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# Red Light Camera Effectiveness Evaluation

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City of Rochester  
Monroe County, New York

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Prepared For:



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2. New York City Red Light Camera Program 2007 Report. New York City Department of Transportation.
3. City of Rochester website. Retrieved from <http://www.cityofrochester.gov/redlight/>
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## I. INTRODUCTION

Improving intersection safety is important for the health and well-being of the community's residents and visitors. Safety improvement strategies may range from educational materials and enforcement campaigns, to engineering enhancements. The City of Rochester, since November 2010, has installed red light cameras at 32 city intersections using 48 total cameras. The goal of the program has been to improve traffic and public safety and reduce the frequency of right angle<sup>1</sup> crashes and crashes whereby drivers have disregarded the traffic control device. With the program operational for over three years, the primary task of this study is to evaluate the effectiveness the red light cameras in reducing the frequency and severity of accidents due to red light running through data-driven analysis.



Image 1 – State St @ Jay St, Rochester, NY

## II. PURPOSE OF RED LIGHT CAMERA ENFORCEMENT

Red light running is defined as “a vehicle that enters the intersection or passes the stop line after the red light turns on.” This may include not fully stopping before turning right on red, passing through the all-red interval immediately following the yellow, and going through a red light while other movements in the intersection are being served.

Red-light running is a serious intersection safety issue across the nation. According to the National Highway Traffic Safety Administration's (NHTSA) Traffic Safety Facts 2012 Report, there were more than 2.5 million reported intersection-related crashes, resulting in more than 2,850 fatalities and approximately 680,000 injury crashes in 2012. Red light running is estimated to cause more than 100,000 crashes and approximately 1,000 deaths per year in the United States.

Red light running is complex and there is no single reason to explain why drivers run red lights. Red light running is generally a result of drivers wanting to save time, however, some factors also include eating while driving, drowsiness, and distracted driving, others factors may include speeding and aggressive driving. Motorists are more likely to be injured in urban crashes involving red light running than in any other type of urban crashes.<sup>2</sup> A study of urban crashes conducted by the Insurance Institute for Highway Safety (IIHS) found that running red lights and other traffic controls was the most common cause of all accidents.

<sup>1</sup> Two vehicles approaching from non-opposing angular directions collide, typically resulting as one vehicle failed to either stop or yield right of way from a Stop or Yield sign, ran a red light, or was not cleared from the intersection upon the onset of the conflicting movement's green signal.

<sup>2</sup> Insurance Institute for Highway Safety (IIHS)

Several studies have found that red light camera programs reduce the number of and rate of red light running violations. In short periods after red light camera programs are implemented, violation rates drop dramatically.

Red light cameras have been used for over a decade in over 400 American cities. They have been used to increase traffic signal enforcement at intersections where there is a noted history of red light running and crashes, and record the violations for legal prosecution. For signalized intersections, red light running affects the public health and safety of passing motorists and pedestrians. The most frequent crashes resulting from red light running at signalized intersections are right angle and rear end<sup>3</sup> crashes with right angle crashes resulting in greater injury severity. To that end, the installations of red light cameras are intended to reduce the frequency of crashes, particularly the more severe right angle crashes, to improve public safety.



Image 2 - Right angle collision, FHWA

### III. RED LIGHT CAMERA LOCATIONS & OPERATION

The City of Rochester initiated a Red Light Photographic Enforcement Program in October 2010. Since that time, 48 cameras have been installed at 32 intersections throughout the City. The camera locations were selected based upon the following criteria:

- Recommendations from the Rochester Police Department based on intersection accident history,
- Review of accident data by City staff, and
- Traffic volumes.

Once potential locations were identified, a portable camera was placed at each location for a 12 hour period to determine signal compliance. An intersection approach was recommended for installation of a red light camera if the following conditions were met:

1. Fifteen or more vehicles were observed running the red light or turning **left** on the red indication during the 12 hour test period.
2. The intersection exhibited a history of pedestrian/cyclist/vehicle accidents.
3. The intersection received a “VIC” number over 250. (The “VIC” number is calculated by the camera manufacturer to determine intersection suitability for a red light camera).

<sup>3</sup> Two vehicles in a position of one behind the other and collide, regardless of what movement(s) either vehicle was in the process of making with the exception of one or both vehicles backing.

A team comprised of City staff from the Rochester Police, Information Technology, Engineering, Law, and Budget departments made the final decision on red light camera locations. Of the 207 potential locations recommended for study, 48 were selected for the program based upon the above criteria.

Table I lists the current camera locations and the dates of installation.

**TABLE I**  
**RED LIGHT CAMERA LOCATIONS & ACTIVATION DATES**

Intersection	Approach/Direction	Go-Live Date	Intersection	Approach/Direction	Go-Live Date
Alexander St. & Broadway St.	WB	11/9/10	Lyell Ave. & Murray St.	WB	9/30/11
Alexander St. & Broadway St.	EB	11/9/10	Maple St. & Saxton St.	WB	9/30/11
State St. & Jay St.	NB	11/9/10	Norton/Hudson	SB	10/17/11
State St. & Jay St.	SB	11/9/10	Broad /Ford St. & W. Main St.	EB	10/31/11
North St. & Clifford Ave.	NB	11/9/10	West Ridge and Ridgeway	EB	11/23/11
North St. & Clifford Ave.	SB	11/9/10	West Ridge and Ridgeway	WB	11/23/11
Dewey & Ridgeway	EB	2/19/11	Lake Ave. & W. Ridge Rd.	EB	11/23/11
Dewey & Ridgeway	SB	2/19/11	Lake Ave. & W. Ridge Rd.	WB	11/23/11
Clinton Ave. & Norton St.	NB	1/27/11	Lake Ave. & Driving Park	SB	12/12/11
Clinton Ave. & Norton St.	SB	2/19/11	Lake Ave. & Driving Park	NB	12/12/11
Culver Rd. & East Ave.	NB	2/19/11	Lake Ave. & Ridgeway	NB	12/12/11
Culver Rd. & East Ave.	WB	2/19/11	West Ridge and Bonesteel St.	EB	01/12/12
N. Clinton Ave. & Andrews St.	NB	1/27/11	Mt. Read Blvd. & Lyell Ave.	EB	02/11/12
West Ave. & Ames St.	SB	6/3/11	Mt. Read Blvd. & Lyell Ave.	SB	02/11/12
West Main St. & Brown St./Genesee St.	EB	6/3/11	Mt. Read Blvd. & Emerson St.	NB	4/4/12
St. Paul St. & Pedestrian Crossing	NB	6/3/11	Mt. Read Blvd. & Emerson St.	SB	4/4/12
St. Paul St. & Pedestrian Crossing	SB	6/3/11	Mt. Read Blvd. & Driving Park	SB	4/4/12
Goodman St. & I-490	NB	7/31/11	Monroe/Alexander	SB	04/12/12
State St. & Allen St.	NB	7/31/11	Goodman/Clifford	NB	04/12/12
State St. & Allen St.	SB	10/17/11	E. Main St. & N. Goodman St.	EB	08/10/12
St. Paul St. & Upper Falls Blvd.	EB	9/30/11	E. Main St. & N Goodman St.	WB	08/10/12
St. Paul St. & Upper Falls Blvd.	WB	9/30/11	Alexander/University	WB	12/07/12
Brown St. & Broad St.	WB	9/30/11	Chestnut St. & Court St.	SB	12/07/12
Lyell Ave. & Murray St.	EB	9/30/11	Mt Hope Ave. & Elmwood Ave.	SB	09/13/13

The red light cameras capture still and video images of vehicles in the act of a red-light violation, which then initiates the procedure to deliver a Notice of Liability to the registered owner of the vehicle. The violation is a civil matter and is not reported to insurance companies nor does it generate points on a driver's license.

Evidence captured by the red light cameras is reviewed by the camera vendor and potential violations are forwarded to the Rochester Police Department where a sworn officer determines whether a violation has occurred. A Notice of Liability is then delivered in the mail to the registered owner of the vehicle. The cameras operate 24 hours a day and capture still photographs and video of every vehicle that runs a red light at the intersection. Cameras photograph only the vehicle and license plate of vehicles running the red lights. No images of the driver or passengers are captured.

#### *IV. EFFECTIVENESS OF THE RED LIGHT CAMERAS*

Crash data at each red light camera intersection was provided by the Rochester Police Department. The data encompassed all crashes occurring at the study intersections between November 10, 2008 and June 30, 2014. The data was then sorted for analysis as follows:

- 1) Intersection approaches that do not have red light cameras were omitted from the analysis.
- 2) Crash data for the pre-camera time period and post-camera time period are identical for each intersection but the time periods differ from intersection to intersection depending upon the date of camera activation.
- 3) "Total collisions" include only right angle and rear end collisions.

The analysis includes crash results for:

- Total collisions (right angle + rear end)
- Total right angle collisions
- Right angle collisions with injury
- Total rear end collisions
- Rear end collisions with injury
- Total collisions involving disregard of a traffic control
- Disregard of a traffic control with injury
- Cost associated with each crash

Since every camera was activated on a different date, the before and after evaluation time periods differ from location to location as indicated above. For consistency, the before and after study time periods are identical so as to compare crashes occurring over an identical before and after time frame at each location. Table II summarizes the overall results of the evaluation inclusive of all of the camera locations as well as total red light camera violations<sup>4</sup>.

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<sup>4</sup> Violations summarized in the tables in this report include only those incidents where the Rochester Police Department determined that a violation occurred and a citation was issued.

Overall total collisions<sup>5</sup> on the red light camera approaches have been reduced by 26%. Collisions involving disregard for a traffic control device have been reduced by 78%. Red light camera violations have decreased 30% from the time that the cameras were installed. It is noted that the results vary from intersection to intersection, however, when reviewing the combined impact of the red light cameras on a Citywide basis, the number and severity of collisions are significantly reduced.

**TABLE II**  
**COLLISIONS AND VIOLATIONS AT RED LIGHT CAMERA INTERSECTIONS<sup>5</sup>**

Collision Type	Pre-Camera	Post-Camera	% Change
Total Collisions <sup>5</sup>	598	440	-26%
Total Injury Collisions	132	92	-30%
Total Right Angle Collisions	267	172	-36%
Total Right Angle Collisions with Injury	87	55	-37%
Total Rear End Collisions	323	264	-18%
Total Collisions Involving Disregard of Traffic Control Device	69	27	-61%
Total Injury Collisions Involving Disregard of Traffic Control Device	32	7	-78%
Total Red Light Camera Violations	1 <sup>st</sup> 3 Months Post-Installation: 42,376	April 1, 2014 thru June 30, 2014: 29,849	-30%

Table III summarizes the analysis results at each individual intersection. The table also summarizes the number of violations recorded by the cameras during the three months immediately following the camera's activation as well as the three month period between April 1, 2014 and June 30, 2014. The comparison of violations provides an indication of motorists' reaction to greater enforcement at these locations.

All of the intersection locations are operated and maintained by either the Monroe County Department of Transportation (MCDOT) or the New York State Department of Transportation (NYSDOT). Both agencies were contacted to determine if any changes were made to signal timings or phasing after installation of the cameras. Any changes are noted in the discussions following each table. If no changes are noted, then no changes have been made since installation of the cameras.

<sup>5</sup> The analyses in this study include all right angle and rear end collisions occurring on the approaches that are monitored by red light cameras.

**TABLE III**  
**CRASH ANALYSIS & VIOLATIONS BY INTERSECTION**

Intersection:	N. Goodman @ Clifford, Go Live Date: 4/12/12, Analysis Time Period = 809 days			
Camera location(s): Northbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	9	4.1	17	7.7
Total Injury	1	0.5	3	1.4
Total Right Angle	6	2.7	5	2.3
Total Right Angle w/Injury	1	0.5	3	1.4
Total Rear End	3	1.4	11	5
Total Collisions involving disregard of a traffic control device	1	0.5	3	1.4
Total Injury collisions involving disregard of a traffic control device	1	0.5	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	222		292	

The total number of crashes related to the northbound approach at the North Goodman/Clifford Street intersection have increased since the camera was installed on April 12, 2012. While the number of right angle crashes have decreased slightly, rear end crashes have increased. The number of violations have increased slightly.

Intersection:	Monroe @ Alexander, Go Live Date: 4/12/12, Analysis Time Period = 809 days			
Camera location(s): Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	22	9.9	13	5.9
Total Injury	5	2.3	1	0.5
Total Right Angle	13	5.9	5	2.3
Total Right Angle w/Injury	4	1.8	1	0.5
Total Rear End	9	4.1	8	3.6
Total Collisions involving disregard of a traffic control device	3	1.4	1	0.5
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	242		322	

Overall total collisions and right angle collisions have decreased since camera installation. In addition, rear end collisions on the camera approach have also decreased slightly. Violations have increased slightly, approximately 33%.



Intersection:	Alexander @ Broadway, Go Live Date: 11/09/10, Analysis Time Period = 738 days			
Camera location(s): Eastbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	10	4.9	19	9.4
Total Injury	4	2	1	0.5
Total Right Angle	9	4.5	7	3.5
Total Right Angle w/Injury	4	2	0	0
Total Rear End	1	0.5	11	5.4
Total Collisions involving disregard of a traffic control device	3	1.5	3	1.5
Total Injury collisions involving disregard of a traffic control device	1	0.5	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1,172		360	

The total number of crashes at the Alexander/Broadway intersection have increased since the camera was installed. While the number of right angle crashes have decreased, rear end crashes have increased significantly. The violations have decreased significantly since the cameras were installed, approximately 69%.

MCDOT extended the yellow clearance interval by 0.5 seconds on Alexander Street at the Broadway/Alexander intersection on March 15, 2010.

Intersection:	State @ Jay, Go Live Date: 11/09/10, Analysis Time Period = 738 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	17	8.4	16	7.9
Total Injury	0	0	3	1.5
Total Right Angle	10	4.9	5	2.5
Total Right Angle w/Injury	0	0	3	1.5
Total Rear End	7	3.5	11	5.4
Total Collisions involving disregard of a traffic control device	3	1.5	1	0.5
Total Injury collisions involving disregard of a traffic control device	0	0	1	0.5
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	2,210		1,418	

Total collisions and right angle collisions have decreased in the pre- and post-camera installation conditions, while rear-end collisions increased slightly. Violations have decreased approximately 35%.

Intersection:	North @ Clifford, Go Live Date: 11/09/10, Analysis Time Period = 738 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	14	6.9	3	1.5
Total Injury	7	3.5	0	0
Total Right Angle	13	6.4	2	1
Total Right Angle w/Injury	13	6.4	1	0.5
Total Rear End	1	0.5	2	1
Total Collisions involving disregard of a traffic control device	3	1.5	1	0.5
Total Injury collisions involving disregard of a traffic control device	7	3.5	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	383		436	

In general collisions have decreased significantly at North & Clifford with the exception of rear ends. Violations have increased slightly from 383 during the first three months following camera installation to 436 during the last three months of this study.

Intersection:	Dewey@ Ridgeway, Go Live Date: 2/19/11, Analysis Time Period = 840 days			
Camera location(s): Easbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	27	11.7	11	4.8
Total Injury	2	0.9	2	0.9
Total Right Angle	9	3.9	6	2.6
Total Right Angle w/Injury	2	0.9	1	0.4
Total Rear End	18	7.8	5	2.2
Total Collisions involving disregard of a traffic control device	3	1.3	1	0.4
Total Injury collisions involving disregard of a traffic control device	1	0.4	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	595		559	

All types of collisions have decreased significantly at Dewey & Ridgeway. Violations have decreased slightly from 595 to 559.

Intersection:	Clinton @ Norton, Go Live Date: 1/27/11, Analysis Time Period = 817 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	27	12.1	14	6.3
Total Injury	6	2.7	1	0.4
Total Right Angle	15	6.7	9	4
Total Right Angle w/Injury	4	1.8	0	0
Total Rear End	12	5.4	5	2.2
Total Collisions involving disregard of a traffic control device	2	0.9	0	0
Total Injury collisions involving disregard of a traffic control device	1	0.4	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	619		1044	

All types of collisions have decreased at Clinton & Norton; however violations have increased significantly from 619 to 1,044.

Intersection:	Culver @ East, Go Live Date: 2/12/11, Analysis Time Period = 840 days			
Camera location(s): Northbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	25	10.9	13	5.6
Total Injury	5	2.2	2	0.9
Total Right Angle	12	5.2	7	3
Total Right Angle w/Injury	1	0.4	2	0.9
Total Rear End	12	5.2	6	2.6
Total Collisions involving disregard of a traffic control device	3	1.3	1	0.4
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	892		562	

In general, collisions and violations have both decreased at the Culver/East intersection.

Intersection:	Clinton @ Andrews, Go Live Date: 1/27/11, Analysis Time Period = 817 days			
Camera location(s): Northbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	14	6.3	10	4.5
Total Injury	5	2.2	2	0.9
Total Right Angle	11	4.9	6	2.7
Total Right Angle w/Injury	4	1.8	2	0.9
Total Rear End	3	1.3	4	1.8
Total Collisions involving disregard of a traffic control device	4	1.8	1	0.4
Total Injury collisions involving disregard of a traffic control device	1	0.4	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	174		196	

Total collisions and right angle collisions have decreased at Clinton & Andrews while rear end collisions have increased slightly. Violations have also increased slightly from 174 to 196.

Intersection:	West @ Ames, Go Live Date: 6/03/11, Analysis Time Period = 944 days			
Camera location(s): Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	7	2.7	3	1.2
Total Injury	4	1.5	1	0.4
Total Right Angle	3	1.2	1	0.4
Total Right Angle w/Injury	3	1.2	3	1.2
Total Rear End	4	1.5	2	0.8
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	3176		832	

All types of collisions have decreased at this intersection. Violations have decreased very significantly from 3,176 to 832.

Intersection:	W. Main @ Brown @ Genesee, Go Live Date: 6/03/11, Analysis Time Period = 944 days			
Camera location(s): Eastbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	3	1.2	7	2.7
Total Injury	1	0.4	1	0.4
Total Right Angle	2	0.8	6	2.3
Total Right Angle w/Injury	1	0.4	1	0.4
Total Rear End	1	0.4	1	0.4
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	563		497	

Total collisions and right angle collisions have increased at W. Main & Brown while rear end collisions stayed the same. Violations have decreased slightly from 563 to 497.

Intersection:	State @ Allen, Go Live Date: 7/31/11, Analysis Time Period = 1002 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	71	24	39	13.2
Total Injury	20	6.8	16	5.4
Total Right Angle	46	15.5	21	7.1
Total Right Angle w/Injury	16	5.4	10	3.4
Total Rear End	25	8.4	19	6.4
Total Collisions involving disregard of a traffic control device	18	6.1	2	0.7
Total Injury collisions involving disregard of a traffic control device	9	3	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	2969		1678	

All types of collisions, as well as violations, have decreased at the State & Allen intersection. It is noted that the lane configurations were modified in the fall of 2012 to eliminate the southbound dual left from State Street onto the Inner Loop eastbound. The approach became a single left turn lane and a through only lane (instead of a left turn lane and shared left and through lane).

Intersection:	St. Paul @ Upper Falls Blvd, Go Live Date: 9/30/11, Analysis Time Period = 1004 days			
Camera location(s): Eastbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	38	13.8	31	11.3
Total Injury	9	3.3	8	2.9
Total Right Angle	13	4.7	11	4
Total Right Angle w/Injury	7	2.5	4	1.5
Total Rear End	25	9.1	20	7.3
Total Collisions involving disregard of a traffic control device	3	1.1	4	1.5
Total Injury collisions involving disregard of a traffic control device	2	0.7	1	0.4
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1431		1085	

Both right angle and rear end collisions have decreased at the St. Paul/Upper Falls Blvd intersection. Violations have also decreased from 1,431 to 1,085.

Intersection:	Brown @ Broad, Go Live Date: 9/30/11, Analysis Time Period = 1004 days			
Camera location(s): Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	9	3.3	6	2.2
Total Injury	1	0.4	1	0.4
Total Right Angle	5	1.8	1	0.4
Total Right Angle w/Injury	1	0.4	1	0.4
Total Rear End	4	1.5	5	1.8
Total Collisions involving disregard of a traffic control device	1	0.4	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1083		815	

Total collisions and right angle collisions have decreased, while there was a slight increase in rear end collisions. Violations have decreased from 1,083 to 815.

Intersection:	Lyell @ Murray, Go Live Date: 9/30/11, Analysis Time Period = 1004 days			
Camera location(s): Eastbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	21	7.6	22	8
Total Injury	8	2.9	6	2.2
Total Right Angle	6	2.2	12	4.4
Total Right Angle w/Injury	3	1.1	4	1.5
Total Rear End	15	5.5	10	3.6
Total Collisions involving disregard of a traffic control device	1	0.4	1	0.4
Total Injury collisions involving disregard of a traffic control device	1	0.4	1	0.4
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	685		598	

Total collisions and right angle collisions have increased at Lyell and Murray during the study period while rear end collisions decreased. Violations have decreased from 685 to 598.

Intersection:	Maple @ Saxton, Go Live Date: 9/30/11, Analysis Time Period = 1004 days			
Camera location(s): Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	2	0.7	0	0
Total Injury	1	0.4	0	0
Total Right Angle	1	0.4	0	0
Total Right Angle w/Injury	1	0.4	0	0
Total Rear End	1	0.4	0	0
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	73		70	

Based on the available data at Maple and Saxton, there were very few right angle and rear end collisions during the pre-camera period and no collisions during the post-camera period. Violations have decreased from 73 to 70.

Intersection:	Norton @ Hudson, Go Live Date: 10/17/11, Analysis Time Period = 987 days			
Camera location(s): Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	27	10	10	3.7
Total Injury	5	1.8	2	0.7
Total Right Angle	5	1.8	7	2.6
Total Right Angle w/Injury	2	0.7	1	0.4
Total Rear End	22	8.1	3	1.1
Total Collisions involving disregard of a traffic control device	1	0.4	0	0
Total Injury collisions involving disregard of a traffic control device	1	0.4	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1425		843	

Total collisions have decreased, right angle collisions have increased at Norton and Hudson during the study period while rear end collisions decreased. Violations have decreased from 1,425 to 843.

Intersection:	Broad @ Ford @ W Main, Go Live Date: 10/31/11, Analysis Time Period = 973 days			
Camera location(s): Eastbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	30	11.3	9	3.4
Total Injury	5	1.9	3	1.1
Total Right Angle	4	1.5	2	0.8
Total Right Angle w/Injury	2	0.8	0	0
Total Rear End	22	8.3	7	2.6
Total Collisions involving disregard of a traffic control device	1	0.4	0	0
Total Injury collisions involving disregard of a traffic control device	1	0.4	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	4871		2729	

All types of collisions have decreased at Broad and Ford. Violations have also decreased from 4,871 to 2,729.



Intersection:	W. Ridge @ Ridgeway, Go Live Date: 11/23/11, Analysis Time Period = 809 days			
Camera location(s): Eastbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	6	2.3	9	3.5
Total Injury	1	0.4	3	1.2
Total Right Angle	1	0.4	2	0.8
Total Right Angle w/Injury	1	0.4	2	0.8
Total Rear End	5	1.9	7	2.7
Total Collisions involving disregard of a traffic control device	1	0.4	0	0
Total Injury collisions involving disregard of a traffic control device	1	0.4	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1680		985	

Based on the available data at W. Ridge and Ridgeway, all types of collisions have increased since installation of the cameras. Violations have decreased from 1,680 to 985.

Intersection:	Lake @ Driving Park, Go Live Date: 12/12/11, Analysis Time Period = 931 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	39	15.3	34	13.3
Total Injury	9	3.5	14	5.5
Total Right Angle	14	5.5	19	7.4
Total Right Angle w/Injury	3	1.2	7	2.7
Total Rear End	23	9	16	6.3
Total Collisions involving disregard of a traffic control device	2	0.8	1	0.4
Total Injury collisions involving disregard of a traffic control device	0	0	1	0.4
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1688		2347	

At the Lake and Driving Park intersection, all types of collisions have decreased with the exception of right angle and right angle injury collisions which have increased. Violations have increased from 1,688 to 2,347.

Intersection:	Lake @ Ridgeway, Go Live Date: 12/12/11, Analysis Time Period = 931 days			
Camera location(s): Northbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	15	5.9	10	3.9
Total Injury	0	0	0	0
Total Right Angle	9	3.5	4	1.6
Total Right Angle w/Injury	0	0	0	0
Total Rear End	6	2.4	6	2.4
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1275		2027	

Overall total collisions and right angle collisions have decreased while rear end collisions stayed the same at Lake and Ridgeway. Violations have increased from 1,275 to 2,027.

Intersection:	W. Ridge @ Bonesteel, Go Live Date: 1/12/12, Analysis Time Period = 900 days			
Camera location(s): Eastbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	16	6.5	12	4.9
Total Injury	2	0.8	2	0.8
Total Right Angle	5	2	4	1.6
Total Right Angle w/Injury	1	0.4	2	0.8
Total Rear End	13	5.3	5	2
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	739		771	

All types of collisions have decreased at W. Ridge and Bonesteel with the exception of right angle w/injury collisions which have increased slightly. Violations have increased from 739 to 771.

Intersection:	Mt. Read @ Lyell, Go Live Date: 2/12/11, Analysis Time Period = 833 days			
Camera location(s): Eastbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	32	14	27	11.8
Total Injury	5	2.2	4	1.8
Total Right Angle	10	4.4	4	1.8
Total Right Angle w/Injury	0	0	1	0.4
Total Rear End	20	8.8	23	10.1
Total Collisions involving disregard of a traffic control device	2	0.9	1	0.4
Total Injury collisions involving disregard of a traffic control device	0	0	1	0.4
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	918		830	

Right angle collisions decreased at Mt. Read and Lyell as did violations. Rear end collisions have increased slightly.

Intersection:	Mt. Read @ Emerson, Go Live Date: 4/4/12, Analysis Time Period = 817 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	19	8.5	19	8.5
Total Injury	9	4	5	2.2
Total Right Angle	10	4.5	4	1.8
Total Right Angle w/Injury	5	2.2	0	0
Total Rear End	9	4	15	6.7
Total Collisions involving disregard of a traffic control device	2	0.9	2	0.9
Total Injury collisions involving disregard of a traffic control device	2	0.9	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	2982		1292	

Right angle collisions have decreased at Mt. Read and Emerson, while rear end collisions have increased. Overall, the number of collisions remained the same. Violations have decreased from 2,982 to 1,292. It is noted that NYSDOT extended the clearance interval at this intersection after the cameras were installed to correct a programming error.

Intersection:	N. Goodman @ E. Main, Go Live Date: 8/10/12, Analysis Time Period = 689 days			
Camera location(s): Eastbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	20	10.6	30	15.9
Total Injury	1	0.5	6	3.2
Total Right Angle	3	1.6	1	0.5
Total Right Angle w/Injury	0	0	0	0
Total Rear End	17	9	29	15.4
Total Collisions involving disregard of a traffic control device	0	0	1	0.5
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1528		1533	

Overall total collisions at N. Goodman and E. Main have increased since the cameras were installed. The number of right angle collisions decreased slightly while the number of rear end collisions have increased. Violations have also increased slightly from 1,528 to 1,533.

Intersection:	Alexander @ University, Go Live Date: 12/07/12, Analysis Time Period = 570 days			
Camera location(s): Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	8	5.1	3	1.9
Total Injury	4	2.6	0	0
Total Right Angle	4	2.6	3	1.9
Total Right Angle w/Injury	2	1.3	0	0
Total Rear End	4	2.6	0	0
Total Collisions involving disregard of a traffic control device	2	1.3	0	0
Total Injury collisions involving disregard of a traffic control device	2	1.3	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	120		290	

All types of collisions have decreased at Alexander and University. However, violations have increased from 120 to 290.

Intersection:	Chestnut @ Court, Go Live Date: 12/07/12, Analysis Time Period = 570 days			
Camera location(s): Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	2	1.3	6	3.8
Total Injury	0	0	3	1.9
Total Right Angle	2	1.3	5	3.2
Total Right Angle w/Injury	0	0	3	1.9
Total Rear End	0	0	1	0.6
Total Collisions involving disregard of a traffic control device	1	0.6	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	286		298	

Based on the available data at Chestnut and Court, all types of collisions have increased since the cameras were installed. Violations have also increased from 286 to 298 during the study time periods.

Intersection:	S. Goodman @ 490, Go Live Date: 7/31/11, Analysis Time Period = 1002 days			
Camera location(s): Northbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	15	5.5	4	1.5
Total Injury	2	0.7	0	0
Total Right Angle	5	1.8	1	0.4
Total Right Angle w/Injury	0	0	0	0
Total Rear End	10	3.6	3	1.1
Total Collisions involving disregard of a traffic control device	3	1.1	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	2571		1641	

All types of collisions have decreased along with violations at the S. Goodman and 490 intersection.

Intersection:	Lake @ W. Ridge, Go Live Date: 11/23/11, Analysis Time Period = 950 days			
Camera location(s): Eastbound & Westbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	36	13.8	30	11.5
Total Injury	6	2.3	3	1.2
Total Right Angle	12	4.6	8	3.1
Total Right Angle w/Injury	5	1.9	2	0.8
Total Rear End	24	9.2	22	8.5
Total Collisions involving disregard of a traffic control device	5	1.9	3	1.2
Total Injury collisions involving disregard of a traffic control device	1	0.4	2	0.8
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	2493		1848	

All types of collisions have decreased at the Lake and W. Ridge intersection. Violations have also decreased from 2,493 to 1,848.

Intersection:	Mt. Read @ Driving Park, Go Live Date: 4/04/12, Analysis Time Period = 817 days			
Camera location(s): Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	4	1.8	2	0.9
Total Injury	2	0.9	0	0
Total Right Angle	1	0.4	0	0
Total Right Angle w/Injury	0	0	0	0
Total Rear End	3	1.3	2	0.9
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1666		475	

All types of collisions have decreased at Mt. Read and Driving Park. Violations have also decreased from 1,666 to 475. NYSDOT made two changes at the Mt. Read/Lexington and Mt. Read/Emerson intersections to extend their clearances to correct programming errors. No other clearance interval timing changes were made.

Intersection:	St. Paul St. @ Pedestrian Crossing, Go Live Date: 6/03/11 Analysis time period: 944 days			
Camera location(s): Northbound & Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	0	0	0	0
Total Injury	0	0	0	0
Total Right Angle	0	0	0	0
Total Right Angle w/Injury	0	0	0	0
Total Rear End	0	0	0	0
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	622		267	

No collisions occurred at this location during the study time period. Violations have decreased from 622 to 267.

Intersection:	Mt. Hope @ Elmwood, Go Live Date: 9/03/13 Analysis time period: 290 days			
Camera location(s): Southbound	Pre-Camera		Post-Camera	
	Total Crashes	Crash Rate (crashes/year)	Total Crashes	Crash Rate (crashes/year)
Total Collisions	3	3.8	7	8.8
Total Injury	0	0	2	2.5
Total Right Angle	2	2.5	2	2.5
Total Right Angle w/Injury	0	0	1	1.3
Total Rear End	0	0	5	6.3
Total Collisions involving disregard of a traffic control device	0	0	0	0
Total Injury collisions involving disregard of a traffic control device	0	0	0	0
Violations	1 <sup>st</sup> 3 months after camera installation		April 1, 2014 thru June 30, 2014	
	1023		909	

Right angle collisions remained the same between the pre- and post-camera time periods at Mt. Hope & Elmwood while rear end collisions increased. Violations have decreased from 1,023 to 909.

Overall, eight locations experienced increases in total collisions while 22 experienced decreases in total collisions; two locations experienced no change. Right angle collisions increased at six intersections, decreased at 24 intersections, and stayed the same at two locations. Rear end collisions increased at 11 intersections, decreased at 18

intersections and stayed the same at 3 intersections. Violations increased at eleven locations and decreased at 21 locations.

## V. COST ANALYSIS

Traffic crashes cost society billions of dollars every year. The costs associated with crashes exceed the costs of congestion in every metropolitan area studied by the Texas Transportation Institute in the annual Urban Mobility Report in 2012. The New York State Department of Transportation Office of Modal Safety & Security Planning & Development Bureau develops average accident cost information for State highways. The most recent NYSDOT data (includes period from August 1, 2011 through July 31, 2013) has been used to determine the average reduction in costs associated with the reduction in crashes that have resulted since installation of the red light cameras in the City of Rochester. Table IV summarizes the cost reductions.

**TABLE IV**  
**COST SAVINGS**

Collision Type	Change in Number of Collisions	NYSDOT Average Accident Cost <sup>6</sup>	Cost Savings
Total Collisions	158	NA	NA
Total Injury Collisions	40	\$93,500	\$3,740,000
Total Non-Injury Collisions	118	\$3,800	\$448,400
Total Cost Savings	-	-	\$4,188,400

The total cost savings of \$4,188,400 is a benefit that stems from the reduction in accidents as a result of the red light cameras.

<sup>6</sup> Average Accident Costs typically include economic losses such as medical costs, lost time at work, costs associated with emergency response, and vehicle repair costs.



## *VI. CONCLUSIONS & RECOMMENDATIONS*

The analysis of collisions before and after the installation of red light cameras indicates that the number and severity of collisions is reduced at the study intersections. The following list summarizes findings and recommendations resulting from this study:

1. Overall, the total number of collisions (right angle and rear end) on approaches with red light cameras has been reduced by 26%.
2. The number of collisions involving disregard of a traffic control device has been significantly reduced (a 61% decrease between before and after camera deployment).
3. The total number of red light camera violations has decreased by 30% when comparing the first three months of violations after the camera was installed to the latest three months of data.
4. Eight intersections experienced increases in total collisions while 22 experienced decreases in total collisions and two locations remained unchanged.
5. Right angle collisions increased at six intersections, decreased at 24 intersections, and stayed the same at two locations.
6. Rear end collisions increased at 11 intersections, decreased at 18 intersections and stayed the same at 3 intersections.
7. Violations increased at eleven intersections and decreased at 21 intersections.
8. It is estimated that the red light cameras have resulted in a total cost savings (collisions prevented) of approximately \$4,188,400.

Based upon the results of this study, the red light camera program has reduced the overall number of accidents, the severity of accidents, and related accident costs. Therefore, it is our recommendation that the City continue the red light camera program.