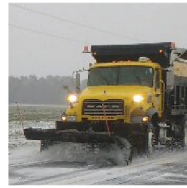


NORTH CAROLINA

Department of Transportation



Mobility and Safety Field Operations Section

John Grant, PE
Regional Traffic Engineer
Capital Region

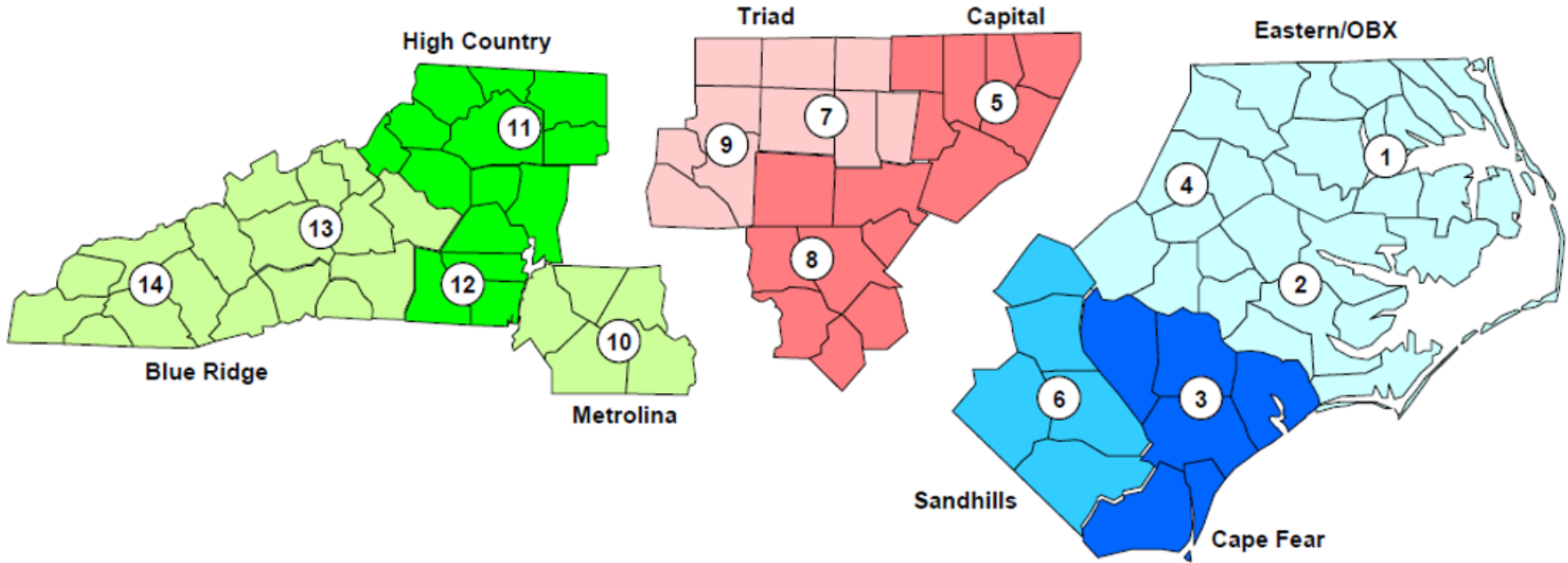
October 23, 2018

NCDOT Regional Offices

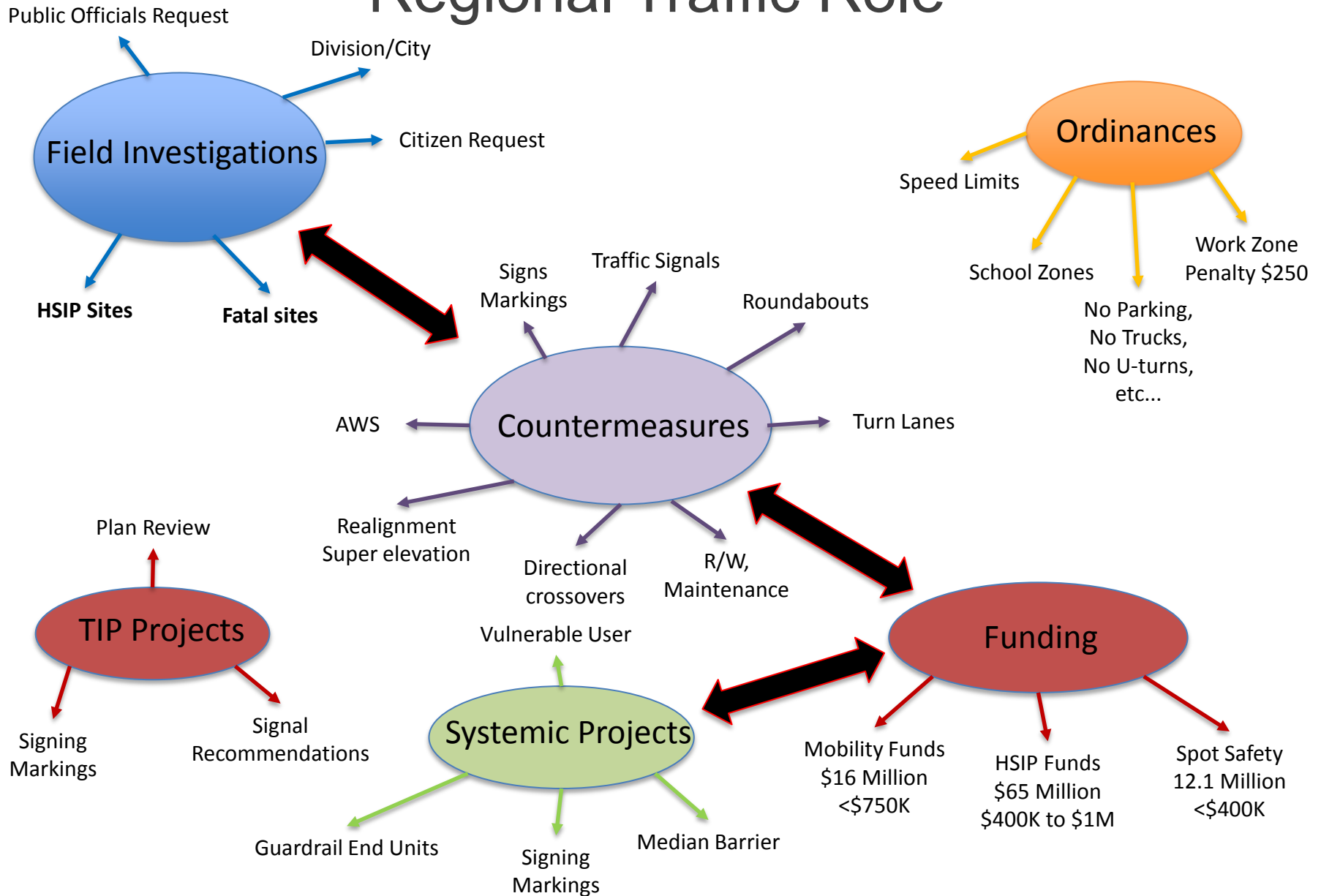
Western
Mobility and Safety
Field Operations Region

Central
Mobility and Safety
Field Operations Region

Eastern
Mobility and Safety
Field Operations Region



Regional Traffic Role



NCDOT Safety and Mobility Programs

Three Project Funding Sources

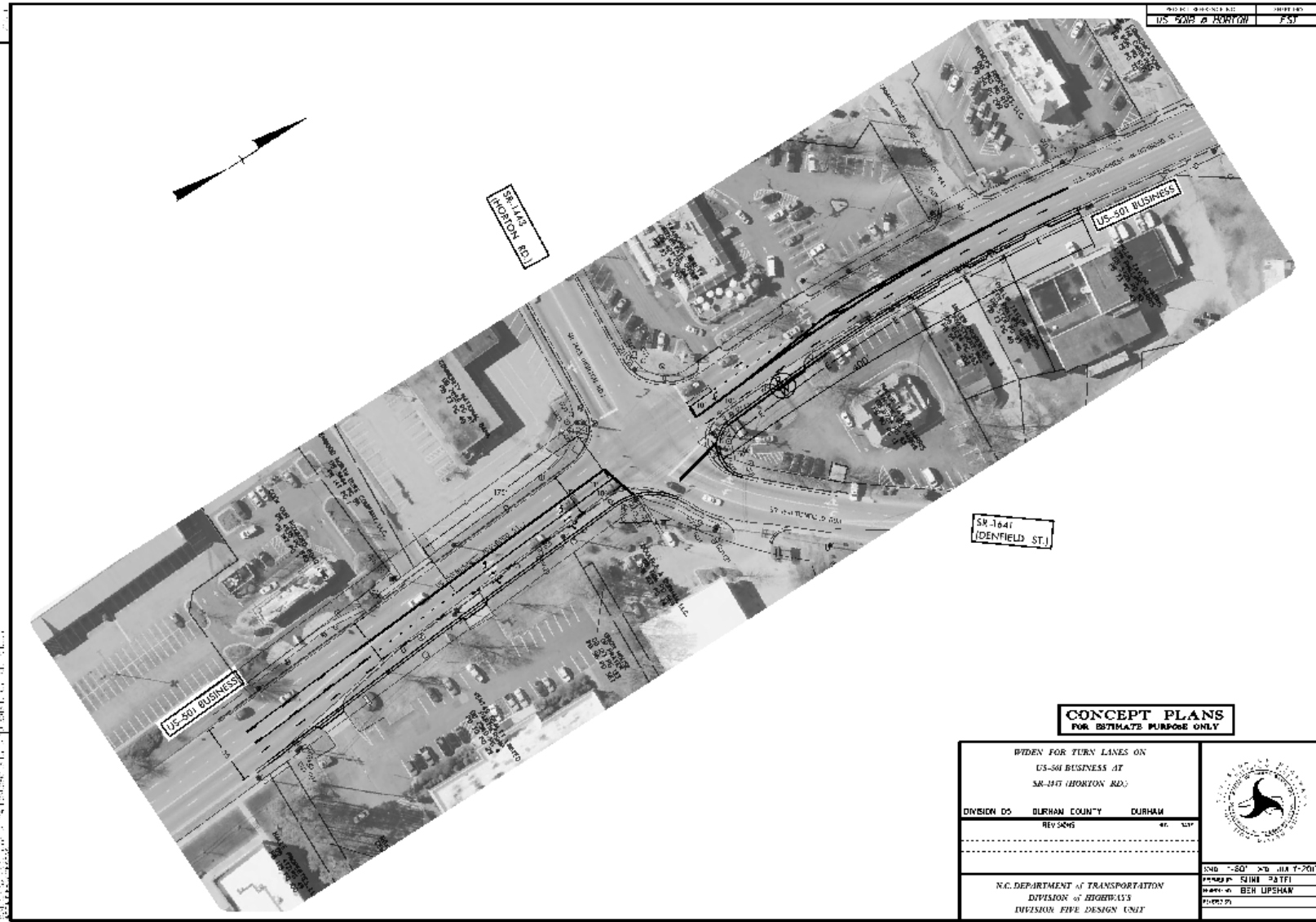
HSIP	Spot Safety	Spot Mobility
\$65M Per Year	\$12.1M Per Year	\$16M Per Year
Federal Funds	State Funds	State Funds
Soft cap of \$1M per project (Projects above \$1M require advanced authorization from the State Traffic Engineer)	\$400K cap per project	\$750K cap per project
B/C based prioritization and systemic investments	Prioritization is based on the Spot Safety Index	Prioritization is based on the Spot Mobility Index
Selected quarterly	Selected quarterly	Selected quarterly

Project Examples

- **W-5705AI**
 - US 501 Bus (Roxboro Rd) at Horton Rd/Denfield St
- **SS-4905EZ**
 - NC 98 at Adams St and Woodcrest St
- **SM-5705AC**
 - NC 98 at Mineral Springs Rd

PROJECT NUMBER	PROJECT NAME
US-501 BUSINESS	SR-1641

SECTION



CONCEPT PLANS
FOR ESTIMATE PURPOSE ONLY

WIDEN FOR TURN LINES ON
US-501 BUSINESS AT
SR-117 (HORTON RD.)

DIVISION 05 DURHAM COUNTY DURHAM
REV 5/05 4/1 1/17

N.C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DIVISION FIVE DESIGN UNIT



DATE	BY
12/11/2019	BER UPHAM

North Carolina Department of Transportation
FUNDING ESTIMATE

January 8, 2019

TIP: N/A	possible PEF design
WBS: N/A	City of Durham for water and sewer
Description: WIDEN FOR TURN LANE ON US-501 BUSINESS AT SR-1641 (HORTON RD)	
County: DURHAM	
Length (LF): 910	

FUNDING ESTIMATE FOR PROJECT: **\$ 1,015,055.95**

ITEM	SECT	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE (\$)	AMOUNT BID (\$)
		FIXED PERCENTAGE OVERHEAD ALLOCATION (ALL PROJECTS)			2.75%	\$ 27,166.95
		DESIGN AND SURVEY	1	LS	\$ 175,000.00	\$ 175,000.00
		INSPECTION AND STAKE OUT	1	LS	\$ 43,812.30	\$ 43,812.30
		CONTINGENCY	1		\$ 63,812.30	\$ 63,812.30
		RIGHT OF WAY	1	LS	\$ 60,000.00	\$ 60,000.00
		UTILITIES	1	LS	\$ 150,000.00	\$ 150,000.00
		SIGNALS	1	LS	\$ 50,000.00	\$ 50,000.00
		SURCHARGE ON PAYMENTS TO CONTRACTOR			1.63%	\$ 7,141.40
1	800	MOBILIZATION	1	LS	\$ 20,863.00	\$ 20,863.00
2	226	GRADING	1	LS	\$ 110,000.00	\$ 110,000.00
3	505	SHALLOW UNDERCUT	100	CY	\$ 40.00	\$ 4,000.00

Statewide Standard Crash Reduction Factors

North Carolina Project Development Crash Reduction Factor Information

Revised April 1, 2015

Note: Items in *(Italics Text)* are for Historical purposes only and should not be used in the Benefit Cost analysis

Countermeasure	Crash Pattern Affected -- Site Specification	Percent Reduction	Service Life	Annual Maintenance / Utility Costs	NCDOT Crash Costs - 2013 (F+A / B+C / PDO)
1. Traffic Signals					
1.1 Install a Traffic Signal	Total Angle Crashes	65	10	\$2,500 / \$475	\$4,544,000 / \$134,000 / \$6,700
	<i>(Total Crashes)</i>	<i>(22)</i>	<i>na</i>	<i>na</i>	<i>na</i>
	<u>3-leg Urban Intersection</u> (injury includes fatality and injury crashes)	34	10	\$2,500 / \$475	\$4,544,000 / \$134,000 / \$6,700
	Total Right-Angle Injury Crashes	-50	10	\$2,500 / \$475	\$3,086,000 / \$113,000 / \$6,700
	Total Rear-End Injury Crashes				
	<i>(Total Injury Crashes)</i>	<i>(14)</i>	<i>na</i>	<i>na</i>	<i>na</i>
	<u>4-leg Urban Intersection</u> (injury includes fatality and injury crashes)	67	10	\$2,500 / \$475	\$4,544,000 / \$134,000 / \$6,700
	Total Right-Angle Injury Crashes	-38	10	\$2,500 / \$475	\$3,086,000 / \$113,000 / \$6,700
	Total Rear-End Injury Crashes				
	<i>(Total Injury Crashes)</i>	<i>(23)</i>	<i>na</i>	<i>na</i>	<i>na</i>
1.2 Upgraded Traffic Signals	<u>3-Leg and 4-Leg Rural Intersection</u>	77	10	\$2,500 / \$475	\$4,544,000 / \$134,000 / \$6,700
	Total Angle Crashes	-58	10	\$2,500 / \$475	\$3,086,000 / \$113,000 / \$6,700
	Total Rear-End Crashes				
	<i>(Total Crashes)</i>	<i>(44)</i>	<i>na</i>	<i>na</i>	<i>na</i>
1.3 Add Protected Left-Turn Phase	Total Fatal Crashes	38	10	\$0 / \$0	\$4,451,000 / \$117,000 / \$6,700
	Total Non-Fatal Injury Crashes	22	10	\$0 / \$0	\$4,451,000 / \$117,000 / \$6,700
	Total PDO Crashes	23	10	\$0 / \$0	\$4,451,000 / \$117,000 / \$6,700
	<i>(Total Crashes)</i>	<i>(22)</i>	<i>na</i>	<i>na</i>	<i>na</i>
1.4 Add Protected Permissive Left-Turn Phase	Total Left-Turn Crashes	70	10	\$0 / \$0	\$4,544,000 / \$134,000 / \$6,700
	<i>(Total Crashes)</i>	<i>(25)</i>	<i>na</i>	<i>na</i>	<i>na</i>
1.5 Change from Permitted or Permitted-Protected to Protected	Total Left-Turn Crashes	40	10	\$0 / \$0	\$4,544,000 / \$134,000 / \$6,700
	<i>(Total Crashes)</i>	<i>(10)</i>	<i>na</i>	<i>na</i>	<i>na</i>
1.6 Pretimed to Actuated	Urban Total Left-Turn Crashes on Treated Approach	99	10	\$0 / \$0	\$4,544,000 / \$134,000 / \$6,700
	Total Crashes	20	10	\$300 / \$0	\$4,451,000 / \$117,000 / \$6,700
1.7 Closed Loop Signal System	Total Crashes	15	10	\$0 / \$0	\$4,451,000 / \$117,000 / \$6,700
1.8 Improve Signal Timing	Total Crashes	15	10	\$0 / \$0	\$4,451,000 / \$117,000 / \$6,700
1.9 Replace 8-inch Signal Heads with 12-inch Signal Heads	Total Angle Crashes	42	10	\$0 / \$0	\$4,544,000 / \$134,000 / \$6,700
	<i>(Total Crashes)</i>	<i>(3)</i>	<i>na</i>	<i>na</i>	<i>na</i>
	Urban Total Angle Crashes	46	10	\$0 / \$0	\$4,544,000 / \$134,000 / \$6,700
1.10 Long Vehicle Detection	Total Crashes	10*	10	\$250 / \$0	\$4,451,000 / \$117,000 / \$6,700

2018 BENEFIT-COST ANALYSIS WORKSHEET

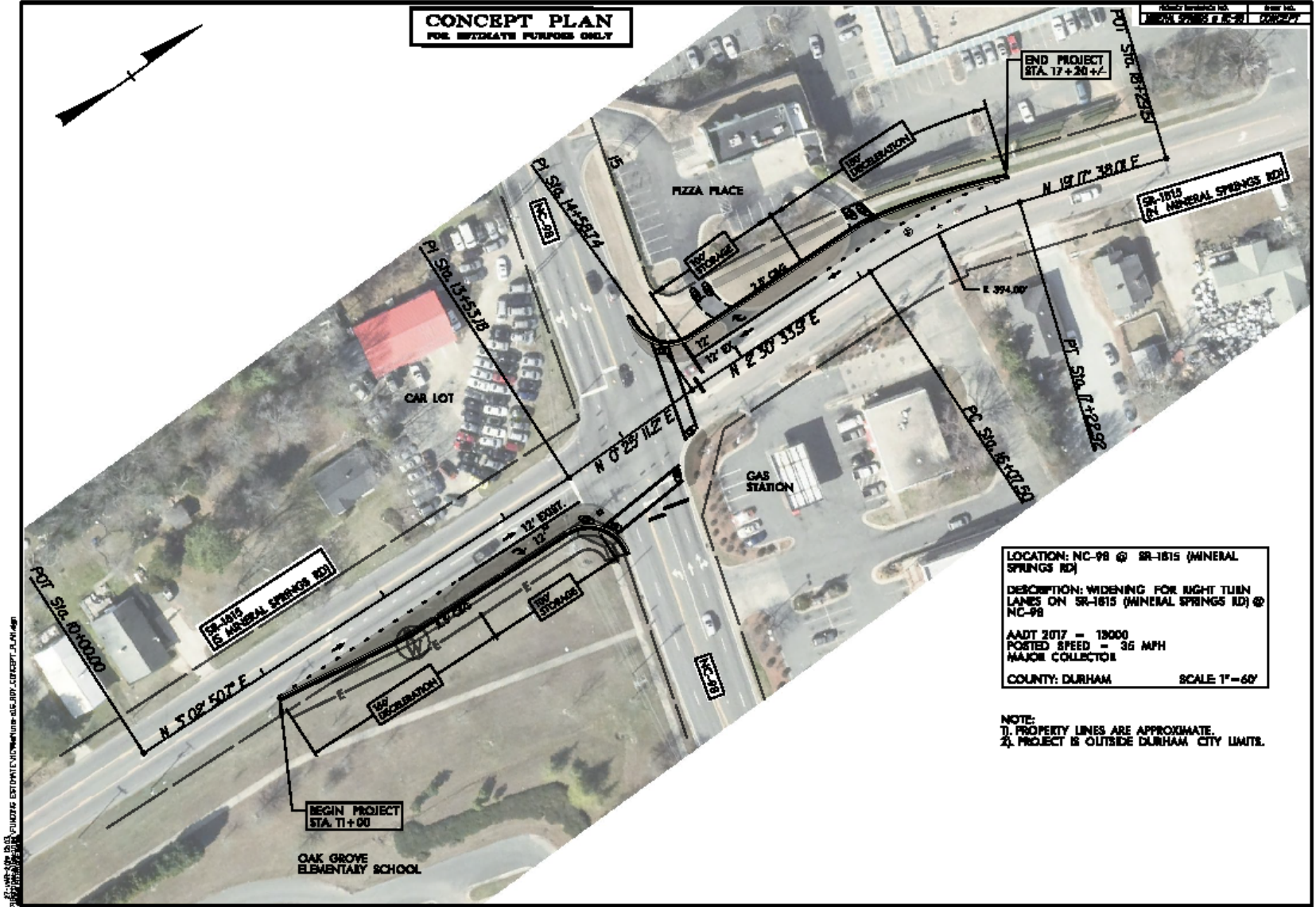
LOCATION:	US 501 Bus (Roxboro St) at Horton Rd/Denfield St			BY:	TLM
FILE NO.:				DATE:	1/28/2019
DETAILED COST TYPE IMPROVEMENT -	3.1 Left Turn Lanes - with signal				
ITEMS	TOTAL	SERVICE	CRP	ANNUAL COST	
Construction	\$630,000	20	0.102	\$64,167	
PE	\$175,000	20	0.102	\$17,824	
Utilities	\$150,000	50	0.082	\$12,261	
Right-of-Way	\$60,000	50	0.082	\$4,905	
TOTALS	\$1,015,000	22	0.098	\$99,157	
ESTIMATED INCREASE IN ANNUAL MAINTENANCE COST =				\$250	
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0	
TOTAL ESTIMATED INCREASE IN ANNUAL COST =				\$250	
MEDIAN YEAR ANNUAL COST =				\$587	
TOTAL MEDIAN YEAR COST=				\$99,744	
TOTAL COST OF PROJECT=				\$1,015,000	
COMPREHENSIVE COST REDUCTION:					
SEE ATTACHED CALCULATION SHEET FOR CALCULATION OF ANNUAL BENEFITS VALUE ENTERED BELOW					
ANNUAL BENEFITS			=	\$933,930	
ANNUAL BENEFITS	X	FUTURE VALUE FACTOR	=	MEDIAN YEAR ANNUAL BENEFITS	
\$933,930	X	1.719	=	\$1,605,245	
NET MEDIAN ANNUAL BENEFITS = MEDIAN ANNUAL BENEFITS - MEDIAN ANNUAL COST			=	\$1,505,501	
BENEFIT-COST RATIO = MEDIAN ANNUAL BENEFITS/MEDIAN ANNUAL COST			=	16.09	
PRELIMINARY ENGINEERING COST NEEDED IN ADDITION TO TOTAL COST			=	\$150,000	
TOTAL COST OF PROJECT	\$1,015,000	COMPREHENSIVE B/C RATIO -		16.09	



NC 98 CORRIDOR IMPROVEMENTS
(ADAMS ST. TO WOODCREST ST.)

2014 BENEFIT-COST ANALYSIS WORKSHEET

LOCATION:	98 at Adams St & NC 98 at Woodcrest St			BY:	JHG
FILE NO.:	05-17-6453			DATE:	5/5/2017
DETAILED COST TYPE IMPROVEMENT -		1.1 Install a Traffic Signal - 9.5 Concrete Island - Channelization			
ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST	
Construction	\$110,000	20	0.102	\$11,204	
Signal	\$50,000	20	0.102	\$5,093	
PE	\$35,000	10	0.149	\$5,216	
Utilities	\$20,000	50	0.082	\$1,635	
Right-of-Way	\$20,000	50	0.082	\$1,635	
TOTALS	\$235,000	18	0.105	\$24,782	
ESTIMATED INCREASE IN ANNUAL MAINTENANCE COST =				\$2,500	
ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$475	
TOTAL ESTIMATED INCREASE IN ANNUAL COST =				\$2,975	
MEDIAN YEAR ANNUAL COST =				\$6,055	
TOTAL MEDIAN YEAR COST=				\$30,837	
TOTAL COST OF PROJECT=				\$235,000	
COMPREHENSIVE COST REDUCTION:					
SEE ATTACHED CALCULATION SHEET FOR CALCULATION OF ANNUAL BENEFITS VALUE ENTERED BELOW					
ANNUAL BENEFITS			=	\$395,151	
ANNUAL BENEFITS	X	FUTURE VALUE FACTOR	=	MEDIAN YEAR ANNUAL BENEFITS	
\$395,151	X	1.569	=	\$620,054	
NET MEDIAN ANNUAL BENEFITS = MEDIAN ANNUAL BENEFITS - MEDIAN ANNUAL COST				=	\$589,217
BENEFIT-COST RATIO = MEDIAN ANNUAL BENEFITS/MEDIAN ANNUAL COST				=	20.11
PRELIMINARY ENGINEERING COST NEEDED IN ADDITION TO TOTAL COST				=	\$35,000
TOTAL COST OF PROJECT	\$235,000	COMPREHENSIVE B/C RATIO -		20.11	



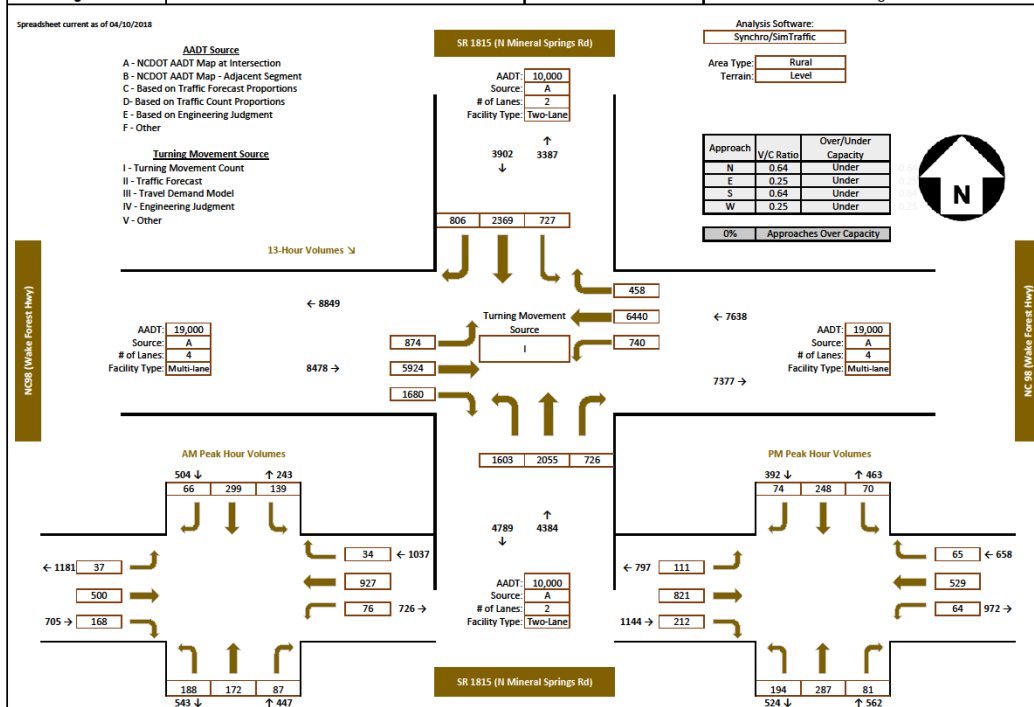
North Carolina Department of Transportation
FUNDING ESTIMATE

3/27/2019

TIP: N/A WBS: 50088.17.5FR1 (APE) Description: WIDENING FOR TURN LANES ON SR-1815 (MINERAL SPRINGS RD) AT NC-98. County: DURHAM Length (LF): 610	ASSUMPTIONS: PROJECT WILL BE DESIGNED BY THE DIVISION. WATER &/OR SEWER RELOCATION COST IS NOT INCLUDED.
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CONSTRUCTION ESTIMATE FOR PROJECT: **\$ 733,466.36**

ITEM	SECT	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE (\$)	AMOUNT BID (\$)
		FIXED PERCENTAGE OVERHEAD ALLOCATION (ALL PROJECTS)			2.76%	\$ 19,630.49
		DESIGN AND SURVEY	1	LS	\$ 87,176.84	\$ 87,176.84
		INSPECTION AND STAKE OUT	1	LS	\$ 38,431.58	\$ 38,431.58
		CONTINGENCY	1		\$ 72,647.36	\$ 72,647.36
		RIGHT OF WAY	1	LS	\$ 25,000.00	\$ 25,000.00
		UTILITIES	1	LS	\$ 60,000.00	\$ 60,000.00
		SIGNALS	1	LS	\$ 40,000.00	\$ 40,000.00
		SURCHARGE ON PAYMENTS TO CONTRACTOR			1.83%	\$ 6,264.35
1	800	MOBILIZATION	1	LS	\$ 18,300.75	\$ 18,300.75
2	226	GRADING	1	LS	\$ 84,465.00	\$ 84,465.00
3	505	SHALLOW UNDERCUT	100	CY	\$ 40.00	\$ 4,000.00
4	505	CLASS IV SUBGRADE STABILIZA- TION	200	TON	\$ 30.00	\$ 6,000.00
5	545	INCIDENTAL STONE BASE	40	TON	\$ 70.00	\$ 2,800.00
6	607	MILLING ASPHALT PAVEMENT, ""DEPTH	290	SY	\$ 20.00	\$ 5,800.00
7	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	320	TON	\$ 125.00	\$ 40,000.00
8	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE H19.0C	180	TON	\$ 125.00	\$ 22,500.00
9	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	160	TON	\$ 125.00	\$ 20,000.00
10	620	ASPHALT BINDER FOR PLANT MIX	35	TON	\$ 600.00	\$ 21,000.00
11	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	40	TON	\$ 150.00	\$ 6,000.00
12	SP	GENERIC DRAINAGE ITEM	1	LS	\$ 25,000.00	\$ 25,000.00
13	846	2'-6" CONCRETE CURB & GUTTER	650	LF	\$ 25.00	\$ 16,250.00
14	848	4" CONCRETE SIDEWALK	140	SY	\$ 80.00	\$ 11,200.00
15	848	CONCRETE CURB RAMPS	8	EA	\$ 1,800.00	\$ 14,400.00
16	SP	ADJUSTMENT OF METER BOXES OR VALVE BOXES	2	LS	\$ 800.00	\$ 1,600.00
17	SP	MARKINGS & SIGNING	1	LS	\$ 15,000.00	\$ 15,000.00
18	SP	GENERIC TRAFFIC CONTROL ITEM	1	LS	\$ 50,000.00	\$ 50,000.00
19	SP	GENERIC EROSION CONTROL ITEM	1	LS	\$ 20,000.00	\$ 20,000.00
20	0	0		0		\$ -
21	0	0		0		\$ -
22	0	0		0		\$ -
23	0	0		0		\$ -
24	0	0		0		\$ -



Data for full intersection

AM Peak Hour			PM Peak Hour		
Existing	Improved	Net	Existing	Improved	Net
94.6	83.2	-11.4	143.3	95.1	-48.2
39.6	28.0	-11.6	89.5	39.7	-49.8
2722.0	2713.0	-9.0	2740.0	2756.0	16.0
0	0	0	12	0	-12
0.9	0.6	-0.3	2.0	0.9	-1.1
Analysis Output			Analysis Output		
Travel Time (hr)			Travel Time (hr)		
Total Delay (hr)			Total Delay (hr)		
Vehicles Entered			Vehicles Entered		
Queued Trips			Queued Trips		
Delay/Vehicle (min)			Delay/Vehicle (min)		

Existing Average AM Delay/Vehicle (mm:ss)	00:52
Improved Average AM Delay/Vehicle (mm:ss)	00:37
Average AM Peak Delay/Vehicle Reduction	29%
Existing Average PM Delay/Vehicle (mm:ss)	01:58
Improved Average PM Delay/Vehicle (mm:ss)	00:52
Average PM Peak Delay/Vehicle Reduction	56%
Average AM Peak Travel Time Savings	11.40 hr
Average PM Peak Travel Time Savings	48.20 hr
Adjusted AM Peak Travel Time Savings	28.50 hr
Adjusted PM Peak Travel Time Savings	120.50 hr
Annual AM Peak Travel Time Savings	7,400 hr
Annual PM Peak Travel Time Savings	31,300 hr
Total Annual Peak Travel Time Savings	38,700 hr
Intersection Benefit	\$851,400

- To be eligible for funding, project must meet the following criteria (must achieve 1 OR 2+3):
- 1 Project reduces average delay/vehicle for intersection by 30 seconds/vehicle
 - 2 Project reduces individual approach average delay/vehicle by 50 seconds/vehicle
 - 3 Project does not increase average delay/vehicle for any approach by 20 seconds/vehicle

PROJECT IS ELIGIBLE FOR SPOT MOBILITY FUNDING

V/C Ratio for Existing Conditions	0.83
V/C Ratio for Improved Conditions	0.67
Congestion Score (out of 20 pts)	1.7

Data for improved approach

	Existing	Improved	Net
AM Approach Delay (hr)	16.0	5.2	-10.8
PM Approach Delay (hr)	66.5	21.8	-44.7
Average AM Peak Approach Delay Savings			10.80 hr
Average PM Peak Approach Delay Savings			44.70 hr
Adjusted AM Peak Approach Delay Savings			27.00 hr
Adjusted PM Peak Approach Delay Savings			111.75 hr
Annual AM Peak Approach Delay Savings			7,000 hr
Annual PM Peak Approach Delay Savings			29,100 hr
Total Annual Peak Approach Delay Savings			36,100 hr
Approach Benefit			\$794,200

Criteria 1 met?	Yes	65.7 sec/veh
Criteria 2 met?	N/A	
Criteria 3 met?	N/A	

Intersection Benefit \$851,400

2014 BENEFIT-COST ANALYSIS WORKSHEET

LOCATION:	NC 98 at SR 1815 (Mineral Springs Rd)				BY: John Grant, PE
FILE NO.:	05-19-57123				DATE: 5/6/2019
DETAILED COST:	TYPE IMPROVEMENT - Construct exclusive right turn lanes on both approaches of SR 1815				
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
	Construction	\$560,000	20	0.102	\$57,037
	PE	\$90,000	20	0.102	\$9,167
	Utilities	\$60,000	50	0.082	\$4,905
	Right-of-Way	\$25,000	50	0.082	\$2,044
	TOTALS	\$735,000	21	0.100	\$73,152
	ESTIMATED INCREASE IN ANNUAL MAINTENANCE COST =				\$500
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0
	TOTAL ESTIMATED INCREASE IN ANNUAL COST =				\$500
	MEDIAN YEAR ANNUAL COST =				\$1,129
	TOTAL MEDIAN YEAR COST=				\$74,281
	TOTAL COST OF PROJECT=				\$735,000
COMPREHENSIVE COST REDUCTION:					
FROM MOBILITY ANALYSIS					
	ANNUAL BENEFITS			=	\$851,400
	ANNUAL BENEFITS	X	FUTURE VALUE FACTOR	=	MEDIAN YEAR ANNUAL BENEFITS
	\$851,400	X	1.676	=	\$1,426,715
	NET MEDIAN ANNUAL BENEFITS = MEDIAN ANNUAL BENEFITS - MEDIAN ANNUAL COST			=	\$1,352,434
	BENEFIT-COST RATIO = MEDIAN ANNUAL BENEFITS/MEDIAN ANNUAL COST			=	19.21
	PRELIMINARY ENGINEERING COST NEEDED IN ADDITION TO TOTAL COST			=	\$90,000
	TOTAL COST OF PROJECT -	\$735,000		COMPREHENSIVE B/C RATIO -	19.21

Recent 5 years of Project Totals

- W Projects = 24
 - \$10.11 Million
- Spot Safety = 19
 - \$ 1.65 Million
- Spot Mobility = 9
 - \$2.96 Million

TOTAL Projects = 52

\$14.71 Million