

Spot Safety Project Evaluation

Order # 41000017051

Spot Safety Project # 01-02-216

Spot Safety Project Evaluation of the Traffic Signal Upgrades and Left Turn Lane Extension NC 12 (Ocean Blvd) and Chicahawk Trail Dare County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



Jason B. Schronce

2-24-2012

Date

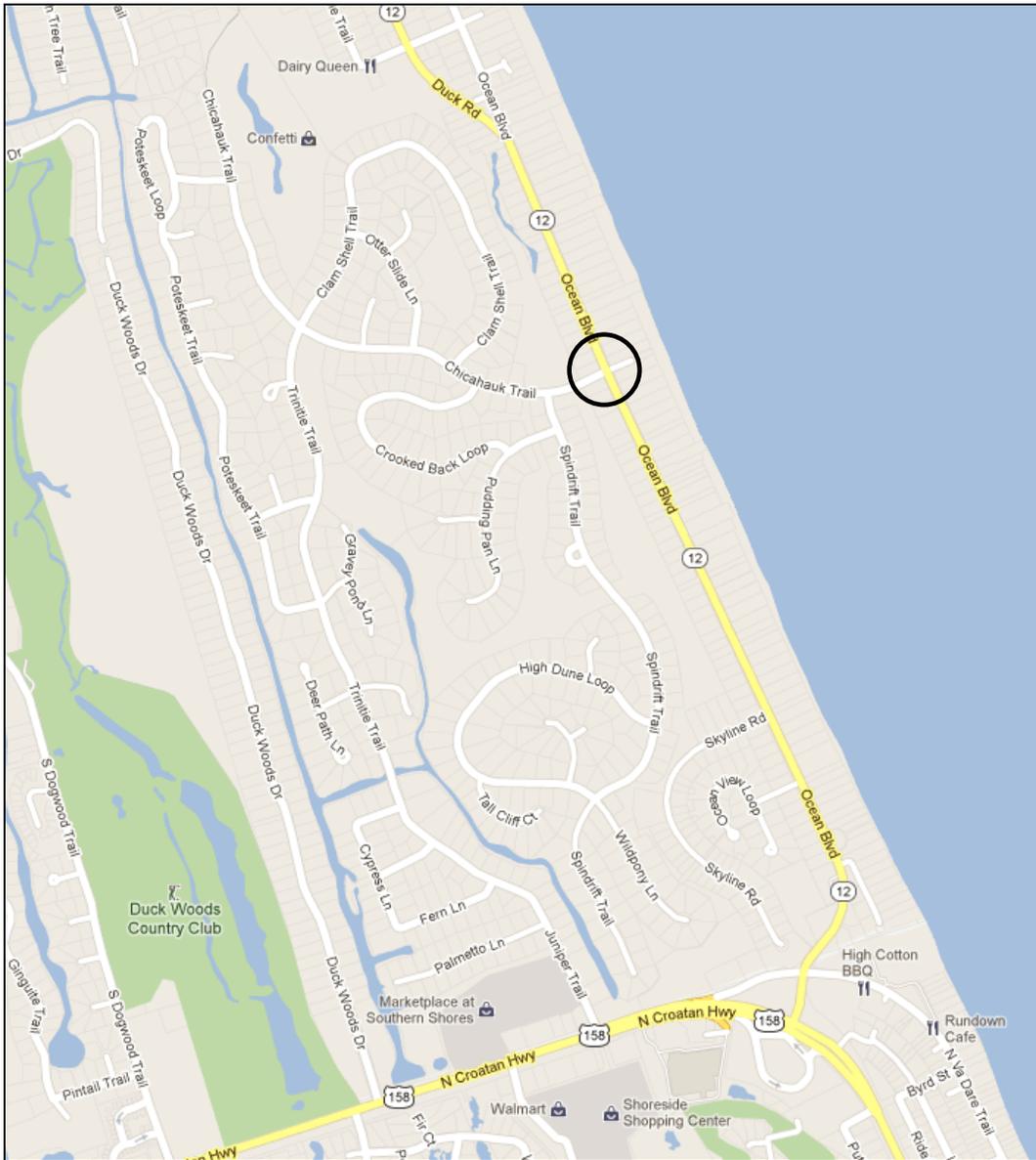
Traffic Safety Project Engineer

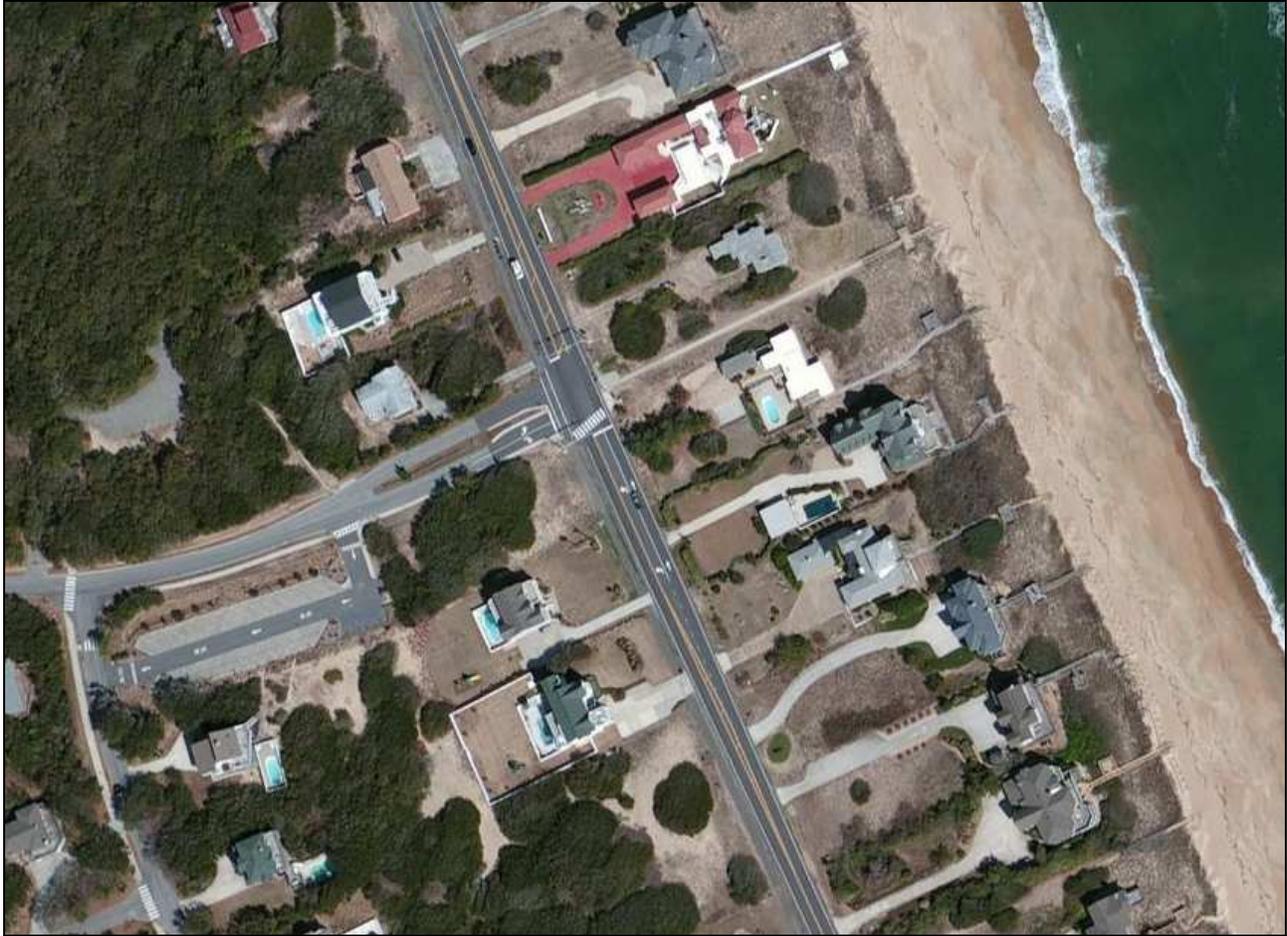
Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 01-02-216 located at the Intersection of NC 12 (Ocean Boulevard) and Chicahauk Trail in Dare County, Town of Southern Shores.

The Sig ID is 01-0469 for this modified / upgraded traffic signal.





Aerial Photo provided from BING Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the existing traffic signal upgrade to metal poles / mask arms and extension of the existing northbound NC 12 left turn lane. From our field measurements, the extended turn lane now consists of 225 feet of vehicle storage capacity. The intersection signal improvements also added the additional phases of a northbound NC 12 left turn traffic phase and pedestrian countdown heads.

NC 12 (Ocean Blvd) and Chicahawk Trail are both two-lane facilities around the subject intersection with speed limits of 45 mph and 35 mph respectfully. The subject location is a three-leg intersection, which is controlled by an existing traffic signal with wooden poles. Also, both roadways widen for left turn lanes at the intersection. Chicahawk Trail serves a residential community.

The original statement of problem concluded that the lack of left turn storage has resulted in numerous rear-end and left turning related crashes. The extra storage of the left turn lane will allow stopped vehicles to be removed from the through travel lane which will increase safety.

The initial crash analysis was completed from November 1, 1998 to October 31, 2001 with twelve (12) reported crashes, nine (9) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on June 7, 2007 with a total cost of \$150,000.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period were the months of April through June 2007. The before period consisted of reported crashes from November 1, 2002 through March 31, 2007 (4 years and 5 months); and the after period consisted of reported crashes from July 1, 2007 through November 30, 2011 (4 years and 5 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection except for a 300 foot y-line on the northbound NC 12 approach. *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Northbound NC 12 Rear-End Queue Crashes were the target crashes for the applied countermeasure.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	9	13	44.4 %
Total Severity Index	3.47	2.14	- 38.3 %
Target Crashes	1	0	- 100.0 %
Target Crash Severity Index	8.40	0.00	- 100.0 %
Volume (2005, 2009)	12,900	11,000	- 14.7 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	0	0	N/A
Class C Injury Crashes	3	2	- 33.3 %
Total Injury Crashes	3	2	- 33.3 %

The naive before and after analysis at the treatment location resulted in a 44 percent increase in Total Crashes, elimination of Target Crashes, but a 38 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period experienced one (1) northbound rear-end collision that was considered a target crash because it occurred beyond the storage capacity of the existing turn lane. There were four (4) other northbound rear-end crashes that either occurred at the stop bar in the through lane or beyond the intersection. With the turn lane extension, zero (0) crashes occurred that appeared to be due to long queues in the northbound NC 12 approach. There were three (3) after period rear-end collisions approaching the through lane stop bar and five (5) rear-end crashes beyond the intersection. The intersection experienced zero (0) frontal impact collisions in either study time period.

The calculated benefit to cost ratio for this project is **(-0.01) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.20**. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided from our Field Visit on February 13th, 2012 for all three approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Treatment Site Photos (Field Visit 2-13-2012)



Travelling Northbound on NC 12 (Ocean Blvd)



Travelling Eastbound on Chicahawk Trail



Travelling Southbound on NC 12

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 12 at Chicahauk		BY: JBS						
COUNTY: Dare		DATE: 2/16/2012						
FILE NO.: SS 01-02-216								
DETAILED COST:	TYPE IMPROVEMENT - Upgrade Signal / Extend Left Turn Lane							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$150,000	10	0.149	\$22,354			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$150,000	10	0.149	\$22,354			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$600			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$23,104			
	TOTAL COST OF PROJECT=				\$150,000			
COMPREHENSIVE COST REDUCTION:								
ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES								
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.42	0	0.00	3	0.68	6	1.36	\$19,412
AFTER	4.42	0	0.00	2	0.45	11	2.49	\$19,751
Annual Benefits from Crash Cost Savings								(\$339)
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$23,444)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.01		
TOTAL COST OF PROJECT		-	\$150,000	COMPREHENSIVE B/C RATIO		-	-0.01	

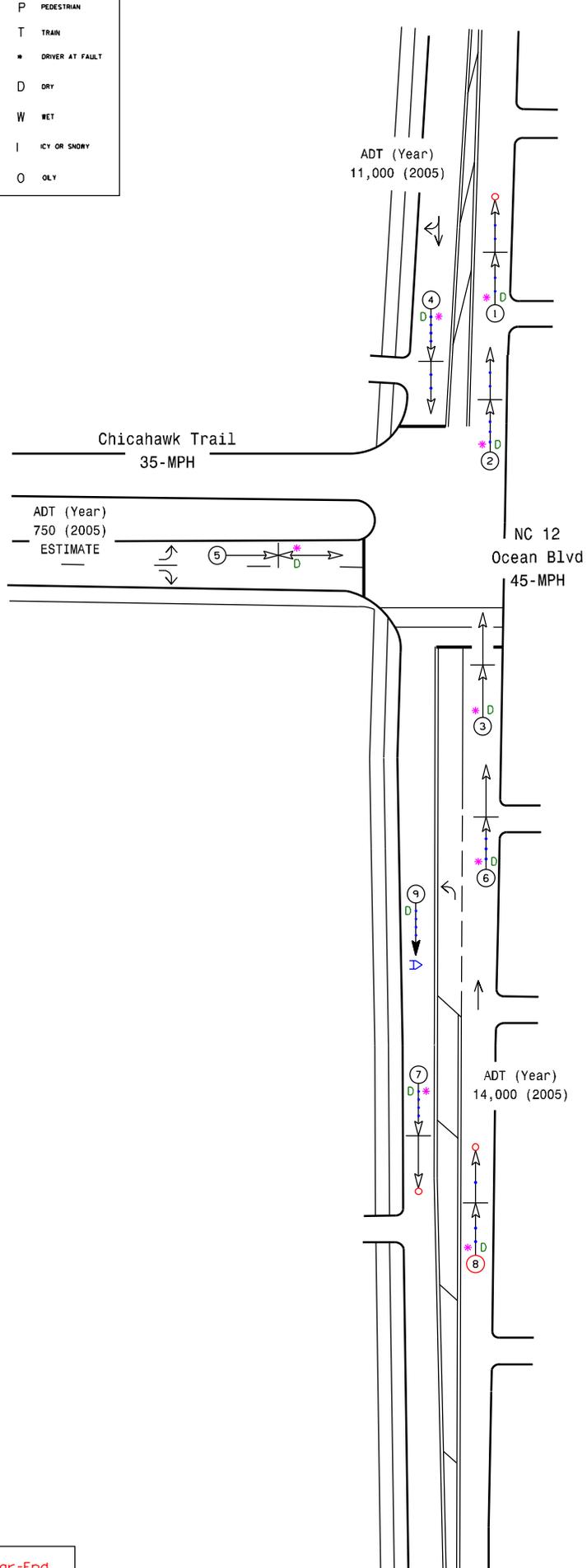
BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 12 at Chicahauk		BY: JBS						
COUNTY: Dare		DATE: 2/16/2012						
FILE NO.: SS 01-02-216		Target Crashes - NB Rear-End						
DETAILED COST:	TYPE IMPROVEMENT - Upgrade Signal / Extend Left Turn Lane							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$150,000	10	0.149	\$22,354			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$150,000	10	0.149	\$22,354			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$600			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$150			
	TOTAL ANNUAL COST=				\$23,104			
	TOTAL COST OF PROJECT=				\$150,000			
COMPREHENSIVE COST REDUCTION:								
ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES								
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.42	0	0.00	1	0.23	0	0.00	\$4,525
AFTER	4.42	0	0.00	0	0.00	0	0.00	\$0
Annual Benefits from Crash Cost Savings								\$4,525
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$18,580)		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	0.20		
TOTAL COST OF PROJECT		-	\$150,000	COMPREHENSIVE B/C RATIO		-	0.20	

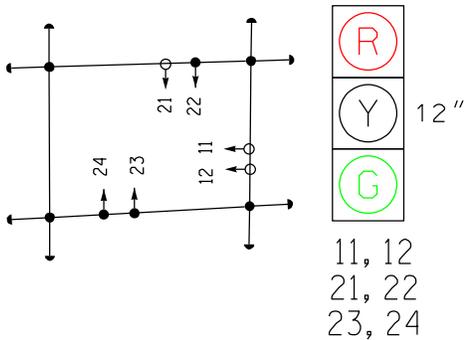
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		* DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		INJURY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		70 AND UP		O ONLY
	RAN OFF ROAD				SPEED UNKNOWN		

SS# 01-02-216
 Order# 41000017051
 Dare County
 BEFORE Period
 11/1/02 - 3/31/07



SIGNAL 01-0469



N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 2-15-2012

Prepared By: J. Schronce

NB Rear-End
Target Crashes

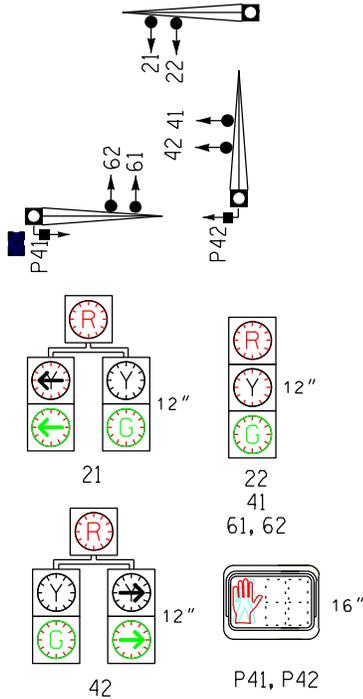
LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		* DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		INJURY		50 MPH TO 59		I ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		O ONLY
	RAN OFF ROAD				70 AND UP		
					SPEED UNKNOWN		

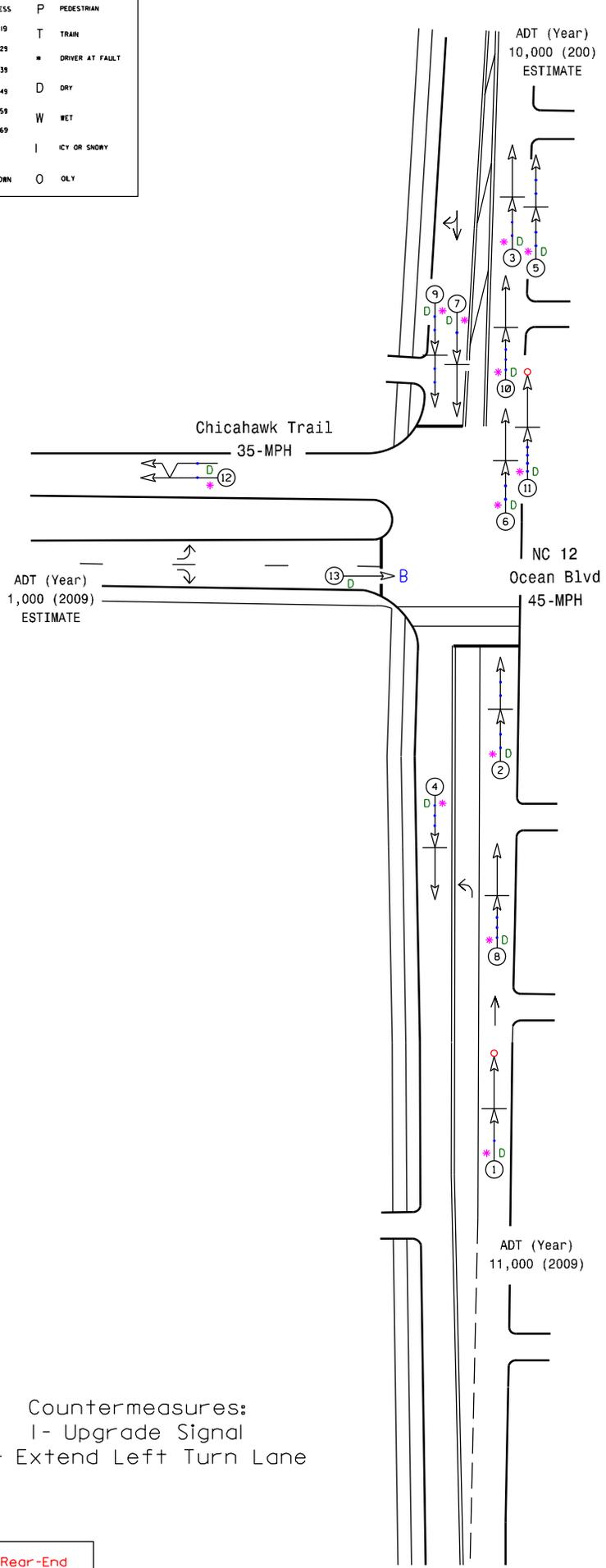
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 Dare County
 AFTER Period
 7/1/07 - 11/30/11

SIGNAL 01-0469

Denotes L.E.D.



ADT (Year)
 1,000 (2009)
 ESTIMATE



Countermeasures:
 1 - Upgrade Signal
 2 - Extend Left Turn Lane

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 SAFETY DIVISION

TRAFFIC SAFETY UNIT

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NB Rear-End
 Target Crashes