REPORT ON RED-LIGHT TRAFFIC CONTROL SIGNAL MONITORING SYSTEMS

Prepared by the New Jersey Department of Transportation

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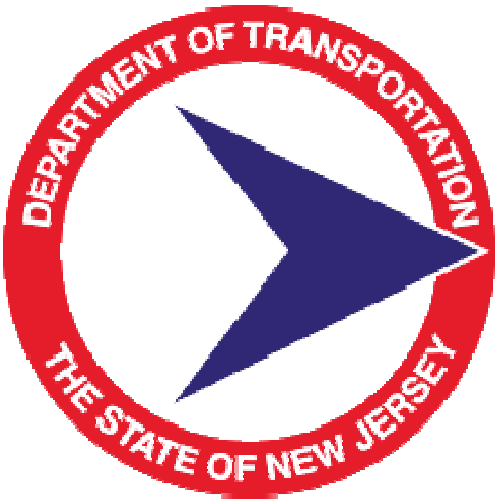


Executive Summary

Public Law 2007, Chapter 348 (P.L. 2007, c.348), signed into law on January 13, 2008, requires the New Jersey Department of Transportation (Department) to establish a five-year pilot program to determine the effectiveness of the installation and utilization of traffic control signal monitoring systems in New Jersey. The pilot program officially began December 16, 2009, the date the first monitoring system was activated, and is set to expire December 16, 2014. This report describes the pilot program and analyzes the safety data for all authorized monitoring systems where violations have been issued for at least one year for the time period ending December 31, 2010.

A traffic control signal monitoring system, also known as a Red Light Running (RLR) system, is an integrated device utilizing one or more cameras and sensors that work in conjunction with a traffic control signal to produce images of vehicles that disregard a red signal or "run a red light." These images are transmitted to law enforcement officials who review both still photos and video produced by the system to determine if a violation has in fact occurred.

As per P.L. 2007, c.348, the Department's goal is to establish monitoring systems at locations where previous engineering, enforcement and educational efforts have not been effective in decreasing traffic violations or crashes attributed to running red lights. Through this report and subsequent iterations, the Department will determine the effectiveness of these systems by analyzing the violation data for month-by-month and annual trend line patterns. The crash data will be analyzed for patterns in the number of crashes occurring, as well as the severity of those crashes.

As of June 1, 2011, there were fifty-nine (59) intersections in twenty-five (25) municipalities approved for program participation. Based on the established reporting parameters, monitoring systems at only two (2) intersections (Broad Street & Market Street and Broad Street & Raymond Boulevard, both within Newark City, Essex County) have been recording violations for one full year. Combining both intersections and comparing the pre-RLR installation (2009) versus post-RLR installation (2010) data, the limited data indicate that total crashes are down 45%, more severe right-angle crashes are down 57%, and same-direction crashes are down 50%. When crash severity is factored into the equation, the overall cost of these crashes, which include the cost for vehicle damage, property damage, emergency response, and medical care, was reduced by an estimated $149,000. Additionally, both locations have a decreasing trend line regarding the number of monthly violations issued.

Although these calculations suggest a potential positive effect on safety as a result of the pilot program, we believe the data are too limited to draw any meaningful conclusions at this time. The Department therefore recommends continued data collection and monitoring of RLR program intersections.

Introduction

As communities across the nation seek to address crashes and reduce both injuries and fatalities, they are increasingly looking for tools to supplement traditional enforcement resources. One of the safety tools nearly 550 communities, including those in New York and Pennsylvania, have employed is a Traffic Control Signal Monitoring System, better known as a Red Light Running (RLR) system. The first such system was installed in New York City in 1991. An RLR system is an integrated device using multiple cameras and vehicle sensors, which work in conjunction with a traffic control signal, to produce still pictures and video images of vehicles that disregard a red signal or "run a red light."

P.L. 2007, c.348 (N.J.S.A. 39:4-8.12 et seq.) signed into law on January 13, 2008, requires the Department to establish a five-year pilot program to determine the effectiveness of the installation and utilization of traffic control signal monitoring systems in New Jersey. The Department is authorized to approve applications from municipalities where such systems may be installed. The statute outlines the application requirements and mandates local governing bodies to approve the installation and use of traffic control signal monitoring systems via ordinance. The statute also requires municipalities to conduct periodic RLR equipment inspections and lays out reporting requirements for municipalities and the Department.

Approval Process

Municipalities desiring to participate in the pilot program must submit an application to the Department. Applications are available on the Department's website at: www.state.nj.us/transportation/refdata/rlr/. For locations approved for program participation, the affected municipalities are required to submit an ordinance establishing the traffic control monitoring system.

When the Department receives an application, the crash, violation and volume data are extracted and analyzed by staff within the Department's Division of Highway and Traffic Design, producing an overall intersection safety score. The applications are then ranked. The municipality will receive a response within forty-five (45) days of application submission. While the program is currently at full participation, new applications continue to be submitted, scored and ranked.

Program Participants

Since inception, a total of fifty-five (55) municipalities have submitted RLR applications to the Department. The Department capped participation at twenty-five (25) municipalities. The following is a list of the participants as of June 1, 2011, along with the dates of their authorizations:

Brick Township (Ocean) 6/1/09
East Brunswick Township (Middlesex) 11/21/08
Englewood Cliffs Borough (Bergen) 1/11/11
Glassboro Borough (Gloucester) 3/16/09
Jersey City (Hudson) 8/2/10
Linden City (Union) 1/29/09
Newark City (Essex) 11/21/08
Palisades Park Borough (Bergen) 9/13/10
Pohatcong Township (Warren) 9/13/10
Roselle Park Borough (Union) 12/1/08
South Brunswick Township (Middlesex) 3/16/09
Union Township (Union) 5/2/11
Woodbridge Township (Middlesex) 3/16/09
Cherry Hill Township (Camden) 3/16/09
Edison Township (Middlesex) 1/29/09
Deptford Township (Gloucester) 3/16/09
Gloucester Township (Camden) 3/16/09
Lawrence Township (Mercer) 1/29/09
Monroe Township (Gloucester) 3/16/09
New Brunswick City (Middlesex) 1/29/09
Piscataway Township (Middlesex) 12/1/08
Rahway City (Union) 9/13/10
Springfield Township (Union) 5/2/11
Stratford Borough (Camden) 3/16/09
Wayne Township (Passaic) 1/29/09

In conjunction with a cap on the number of participants, the Department has made a concerted effort to assure full municipal compliance with program requirements, the result being that four (4) municipalities have had their original RLR authorizations rescinded. In one instance, authorization was rescinded when the Department discovered that the side street yellow clearance interval at the desired location was inadequate, thereby skewing the violation data and making it impossible to conclude if RLR would provide any additional safety benefit beyond adjusting the yellow time to its appropriate value. The municipality was given the opportunity to submit an application for an alternative location, but chose not to do so. The authorizations for the other three (3) municipalities were rescinded due to lack of action taken by the governing bodies to move program participation forward. Following rescission of the four RLR authorizations, the four highest ranking towns on the waiting list were added to the program.

Yellow Change Interval

Considering its effect on data collection and program viability, a discussion of the methodology of determining the yellow change interval at signals is appropriate. In New Jersey, yellow change intervals are determined by nationally accepted standards. Our guiding principle is the 2009 edition of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), as amended and supplemented. Section 4D.26 of the MUTCD states: *The duration of the yellow change interval shall be determined using engineering practices*. The MUTCD is adopted in New Jersey through existing motor vehicle law, specifically Title 39 of the Revised Statutes. The accepted engineering practice to determine yellow change intervals is from the Institute of Transportation Engineers' 1994 report, "Determining Vehicle Signal Change and Clearance Intervals". For more detailed information, see *Technical Appendix for Report on Red-Light Traffic Control Signal Monitoring Systems* available at the following website http://www.state.nj.us/transportation/publicat/lmreports/.

Some jurisdictions outside of New Jersey have reportedly shortened yellow change times at red light locations. However, New Jersey continues to follow nationally

accepted standards and does not accept such a practice within this pilot program. Municipalities are required to submit six-month operational certifications regarding the RLR cameras and related equipment, pursuant to N.J.S.A. 39:4-8.14(e). Should any municipality reduce yellow change intervals and the Department becomes aware of such actions, RLR authorization will be rescinded immediately.

Crash Data

For calendar year 2010, only two (2) locations, Broad Street & Market Street and Broad Street & Raymond Boulevard, both in Newark City (Essex County) have had RLR systems where violations have been issued for a full year. As per N.J.S.A. 39:4-8.17, authorized municipalities must submit reports every twelve (12) months, detailing increases or decreases in crashes or violations. The Department is focused on two (2) types of crashes: right-angle and same-direction. The reason is that a right-angle crash is directly attributed to red light running. Additionally, national reports of RLR programs have generally shown a slight to moderate rise in same-direction crashes due to sudden stops by motorists knowing of the presence of RLR cameras. Using the data provided by Newark City, 2009 (pre-RLR) was compared to 2010 (post-RLR). See *Technical Appendix for Report on Red-Light Traffic Control Signal Monitoring Systems* available at the following website http://www.state.nj.us/transportation/publicat/lmreports/, for more detailed information on crash data collected at these locations.

Table 1: Pre- and Post-Year Count of Crash Types per Intersection

Pre-Red Light Camera Installation (November 2008 – Oct 2009)

Intersection	Municipality	County	Total Crashes	Right Angle Crashes	Same Direction Crashes
Broad St. & Market St.	Newark City	Essex	28	1	6
Broad St. & Raymond Blvd.	Newark City	Essex	19	6	6
Broad St. & Kinney St.*	Newark City	Essex	11	0	3

*** Reference Location**

Post-Red Light Camera Installation (Jan 2010 – Dec 2010)

Intersection	Municipality	County	Total Crashes	Right Angle Crashes	Same Direction Crashes
Broad St. & Market St.	Newark City	Essex	21	2	6
Broad St. & Raymond Blvd.	Newark City	Essex	5	1	0
Broad St. & Kinney St.*	Newark City	Essex	7	1	4

*** Reference Location**

For Broad Street & Market Street, overall crashes decreased 25% (28 in 2009 to 21 in 2010). However, right angles increased 100% (1 to 2), and same directions remained the same (6 to 6). For Broad Street & Raymond Boulevard, crashes were down. Overall crashes decreased 74% (19 to 5), right angles decreased 83% (6 to 1) and same directions decreased 100% (6 to 0).

For both the Broad Street & Market Street and Broad Street & Raymond Boulevard RLR installations, the intersection of Broad Street & Kinney Street was designated by Newark City as its "control" or "reference" location. The purpose of this requirement is to allow a direct crash data comparison between an intersection with a RLR camera and another one without a camera.

In a review of the focus crashes (right-angles and same-directions), the reference location was the site of three (3) same-direction crashes in 2009. In 2010, the reference location was noted to have an increase of 67% in its focus crash data, experiencing five (5) focus crashes – four (4) same-directions and one (1) right-angle. In comparison, Broad Street & Market Street experienced a 14% increase, while Broad Street & Raymond Boulevard experienced a 92% decrease. Both RLR intersections within this report performed better than the reference location.

Crash Severity and Cost

National studies that focus exclusively on raw numbers and associated percentage changes are missing the critical factor of crash severity. For example, at a location where right-angle crashes decreased by two (2) but same-direction crashes increased by three (3), it might be concluded that RLR was ineffective, as the total number of crashes increased. However, in general, right-angle crashes tend to be much more severe when compared to other crash types. As a result, crashes must be analyzed not only numerically but also by severity.

One way to measure crash severity is to estimate and compare the monetary cost of crashes. Costs considered include, but are not limited to, vehicle damage and repair, damage to property, emergency response, medical care, and even funeral costs. The U.S. Department of Transportation and the Federal Highway Administration outlined in a January 2010 report "Highway Safety Improvement Program Manual – The Focus is Results" that the National Safety Council developed a scale of five (5) categories of injuries: fatality, disabling injury, evident injury, possible injury, and property damage only (no injury). Table 2 shows these categories and associated costs.

Table 2: Crash Severity Costs

Severity	
K = Fatality	$4,008,900
A = Disabling Injury	$216,000
B = Evident Injury	$79,000
C = Possible Injury	$44,900
O = Property Damage Only	$7,400

Utilizing the above crash severity cost figures, the Department compared the severity data for the two Newark intersections with the reference intersection. Table 3 provides a summary of that analysis. See *Technical Appendix for Report on Red-Light Traffic Control Signal Monitoring Systems* available at the following website

http://www.state.nj.us/transportation/publicat/lmreports/, for more detailed information on the crash severity data. Comparing the crash severity and costs at Broad Street & Market Street, the right-angle crash costs increased by $44,900 between 2009 (pre-installation year) and 2010 (year 1 of the program). With an equal number of crashes year-to-year, same-direction costs did not change. Overall, the net crash cost for that intersection increased $44,900.

Table 3: Year-to-Year Cost/Benefit Analysis Summary

			Pre-Camera Yr (2009) to Yr 1 (2010)		
Location	**Municipality**	**County**	**Right Angle**	**Same Direction**	**Net Benefit [Loss]**
Broad St. & Market St.	Newark City	Essex	[$44,900]	0	[$44,900]
Broad St. & Raymond Blvd.	Newark City	Essex	$74,500	$119,400	$193,900
Broad St. & Kinney St.*	Newark City	Essex	[$7,400]	[$82,400]	[$89,800]

*** Reference Location**

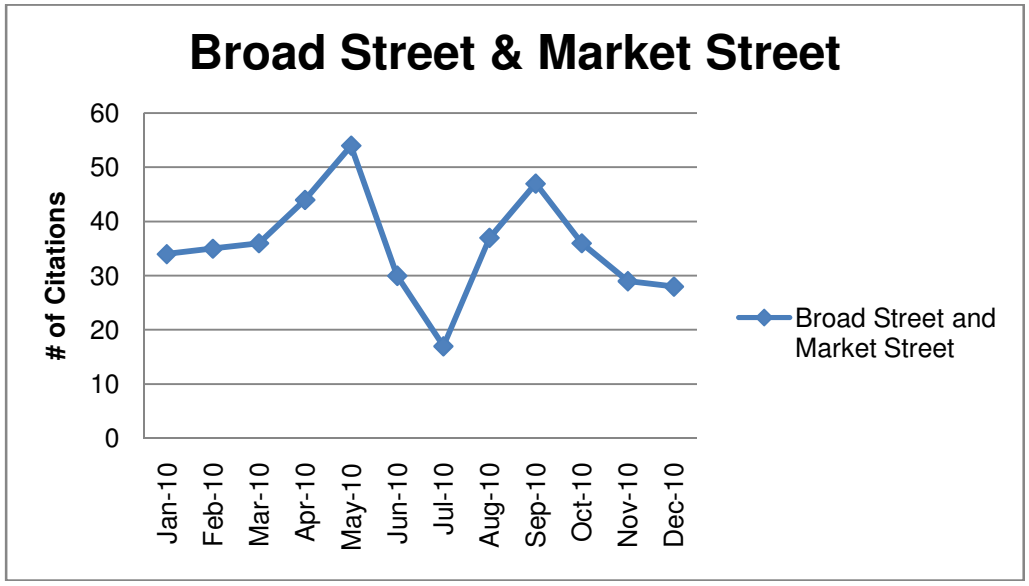
The intersection of Broad Street & Raymond Boulevard saw a decrease in right-angle crash costs of $74,500 in 2010 as compared to 2009. Same-direction crashes also saw a decrease in costs of $119,400. Overall, the net crash cost (year-to-year cost decrease) for that intersection was $193,900.

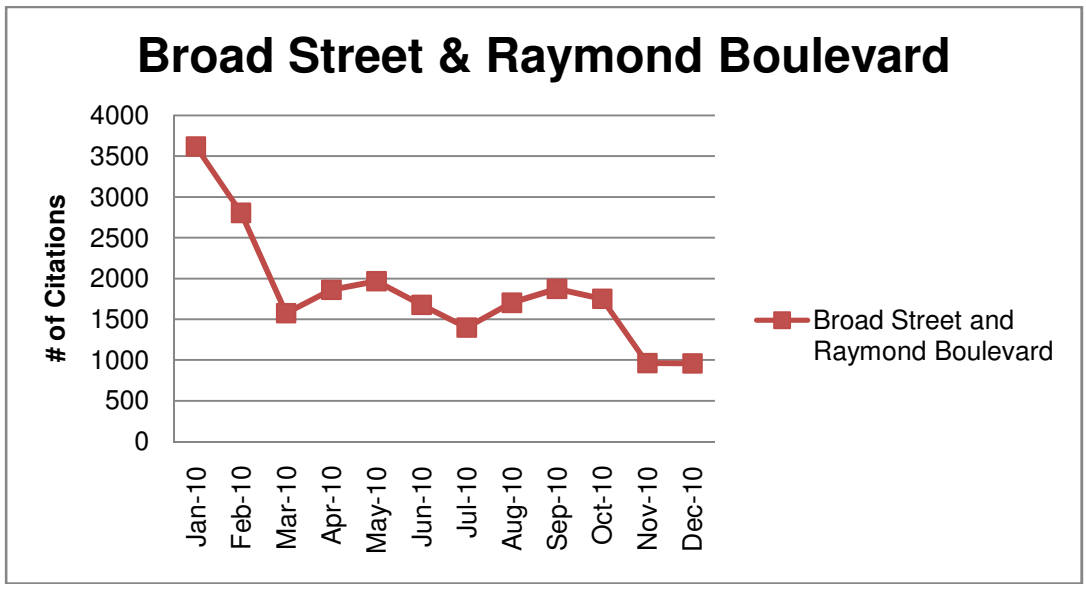
Taking both intersections into consideration, RLR had a net economic benefit, as crashes cost $149,000 less ($193,900 minus $44,900) for the post-installation year of 2010 than in 2009. In addition, both intersections had a greater cost benefit than the reference location, which saw an increase in property damage and minor crashes and an overall net crash cost (year-to-year cost increase) of $89,800. This analysis reveals that the safety benefits derived from RLR are initially potentially promising. However, with limited data, no definitive conclusions of any kind can be drawn at this time.

Violation Data

There can be no true comparison of violations issued by a police enforcement presence versus an RLR system. The Department expects that the presence of RLR would reduce the number of automated citations issued, certainly year-to-year if not month-to-month, indicating that motorist behavior, and therefore overall safety, is improving. The specific violation associated with RLR is N.J.S.A. 39:4-81, failure to observe a traffic signal. The following chart details the monthly post-RLR (2010) violations, using January-December data provided by Newark.

Chart 1: 2010 Count of Citations per Intersection





Comparing the number of automated violations issued in January 2010 with the amount issued in December 2010, the Broad Street & Market Street installation saw a decrease of 18%. For Broad Street & Raymond Boulevard, the decrease was 74%. For both intersections combined, a total of 3,652 violations were issued in January, compared to 985 issued in December, representing a total decrease of 73%.

While the annual trend line decreases for both locations, Chart 1 shows monthly spikes in the number of violations issued in May and September. The Department believes these spikes can be explained by the fact the intersections are adjacent to Newark's

University District, where traffic volumes are heavier during the beginning and end of the school year. Nevertheless, at this time, there is not enough data to draw definitive conclusions about the impact of RLR on motorist behavior.

Conclusions and Next Steps

The Department's focus remains solely on the potential safety benefits provided through RLR. As such, while the safety data are promising—overall decreases in right-angle and same-direction crashes; decreases in the costs of those crashes; and decreases in the number of violations issued—we must underscore that it is not possible at this time to draw any conclusions based on such a small sample size.

Additional analysis is needed. The Department recommends that the Traffic Control Signal Monitoring Systems Pilot Program continue in order to determine if the preliminary potential benefits shown in 2010 are demonstrated in other RLR intersections. The Department's next report on this pilot will include 2011 data from approximately 85 percent of all municipalities who are participating. The Department expects the second report to be published in mid-2012.

Acknowledgments

The Department would like to acknowledge its staff within the Bureau of Traffic Engineering and the Bureau of Transportation Date and Safety, along with support from the staff at Rutgers University Transportation Safety Resource Center, for their roles in administering the pilot program and for researching and compiling this Annual Report.