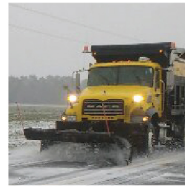




NORTH CAROLINA

Department of Transportation



Mobility and Safety Field Operations Section

John Grant, PE
Regional Traffic Engineer
Capital Region

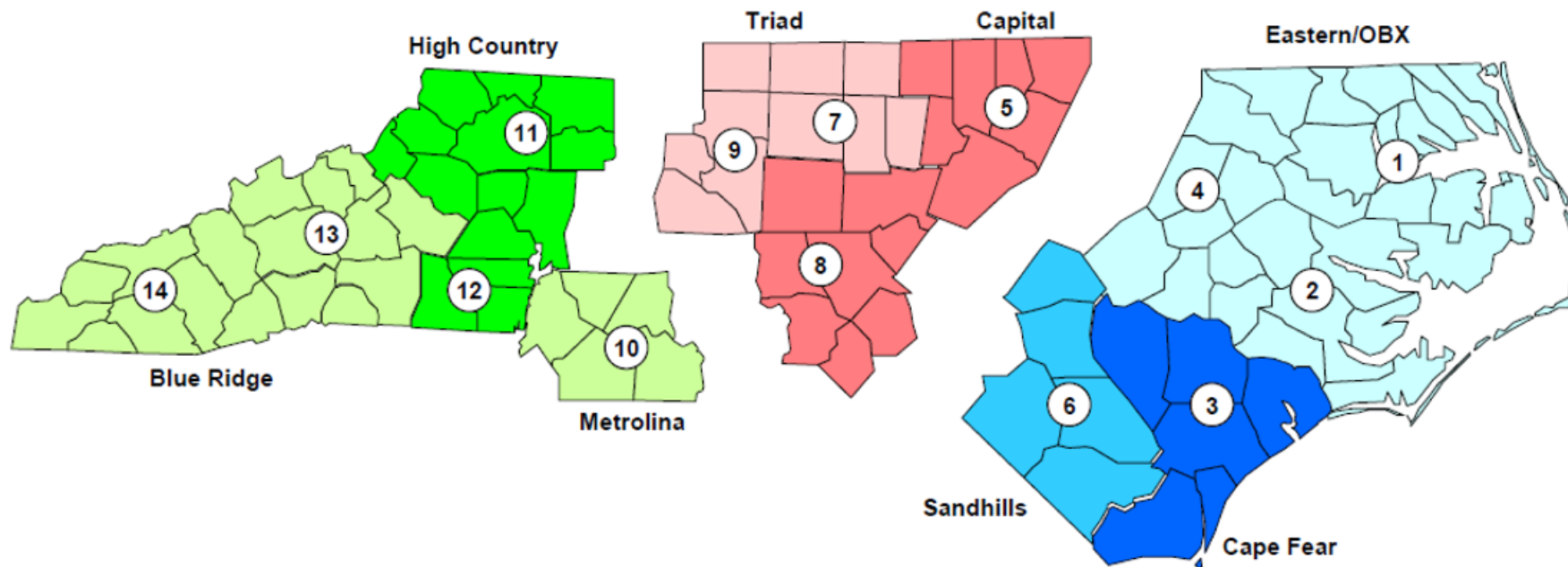
October 23, 2018

NCDOT Regional Offices

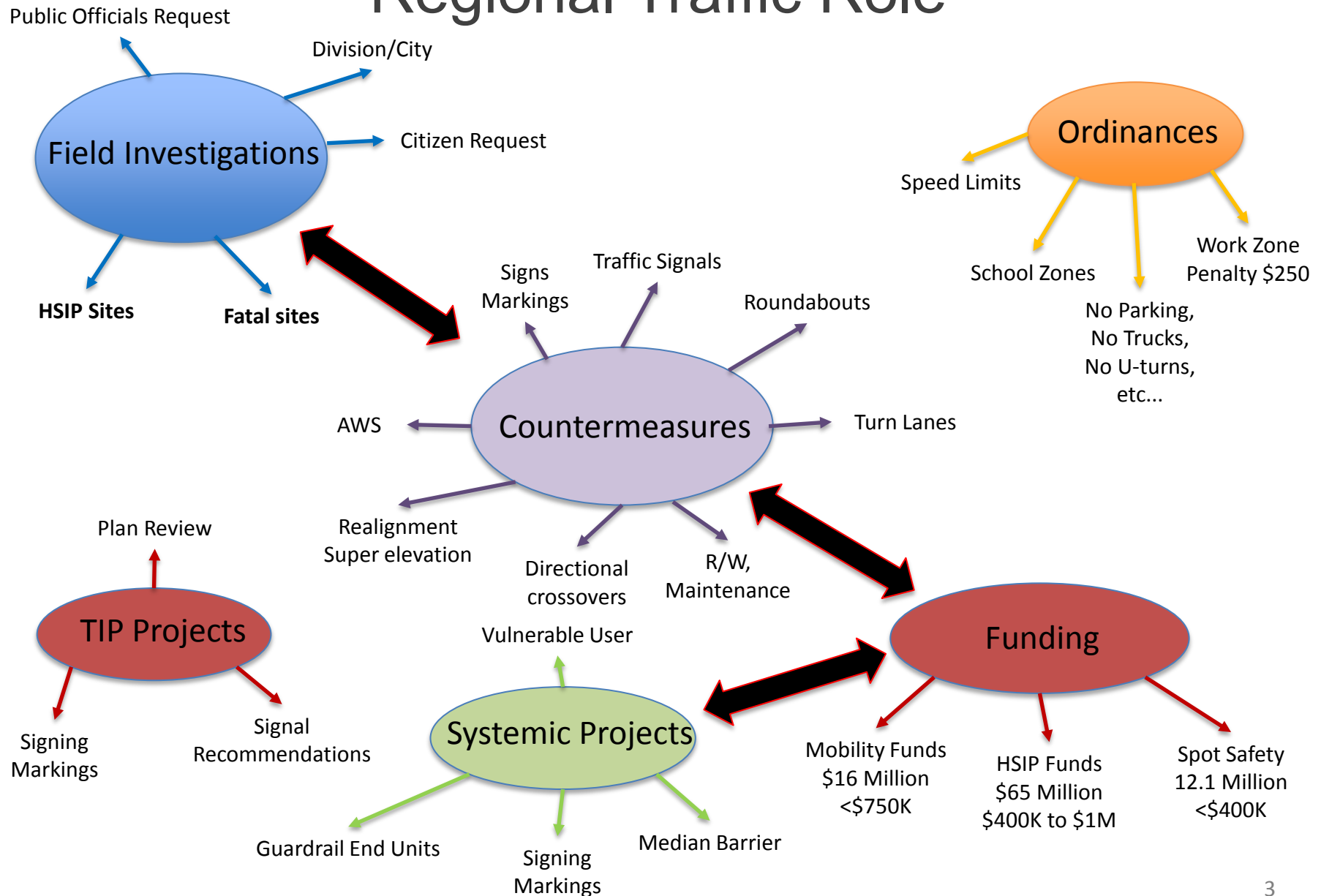
Western
Mobility and Safety
Field Operations Region

Central
Mobility and Safety
Field Operations Region

Eastern
Mobility and Safety
Field Operations Region



Regional Traffic Role



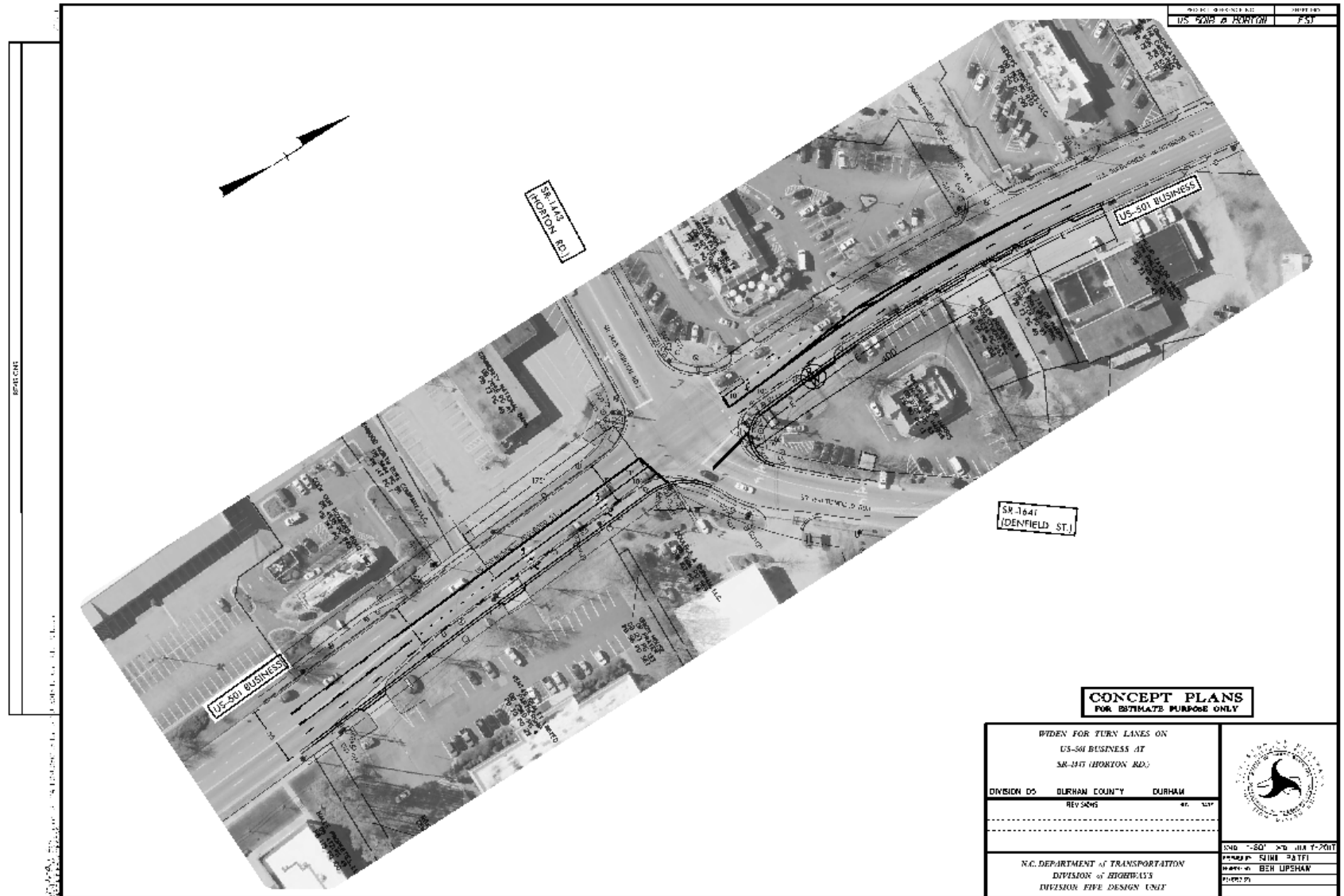
NCDOT Safety and Mobility Programs

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



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

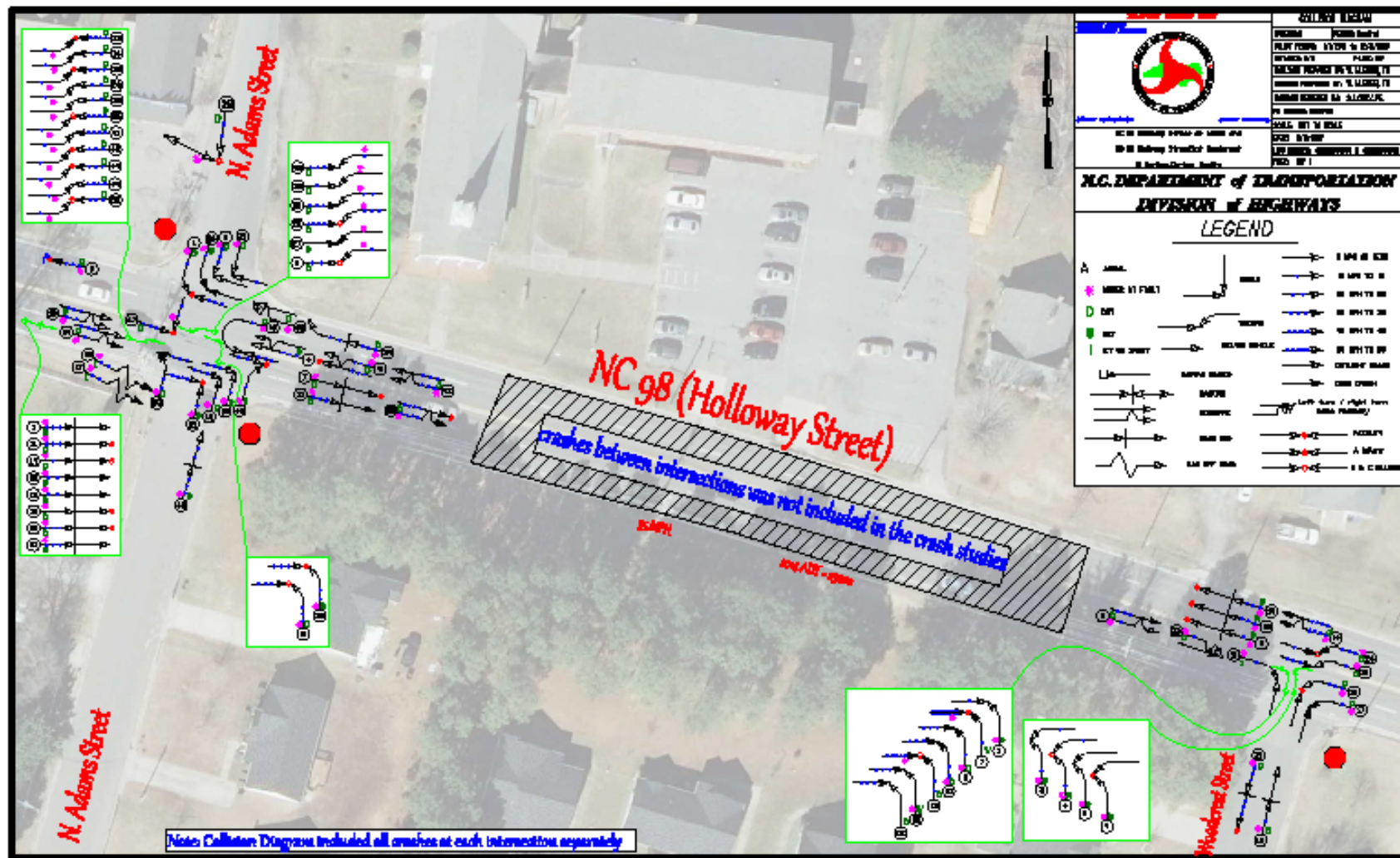
Revised April 1, 2015

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>				
	Total Angle Crashes	77	10	\$2,500 / \$475	\$4,544,000 / \$134,000 / \$6,700
	Total Rear-End Crashes	-58	10	\$2,500 / \$475	\$3,086,000 / \$113,000 / \$6,700
	<i>(Total Crashes)</i>	<i>(44)</i>	<i>na</i>	<i>na</i>	<i>na</i>
	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>
	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>
1.3 Add Protected 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>
1.4 Add Protected Permissive Left-Turn Phase	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>
1.5 Change from Permitted or Permitted-Protected to Protected	Urban Total Left-Turn Crashes on Treated Approach	99	10	\$0 / \$0	\$4,544,000 / \$134,000 / \$6,700
1.6 Pretimed to Actuated	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	\$ 38,431.68	\$ 38,431.68
		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%	\$ 5,264.35
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		\$ -

NC38@MineralIS_CONCEPT_FUNDING ESTIMATE.xls

Date:	03/07/2019	SP No.:		County:	Durham	Division:	5
Existing Problem:				Solution:	Add NB & SB Right Turn Lanes		

Spreadsheet current as of 04/10/2018

AADT Source

A - NCDOT AADT Map at Intersection
B - NCDOT AADT Map - Adjacent Segment
C - Based on Traffic Forecast Proportions
D - Based on Traffic Count Proportions
E - Based on Engineering Judgment
F - Other

Turning Movement Source

I - Turning Movement Count
II - Traffic Forecast
III - Travel Demand Model
IV - Engineering Judgment
V - Other

13-Hour Volumes

SR 1815 (N Mineral Springs Rd)

AADT:	10,000
Source:	A
# of Lanes:	2
Facility Type:	Two-Lane

3902 3387

806 2369 727

← 8849

458

Turning Movement Source

I

874 6440 740

5924

1680

← 7638

7377 →

AM Peak Hour Volumes

504 ↓	243 ↑
66 299 139	
← 1181 37	34 ← 1037
500	927
705 → 168	76 726 →
188 172 87	
543 ↓	447 ↑

SR 1815 (N Mineral Springs Rd)

PM Peak Hour Volumes

392 ↓	463 ↑
74 248 70	
← 797 111	65 ← 658
821	529
1144 → 212	64 972 →
194 287 81	
524 ↓	562 ↑

Analysis Software:

Synchro/SimTraffic

Area Type: Rural

Terrain: Level

Approach	V/C Ratio	Over/Under Capacity
N	0.64	Under
E	0.25	Under
S	0.64	Under
W	0.25	Under

0% Approaches Over Capacity

N

NCSB (Wake Forest Hwy)

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

Travel Time (hr)	143.3	95.1	-48.2
Total Delay (hr)	89.5	39.7	-49.8
Vehicles Entered	2740.0	2756.0	16.0
Queued Trips	12	0	-12
Delay/Vehicle (min)	2.0	0.9	-1.1

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

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

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	Yes	65.7 sec/veh
2	Project reduces individual approach average delay/vehicle by 60 seconds/vehicle	N/A	
3	Project does not increase average delay/vehicle for any approach by 20 seconds/vehicle	N/A	

PROJECT IS ELIGIBLE FOR SPOT MOBILITY FUNDING

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