NORTH CAROLINA
Department of Transportation

NCDOT Traffic Safety Unit

Pre-Construction Conference

May 2018

2016 Crash Facts – Statewide Summary

NORTH CAROLINA

Reportable	2012 Crashes	2012 Injuries	2013 Crashes	2013 Injuries	2014 Crashes	2014 Injuries	2015 Crashes	2015 Injuries	2016 Crashes	2016 Injuries	5 Year Avg. Crashes	5 Year Avg. Injuries
Fatal	1,190	**1,262**	1,158	**1,260**	1,181	**1,277**	1,273	**1,380**	1,340	**1,441**	1,228	**1,324**
Non Fatal Injury	70,109	**110,406**	69,547	**108,436**	71,029	**110,525**	78,857	**123,589**	82,603	**130,137**	74,429	**116,619**
PDO	142,306		149,566		154,342		171,508		183,551		160,255	
Total	213,605	**111,668**	220,271	**109,696**	226,552	**111,802**	251,638	**124,969**	267,494	**131,578**	235,912	**117,943**

General Information

Population (2015)	10,056,683
Registered Vehicles (2015)	9,078,074
Estimated Avg. Annual Miles Traveled (100 MVMT) (2015)	1,118.73

Time To Next....

Crash	0.0	Hours
Fatal Injury	6.3	Hours
Injury	0.1	Hours
Crash Cost Per Hour	$2,928,043	

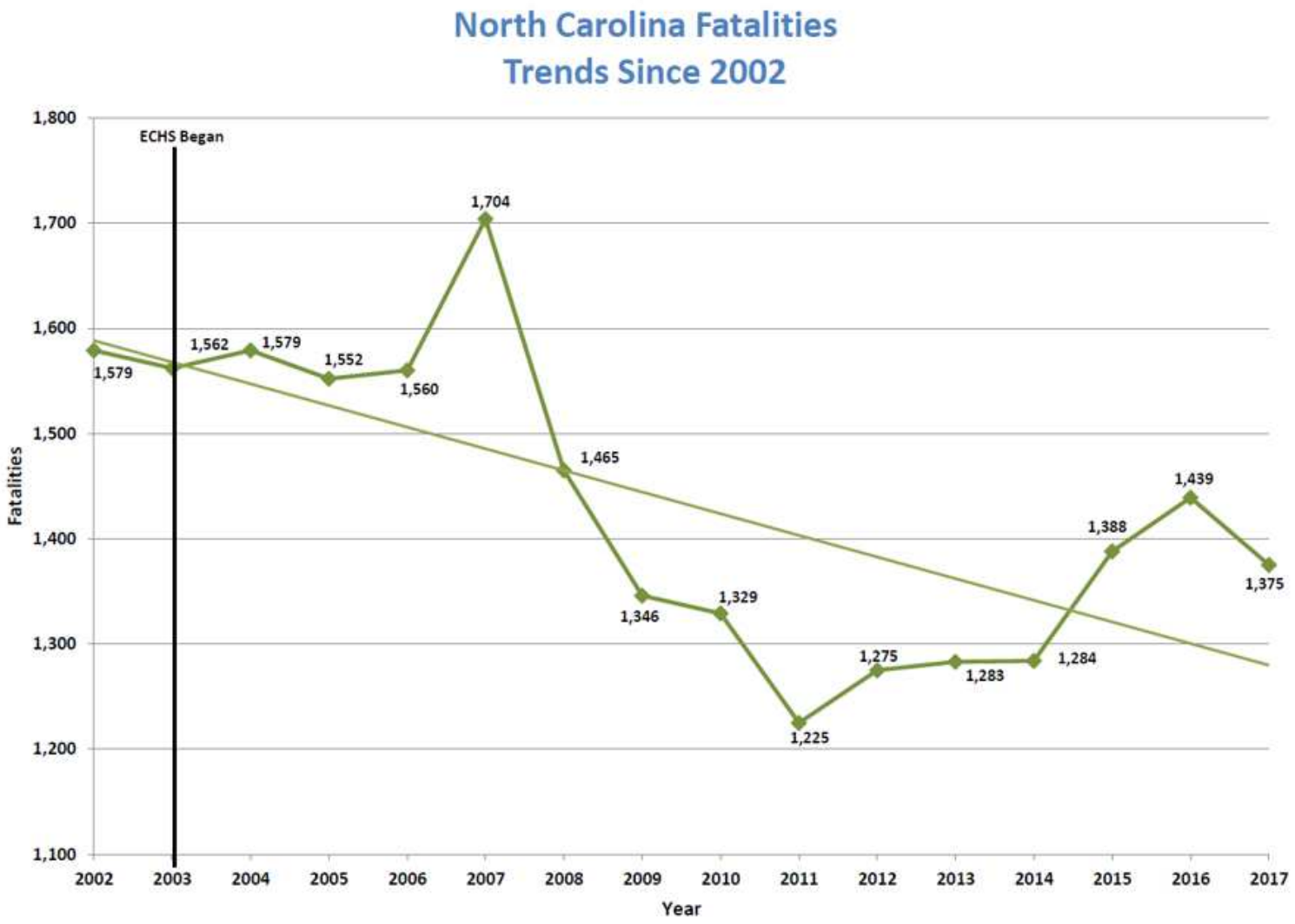
$$ Comprehensive Crash Cost $$

(Based on a 3 Year Average of All Reported Crashes in 2015 Dollars)

Average Annual Cost	$25,649,652,967
Average Cost Per Crash	$77,312
Average Cost Per Person	$2,551
Average Cost Per Vehicle	$2,825
Average Cost / 100 Miles Traveled	$22.93

Mission

Reduce Crashes and/or Severity of Crashes



Unit Work Groups / Areas

NORTH CAROLINA
Department of Transportation

Regional Field Operations

Pre-Construction Conference

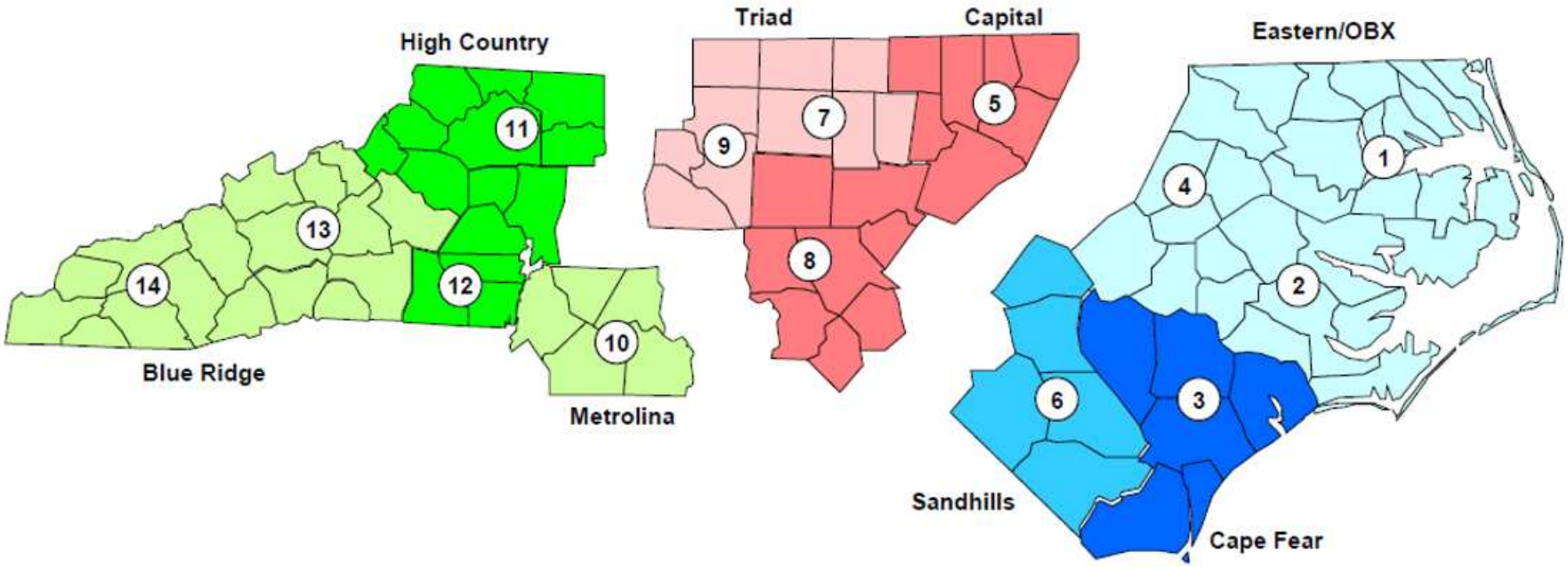
May 2018

NCDOT Regional Offices

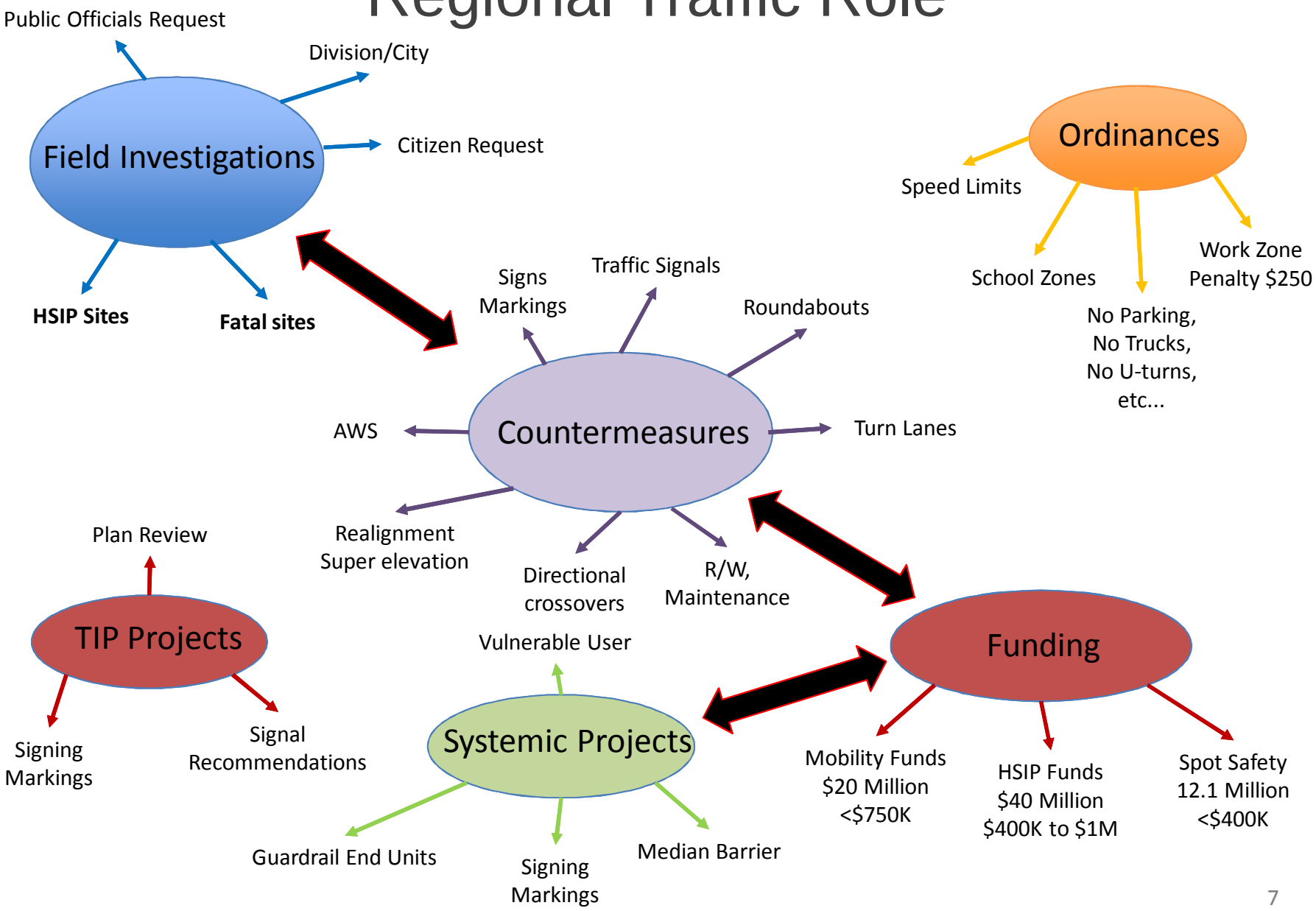
Western
Mobility and Safety
Field Operations Region

Central
Mobility and Safety
Field Operations Region

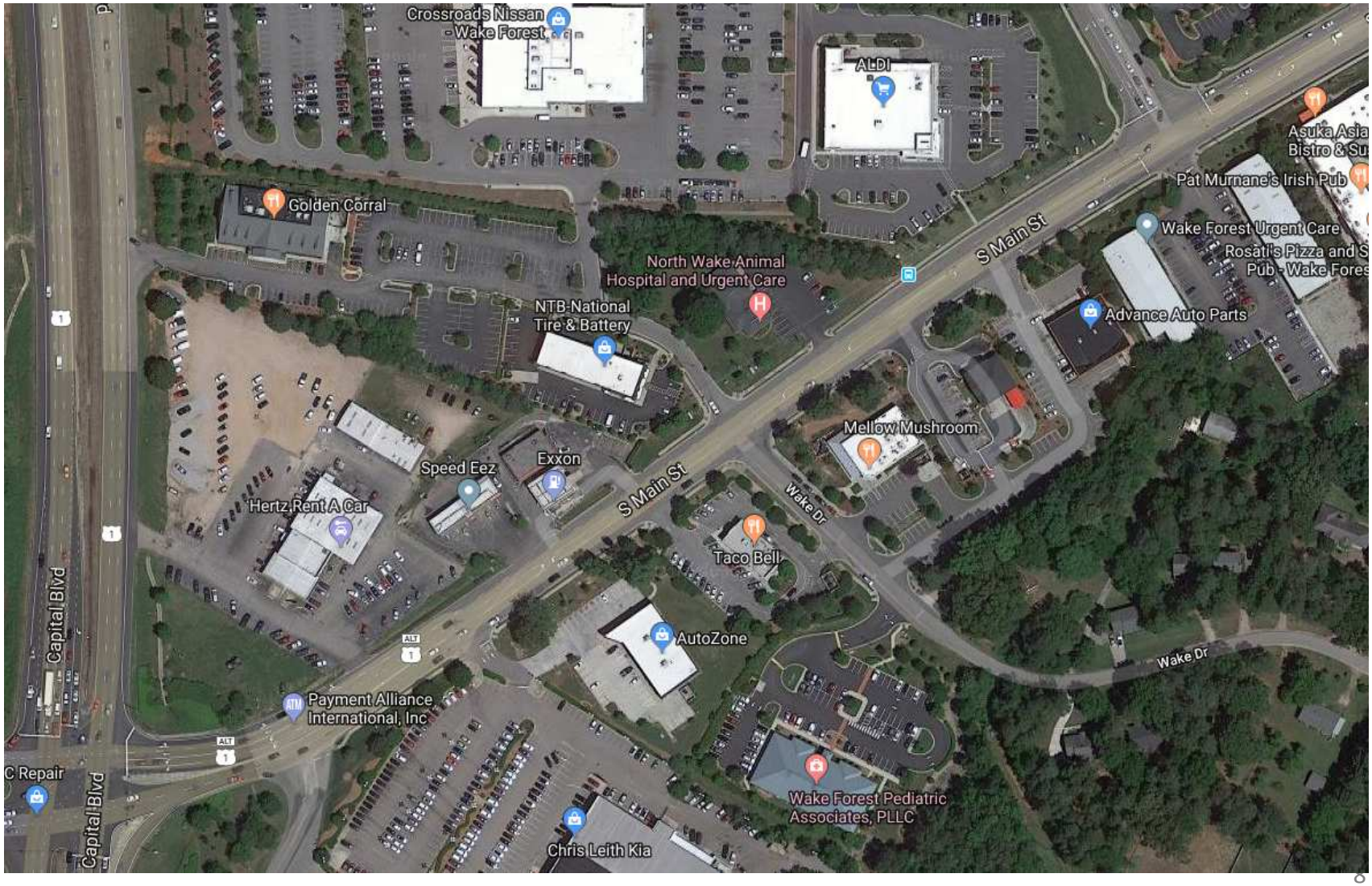
Eastern
Mobility and Safety
Field Operations Region

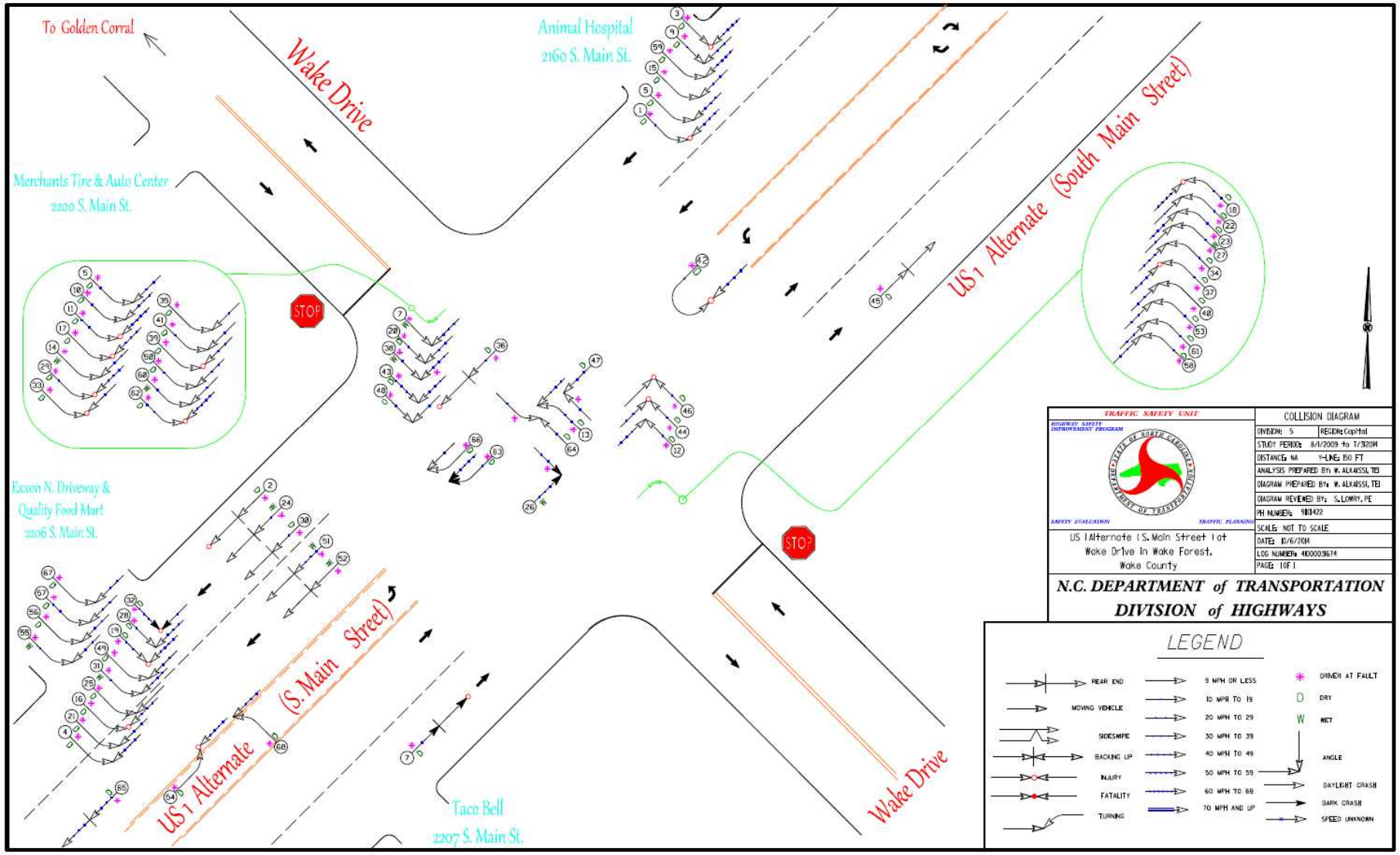


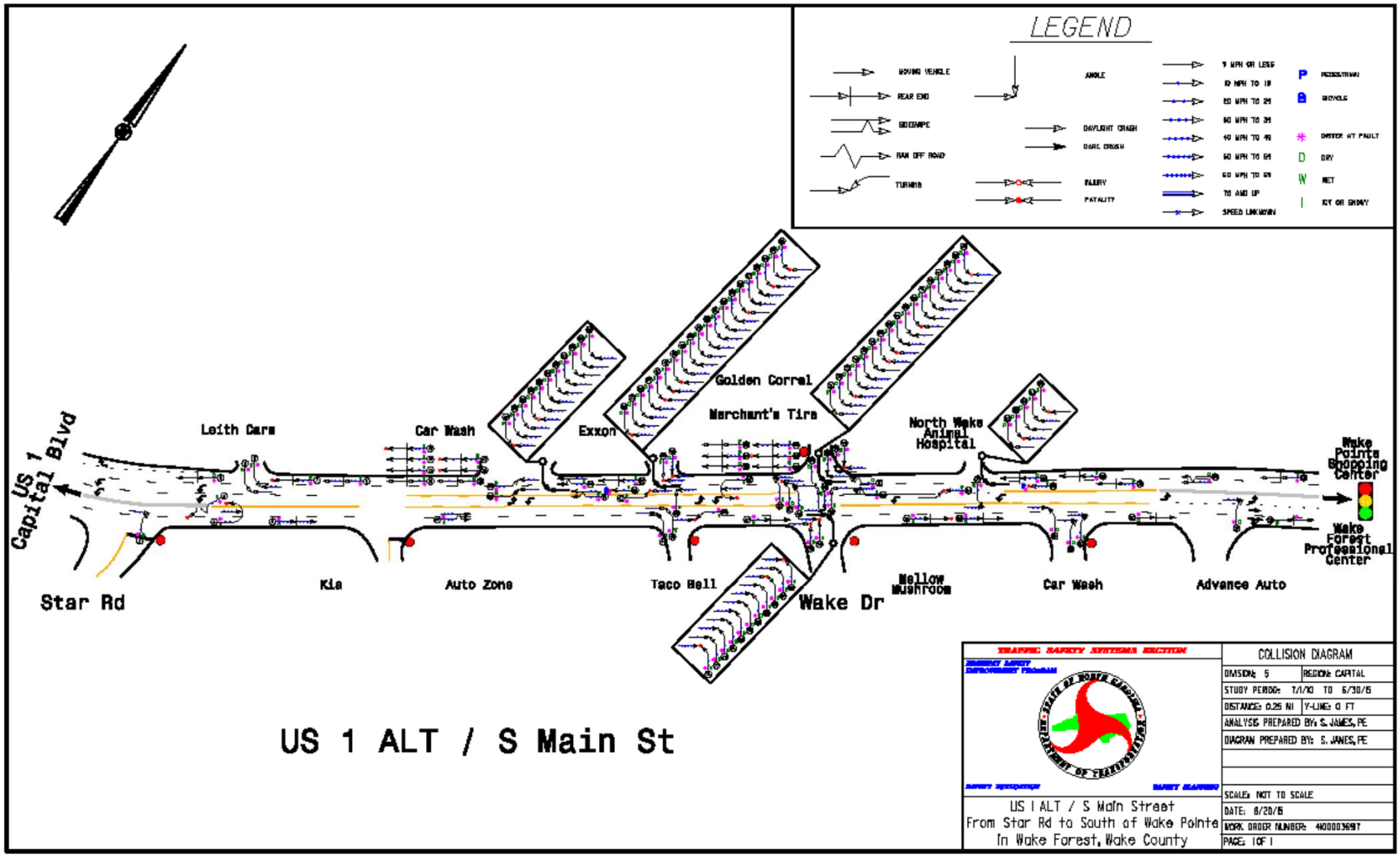
Regional Traffic Role



US 1 A (Main St)


Crossroads Nissan - Wake Forest
ALDI
Asuka Asia Bistro & Su
Pat Murnane's Irish Pub
Golden Corral
Wake Forest Urgent Care
S Main St
North Wake Animal Hospital and Urgent Care
Rosati's Pizza and S Pub - Wake Fores
NTB-National Tire & Battery
Advance Auto Parts
Mellow Mushroom
Speed Eez
Exxon
S Main St
Wake Dr
Hertz Rent A Car
Taco Bell
Capital Blvd
AutoZone
Wake Dr
Payment Alliance International, Inc
C Repair
Capital Blvd
Wake Forest Pediatric Associates, PLLC
Chris Leith Kia

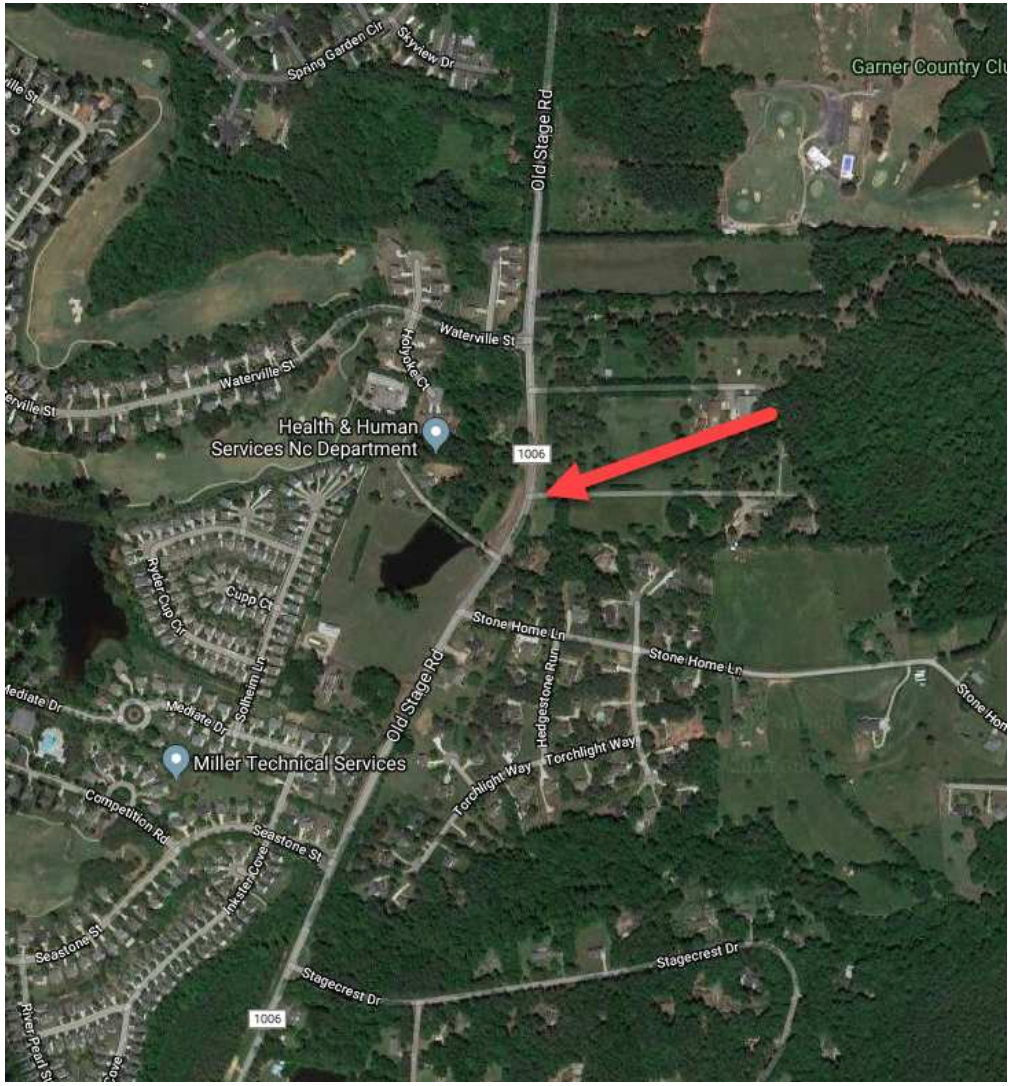

To Golden Corral
Wake Drive
Animal Hospital
2160 S. Main St.
Merchants Tire & Auto Center
2200 S. Main St.
US 1 Alternate (South Main Street)
STOP
STOP
Exxon N. Driveway &
Quality Food Mart
2206 S. Main St.
US 1 Alternate (S. Main Street)
Taco Bell
2207 S. Main St.
Wake Drive
TRAFFIC SAFETY UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY EVALUATION
TRAFFIC PLANNING
COLLISION DIAGRAM
DIVISION: 5
REGION: Capital
STUDY PERIOD: 8/1/2009 to 7/31/2014
DISTANCE: NA
Y-LINE: 150 FT
ANALYSIS PREPARED BY: W. ALKASSI, TEI
DIAGRAM PREPARED BY: W. ALKASSI, TEI
DIAGRAM REVIEWED BY: S. LOWRY, PE
PH NUMBER: 981422
SCALE: NOT TO SCALE
DATE: 10/6/2014
LOG NUMBER: 40000367A
PAGE: 1 OF 1
US 1 Alternate (S. Main Street) at
Wake Drive in Wake Forest,
Wake County
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
LEGEND
REAR END
MOVING VEHICLE
SIDESWIPE
BACKING UP
INJURY
FATALITY
TURNING
9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 MPH AND UP
DRIVER AT FAULT
D DRY
W WET
ANGLE
DAYLIGHT CRASH
DARK CRASH
SPEED UNKNOWN

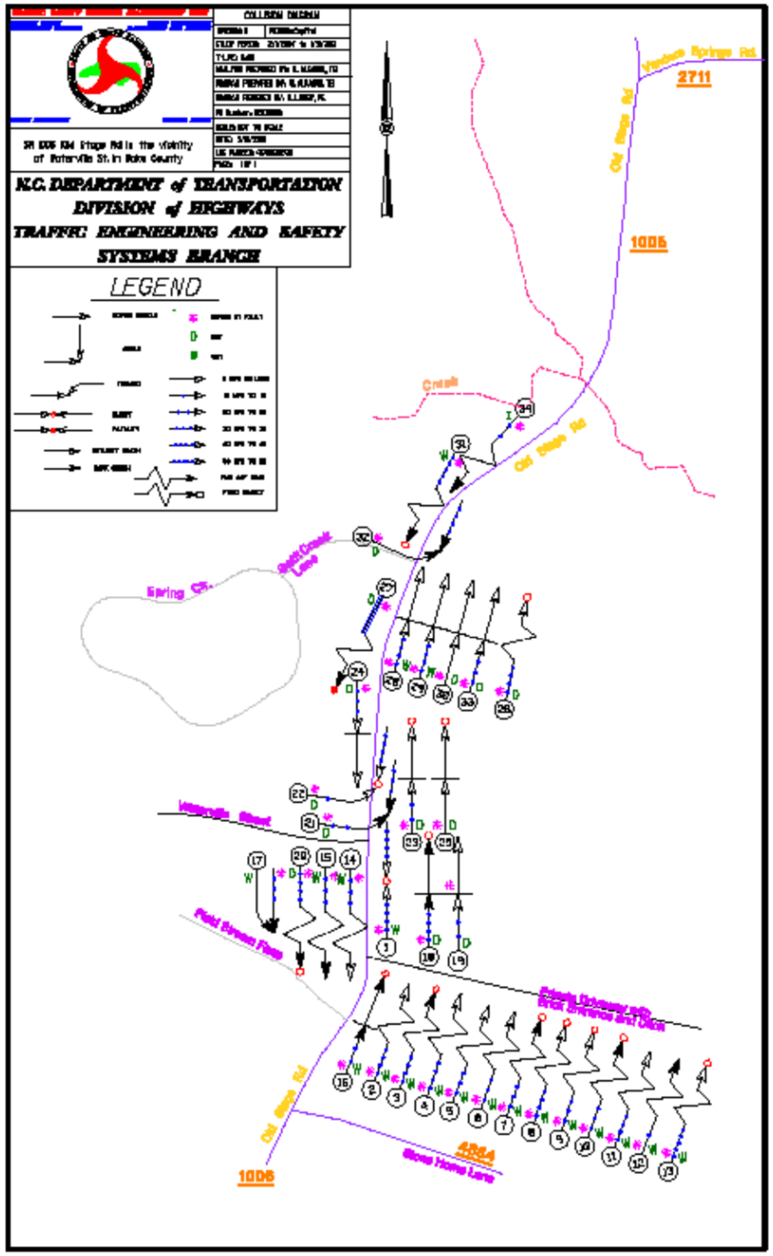

LEGEND
MOVING VEHICLE
REAR END
SIDESWIPE
RAN OFF ROAD
TURNING
ANGLE
DAYLIGHT CRASH
DARK CRASH
INJURY
FATALITY
9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN
P PEDESTRIAN
B BICYCLE
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
US 1 Capital Blvd
Leith Cars
Car Wash
Exxon
Golden Corral
Merchant's Tire
North Wake Animal Hospital
Wake Pointe Shopping Center
Wake Forest Professional Center
Star Rd
Kia
Auto Zone
Taco Bell
Wake Dr
Mellow Mushroom
Car Wash
Advance Auto
US 1 ALT / S Main St
TRAFFIC SAFETY SYSTEMS SECTION
COLLISION DIAGRAM
DIVISION: 5
REGION: CAPITAL
STUDY PERIOD: 1/1/10 TO 6/30/15
DISTANCE: 0.25 MI
Y-LINE: 0 FT
ANALYSIS PREPARED BY: S. JAMES, PE
DIAGRAM PREPARED BY: S. JAMES, PE
SCALE: NOT TO SCALE
DATE: 8/20/15
WORK ORDER NUMBER: 4800036917
PAGE: 1 OF 1
US 1 ALT / S Main Street
From Star Rd to South of Wake Pointe
In Wake Forest, Wake County

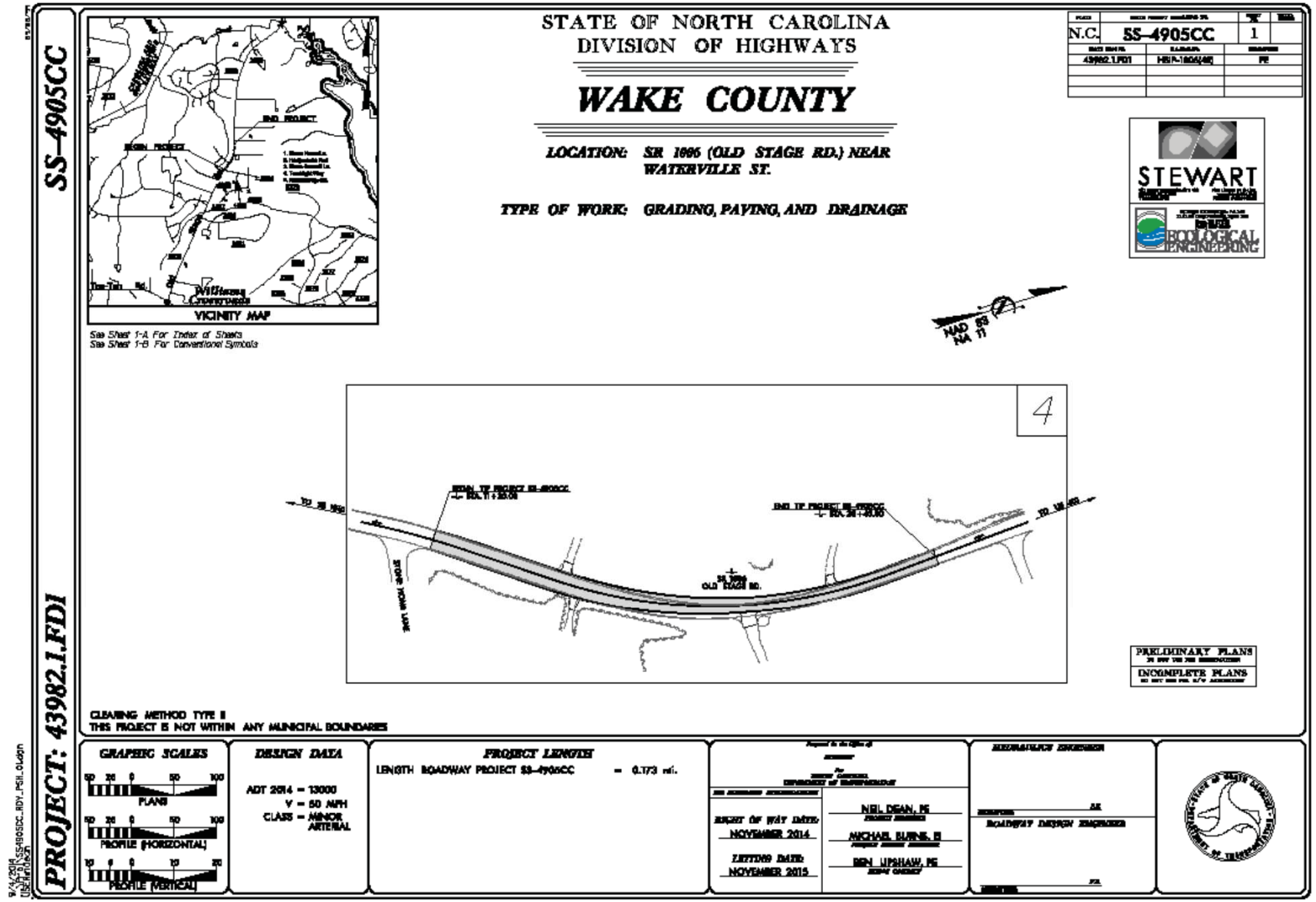
US 1 A (Main St)


WAKE DRIVE
150' TRANSITION
150' TRANSITION
S MAIN STREET
2' ISLAND
2' ISLAND
2' ISLAND
2' ISLAND
2' ISLAND
10'
10'
10'
10'
10'
10'
10'
10'
US-1A
S MAIN STREET
WAKE DRIVE

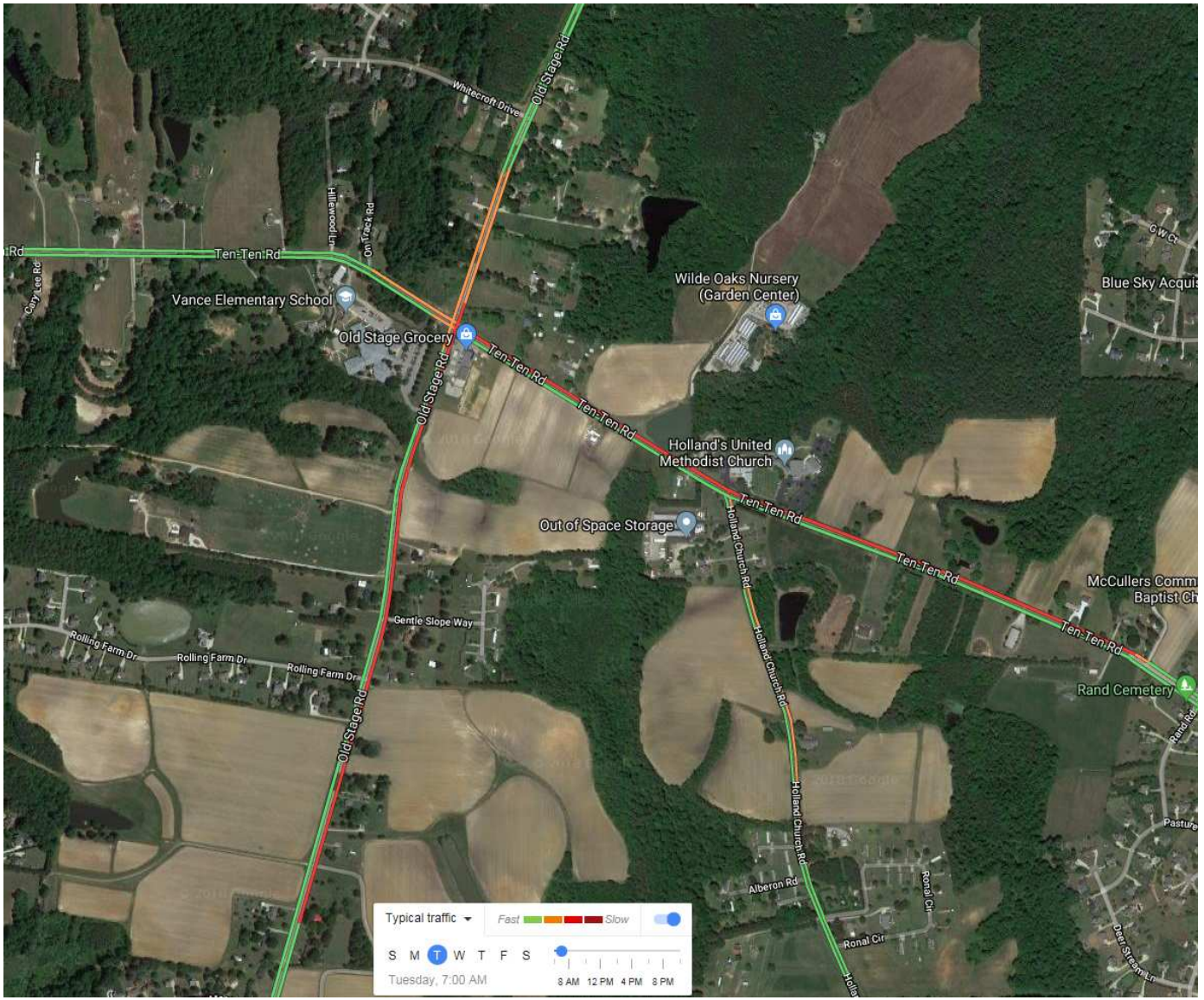
SR 1006 (Old Stage Rd)



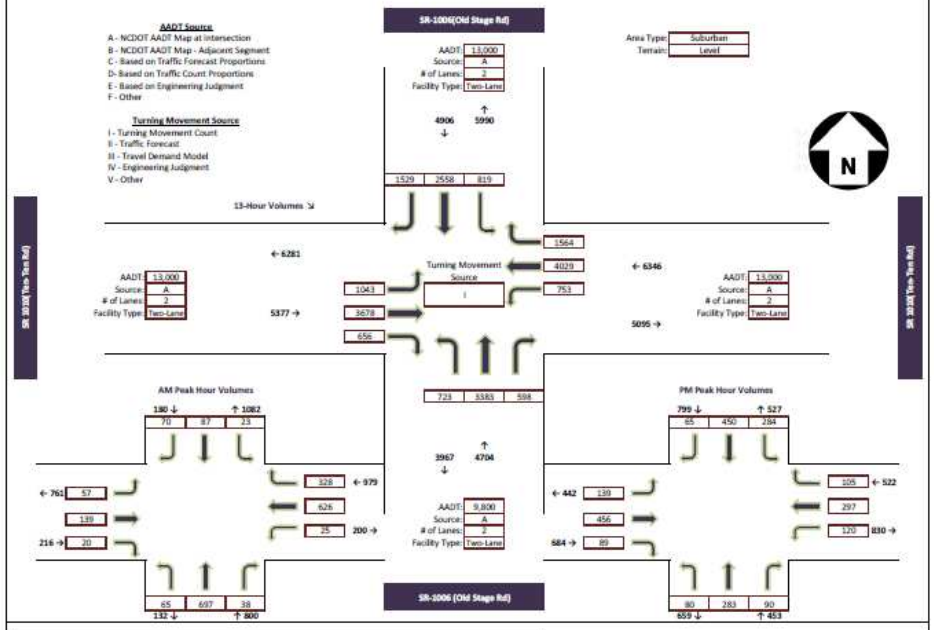

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH
LEGEND
Old Stage Rd
1006
2711
4864
Creek
Spring Ck.


PROJECT: 43982.1.FDI
SS-4905CC
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
WAKE COUNTY
LOCATION: SR 1005 (OLD STAGE RD.) NEAR WATERVILLE ST.
TYPE OF WORK: GRADING, PAVING, AND DRAINAGE
N.C. SS-4905CC 1
43982.1.FD1 HSIP-1804(48) PE
STEWART
BIOLOGICAL ENGINEERING
VICINITY MAP
See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols
NAD 83 NA 11
4
PRELIMINARY PLANS
INCOMPLETE PLANS
CLEARING METHOD TYPE II
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES
GRAPHIC SCALES
PLANS
PROFILE (HORIZONTAL)
PROFILE (VERTICAL)
DESIGN DATA
ADT 2014 = 13000
V = 50 MPH
CLASS = MINOR ARTERIAL
PROJECT LENGTH
LENGTH ROADWAY PROJECT SS-4905CC = 0.173 mi.
RIGHT OF WAY DATE: NOVEMBER 2014
LETTING DATE: NOVEMBER 2015
NEIL DEAN, PE
MICHAEL BURNS, III
BEN UPSHAW, PE
ROADWAY DESIGN ENGINEER

SR 1006 at SR 1010



SPOT ID:		SP No.		County:	Wake	Division:	5
Existing Problem:				Solution:	200 ft Full Storage WBR Lane		



Existing Conditions

AM Peak

Simulation	1	2	3	4	5	6	7	8	9	10	Average
Travel Time (hr)	311.4	280.6	297.5	274.4	279.6	275.0	251.7	299.9	294.7	287.0	285.2
Total Delay (hr)	294.7	264.1	280.4	257.7	263.1	258.6	235.1	282.6	277.9	270.3	268.5
Vehicles Entered	1804	1802	1860	1830	1809	1765	1809	1881	1845	1805	1824
Queued Trips	407	406	406	355	370	355	384	381	399	384	385
Delay/Vehicle (min)	9.8	8.8	9.0	8.4	8.7	8.7	7.8	9.0	9.0	9.0	8.8
Travel Time/ Average Travel Time	1.09	0.98	1.04	0.96	0.98	0.96	0.88	1.05	1.03	1.01	1.09 MAX
Delay/ Average Delay	1.10	0.98	1.04	0.96	0.98	0.96	0.88	1.05	1.04	1.01	1.10

PM Peak

Simulation	1	2	3	4	5	6	7	8	9	10	Average
Travel Time (hr)	149.3	87.2	206.5	152.1	108.9	52.3	63.9	163.3	152.7	65.4	120.2
Total Delay (hr)	127.6	64.8	184.6	130.7	87.5	31.2	41.8	141.2	130.5	43.3	98.3
Vehicles Entered	2356	2443	2372	2318	2325	2301	2402	2381	2394	2405	2370
Queued Trips	105	20	222	177	102	21	18	128	104	1	90
Delay/Vehicle (min)	3.2	1.6	4.7	3.4	2.3	0.8	1.0	3.6	3.3	1.1	2.5
Travel Time/ Average Travel Time	1.24	0.73	1.72	1.27	0.91	0.44	0.53	1.36	1.27	0.54	1.72 MAX
Delay/ Average Delay	1.30	0.66	1.88	1.33	0.89	0.32	0.43	1.44	1.33	0.44	1.88

Existing Average AM Delay/Vehicle (mm:ss)	08:50
Improved Average AM Delay/Vehicle (mm:ss)	02:36
Average AM Peak Delay/Vehicle Reduction	71%
Existing Average PM Delay/Vehicle (mm:ss)	02:30
Improved Average PM Delay/Vehicle (mm:ss)	02:23
Average PM Peak Delay/Vehicle Reduction	4%
Congestion Score (out of 20 pts)	**16**
Existing v/c	1.18
Improved v/c	0.96

Improved Conditions

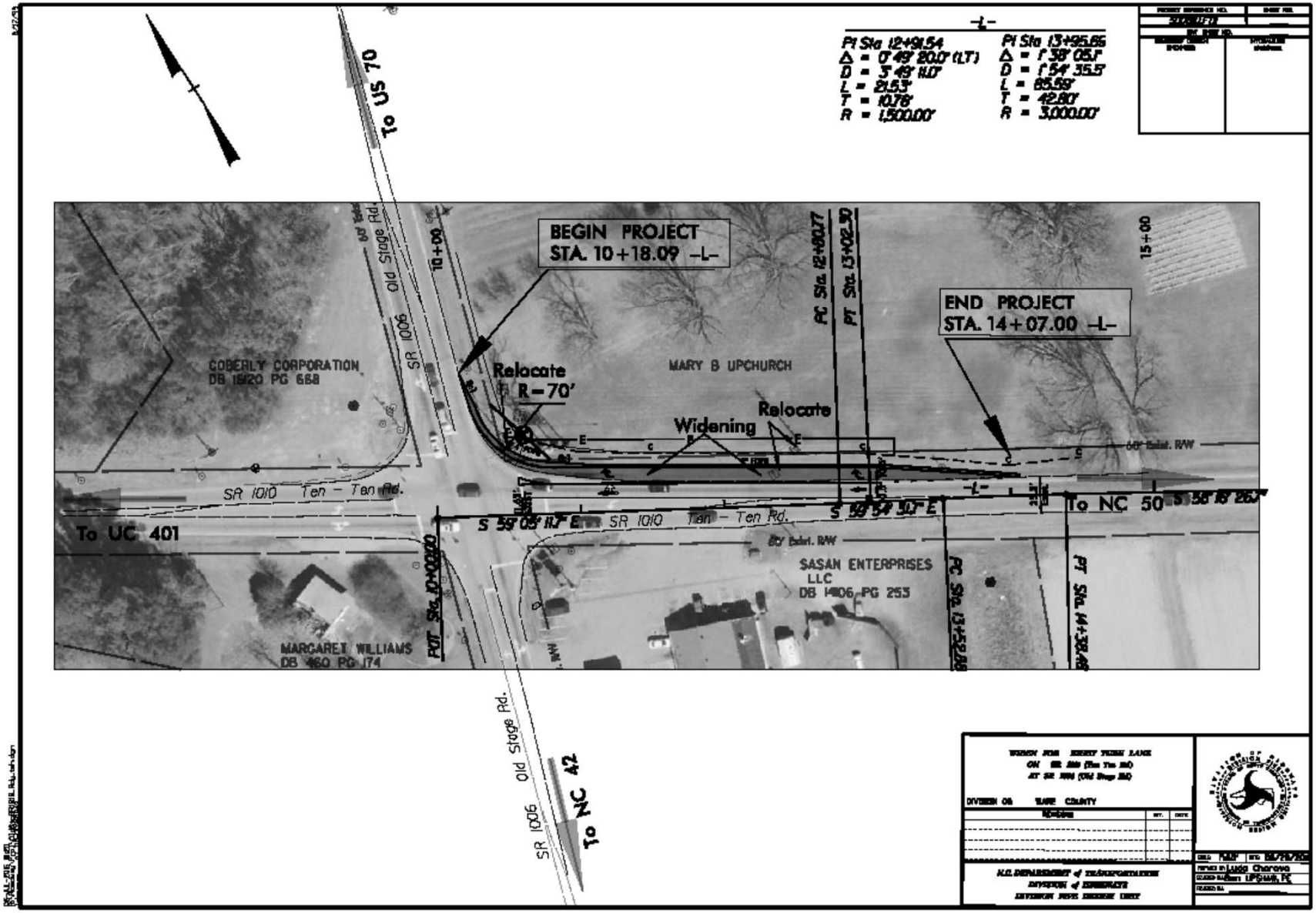
AM Peak

Simulation	1	2	3	4	5	6	7	8	9	10	Average
Travel Time (hr)	122.1	103.4	123.4	110.3	99.1	88.7	100.9	120.5	133.4	101.9	110.4
Total Delay (hr)	102.7	84.3	103.5	91.6	80.1	69.6	82.0	100.7	114.2	82.7	91.1
Vehicles Entered	2092	2101	2178	2079	2086	2073	2078	2160	2123	2090	2106
Queued Trips	78	84	75	78	64	28	100	74	100	63	74
Delay/Vehicle (min)	2.9	2.4	2.9	2.6	2.3	2.0	2.4	2.8	3.2	2.4	2.6
Travel Time/ Average Travel Time	1.11	0.94	1.12	1.00	0.90	0.80	0.91	1.09	1.21	0.92	1.21 MAX
Delay/ Average Delay	1.13	0.92	1.14	1.01	0.88	0.76	0.90	1.10	1.25	0.91	1.25

PM Peak

Simulation	1	2	3	4	5	6	7	8	9	10	Average
Travel Time (hr)	157.6	76.8	206.5	138.9	100.3	50.1	57.2	179.6	146.7	50.7	116.8
Total Delay (hr)	135.7	56.4	186.6	117.3	78.6	28.9	34.9	157.4	124.3	28.6	96.9
Vehicles Entered	2366	2452	2376	2347	2350	2319	2420	2400	2401	2405	2384
Queued Trips	95	12	218	148	77	3	1	130	83	1	77
Delay/Vehicle (min)	3.4	1.4	4.7	3.0	2.0	0.7	0.9	3.9	3.1	0.7	2.4
Travel Time/ Average Travel Time	1.35	0.67	1.78	1.19	0.86	0.43	0.49	1.54	1.26	0.43	1.78 MAX
Delay/ Average Delay	1.43	0.59	1.97	1.24	0.83	0.30	0.37	1.66	1.31	0.30	1.97

Average AM Peak Travel Time Savings	174.82 hr
Average PM Peak Travel Time Savings	3.32 hr
Adjusted AM Peak Travel Time Savings	437.05 hr
Adjusted PM Peak Travel Time Savings	8.30 hr
Annual AM Peak Travel Time Savings	114,000 hr
Annual PM Peak Travel Time Savings	2,200 hr
Total Annual Peak Travel Time Savings	**116,200 hr**
Total Benefit	**$2,556,400**


To US 70
PI Sta 12+91.54
Δ = 0°49'20.0" (LT)
D = 3°49'11.0"
L = 215.3'
T = 107.8'
R = 1,500.00'
PI Sta 13+95.85
Δ = 1°38'05.1"
D = 1°54'35.5"
L = 85.59'
T = 42.80'
R = 3,000.00'
BEGIN PROJECT
STA. 10+18.09 -L-
END PROJECT
STA. 14+07.00 -L-
Old Stage Rd.
SR 1006
COBERLY CORPORATION
DB 1820 PG 668
MARY B UPCHURCH
Relocate
R=70'
Widening
Relocate
SR 1010 Ten - Ten Rd.
To UC 401
To NC 50
SASAN ENTERPRISES
LLC
DB 1806, PG 253
MARGARET WILLIAMS
DB 460 PG 174
To NC 42

Spot Safety & Hazard Elimination

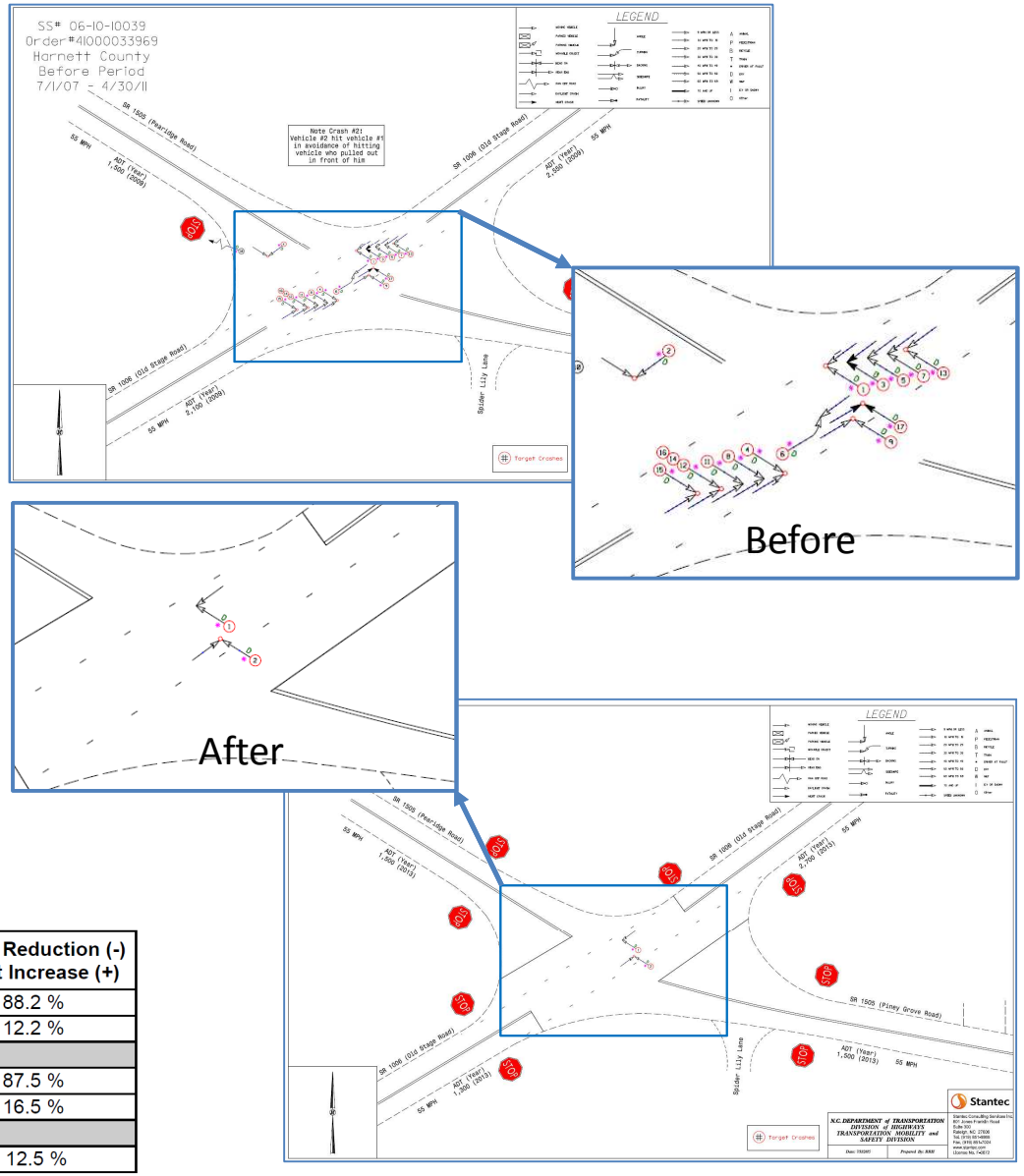
Spot Safety Project Evaluation

Project Information

Order ID:	41000033969
Project ID:	06-10-10039
Location:	Intersection of SR 1006 (Old Stage Rd) at SR 1505 (Pearidge Rd/Piney Grove Rd)
County:	Harnett
City:	Angier
Division:	6
Signal ID:	N/A
Countermeasures:	Convert to All-Way Stop with dual mounted Stop signs at each approach, and installed Stop Bars for each approach.
Project Completion:	July 12, 2011
Project Cost:	$9,500.00

Map and Aerial (from Google Maps, Coordinates are 35.502720, -78.691507)

Treatment Information	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	17	2	- 88.2 %
Total Severity Index	5.35	4.70	- 12.2 %
Target Crashes	16	2	- 87.5 %
Target Crash Severity Index	5.63	4.70	- 16.5 %
Volume (2009, 2013)	4,000	3,500	- 12.5 %



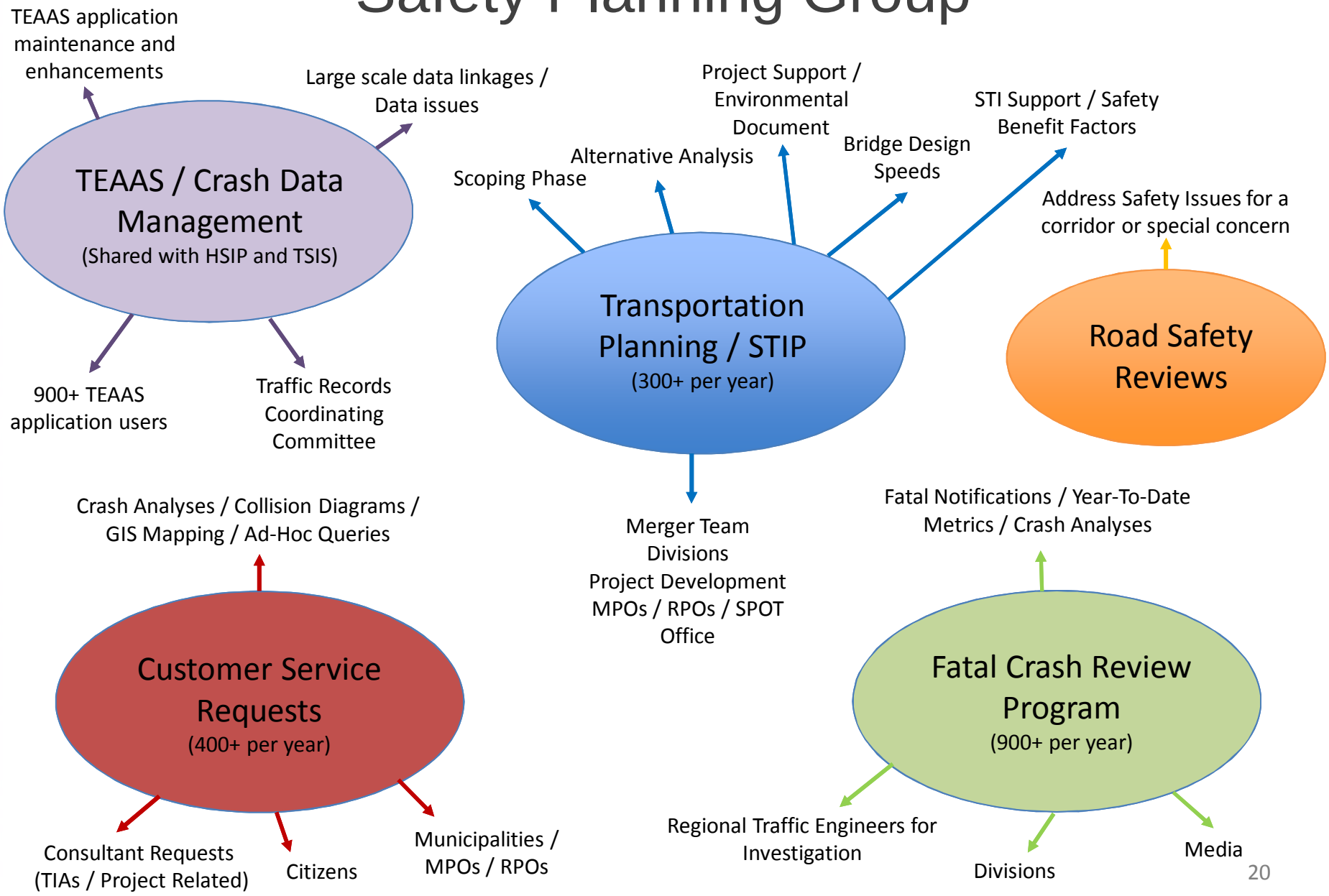
NORTH CAROLINA
Department of Transportation

Safety Planning

Pre-Construction Conference

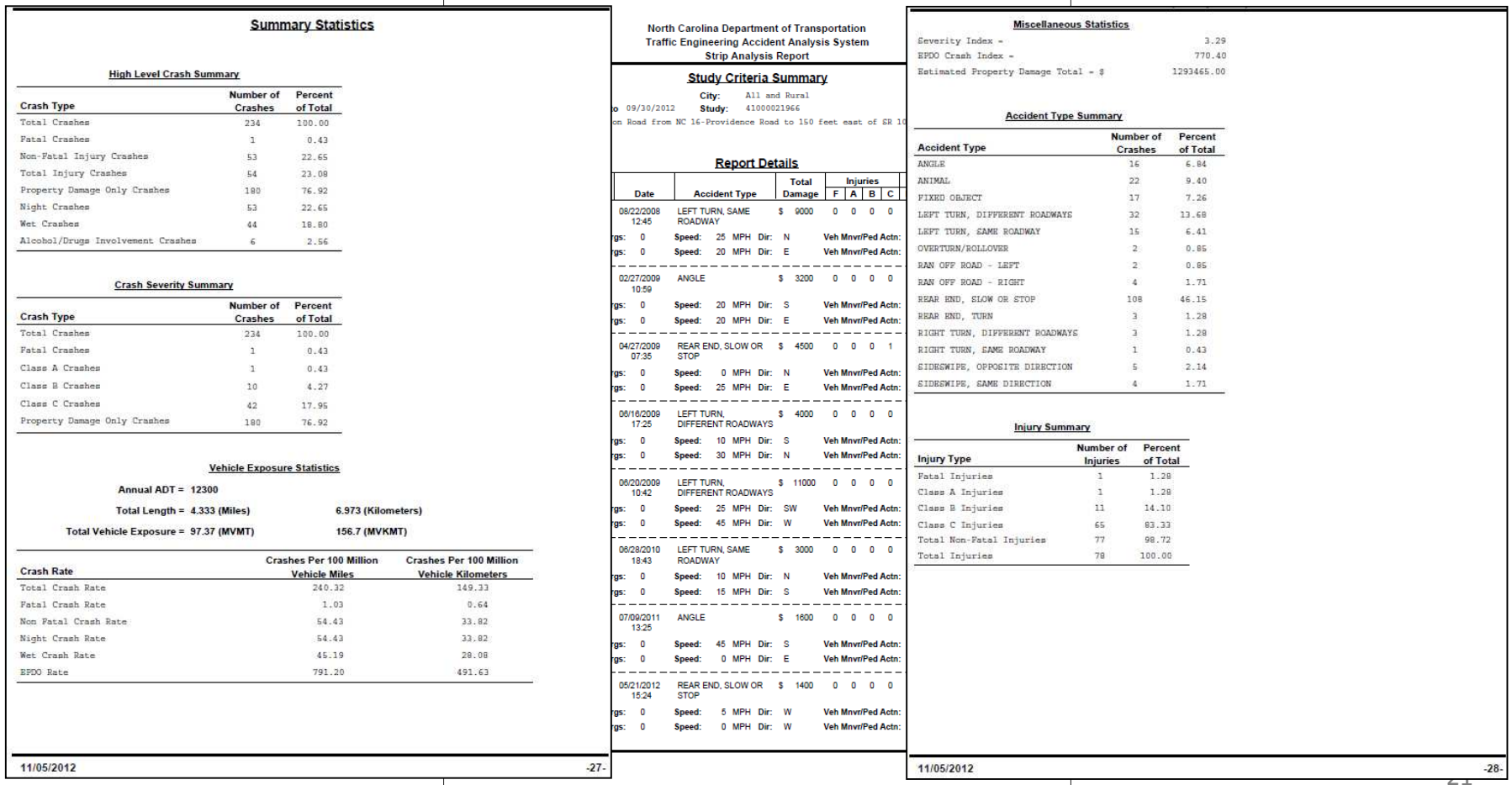
May 2018

Safety Planning Group



Project Scoping

- Identify patterns of crashes the project should address
  - Detailed Crash Analysis



Summary Statistics

High Level Crash Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	234	100.00
Fatal Crashes	1	0.43
Non-Fatal Injury Crashes	53	22.65
Total Injury Crashes	54	23.08
Property Damage Only Crashes	180	76.92
Night Crashes	53	22.65
Wet Crashes	44	18.80
Alcohol/Drugs Involvement Crashes	6	2.56

Crash Severity Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	234	100.00
Fatal Crashes	1	0.43
Class A Crashes	1	0.43
Class B Crashes	10	4.27
Class C Crashes	42	17.95
Property Damage Only Crashes	180	76.92

Vehicle Exposure Statistics

Annual ADT = 12300

Total Length = 4.333 (Miles) 6.973 (Kilometers)

Total Vehicle Exposure = 97.37 (MVMT) 156.7 (MVKMT)

Crash Rate	Crashes Per 100 Million Vehicle Miles	Crashes Per 100 Million Vehicle Kilometers
Total Crash Rate	240.32	149.33
Fatal Crash Rate	1.03	0.64
Non Fatal Crash Rate	54.43	33.82
Night Crash Rate	54.43	33.82
Wet Crash Rate	45.19	28.08
EPDO Rate	791.20	491.63

11/05/2012 -27-

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Study Criteria Summary

City: All and Rural
o 09/30/2012 Study: 41000021966
on Road from NC 16-Providence Road to 150 feet east of SR 10

Report Details

Date	Accident Type	Total Damage	Injuries F	A	B	C
08/22/2008 12:45	LEFT TURN, SAME ROADWAY	$ 9000	0	0	0	0
gs: 0	Speed: 25 MPH Dir: N		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 20 MPH Dir: E		Veh Mnvr/Ped Actn:			
02/27/2009 10:59	ANGLE	$ 3200	0	0	0	0
gs: 0	Speed: 20 MPH Dir: S		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 20 MPH Dir: E		Veh Mnvr/Ped Actn:			
04/27/2009 07:35	REAR END, SLOW OR STOP	$ 4500	0	0	0	1
gs: 0	Speed: 0 MPH Dir: N		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 25 MPH Dir: E		Veh Mnvr/Ped Actn:			
06/16/2009 17:25	LEFT TURN, DIFFERENT ROADWAYS	$ 4000	0	0	0	0
gs: 0	Speed: 10 MPH Dir: S		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 30 MPH Dir: N		Veh Mnvr/Ped Actn:			
06/20/2009 10:42	LEFT TURN, DIFFERENT ROADWAYS	$ 11000	0	0	0	0
gs: 0	Speed: 25 MPH Dir: SW		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 45 MPH Dir: W		Veh Mnvr/Ped Actn:			
06/28/2010 18:43	LEFT TURN, SAME ROADWAY	$ 3000	0	0	0	0
gs: 0	Speed: 10 MPH Dir: N		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 15 MPH Dir: S		Veh Mnvr/Ped Actn:			
07/09/2011 13:25	ANGLE	$ 1600	0	0	0	0
gs: 0	Speed: 45 MPH Dir: S		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 0 MPH Dir: E		Veh Mnvr/Ped Actn:			
05/21/2012 15:24	REAR END, SLOW OR STOP	$ 1400	0	0	0	0
gs: 0	Speed: 5 MPH Dir: W		Veh Mnvr/Ped Actn:			
gs: 0	Speed: 0 MPH Dir: W		Veh Mnvr/Ped Actn:			

Miscellaneous Statistics

Severity Index =	3.29
EPDO Crash Index =	770.40
Estimated Property Damage Total = $	1293465.00

Accident Type Summary

Accident Type	Number of Crashes	Percent of Total
ANGLE	16	6.84
ANIMAL	22	9.40
FIXED OBJECT	17	7.26
LEFT TURN, DIFFERENT ROADWAYS	32	13.68
LEFT TURN, SAME ROADWAY	15	6.41
OVERTURN/ROLLOVER	2	0.85
RAN OFF ROAD - LEFT	2	0.85
RAN OFF ROAD - RIGHT	4	1.71
REAR END, SLOW OR STOP	108	46.15
REAR END, TURN	3	1.28
RIGHT TURN, DIFFERENT ROADWAYS	3	1.28
RIGHT TURN, SAME ROADWAY	1	0.43
SIDESWIPE, OPPOSITE DIRECTION	5	2.14
SIDESWIPE, SAME DIRECTION	4	1.71

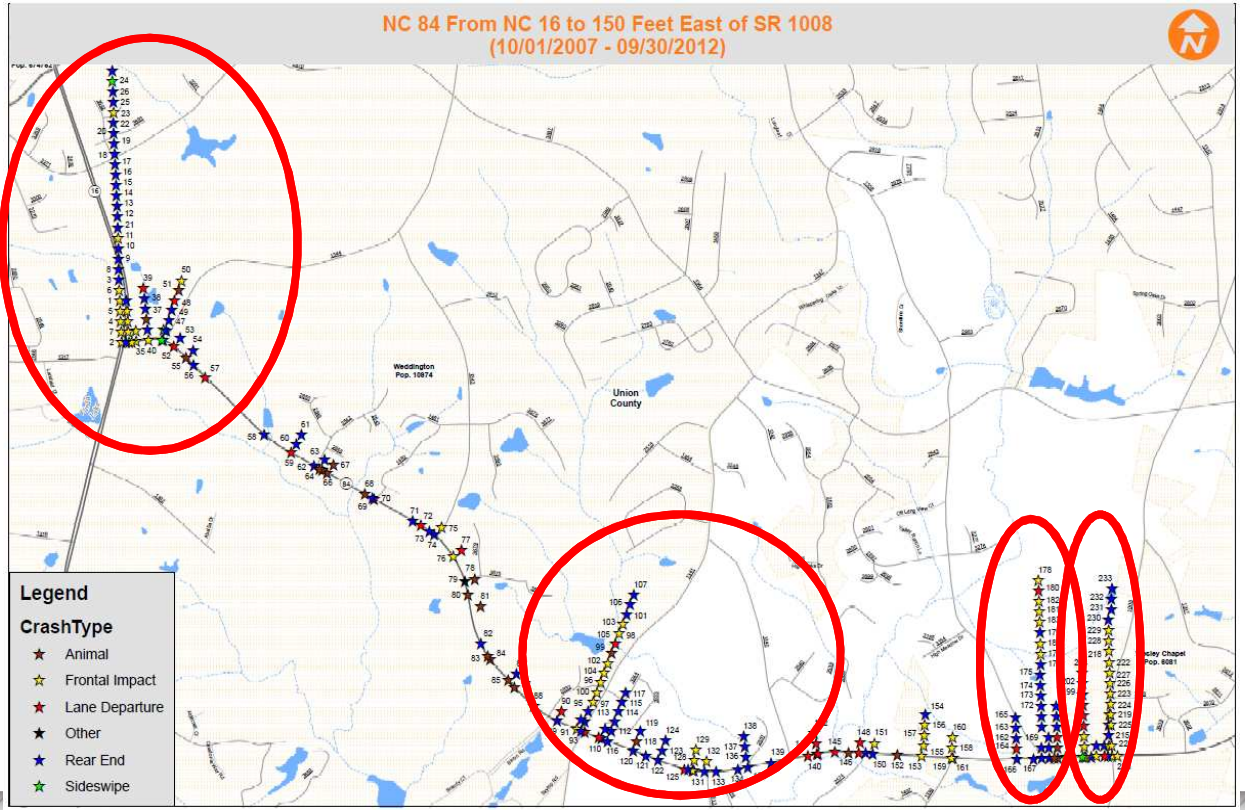
Injury Summary

Injury Type	Number of Injuries	Percent of Total
Fatal Injuries	1	1.28
Class A Injuries	1	1.28
Class B Injuries	11	14.10
Class C Injuries	65	83.33
Total Non-Fatal Injuries	77	98.72
Total Injuries	78	100.00

11/05/2012 -28-

Project Scoping

- Identify patterns of crashes the project should address
  - Detailed Crash Analysis
  - Mapping
    - Helps to identify patterns
    - Helps to communicate safety concerns



Project Scoping

- Identify patterns of crashes the project should address
  - Detailed Crash Analysis
  - Mapping
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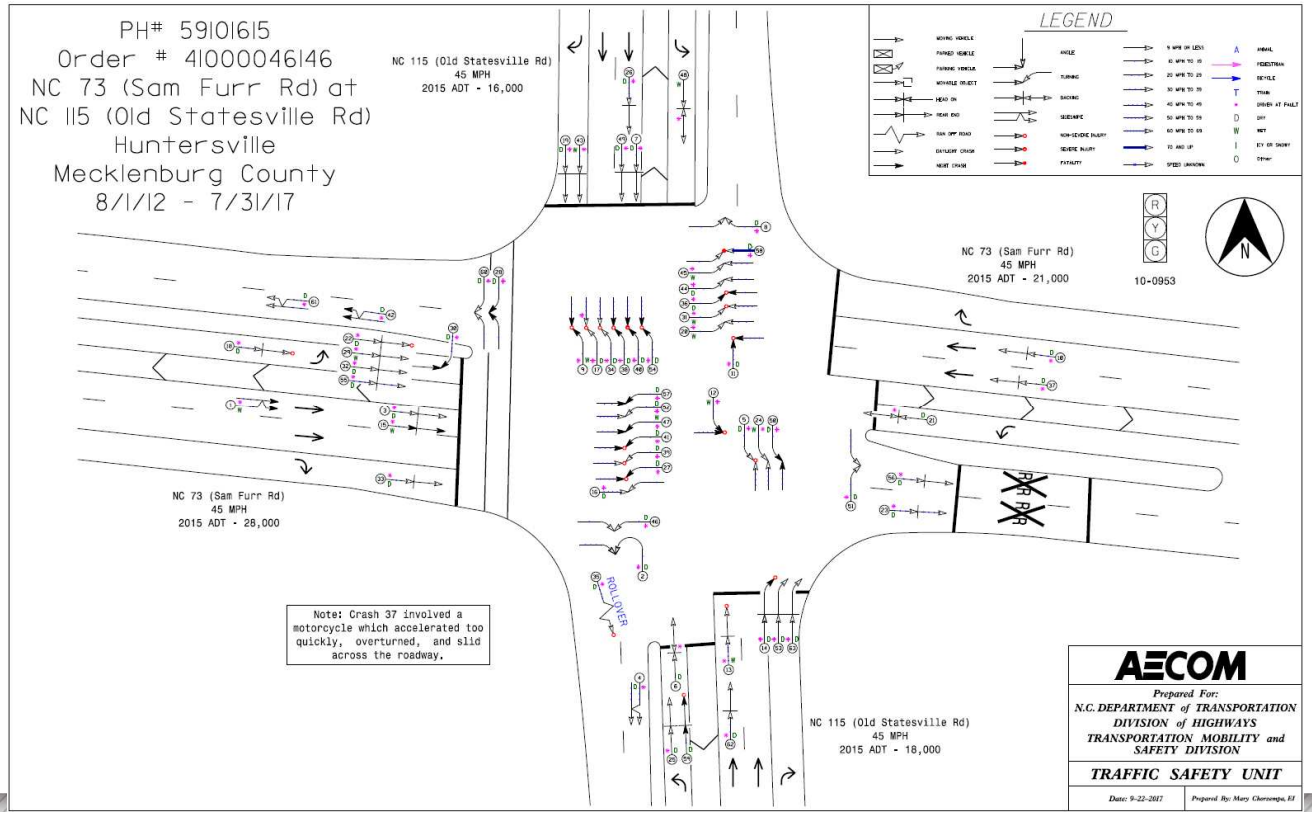
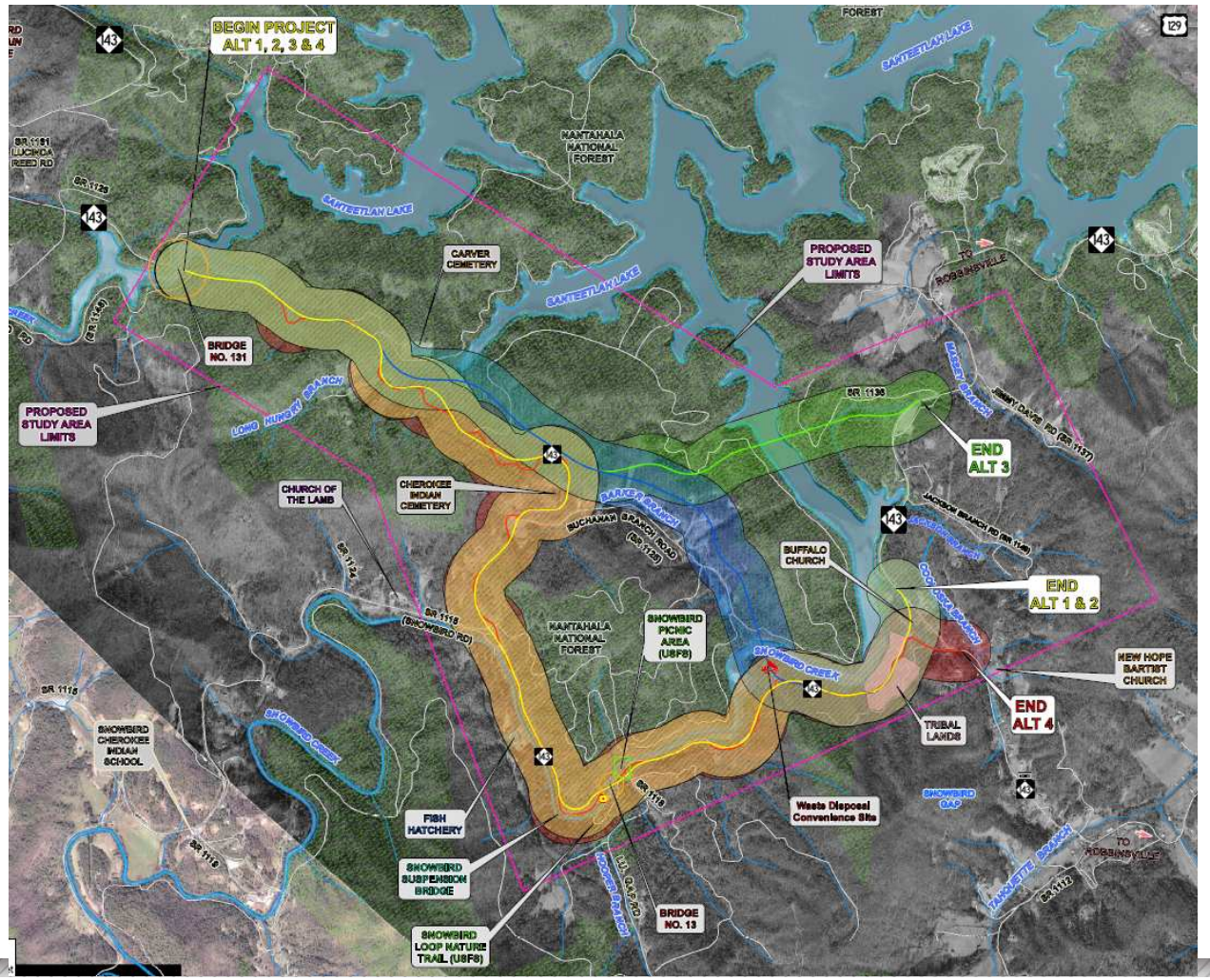


Alternative Analysis

- Compare the “Safety” of each Alternative
  - How???



Alternative Analysis

- Compare the “Safety” of each Alternative
  - How???
  - Predictive Analysis utilizing Safety Performance Functions
    - Using crash, roadway, and traffic volume data to provide estimates of an existing or proposed roadway’s expected safety performance
    - Can be used to quantify the safety impacts of proposed transportation improvements

Alternative Analysis

- Safety Performance Functions
  - Example: Base function for 2-lane rural roadway

$$N_{spf\,rs} = AADT \times L \times 365 \times 10^{-6} \times e^{(-0.312)}$$

Where:

$N_{spf\,rs}$ = predicted total crash frequency for roadway segment base conditions;

$AADT$ = average annual daily traffic volume (vehicles per day); and

L = length of roadway segment (miles).

Table 10-7. Summary of Crash Modification Factors (CMFs) in Chapter 10 and the Corresponding Safety Performance Functions (SPFs)

Table 10-8. CMF for Lane Width on Roadway Segments (CMF_{1a})

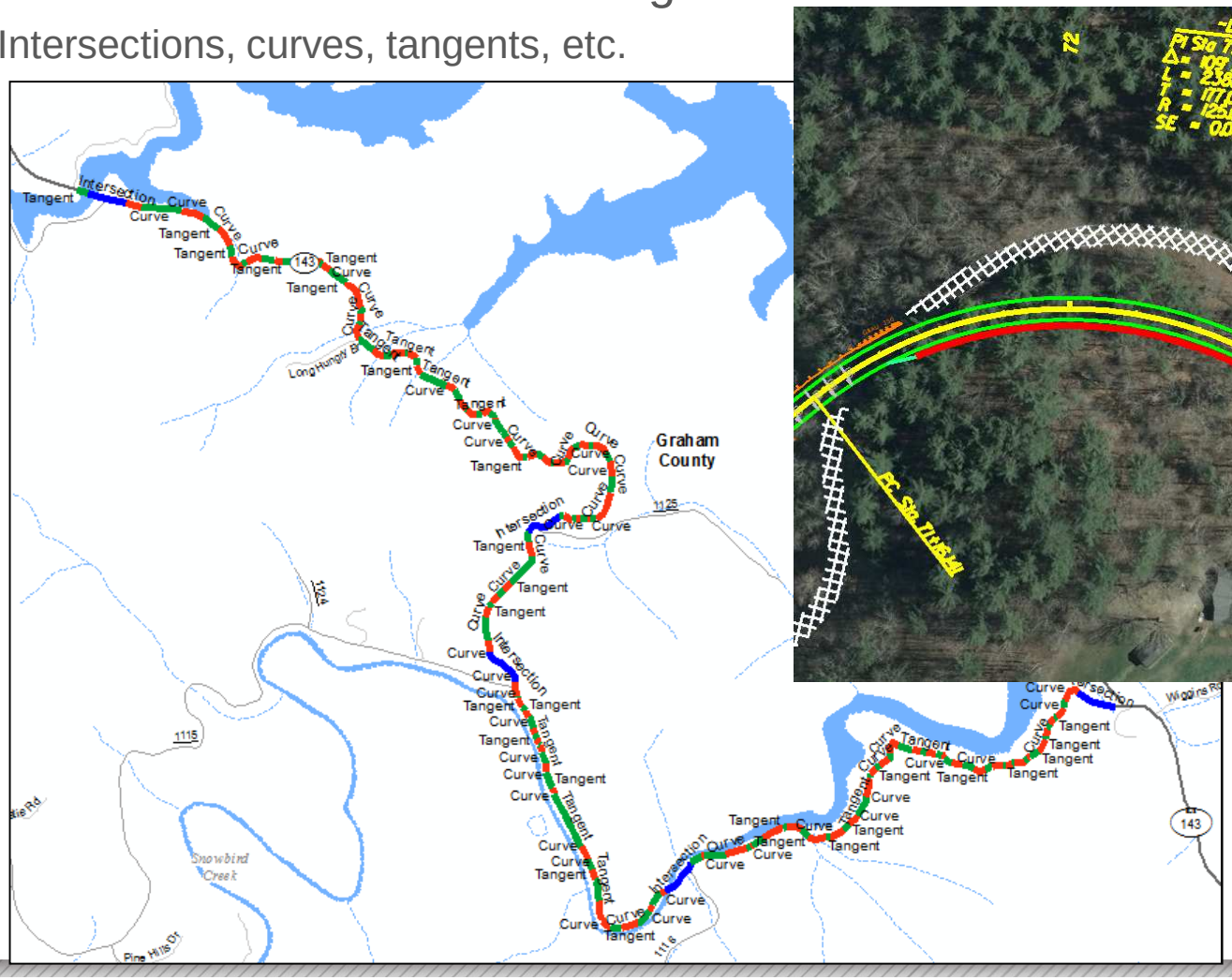
	AADT (vehicles per day)		
Lane Width	**< 400**	**400 to 2000**	**> 2000**
9 ft or less	1.05	$1.05 + 2.81 \times 10^{-4}(AADT - 400)$	1.50
10 ft	1.02	$1.02 + 1.75 \times 10^{-4}(AADT - 400)$	1.30
11 ft	1.01	$1.01 + 2.5 \times 10^{-5}(AADT - 400)$	1.05
12 ft or more	1.00	1.00	1.00

Note: The collision types related to lane width to which this CMF applies include single-vehicle run-off-the-road and multiple-vehicle head-on, opposite-direction sideswipe, and same-direction sideswipe crashes.

CMF_{1b}	Roadside Design	Equation 10-20
CMF_{1l}	Lighting	Equations 10-21, Table 10-12
CMF_{1s}	Automated Speed Enforcement	See text

Alternative Analysis

- Methodology for Analyzing a Corridor Alternative
  - Break corridor down into “like” segments
    - Intersections, curves, tangents, etc.



Alternative Analysis

- Methodology for Analyzing a Corridor Alternative
  - Break corridor down into "like" segments
  - Analyze each segment individually

$$N_{spf\ 4ST} = exp[-8.56 + 0.60 \times ln(AADT_{maj}) + 0.61 \times ln(AADT_{min})] \quad (10\text{-}9)$$

Where:

$N_{spf\ 4ST}$ = estimate of intersection-related predicted average crash frequency for base conditions for four-leg stop controlled intersections;

$AADT_{maj}$ = AADT (vehicles per day) on the major road; and

$AADT_{min}$ = AADT (vehicles per day) on the minor road.

$$N_{spf\ rs} = AADT \times L \times 365 \times 10^{-6} \times e^{(-0.312)}$$

Where:

$N_{spf\ rs}$ = predicted total crash frequency for roadway segment base conditions;

$AADT$ = average annual daily traffic volume (vehicles per day); and

L = length of roadway segment (miles).

R-2594 Alt 3B						
		1	2	3	4	5
Geometrics	Section Type	Section-Tangent	Section-Curved	Intersection	Section-Tangent	Section-Curved
	Segment Category	2L Rural	2L Rural	3 Leg-Stop	2L Rural	2L Rural
	f Interchange?	No	No	No	No	No
		NC 215	NC 215	NC 215	NC 215	NC 215
		NA	NA	NA	NA	NA
		NA	NA	NA	NA	NA
				Old NC 215		
				1489.980		
		0.014	0.031	0.095	0.163	0.073
Volumes		1600	1600		1400	1400
	Major 1			1600		
	Approach AADT - Major 2			1400		
	Approach AADT - Avg Major			1500		
	Approach AADT - Minor 1			600		
	Approach AADT - Minor 2					
	Approach AADT - Avg Minor			600		
CMFs	Lane Width	11	11		11	11
	CMF_{RA} Lane Width	1.040	1.040		1.035	1.035
	CMF_{1f} Lane Width	1.023	1.023		1.020	1.020
	Shoulder Width	6.000	6.000		6.000	6.000
	Shoulder Type	Composite	Composite		Composite	Composite
	CMF_{WRA} Shoulder Width	1.000	1.000		1.000	1.000
	CMF_{TRA} Shoulder Type	1.040	1.040		1.040	1.040
	CMF_{2f} Shoulder width and type	1.023	1.023		1.023	1.023
	CMF_{5f} Grade	1.00	1.00		1.16	1.16
	Curve Radius (English) in feet		760.000			1500.000
	Spiral Transition?		0			0
	CMF_{3f} Horizontal Curve	1.000	3.185		1.000	1.472
	Approaches with LT Lanes			0.000		
	CMF_{2i} LT			1.000		
	Approaches with RT Lanes			0.000		
	CMF_{3i} RT			1.000		
	Skew			0.000		
	CMF_{1i} Skew			1.000		
	Lighting?			N		
	CMF_{4i} Lighting			1.000		
	NCDOT Calibration Factor (CF)	1.330	1.330	0.570	1.330	1.330
	Base HSM SPF	0.006	0.013	0.387	0.061	0.027
	HSM SPF include CMFs	0.006	0.044	0.387	0.074	0.049

CMFs

CMFs

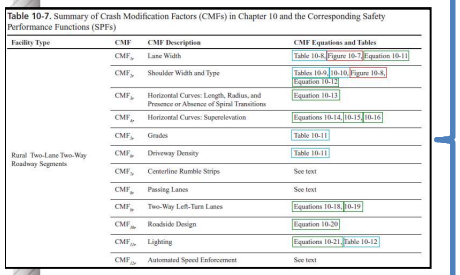
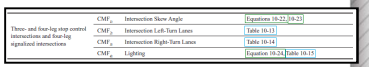


Table 10-7. Summary of Crash Modification Factors (CMFs) in Chapter 10 and the Corresponding Safety Performance Functions (SPFs)

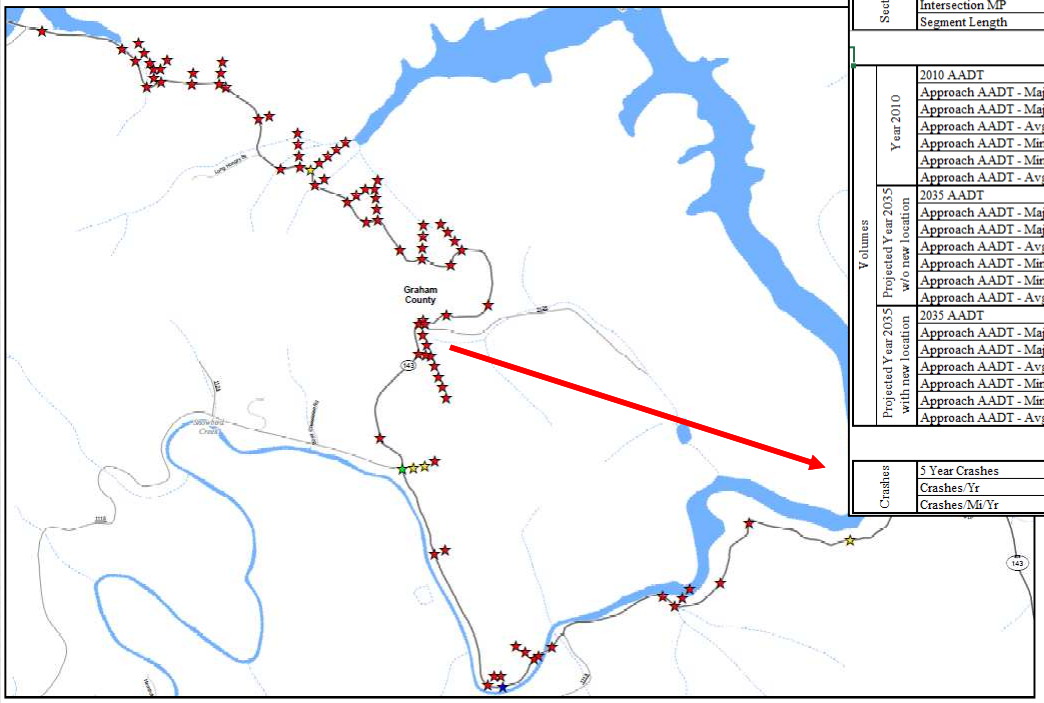
Facility Type	CMF	CMF Description	CMF Equations and Tables
Rural Two-Lane Two-Way Roadway Segments	CMF_{1r}	Lane Width	Table 10-8, Figure 10-7, Equation 10-11
	CMF_{2r}	Shoulder Width and Type	Tables 10-9, 10-10, Figure 10-8, Equation 10-12
	CMF_{3r}	Horizontal Curves: Length, Radius, and Presence or Absence of Spiral Transitions	Equation 10-13
	CMF_{4r}	Horizontal Curves: Superelevation	Equations 10-14, 10-15, 10-16
	CMF_{5r}	Grades	Table 10-11
	CMF_{6r}	Driveway Density	Table 10-11
	CMF_{7r}	Centerline Rumble Strips	See text
	CMF_{8r}	Passing Lanes	See text
	CMF_{9r}	Two-Way Left-Turn Lanes	Equations 10-18, 10-19
	CMF_{10r}	Roadside Design	Equation 10-20
	CMF_{11r}	Lighting	Equations 10-21, Table 10-12
	CMF_{12r}	Automated Speed Enforcement	See text


Three- and four-leg stop control intersections and four-leg signalized intersections

CMF_{1i}	Intersection Skew Angle	Equations 10-22, 10-23
CMF_{2i}	Intersection Left-Turn Lanes	Table 10-13
CMF_{3i}	Intersection Right-Turn Lanes	Table 10-14
CMF_{4i}	Lighting	Equation 10-24, Table 10-15

Alternative Analysis

- Methodology for Analyzing a Corridor Alternative
  - Break corridor down into “like” segments
  - Analyze each segment individually
  - Incorporate existing crash history



R-2594 Alternative Comparison

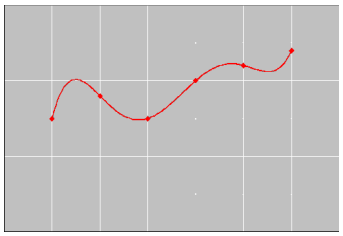
		189	190	191	192	193	194
Section Characteristics	Section Type	Section - Tangent	Section - Curve	Section - Tangent	Section - Curve	Section - Tangent	Intersection
	Segment Category	2L Rural	2L Rural	2L Rural	2L Rural	2L Rural	3-Leg Stop
	Route	NC 215	NC 215	NC 215	NC 215	NC 215	NC 215
	Begin MP	5.847	5.857	5.881	5.909	5.957	5.998
	End MP	5.857	5.881	5.909	5.957	5.998	6.093
							SR 1326
	Intersection MP						6.031
	Segment Length	0.010	0.024	0.028	0.048	0.041	0.095
Volumes	2010 AADT	1,200	1,200	1,200	1,200	1,200	
	Approach AADT - Major 1						1,200
	Approach AADT - Major 2						1,000
	Approach AADT - Avg Major						1,100
	Approach AADT - Minor 1						400
	Approach AADT - Minor 2						
	Approach AADT - Avg Minor						400
	2035 AADT	1600	1600	1600	1600	1600	
	Approach AADT - Major 1						1,600
	Approach AADT - Major 2						1,600
	Approach AADT - Avg Major						1,600
	Approach AADT - Minor 1						600
	Approach AADT - Minor 2						
	Approach AADT - Avg Minor						600
	2035 AADT	200	200	200	200	200	
	Approach AADT - Major 1						200
	Approach AADT - Major 2						600
	Approach AADT - Avg Major						400
	Approach AADT - Minor 1						600
	Approach AADT - Minor 2						
	Approach AADT - Avg Minor						600
Crashes	5 Year Crashes	0	0	0	0	0	1
	Crashes/Yr	0.00	0.00	0.00	0.00	0.00	0.20
	Crashes/Mi/Yr	0.00	0.00	0.00	0.00	0.00	2.11

Alternative Analysis

- Methodology for Analyzing a Corridor Alternative
  - Break corridor down into “like” segments
  - Analyze each segment individually
  - Incorporate existing crash history
  - Calculate predicted and expected crashes
    - Predicted -> Based on calibrated safety performance function
    - Expected -> Based on Empirical Bayes (EB) analysis

Clue #1

Crash History at Treatment Site



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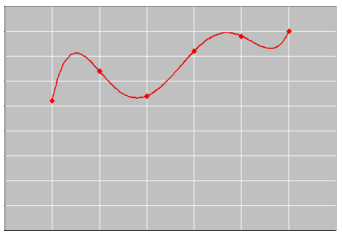
Clue #2

Crash History at Large Pool Of Reference Sites

(Described by SPF)



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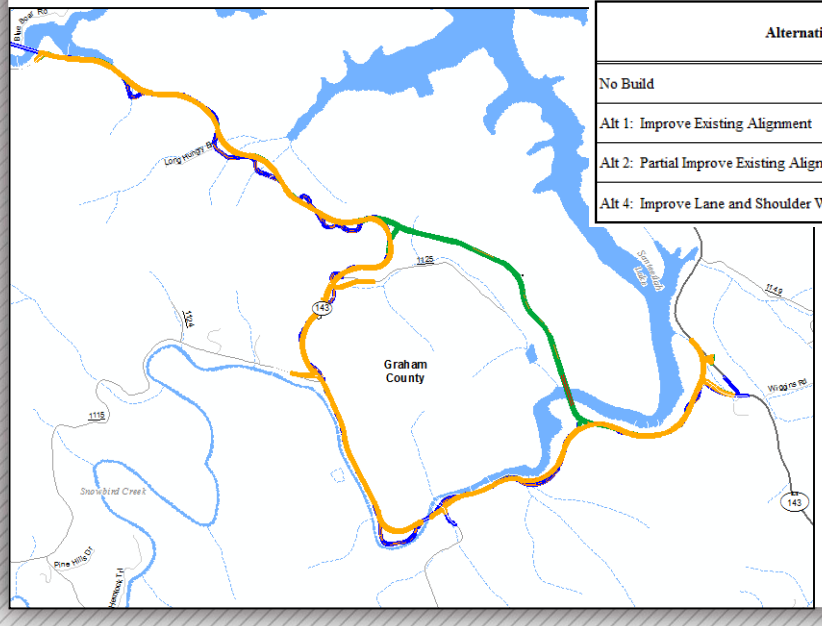
Alternative Analysis

- Methodology for Analyzing a Corridor Alternative
  - Break corridor down into “like” segments
  - Analyze each segment individually
  - Incorporate existing crash history
  - Calculate predicted and expected crashes
  - Summarize results of each individual segment analyzed to get estimates for entire corridor

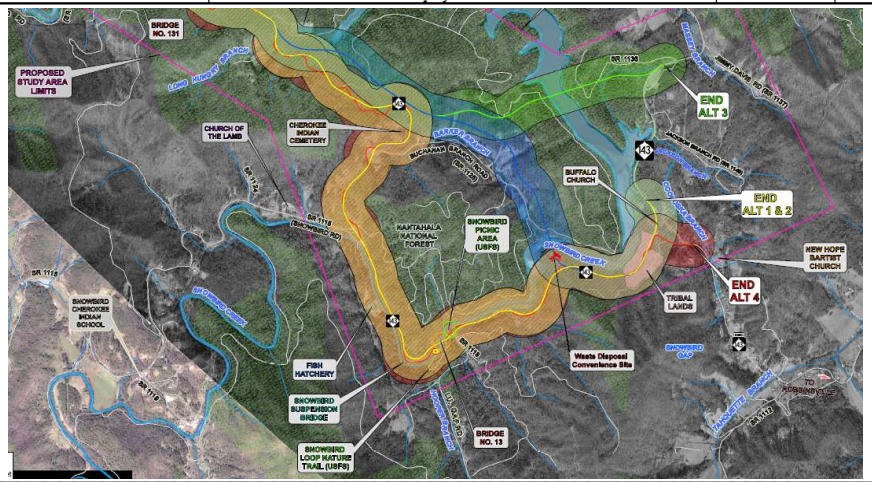


Alternative	Description	Predicted Crashes Per Year (2035)	Predicted Crash Frequency as Compared with the No Build Option
No Build	Predicted crashes along NC 143 in the build out year without significant roadway improvements with 2035 volume projections	29	--
Alt 1: Improve Existing Alignment	Predicted crashes along an improved alignment of existing NC 143 under "Build - Alt 1" 2035 volumes	8	-74%
Alt 2: Partial Improve Existing Alignment, Partial New Location	Predicted crashes along NC 143 Alternate 2 alignment plus predicted crashes on the unimproved existing alignment under new location 2035 volumes	9	-69%
Alt 4: Improve Lane and Shoulder Widths on Existing Alignment	Predicted crashes along the existing alignment of NC 143 with improved lane and shoulder widths with 2035 volume projections	20	-31%

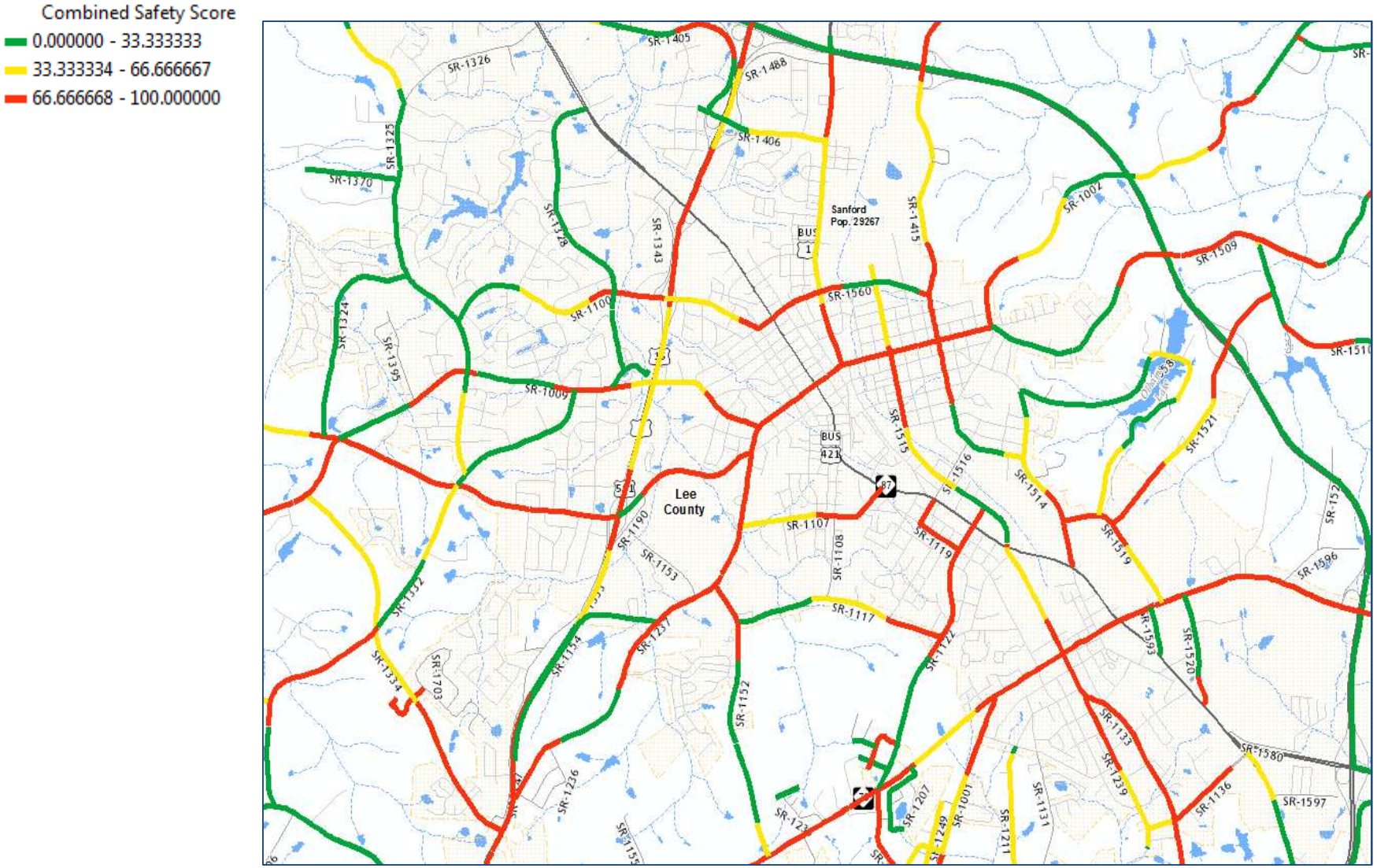
Alternative Analysis

- Benefits of Alternative Analysis
  - Quantifies expected safety for each alternative
    - Allows safety to be part of the discussion when comparing all measurables (i.e. wetlands impacted, relocations, etc.) for each alternative
  - Often allows projects to move forward and not get mired down in subjective discussions

Alternative	Description	Predicted Crashes Per Year (2035)	Predicted Crash Frequency as Compared with the No Build Option
No Build	Predicted crashes along NC 143 in the build out year without significant roadway improvements with 2035 volume projections	29	--
Alt 1: Improve Existing Alignment	Predicted crashes along an improved alignment of existing NC 143 under "Build - Alt 1" 2035 volumes	8	-74%
Alt 2: Partial Improve Existing Alignment, Partial New Location	Predicted crashes along NC 143 Alternate 2 alignment plus predicted crashes on the unimproved existing alignment under new location 2035 volumes	9	-69%
Alt 4: Improve Lane and Shoulder Widths on Existing Alignment	Predicted crashes along the existing alignment of NC 143 with improved lane and shoulder widths with 2035 volume projections	20	-31%



Strategic Mobility Formula



Questions / Discussion