

Spot Safety Project Evaluation

Order # 41000006524

Spot Safety Project # 10-00-200

Spot Safety Project Evaluation of the Traffic Signal Installation NC 16 at NC DMV Driveway Mecklenburg 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

8-3-2010

Date

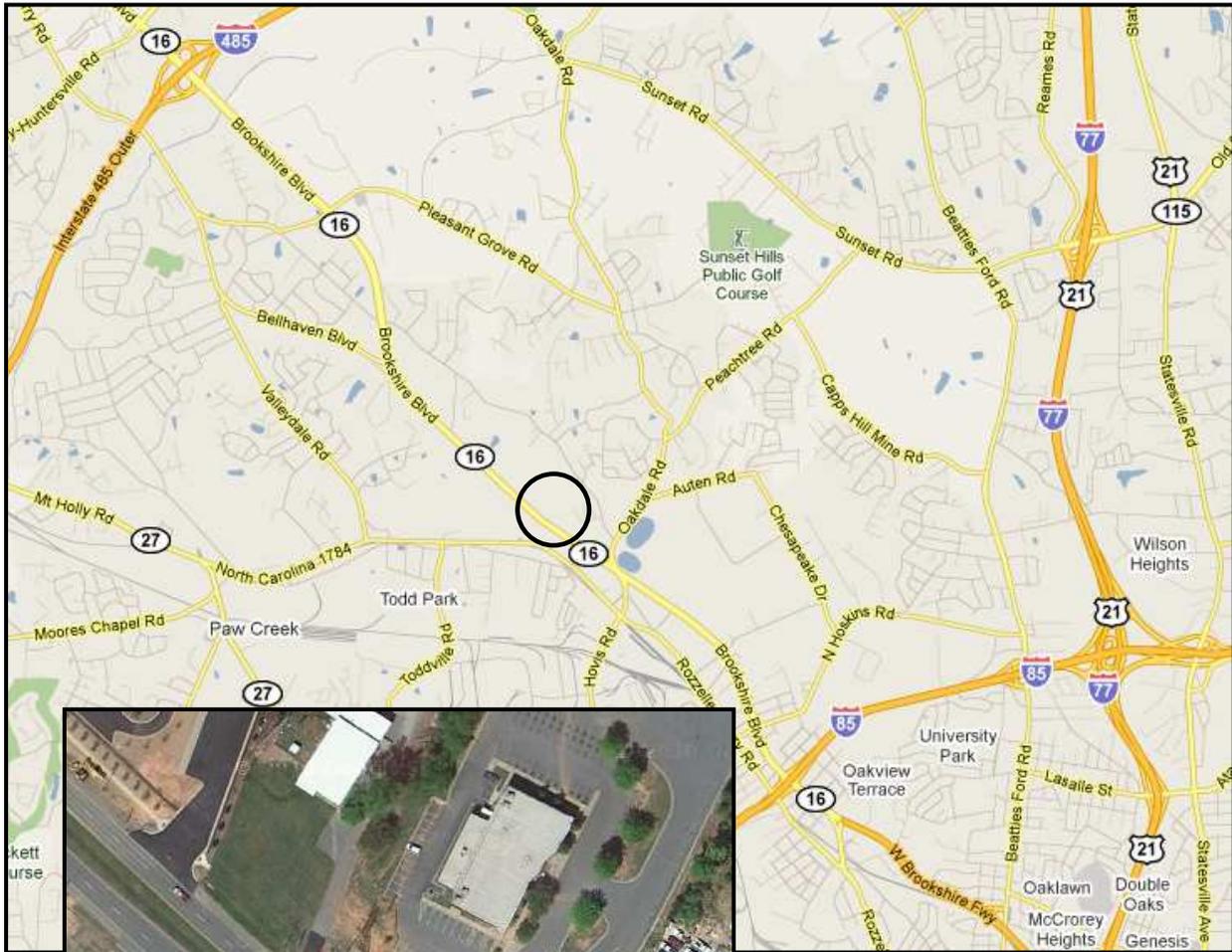
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-00-200 located at the Intersection of NC 16 (Brookshire Blvd) and the NC Department of Motor Vehicles Driveway in Mecklenburg County, City of Charlotte. The signal is located on NC 16 between Oakdale Rd and Bellhaven Blvd.

The Sig ID is 10-1348 for this newly installed traffic signal.



Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection traffic signal. NC 16 is a four-lane divided highway with left turn lanes at this location and a right turn lane for the westbound approach. The speed limit on NC 16 is 45 mph. The DMV driveway is a dead-end roadway with a left-thru lane and a right turn lane exiting onto NC 16. The subject location is a three-leg paved roadway intersection, which was controlled by a stop sign on the NC DMV driveway and an overhead flasher. The fourth leg of the intersection is a gravel driveway that services multiple businesses including a trucking company.

The original statement of problem was the existence of excessive delay and angle collisions related to motorists entering a high volume roadway from the DMV driveway. The intended purpose of the new traffic signal is to alleviate the current angle crash pattern and reduce congestion and delay.

The initial crash analysis was completed from September 1, 1996 to September 1, 1999 with eight (8) reported crashes, three (3) of which were deemed correctable angle collisions. The final completion date for the improvement at the subject intersection was on March 1, 2005 with a total cost of \$26,500.

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 February through March 2005. The before period consisted of reported crashes from June 1, 2001 through January 31, 2005 (3 years and 8 months); and the after period consisted of reported crashes from April 1, 2005 through November 30, 2008 (3 years and 8 months). The ending date for this analysis was limited by crash reporting issues with the City of Charlotte.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *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 Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; U-turn; and Angle.

| <u>Treatment Information</u> | Before | After | Percent Reduction (-) Percent Increase (+) |
|-------------------------------------|---------------|--------------|---|
| Total Crashes | 11 | 7 | - 36.4 % |
| Total Severity Index | 5.71 | 4.17 | - 27.0 % |
| | | | |
| Target Crashes | 7 | 2 | - 71.4 % |
| Target Crash Severity Index | 8.40 | 8.40 | 0.0 % |
| | | | |
| Volume (2003, 2007) | 29,000 | 29,000 | 0.0 % |

| <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 | 2 | 1 | - 50.0 % |
| Class C Injury Crashes | 5 | 2 | - 60.0 % |
| Total Injury Crashes | 7 | 3 | - 57.1 % |

The naive before and after analysis at the treatment location resulted in a 36 percent decrease in Total Crashes, a 71 percent decrease in Target Crashes, and a 27 percent decrease in the Total Severity Index. The before period ADT year was 2003 and the after period ADT year was 2007.

Results and Discussion

Referencing the *Collision Diagrams*, the before period experienced a pattern of seven (7) frontal impact crashes which all resulted in a minor injury. Of these crashes, five (5) resulted from motorists improperly accessing NC 16 from the NC DMV driveway. There was also one (1) left turn same roadway crash in the NC 16 westbound lane and one (1) u-turn collision in the NC 16 eastbound lane. After the signal installation, frontal impact crashes were reduced to two (2); which both resulted from a westbound vehicle running the red light. With the installation of the signal, rear-end collisions increased from zero (0) to three (3) on the NC 16 approaches to the intersection.

The calculated benefit to cost ratio for this project is **3.18 considering total crashes**. The benefit to cost ratio **considering only target crashes is 3.98**. 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 Google Street View for all four 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



Traveling West / Northwest on NC 16 (Brookshire Blvd)



Traveling East / Southeast on NC 16 (Brookshire Blvd)



Looking North onto NC DMV access drive



Looking South onto local businesses with gravel approach

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

| | | | | | | | | | |
|---|--|------------------|----------------------------|-------------------------|----------------------------|---|--------------------------|-----------------|--|
| LOCATION: NC 16 at DMV Driveway | | BY: JBS | | | | | | | |
| COUNTY: Mecklenburg | | DATE: 7/28/2010 | | | | | | | |
| FILE NO.: SS 10-00-200 | | | | | | | | | |
| DETAILED COST: | TYPE IMPROVEMENT - Shoulder Guardrail | | | | | | | | |
| | ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST | | | | |
| | Construction | \$26,500 | 10 | 0.149 | \$3,949 | | | | |
| | Right-of-Way | \$0 | 0 | 0.000 | \$0 | | | | |
| | | \$0 | 0 | 0.000 | \$0 | | | | |
| | TOTALS | \$26,500 | 10 | 0.149 | \$3,949 | | | | |
| | ESTIMATED INCREASE IN ANNUAL MAINT. COST = | | | | \$2,000 | | | | |
| | ESTIMATED INCREASE IN ANNUAL UTILITY COST = | | | | \$900 | | | | |
| | TOTAL ANNUAL COST= | | | | \$6,849 | | | | |
| | TOTAL COST OF PROJECT= | | | | \$26,500 | | | | |
| 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 | 3.67 | 0 | 0.00 | 7 | 1.91 | 4 | 1.09 | \$42,834 | |
| AFTER | 3.67 | 0 | 0.00 | 3 | 0.82 | 4 | 1.09 | \$21,035 | |
| | | | | | | Annual Benefits from Crash Cost Savings | | \$21,798 | |
| NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST | | | | | = | \$14,949 | | | |
| BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST | | | | | = | 3.18 | | | |
| TOTAL COST OF PROJECT | | - | \$26,500 | COMPREHENSIVE B/C RATIO | | - | 3.18 | | |

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

| | | | | | | | | | |
|---|--|------------------|----------------------------|-------------------------|----------------------------|---|--------------------------|-----------------|--|
| LOCATION: NC 16 at DMV Driveway | | BY: JBS | | | | | | | |
| COUNTY: Mecklenburg | | DATE: 7/28/2010 | | | | | | | |
| FILE NO.: SS 10-00-200 | | | | | | | | | |
| DETAILED COST: | TYPE IMPROVEMENT - New Traffic Signal | | | | | | | | |
| | ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST | | | | |
| | Construction | \$26,500 | 10 | 0.149 | \$3,949 | | | | |
| | Right-of-Way | \$0 | 0 | 0.000 | \$0 | | | | |
| | | \$0 | 0 | 0.000 | \$0 | | | | |
| | TOTALS | \$26,500 | 10 | 0.149 | \$3,949 | | | | |
| | ESTIMATED INCREASE IN ANNUAL MAINT. COST = | | | | \$2,000 | | | | |
| | ESTIMATED INCREASE IN ANNUAL UTILITY COST = | | | | \$900 | | | | |
| | TOTAL ANNUAL COST= | | | | \$6,849 | | | | |
| | TOTAL COST OF PROJECT= | | | | \$26,500 | | | | |
| 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 | 3.67 | 0 | 0.00 | 7 | 1.91 | 0 | 0.00 | \$38,147 | |
| AFTER | 3.67 | 0 | 0.00 | 2 | 0.54 | 0 | 0.00 | \$10,899 | |
| | | | | | | Annual Benefits from Crash Cost Savings | | \$27,248 | |
| NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST | | | | | = | \$20,399 | | | |
| BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST | | | | | = | 3.98 | | | |
| TOTAL COST OF PROJECT | | - | \$26,500 | COMPREHENSIVE B/C RATIO | | - | 3.98 | | |

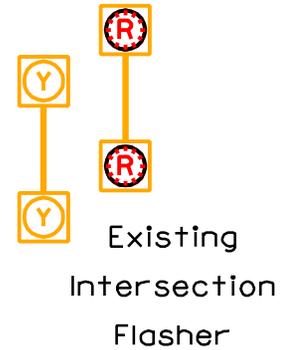
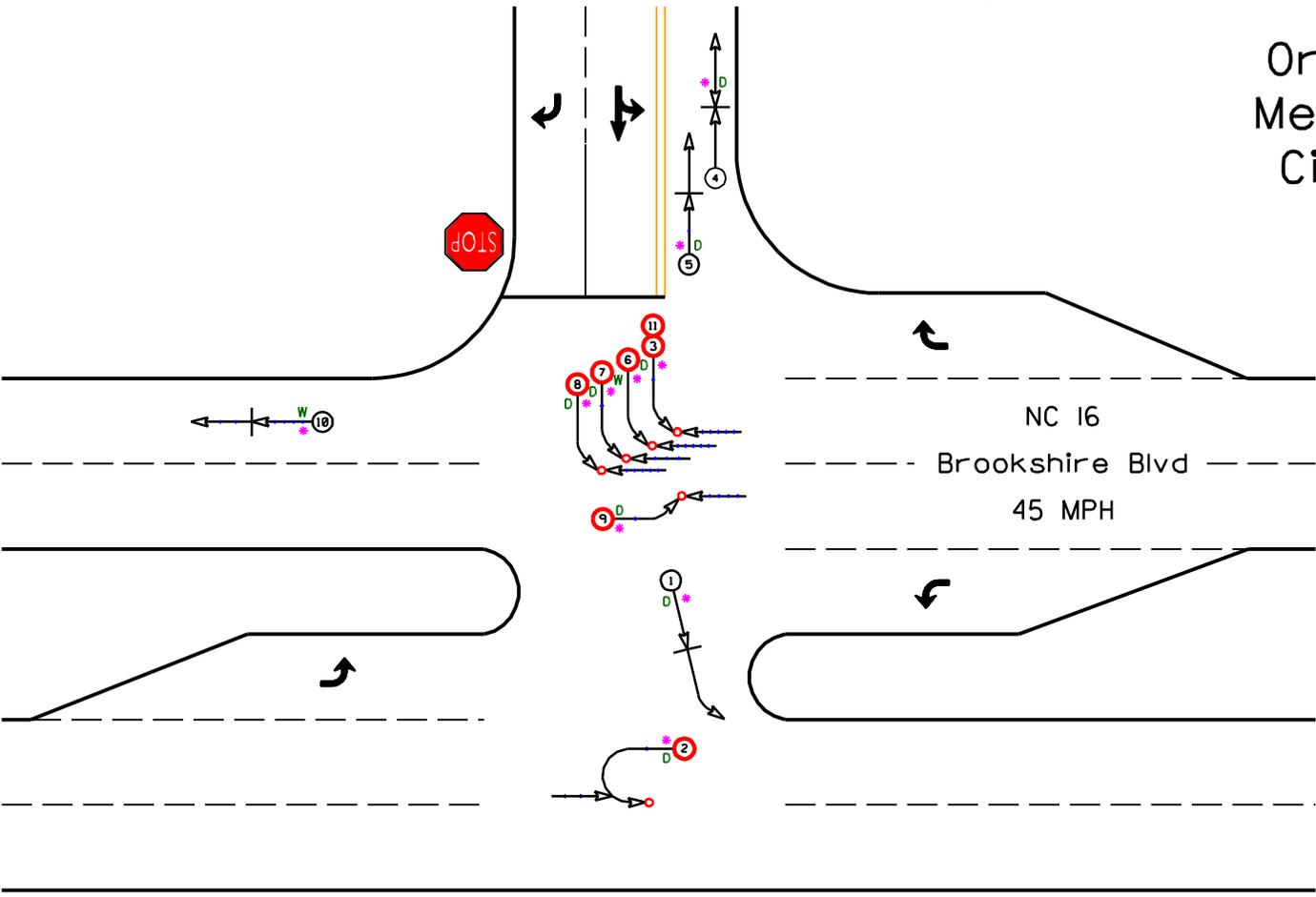
NC DMV
Office



LEGEND

| | | | | | | | |
|--|-----------------|--|----------------|--|---------------|--|-----------------|
| | MOVING VEHICLE | | ANGLE | | 9 MPH OR LESS | | PEDESTRIAN |
| | PEDESTRIAN | | TURNING | | 10 MPH TO 19 | | TRAM |
| | PAKED 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 | | TO AND UP | | 50 MPH TO 59 | | I ICY OR SNOW |
| | REAR END | | INJURY | | 60 MPH TO 69 | | F FATALITY |
| | RAN OFF ROAD | | SPEED UNKNOWN | | 9 MPH OR LESS | | O ONLY |

SS# 10-00-200
 Order# 41000006524
 Mecklenburg County
 City of Charlotte
 BEFORE Period
 6/1/01 - 1/31/05



Multiple Businesses (Gravel Driveways)

Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

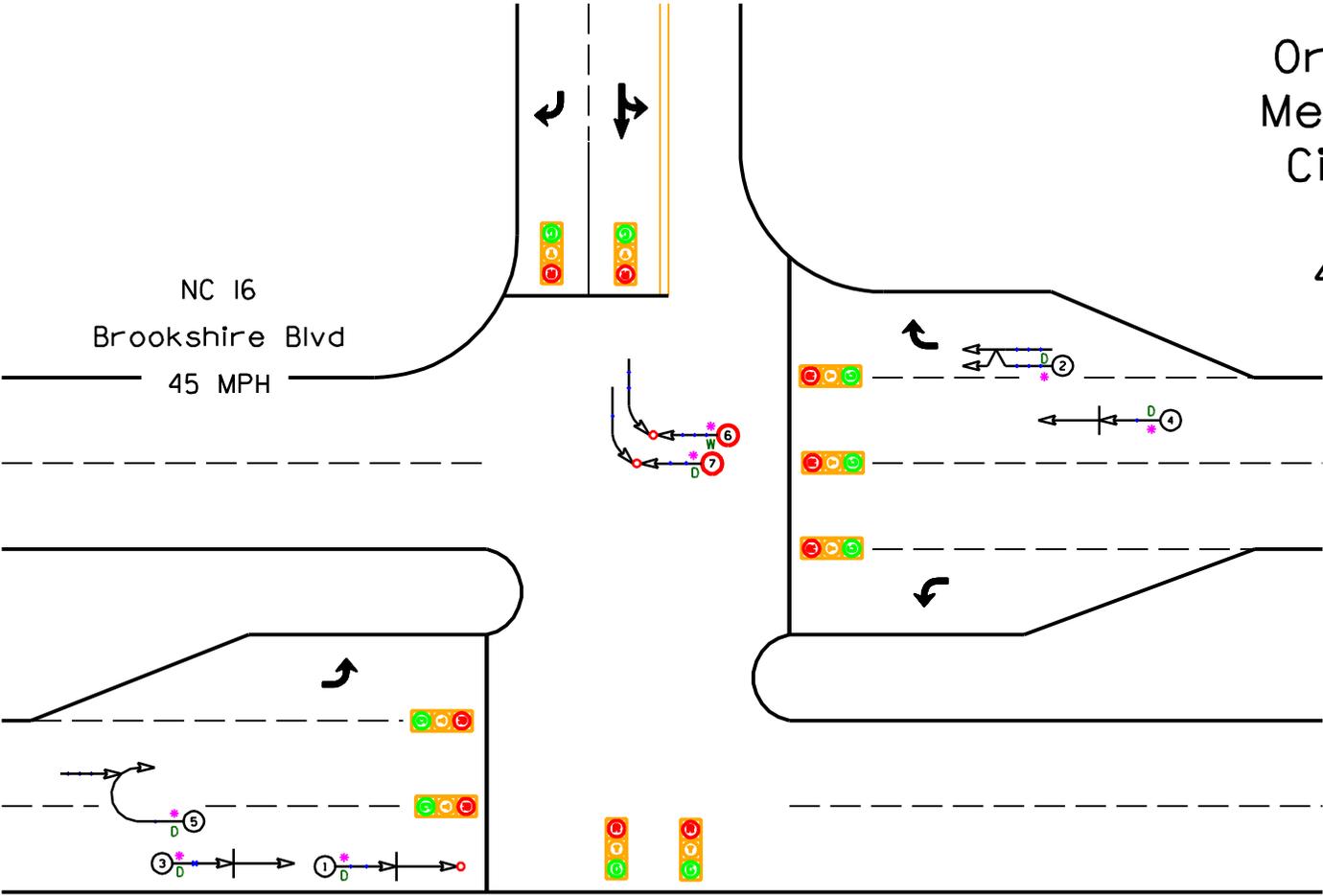
Date: 7-26-2010 Prepared By: J. Schronce

NC DMV
Office

LEGEND

| | | | | | | | |
|--|-----------------|--|----------------|--|----------------|--|-----------------|
| | MOVING VEHICLE | | ANGLE | | 9 MPH OR LESS | | PEDESTRIAN |
| | PEDESTRIAN | | TURNING | | 10 MPH TO 19 | | TRAM |
| | PAKED VEHICLE | | BACKING | | 20 MPH TO 29 | | DRIVER AT FAULT |
| | PARKING VEHICLE | | SIDESWIPE | | 30 MPH TO 39 | | DRY |
| | FIXED OBJECT | | OUT OF CONTROL | | 40 MPH TO 49 | | WET |
| | HEAD ON | | HIT AND RUN | | 50 MPH TO 59 | | ICY OR SNOW |
| | REAR END | | INJURY | | 60 MPH TO 69 | | FATALITY |
| | RAN OFF ROAD | | SPEED UNKNOWN | | 70 MPH OR MORE | | OTHER |

SS# 10-00-200
Order# 41000006524
Mecklenburg County
City of Charlotte
AFTER Period
4/1/05 - 11/30/08



New Signalized
Intersection
Sig ID 10-1548

Frontal Impact
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 7-26-2010 Prepared By: J. Schronce