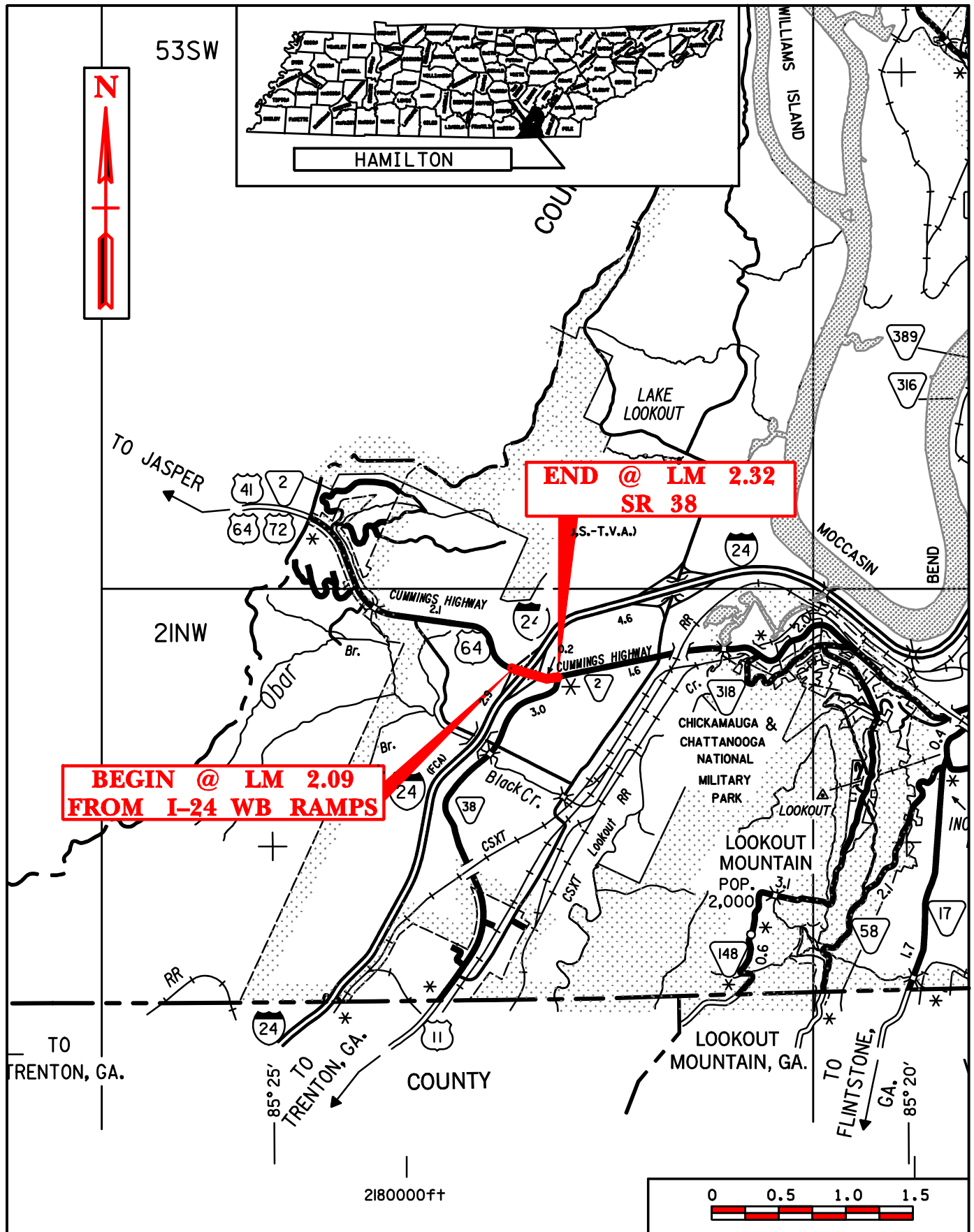
Approved by:	Signature	DATE
<b>DIRECTOR Strategic Transportation Investments Division</b>		<b>12-9-13</b>

*This document is covered by 23 USC § 409 and its production pursuant to fulfilling public planning requirements does not waive the provisions of § 409.*



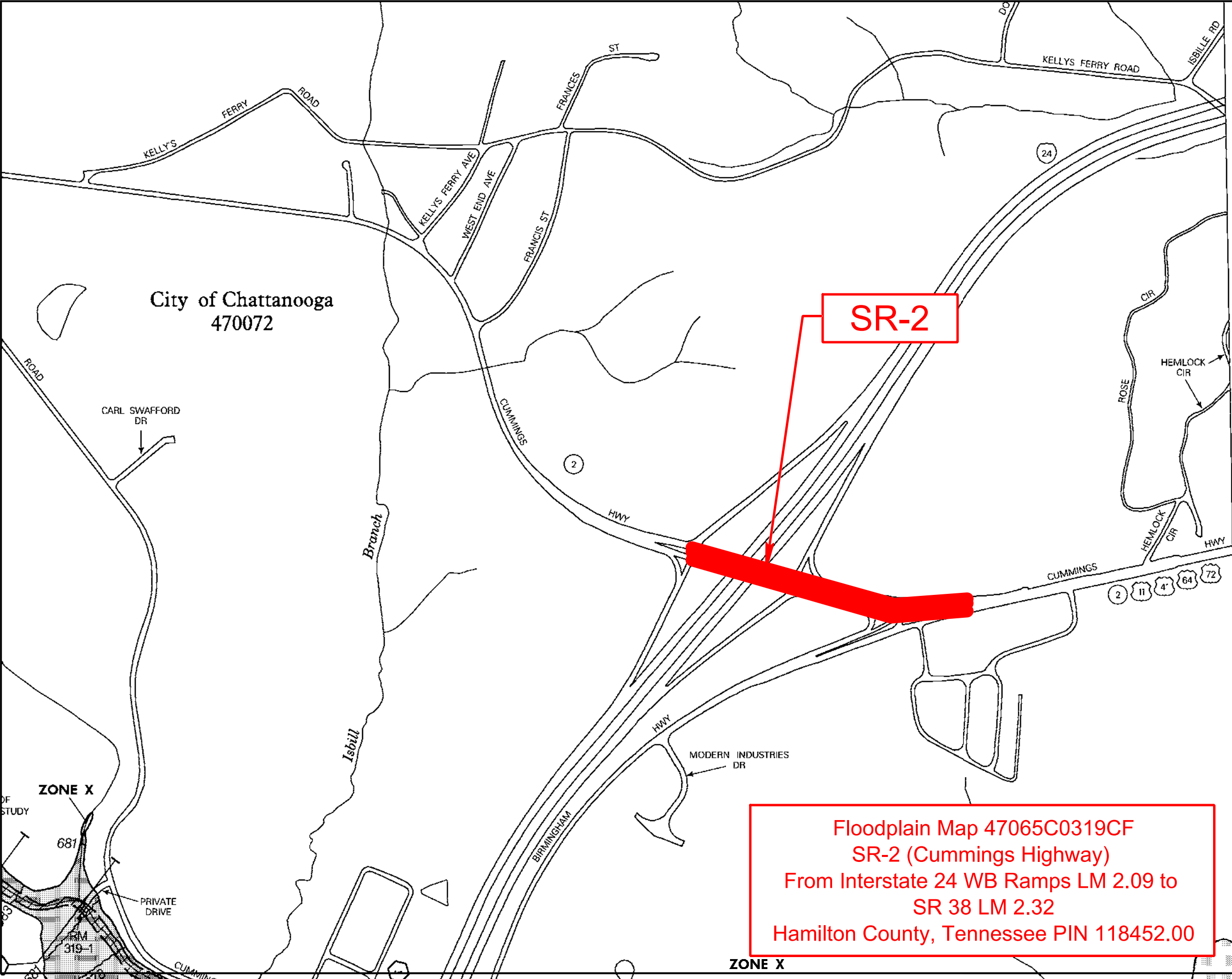




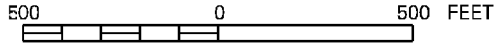


**LOCATION MAP  
ROADWAY SAFETY AUDIT  
SR 2 (CUMMINGS HIGHWAY)  
FROM I-24 WB RAMPS  
TO SR 38  
HAMILTON COUNTY, TN**

DRAWN BY:	CHECKED BY:
SH	CB
SR 2 LM 2.09 TO LM 2.16	
PIN 118452.00	
SCALE:	DATE:
1" = 1 MILE	03-22-13



APPROXIMATE SCALE



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
FLOOD INSURANCE RATE MAP  
HAMILTON COUNTY,  
TENNESSEE  
AND INCORPORATED AREAS

PANEL 319 OF 530

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHATTANOOGA, CITY OF	470072	0319	F
HAMILTON COUNTY	470072	0319	F

Notice to User: The MAP NUMBER shown above should be used when ordering this map. The COMMUNITY NUMBER shown above should be used when ordering this map. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



MAP NUMBER  
47065C0319F

EFFECTIVE DATE:  
NOVEMBER 7, 2002

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

## Hamilton County

SR 2 (Cummings Highway)

From Interstate 24 WB Ramps LM 2.09 to SR 38 (Birmingham Highway, LM 2.32)  
118452.00

## Road Safety Audit Review

Date of Review: March 28, 2013

### Project Description and Background

This project was identified through the Tennessee Department of Transportation (TDOT) safety needs planning process. The section of State Route (SR) 2 from log mile 2.09 to log mile 2.32 is a four (4) lane divided urban minor arterial, with twelve (12) feet lane widths and shoulder widths varying from two (2) to ten (10) feet. SR 2 appears on the Highway Safety Improvement Program (HSIP) list and qualifies for Hazard Elimination Safety Program (HESP) funds, because the crash ratio (actual crash rate divided by critical crash rate) was 5.88 which is greater than 3.50, the current minimum threshold.

The RSAR team members are provided below.

### RSAR Team Members

Name	Organization	Title	Phone #	Email
Glenda Tyus	TDOT-Strategic Transportation Investments Div.	Transportation Planner 4	615-741-1816	<a href="mailto:Glenda.Tyus@tn.gov">Glenda.Tyus@tn.gov</a>
David Duncan	TDOT- Strategic Transportation Investments Div.	Roadway Specialist 2	615-532-6131	<a href="mailto:David.A.Duncan@tn.gov">David.A.Duncan@tn.gov</a>
Mike Gilbert	TDOT- Strategic Transportation Investments Div.	Roadway Specialist 2	615-741-0772	<a href="mailto:Michael.Gilbert@tn.gov">Michael.Gilbert@tn.gov</a>
Terrance Hill	TDOT-UT	Special Projects Coordinator	615-532-5824	<a href="mailto:Terrance.Hill@tn.gov">Terrance.Hill@tn.gov</a>
Alan Wolfe	TDOT-Traffic Region 2	Regional Traffic Manager	423-510-1139	<a href="mailto:Alan.Wolfe@tn.gov">Alan.Wolfe@tn.gov</a>
Landon Castleberry	TDOT-Traffic Region 2	Ops. Specialist 2	423-510-1208	<a href="mailto:Landon.T.Castleberry@tn.gov">Landon.T.Castleberry@tn.gov</a>
Amber Thornton	TDOT-Project Management Region 2	Transportation Project Manager 2	423-510-1225	<a href="mailto:Amber.Thornton@tn.gov">Amber.Thornton@tn.gov</a>
Karen Anderson	ARCADIS	Project Engineer	423-756-7193	<a href="mailto:Karen.Anderson@arcadis-us.com">Karen.Anderson@arcadis-us.com</a>
Harvey McKaig	ARCADIS	Transportation Specialist	423-756-7193	<a href="mailto:Harvey.McKaig@arcadis-us.com">Harvey.McKaig@arcadis-us.com</a>
Jason Yakimowich	City of Chattanooga	Traffic Engineer	423-643-5950	<a href="mailto:Yakimowich_J@chattanooga.gov">Yakimowich_J@chattanooga.gov</a>

## **Hamilton County**

SR 2 (Cummings Highway)

From Interstate 24 WB Ramps LM 2.09 to SR 38 (Birmingham Highway, LM 2.32)  
118452.00

### **Information Used in the Review**

- TDOT Hamilton County Highway Map
- United States Geological Survey (USGS) Map
- Aerial Photography
- TRIMS Traffic Report
- TRIMS Geometric Report
- TRIMS Road Segment Report
- TRIMS Route Feature Description Listing
- TRIMS Crash Data (2007, 2008, and 2009)
- TRIMS Crash Summary Report
- Crash Reports
- Crash Summary Sheets

### **Pre-Brief Summary**

The RSAR pre-brief meeting was held on Tuesday, March 26, 2013 at 9:00 AM CDT via teleconference.

An overview of the crash data observations and findings for the section of State Route 2 were reviewed with the team members. From January 01, 2007 to December 31, 2009 a total of fifty-three (53) crashes occurred on this section with thirty-seven (37) property damage crashes, twelve (12) non-incapacitating injury crashes and four (4) incapacitating injury crashes.

Discussions among pre-brief meeting attendees included:

- The Waffle House parking lot was selected as the meeting location. It is located in the northwest corner of the intersection of SR 2 and Interstate 24 WB Ramp. Meeting time was set at 9:00 AM CDT.

### **Observations**

The following observations were made utilizing existing data and information collected during the on-site visit conducted on Thursday, March 28, 2013:

- Following the field review, the project limits were extended to include the intersections of I-24 EB Ramps at SR 2 and SR 38 (Birmingham Highway) at SR 2. This will provide a coordinated review of the control at all three intersections.
- SR 2 is a four (4) lane divided urban minor arterial route with an asphalt pavement surface.
- The pavement is in good condition.
- A heavy left turning truck volume was observed travelling eastbound from the Interstate 24 WB ramp.
- Centerline raised pavement markers were present along SR 2.
- SR 2 has edge line rumble stripes.

## **Hamilton County**

SR 2 (Cummings Highway)

From Interstate 24 WB Ramps LM 2.09 to SR 38 (Birmingham Highway, LM 2.32)

118452.00

- Shoulder widths vary from two (2) to ten (10) feet. Under Interstate 24 only, five (5) feet sidewalks are present on both sides of SR 2.
- TRIMS indicated a 2011 Annual Average Daily Traffic (AADT) volume of 3,540 for this section and 11,010 for SR 2 east of Interstate 24.
- TDOT provided Turning Movement Counts (TMC) at the Interstate 24 WB intersection for Signal Warrant Analysis and Roundabout Analysis.
- The Interstate 24 WB intersection does not meet Signal Warrant. (Results provided in the appendix.)
- Peak hour traffic counts were collected on Thursday October 10, 2013 along State Route 2 at the intersections of Interstate 24 eastbound ramps, westbound ramps and State Route 38 (Birmingham Highway). Counts are provided in the Appendix.
- Analysis of the existing geometrics with existing traffic volumes indicate that the stop controlled intersection of SR 2 and the Interstate 24 westbound ramps operate at an LOS E in the AM peak hour and an LOS F in the PM peak hour. The stop controlled intersection of SR 2 and the Interstate 24 eastbound ramps operate at an LOS B in the AM and PM peak hours. Analysis of the existing geometrics and existing traffic volumes at the signalized intersection of SR 38 and SR 2 operate at an LOS B for both the AM peak hour and a LOS C in PM peak hour.
- Analysis of the proposed geometrics with existing traffic volumes indicate that the two (2) Interstate 24 ramp intersection roundabouts will operate at an LOS A during both the AM and PM peak hours. Analysis of the proposed geometrics and existing traffic volumes at the SR 38 and SR 2 signalized intersection indicate that it will operate at an LOS B in the AM peak hour and an LOS C in the PM peak hour. The maximum expected northbound queue along SR 38 at SR 2 is 111 feet. The storage between the two intersections is approximately 400 feet. Therefore, the SR 38 at SR 2 signal queue will not impact the roundabout operations. (Traffic Counts and Results are provided in the appendix.)

Construction of the roundabout at the Interstate 24 westbound ramps will improve the operations from an LOS E to an LOS A in the AM peak and from an LOS F to an LOS A in the PM peak. The Interstate 24 eastbound roundabout will improve the operations from an LOS B to an LOS A for both the AM and PM peaks. LOS at the signalized intersection of SR 38 and SR 2 will remain an LOS B for both the AM and PM peaks.

Recommended improvements and guidance are on the following aerial figures.

The total estimated cost of improvements listed in the report is \$2,551,000. Right-of-way acquisition is required. A lighting maintenance agreement is required (City of Chattanooga). No local match is required. These improvements will be let to contract.



## Project Photographs

SR 2 (Cummings Highway)  
From Interstate 24 WB Ramp (LM 2.09)  
To SR 38 (Birmingham Highway LM 2.32)  
Hamilton County  
Date Photos Taken: March 28, 2013  
October 30, 2013

### Photograph 1

Taken: March 28, 2013  
View looking west along  
SR 2 near Interstate 24  
WB Off Ramp



### Photograph 2

Taken: March 28, 2013  
View looking east along  
SR 2 from the Interstate  
24 WB Off Ramp



## Project Photographs

SR 2 (Cummings Highway)  
From Interstate 24 WB Ramp (LM 2.09)  
To SR 38 (Birmingham Highway LM 2.32)  
Hamilton County  
Date Photos Taken: March 28, 2013  
October 30, 2013

### **Photograph 3**

Taken: March 28, 2013  
View looking north along  
Interstate 24 WB Off  
Ramp



### **Photograph 4**

Taken: March 28, 2013  
View looking south along  
Interstate 24 WB Off  
Ramp toward SR 2





## Project Photographs

SR 2 (Cummings Highway)  
From Interstate 24 WB Ramp (LM 2.09)  
To SR 38 (Birmingham Highway LM 2.32)  
Hamilton County  
Date Photos Taken: March 28, 2013  
October 30, 2013

### **Photograph 5**

Taken: March 28, 2013  
View looking east along  
SR 2 toward Interstate 24  
WB Ramps.



### **Photograph 6**

Taken: March 28, 2013  
View looking west along  
SR 2 toward Interstate 24





## Project Photographs

SR 2 (Cummings Highway)  
From Interstate 24 WB Ramp (LM 2.09)  
To SR 38 (Birmingham Highway LM 2.32)  
Hamilton County  
Date Photos Taken: March 28, 2013  
October 30, 2013

### Photograph 7

Taken: October 30, 2013  
View looking north from  
Interstate 24 EB off ramp.



### Photograph 8

Taken: October 30, 2013  
View looking south at I-24  
EB off ramp.



## Project Photographs

SR 2 (Cummings Highway)  
From Interstate 24 WB Ramp (LM 2.09)  
To SR 38 (Birmingham Highway LM 2.32)  
Hamilton County  
Date Photos Taken: March 28, 2013  
October 30, 2013

### **Photograph 9**

Taken: October 30, 2013  
View looking north at I-24  
EB on ramp.



### **Photograph 10**

Taken: October 30, 2013  
View looking west at the  
SR 2 and SR 38  
intersection.





## Project Photographs

SR 2 (Cummings Highway)  
From Interstate 24 WB Ramp (LM 2.09)  
To SR 38 (Birmingham Highway LM 2.32)  
Hamilton County  
Date Photos Taken: March 28, 2013  
October 30, 2013



### **Photograph 11**

Taken: October 30, 2013  
View looking south along  
SR 38 (Birmingham Hwy).



### **Photograph 12**

Taken: October 30, 2013  
View looking north along  
SR 38 at the SR 2  
intersection.



Route:	SR 2 (Cummings Highway)
Description:	From Interstate 24 WB Ramps (LM 2.09) to SR 38 (LM 2.32)
County:	Hamilton County
Length:	0.23 Miles
Date:	December 5, 2013

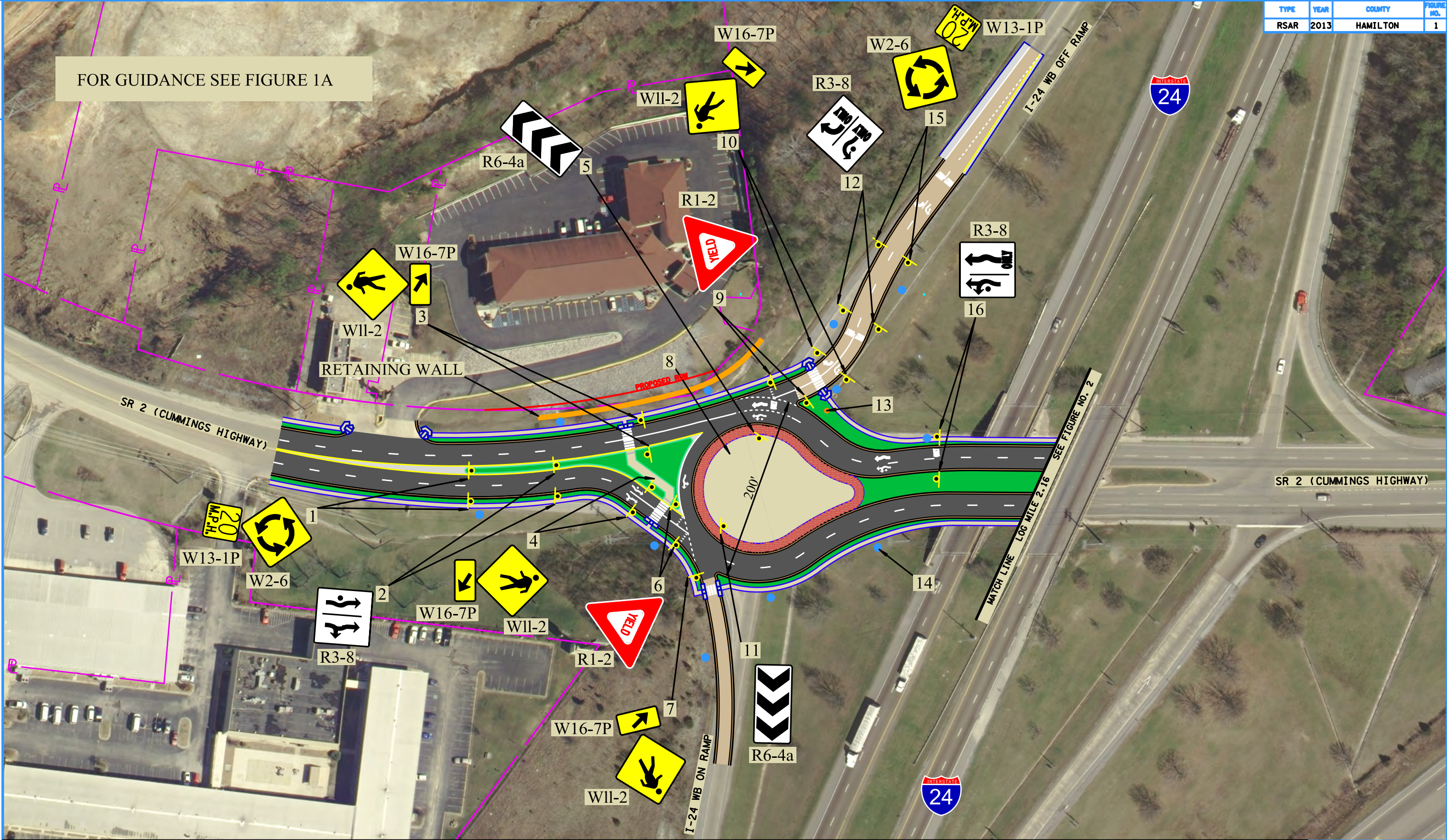
<u>DESCRIPTION</u>	<u>LOCAL</u>	<u>STATE</u>	<u>FEDERAL</u>	<u>TOTAL</u>
Right-of-Way	\$ -	\$ -	\$ 40,000	\$ 40,000
Clearing and Grubbing	\$ -	\$ -	\$ 10,000	\$ 10,000
Earthwork	\$ -	\$ -	\$ 375,000	\$ 375,000
Railroad Crossing or Separation	\$ -	\$ -	\$ -	\$ -
Drainage	\$ -	\$ -	\$ 110,000	\$ 110,000
Utilities	\$ -	\$ -	\$ 60,000	\$ 60,000
Structures	\$ -	\$ -	\$ -	\$ -
Pavement Removal	\$ -	\$ -	\$ 54,400	\$ 54,400
Paving	\$ -	\$ -	\$ 548,000	\$ 548,000
Roadway and Pavement Appurtenances	\$ -	\$ -	\$ 189,700	\$ 189,700
Retaining Walls	\$ -	\$ -	\$ 200,300	\$ 200,300
Topsoil	\$ -	\$ -	\$ -	\$ -
Seeding	\$ -	\$ -	\$ -	\$ -
Sodding	\$ -	\$ -	\$ 24,400	\$ 24,400
Rip-Rap or Slope Protection	\$ -	\$ -	\$ -	\$ -
Fencing	\$ -	\$ -	\$ -	\$ -
Signing <sup>1</sup>	\$ -	\$ -	\$ 15,200	\$ 15,200
Pavement Markings <sup>1</sup>	\$ -	\$ -	\$ 18,900	\$ 18,900
Lighting <sup>1</sup>	\$ -	\$ -	\$ 70,000	\$ 70,000
Signalization <sup>1</sup>	\$ -	\$ -	\$ -	\$ -
Guardrail <sup>1</sup>	\$ -	\$ -	\$ 3,500	\$ 3,500
Pay Item Quantity Adjustment (15%) <sup>2</sup>	\$ -	\$ -	\$ 257,900	\$ 257,900
Maintenance of Traffic	\$ -	\$ -	\$ 30,000	\$ 30,000
Mobilization (5%)	\$ -	\$ -	\$ 100,400	\$ 100,400
CONSTRUCTION COST (rounded)	\$ -	\$ -	\$ 2,107,700	\$ 2,107,700
Engineering and Contingency (10%)	\$ -	\$ -	\$ 210,800	\$ 210,800
TOTAL CONSTRUCTION COST (rounded)	\$ -	\$ -	\$ 2,319,000	\$ 2,319,000
Preliminary Engineering (10%)	\$ -	\$ -	\$ 232,000	\$ 232,000
<b>PROJECT COST <sup>3</sup>(rounded)</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$2,551,000</b>	<b>\$2,551,000</b>

<sup>1</sup> This safety item is 100% eligible and does not require a 10% funding match by the local agency.

<sup>2</sup> For estimating purposes pay items are adjusted for fluxuation of cost based on quantity.

<sup>3</sup> For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.





FOR GUIDANCE SEE FIGURE 1A

ROADWAY SAFETY AUDIT REVIEW  
STATE ROUTE 2  
FROM I-24 WB RAMPS LM 2.09  
TO SR 38 LM 2.32  
HAMILTON COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
STRATEGIC TRANSPORTATION  
INVESTMENTS DIVISION  
FIGURE 1  
SR 2  
L.M.2.09 to  
L.M. 2.16

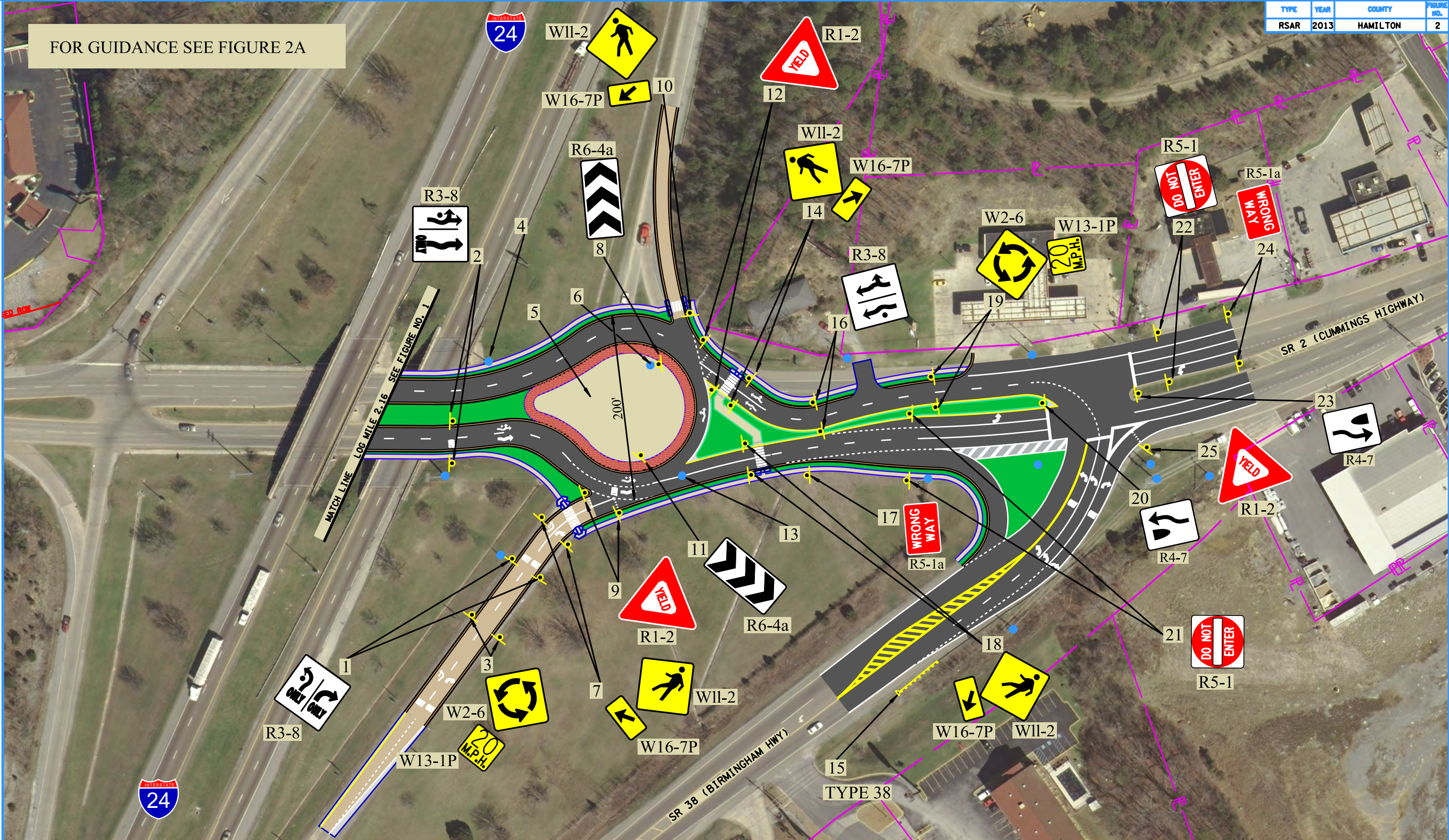


GUIDANCE

1. Install one (1) Roundabout Warning (W2-6) (36"x36") sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque and one (1) supplemental Roundabout Warning (W2-6) sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque, southbound on SR 2 approximately 300 feet north of Interstate 24 WB Ramps.
2. Install one (1) Advanced Intersection Lane Control (R3-8) (48"x36") sign and one (1) supplemental Advanced Intersection Lane Control (R3-8) sign, southbound on SR 2 approximately 200 feet north of Interstate 24 WB Ramps.
3. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque and one (1) supplemental Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, northbound on SR 2 approximately 20 feet south of pedestrian crosswalk.
4. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque and one (1) supplemental Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, southbound on SR 2 approximately 20 feet north of pedestrian crosswalk.
5. Install one (1) Roundabout Directional Chevron (R6-4a) (48"x24") sign, inside roundabout as shown facing the Interstate 24 WB Off Ramp approach at SR 2.
6. Install one (1) Yield (R1-2) (48"x48"x48") sign and one (1) supplemental Yield (R1-2) sign, southbound on SR 2 at Interstate 24 WB Ramps. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
7. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, westbound on I-24 WB on ramp approximately 20 feet east of pedestrian crosswalk.
8. Improve the intersection of SR 2 and Interstate 24 WB Ramps to provide a two (2) lane roundabout, curb and gutter, 5' sidewalks and handicap ramps in accordance with TDOT Standard Drawing RD01-TS-10. The intersection shall have all pavement markings and appropriate signing laid out according to TDOT design guidelines. All striping shall be Enhanced Flatline Thermoplastic.
9. Install one (1) Yield (R1-2) (48"x48"x48") sign and one (1) supplemental Yield (R1-2) sign, westbound on Interstate 24 WB Off Ramp at SR 2. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
10. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque and one (1) supplemental Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, westbound on Interstate 24 WB Off Ramp approximately 20 feet east of pedestrian crosswalk.
11. Install one (1) Roundabout Directional Chevron (R6-4a) (48"x24") sign, inside roundabout as shown facing the SR 2 southbound approach at Interstate 24 WB Ramps.
12. Install one (1) Advanced Intersection Lane Control (R3-8) (48"x36") sign and one (1) supplemental Advanced Intersection Lane Control (R3-8) sign, westbound on Interstate 24 WB Off Ramp approximately 200 feet east of SR 2.
13. Remove and relocate one (1) utility pole.
14. Install roadway lighting according to the TDOT design guidelines (Including a lighting plan).
15. Install one (1) Roundabout Warning (W2-6) (36"x36") sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque and one(1) supplemental Roundabout Warning (W2-6) sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque , westbound on Interstate 24 WB Off Ramp approximately 300 feet east of SR 2.
16. Install one (1) Advanced Intersection Lane Control (R3-8) (48"x36") sign and one (1) supplemental Advanced Intersection Lane Control (R3-8) sign, northbound on SR 2 approximately 200 feet south of Interstate 24 WB Ramps.



FOR GUIDANCE SEE FIGURE 2A



ROADWAY SAFETY AUDIT REVIEW  
STATE ROUTE 2  
FROM I-24 WB RAMPS LM 2.09  
TO SR 38 LM 2.32  
HAMILTON COUNTY

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
STRATEGIC TRANSPORTATION  
INVESTMENTS DIVISION  
FIGURE 2  
SR 2  
L.M.2.16 to  
L.M. 2.32



GUIDANCE

1. Install one (1) Advanced Intersection Lane Control (R3-8) (48"x36") sign and one (1) supplemental Advanced Intersection Lane Control (R3-8) sign, eastbound on Interstate 24 EB Off Ramp approximately 200 feet west of SR 2.
2. Install one (1) Advanced Intersection Lane Control (R3-8) (48"x36") sign and one (1) supplemental Advanced Intersection Lane Control (R3-8) sign, southbound on SR 2 approximately 200 feet north of Interstate 24 EB Ramps.
3. Install one (1) Roundabout Warning (W2-6) (36"x36") sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque and one(1) supplemental Roundabout Warning (W2-6) sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque , eastbound on Interstate 24 Off Ramp approximately 300 feet west of SR 2.
4. Remove and relocate one (1) utility pole.
5. Improve the intersection of SR 2 and Interstate 24 EB Ramps to provide a two (2) lane roundabout, curb and gutter, 5' sidewalks and handicap ramps in accordance with TDOT Standard Drawing RD01-TS-10. The intersection shall have all pavement markings and appropriate signing laid out according to TDOT design guidelines. All striping shall be Enhanced Flatline Thermoplastic.
6. Remove and relocate one (1) utility pole.
7. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque and one (1) supplemental Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, eastbound on Interstate 24 EB Off Ramp approximately 20 feet west of pedestrian crosswalk.
8. Install one (1) Roundabout Directional Chevron (R6-4a) (48"x24") sign, inside roundabout as shown facing the Interstate 24 EB Off Ramp approach at SR 2.
9. Install one (1) Yield (R1-2) (48"x48"x48") sign and one (1) supplemental Yield (R1-2) sign, eastbound on Interstate 24 EB Off Ramp at SR 2. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
10. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, northbound on SR 2 approximately 20 feet south of pedestrian crosswalk.
11. Install one (1) Roundabout Directional Chevron (R6-4a) (48"x24") sign, inside roundabout as shown facing the Interstate 24 EB Off Ramp approach at SR 2.
12. Install one (1) Yield (R1-2) (48"x48"x48") sign and one (1) supplemental Yield (R1-2) sign, northbound on SR 2 at Interstate 24 EB Ramps. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
13. Remove and relocate one (1) utility pole.
14. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque and one (1) supplemental Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, northbound on SR 2 approximately 20 feet south of pedestrian crosswalk.
15. Remove existing guardrail end terminal and install one (1) Type 38 guardrail end terminal on SR 38 eastbound approximately 400 feet west of SR 2.
16. Install one (1) Advanced Intersection Lane Control (R3-8) (48"x36") sign and one (1) supplemental Advanced Intersection Lane Control (R3-8) sign, northbound on SR 2 approximately 200 feet south of Interstate 24 EB Ramps.
17. Install one (1) Wrong Way (R5-1a) (36"x24") sign , northbound on SR 2 approximately 300 feet north of SR 38. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
18. Install one (1) Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque and one (1) supplemental Pedestrians (W11-2) (36"x36") sign with one (1) Downward Diagonal Arrow (W16-7P) plaque, southbound on SR 2 approximately 20 feet north of pedestrian crosswalk.

19. Install one (1) Roundabout Warning (W2-6) (36"x36") sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque and one (1) supplemental Roundabout Warning (W2-6) sign with one (1) 20 MPH Speed Advisory (W13-1P) Plaque, northbound on SR 2 approximately 300 feet south of Interstate 24 EB Ramps.
20. Install one (1) Keep Right (R4-7) (24"x30") sign , northbound on SR 2 in the center island at the intersection of SR 38.
21. Install one (1) Do Not Enter (R5-1) (30"x30") sign one (1) supplemental Do Not Enter (R5-1) (30"x30") sign, southbound on SR 2 approximately 200 feet north of SR 38. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
22. Install one (1) Do Not Enter (R5-1) (30"x30") sign one (1) supplemental Do Not Enter (R5-1) (30"x30") sign, northbound on SR 2 approximately 100 feet south of SR 38. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
23. Install one (1) Keep Right (R4-7) (24"x30") sign , southbound on SR 2. in the center island at the intersection of SR 38.
24. Install one (1) Wrong Way (R5-1a) (36"x24") sign one (1) supplemental Wrong Way (R5-1a) (36"x24") sign, southbound on SR 2 approximately 300 feet south of SR 38. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.
25. Install one (1) Yield (R1-2) (48"x48"x48") sign ,northbound on SR 38 at SR 2. Install 2” min. width red reflective strip on sign posts. See Detail 1, Figure 3.

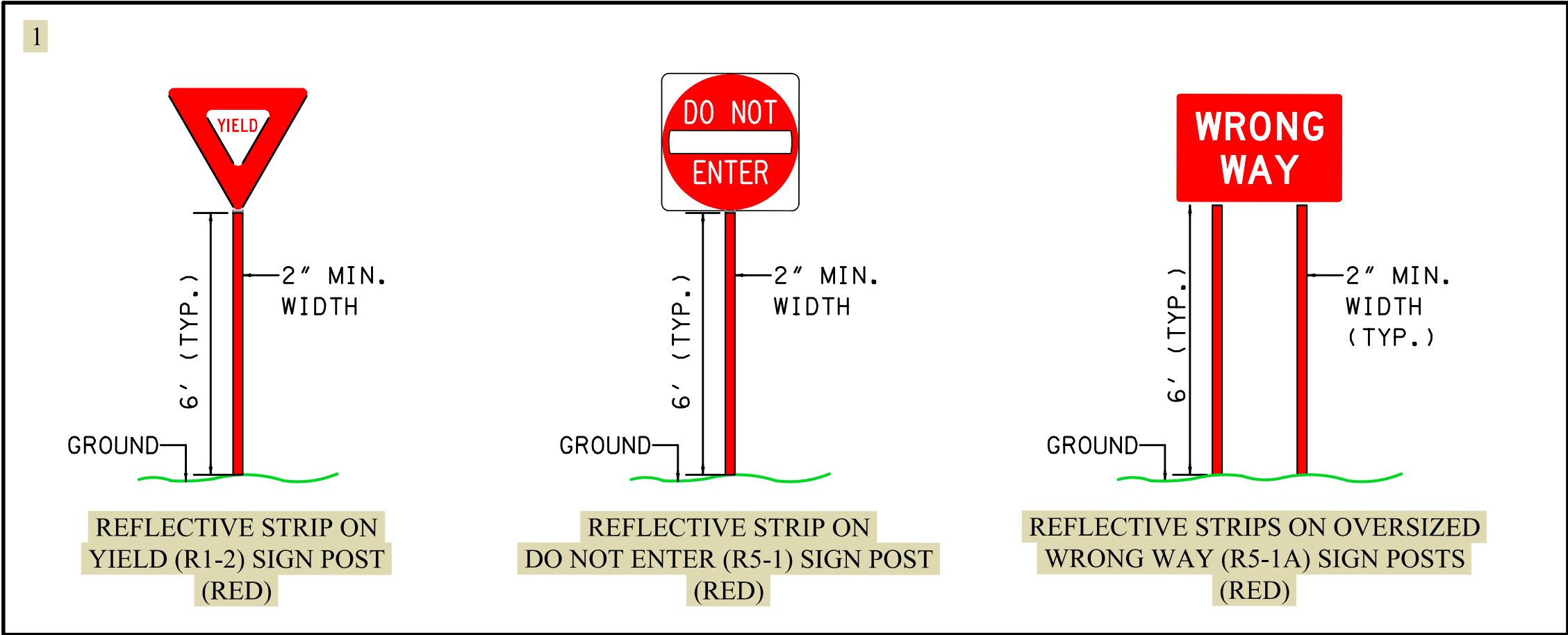
ROADWAY SAFETY AUDIT REVIEW

STATE ROUTE 2

FROM I-24 WB RAMPS LM 2.09

TO SR 38 LM 2.32

HAMILTON COUNTY



ROADWAY SAFETY AUDIT REVIEW

STATE ROUTE 2  
FROM I-24 WB RAMPS LM 2.09  
TO SR 38 LM 2.32  
HAMILTON COUNTY



**Hamilton County**

SR 2 (Cummings Highway)

From Interstate 24 WB Ramps LM 2.09 to SR 38 (Birmingham Highway, LM 2.32)

118452.00

# APPENDIX

## Hamilton County

## SR 2 (Cummings Highway)

## Pay Item Summary

TDOT PAY ITEM	TDOT DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
-	Right-of-Way	LS	LS	\$ 40,000.00	\$ 40,000
<b>RIGHT-OF-WAY TOTAL (ROUNDED)</b>					<b>\$ 40,000</b>
201-01	Clearing and Grubbing	LS	LS	\$ 10,000.00	\$ 10,000
<b>CLEAR AND GRUBBING TOTAL (ROUNDED)</b>					<b>\$ 10,000</b>
203-01	Road & Drainage Excavation (Unclassified)	CY	15000	\$ 5.00	\$ 75,000
203-03	Borrow Excavation (Unclassified)	CY	20000	\$ 15.00	\$ 300,000
<b>EARTHWORK TOTAL (ROUNDED)</b>					<b>\$ 375,000</b>
202-03.01	Removal of Asphalt Pavement	SY	7,800	\$ 5.00	\$ 39,000
415-01.02	Cold Planning Bituminous Pavement	SY	4,400	\$ 3.50	\$ 15,400
<b>PAVEMENT REMOVAL TOTAL (ROUNDED)</b>					<b>\$ 54,400</b>
607-03.02	18" Conc. Pipe Culvert (Class III)	LF	2000	\$ 40.00	\$ 80,000
611-12.02	Catch Basin, Type 12, 4'-8' Depth	EA	12	\$ 2,500.00	\$ 30,000
<b>DRAINAGE TOTAL (ROUNDED)</b>					<b>\$ 110,000</b>
-	Utility Pole Relocation	LS	4	\$ 15,000.00	\$ 60,000
<b>UTILITIES TOTAL (ROUNDED)</b>					<b>\$ 60,000</b>
<b>STRUCTURES TOTAL (ROUNDED)</b>					<b>\$ -</b>
<b>RAILROAD CROSSING OR SEPARATION TOTAL (ROUNDED)</b>					<b>\$ -</b>
303-01	Mineral Aggregate, TY A Base, Grading D	TON	4994.7	\$ 20.00	\$ 99,894
307-01.01	Asp. Conc. Mix(PG64-22) (BPMB-HM) Gr. A	TON	918.0	\$ 65.00	\$ 59,671
307-01.08	Asphalt Conc Mx(PG64-22)(BPMB-HM)Gr B-M2	TON	867.8	\$ 70.00	\$ 60,744
313-03	Treated Permeable Base	SY	1736.8	\$ 18.00	\$ 31,262
402-01	Bituminous Material for Prime Coat (PC)	TON	10.7	\$ 400.00	\$ 4,275
402-02	Aggregate for Cover Material (PC)	TON	42.3	\$ 32.00	\$ 1,354
411-01.07	ACS Mix (PG64-22) Grading E Shoulder	TON	410.8	\$ 80.00	\$ 32,862
411-01.10	ACS Mix(PG64-22) Grading D	TON	643.2	\$ 80.00	\$ 51,452
415-01.02	Cold Planing Bituminous Pavement	SY	4,391	\$ 3.50	\$ 15,369
501-01.03	Portland Cem Concrete Pvmt (Plain) 10"	SY	1736.8	\$ 62.00	\$ 107,680
604-03.07	Class A Concrete	CY	190.0	\$ 400.00	\$ 76,000
701-03	Concrete Median Pavement	CY	13.8	\$ 500.00	\$ 6,907
411-12.01	Scoring shoulders (cont. 16 IN)	L.M.	0.2	\$ 500.00	\$ 100
<b>PAVING TOTAL (ROUNDED)</b>					<b>\$ 548,000</b>
701-01.01	Concrete Sidewalk (4")	SF	16180	\$ 3.50	\$ 56,630
701-02.03	Concrete Handicap Ramp	SF	800	\$ 15.00	\$ 12,000
702-03	Concrete Combined Curb & Gutter	CY	440.00	\$ 275.00	\$ 121,000
<b>ROADWAY AND PAVEMENT APPURTENANCES TOTAL (ROUNDED)</b>					<b>\$ 189,700</b>
604-07.01	Retaining Wall	SF	1335	\$ 150.00	\$ 200,250
<b>RETAINING WALLS TOTAL (ROUNDED)</b>					<b>\$ 200,300</b>
712-01	Traffic Control	LS		\$ 30,000.00	\$ 30,000
<b>MAINTENANCE OF TRAFFIC TOTAL (ROUNDED)</b>					<b>\$ 30,000</b>
<b>TOPSOIL TOTAL (ROUNDED)</b>					<b>\$ -</b>
<b>SEEDING TOTAL (ROUNDED)</b>					<b>\$ -</b>
803-01	Sodding (New Sod)	SY	6,100	\$ 4.00	\$ 24,400
<b>SODDING TOTAL (ROUNDED)</b>					<b>\$ 24,400</b>
713-11.01	"U" Section Steel Posts	LB	1,026	\$ 5.00	\$ 5,130
713-02.21	Sign Post Delineation Enhancement	LF	62	\$ 5.00	\$ 310
713-13.04	Flat Sheet Aluminum Signs (0.100" Thick)	SF	483	\$ 15.00	\$ 7,245
713-13.14	Florescent Yellow Sign Sheeting	SF	244	\$ 5.10	\$ 1,244
713-15.02	Removal & Relocation of Sign & Support	EA	16	\$ 80.00	\$ 1,280
<b>SIGNING TOTAL (ROUNDED)</b>					<b>\$ 15,200</b>

## Hamilton County

## SR 2 (Cummings Highway)

## Pay Item Summary

TDOT PAY ITEM	TDOT DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
716-02.06	Plastic Pavement Marking (Turn Lane Arrow)	EA	10	\$ 120.00	\$ 1,200
716-02.08	Plastic Pavement Marking (8" Dotted Line)	LF	1,200	\$ 2.50	\$ 3,000
716-02.09	Plastic Pavement Marking (Longitudinal Cross-Walk)	LF	140	\$ 20.00	\$ 2,800
716-03.01	Plastic Word Pavement Marking (Only)	EA	6	\$ 135.00	\$ 810
716-04.01	Plastic Pavement Marking (Straight-Turn Arrow)	EA	10	\$ 200.00	\$ 2,000
716-04.05	Plastic Pavement Marking (Straight Arrow)	EA	8	\$ 110.00	\$ 880
716-04.12	Plastic Pavement Marking (Yield Line)	SF	216	\$ 10.00	\$ 2,160
716-12.01	Enhanced Flatline Thermo Pvmt Mrkng (4" Line)	LM	2	\$ 3,000.00	\$ 6,000
<b>PAVEMENT MARKINGS TOTAL (ROUNDED)</b>					<b>\$ 18,900</b>
714-01.36	Roadway Lighting	LS	LS	\$ 70,000.00	\$ 70,000
<b>LIGHTING TOTAL (ROUNDED)</b>					<b>\$ 70,000</b>
<b>SIGNALIZATION TOTAL (ROUNDED)</b>					<b>\$ -</b>
<b>FENCE TOTAL (ROUNDED)</b>					<b>\$ -</b>
705-04.07	Guardrail Terminal (Type 38)	EA	1	\$ 3,350.00	\$ 3,350
706-01	Guardrail Removed	LF	50	\$ 3.00	\$ 150
<b>GUARDRAIL TOTAL (ROUNDED)</b>					<b>\$ 3,500</b>
<b>RIP-RAP OR SLOPE PROTECTION TOTAL (ROUNDED)</b>					<b>\$ -</b>



Designation	Legend or Description	No. of Signs	Size (in.)	Size (sq. ft.)	Total Sq.Ft.
R1-2	YIELD	9	48" x 48" x 48"	7.00	63.00
R3-8	ADVANCED INTERSECTION LANE CONTROL	12	48" x 36"	12.00	144.00
R6-4a	ROUNDABOUT DIRECTIONAL CHEVRON	4	48" x 24"	8.00	32.00
W2-6	ADVANCED ROUNDABOUT WARNING	8	36" x 36"	9.00	72.00
W11-2	ADVANCED PEDESTRIAN WARNING	14	36" x 36"	9.00	126.00
W13-1P	ADVISORY SPEED PLAQUE	8	18" x 18"	2.25	18.00
W16-7P	DOWNWARD DIAGONAL ARROW PLAQUE	14	24" x 12"	2.00	28.00
Totals		69			483.00

COUNTY	=	Hamilton	Date:	11/4/2013
Route	=	SR 2 (Cummings Highway)		
Location	=	I-24 WB Ramps (L.M. 2.09) to SR 38 (L.M. 2.32)		
Highway Type	=	4 LANE SECTION		
FUNCTIONAL CLASS	=	SR 2 (Cummings Highway) is a Urban Minor Arterial		
DATA YEARS	=	2007 to 2009 TRIMS Crash Data		
ADT YEARS USED	=	2011 TRIMS & ADAM		
COMMENTS	=	4 Incapacitating Injury Crashes and no Fatal Crashes		
ANALYZED BY	=	CB		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN 0.10 MILE					
BLM	ELM	Length	Average AADT	VMT	
2.09	2.16	0.07	3,540	248	
2.16	2.32	0.16	11,010	1,762	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
0.00	0.00	0.00	0	0	
		0.23	8,737	2,009	

INTERSECTION		Leg	Traffic AADT
Log Mile	=	North	= 0
		East	=
		South	= 0
		West	= 0
		Entering AADT	= 0
		2011 Trims & Adam	
4 Lane Section			
2007 To 2009 Trims Crash Data			
		Total	Fatal
No. of Crashes	=	53	0
No. of Years	=	3	
SW avg. rate	=	1.777	0.009
08-10 S/W Rates			
		Incap. Injury	
		4	
			*Severe Crashes
			4
			Other Injury
			12
			0.057
			0.426
Exposure (E)	=	2.2003	
Crash Rate (A)	=	24.088	0.000
Critical Rate (C)	=	4.095	1.818
Severity Index (SI)	=	0.3774	1.818
			5.454
Actual Rate/SW Average	=	13.56	0.00
Ratio of A/C	=	5.88	37.87
			31.89
			12.80

\* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/3/2007

T.D.O.T. STRATEGIC TRANSPORTATION INVESTMENTS DIVISION (SAFETY PLANNING SECTION)

Cb





ROADWAY SAFETY AUDIT REVIEW

STATE ROUTE 2  
FROM I-24 WB RAMPs LM 2.09  
TO SR 38 LM 2.32  
HAMILTON COUNTY

CRASHES OCCURED  
BETWEEN 2007 TO 2009

LEGEND

- FATALITY
- INCAPACITATING INJURY
- NON-INCAPACITATING INJURY
- PROPERTY DAMAGE

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
STRATEGIC TRANSPORTATION  
INVESTMENTS DIVISION

FIGURE 1  
SR 2  
L.M.2.09 to  
L.M. 2.32



FROM : 01-01-2007  
TO : 12-31-2007



I-24 WEST BOUND OFF RAMP

08-22-2007 08:30PM - D/C

02-16-2007 11:55AM - D/C

07-11-2007 7:35 PM - W/R

06-19-2007 5:00 PM - W/R

07-23-2007 4:00 PM - D/C

09-14-2007 2:28 PM - W/R

SR 2 (CUMMINGS HIGHWAY)

SR 2 (CUMMINGS HIGHWAY)

I-24

I-24 WEST BOUND ON RAMP

### LEGEND

PATH OF MOVING MOTOR VEHICLE.....  
PEDESTRIAN PATH.....  
FATAL CRASH.....  
INJURY CRASH.....  
REAR-END COLLISION.....  
PARKED VEHICLE.....  
FIXED OBJECT.....  
OVERTURNED.....  
OUT OF CONTROL.....  
SIDESWIPED.....

PAVEMENT: D=DRY I=ICY W=WET  
WEATHER: C=CLEAR F=FOG R=RAIN SL=SLEET S=SNOW

TYPE OF CRASH	DAY	NIGHT
FATAL	0	0
INCAPACITING INJURY	0	0
NON-INCAPACITING INJURY	1	1
PROPERTY DAMAGE	4	0
TOTAL	5	1



**COLLISION DIAGRAM**  
**ROAD SAFETY AUDIT REVIEW**  
**SR 2 L.M. 2.09 TO L.M. 2.16**  
**HAMILTON COUNTY, TN**

DRAWN BY:

**SH**

CHECKED BY:

**CB**

**SR 2**

**PIN 118452.00**

DATE:

**03-22-13**



FROM : 01-01-2008  
TO : 12-31-2008



I-24 WEST BOUND OFF RAMP

I-24 2008 05:30 PM - W/R

SR 2 (CUMMINGS HIGHWAY)

08-29-2008 4:40 PM - D/C

02-29-2008 3:30 PM - W/R

03-04-2008 6:45 AM - W/R

03-04-2008 09:20 AM - D/C

SR 2 (CUMMINGS HIGHWAY)

I-24

I-24 WEST BOUND ON RAMP

### LEGEND

PATH OF MOVING MOTOR VEHICLE.....  
PEDESTRIAN PATH.....  
FATAL CRASH.....  
INJURY CRASH.....  
REAR-END COLLISION.....  
PARKED VEHICLE.....  
FIXED OBJECT.....  
OVERTURNED.....  
OUT OF CONTROL.....  
SIDESWIPED.....

PAVEMENT: D=DRY I=ICY W=WET  
WEATHER: C=CLEAR F=FOG R=RAIN SL=SLEET S=SNOW

TYPE OF CRASH	DAY	NIGHT
FATAL	0	0
INCAPACITATING INJURY	1	0
NON-INCAPACITATING INJURY	1	0
PROPERTY DAMAGE	2	1
TOTAL	4	1



**COLLISION DIAGRAM**  
**ROAD SAFETY AUDIT REVIEW**  
**SR 2 L.M. 2.09 TO L.M. 2.16**  
**HAMILTON COUNTY, TN**

DRAWN BY:

**SH**

CHECKED BY:

**CB**

**SR 2**

**PIN 118452.00**

DATE:

**03-22-13**



FROM : 01-01-2009  
TO : 12-31-2009



I-24 WEST BOUND OFF RAMP

09-28-2009 05:55 PM - D/C  
05-04-2009 06:45 AM - D/C  
12-19-2009 07:35 PM - W/R

SR 2 (CUMMINGS HIGHWAY)

11-30-2009 8:54 AM - W/R  
08-01-2009 5:45 PM - D/C  
10-02-2009 3:35 PM - D/C  
01-16-2009 01:43 AM - D/C

SR 2 (CUMMINGS HIGHWAY)

I-24

I-24 WEST BOUND ON RAMP

05-22-2009  
NO CRASH REPORT DATA

**LEGEND**

- PATH OF MOVING MOTOR VEHICLE.....  
PEDESTRIAN PATH.....  
FATAL CRASH.....  
INJURY CRASH.....  
REAR-END COLLISION.....  
PARKED VEHICLE.....  
FIXED OBJECT.....  
OVERTURNED.....  
OUT OF CONTROL.....  
SIDESWIPE.....  
HEADON.....
- PAVEMENT: D=DRY I=ICY W=WET  
WEATHER: C=CLEAR F=FOG R=RAIN SL=SLEET S=SNOW

TYPE OF CRASH	DAY	NIGHT
FATAL	0	0
INCAPACITING INJURY	0	0
NON-INCAPACITING INJURY	3	0
PROPERTY DAMAGE	3	2
TOTAL	6	2



**COLLISION DIAGRAM**  
**ROAD SAFETY AUDIT REVIEW**  
**SR 2 L.M. 2.09 TO L.M. 2.16**  
**HAMILTON COUNTY, TN**

DRAWN BY: <b>SH</b>	CHECKED BY: <b>CB</b>
<b>SR 2</b>	
<b>PIN 118452.00</b>	
DATE: <b>03-22-13</b>	



**RSAR – SR 2 (CUMMINGS HIGHWAY) HAMILTON COUNTY  
CRASH REPORT SUMMARY (2007-2009)  
INCAPACITATING INJURY CRASH (NO FATAL CRASHES)**

L.M. 2.11 02/29/2008: Vehicle on I-24 Westbound Exit Ramp was attempting to turn left onto SR 2 (Cummings Highway) and was struck by a westbound vehicle on SR 2 (Cummings Highway). Left turning vehicle failed to yield right-of-way. Daylight, rain. One (1) incapacitating injury.

L.M. 2.21 07/07/2007: Angle crash. Daylight, clear. Two (2) incapacitating injuries. Crash report was not provided.

L.M. 2.24 05/27/2007: Angle crash. Daylight, clear. One (1) incapacitating injury. Crash report was not provided.

L.M. 2.32 11/27/2007: Head-on crash. Daylight, clear. Two (2) incapacitating injuries. Crash report was not provided.

**CRASH SUMMARY SHEET**  
**RSAR: SR 2 (Cummings Hwy)**  
**at Interstate 24 Eastbound Ramps (LM 2.21)**

**1/1/07 to 12/31/09 Crash Data Observations**

**Crash Summary (1/1/07 to 12/31/09)**

Total Number of Crashes = 8

Total Number of Fatal Crashes = 0

Total Number of Incapacitating Injury Crashes = 2

**Overall Corridor Crash Types (2 or more Crashes)**

- ✓ 75% (6) were Angle Crashes
- ✓ 25% (2) were Rear End Crashes

**Overall Corridor Contributing Factors**

- ✓ 13% (1) occurred at Dark-Lighted
- ✓ 87% (7) occurred during Daylight
- ✓ 13% (1) were due to Wet Conditions
- ✓ 87% (7) occurred in Dry Conditions



**CRASH SUMMARY SHEET**  
**RSAR: SR 2 (Cummings Hwy)**  
**at SR 38 (Birmingham Hwy, LM 2.32)**

**1/1/07 to 12/31/09 Crash Data Observations**

**Crash Summary (1/1/07 to 12/31/09)**

Total Number of Crashes = 26

Total Number of Fatal Crashes = 0

Total Number of Incapacitating Injury Crashes = 1

**Overall Corridor Crash Types (2 or more Crashes)**

- ✓ 38% (10) were Angle Crashes
- ✓ 23% (6) were Rear End Crashes
- ✓ 19% (5) were Sideswipe Crashes
- ✓ 12% (3) were No Collision w/ Vehicle
- ✓ 8% (2) were Head-On Crashes

**Overall Corridor Contributing Factors**

- ✓ 15% (4) occurred at Dark-Lighted
- ✓ 81% (21) occurred during Daylight
- ✓ 1% (1) occurred at Dawn
- ✓ 31% (8) were due to Wet Conditions
- ✓ 69% (18) occurred in Dry Conditions

One Incap Injury in 2010, Rear End, Wet Conditions

# TRAFFIC SIGNAL WARRANT ANALYSIS - VOLUME WARRANTS

Intersection of and **SR 2 (Cummings Highway)** Date of Count: **5/8/2013** Are warranting volumes to be adjusted for built up area or speeds greater than 40 mph? **YES**  
**Interstate 24 WB Ramp** Day of Week of Count: **Wednesday**  
 City or County: **Chattanooga** State: **TN** Adjustment factor for day of week and month of year of count: **1.00**  
 Number of Lanes: **2** Major Street **1.00** Minor Street **1.00**  
**2** **2**

Time	Major Street			Minor Street		Warrant 1A Min Vehicular Volume		Warrant 1B Inter of Cont Traffic		Warrant 1C 80% of Warrant 1A		Warrant 1D 80% of Warrant 1B		Warrant 2 Four Hour Volume		Warrant 3 Peak Hour Volume		
	Actual Volume			Adjusted Total Volume	Actual Volume	Adjusted Total Volume	Percent of Warrant		Percent of Warrant		Percent of Warrant		Percent of Warrant		Warrant Volume	Percent of Warrant	Warrant Volume	Percent of Warrant
	App #1	App #2	Total				Major	Minor	Major	Minor	Major	Minor	Major	Minor				
Beginning																		
6:00 am	110	106	216	216	70	51	50	34	100	45	44	30	88	0	*****	0	*****	
7:00	232	147	379	379	112	90	80	60	160	79	70	53	140	310	36	0	*****	
8:00	181	163	344	344	59	82	42	55	84	72	37	48	74	0	*****	0	*****	
9:00 am	158	185	343	343	42	82	30	54	60	71	26	48	53	0	*****	0	*****	
10:00	163	190	353	353	43	84	31	56	61	74	27	49	54	330	13	0	*****	
11:00	172	208	380	380	41	90	29	60	59	79	26	53	51	310	13	0	*****	
12:00 noon	197	254	451	451	65	107	46	72	93	94	41	63	81	260	25	400	16	
1:00	196	340	536	536	69	128	49	85	99	112	43	74	86	210	33	340	20	
2:00	152	251	403	403	45	96	32	64	64	84	28	56	56	290	16	0	*****	
3:00 pm	234	503	737	737	100	175	71	117	143	154	63	102	125	120	83	240	42	
4:00	188	383	571	571	90	136	64	91	129	119	56	79	113	190	47	320	28	
5:00	231	608	839	839	94	200	67	133	134	175	59	117	118	90	104	200	47	
6:00 pm			0	0		0	0	0	0	0	0	0	0	0	*****	0	*****	
7:00			0	0		0	0	0	0	0	0	0	0	0	*****	0	*****	
8:00			0	0		0	0	0	0	0	0	0	0	0	*****	0	*****	

Note:

--- No adjustment made.

--- Where more than one minor approach exists use the higher approach volume

--- Number of hours shown is the minimum meeting the MUTCD requirements. Additional hours outside of the count period may meet the MUTCD specified volume levels.

Warranting Volumes 420 140	Warranting Volumes 630 70	Warranting Volumes 480 160	Warranting Volumes 720 80	Warranting Volumes From MUTCD Fig. 4-8	Warranting Volumes From MUTCD Fig. 4-6
Total Hours Meeting Warrant = 0	Total Hours Meeting Warrant = 2	Total Hours Meeting Warrant = 0	Total Hours Meeting Warrant = 2	Total Hours Meeting Warrant = 1	Total Hours Meeting Warrant = 0
Warrant Met No	Warrant Met No	Warrant Met No	Warrant Met No	Warrant Met No	Warrant Met No

\*\*\*\*\* Major Street volume is so low that no Minor Street warrant exists

Warrant 1 Met No

Comments: (include any information which may be useful to the reviewer)

Existing geometrics.

Analysis Prepared by Name : Karen Anderson  
 Organization: ARCADIS

Date: 05/31/13  
 Time: 10:44

Developed by: T. Darcy Sullivan, P.E.  
 Distributed by: SITE, Incorporated

Updated by: Jason A. Crouch, E.I.

VC/R4

**Intersection**

Intersection Delay, s/veh 17.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Vol, veh/h	0	286	8	95	61	0	0	0	0	64
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	-	None
Storage Length	-	-	-	115	-	-	-	-	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	91	50	74	80	92	92	92	92	60
Heavy Vehicles, %	2	2	2	11	7	2	2	2	2	5
Mvmt Flow	0	314	16	128	76	0	0	0	0	107

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	76	0	0	314	0	0	490	39	
Stage 1	-	-	-	-	-	-	333	-	
Stage 2	-	-	-	-	-	-	157	-	
Follow-up Headway	2.22	-	-	2.31	-	-	3.57	3.35	
Pot Capacity-1 Maneuver	1521	-	-	1180	-	-	495	1014	
Stage 1	-	-	-	-	-	-	684	-	
Stage 2	-	-	-	-	-	-	840	-	
Time blocked-Platoon, %	-	-	-	-	-	-	-	-	
Mov Capacity-1 Maneuver	1520	-	-	1179	-	-	441	1013	
Mov Capacity-2 Maneuver	-	-	-	-	-	-	441	-	
Stage 1	-	-	-	-	-	-	610	-	
Stage 2	-	-	-	-	-	-	840	-	

Approach	EB	WB	SW
HCM Control Delay, s	0	5.3	37.6
HCM LOS			E

Minor Lane / Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	1520	-	-	1179	-	-	514
HCM Lane V/C Ratio	-	-	-	0.109	-	-	0.83
HCM Control Delay (s)	0	-	-	8.426	-	-	37.6
HCM Lane LOS	A			A			E
HCM 95th %tile Q(veh)	0	-	-	0.366	-	-	8.306

**Notes**

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






















Intersection											
Intersection Delay, s/veh	4.3										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL	NER	
Vol, veh/h	175	372	0	0	149	156	0	0	0		214
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	0		0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop		Stop
RT Channelized	-	-	None	-	-	None	-	-	-		None
Storage Length	90	-	-	-	-	-	-	-	0		-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0		-
Grade, %	-	0	-	-	0	-	0	-	0		-
Peak Hour Factor	95	84	92	92	87	95	92	92	92		88
Heavy Vehicles, %	3	6	2	2	8	14	2	2	2		4
Mvmt Flow	184	443	0	0	171	164	0	0	0		243
Major/Minor	Major1		Major2						Minor1		
Conflicting Flow All	335	0	0	443	0	0			897		222
Stage 1	-	-	-	-	-	-			811		-
Stage 2	-	-	-	-	-	-			86		-
Follow-up Headway	2.23	-	-	2.22	-	-			3.75		3.34
Pot Capacity-1 Maneuver	1214	-	-	1113	-	-			240		775
Stage 1	-	-	-	-	-	-			344		-
Stage 2	-	-	-	-	-	-			863		-
Time blocked-Platoon, %		-	-		-	-					
Mov Capacity-1 Maneuver	1213	-	-	1112	-	-			203		774
Mov Capacity-2 Maneuver	-	-	-	-	-	-			203		-
Stage 1	-	-	-	-	-	-			292		-
Stage 2	-	-	-	-	-	-			862		-
Approach	EB		WB						NE		
HCM Control Delay, s	2.5		0						14		
HCM LOS									B		
Minor Lane / Major Mvmt	NELn1		EBL	EBT	EBR	WBL	WBT	WBR			
Capacity (veh/h)	659		1213	-	-	1112	-	-			
HCM Lane V/C Ratio	0.393		0.152	-	-	-	-	-			
HCM Control Delay (s)	14		8.499	-	-	0	-	-			
HCM Lane LOS	B		A			A					
HCM 95th %tile Q(veh)	1.874		0.535	-	-	0	-	-			
Notes											
~ : Volume Exceeds Capacity; \$ : Delay Exceeds 300 Seconds; Error : Computation Not Defined											

# HCM Signalized Intersection Capacity Analysis

## 9: Birmingham Hwy. & SR 2 (Cummings Hwy.)

AM\_Existing.syn

12/2/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	278	282	115	169	17	97	11	120	2	5	35
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	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95			1.00	
Frt	1.00	0.93		1.00	0.98		1.00	0.87			0.89	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1719	3184		1641	3235		1517	1350			1655	
Flt Permitted	0.61	1.00		0.25	1.00		0.72	0.99			0.99	
Satd. Flow (perm)	1106	3184		437	3235		1153	1338			1644	
Peak-hour factor, PHF	0.79	0.78	0.81	0.61	0.86	0.61	0.87	0.69	0.75	1.00	0.63	0.80
Adj. Flow (vph)	28	356	348	189	197	28	111	16	160	2	8	44
RTOR Reduction (vph)	0	257	0	0	15	0	0	101	0	0	28	0
Lane Group Flow (vph)	28	447	0	189	210	0	100	86	0	0	26	0
Heavy Vehicles (%)	5%	4%	6%	10%	10%	6%	13%	0%	18%	2%	2%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.8	11.8		20.3	20.3		16.6	16.6			16.6	
Effective Green, g (s)	11.8	11.8		20.3	20.3		16.6	16.6			16.6	
Actuated g/C Ratio	0.26	0.26		0.45	0.45		0.37	0.37			0.37	
Clearance Time (s)	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	
Lane Grp Cap (vph)	290	836		318	1462		426	494			607	
v/s Ratio Prot		0.14		c0.06	0.06							
v/s Ratio Perm	0.03			c0.21			c0.09	0.06			0.02	
v/c Ratio	0.10	0.54		0.59	0.14		0.23	0.17			0.04	
Uniform Delay, d1	12.5	14.2		8.6	7.2		9.8	9.5			9.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	0.7		3.0	0.0		1.3	0.8			0.1	
Delay (s)	12.7	14.9		11.6	7.3		11.1	10.3			9.2	
Level of Service	B	B		B	A		B	B			A	
Approach Delay (s)		14.8			9.2			10.6			9.2	
Approach LOS		B			A			B			A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			12.2			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			44.9			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			46.4%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group



Intersection										
Intersection Delay, s/veh	160.3									
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Vol, veh/h	0	202	15	342	174	0	0	0	0	119
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	-	None
Storage Length	-	-	-	115	-	-	-	-	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	79	63	86	82	92	92	92	92	80
Heavy Vehicles, %	2	1	0	4	2	2	2	2	2	6
Mvmt Flow	0	256	24	398	212	0	0	0	0	149
Major/Minor	Major1			Major2			Minor2			
Conflicting Flow All	212	0	0	256	0	0	1136	107		
Stage 1	-	-	-	-	-	-	1008	-		
Stage 2	-	-	-	-	-	-	128	-		
Follow-up Headway	2.22	-	-	2.24	-	-	3.58	3.36		
Pot Capacity-1 Maneuver	1356	-	-	1291	-	-	# 187	914		
Stage 1	-	-	-	-	-	-	300	-		
Stage 2	-	-	-	-	-	-	866	-		
Time blocked-Platoon, %	-	-	-	-	-	-				
Mov Capacity-1 Maneuver	1355	-	-	1290	-	-	# 129	913		
Mov Capacity-2 Maneuver	-	-	-	-	-	-	# 129	-		
Stage 1	-	-	-	-	-	-	# 207	-		
Stage 2	-	-	-	-	-	-	866	-		
Approach	EB			WB			SW			
HCM Control Delay, s	0			5.9			\$ 518.2			
HCM LOS							F			
Minor Lane / Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1			
Capacity (veh/h)	1355	-	-	1290	-	-	192			
HCM Lane V/C Ratio	-	-	-	0.308	-	-	2.022			
HCM Control Delay (s)	0	-	-	9.029	-	-	\$ 518.2			
HCM Lane LOS	A			A			F			
HCM 95th %tile Q(veh)	0	-	-	1.321	-	-	29.468			
Notes										
~ : Volume Exceeds Capacity; \$ : Delay Exceeds 300 Seconds; Error : Computation Not Defined										




















Intersection											
Intersection Delay, s/veh	2.7										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL	NER	
Vol, veh/h	96	307	0	0	494	296	0	0	0	179	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	
RT Channelized	-	-	None	-	-	None	-	-	-	None	
Storage Length	90	-	-	-	-	-	-	-	0	-	
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-	
Grade, %	-	0	-	-	0	-	0	-	0	-	
Peak Hour Factor	80	75	92	92	89	81	92	92	92	84	
Heavy Vehicles, %	2	4	2	2	3	5	2	2	2	9	
Mvmt Flow	120	409	0	0	555	365	0	0	0	213	
Major/Minor	Major1			Major2				Minor1			
Conflicting Flow All	920	0	0	409	0	0		927		205	
Stage 1	-	-	-	-	-	-		649		-	
Stage 2	-	-	-	-	-	-		278		-	
Follow-up Headway	2.22	-	-	2.22	-	-		3.63		3.39	
Pot Capacity-1 Maneuver	738	-	-	1146	-	-		248		780	
Stage 1	-	-	-	-	-	-		453		-	
Stage 2	-	-	-	-	-	-		712		-	
Time blocked-Platoon, %	-	-	-	-	-	-					
Mov Capacity-1 Maneuver	738	-	-	1146	-	-		208		780	
Mov Capacity-2 Maneuver	-	-	-	-	-	-		208		-	
Stage 1	-	-	-	-	-	-		379		-	
Stage 2	-	-	-	-	-	-		712		-	
Approach	EB			WB				NE			
HCM Control Delay, s	2.5			0				14			
HCM LOS								B			
Minor Lane / Major Mvmt	NELn1	EBL	EBT	EBR	WBL	WBT	WBR				
Capacity (veh/h)	631	738	-	-	1146	-	-				
HCM Lane V/C Ratio	0.369	0.163	-	-	-	-	-				
HCM Control Delay (s)	14	10.823	-	-	0	-	-				
HCM Lane LOS	B	B			A						
HCM 95th %tile Q(veh)	1.699	0.578	-	-	0	-	-				
Notes											
~ : Volume Exceeds Capacity; \$ : Delay Exceeds 300 Seconds; Error : Computation Not Defined											

# HCM Signalized Intersection Capacity Analysis

## 9: Birmingham Hwy. & SR 2 (Cummings Hwy.)

PM\_Existing.syn

12/2/2013

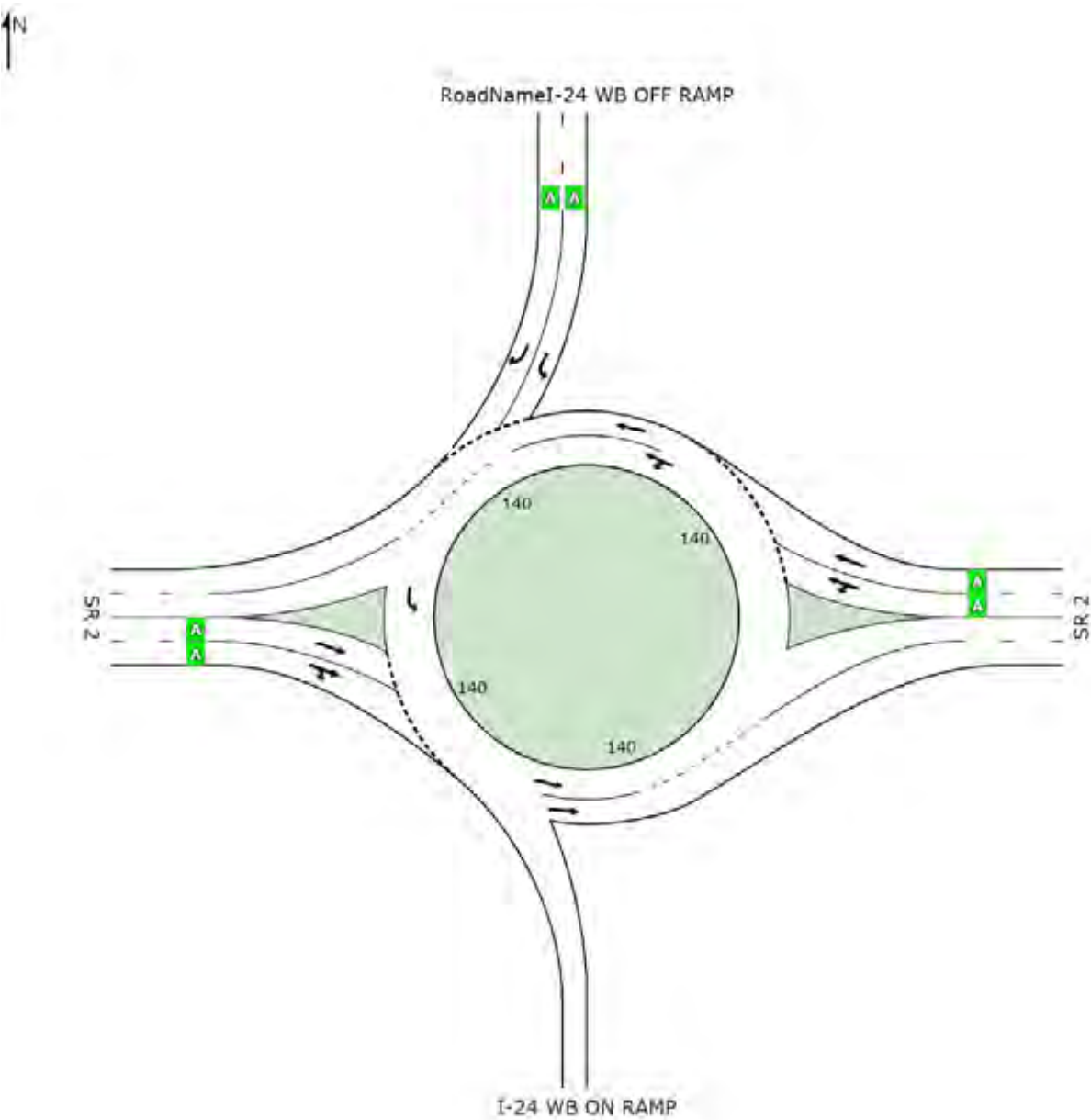
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	337	119	237	475	26	245	14	229	4	4	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99			1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.87			0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	3289		1735	3513		1618	1491			1648	
Flt Permitted	0.44	1.00		0.21	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	835	3289		387	3513		1618	1491			1648	
Peak-hour factor, PHF	0.88	0.83	0.87	0.87	0.89	0.81	0.72	0.70	0.74	1.00	0.50	0.94
Adj. Flow (vph)	40	406	137	272	534	32	340	20	309	4	8	72
RTOR Reduction (vph)	0	45	0	0	6	0	0	234	0	0	56	0
Lane Group Flow (vph)	40	498	0	272	560	0	306	129	0	0	28	0
Confl. Peds. (#/hr)			1	1					1	1		
Heavy Vehicles (%)	0%	5%	5%	4%	2%	0%	6%	14%	3%	0%	0%	2%
Turn Type	Perm	NA		pm+pt	NA		Split	NA		Split	NA	
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4			8								
Actuated Green, G (s)	14.9	14.9		27.9	27.9		18.0	18.0			16.0	
Effective Green, g (s)	14.9	14.9		27.9	27.9		18.0	18.0			16.0	
Actuated g/C Ratio	0.20	0.20		0.38	0.38		0.24	0.24			0.22	
Clearance Time (s)	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	
Lane Grp Cap (vph)	168	663		310	1326		394	363			356	
v/s Ratio Prot		0.15		c0.11	0.16		c0.19	0.09			c0.02	
v/s Ratio Perm	0.05			c0.22								
v/c Ratio	0.24	0.75		0.88	0.42		0.78	0.36			0.08	
Uniform Delay, d1	24.7	27.8		18.2	17.0		26.1	23.2			23.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.7	4.8		23.2	0.2		13.9	2.7			0.4	
Delay (s)	25.5	32.6		41.3	17.3		40.0	25.9			23.5	
Level of Service	C	C		D	B		D	C			C	
Approach Delay (s)		32.1			25.1			32.3			23.5	
Approach LOS		C			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			29.1			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			73.9			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			57.2%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												



# LEVEL OF SERVICE SUMMARY

Site: WB Ramps\_AM

Paired Roundabout - Intersection 1 (varying number of approach & circul. lanes)  
MUTCD (FHWA 2009) example number: C-13  
Roundabout Guide (TRB 2010) example number: A-14  
Roundabout



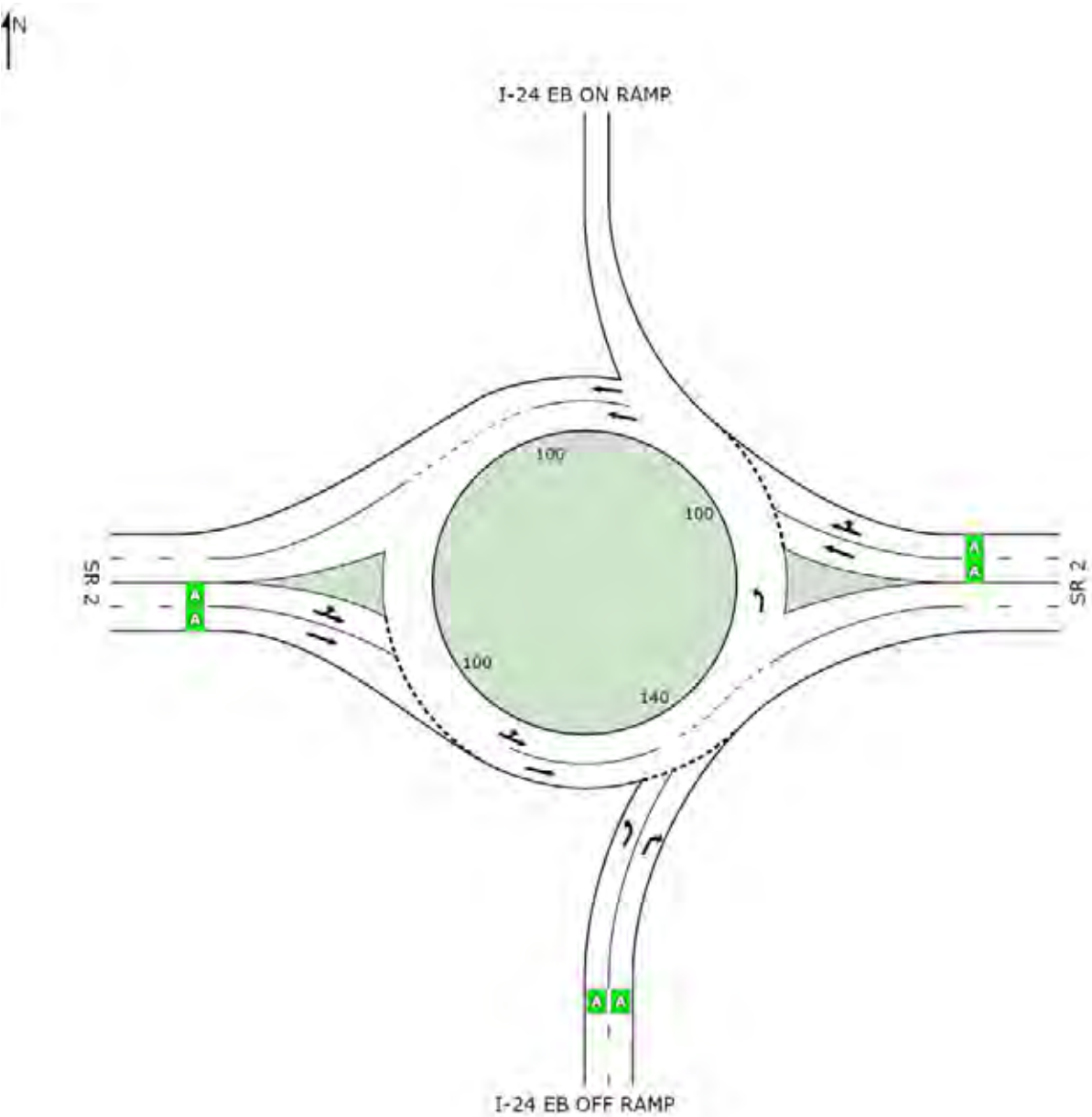
	South	East	North	West	Intersection
LOS	NA	A	A	A	A

Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Model used. Geometric Delay not included.

# LEVEL OF SERVICE SUMMARY

Site: EB Ramps\_AM

Paired Roundabout - Intersection 2 (varying number of approach & circul. lanes)  
MUTCD (FHWA 2009) example number: C-13  
Roundabout Guide (TRB 2010) example number: A-14  
Roundabout



	South	East	North	West	Intersection
LOS	A	A	NA	A	A























Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Model used. Geometric Delay not included.

# HCM Signalized Intersection Capacity Analysis

## 9: Birmingham Hwy. & SR 2 (Cummings Hwy.)

AM\_Proposed.syn

12/3/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	278	282	115	169	17	97	11	120	2	5	35
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	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85		0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		1.00	
Satd. Flow (prot)	1719	3471	1524	1641	3235		1517	1585	1369		1655	
Flt Permitted	0.61	1.00	1.00	0.40	1.00		0.72	0.82	1.00		0.99	
Satd. Flow (perm)	1106	3471	1524	691	3235		1153	1349	1369		1649	
Peak-hour factor, PHF	0.79	0.78	0.81	0.61	0.86	0.61	0.87	0.69	0.75	1.00	0.63	0.80
Adj. Flow (vph)	28	356	348	189	197	28	111	16	160	2	8	44
RTOR Reduction (vph)	0	0	258	0	15	0	0	0	101	0	28	0
Lane Group Flow (vph)	28	356	90	189	210	0	63	64	59	0	26	0
Heavy Vehicles (%)	5%	4%	6%	10%	10%	6%	13%	0%	18%	2%	2%	2%
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	11.5	11.5	11.5	20.0	20.0		16.5	16.5	16.5		16.5	
Effective Green, g (s)	11.5	11.5	11.5	20.0	20.0		16.5	16.5	16.5		16.5	
Actuated g/C Ratio	0.26	0.26	0.26	0.45	0.45		0.37	0.37	0.37		0.37	
Clearance Time (s)	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	
Lane Grp Cap (vph)	285	897	393	406	1453		427	500	507		611	
v/s Ratio Prot		0.10		c0.05	0.06							
v/s Ratio Perm	0.03		0.06	c0.16			c0.05	0.05	0.04		0.02	
v/c Ratio	0.10	0.40	0.23	0.47	0.14		0.15	0.13	0.12		0.04	
Uniform Delay, d1	12.6	13.6	13.0	7.8	7.2		9.3	9.2	9.2		9.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.2	0.3	0.3	0.8	0.0		0.7	0.5	0.5		0.1	
Delay (s)	12.7	13.9	13.3	8.7	7.3		10.0	9.8	9.7		9.1	
Level of Service	B	B	B	A	A		B	A	A		A	
Approach Delay (s)		13.6			7.9			9.8			9.1	
Approach LOS		B			A			A			A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			11.1			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			44.5			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			37.2%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group












## Queues

AM\_Proposed.syn

## 9: Birmingham Hwy. &amp; SR 2 (Cummings Hwy.)

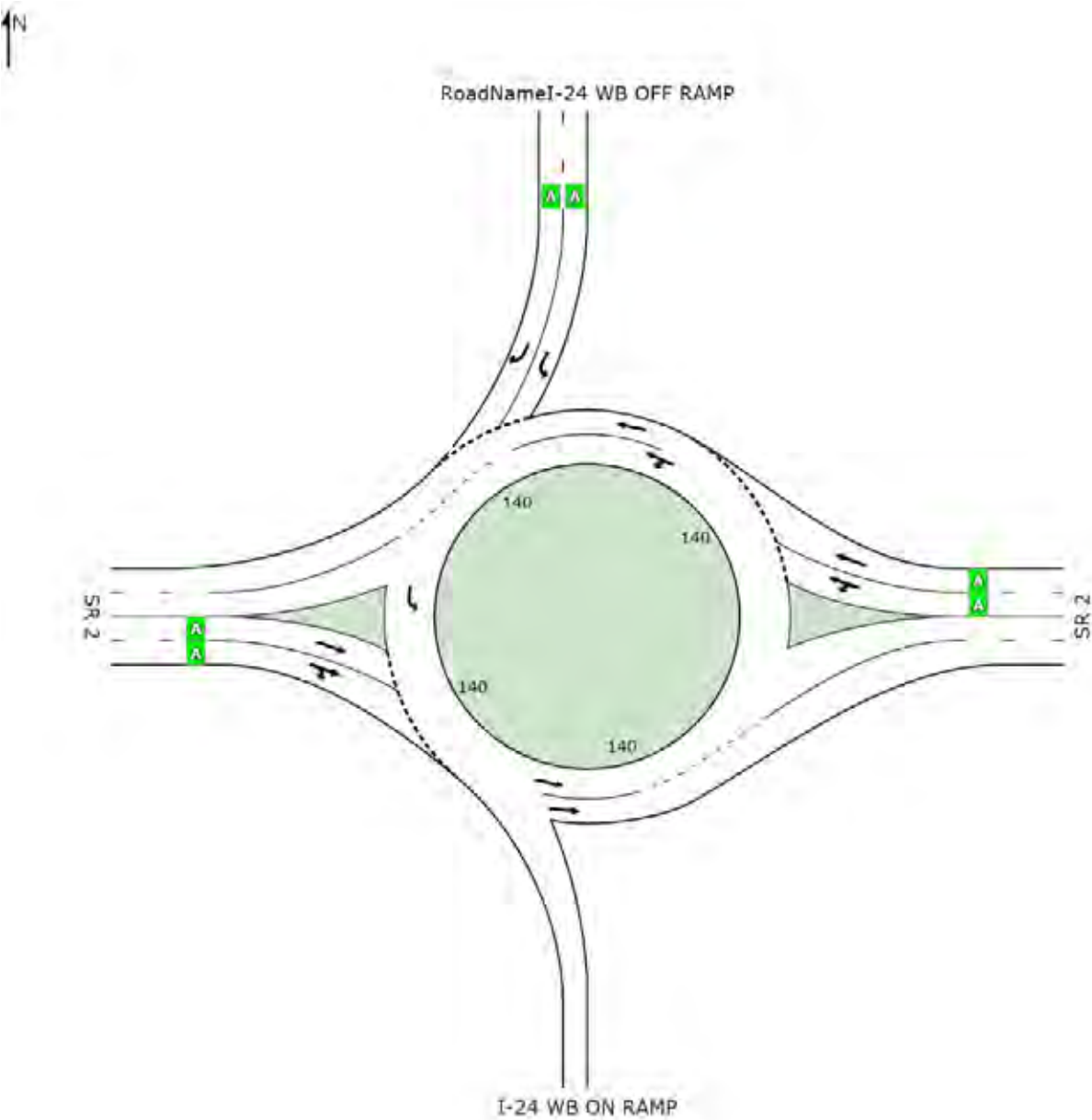
12/3/2013

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	28	356	348	189	225	63	64	160	54
v/c Ratio	0.10	0.39	0.53	0.44	0.16	0.14	0.13	0.26	0.08
Control Delay	13.2	14.8	5.3	10.4	6.0	12.7	12.3	4.2	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	14.8	5.3	10.4	6.0	12.7	12.3	4.2	6.0
Queue Length 50th (ft)	6	40	0	27	13	11	11	0	2
Queue Length 95th (ft)	17	57	31	34	25	35	27	19	11
Internal Link Dist (ft)		408			592		651		11
Turn Bay Length (ft)	90		75	125				125	
Base Capacity (vph)	417	1310	791	434	1994	435	509	616	649
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.27	0.44	0.44	0.11	0.14	0.13	0.26	0.08
Intersection Summary									

# LEVEL OF SERVICE SUMMARY

Site: WB Ramps\_ PM

Paired Roundabout - Intersection 1 (varying number of approach & circul. lanes)  
MUTCD (FHWA 2009) example number: C-13  
Roundabout Guide (TRB 2010) example number: A-14  
Roundabout



	South	East	North	West	Intersection
LOS	NA	A	A	A	A

Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Model used. Geometric Delay not included.

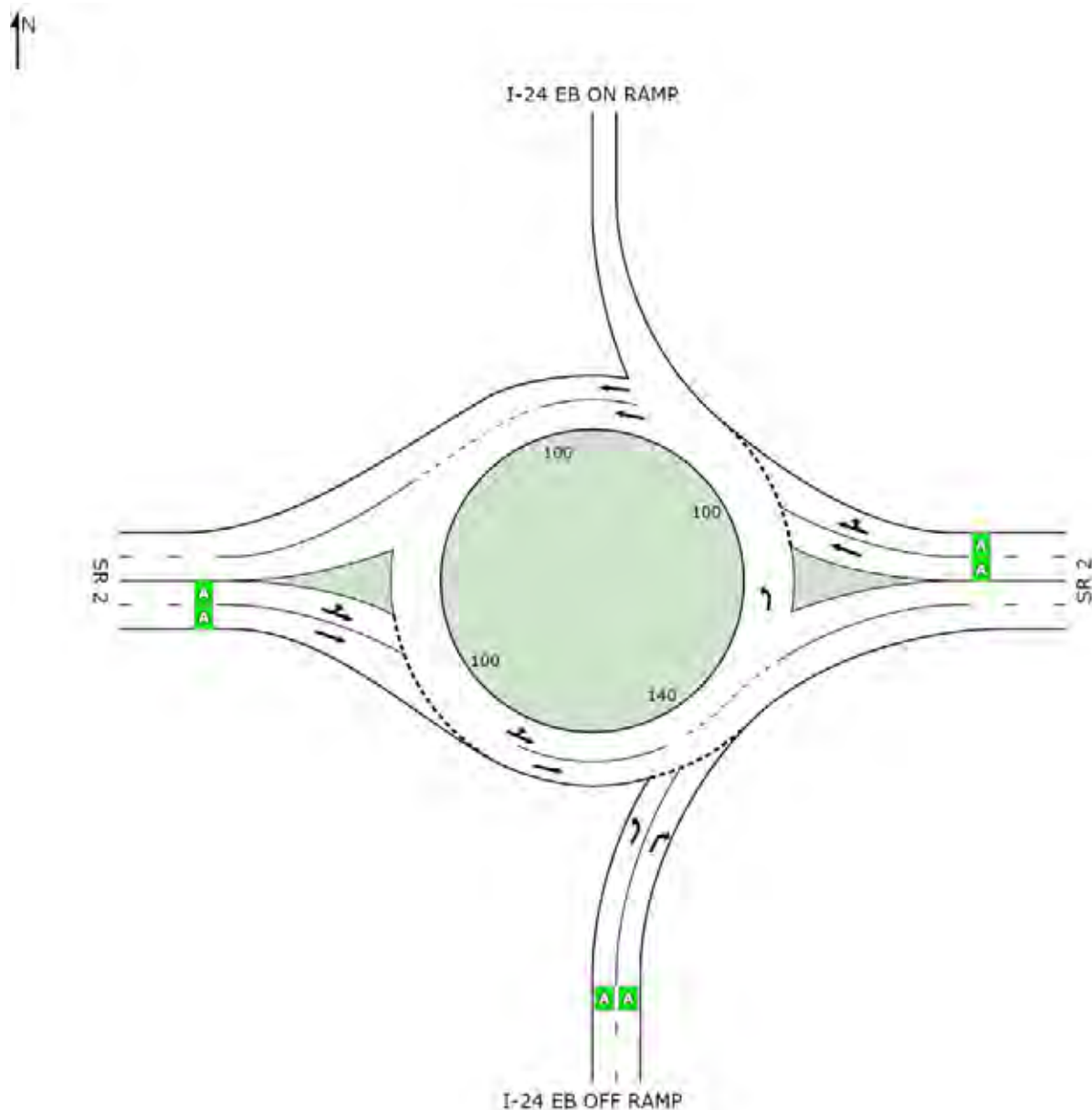


**Site: EB Ramps\_PM**

MUTCD (FHWA 2009) example number: C-13

Roundabout Guide (TRB 2010) example number: A-14

## Roundabout



	South	East	North	West	Intersection
LOS	A	A	NA	A	A

Roundabout LOS Method: Same as Sign Control.

LOS F will result if  $v/c > 1$  irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).























HCM Delay Model used. Geometric Delay not included.

# HCM Signalized Intersection Capacity Analysis

## 9: Birmingham Hwy. & SR 2 (Cummings Hwy.)

PM\_Proposed.syn

12/3/2013










												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	337	119	237	475	26	245	14	229	4	4	68
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	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99		1.00	
Flpb, ped/bikes	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	0.99		1.00	1.00	0.85		0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		1.00	
Satd. Flow (prot)	1805	3438	1504	1735	3513		1618	1617	1547		1648	
Flt Permitted	0.44	1.00	1.00	0.30	1.00		0.95	0.96	1.00		1.00	
Satd. Flow (perm)	835	3438	1504	543	3513		1618	1617	1547		1648	
Peak-hour factor, PHF	0.88	0.83	0.87	0.87	0.89	0.81	0.72	0.70	0.74	1.00	0.50	0.94
Adj. Flow (vph)	40	406	137	272	534	32	340	20	309	4	8	72
RTOR Reduction (vph)	0	0	110	0	7	0	0	0	236	0	55	0
Lane Group Flow (vph)	40	406	27	272	559	0	180	180	73	0	29	0
Confl. Peds. (#/hr)			1	1					1	1		
Heavy Vehicles (%)	0%	5%	5%	4%	2%	0%	6%	14%	3%	0%	0%	2%
Turn Type	Perm	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	
Protected Phases		4		3	8		2	2		6	6	
Permitted Phases	4		4	8					2			
Actuated Green, G (s)	13.3	13.3	13.3	23.3	23.3		16.0	16.0	16.0		16.0	
Effective Green, g (s)	13.3	13.3	13.3	23.3	23.3		16.0	16.0	16.0		16.0	
Actuated g/C Ratio	0.20	0.20	0.20	0.35	0.35		0.24	0.24	0.24		0.24	
Clearance Time (s)	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	
Lane Grp Cap (vph)	165	679	297	294	1216		384	384	367		391	
v/s Ratio Prot		0.12		c0.08	0.16		0.11	c0.11			c0.02	
v/s Ratio Perm	0.05		0.02	c0.24					0.05			
v/c Ratio	0.24	0.60	0.09	0.93	0.46		0.47	0.47	0.20		0.07	
Uniform Delay, d1	22.8	24.6	22.1	19.6	17.1		22.0	22.0	20.5		19.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.8	1.4	0.1	33.2	0.3		4.1	4.1	1.2		0.4	
Delay (s)	23.5	26.0	22.2	52.8	17.4		26.1	26.1	21.8		20.3	
Level of Service	C	C	C	D	B		C	C	C		C	
Approach Delay (s)		24.9			28.9			24.1			20.3	
Approach LOS		C			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			26.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			67.3			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			46.4%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

## Queues

PM\_Proposed.syn

## 9: Birmingham Hwy. &amp; SR 2 (Cummings Hwy.)

12/3/2013

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	40	406	137	272	566	180	180	309	84
v/c Ratio	0.24	0.60	0.34	0.93	0.46	0.47	0.47	0.51	0.19
Control Delay	26.5	28.5	7.0	58.9	18.1	27.5	27.5	6.6	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.5	28.5	7.0	58.9	18.1	27.5	27.5	6.6	9.0
Queue Length 50th (ft)	14	81	0	85	91	68	68	0	4
Queue Length 95th (ft)	38	111	35	#196	131	100	97	26	8
Internal Link Dist (ft)		408			592		651		11
Turn Bay Length (ft)	90		75	125				100	
Base Capacity (vph)	198	818	464	294	1365	384	384	603	447
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.50	0.30	0.93	0.41	0.47	0.47	0.51	0.19

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.



**TENNESSEE DEPARTMENT OF TRANSPORTATION  
PROJECT PLANNING DIVISION**

PROJECT NO.: 33007-1205-94 ROUTE: S.R. 2  
COUNTY: HAMILTON CITY: CHATTANOOGA  
PROJECT PIN NUMBER:  
PROJECT DESCRIPTION: S.R. 2 @ I-24 WESTBOUND RAMPS.

**DIVISION REQUESTING:**

MAINTENANCE	<input type="checkbox"/>	PAVEMENT DESIGN	<input type="checkbox"/>
PLANNING	<input checked="" type="checkbox"/>	STRUCTURES	<input type="checkbox"/>
PROG. DEVELOPMENT & ADM.	<input type="checkbox"/>	SURVEY & DESIGN	<input type="checkbox"/>
PUBLIC TRANS. & AERO.	<input type="checkbox"/>	TRAFFIC SIGNAL DESIGN	<input type="checkbox"/>
YEAR PROJECT PROGRAMMED FOR CONSTRUCTION:		OTHER	<input type="checkbox"/>
PROJECTED LETTING DATE:			

**TRAFFIC ASSIGNMENT:**

BASE YEAR		DESIGN YEAR					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
AADT	YEAR	AADT	DHV	%	YEAR	DIR.DIST.	DHV	AADT	FLEX	RIGID
10,330	2016	13,950	1,383	10	2016	55-45	5	8		

REQUESTED BY: NAME GLENDY TYUS DATE 3/26/13  
DIVISION PLANNING  
ADDRESS 1000 J. K. POLK BUILDING  
NASHVILLE TN 37243

REVIEWED BY: TONY ARMSTRONG Tony Armstrong DATE 5-13-13  
TRANSPORTATION MANAGER  
SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: BILL HART Bill Hart DATE 5/13/13  
TRANSPORTATION MANAGER 2  
SUITE 1000, JAMES K. POLK BUILDING

**COMMENTS:**

REQUESTING AADT's AND TURNING MOVEMENT COUNT AT INTERSECTION AT S.R. 2 AND I-24 WESTBOUND RAMPS.

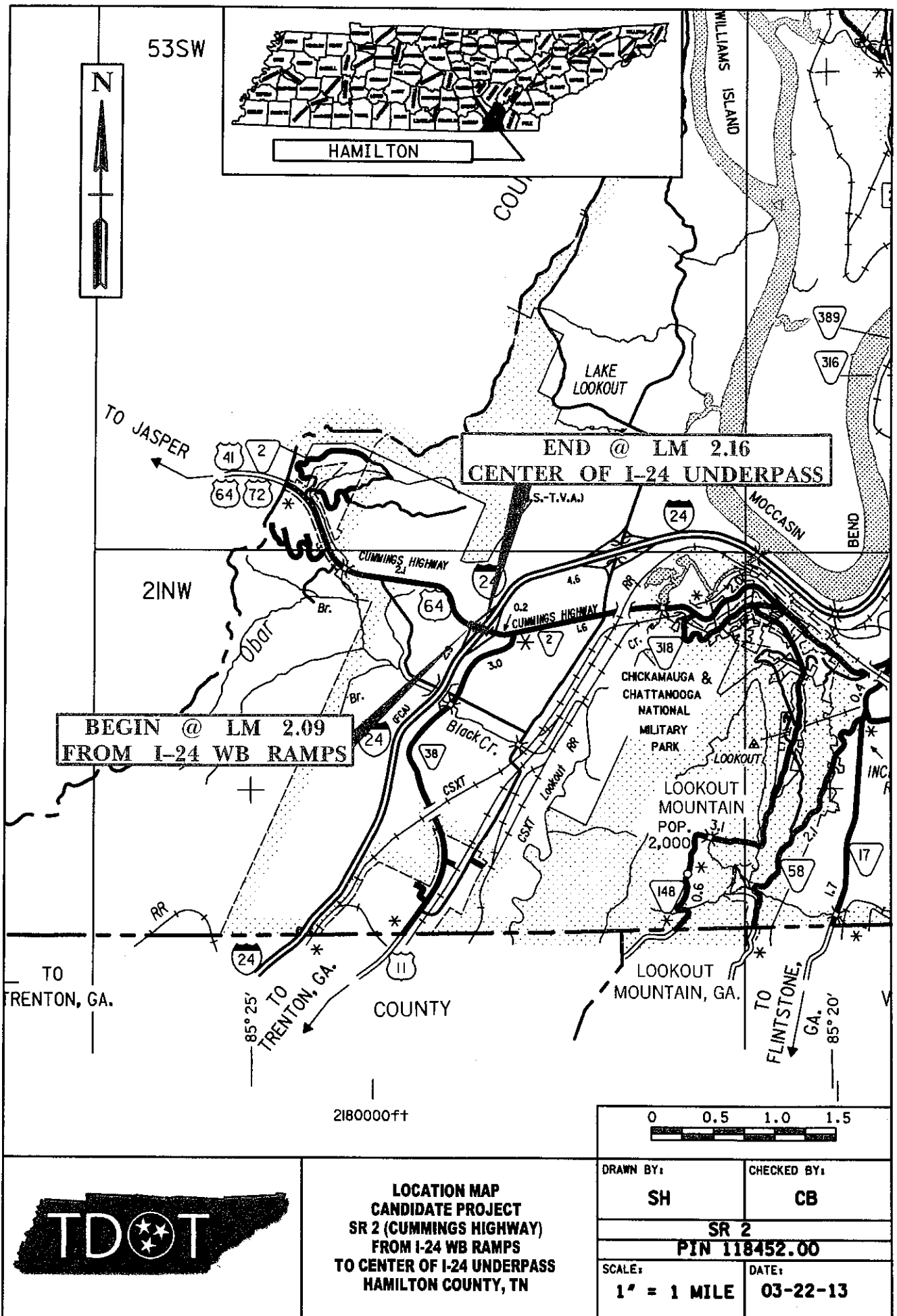
THIS TRAFFIC IS BASED ON 2011 & 2012 CYCLE AND RAMP COUNTS AND [1] 12-HOUR TURNING MOVEMENT COUNT [MAY 2013]. THE FUTURE TRAFFIC IS BASED ON THE AVERAGE GROWTH RATE FROM THE CHATTANOOGA TPO COMPUTER ASSIGNMENT MODEL. AADT's & DHV's ARE INCLUDED.

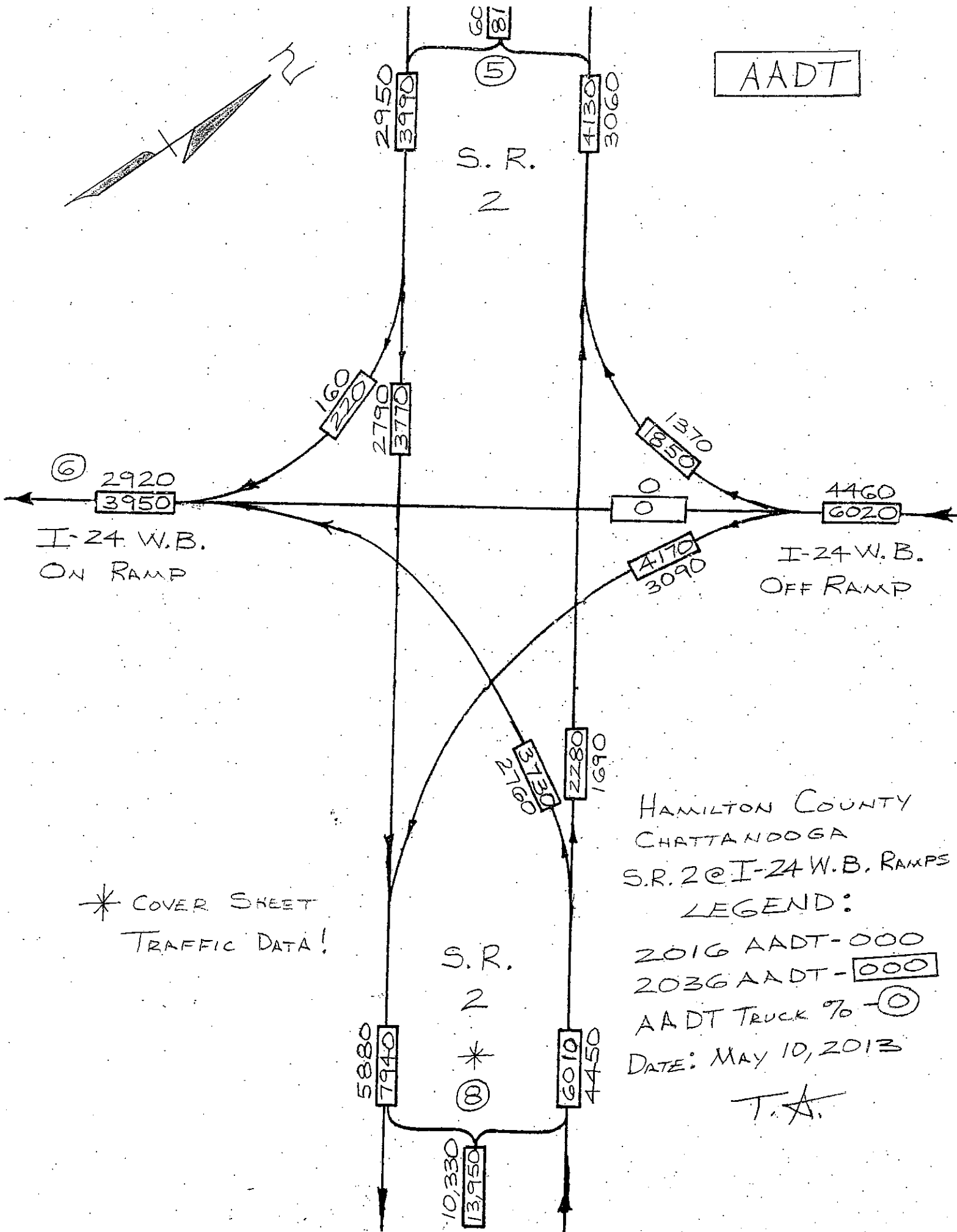
**DHV'S ARE NOT REQUIRED FOR SIDE ROADS LESS THAN 1000 AADT.**

NOTE: FOR BRIDGE REPLACEMENT PROJECTS, ADLs ARE NOT REQUIRED FOR AADT's OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.

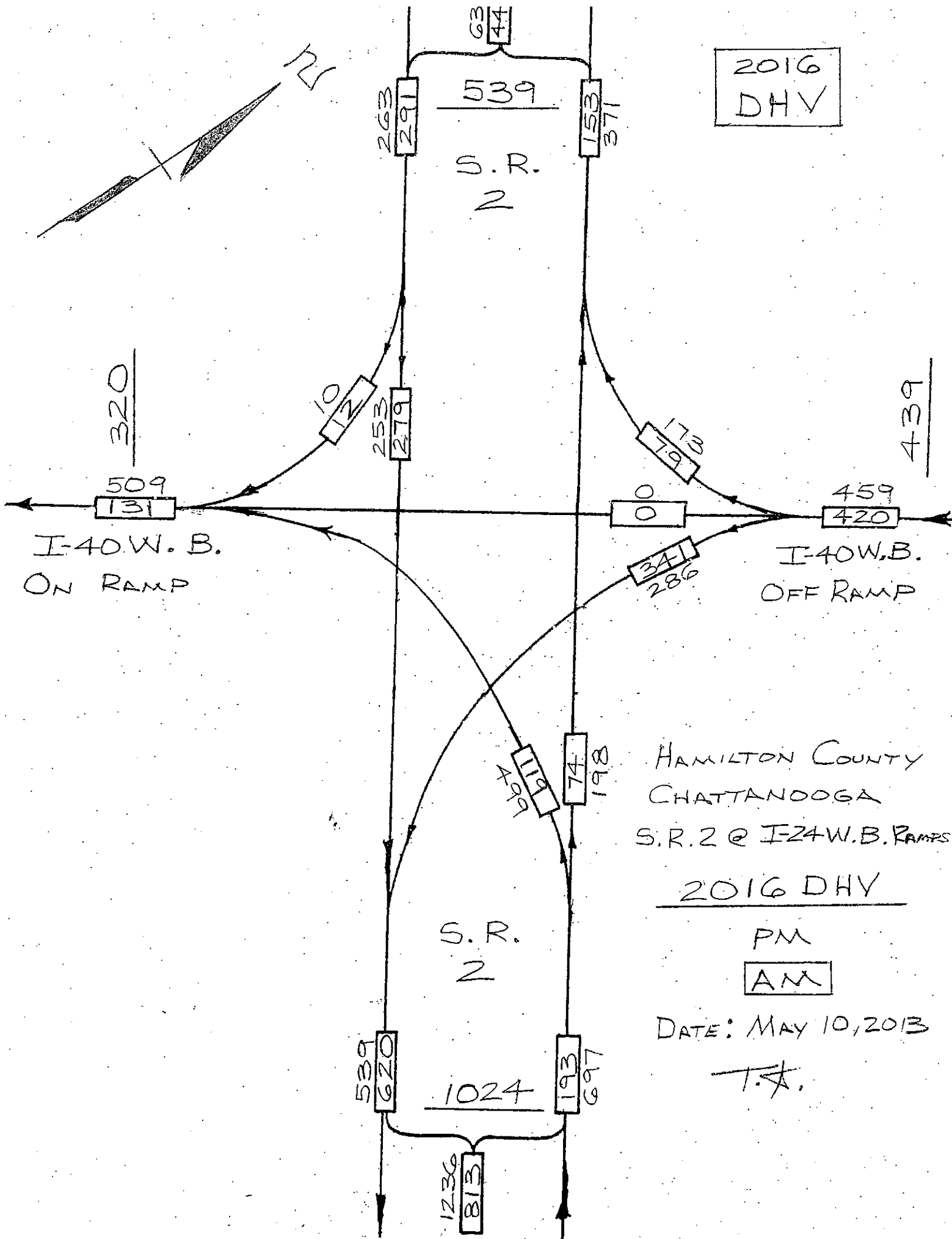
SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS.

(REV. 9/20/07)









2016  
DHV

HAMILTON COUNTY  
CHATTANOOGA  
S.R. 2 @ I-40 W.B. RAMP

2016 DHV

PM

AM

DATE: MAY 10, 2013

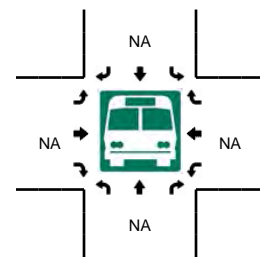
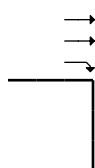
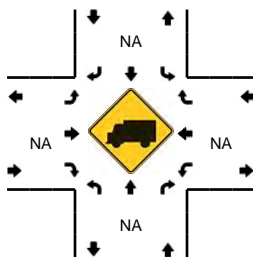
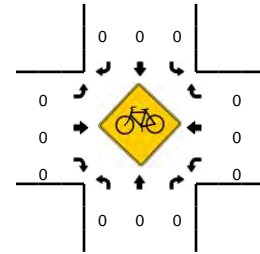
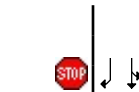
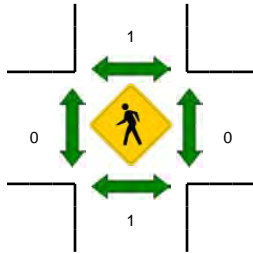
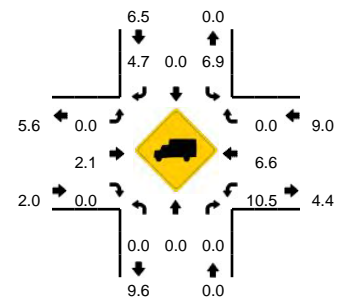
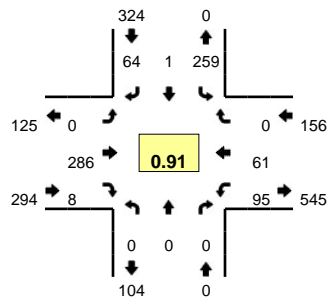
T.A.



**LOCATION:** I-24 SB Ramps -- SR 2  
**CITY/STATE:** Chattanooga, TN

**QC JOB #:** 11334605  
**DATE:** Thu, Oct 10 2013

**Peak-Hour: 7:15 AM -- 8:15 AM**  
**Peak 15-Min: 7:45 AM -- 8:00 AM**



15-Min Count Period Beginning At	I-24 SB Ramps (Northbound)				I-24 SB Ramps (Southbound)				SR 2 (Eastbound)				SR 2 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	35	0	18	0	0	38	2	0	18	12	0	0	123	
7:15 AM	0	0	0	0	61	0	11	0	0	68	1	0	32	11	0	0	184	
7:30 AM	0	0	0	0	59	1	11	0	0	79	2	0	16	19	0	0	187	
7:45 AM	0	0	0	0	80	0	15	0	0	79	4	0	19	15	0	0	212	706
8:00 AM	0	0	0	0	59	0	27	0	0	60	1	0	28	16	0	0	191	774
8:15 AM	0	0	0	0	32	0	22	0	0	52	6	0	24	20	0	0	156	746
8:30 AM	0	0	0	0	39	0	15	0	0	39	6	0	25	15	0	0	139	698
8:45 AM	0	0	0	0	36	0	17	0	0	49	3	0	21	24	0	0	150	636
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	320	0	60	0	0	316	16	0	76	60	0	0	848	
Heavy Trucks	0	0	0	0	4	0	4	0	0	8	0	0	4	0	0	0	20	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

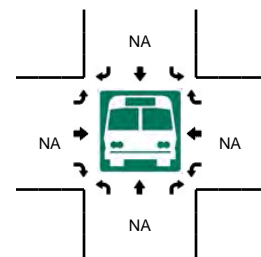
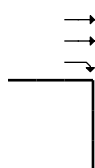
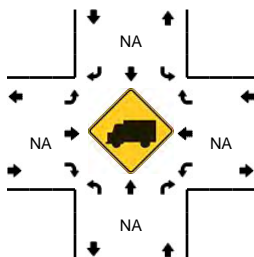
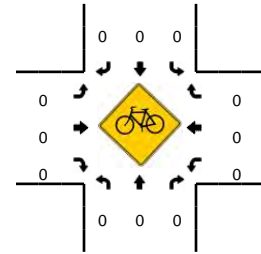
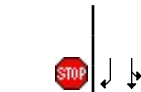
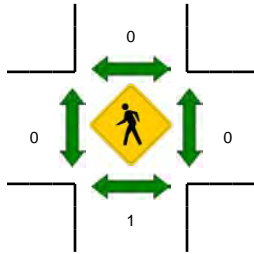
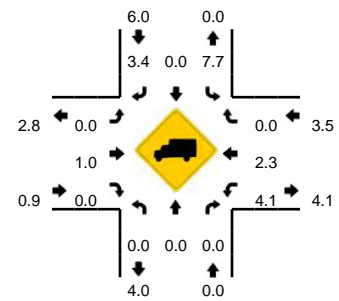
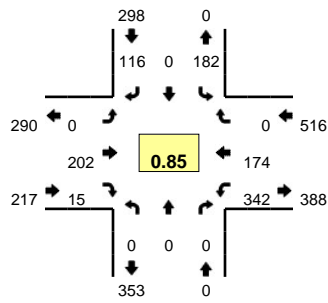
Comments:



**LOCATION:** I-24 SB Ramps -- SR 2  
**CITY/STATE:** Chattanooga, TN

**QC JOB #:** 11334606  
**DATE:** Thu, Oct 10 2013

**Peak-Hour: 4:30 PM -- 5:30 PM**  
**Peak 15-Min: 5:15 PM -- 5:30 PM**



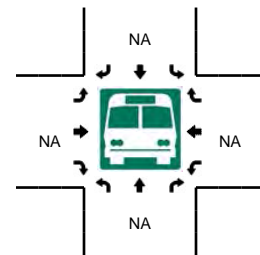
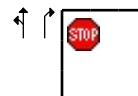
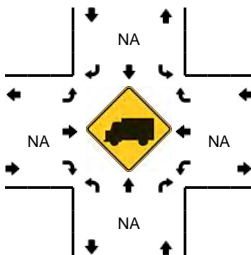
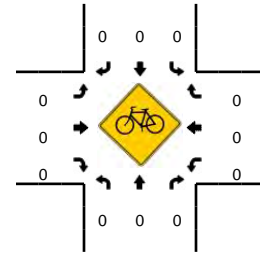
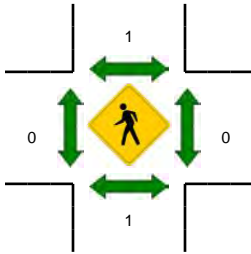
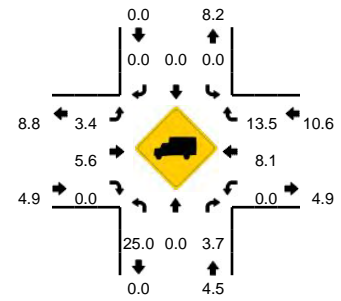
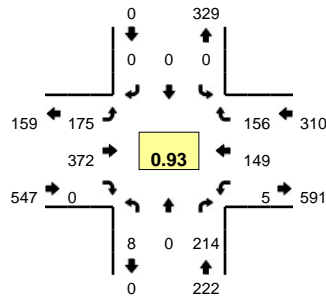
15-Min Count Period Beginning At	I-24 SB Ramps (Northbound)				I-24 SB Ramps (Southbound)				SR 2 (Eastbound)				SR 2 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	48	0	26	0	0	52	7	0	62	43	0	2	240	
4:15 PM	0	0	0	0	55	2	23	0	0	57	4	0	63	38	0	1	243	
4:30 PM	0	0	0	0	40	0	37	0	0	32	4	0	79	37	0	0	229	
4:45 PM	0	0	0	0	46	0	27	0	0	43	3	0	91	36	0	2	248	960
5:00 PM	0	0	0	0	36	0	23	0	0	64	6	0	68	53	0	1	251	971
5:15 PM	0	0	0	0	60	0	29	0	0	63	2	0	100	48	0	1	303	1031
5:30 PM	0	0	0	0	38	0	30	0	0	47	3	0	74	32	0	2	226	1028
5:45 PM	0	0	0	0	38	0	29	0	0	55	2	0	64	34	0	1	223	1003
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	240	0	116	0	0	252	8	0	400	192	0	4	1212	
Heavy Trucks	0	0	0	0	20	0	0	0	0	0	0	0	4	0	0	0	24	
Pedestrians	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

**Comments:**

**LOCATION:** I-24 NB Ramps -- SR 2  
**CITY/STATE:** Chattanooga, TN

**QC JOB #:** 11334603  
**DATE:** Thu, Oct 10 2013

**Peak-Hour: 7:15 AM -- 8:15 AM**  
**Peak 15-Min: 7:45 AM -- 8:00 AM**



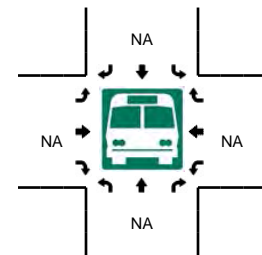
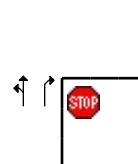
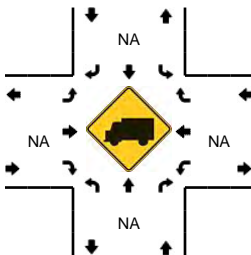
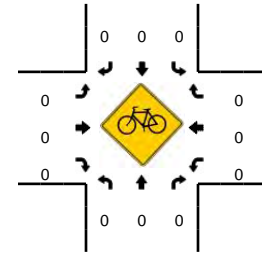
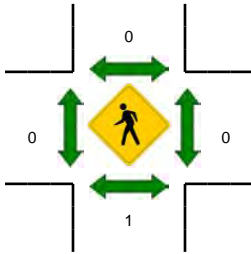
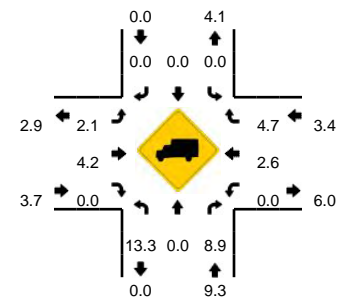
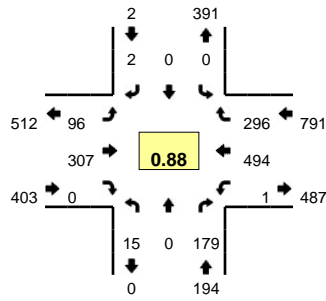
15-Min Count Period Beginning At	I-24 NB Ramps (Northbound)				I-24 NB Ramps (Southbound)				SR 2 (Eastbound)				SR 2 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	0	42	0	0	0	0	0	27	49	0	0	0	26	27	1	175	
7:15 AM	4	0	53	0	0	0	0	0	43	88	0	0	0	37	32	0	257	
7:30 AM	3	0	59	0	0	0	0	0	44	96	0	0	0	36	47	2	287	
7:45 AM	0	0	61	0	0	0	0	0	46	111	0	1	0	33	36	2	290	1009
8:00 AM	1	0	41	0	0	0	0	0	40	77	0	1	0	43	41	1	245	1079
8:15 AM	3	0	36	0	0	0	0	0	32	49	0	0	0	41	40	0	201	
8:30 AM	3	0	35	0	0	0	1	0	25	55	0	0	0	36	36	0	191	927
8:45 AM	6	0	44	0	0	0	0	0	28	56	0	0	0	39	40	0	213	850
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	244	0	0	0	0	0	184	444	0	4	0	132	144	8	1160	
Heavy Trucks	0	0	4		0	0	0		4	8	0		0	8	20		44	
Pedestrians			0				0				0				0		0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

**Comments:**

**LOCATION:** I-24 NB Ramps -- SR 2  
**CITY/STATE:** Chattanooga, TN

**QC JOB #:** 11334604  
**DATE:** Thu, Oct 10 2013

**Peak-Hour: 4:45 PM -- 5:45 PM**  
**Peak 15-Min: 5:15 PM -- 5:30 PM**



15-Min Count Period Beginning At	I-24 NB Ramps (Northbound)				I-24 NB Ramps (Southbound)				SR 2 (Eastbound)				SR 2 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	4	1	41	0	0	0	0	0	27	73	0	0	0	110	72	0	328	
4:15 PM	5	0	47	0	0	0	0	0	24	91	0	0	0	84	72	2	325	
4:30 PM	1	1	35	0	0	0	0	0	12	58	0	0	0	120	71	2	300	
4:45 PM	4	0	45	0	0	0	0	0	13	80	0	0	0	122	40	0	304	1257
5:00 PM	5	0	31	0	0	0	2	0	30	69	0	0	0	124	90	0	351	1280
5:15 PM	1	0	53	0	0	0	0	0	23	103	0	1	0	139	75	0	395	1350
5:30 PM	5	0	50	0	0	0	0	0	29	55	0	0	0	109	91	1	340	1390
5:45 PM	1	0	47	0	0	0	0	0	27	69	0	0	0	92	55	0	291	1377
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	4	0	212	0	0	0	0	0	92	412	0	4	0	556	300	0	1580	
Heavy Trucks	0	0	12	0	0	0	0	0	0	20	0	0	0	0	12	0	44	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

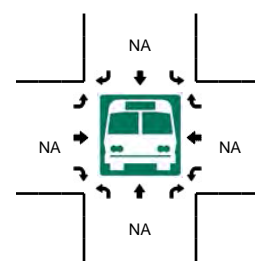
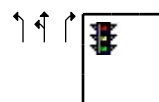
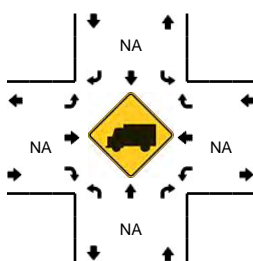
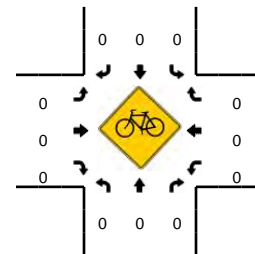
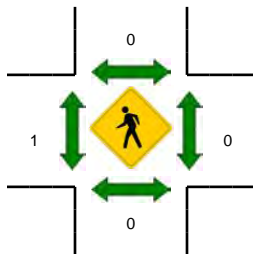
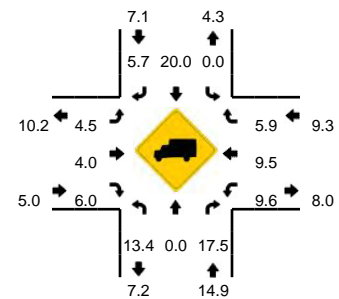
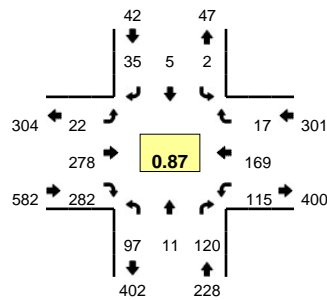
Comments:



**LOCATION:** SR 38 -- SR 2  
**CITY/STATE:** Chattanooga, TN

**QC JOB #:** 11334601  
**DATE:** Thu, Oct 10 2013

**Peak-Hour: 7:15 AM -- 8:15 AM**  
**Peak 15-Min: 7:45 AM -- 8:00 AM**



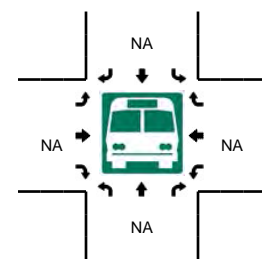
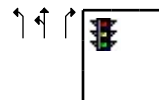
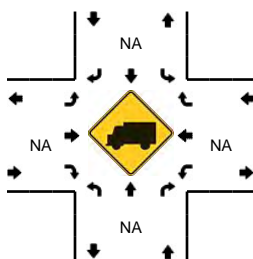
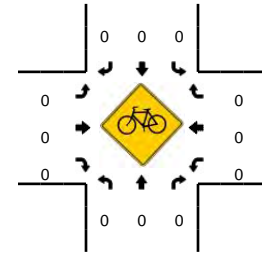
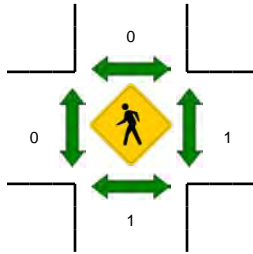
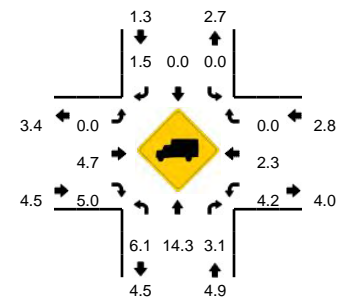
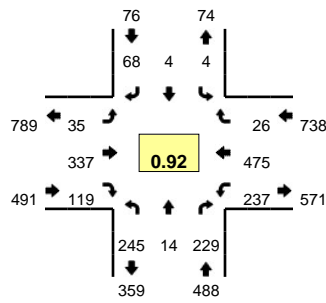
15-Min Count Period Beginning At	SR 38 (Northbound)				SR 38 (Southbound)				SR 2 (Eastbound)				SR 2 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	27	1	17	0	1	0	4	0	4	46	40	0	19	31	5	0	195	
7:15 AM	22	4	22	0	0	0	9	0	5	52	74	2	21	37	3	0	251	
7:30 AM	28	2	29	0	0	2	11	0	7	89	61	0	24	47	7	0	307	
7:45 AM	23	2	40	0	0	2	7	0	5	79	87	1	47	36	4	0	333	1086
8:00 AM	24	3	29	0	2	1	8	0	2	58	60	0	23	49	3	0	262	1153
8:15 AM	22	0	28	0	1	1	6	0	6	50	33	0	22	52	2	0	223	1125
8:30 AM	23	0	30	0	1	0	6	0	7	43	28	0	23	43	2	0	206	1024
8:45 AM	25	3	34	0	2	0	12	0	11	64	29	0	19	41	2	0	242	933
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	92	8	160	0	0	8	28	0	20	316	348	4	188	144	16	0	1332	
Heavy Trucks	12	0	32		0	4	0		0	4	12		20	16	0		100	
Pedestrians	0				0				0				0				0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

**Comments:**

**LOCATION:** SR 38 -- SR 2  
**CITY/STATE:** Chattanooga, TN

**QC JOB #:** 11334602  
**DATE:** Thu, Oct 10 2013

**Peak-Hour: 4:45 PM -- 5:45 PM**  
**Peak 15-Min: 5:00 PM -- 5:15 PM**



15-Min Count Period Beginning At	SR 38 (Northbound)				SR 38 (Southbound)				SR 2 (Eastbound)				SR 2 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	61	5	63	0	1	1	15	0	6	74	30	1	59	106	8	0	430	
4:15 PM	50	1	41	0	2	1	18	0	11	86	32	0	58	88	4	0	392	
4:30 PM	57	2	53	0	1	0	13	0	7	66	22	0	59	120	9	0	409	
4:45 PM	35	2	34	0	0	1	17	0	9	83	32	0	58	109	8	0	388	1619
5:00 PM	85	5	77	0	0	1	17	0	10	75	22	0	66	120	7	0	485	1674
5:15 PM	56	2	45	0	0	2	16	0	12	102	34	1	68	134	4	1	477	1759
5:30 PM	69	5	73	0	4	0	18	0	3	77	31	0	44	112	7	0	443	1793
5:45 PM	46	2	47	0	1	0	14	0	7	90	19	1	50	90	8	0	375	1780
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	340	20	308	0	0	4	68	0	40	300	88	0	264	480	28	0	1940	
Heavy Trucks	8	4	4		0	0	0		0	8	4		8	16	0		52	
Pedestrians		4				0				0				0			4	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

**Comments:**