# Evaluation of the Possible Effects of Installing Red Light Cameras in Swampscott, Massachusetts




**FINAL REPORT**

Prepared By:
The Committee to Study Red Light Cameras

October 16, 2006

# Foreword

This is the final report of the Committee to Study Red Light Cameras (hereinafter "the Committee") on the results of its evaluation of the possible effects of installing red light cameras (RLCs) in Swampscott. This report was prepared at the request of the Swampscott Board of Selectmen (hereinafter "the Selectmen").

# Notice

This report is produced only for the limited purpose of information exchange and discussion. The Town of Swampscott assumes no liability for the use of the information contained in this report. This report does not constitute a standard, specification, or regulation.

Nothing in this report is to be interpreted as an endorsement of any product, service or manufacturer by the Committee or by the Town of Swampscott. Any manufacturer's name that appears in this report appears only because it is considered essential to full disclosure of the workings of the committee and/or the objectives of this report.

# Quality Assurance Statement

The Committee has attempted in this report to provide the most accurate information available within the relatively brief time available to gather and analyze such information. Though the Committee believes the information provided in the report is accurate, no guarantee to that effect is implied or should be inferred.

# Acknowledgements

The Committee would like to thank the following individuals and organizations for their assistance:

| | |
|---|---|
| David Castellarin | Town Accountant |
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| Gino Cresta | Swampscott Department of Public Works |
| Ron Madigan | Chief, Swampscott Police Dept. |
| Peter McNerney | RedFlex Northeast |
| Tom Stephens | Lieutenant, Swampscott Police Dept. |
| Ivan Sever | National Motorist Association |

The Committee also acknowledges the Selectmen for their desire to ensure that Swampscott citizens are fully informed about the implications of installing RLCs in Swampscott.

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# 1.0 Executive Summary

The primary objective of this study was to determine the public safety consequences of installing red light cameras (RLCs) at signalized intersections in Swampscott. Important but secondary objectives were: to evaluate the financial consequences to the town of installing RLCs; to examine the legal issues surrounding RLCs; and to survey the quality-of-life issues regarding RLCs.

To accomplish its primary objective, the Committee conducted a review of existing RLC literature including an in depth examination of many of the significant independent scientific studies regarding RLCs. The result of this examination showed that, though the vast majority of the studies suffered from methodological shortcomings and did not support a scientifically definitive conclusion, there was consistent support for the assertion that RLCs, when installed at properly selected intersections, do have a positive public safety benefit. This support was most evident in the more recent studies that tended to have improved statistical and scientific methodologies.

The examination also revealed that there was similar support for the assertion that RLCs increase rear-end collisions but reduce the more dangerous angle collisions at a greater percentage. The examination also clearly showed that RLCs should be installed at intersections with a high number of angle collisions and significant traffic volume, and that engineering improvements to yellow and red light phases reduced the effectiveness and thus the need for RLCs.

The Committee also obtained crash data (2002 – 2005) for all signalized intersections in Swampscott broken down by crash type. Analysis of this data revealed that, over the four year period, there has been a combined total of 10-13[1] angle crashes caused by red light running (RLR). The limited number of angle crashes, combined with the likelihood that RLCs increase rear-end crashes, led the Committee to conclude that the installation of

[1] The individual sections of this report (Section 4.1.1 through 4.1.11) detail the available crash information for each signalized intersection and explain the uncertainty in ascribing red light running as the precise cause of an angle crash.

RLCs is contra-indicated at all signalized intersections in Swampscott. Strictly on the basis of public safety, the Committee recommends against the use of RLCs in Swampscott.

Additionally, the Committee concludes that RLCs:

- Would likely be self-supporting and possibly revenue positive for the town.
- Do not violate an individual's right to privacy when used to prevent RLR.
- Cannot be placed on Rte 1A/Paradise Road without the permission of the Massachusetts Highway Department.

Finally, the Committee also recognizes that various Swampscott residents have "quality of life" concerns which, although not a determining factor in the Committee's conclusions, must be given due deference along with financial and legal issues regarding RLCs.

# 2.0 The Committee

The Selectman created the Committee upon the request of Chairman Marc Paster. The Committee was formed as a result of concerns expressed by Swampscott Town Meeting members at the regularly scheduled Town Meeting held in April of this year (2006). The Warrant Article (Appendix A.) in support of the RLCs was rejected by a narrow margin by Town Meeting members following a recommendation that more information was needed to support a full discussion.

## 2.1 The Mandate of the Committee

The mandate of the Committee to Study RLCs, as established by the Selectmen, is to provide a comprehensive examination of the issues surrounding RLCs, with an emphasis on public safety.

## 2.2 Committee Members

The Board of Selectmen appointed the following five (5) Swampscott residents to the Committee:

William Hyde (*Chairperson*): Now retired, Mr. Hyde was the Chief of the Swampscott Fire Department for twenty-eight years. After an injury ended a promising professional baseball career, Mr. Hyde joined the Swampscott Fire department and moved quickly through the ranks, becoming a Captain in five years and Chief in less than nine. Mr. Hyde also served on the Swampscott Board of Selectmen from 2003-2006. A 1954 graduate of Lynn English High School, he is married to Sally (Stowell) Hyde and together they have four sons and seven grandchildren.

Randy Chapman, Esq.: Mr. Chapman has been a trial attorney for 20 years. He formerly was an Essex County Assistant District Attorney at both the District and Superior Court levels and was also the Chief of the Motor Vehicle Homicide Unit. He is currently in private practice, concentrating in the areas of criminal defense and personal injury. He has lectured around the country on behalf of the National Highway Traffic Safety Administration, Northwestern University Traffic Safety Institute in Chicago, and the National District Attorney's Association on issues surrounding the prosecution of motor

vehicle homicide and impaired drivers. He was recently named the President-Elect of the Massachusetts Association of Criminal Defense Attorneys and is also a legal analyst for New England Cable News. Mr. Chapman is a town meeting member and resides with his wife, Sharon, and two sons.

Kelly Cunningham: Mr. Cunningham is currently Chief Operating Officer for a Software Technology Company. He holds a Bachelor of Science degree in Computer Science and has worked in the computer software industry for over twenty-three years. Mr. Cunningham is a Town Meeting Member and resides with his wife and daughter on Greenwood Ave.

Cabot Dodge: Mr. Dodge is a retired Police Officer and has worked for over twenty two years in public and private law enforcement. He holds a Master of Science degree in Administrative Studies and Organizational Policy and a Bachelor of Science degree in Criminal Justice. Mr. Dodge has been a resident of Swampscott for fourteen years where he lives with his wife and son.

Paul Levinson, Esq.: Mr. Levenson is a graduate of Brandeis University B.A. 1952 (cum laude), L.L.D. 1987 (honorary) and Yale Law School (J.D. 1955). He has practiced law since 1955. He is a past member and Chair of the Board of Selectmen, a 30-year Town Meeting Member, and has served on a number of other Town boards and committees. In 2000, Mr. Levenson received Swampscott's Distinguished Citizen Award. His other public sector experience includes service as a Special Assistant to the Governor ('63-'64), Exec. Director of the Governor's Highway Safety Bureau ('64-'66); Special Assistant Atty. General (MA '66-'71, '76-'77); and Special Counsel, Executive Office of Public Safety ('71-'75). Mr. Levenson was also in the U.S. Army Reserves from 1954 to 1963, including an Active Tour of Duty from 1955 to 1957.

# 3.0 Red Light Camera Systems

A RLC System automatically detects when a vehicle illegally enters a signalized intersection and takes a photograph or video (or both) of the RLR infraction. Those with proper jurisdictional authority then review the evidence and determine whether to issue a ticket for the infraction.

After being used extensively overseas for more than a decade, the use of RLC systems has recently risen dramatically in the U.S.[2]. This widespread adoption of these programs has also given rise to a strong desire on the part of the general public to understand how RLCs work, how effective they are at improving public safety, what threat, if any, they pose to privacy and civil liberties, and how they can help cities and towns improve their overall financial health.

Although RLCs utilize sophisticated technology, they are conceptually simple in design. A red-light camera system includes three basic elements:

- An image capturing device (i.e. video, digital, or analog camera)
- One or more automated triggering devices
- A computer for monitoring the traffic light and coordinating the activities of the triggering device, and the image-capturing device.

In a typical RLC system, image-capturing devices are positioned on poles at the corners of an intersection. The image-capturing device points inward to easily record cars driving through the intersection. The triggering devices detect when a car has moved past a particular point in the road. The computer is connected to the image capturing device(s), the triggers, and the traffic light. The computer monitors the traffic signal and ensures that an image is captured if a vehicle sets off the triggering mechanism when the light is red.

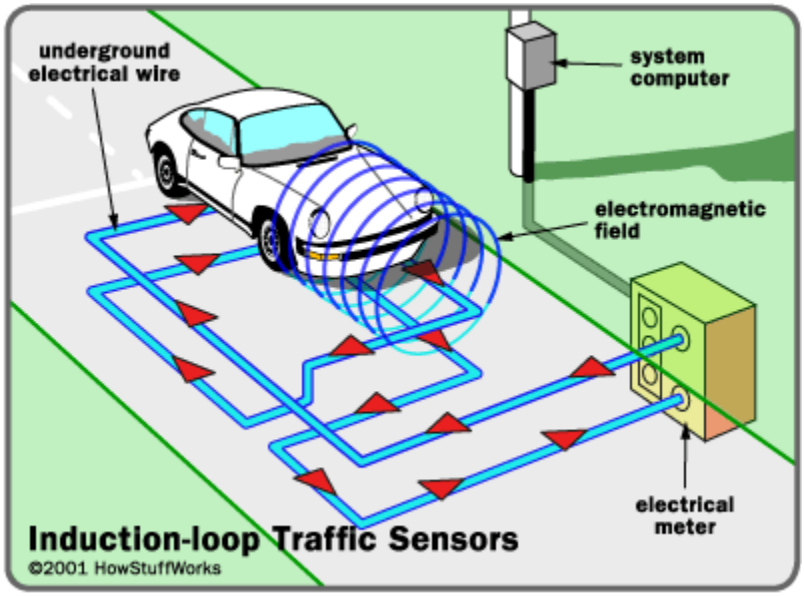
Cities and towns considering the installation of RLCs must decide upon the type of triggering mechanism to employ. The main trigger technology used in RLC systems is the induction loop. An induction loop trigger is a length of electrical wire buried just

[2] Safety Evaluation of Red Light Cameras. April 2005. U.S. Department of Transportation (DOT) Publication: FHWA-HRT-05-048. Pg. 7.

under the asphalt. Usually, the wire is laid out in a couple of rectangular loops resting on top of each other (see diagram below). This wire is hooked up to an electrical power source and a meter. The meter monitors the total inductance level of the circuit. When a car drives over an induction loop, it disturbs the loop's electromagnetic field. This changes the total inductance of the loop circuit (Figure 1).

An emerging trigger mechanism is the video loop. In this system, a computer analyzes a video feed from the intersection. As the computer receives each new video frame, it checks for substantial changes at specific points in the image. The computer is programmed to recognize the particular changes that indicate a car moving through the intersection. If the light is red and the computer recognizes this sort of change, it activates the still cameras. The main advantage of this system is that it is not necessary to dig up the road to install it, and the trigger areas can be adjusted at any time. Essentially, it is a virtual inductive-loop trigger. Additional triggering mechanisms available include: radar, laser or air-tube sensors. [3]

Figure 1.




When a car drives over an induction loop, it disturbs the loop's electromagnetic field. This changes the total inductance of the loop circuit.

[3] http://auto.howstuffworks.com/red-light-camera1.htm How Stuff Works website..

# 4.0 Red Light Running and Public Safety

RLR is a serious problem in the United States. In 2004, crashes caused by RLR resulted in as many as 854 fatalities and more than 168,000 injuries.[4]

The occurrence of RLR violations is influenced by both intersection factors and human factors. Some factors, mostly intersection related, point to the need to implement engineering countermeasures. Other factors, mostly driver related, point to the need for improved enforcement and public awareness programs.[5]

Statistically, RLR crashes are more likely to occur in urban areas, and fatal RLR crashes are more likely to occur during daylight hours. More male drivers are involved in RLR crashes than female drivers. However, for all age groups, the percentage of male drivers who ran a red light is very similar to the percentage of female drivers who ran the red light. For drivers under 40 years of age, the percentage that runs red lights is highest for drivers who are about 20 years old. For drivers over 40, the percentage of crash-involved drivers who run red lights increases with age. Younger drivers tend to be more involved in RLR situations that include night crashes, alcohol consumption, and/or suspended or revoked driver licenses. [6]

## 4.1 RLR Crash Statistics (2002-2005) for Swampscott

Pursuant to its mandate, the Committee endeavored to determine if there is a public safety need for a RLC system in Swampscott. The Committee felt that crash data specific to Swampscott would be the most accurate indicator as to the need for such a system. To that end, a public records request, directed to the Massachusetts Highway Department, yielded detailed crash data for 2002 through 2005 for eleven signalized intersections in the Town of Swampscott. The Committee examined this

[4] http://safety.fhwa.dot.gov/intersections/redl_facts.htm. U.S. DOT Federal Highway Administration (FHWA) website.
[5] Red Light Running – A Policy Review. Texas A&M, Texas Transportation Institute. March 2003. P iii.
[6] IBID

data to determine the number of angle and rear-end collisions. [7] The crash data was obtained from driver submitted accident reports and accident reports submitted by the Swampscott Police Department.

Sections 4.1.1 through 4.1.12 provide an overview of the crash data broken down by signalized intersections in Swampscott. This information was obtained by identifying only crashes listed as occurring at signalized intersections in Swampscott from the raw crash data. As will be readily apparent, incidents of angle crashes at all signalized intersections combined in Swampscott according to this data are very low, averaging a little over three crashes annually where RLR appears to have been a likely cause.

[7] Angle collisions that occurred between vehicles traveling perpendicular to each other at signalized intersections were assumed to result from RLR, though the crash data supplied did not specifically identify the cause of the accident.

# 4.1.1 Humphrey and Redington


| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 1 | 1 |
| Rear End Collisions | 0 | 0 | 2 | 0 | 2 |
| Sideswipe | 0 | 1 | 1 | 0 | 2 |
| Head-On | 1* | 1 | 0 | 0 | 2 |
| Totals | 1 | 2 | 3 | 1 | 7 |

* Vehicles traveling in opposite directions on Humphrey Street. Unlikely caused by RLR. This Crash appears twice in data, once as angle crash and another as head-on crash. Duplicate data resulted from multiple crash reports being submitted for same accident.

## 4.1.2 Humphrey and Puritan


| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 0 | 0 |
| Rear End Collisions | 0 | 1 | 0 | 0 | 1 |
| Sideswipe (SD) | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 1 | 0 | 0 | 1 |

# 4.1.3 Paradise and Burrill

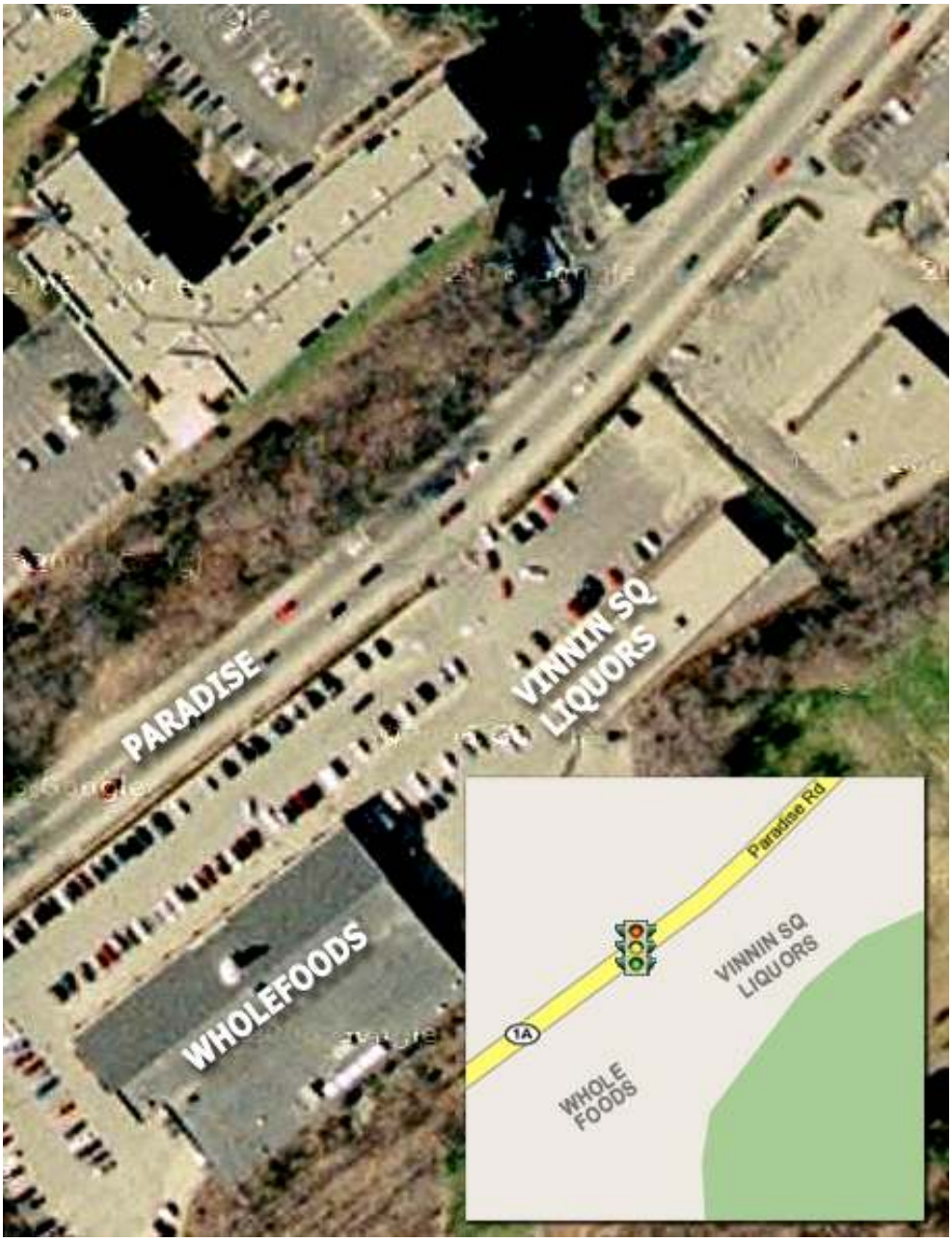

| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 2 | 5* | 0 | 0 | 7 |
| Rear End Collisions | 0 | 1** | 2 | 0 | 3 |
| Sideswipe | 1*** | 1**** | 0 | 0 | 2 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 3 | 7 | 2 | 0 | 12 |

* 2 crashes between vehicles traveling opposite directions and 1 crash between vehicles traveling in the same direction, so unlikely to have been caused by RLR violations.
** Weather condition listed as snowy.
*** Vehicles traveling same direction. Unlikely caused by RLR violation.
**** Contradictory information on direction vehicles traveling. Crash described as sideswipe, same direction - but vehicles listed as traveling right angle to each other so it is possible this was a RLR accident.

## 4.1.4 Paradise and Ellis


| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 0 | 0 |
| Rear End Collisions | 0 | 0 | 2 | 0 | 2 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 2 | 0 | 2 |

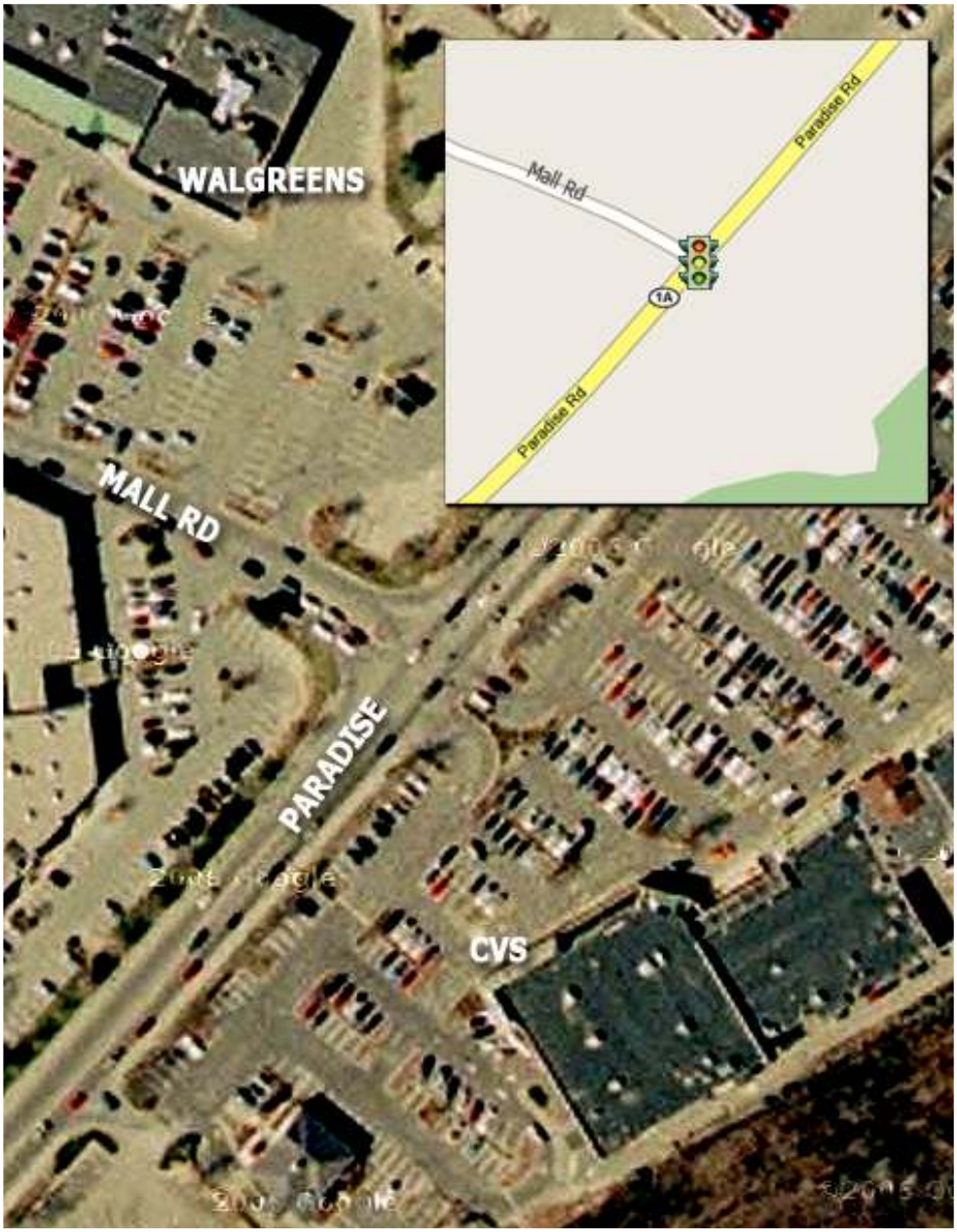
# 4.1.5 Paradise and Wholefoods




| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 1* | 0 | 0 | 0 | 1 |
| Rear End Collisions | 0 | 0 | 0 | 0 | 0 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 1 | 0 | 0 | 0 | 1 |

* Weather conditions listed as rain and snow.

# 4.1.6 Paradise and Mall Rd




| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 1 | 1 | 0 | 2 |
| Rear End Collisions | 1 | 0 | 1 | 0 | 2 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 1* | 0 | 0 | 0 | 1 |
| Total | 2 | 1 | 2 | 0 | 5 |

* Vehicles traveling in opposite directions. Unlikely caused by RLR

## 4.1.7 Paradise and Vinnin St.


| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 0 | 0 |
| Rear End Collisions | 0 | 0 | 0 | 1 | 1 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 1 | 1 |

# 4.1.8 Essex and Burpee


| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 0 | 0 |
| Rear End Collisions | 1 | 0 | 1 | 1 | 3 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 1 | 0 | 1 | 1 | 3 |

# 4.1.9 Essex and Danvers


| | 2002 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 1 | 0 | 1 | 0 | 2 |
| Rear End Collisions | 3 | 0 | 2 | 0 | 5 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 1* | 0 | 0 | 0 | 1 |
| Total | 5 | 0 | 3 | 0 | 8 |

* Vehicles traveling in opposite directions. Unlikely caused by RLR

## 4.1.10 Essex and Mall Rd


| | 2003 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 0 | 0 |
| Rear End Collisions | 0 | 0 | 0 | 0 | 0 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 0 | 0 |

## 4.1.11 Salem St. and Vinnin St.


| | 2003 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 0 | 0 | 0 | 0 | 0 |
| Rear End Collisions | 0 | 0 | 0 | 0 | 0 |
| Sideswipe | 0 | 0 | 0 | 0 | 0 |
| Head-On | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 0 | 0 |

# 4.1.12 Crash Totals

| | 2003 | 2003 | 2004 | 2005 | Total |
|---|---|---|---|---|---|
| Angle Crashes | 4* | 6** | 2 | 1 | 13 |
| Rear End Collisions | 5 | 2 | 10 | 2 | 19 |
| Sideswipes | 1 | 2 | 1 | 0 | 4 |
| Head-On | 3 | 1 | 0 | 0 | 4 |
| Total | 13 | 11 | 13 | 3 | 40 |

* 1 may have been caused by bad weather.

** 3 unlikely RLR, traveling parallel to each other, in same or opposite direction.

# 5.0 Review of Information on RLCs and their Usage

In attempting to fulfill its mandate, the Committee felt it was important to try to make sense of the vast reservoir of information available on RLCs and their usage. To do this, the Committee first identified information assets that examined any of the issues related to RLC usage. Next, the source of the asset was investigated using the Internet to determine if it was generally perceived as having a partisan viewpoint on RLCs or could be viewed as a non-partisan, objective source. Finally, each information asset was considered in terms of the scientific and statistical rigor with which it approached the topic of RLC usage. Each information asset can be categorized into one of four groups:

1. Scientifically rigorous information from an objective source
2. Anecdotal information from an objective source
3. Scientifically rigorous information from a partisan source
4. Anecdotal information from a partisan source

Information in group 1 is likely to be the most defensible. Conversely, the information in group 4 is likely to be the least defensible. However, even if an asset was in group 1, it did not guarantee that the study or information presented was without issue. Additionally, information assets designated as belonging in group 4 were not assumed to be completely inaccurate but simply less defensible in terms of overall reliability and methodological accuracy.

Since the Committee had a limited amount of time to complete its mission, the categorization of information assets allowed it to concentrate on reviewing documents that seemed likely to provide the greatest value for the time required for the review. (See Appendix B. for a list of information assets considered in the filtering process.) Inclusion in this list does not mean that the asset was reviewed or utilized in the preparation of this report, but rather that its existence was known and its usefulness considered. The footnotes and list of References identify the information assets actually used by the Committee for the preparation of this report.

As part of this review, the Committee examined past RLC studies and their findings, the effects of RLCs on public safety, and how communities across the country are responding to RLC installations.

## 5.1 Summary of Findings from Past Studies

Partisan supporters and opponents of RLCs often cite various studies in support of their positions. Even the way studies are often described (i.e. The Burkey-Obeng Red Light Camera Study, the most comprehensive government study of accidents and red-light cameras…[8]) are intended to predispose readers to their acceptance. However, almost all the major research studies conducted have suffered from methodological difficulties that subject their findings to challenge and make it impossible to draw conclusions with scientific certainty as to the benefit - or lack thereof – of installing RLCs.[9] These shortcomings have included:

- Insufficient sample size.
- Regression to the mean effects (Bias by example)
- Failure to account for RLC spillover (halo) effect
- Inconsistent reporting of crash data
- Inconsistent definition of the meaning of "red-light-running crashes"
- Changes in intersection configuration during study
- Yellow interval improvements made at time of installation of RLCs[10]

Still, in examining many of the major studies conducted on RLCs -- especially the more recent ones where the pitfalls in evaluation studies and methods are generally better handled. [11] -- there does seem to be a consistent, though again not scientifically conclusive, level of support for the suggestion that RLCs have an aggregate positive public safety benefit (1). In addition, and for the Committee's purposes, just as importantly, there are also consistent indications that RLCs reduce angle crashes but increase rear-end accidents (2). A detailed examination of most major studies conducted on RLCs appears as Appendix C. at the back of this document.

[8] http://corridornews.blogspot.com/2006/08/there-is-much-more-to-red-light.html.
[9] Safety Evaluation of Red Light Cameras. U.S. Department of Transportation. April 2005. P1.
[10] IBID. P18. (See also Table 1)
[11] IBID. P2.

## 5.2 The Effects of RLCs on Specific Intersections.

As stated, there is support for the suggestion that RLCs have an aggregate public safety benefit. However, that generalization is of limited value when trying to determine if the installation of a RLC at a specific signalized intersection in Swampscott will have a positive or negative impact on public safety.

As most people understand, generalizations do not work in reverse. You cannot examine individual events to reach a general conclusion and then insist that the general conclusion provides the means to predict with certainty an individual event. Even if, for the sake of argument, it is agreed that an aggregate analysis of RLC usage shows a positive general public safety benefit (and there are still many who would dispute this contention), it does not follow that installing a RLC at any particular signalized intersection in Swampscott (or anywhere else for that matter) will result in such a benefit.

To understand what is likely to occur at any particular intersection requires a more complete, disaggregate analysis of the various factors known to correlate (either in a determinant or predictive fashion) with successful RLC installations. These factors are:

1. Large ratio of angle to rear-end crashes
   Because the studies that show an aggregate benefit to RLCs consistently show a decrease in angle crashes and an increase in rear-end collisions, candidate intersections for RLCs should historically have more angle crashes than rear-end collisions. The reason is that intersections with low angle crashes have little room to improve public safety as a result of a RLC, while there is plenty of room for things to get worse by increasing the likelihood of rear-end collisions (3). This factor is considered the most important determinant of the public safety trade-off of installing a RLC at a given intersection.[12]

[12] Safety Evaluation of Red Light Cameras. U.S. Department of Transportation. April 2005. P. 72.

2. Significant Traffic Volume
   There is a strong correlation between the number of crashes at an intersection and the volume of traffic, also referred to as the average annual daily traffic. All other things being equal, the higher the average annual daily traffic the more crashes occur. RLCs are generally most effective at four way intersections with high traffic volume that flows freely in all directions. These types of intersections are the most likely to experience a high incidence of angle crashes. Three way intersections or intersections where the traffic does not flow freely (i.e. egress into or out of a parking lot, mall area, or side street) are not as prone to angle crashes as four way, free flowing intersections.

3. Short Cycle Lengths
   RLCs work best at intersections where the duration of the yellow light phase is low (fast yellow). Again, such intersections tend to have more RLRs resulting in more angle crashes than similar intersections with longer yellow light phases. This has given rise to the assertion that improvements in light phasing can be as effective if not more so tha RLCs in improving public safety. *A recent study concluded that an increase of 0.5 to 1.5 seconds in yellow duration (such that it does not exceed 5.5 s) will decrease the frequency of red-light-running by at least 50 percent.*[13]

4. No All-Red Phase
   Having an all-red phase (where all the sides of a traffic signal are red at the same time) strongly correlates to a decrease in angle crashes at a signalized intersection and an increase in overall public safety.[14] Without an all-red phase, there are more angle crashes, which mea RLCs have more room for improving public safety. Of course, as with yellow phasing, there is the suggestion that engineering improvements to the signal (i.e. instituting an all-red phase) is a more effective and less invasive alternative to Red Light Cameras.

5. Left Turn protected phases
   RLCs seem to be more effective at intersections that have protected left turn phases than intersections without such phasing.

The likely effect on public safety of installing a RLC at any given intersection must include consideration of these disaggregate factors. It is worth repeating that it is a critical misapplication of statistics to take a general conclusion arrived

[13] Effect of Yellow Interval Timing on Red-Light Violation Frequency at Urban Intersections. Texas Transportation Institute (Bonneson & Zimmerman), July, 2003.
[14] Driver Behavior Characteristics at Urban Signalized Intersections. Wayne State University. Detroit, MI. (Kerrie L. Schattler, Ph.D. & Tapan K. Datta, Ph.D., P.E.). P 1.

at by way of an aggregate analysis of RLCs and then to mistakenly assert that the conclusion applies to every individual signalized intersection – especially where there are known disaggregate factors that would suggest otherwise.

In analyzing the crash data for Swampscott and in formulating its conclusions and recommendations, the Committee felt strongly that the citizens of Swampscott would be best served, from a public safety point of view, by taking a close look at the disaggregate factors at each signalized intersection to understand the likely impact of installing RLCs.

## 5.3 RLC Programs in the U.S. to Date

State actions regarding RLCs have mirrored the disparity in studies regarding their effect on public safety as well as the ongoing controversy over legal and quality of life issues. While some states have banned RLCs or cancelled programs based on concerns about public safety, other states (and cities) have insisted that intersections where RLCs have been installed are safer.[15]

Twelve states and the District of Columbia have enacted legislation allowing the use of RLCs. Many states have applied certain conditions to their use including mandating that only communities over a certain size may install them. New York, for example, allows RLCs to be used only in communities with a population of 1 million or more. North Carolina has authorized their use only in certain cities and in Oregon only communities with a population greater than 30,000 may install RLCs.[16] In total, more than a 110 communities across the country employ red light cameras[17] (see Appendix D for a complete list)

In Arizona, Iowa, Missouri, New Mexico, Ohio, Rhode Island, South Dakota, Texas, and Tennessee, RLCs are in use in the absence of any specific state

[15] Red Light Cameras in Texas: A Status Report. House Research Organization. Texas House of Representatives. P. 3.
[16] IBID
[17] IBID P. 4.

statute.[18] Massachusetts' law is currently silent on the use of RLCs though HB 2023 (Honan) would authorize the cities of Boston and Cambridge to use automated traffic enforcement devices on certain roadways. However, the Bill is "stuck in committee", having been referred to the Joint Committee on Transportation on 1/26/2005.[19]

Though some cities, such as Charlotte, NC, Sacramento, CA, and Baltimore County, MD have reported decreases in accidents and violations as a result of RLCs, Virginia, Wisconsin, Arkansas, and Nevada have banned RLCs. Hawaii lawmakers cancelled a RLC program in 2002.[20]

## 5.4 International RLC Programs

Red light cameras have been used in at least 33 foreign countries since the 1970s.[21] Countries that use red light cameras include Australia, Austria, Belgium, Canada, Germany, Israel, the Netherlands, Singapore, South Africa, Switzerland, Taiwan, and the United Kingdom.

## 5.5 Compliance, RLCs, and Public Safety

In meeting with the Committee, Swampscott Police Chief Ron Madigan, stated that he favors RLCs as a tool to reduce RLR crashes and to increase compliance with the law. Unfortunately, the relationship between RLCs, compliance, and public safety is not as straightforward as it may intuitively appear. Though RLCs do appear to improve compliance, individual disaggregate factors at any given intersection may actually be accompanied by a decrease in public safety. Many studies that suggest that RLCs decrease angle crashes but increase read-end accidents also report an increase in compliance. The increase in compliance did

[18] IBID P. 3.
[19] http://www.stopredlightrunning.com/html/legislation.htm (National Campaign to Stop Red Light Running website).
[20] Red Light Cameras in Texas: A Status Report. House Research Organization. Texas House of Representatives. P. 4.
[21] Blackburn, R.R. and Glibert, D.T. 1995. Photographic enforcement of traffic laws. Washington, DC: National Academy Press.

not result in fewer rear-end collisions. At intersections with few, if any, angle crashes, RLCs are likely to improve compliance while increasing the number of rear-end collisions and thus negatively impact public safety. The increase in rear-end collisions is the cost of increased compliance using RLCs[22] and, at intersections with few, if any, angle crashes, that cost cannot be offset by the same positive benefits that accrue to intersections with more angle crashes than rear-end accidents.

## 5.6 Engineering Improvements

One concern often noted by RLCs opponents is that they actually discourage good engineering improvements regarding traffic signals. Though the three "E"s (Education, Enforcement, and Engineering) all have a role to play in preventing RLCs, engineering countermeasures appear to address the majority of the causes of red-light running.[23] Important engineering countermeasures that can improve safety and reduce RLR include:

- Improved Signal Visibility: 40% of drivers say they did not see the signal or thought it was green.[24] Countermeasures to improve signal visibility include redundancy, increasing the size of signal display (allows earlier sighting of signal), replacing incandescent light bulbs with LED bulbs, placing signals as close to the driver's line of sight as possible, providing visors for lights that receive direct sun, and providing backplates for improved contrast.

- Optimal Placement and Number of Signal Heads: Overhead mounted signals are more effective than pole-mounted signals. Pole-mounted signal heads pose three main challenges: lack of conspicuity; mounting locations may not provide a display with clear meaning and; and line-of-sight blockage. However, a combination of pole mounted and overhead mounted signals can provide extra conspicuity.

- Increasing the Likelihood of Stopping: Intersections should be carefully engineered so that they provide sufficient information to the motorist regarding the traffic signal. With the information provided at the right time and place, the probability that a driver will stop for a red signal may

[22] Safety Evaluation of Red Light Cameras. U.S. Department of Transportation. April 2005. Page 28.
[23] Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running Institute of Transportation Engineers 2003. Publication No. IR-115. Page 16.
[24] IBID. Page 17.

increase.[25] The likelihood of stopping at a red light may be increased at any given intersection through: signal ahead signs; advanced warning flashers; rumble strips; left-turn signal sign; and pavement condition (the age of a road as well as the pavement material influence how easily a car will skid in inclement weather).[26]

- Signal optimization: Poor signal timings are inefficient and may cause a driver to respond recklessly. The traffic demands at each intersection must be carefully analyzed when the phase sequence and timings are developed.[27]

- Signal cycle length: Proper timing of signal-cycle lengths reduce driver frustration and the temptation to run a red light. Signal timing includes the green, yellow and red phase for each approach as well as the overall signal-cycle length. Generally, the longer the overall signal-cycle length the fewer opportunities exist for RLR.[28]

- Yellow change interval: A properly timed yellow interval is *essential* to reduce signal violations. If the yellow interval is not long enough for the conditions at the intersection (i.e. approach speed, traffic volume, etc.), motorists will violate the signal, intentionally and unintentionally.[29] A number of studies have confirmed that RLR violations decrease significantly with an increased yellow interval.[30]

- All-red clearance interval: Use of an all-red phase or clearance interval at a signalized intersection can improve the safety of an intersection significantly. However, the use of an all-red phase does not reduce RLR.[31]

Installing RLCs in low-risk environments (e.g., on roads with low volumes of traffic and no history of speed-related crashes) generates public skepticism about the motives for their use and leads to accusations that the cameras are being used to generate revenue, not to improve road safety (Associated Press, 2005) (Wilber, 2004) (Pilkington, 2003).[32] Similarly, installing RLCs in intersections that have engineering related shortcomings increases public skepticism about the stated

[25] IBID. Page 28.
[26] IBID. Page 31.
[27] IBID. Page 32.
[28] IBID.
[29] IBID. Page 33.
[30] IBID. Page 34.
[31] IBID. Page 35
[32] Speed Cameras: Effectiveness and a Policy Review. David K. Willis. Texas Transportation Institute. Texas A&M University System. Feb 2005. PAGE 7.

concern for public safety. For any given signalized intersection, engineering countermeasures may obviate the need for RLCs.

# 6.0 Financial Cost/Benefit of RLC Usage

Among the many issues the Committee was mandated to examine was what, if any, financial benefit may accrue to the town as a result of the proposed RLC program. The Committee has made concerted efforts to ascertain what revenues and costs might result from the program, but for reasons identified below it is unable to predict with any certainty the financial benefits of the various proposals. However, it does appear that, at a minimum (and barring any unforeseen legal costs), revenues from the program will likely exceed the incremental and fixed costs.

At the outset it should be noted that the Committee firmly believes that any financial benefit to the town should not be a determining factor as to whether the program should be implemented. Rather public safety concerns must be the paramount, if not the sole, determining consideration. The Committee feels that utilizing the town's law enforcement powers to raise revenue is inappropriate. [33] This issue could potentially be exacerbated if the contractual relationship between the town and the RLC vendor involves law enforcement in a revenue sharing plan.

Notwithstanding the aforementioned position, the Committee has endeavored to project revenues and potential expenditures which may result from the program. Since the revenues are based entirely on the number of red light violations, a quantitative study is critical to any reasonable projections. The Committee was not aware of any comprehensive studies in Swampscott, or in comparable jurisdictions, which would assist in ascertaining the amount of money that may be generated as a result of the program.

The Committee has received a revenue projection from the town accountant. (Appendix E.) This projection suggests that the town could realize in excess of $490,000[34] in the

[33] Certainly, effective public safety is dependent upon an adequately funded police department. The Committee has no difficulty with revenues that are generated during the course of routine law enforcement, such as issuing citations for moving violations. However, in the view of the Committee, issuing citations for the sole purpose of creating revenue is problematic, and inappropriate.

[34] The projection is that $985,000.00/year in fines will be generated, with a collection rate of 50% resulting in collected fines of $492,000.00.

first year of operation. The figure is based loosely on a RLC program in Marysville, California where similar revenues were realized. However, while Marysville is similar in population to Swampscott (approximately 14,000 residents), the nature of the intersections are significantly different, and includes a major state highway. This makes comparison to Swampscott extremely tenuous. Also, the Town of Marysville receives over $130 per ticket. This is substantially more than the maximum of $75.00 per ticket that Swampscott would receive.

If the town accountant's revenue estimate is correct there would have to be a total of 9,850 red light violations per year at four (4) intersections in town.[35] It is not clear to the Committee that the statistical evidence available through crash reports and past citations support this number of violations in Swampscott.

Throughout the process the Committee was greatly assisted by the Swampscott Police Department. However, software limitations of the department computer and vagaries in the manner which certain data was kept made the information provided of only limited usefulness. In an effort to provide the Committee with quantitative data, Swampscott Police Chief Ron Madigan ordered undercover officers to observe several intersections for red light violations. The information he developed suggests that RLR during rush hour in Swampscott is not a rare event (Appendix F.). However, what remains unclear is if the observed rate of violations would be sustained over a longer period of time (i.e. seven days a week, 365 days a year).

In addition, though the focus is often on revenues, net proceeds from RLCs do not necessarily present as positive a result. For example, the California state auditor reported in 2002 that red light cameras were not generating large amounts of revenue.[36] The financial status of only two of the state's seven camera programs was break even or better. The US General Accounting Office reported in 2003 on the contribution of federal funds to local use of photo enforcement technology and the amount of revenue generated

[35] This estimate is based on the projection of $985,500.00 gross revenue per year divided by $100/violation = 9,850 violations/year.
[36] California State Auditor. 2002. Red light camera programs. Sacramento, CA: Bureau of State Audits.

by these programs. The report found that photo enforcement program revenues were lower than program costs in three jurisdictions, while the revenues in two other jurisdictions exceeded program costs.[37]

Nevertheless, while it is not possible at this time to quantify the financial impact that might result from the installation of RLCs at signalized intersections in Swampscott, it is reasonable to conclude that net revenues will likely be positive. The greatest yield will be at the early stages of the program. Thereafter, it is highly probable that revenues will trail off as compliance increases. It is axiomatic that the revenues at the early stages will diminish as more people become aware of the cameras and adjust their driving behavior accordingly. At least one potential vendor has presented information that once the program is implemented, the amount of violations generally drops 50 to 60% in the first 13 months, or sooner. However, historically it has never been successful in completely eradicating red light violations.

As with the revenue, the potential costs associated with the program cannot be easily quantified. One reason is that the costs are dependent upon the nature of the contract with the vendor. For example, one option available to the town includes purchasing the equipment and related services for a fixed cost. Under this plan, the costs will be greater, but the town will retain all revenues. Another option includes sharing the revenue with the private vendor on a percentage basis, in exchange for the vendor incurring all fixed costs for equipment, installation and service. Still another plan appears to be a hybrid, whereby the town incurs a smaller portion of the costs, but the town keeps a greater portion of the revenue.

Regardless of which proposal is considered, there will be certain incremental and fixed costs to the town. These costs include, but are not necessarily limited to: (1) law enforcement time to review the alleged violation and issue a ticket where appropriate, (2) time of a neutral and detached hearing officer to handle appeals of tickets from vehicle

[37] General Accounting Office. 2003. Traffic enforcement: funding of automatic red-light and speed enforcement technologies. Report no. GAO-03-408R. Washington, DC.

owners [38], (3) time related to assembling evidence, producing documentation and testifying in court pursuant to a court order or summons for the records, and (4) unanticipated legal costs associated with any appeals of the program to state or federal court.

The first three costs are fairly certain and should be incorporated into any detailed cost/benefit analysis. The final cost, related to appeals to state or federal court, is more uncertain. Currently no city or town in Massachusetts has actually implemented the program.[39] Several aspects of the program present novel issues that may result in legal challenges. For example, it is unclear whether cities and towns can promulgate by-laws that effectively circumvent the mandates of the civil motor vehicle infraction law that currently exists under state law. (See next section regarding legal issues). It is also unclear whether current due process procedures in place for parking tickets are adequate for red light violations. Since Swampscott may be venturing into "un-chartered waters", the possibility of legal challenges to the program, even if they are without merit, should be acknowledged.

Again, the Committee believes that public safety considerations, and not revenue, should be the determining factor in whether to establish the program. It also concludes that an undetermined amount of revenue will likely be generated from the system, but that over time it will decrease as compliance increases. Additionally, there are certain costs that must be considered in any cost/benefit analysis, including the time of police and hearing officer(s). Finally, aside from unforeseen legal costs, it is likely that the revenues will exceed the incremental and fixed costs in implementing and maintaining the program.

[38] The Committee feels strongly that any appeal must be heard by a neutral and detached hearing officer. With no intention of disparaging any individual, the integrity of the program necessitates that the hearing officer not be associated, in any manner, with the financial success of the program. Any appearance of impropriety must be avoided.

[39] The Town of Saugus has reportedly contracted with a vendor, but has not fully implemented the program. The City of Boston is also considering a RLC program: *It Could be a Snap to Catch Red Light Runners.* Boston Globe. Oct. 4, 2006. Adrienne P. Samuels.

# 7.0 Legal Concerns

The use of RLCs has generated a number of legal concerns throughout the country. These concerns include issues regarding privacy, due process, and the fairness of punishments.[40] Additionally, one important local issue involves legal restrictions to placing RLCs on State controlled highways (i.e. Route 1A/Paradise Road) without the approval of the Massachusetts Highway Department.

The host of legal concerns being raised nationally has led both opponents and advocates of RLCs to contend that a state considering RLCs should enact a statute that explicitly allows or prohibits the use of RLCs by local municipalities.[41]

## 7.1 RLCs and the Right to Privacy

An issue often raised by the general public when discussing RLC is whether the use of the cameras violates the vehicle owner's or operator's right to be free from unreasonable search and seizure. More precisely, does the use of a camera system that captures only the license plate and possibly video of the travel of the vehicle violate a constitutionally recognized expectation of privacy? [42]

The plain answer to this question is that the cameras system(s) currently being considered do not violate the expectation of privacy of either the owner or the operator. This conclusion is the same under both state and federal constitutions.

Massachusetts General Law chapter 90 section 6 requires all motor vehicles have a registration number "displayed conspicuously thereon by the number plates furnished the registrar…". The plate must be kept clean, have clearly visible numbers and shall not be obscured in any manner. Lights must also display the plate at night such that it is plainly visible from a distance of sixty feet.

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[40] Red Light Cameras in Texas: A Status Report. House Research Organization. Texas House of Representatives. Page 6.
[41] IBID. Page 10.
[42] This section does not address "quality of life" issues that are oftentimes raised as an objection to the use of surveillance cameras by government officials (sometimes referred to as "Big Brother" watching). These issues are addressed in section 9.0 of this document.

The Fourth Amendment to the United States Constitution and Article 14 of the Massachusetts Declaration of Rights protect all citizens against unreasonable searches and seizures. This right extends to areas in which an individual has a reasonable expectation of privacy. However, as held by the United States Supreme Court, "(w)hat a person knowingly exposes to the public…is not subject to Fourth Amendment protection." Katz v. United States, 389 U.S. 347 (1967).

Recently, in Commonwealth v. Starr, 55 Mass. App. Ct. 590 (2002), and again in Commonwealth v. Muckle, 61 Mass. App. Ct. 678 (2004), the Massachusetts Court of Appeals directly addressed the issue before us. In both these cases the court held that there is no reasonable expectation of privacy in a license plate number. A license plate, which, by law, must be conspicuously displayed to the public, is not entitled to constitutional protections. Even random computer checks of number plates by the police are permissible.

The Committee believes that the use of RLCs as currently proposed does not violate federal or state constitutional law regarding the right to privacy.

## 7.2 Due Process

In addition to privacy concerns, another concern often expressed about RLCs is the problem of ensuring full due process for those who receive a citation or ticket for a violation recorded by an RLC. Lawmakers throughout the country have expressed concern about the fact that there will be times when an owner of the car will be ticketed though he or she was not driving the vehicle. "The burden of proof usually then falls on the owner to prove he or she was not driving at the time," says the American Civil Liberties Union. "This is a violation of the bedrock American principle that the accused be considered innocent until proven guilty."[43] Some states and municipalities have responded to this concern by de-

[43] http://articles.moneycentral.msn.com/Insurance/InsureYourCar/AreRedLightCamerasFairToDrivers.aspx?page=2 MSN Money website

criminalizing the RLR offense, making it akin to a parking ticket, though generally with a much steeper fine. That is currently the proposed course of action for Swampscott.

Additional concerns have been expressed that the use of RLCs promotes a presumption of guilt and does not allow an accused to confront his or her accuser as guaranteed by the 6th Amendment. Concerning the latter, it has been maintained that since: "*the actual cameras* that took the pictures cannot be brought before the court and asked to testify," that "the right to confront one's accuser is violated".[44] However, the Committee believes that due process concerns are satisfied under the current proposal since the owner will be entitled to review all evidence generated regarding the offense (i.e. pictures and/or videos produced by the RLC system). Also, the owner will be given an opportunity for a hearing before an independent hearing officer who can exercise the same discretion to dismiss a ticket that a police officer might.[45] In addition, an appeal may be pursued through the appeals court if the process violates State or Federal law.

## 7.3 Equality of Punishment and Double Jeopardy

A vehicle running a red light in a community with RLCs can be subject to unequal punishments, critics say, depending on who catches the violator. A driver caught by a RLC would likely face a ticket (that at least would be the case in Swampscott under the currently proposed RLC system) and a fine that may be lower than the one issued by a uniformed officer. Also, because, in Massachusetts, an officer issued ticket is a civil motor vehicle citation, it can add points to a driver's record and potentially raise that person's insurance rates.[46] In addition, since there are likely to be scenarios where a person who runs a red light at a treated intersection could receive a civil motor vehicle citation in addition to a ticket from the RLC, some experts believe that the offender could pay the ticket

[44] http://www.notbored.org/traffic-cameras.html notbored.org website.
[45] Red Light Cameras in Texas: A Status Report. House Research Organization. Texas House of Representatives. Page8.
[46] IBID. Page 6.

and then argue that double jeopardy applies.[47] However, this scenario is speculative since presumably the police would not issue a RLC ticket if an offender had already received a ticket from an officer. Additionally, it is doubtful that the equivalent of a parking ticket would actually trigger the protections of the double jeopardy clause.

## 7.4 Placement of RLC on State Highways

One issue which has plagued the Committee throughout its fact finding stage is whether the Town of Swampscott will be permitted to place RLCs on roads which are under the jurisdiction of the Massachusetts Highway Department. In particular, will the town be allowed to put cameras at intersections on Route 1A, also known as Paradise Road? This issue is critically important since many of the most highly traveled intersections are on Paradise Road.

Massachusetts General Law c. 85 section 2 (see Appendix G.), provides that the Massachusetts Department of Highways has jurisdiction over the construction and maintenance of all traffic signals on state highways. It appears Section 2 mandates written approval of Massachusetts Highway Department before installation of RLCs on Paradise Road. Specifically the section reads, in relevant part, that any city or town "rule, regulation, order, ordinance or by-law shall not take effect until approved in writing by the (highway) department, or be effective after such approval is revoked, if made or promulgated relative to or in connection with the following: (1) any way at its intersection or junction with a state highway…"[48]

[47] IBID. Page 11.

[48] In some circumstances written approval may not be required if the change by the city or town has been pre-approved by Mass Highway in its manual on uniform traffic control devices. See M.G.L. c. 85, section 2 ("Except as hereinafter provided, any rule, regulation, order, ordinance or by-law… made or promulgated relative to or in connection with the erection or maintenance of signs, traffic control signals, traffic devices, school zones, parking meters or markings on any way within its control shall take effect without department approval provided… conformance with the department's current manual on uniform traffic control devices and the department's sample regulation for a standard municipal traffic code."). To the best of the Committee's knowledge, a red light camera program has not been approved in the Massachusetts Highway Department manual on uniform traffic control devices, or the sample regulation.

The purpose and spirit of Section 2 appears twofold. One purpose is to ensure uniformity among various intersections throughout the state highway system. Another purpose is to prevent cities or towns from creating changes that interfere with the unobstructed travel of citizens from neighboring towns. For example, when a city or town passes a by-law that excludes travel between cities or towns linked by a state highway, public notice must be given to neighboring cities and towns, as well to the abutting jurisdiction's chief executive officer.

As a result of this dilemma regarding Route1A/Paradise Road, the Committee contacted William F.M. Hicks, Legal Counsel to the state Executive Office of Transportation (EOT). EOT has statutory authority over Massachusetts Highway Department. Mr. Hicks informed the Committee, by E-mail, of the current position of Massachusetts Highway Department regarding RLCs. Mr. Hicks reported, *"I am informed that Massachusetts Highway Department currently does not allow the placement of such cameras on its facilities. As for their placement on locally owned posts, that is a local matter beyond Massachusetts Highway Department's purview."*

The Committee has also contacted Gino Cresta, head of Swampscott's Department of Public Works, and he is in agreement that Massachusetts Highway Department must approve the installation of RLCs on Route 1A/ Paradise Rd.

Currently, until Massachusetts Highway Department alters its position regarding RLCs, the system cannot be placed at any intersections on Route 1A/Paradise Road.

# 8.0 Quality of Life Issues

Unlike public safety, financial projections, and even legal analysis, examining the quality of life issues that surround the question of installing RLCs is primarily about personal philosophy. Stated another way, even if the town can legally install RLCs and it is fiscally sound to do so, should it be done? Do the town citizens want this technology at its signalized intersections? To say that this makes agreement more difficult and resolution that much harder is to understate the obvious. Yet the need for a full consideration of how RLCs will affect the quality of life in Swampscott, both short and long term, is of vital concern to many Swampscott residents and, therefore, must be discussed. The most readily identifiable quality of life issues the Committee examined are concerns about "Big Brother" and the potential for "Mission Creep."

## 8.1 Concerns about Big Brother

The phrase "Big Brother" owes its popular meaning to George Orwell's classic anti-totalitarian novel 1984. In the fictional 1984, the state (Big Brother) penetrated all facets of everyday life, institutionalizing a totalitarian debasement of language and morality[49]. 1984 depicts a world that has been reduced to absolute governmental control over all areas of life, banishing the freedom to love, read and even think freely.[50]

In terms of RLCs, the analogy of Big Brother is used to convey the concern that government monitoring and control of everyday life will increase.
The undeniable fact is that, by definition, RLCs will increase government monitoring of everyday life. Although monitoring is extensively done by private businesses, such as banks, increased government monitoring of citizens through technology should not be taken lightly. This principle has been embodied in both

[49] http://www.nationalreview.com/goldberg/goldberg032202.shtml Big Brother, My Butt. NRO website. Jonah Goldberg.
[50] http://foi.missouri.edu/civilliberties/orwell.html Do Orwell's predictions come true? The Freedom of Information Center website. Derek Shaw.

state and federal laws that limit the use of wiretapping to situations where traditional law enforcement techniques are not effective (i.e. penetrating organized crime)[51]. Though RLCs are not in any manner as intrusive as wiretapping, it is still reasonable to consider whether the technology is necessary if traditional methods of law enforcement are available and effective.

In addition, to the extent that their purpose is to reduce RLR, RLCs are also intended to control behavior. However, control of this type of overtly illegal behavior is not generally the area of concern of those who object to RLCs. Rather, the "Big Brother" objection relates to two other potential consequences of RLCs: (1) that their use eventually exceeds their initially stated purpose (i.e. "mission creep" covered in Section 9.2); and (2) that the data collected is used illegally or surreptitiously or for purposes other than originally intended.

Illegal use of the data by so called "hackers" can be aggressively prevented using standard data retention and security practices. However, surreptitious use of the data by law enforcement or government agencies is also a concern and would likely be more difficult to detect and prevent.

In an audit of seven local governments, the state of California discovered that six acknowledged that they have used or would use the photographs for purposes other than enforcing red light violations, such as investigating unrelated crimes.[52] While this type of use may be expected by many and encouraged by some, it nevertheless demonstrates the ease with which the technology can be exploited beyond its originally defined purpose.

The problem becomes even more vexing once private parties seek to "harvest" the information for other purposes. For instance, it appears likely, if not certain, that, in the future, insurance companies would seek to determine, using RLC data, if their insured vehicles are being negligently entrusted to third parties. Although

[51] M.G.L. c. 262, sec. 99
[52] Red Light Camera Programs. California State Auditor's Report. July 2002. Page 13.

the RLC data is not intended to be used to affect a vehicle owner's insurance premiums, it will be difficult to limit the manner in which third parties attempt to exploit the information.

The audit also revealed that vendors often retain the data for an unspecified period, usually from 3 to 5 years, but do not indicate, as required by California law, why such a long retention period is necessary. Vendors, the audit states, are retaining a significant number of photographs well beyond the time their legitimate use has ended.[53]

As part of one vendor's presentation, the Committee has been shown still photographs and video of actual red light violations and related accidents. While this was helpful to understand the technology, it does raise concerns about whether private vendors claim some type of proprietary interest in the evidence and whether it will use evidence from Swampscott RLCs as part of future sales campaigns.

## 8.2 "Mission Creep"

Several Swampscott citizens have spoken publicly and privately to members of the Committee to express concerns about the potential for the use of RLCs to be expanded beyond their initially stated purpose of reducing RLR. Even the American Civil Liberties Union does not object to the idea of RLCs but rather to their potential for other, more expansive uses. The ACLU advises against the use of RLCs that use video recorders since they believe that such devices are easily converted to general surveillance use.[54]

Indeed, technology is often said to be ethically neutral, intrinsically neither good nor bad. However, the use of any technology implies a certain context. For instance, automobile technology implies the context of roads laid upon the

[53] IBID. Page 23.
[54] http://www.aclu.org/privacy/spying/15369prs20000713.html ACLU Responds to Plan to Use Surveillance Cameras to Track Drivers Who Run Red Lights. ACLU website.

landscape, oil to run the cars, and huge institutions to find the oil, pump it and distribute it.[55]

RLCs are generally considered in the context of a partnership with a "for profit" company that installs and maintains the RLCs and earns revenues from detecting RLRs. Within this context, the private company will have a fiduciary responsibility to its owners or shareholders to optimize its profit. This fiduciary responsibility will naturally cause the company to act in its own best financial interest and not in the town's interest. The company's interest in RLCs in Swampscott, or any other town for that matter, will be to expand their use in a way that increases or at least ensures a certain financial return.

One area where the use of RLC technology may be easily expanded is speed enforcement. Currently imbedded in at least one system is radar detection systems which can be easily used to issue speeding tickets to the owners of the cars. For example, town officials in Saugus, MA have voted to authorize the use of the RLC technology to issue violations for speeding.[56]

The Committee acknowledges the very real possibility of "mission creep" as well as the almost certain pressure from vendors advocating for the expansion of the use of their product, if Swampscott were to decide to install RLCs. Recommendations for dealing with these issues if a RLC program is adopted appear in Section 10 of this report.

[55] Questioning Technology, edited by John Zerzan and Alice Carnes. New Society Publishers.
[56] Smile, you're on catch 'em camera. By Chris Stevens. Lynn Item. *Thursday, September 28, 2006*

# 9.0 Conclusions of the Committee

After extensive investigation and deliberation the Committee unanimously reaches the following conclusions regarding the use of red light cameras (RLC) in the Town of Swampscott[57]:

1. RLCs can have a positive public safety benefit at properly selected signalized intersections;

2. In particular, RLCs have proven effective in reducing the more injurious and destructive angle crashes;

3. However, the use of RLCs has also resulted in the increase of rear-end crashes;

4. As a result, RLCs should only be installed where there are significantly more angle crashes than rear-end crashes;

5. RLCs should generally only be installed at intersections where there are at least two major roads intersecting, presenting the increased likelihood of angle crashes;

6. Conversely, RLCs are generally not appropriate for intersections where a major road meets a side street or parking lot because of the low likelihood of angle crashes;

7. Several measures, which do not involve the use of RLCs, have proven to significantly increase public safety without the need for RLCs (some of these measures have already been implemented by the Town of Swampscott). These measures include, but are not limited, to:
    - Lengthening the yellow light phase at a signalized intersection;
    - The use of an "all red" phase at a signalized intersection (all lights at the intersection are simultaneously red for one to two seconds);

8. A history of motor vehicle accidents and their causes, are the single best indicator of the need, or lack of need, for RLCs on the basis of public safety;

9. Due to several factors, including engineering, Swampscott's signalized intersections experience few angle collisions (approximately 3 annually);

9. Swampscott's signalized intersections experience slightly more rear-end accidents (approximately 5 annually) than angle collisions;

[57] These recommendations are based exclusively on public safety factors. Financial benefits that may accrue to the town as a result of the program, while recognized in this report, are not the basis for the foregoing conclusions.

10. Whereas the available data does not demonstrate a public safety problem in Swampscott with angle crashes, RLCs are contra-indicated at all signalized intersections in Swampscott;

11. Plainly stated, since RLCs can result in an increase of rear-end accidents, their installation may actually create a public safety problem where one did not previously exist;

12. It is unknown how many red light violations occur in the Town of Swampscott on an annual basis. Undoubtedly, some of these violations create a public safety concern. Others may be categorized as compliance problems (i.e. jumping a red light on an empty street at 3:00am). Nevertheless, to the extent that there is a problem (public safety or compliance), traditional law enforcement methods should be implemented and utilized. Since the town shares in all proceeds from tickets written by law enforcement officials, these revenues should fully support increased expenditures towards traffic law enforcement;

13. RLCs should not be installed solely for revenue enhancement.

14. An additional impediment which has been recognized by the Committee, but which did not influence its final conclusions, is that RLCs cannot be placed on state highways (Rte 1A/Paradise Rd) without permission from the Massachusetts Highway Department and such permission is unlikely at this time or in the foreseeable future.

In summary, the Committee believes that red light cameras, while effective public safety tools in the right circumstances, are <u>not</u> appropriate at the Town of Swampscott signalized intersections. Accident information for the past five years simply does not support the necessity for the cameras. To the extent that there is a problem with RLR, traditional law enforcement tools are available to address it.

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# 10.0 Recommendations of the Committee

As stated in the preceding section, it is the unanimous conclusion of the Committee that based on public safety concerns, RLCs are contra-indicated at all of Swampscott's signalized intersections. The Committee, therefore, must recommend against the installation of RLCs in Swampscott.

However, the Committee fully recognizes that its recommendation is not binding on the Selectman or Town Meeting. Mindful of its mandate to provide thoughtful and balanced insight and recommendations to the town, the Committee makes the following additional and contingent recommendations should the program be approved:

1. Any contract negotiated by the town should carefully consider a limited duration with the greatest degree of flexibility in the event that the RLC program is unsuccessful as a public safety tool, becomes cost prohibitive, or is successfully challenged in court.

2. Contract standards should be tied to a reduction in the number of red light violations, not simply operational standards (i.e. the time the equipment is functioning properly.)

3. The contract should set limits on data retention by the vendor, provide for periodic auditing to ensure the negotiated data retention policy is strictly followed, and prohibit the unauthorized use of the information by the vendor (i.e. use of pictures or video for promotional purposes).

4. To the extent reasonably possible, the vendor should incur any costs associated with legal challenges to the system.

5. An impartial and detached hearing officer who is not related to the fiscal success of the program should be appointed to avoid the appearance of impropriety.

6. The Selectman and Town Meeting should be provided annually with all statistical data related to the program, including its effect on public safety.

7. Any enacting legislation, including home rule petitions and by-laws, should strictly prohibit the use of the information for unauthorized or intended purposes;

8. Any enacting legislation, including home rule petitions and by-laws, should strictly prohibit expansion of the program beyond its intended purpose of issuing

tickets to vehicle owners for red light violations. This includes prohibiting the use of cameras for issuing speeding tickets.

9. The capabilities of the RLC technology should be limited (still photographs versus streaming video) to what is reasonably necessary to accomplish the goals of the program. A determination, outside the scope of this report, should be made as to whether still photographs are sufficient to determine if a violation occurred or whether streaming video is essential for the defense of the accused violator.

# Appendix A

## April 2006 Town Warrant

ARTICLE 30. To see if the Town will vote to adopt a General By-Law and/or to authorize the Board of Selectmen to seek special legislation authorizing the use of a photographic traffic monitoring system, also referred to as a so-called "automated red light enforcement" system, which will record digital images, or images on other types of media, of vehicles proceeding through red lights at intersections where monitoring equipment is installed and authorizing the Swampscott Police Department to take enforcement action against the owners or lessees of vehicles who the Swampscott Police Department determine, based upon the images captured by the traffic monitoring system, proceeded through red lights; said bylaw or special legislation will also address various issues relative to implementation of said traffic monitoring system, including the specific processes for enforcement of violations and maintaining and using data collected by the photographic monitoring system, or take any other action relative thereto.

Sponsored by the Town Administrator

Comment: This Article will add to the Town's General By-Laws the language necessary to implement a video traffic enforcement system.

# Appendix B

## Information Assets by Category

(Category determined by two attributes: Bias and Methodology)

<u>Independent, Scientific</u>

- Safety Evaluation of Red Light Cameras. Department of Transportation (DOT) April 2005
- Detailed Investigation of Crash Risk Reduction Resulting from Red Light Cameras in Small Urban Areas (Urban Transit Institute) July 2004.
- Impact of Red Light Camera Enforcement on Crash Experience (TRB) 2003.
- Synthesis and Evaluation of Red Light Running Automated Enforcement Programs in the United States (DOT) September 1999.
- Red Light Cameras Operational Guidelines (DOT)
- Making Intersections Safer (FHA)
- A Long Term Study of Red Light Cameras and Accidents (Australian Road Research Board).
- Development of Guidelines for Identifying and Treating Locations with a Red-Light-Running Problem. (Texas Transportation Institute)
- Effect of Red Light Camera on Accident Risk at Intersections
- EVALUATION OF THE RED LIGHT CAMERA ENFORCEMENT PILOT PROJECT (Ministry of Trans. Ontario)
- AN EVALUATION OF RED LIGHT CAMERA (PHOTO-RED) ENFORCEMENT PROGRAMS IN VIRGINIA
- Red Light Running Behavior at Red Light Camera and Control Intersections. (Monash University)

<u>Independent, Anecdotal</u>

- Photo Enforcement Program Review (City of Winnipeg Audit Dept)
- D.C. Red-Light Cameras Fail to Reduce Accidents (Washington Post)
- Hitting Breaks on Red Light Cameras (Washington Post)

<u>Partisan, Scientific</u>

- A Review of: Detailed Investigation of Crash Risk Reduction Resulting from Red Light Cameras in Small Urban Areas (Insurance Institute for Highway Safety)
- Insurance Institute for Highway Safety Red Light Running Web Site (Some References)

<u>Partisan, Anecdotal</u>

- ACLU Responds to Plan to Use Surveillance Cameras to Track Drivers Who Run Red Lights (Press release)
- Insurance Institute for Highway Safety Red Light Running Web Site (Some References)
- The Red Light Running Crisis (The Office of the Majority Leader. House of Rep).
- the National Campaign to Stop red Light Running Website

# Appendix C

## Detailed Examination of Previous RLC Studies[58]

A number of detailed RLC studies have been conducted over the last 25 years, starting in Australia in 1981. Though there is a general suggestion in favor of the conclusion that RLCs improve public safety by reducing angle crashes while increasing less injurious and less destructive rear-end collisions, almost all the studies suffer from severe methodological shortcomings that make an assertion of scientific certainty untenable.

**International Studies**

The first study of RLCs was conducted in Australia in 1981 by G.E. Maisey[59]. Although the report was not obtainable on the Internet, it was reviewed by two Australian research teams who reported that the study involved one camera installation at a single intersection for 1 year compared against nine other untreated signalized intersections, beginning in July 1979. One team reported that the data for the one year suggested that the camera brought about a reduction in right-angle crashes along with an increase in rear-end crashes.[60] The other team was critical of that conclusion, however, pointing out that a follow-up two year comparison showed that before and after crashes were similar and that Maisey's claim of significant difference between the before and after was incorrect because of a misinterpretation of the chi-square value.[61]

A study, performed in Melbourne, Australia included 46 camera-equipped intersections (treatment sites) and 50 non-equipped or untreated signalized intersections as control sites. The treatment and control sites were selected to be as similar as possible with

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[58] Most of the information, though not all, in this appendix was summarized from: *Impact of Red Light Camera Enforcement on Crash Experience*. Transportation Research Board. NCHRP Synthesis. 2003. Where possible, attribution is given to the original study in the footnotes that follow, though the overall source for the information remains the NCHRP Synthesis.

[59] The Effect of a Mechanical Surveillance Device on Urban Signalized Intersection Accidents. Maisey, G.E. *Research and Statistics Report No. 17*, Road Traffic Authority, Perth, Western Australia, 1981.

[60] *Evaluation of the Red Light Camera Program and the Owner Onus Legislation*, Report SR/88/1, Road Traffic Authority, Victoria, Australia, 1988. South, D., W. Harrison, I. Portans, and M. King.

[61] *A Long Term Study of Red LightCameras and Accidents*, Australian Road Research Board Ltd., Victoria, Australia, February 1995. Andreassen, D.

regard to geometrics and speed limits. The before period was from 1979 to 1984, and the after period from 1984 through 1986. To normalize the difference in time periods, a crash-per-year statistic was used  The statistical analysis method used to compare the treatment and control sites was a 2 by 2 contingency table analysis using a chi-square test for independence.  In the initial reporting of the results, it was reported that there was a statistically significant reduction in right-angle crashes, with no statistically significant changes in all other categories.[62] However, it was later discovered that the results were miscalculated and that the observed right-angle crash reduction was also not statistically significant.[63]

In 1987, a RLC program commenced in the Sydney metropolitan area. Camera housings and signs were installed at 20 locations from January 1988 to June 1989, and six cameras were circulated among the sites. A study of the crash effects was undertaken by the New South Wales Roads and Traffic Authority.  The study, published in 1993, included 16 intersections with cameras and another 16 intersections as control (the control sites were matched on the basis of crash history, traffic volume, and intersection configuration).  A 2-year before (1986 and 1987) and 2-year after (1989 and 1990) analysis period was used. The report provides several before-and-after comparison tables, with percent changes reported. Also, a log-linear analysis was performed, though not much information is provided on the statistical methodology. The researchers concluded: that RLCs, in general, appeared to reduce right-angle and right- (left-) turn against crashes, and to increase (to a smaller extent) rear-end crashes and that the overall crash severity was reduced;  that visible RLC hardware (signposting, signs, and housing for cameras) appeared to be effective at reducing right-angle and right- (left-) turn against crashes, when present but not in use at active sites;  that other countermeasures to the target crash types, such as turning lanes, S-lanes, and additional signal phases, also appear to be as effective as RLCs;  suggested that there might not be any spillover (or halo) effect on RLR crashes at noncamera sites, though it bears noting that RLC warning signs were

[62] *Evaluation of the Red Light Camera Program and the Owner Onus Legislation*, Report SR/88/1, Road Traffic Authority, Victoria, Australia, 1988. South, D., W. Harrison, I. Portans, and M. King.
[63] *Impact of Red Light Camera Enforcement on Crash Experience*.  Transportation Research Board. NCHRP SYNTHESIS 310. 2003.  Page 13.

posted at treated intersections only . *The analysis of the crash experience also led the researchers to conclude that red light cameras should be limited to locations with a clear history of RLR crashes.*[64]

The RLC program in Adelaide, South Australia, began in July 1988. Five cameras were rotated among 15 sites, marked with signs, in the metropolitan area. The South Australian Department of Transport, evaluated the effectiveness of the program by comparing the crash change at 8 RLR camera sites with that of 14 similar untreated sites for 5 years before vis-à-vis 5 years after installation. Also, there was a third set of five sites where, in addition to cameras, there were significant changes in signal phasing and/or road geometry. The researchers drew the following conclusions from their analysis: Although there were observed reductions in casualty producing crashes, because of a lack of statistical significance, there was no evidence that the cameras were effective in preventing crashes; the sites with RLR cameras and the other modifications showed significantly greater crash reductions than did the control group, but the effects of RLR cameras could not be isolated; there was a strong improvement in crash rates at all sites, which was attributed to general improvements in road safety and the implementation of 4-s yellow phasing (increased from 3 s) that was introduced throughout the metropolitan area at the same time as the RLR camera program. The researchers also noted two methodological issues inherent in the analyses that are prevalent in most of the studies discussed in this synthesis: the small number of intersections may have prevented a statistical detection of small effects and that RLCs were installed at high crash intersections and therefore the control group are not strictly comparable with the treatment group. The regression-to-mean effect could have influenced the results.[65]

In 1995, a study of the long-term effect on crash types of red light cameras at 41 signalized intersections in Melbourne, from 1979 to 1989 concluded that the installation

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[64] *An Evaluation of Red Light Cameras in Sydney*, Road Safety Bureau, RN 1/93, Roads and Traffic Authority, New South Wales, Australia, 1993. Hillier, W., J. Ronczka, and F. Schnerring.

[65] *Evaluation of the Effects of Installing Red Light Cameras at Selected Adelaide Intersections*, Office of Road Safety Report Series 7/94, South Australia Department of Transport, Adelaide, 1994. Mann, T., S. Brown, and C. Coxon.

of RLR cameras at the 41 sites did not provide any reduction in crashes. Rather, there were increases in rear-end and adjacent approaches (right-angle) crashes on a before-and-after basis and also by comparison with changes in crashes at signalized intersections. However, there were inherent analysis deficiencies in his study: not properly accounting for regression to mean and not considering the possible spillover effect. The data analyzed covered 11 years, during which there were many changes in the composition of both treated and untreated sites, as indicated by the author, as well as the introduction of an extensive area wide speed camera enforcement program in Melbourne.[66] (Note: a simple correlation analysis was undertaken for RLR data in a 1995 study conducted by Monash University Accident Research Centre to confirm Andreassen's conclusion. The Monash study concluded: that there was no significant relationship between the frequency of crashes at RLC and non-RLC sites and differences in RLR behavior; and revealed no significant relationship between the frequency of crashes at RLC and non-RLC sites and differences in RLR behavior.[67])

A 1997 British study examined the combined effects of 21speed cameras and 12 RLCs at selected trunk road locations in West London and looked at the overall effects in the area. This was a simple before-and-after comparison using 36 months for each period and a comparison group consisting of nontrunk "A" class roads external to the trunk road study area. For the camera portion of the evaluation, a 16% decrease in "disobeyed traffic signal" crashes was observed, but it was deemed to be statistically insignificant. Had there been a conclusion that RLR cameras reduced crashes significantly, then there would be a concern that the speed cameras would have influenced this result. [68]

In 1991, in Glasgow, Scotland, RLR cameras were installed at six signal-controlled intersections. While the cameras were operational, only warnings were issued until

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[66] *A Long Term Study of Red Light Cameras and Accidents*, Australian Road Research Board Ltd., Victoria, Australia, February 1995. Andreassen, D.

[67] Monash University Accident Research Centre - Report #73 – 1995. S. Kent, B. Corben, B. Fildes & D. Dyte. Page X.

[68] London Accident Analysis Unit, *West London Speed Camera Demonstration Project: An Analysis of Accident and Casualty Data 36 Months "After" Implementation and Comparison with the 36 Months "Before" Data*, London Research Centre, Environment and Transport Studies, London, United Kingdom, July 1997.

1993, at which time fines were levied. The findings were as follows: A 69% reduction in the total number of RLR violations; a violation rate (violations as percentage of number of opportunities for violation) that fell from 6.1% to 2.2%, a significant reduction in the number of violations that occurred a longer period into the red-signal phase; a 62% reduction (70 crashes to 27 crashes) in the number of injury crashes. Unfortunately, there is no indication that the crash or violation reductions were compared with any control site crash experience. Thus, although large reductions were observed for, the study is neither complete nor conclusive with regard to the total safety benefit.[69]

In 1996, a subsequent and more comprehensive analysis of the Glasgow RLC program was conducted. The analysis noted the overall decline of 25% for signalized intersections in Glasgow was similar to Scotland's national decline of 20%. Furthermore, it was noted that there was a "substantial drop in crashes in 1993, which was not matched at the national level and coincides with the introduction into full operation of the red light cameras." However, not mentioned is the upturn in 1994 for all intersections in Glasgow that was then reversed for signalized intersections in 1995. The largest reduction (32.7%) in RLR-related injury crashes was in the area most remote from the camera locations. The analysis states that this "demonstrates that other factors such as junction improvements, local traffic management and increased pedestrian and driver vigilance may have been important in reducing RLR crashes across the whole area." Another interesting finding was that a reduction in RLR-related crashes involving buses and taxis was the only category subject to significant change. The analysis conjectures that the level of awareness of the use of the cameras would be greater among professional drivers.[70]

The safety impact of RLR camera systems installed at a large number of signalized intersections in Singapore, during a 5-year program that started in August 1986, was reported in 1997. At the time of the report, about one in five signalized intersections was covered by one to three camera

[69] http://www.scotland.gov.uk/cru.resfinds/drf7-00.htm "Running the Red and Evaluation of Strathclyde Police's Red Light Camera Initiative," The Scottish Office, Central Research Unit, Edinburgh, 1995. Winn, R.,

[70] www.scotland.gov.uk/cru.resfinds/drf23-0.htm. Accidents at Signal Controlled Junctions in Glasgow," The Scottish Office, Central Research Unit, Edinburgh, 1996 [Online]. Fox, H.,

systems. (This would make Singapore the highest number and density location for RLR camera systems.) The researchers undertook different crash analyses. One was designed to review the trend of crashes at 125 camera locations over several years. The study shows a nearly steady decline in average annual crashes at camera locations since 1986, when the first stage of cameras was installed. The study noted that the decline occurred despite a 22% growth in vehicle population and a general flat crash trend among the population of signalized intersections. Another analysis examined the before-and-after change in crash types at the camera locations. Although as recognized by the authors the reductions are impressive, there is no certainty that they are due solely to the cameras. To better isolate the treatment effect, they compared the crash counts at 42 treatment locations to equivalent comparison locations that had an average "similarly high accident counts." The analysis period was a 3-year before and 3-year after, with the exclusion of the first phase of implementation to account for any novelty or familiarization effects. The treatment group had 26%, 22%, and 26% reductions in right-angle, rear-end, and all collisions, respectively, compared with 18%, 27%, and 19% reductions for the comparison group. Thus, the net effect on right-angle and total collisions was concluded to be 8% and 7%, respectively, with a slight increase of 5% in rear-end collisions. None of the changes, however, were found to be statistically significant based on a chi-square test.[71] Although using a comparison group strengthened the analysis and resulting conclusion, it did not fully account for possible regression to mean. It would have been better to select the comparison group based on equivalent volumes. Also, the comparison group came from a group of sites distributed geographically similar to that of the treatment group. There could have been a spillover effect wherein the behavior at the RLR cameras locations was carried over to other noncamera locations. If so, then the safety effects at the treatment sites and overall sites might have been considerably underestimated.[72]

**U.S. Studies**

One of the most widely publicized evaluations of red light cameras was that done for Oxnard by Retting and Kyrychenko of the Insurance Institute of Highway Safety. Oxnard was one of the first jurisdictions in the United States to employ cameras.

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[71] *The Impact of Red-Light Surveillance Cameras on Road Safety in Singapore*. Road and Transport Research, Vol. 6, No. 2, 1997, pp. 72–80. Ng, C.H., Y.D. Wong, and K.M. Lum.
[72] *Impact of Red Light Camera Enforcement on Crash Experience*. Transportation Research Board. NCHRP SYNTHESIS 310. 2003. Page 18.

*Note: the Committee considers the Oxnard Study a group 3 Information asset – that is it is being presented by an organization with a known bias in the RLC debate that is funded by a "for profit" industry group. The study itself takes a scientific approach but its predisposition towards a positive conclusion regarding RLCs and public safety seems obvious in its insistence on making the assumption that a spillover(or halo) effect exists when more credible and independent studies contend that no such conclusion can be scientifically defended and that further study on the issue is needed[73]. Without this assumption, no conclusion can be drawn regarding RLCs and public safety from this study.*

The authors compared the change in crashes for signalized and non-signalized intersections in four similar (with respect to size and crash frequency) California cities—Oxnard, Bakersfield, San Bernardino, and Santa Barbara. In Oxnard, RLR cameras were installed for one approach at 11 of their approximately 125 signalized intersections; enforcement began in July 1997. The other three cities, which did not have RLR cameras, were used as control sites to establish that any observed change in crashes found in Oxnard was due to the camera program and not to potentially confounding external factors. The evaluation consisted of comparing the before-and after crash data for both signalized and non-signalized intersections in Oxnard and the three control and comparable cities. The evaluation period was 29 months for both the before-and-after camera installation. The crash data for the 11 camera-equipped intersections in Oxnard were not isolated in the analysis. It was assumed that whatever effect cameras had on crash occurrence at the treated intersections would spill over to other untreated signalized intersections within Oxnard. It was concluded that red light camera enforcement reduced the number of crashes at signalized intersections in Oxnard by 7% and the number of injury crashes by 29%. The researchers also analyzed both right-angle and rear-end crashes separately and found that signalized intersections in Oxnard experienced a statistically significant 32% reduction in right-angle crashes and a significant 68% reduction in right-angle injury crashes. For rear-end crashes, there was a statistically

[73] Safety Evaluation of Red Light Cameras. U.S. DOT. P 65

insignificant 3% increase; no finding was offered for injury changes for this type of crash.[74]

Polk County, Florida began using RLR automated enforcement technology in September 1994 as part of an FHWA demonstration project. In 1994, an RLR camera system was placed at one intersection in four different areas within the county. As part of the demonstration project, the county implemented several public information and education strategies in 1996. Positive results (i.e., safety improvement) were reported, citing the reduction in crashes 1 year after installation (241 crashes) compared with those the year before (260 crashes). This 8% decrease was experienced in comparison with a 5% increase in Florida statewide crashes. Conclusions should not be drawn from this simple comparison study for several reasons. That there were fewer crashes in 1994 gives evidence of the regression-to-mean phenomenon and downplays the reduction found in the 1995 to 1996 comparison period. Also, using a statewide trend for a base comparison is tenuous, given the many factors that are involved in the annual change in crashes at a state level. Finally, there is some question as to whether or not there was any actual enforcement connected with the camera use.[75]

Mesa, Arizona has a program of using both photo radar speed (PRS) and red light cameras. There are 18 intersections with RLR cameras and 5 mobile/speed stations. It is not known how many signalized intersections there are in Mesa. A study was conducted to evaluate the effect of these technologies on the crash rate. This was a 2-year (1995–1996) before study versus a 2-year (1997–1998) after comparison. Twenty-four signalized intersections with the highest average crash rates were identified and divided equally into four quadrants of the city. Each of the quadrants was then assigned as an experimental (i.e. treatment) or control area. There was a decrease in all four quadrants, with the highest decrease found in Quadrant Two; however, the second highest was in Quadrant One, which was the control quadrant without either RLR cameras or PRS. When examining the data for the individual intersections, it is noted that there is a wide variation in the changes in rates. For example, in Quadrant Four, three of the

[74] Reductions in Injury Crashes Associated with Red Light Camera Enforcement in Oxnard, California. *American Journalof Public Health*, Vol. 92, No. 11, 2002, pp. 1822–1825. Retting, R.A. and S.Y. Kyrychenko.
[75] *Impact of Red Light Camera Enforcement on Crash Experience*. Transportation Research Board. NCHRP SYNTHESIS 310. 2003. Page 19.

intersections experienced an increase in the rate, albeit low, ranging from 1.1% to 3.5%, whereas three intersections experienced significantly higher reductions, ranging from –16.7% to –28.0%. There was no disaggregating of the crash data to examine how crash types changed. However, crash injuries and fatalities were evaluated. Slight reductions (–4.1 to –4.9%) in the combined injury and fatality crash rates were observed for Quadrants 1, 2, and 4, but these were not statistically significant.[76]

An evaluation of photo enforcement systems was conducted for San Diego by PB Farradyne, Inc. (*19*). San Diego deployed its first red light photo enforcement camera in July 1998 and had 19 installations by February 2000. Using crash data from April 1995 through October 2001 provided by the city, PB Farradyne, conducted several types of before-and-after analyses. First, the researchers examined how two accident types, right angle (RA) and ran signal (RS), changed compared with all other crashes at the 19 locations. The statistic used was the average crash rate per year for all locations for each type, before and after camera installation. The results indicate that RA and RS crashes were reduced by 29.8%, whereas all other crashes increased by 24.4% Subsequent examination of the non-RA/RS crashes revealed that the increase was attributed to rear-end crashes, which increased from an average of 3.3 to 4.5 (37%) per year per intersection. In another analysis of rear-end crashes, they were divided into two groups, those for approaches with camera enforcement and those without. It was observed that both groups increased, but the increase was higher for the approaches with camera enforcement (45% versus 31%). When the analysts looked at just the through movement (THM) enforcement—as opposed to the left-turn movement enforcement—they observed that there was a higher increase in rear-end crashes for the THM. The final analysis of rear-end crashes was designed to examine if the observed increase was consistent over the 4 "after" years. As shown in Figure 4, by the fourth year, the rate of rear-end crashes equaled that of the before period. The analysts note that a longer time is needed to determine if this trend will continue. Also, it should be noted that the report does not

[76] http://www.ci.mesa.as.us/police/traffic/march_1999 report.htm. Vinzant, J.C. and B.J. Tatro, *Evaluation of the Effects of Photo Radar Speed and Red Light Camera Technologies on Motor Vehicle Crash Rates*, Prepared forth City of Mesa Police Department, Arizona State University, and B.J. Tatro Consulting, March 1, 1999

indicate if the 3.3 "before" rate is for the year just preceding the implementation or an average for the before years. The RA and RS crash changes were also examined in more detail, with the following finding: decreases in RA and RS crash rates were greater for the enforced movements (46%) than for the nonenforced movements (25%); combined RA and RS crash rate reduction was greater for intersections where the THM is enforced (44%) than for those intersections where the left-turn movement is enforced (20%). The crash analysis performed for San Diego was fairly comprehensive, but the findings must be tempered by the fact that there were no control or comparison sites.

In 1998, Fleck and Smith (*20*) reported on the results to date of San Francisco's pilot red light camera enforcement program. San Francisco began issuing photo-enforcement citations in October 1996. There has been a nearly 9% reduction in injury collisions reported, a 10.5% reduction in injuries, and a 50% reduction in fatalities in the 5 years after use of the cameras compared with the 5 years before their use. In reviewing the data, it is observed that the count for injury collisions for any of the "after" years is lower than the lowest year for the "before" period. However, whether or not these reductions are statistically significant or can be attributed solely to the red light camera enforcement program cannot be determined.

In 2003 (with an update in 2004), a study by Mark L. Burkey, PH.D. and Kofi Obeng, PH.D., sponsored by the Transportation Institute at North Carolina Agricultural & Technical State University, released a study that determined that RLCs are associated with higher levels of many types and severity categories of crashes. [77] Using a large data set, including 26 months before the introduction of RLCs, they reported analyzing reported accidents occurring near 303 intersections over a 57-month period, for a total of 17,271 observations, all occurring in Greensboro, North Carolina. Employing maximum likelihood estimation of Poisson regression models, that the results did not support the view that red light cameras reduce crashes.[78] The methodology and the conclusions of this study were criticized by Sergey Y. Kyrychenko and Richard A. Retting of the IIHS,

[77] A Detailed Investigation of Crash Risk Reduction Resulting from Red Light Cameras in Small Urban Areas. Obeng & Burkey. Executive Summary.
[78] IBID

claiming that the study did not account for spillover effects at non-camera, signalized intersections and that cameras were in fact placed disproportionately at high-crash intersections (selection bias).[79] An ongoing point and counterpoint dialog has ensued from this report that demonstrates the difficulties in designing and conducting a comprehensive, scientifically defensible study regarding RLC usage.

In the October 4, 2005 Edition of the Washington Post an investigative report appeared on the effectiveness of RLCs in Washington D.C. The story concluded that "the number of accidents has gone up at intersections with the cameras" and that the "increase is the same or worse than at traffic signals without the devices".[80] Though this was essentially a news story and not a scientifically defensible, peer reviewed study, the Post article is often quoted by RLC opponents as evidence of their ineffectiveness. In fact, the story has received so much attention that the Committee decided to include this mention of it though it is considered a group-2 information asset (impartial but methodologically flawed). The story itself may be of interest, but it should not be seen as a serious study of RLC usage. In addition to the small sampling size, the story was tainted by the fact that that a change in the way crash statistics were reported and recorded was instigated between 1999 and 2000[81], the "after" period in the before and after study.

[79] Review of "A Detailed Investigation of Crash Risk Reduction Resulting from Red Light Cameras in Small Urban Areas". Sergey Y. Kyrychenko and Richard A. Retting. Page 1.
[80] Washington Post. D.C. Red-Light Cameras Fail to Reduce Accidents *By Del Quentin Wilber and Derek Willis* Page A01.
[81] Flawed analysis of red light camera program draws Institute critique. IIHS Status Report. Vol. 40, No. 9, Nov.19, 2005. Page 7.

# Appendix D

Communities Where RLCs Have Been Installed

**Arizona**
Avondale
Chandler
Mesa
Paradise Valley
Phoenix
Scottsdale
Tempe

**California**
Bakersfield
Baldwin Park
Beverly Hills
Capitola
Cerritos
Compton
Costa Mesa
Culver City
Davis
Del Mar
El Cajon
Encinitas
Escondido
Fremont
Fresno
Fullerton
Garden Grove
Gardena
Hawthorne
Indian Wells
Inglewood
Lancaster
Loma Linda
Long Beach
Los Angeles City
Los Angeles County
Millbrae
Modesto
Montclair
Montebello
Murrieta

**Colorado**
Aurora
Boulder
Denver
Fort Collins
Greenwood Village
Northglenn

**Delaware**
Dover
Elsmere
Newark
Seaford
Wilmington

**District of Columbia**

**Georgia**
Alpharetta
Atlanta
Brunswick
Decatur
Duluth
Fulton County
Georgetown
Griffin
Gwinnett County
Hapeville
Lilburn
Marietta
Rome
Roseville
Savannah
Snellville
Suwanee
Thomasville

**Illinois**
Chicago

**Iowa**

**Minnesota**
Minneapolis

**Missouri**
Arnold
Florissant

**New Mexico**
Albuquerque

**New York**
New York City

**North Carolina**
Cary
Charlotte
Fayetteville
Greenville
Indian Trail
Marshville
Monroe
Raleigh
Rocky Mount
Wilmington

**Ohio**
Cleveland
Dayton
Middletown
Northwood
Springfield
Toledo
Trotwood

**Oregon**
Beaverton
Medford
Portland

**Pennsylvania**

Oceanside
Oxnard
Pasadena
Poway
Rancho Cucamonga
Redwood City
Riverside
Sacramento City
Sacramento County
San Bernardino
San Diego
San Francisco
San Juan Capistrano
San Mateo
Santa Ana
Santa Clarita
Santa Fe Springs
Solana Beach
South Gate
Stockton
Ventura
Union City
Upland
Vista
West Hollywood
Whittier
Yuba City

Clive
Council Bluffs
Davenport

**Maryland**
Anne Arundel County
Annapolis
Baltimore City
Baltimore County
Bel Air
Bladensburg
Bowie
Charles County
Cheverly
College Park
Cottage City
Forest Heights
Frederick
Greenbelt
Howard County
Hyattsville
Laurel
Landover Hills
Montgomery County
Morningside
Prince Georges County
Riverdale Park
Rockville

Philadelphia

**Rhode Island**
Providence

**South Dakota**
Sioux Falls

**Tennessee**
Gallatin
Germantown
Jackson
Knoxville
Red Bank

**Texas**
Denton
Duncanville
Frisco
Garland
Grand Prairie
Houston
Plano
Richardson
Rowlett

**Washington**
Auburn
Bonney Lake
Lakewood
Seattle

# APPENDIX E.

**Revenue Analysis of Red Light Traffic Cameras**

Assumptions:

Ticket Amount: $100

Town's share: $75.00 (75%)

Number of Intersections with Cameras: 4

Collection Rate will be 50%

Per Intersection Averages

Average Number of Offenses (Daily): 12

Average Number of Tickets that will result with RLCs (75% issue rate): 9

Average Fines per Intersection per day: $900.00 (9 x $100)

Average Town's Share per Intersection per day: $675 ($900 x .75)

Summary

Fines per day: $2,700 (4 x $675) = $2700

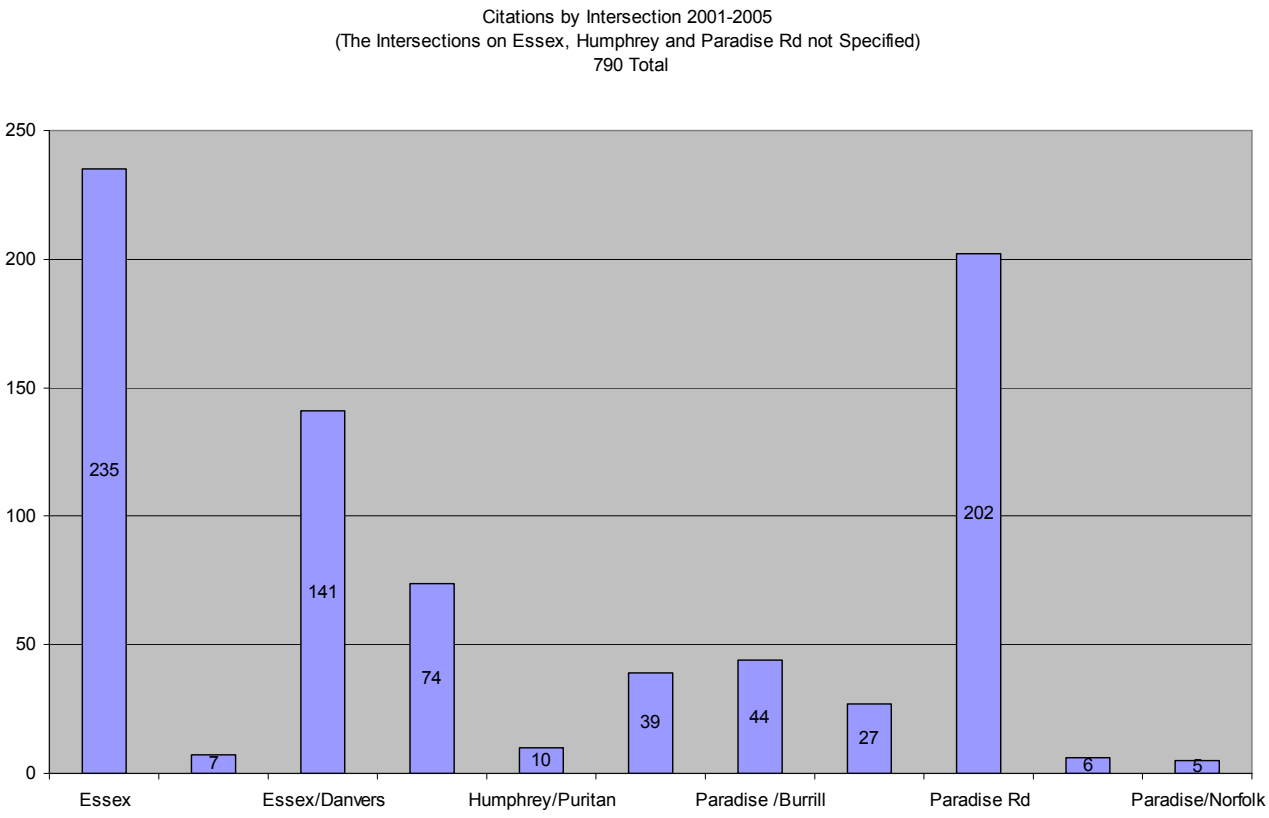
Fines per year: (375 x $2700) = $985,500

Total Annual Revenue to the Town (.5 * $985,500) = $492,750

# APPENDIX F.

RLR Violation Information from Chief Ron Madigan

**Note:** The Citation information below is for Failure to Stop, which includes RLR violations as well as other violations. Citation information for RLR violations only is not collected and was therefore not available to the Committee.




**Note:** violations observed by officers positioned in unmarked vehicle*s*.

| | |
|---|---|
| Date: September 20<br>Intersection: Essex Street /Eastman Ave<br>Time: 4:50pm to 5:50pm<br>Observed: 5 violations Salem bound,<br>6 Lynn bound.<br>11 violations total. | |
| Date: September 21<br>Intersection: Paradise Road/Mall<br>Time: 9:20am to 10:20am<br>Observed: 6 violations Lynn bound only | Date: September 21<br>Intersection: Humphrey Street/ Redington<br>Time: 4:50pm to 5:50pm-<br>Observed: 3 violations Marblehead bound,<br>3 violations Lynn bound.<br>6 total. |

# APPENDIX G.

## M.G.L.A. 85 § 2

Massachusetts General Laws Annotated Currentness
Part I. Administration of the Government (Ch. 1-182)
Title XIV. Public Ways and Works (Ch. 81-92B)
Chapter 85. Regulations and By-Laws Relative to Ways and Bridges (Refs & Annos)
§ 2. Traffic signs or devices; erection and maintenance; rules and regulations

The department of highways, in this chapter called the department, shall erect and maintain on state highways and on ways leading thereto and therefrom, and on all main highways between cities and towns, such direction signs, warning signs or lights, curb, street or other traffic markings, mechanical traffic signal systems, traffic devices, or parking meters as it may deem necessary for promoting the public safety and convenience and shall likewise install and maintain in accordance with the department's current manual on uniform traffic control devices, such curb, highway, street or other traffic markings as conditions may require or as may be necessary to carry out the provisions of other statutes pertaining to highway markings. The department may, from time to time, make, alter, rescind or add to rules and regulations relative to such signs, lights, signal systems, traffic devices, parking meters and markings, and may issue rules and regulations to direct, govern and restrict the movements of vehicles on all state highways and to carry out the purposes of section nine of chapter eighty-nine on highways, including state highways, which are designated thereunder by the department as through ways, with penalties for the violation thereof not exceeding twenty dollars for each offense. No such rule or regulation shall prohibit the use of passenger or station wagon type motor vehicles whose gross weight is less than five thousand pounds and which are registered for commercial use, on ways, parkways or boulevards where noncommercial passenger-type motor vehicles are permitted to operate. No such signs, lights, signal systems, traffic devices, parking meters or markings shall be erected or maintained on any state highway by any authority other than the department except with its written approval as to location, shape, size and color thereof, and except during such time as said approval is in effect. The department may, after notice, revoke any approval granted under this section. Except as otherwise provided in section two E, any rule, regulation, order, ordinance or by law which excludes motor vehicles from state highways shall be invalid and of no effect. Except as hereinafter provided, any rule, regulation, order, ordinance or by-law of a city or town hereafter made or promulgated relative to or in connection with the erection or maintenance of signs, traffic control signals, traffic devices, school zones, parking meters or markings on any way within its control shall take effect without department approval provided such signs, traffic control signals, traffic devices, parking meters, school zones or markings are in conformance with the department's current manual on uniform traffic control devices and the department's sample regulation for a standard municipal traffic code; provided, however, that such rule, regulation, order, ordinance or by-law shall not take effect until approved in writing by the department, or be effective after such approval is revoked, if made or

promulgated relative to or in connection with the following: (1) any way at its intersection or junction with a state highway; (2) any project which is or was federally aided, in whole or in part; (3) any traffic control signal or flasher in any city or town which does not employ a registered professional engineer in the commonwealth to design, redesign or change the timing and sequence of signal or flasher; (4) any sign excluding heavy commercial vehicles; (5) any school zone establishment or signing in relation to which the city or town intends to seek reimbursement from the commonwealth; (6) any one-way street sign not placed at an intersection of public ways; (7) any rule, regulation, order, ordinance or by-law of a city or town which when made or promulgated would exclude motor vehicle travel on any existing way which connects one city or town with another, unless such rule, regulation, order, ordinance or by-law was promulgated in compliance with the following: (a) the rule-making body of the city or town initiating such rule, regulation, order, ordinance or by-law gives written notice of such action to the chief executive officer of the abutting city, town or county into which the said way extends, and (b) a public hearing is held by the city, town or county initiating such alteration, relocation or discontinuance, public notice of which must be published for each of the two weeks preceding such hearing in a newspaper of general circulation in the abutting city, town or county into which the said way extends, and (c) after concurrence in writing by the chief executive officer of the abutting city or town into which the said way extends or his designee. Notwithstanding the foregoing, speed control signs may be established only in accordance with the provisions of section eighteen of chapter ninety. If any city or town installs and maintains any of the aforesaid traffic control devices without either requesting or obtaining the required approval or after being notified of such disapproval, or in noncompliance with said manual, the department shall withhold or withdraw the unexpended balance of any funds assigned to the said city or town under the provisions of section thirty-four of chapter ninety or sections twenty-five and twenty-six of chapter eighty-one. Any traffic control device which has not been erected or maintained in accordance with the foregoing provisions may be removed by or under the direction of the department and be stored by the department until claimed by the owner or, if not claimed within sixty days after written notice to said owner, may be disposed of at the discretion of the department. Color and arrow indications of traffic control signals shall have the commands ascribed to them in said manual. The use of the flashing white walk pedestrian signal indication, as defined in the official standards of the department, is prohibited. The superior court shall have jurisdiction in equity to enforce the provisions of this section and section one, and also sections one and four of chapter eighty-nine and any rule or regulation made thereunder or to enjoin the violation thereof. The provisions of this section shall not apply to the installation by any city or town, on any way within its boundary, of signs warning motorists of the presence of blind, deaf or otherwise handicapped children in the vicinity.

# References

**1.** Many studies draw the conclusion that there is an overall public safety benefit to RLCs: A non exhaustive list includes: Improving Road Safety: Speed and Red Light Cameras and The Road Trauma Trust Fund, Perth Australia. 1993; An Evaluation of Red-Light Cameras in Sydney, 1993; Accidents at Signal Controlled Junctions in Glasgow, 1996; Assessment of Red Light Running Cameras in Fairfax County, Virginia. 2003; Impact of Red Light Camera on Violation Characteristics. Singapore, China. 2003; Red Light Cameras Yield Big Reductions in Crashes and Injuries. Oxnard, CA. Retting and Kyrychenko. 2001. Safety Evaluatiion of Red Light Cameras. U.S. DOT April 2005.

**2.** Many studies conclude that angle crashes decrease and rear end crashes increase. A non exhaustive list includes: Improving Road Safety: Speed and Red Light Cameras and The Road Trauma Trust Fund, Perth Australia. 1993; An Evaluation of Red-Light Cameras in Sydney, 1993; Accidents at Signal Controlled Junctions in Glasgow, 1996; Evaluation of the Effects of Installing Red Light Cameras at Selected Adelaide Intersections, South Adelaide, Australia DOT, 1994; Assessment of Red Light Running Cameras in Fairfax County, Virginia. 2003; Impact of Red Light Camera on Violation Characteristics. Singapore, China. 2003; Safety Evaluatiion of Red Light Cameras. U.S. DOT April 2005.

**3.** Though some studies show an overall public safety benefit to RLCs and others show little, no, or negative benefit, many studies report an increase in rear-end crashes. A non exhaustive list includes: Improving Road Safety: Speed and Red Light Cameras and The Road Trauma Trust Fund, Perth Australia. 1993; An Evaluation of Red-Light Cameras in Sydney, 1993; Accidents at Signal Controlled Junctions in Glasgow, 1996; Evaluation of the Effects of Installing Red Light Cameras at Selected Adelaide Intersections, South Adelaide, Australia DOT, 1994; Assessment of Red Light Running Cameras in Fairfax County, Virginia. 2003; Impact of Red Light Camera on Violation Characteristics. Singapore, China. 2003; A Detailed Investigatiion of Crash Risk Resulting from Red light Cameras in Small Urban Areas. Mark Burkey, Ph.D., Kofi Obeng, Ph.D., July 2004. Safety Evaluatiion of Red Light Cameras. U.S. DOT April 2005.