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IN THE

Supreme Court of Florida

Case No.: SC12-1471
L.T. Case Nos.: 5D11-720, 09-CA-26741

CITY OF ORLANDO, FLORIDA,
Petitioner,

vs.

MICHAEL UDOWYCHENKO, etc., et al.
Respondents.

BRIEF *AMICI CURIAE* OF FLORIDA LEAGUE OF CITIES, INC., AMERICAN TRAFFIC SOLUTIONS, INC., AND XEROX STATE & LOCAL SOLUTIONS, INC., IN SUPPORT OF PETITIONER

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IDENTITY AND INTEREST OF *AMICI CURIAE*

The Florida League of Cities (the "League") is the united voice for Florida's municipal governments. Its goals are to serve the needs of Florida's cities and promote local self-government. The League was founded on the belief that local self-government is the keystone of American democracy.

The League has a special interest in this case due to its potential impact on the ability of Florida municipalities to institute and administer public safety programs, such as intersection safety camera programs, pursuant to their constitutional and statutory home rule authority and police powers.

American Traffic Solutions, Inc. ("ATS") and Xerox State & Local Solutions, Inc. ("Xerox") are providers of technology and business solutions for photo traffic safety programs in Florida. With respect to intersection safety camera programs like those at issue in this appeal, ATS and Xerox provide local governments and other governmental entities with intersection safety cameras, vehicle sensors, and other equipment and processes to capture a video recording and photographic images of motor vehicles involved in red light violations. The video and photographic evidence is reviewed by local authorities responsible for enforcing applicable laws and ordinances, who decide whether a violation of applicable law or ordinance has occurred and should be enforced.

ATS's customers include more than 300 government agencies. It has installed nearly 3,000 intersection safety cameras throughout the country, with hundreds more in various stages of planning. ATS also currently serves more than 60 local governments throughout the state of Florida. ATS acquired the stock of Lasercraft, Inc., which is not actively participating in this review proceeding, during the course of proceedings below. ATS has not participated in the litigation of this case.

Xerox has five programs in Florida and, over the past decade, Xerox has operated over 30 contracts with government agencies in 14 states with more than 500 cameras installed and operated.

Both ATS and Xerox have a global perspective to offer the Court in its consideration of the issues.

SUMMARY OF THE ARGUMENT

Intersection safety camera programs like those under review here save lives and conserve the increasingly scarce resources of local governments seeking to improve public safety. By employing cameras and vehicle sensors, such programs allow local governments to detect red light violations despite the impracticability and significant expense of having a live traffic officer at the scene. *See City of Davenport v. Seymour*, 755 N.W.2d 533, 535-36 (Iowa 2008).

Prior to the recent state legislation bringing intersection safety camera programs within the ambit of Chapter 316 of the Florida Statutes, at least 37 local governments in Florida operated such programs pursuant to local ordinances. Local innovation in this field found legal support in the rule that a regularly enacted ordinance is presumed to be a valid exercise of a municipality's broad home rule powers, a presumption that is at its zenith when a local government legislates on matters affecting the health, safety, and welfare of its citizens. Approving the Fifth District's decision would contravene that established presumption and stifle both the ability and willingness of local legislatures to pursue new programs and new technologies to protect the safety of their citizens.

The local governments' foresight in exercising their home rule powers to adopt intersection safety camera programs is justified by the empirical research. The studies demonstrate that intersection safety camera programs provide proven safety benefits, consistently finding a decline in right-angle collisions at intersection after intersection where safety cameras were installed. The action of those municipalities that adopted ordinances like the one in this case thus demonstrably made their citizens safer than those of municipalities that did not. That type of safety legislation lies at the heart of the constitutional home rule power.

The local governments' use of their home rule authority and police powers is also consonant with the desires of their constituents. A 2012 poll of 800 registered voters in Florida, conducted by FrederickPolls, revealed that 71% of voters support the use of these cameras in their communities to detect red-light runners.

The Fifth District's decision should be quashed.

ARGUMENT

I. THE INTERSECTION SAFETY CAMERA PROGRAMS AT ISSUE HERE ARE PROPER EXERCISES OF HOME RULE AUTHORITY AND POLICE POWERS.

Prior to the recent state legislation bringing intersection safety camera programs within the ambit of Chapter 316 of the Florida Statutes, local governments (like the City of Orlando in this case) enacted intersection safety camera programs through ordinances under their very broad home rule authority and in the exercise of their police powers. *See* Art. VIII, § 2(b), Fla. Const.; § 166.021(1) , (3)(c), (4), Fla. Stat. (1999); *City of Hollywood v. Mulligan*, 934 So. 2d 1238, 1243 (Fla. 2006) ("In Florida, a municipality is given broad authority to enact ordinances under its municipal home rule powers."). Consistent with the exercise of those powers, Chapter 316 of the State Uniform Traffic Code (as it existed at the time these ordinances were adopted) did not prevent local governments from regulating their streets "by means of police officers or official traffic control devices." *See* § 316.008(1)(b), Fla. Stat. (2009). Indeed, section 316.008(1)(w) expressly provided:

> (1) The provisions of this chapter shall not be deemed to prevent local authorities, with respect to streets and highways under their jurisdiction and within the reasonable exercise of the police power, from:
>
> . . . .

> (w) Regulating, restricting, or monitoring traffic by security devices or personnel on public streets and highways, whether by public or private parties. . . .

Because the authority for these programs is rooted in municipal home rule authority and police powers, the decision in this appeal could have far-reaching effects by casting doubt upon the legitimacy of statewide intersection safety camera programs, exposing scores of local governments (and vendors like ATS and Xerox) to protracted disputes and litigation over traffic safety programs that lie at the heart of the home rule power.

A. The Scope of Home Rule Authority

The Florida Constitution gives municipalities broad governmental, corporate, and proprietary powers. *See Quiles v. City of Boynton Beach*, 802 So. 2d 397, 398 (Fla. 4th DCA 2001); Art. VIII, § 2(b), Fla. Const.; § 166.021, Fla. Stat. ("As provided in s. 2(b), Art. VIII of the State Constitution, municipalities shall have the governmental, corporate, and proprietary powers to enable them to conduct municipal government, perform municipal functions, and render municipal services, and may exercise any power for municipal purposes, except when expressly prohibited by law.").

Florida courts define the scope of a "municipal purpose" to include a duty "to protect the safety, the health and the general welfare of the citizens." *See Quiles*, 802 So. 2d at 398, 400 (holding a community's home rule authority includes police power to fluoridate its water for the health, safety, and general welfare of the citizens); *see also City of Aventura v. Masone*, 89 So. 3d 233, 235 (Fla. 2011) ("It is well established that Florida law grants municipalities broad home rule and police powers."), *jurisdiction accepted sub nom. Masone v. City of Aventura*, No. SC12-644, 2012 WL 5991346 (Fla. Nov. 6, 2012); *Carter v. Town of Palm Beach*, 237 So. 2d 130, 131 (Fla. 1970) ("A municipality may, under the police power, regulate and restrain activities which threaten the public health, safety and welfare."); *see, e.g., Masone*, 89 So. 3d at 236-37 (affirming ordinance enacted under City's "broad home rule powers in response to concerns that drivers . . . were failing to heed existing traffic control signals" because "the plain text of the Uniform Traffic Control Law expressly confers authority to a municipal government to regulate traffic within its municipal boundaries as a reasonable exercise of its police power where such regulation does not conflict, but supplements the laws found therein."); *City of Hallandale Beach v. Smith*, 853 So. 2d 495, 497-98 (Fla. 4th DCA 2003) (city condemning property inside its city limits "was permitted to acquire the Church pursuant to its home rule powers to condemn property located within its boundaries absent an express prohibition").

The Legislature respects the sweeping power of municipalities and has expressed a legislative purpose "to remove limitations on the exercise of home rule powers" by codifying municipalities' broad home rule powers in the Municipal

Home Rule Powers Act ("Home Rule Powers Act"). *See City of Miami Beach v. Rocio Corp.*, 404 So. 2d 1066, 1067-68 (Fla. 3d DCA 1981). The Home Rule Powers Act includes a provision granting a municipality the authority to enact local ordinances that do not conflict with general law. *See* § 166.021(3)(c), Fla. Stat.; *Masone*, 89 So. 3d at 235-36. The Home Rule Powers Act also acknowledges that municipalities enjoy a sweeping reserve of power in the absence of clear, express legislative or constitutional prohibition:

> The provisions of this section shall be so construed as to secure for municipalities the broad exercise of home rule powers granted by the constitution. It is the further intent of the Legislature to extend to municipalities the exercise of powers for municipal governmental, corporate, or proprietary purposes not expressly prohibited by the constitution, general or special law, or county charter and to remove any limitations, judicially imposed or otherwise, on the exercise of home rule powers other than those so expressly prohibited.

§ 166.021(4), Fla. Stat.

Thus, when a municipality enacts an ordinance in furtherance of its broad home rule powers, "[a] regularly enacted ordinance will be presumed to be valid until the contrary is shown, and a party who seeks to overthrow such an ordinance has the burden of establishing its invalidity." *Masone*, 89 So. 3d at 236 (internal quotation marks omitted). Where there is no direct conflict between a municipal ordinance and a general law, appellate courts will "'indulge every reasonable presumption in favor of an ordinance's constitutionality.'" *Id.* (quoting *City of*

Kissimmee v. Fla. Retail Fed'n Inc., 915 So. 2d 205, 209 (Fla. 5th DCA 2005)); *Lowe v. Broward Cnty.*, 766 So. 2d 1199, 1203 (Fla. 4th DCA 2000).

B. A Municipality's Home Rule Authority to Maintain Safe Roadways is Consistent with General Law

The extent of home rule authority reaches its limits only if the subject matter of its ordinance is preempted by state statute, or if its ordinance conflicts with a general law. The test of direct conflict between an ordinance and a statute is similarly constrained. For example, if an ordinance merely offers a more stringent regulation or penalty than a statute, that ordinance does not conflict with the statute. *See, e.g., Laborers' Int'l Union of N. Am., Local 478 v. Burroughs*, 541 So. 2d 1160, 1161 (Fla. 1989) (test of conflict is not met where county ordinance imposes identical anti-discrimination requirements as the state statute, albeit upon a wider and broader class of entities than the statute); *Exile v. Miami-Dade Cnty.*, 35 So. 3d 118, 119 (Fla. 3d DCA 2010) (ordinance mandating stricter standard did not conflict with statute because, by complying with the stricter local ordinance, party would be in compliance with the looser state regulation).

It is clear that the Uniform Traffic Control Law does not preempt a municipality's power to control and regulate traffic through red light cameras because the statute expressly contemplates a municipality's authority to use such measures. As the *Masone* Court correctly noted, the statute specifically contemplates the use of such devices, whether provided by public or private parties, and "[t]he City is in a unique position to identify dangerous intersections within its boundaries and implement additional safeguards to prevent accidents at such intersections." 89 So. 3d at 237. Furthermore, even in the absence of an express grant of authority by the Legislature, a municipality retains the authority to exercise its home rule powers. Legislative enactments serve merely to express parameters regarding existing home rule powers. "Thus, municipalities are not dependent upon the legislature for further authorization, and legislative statutes are relevant only to determine limitations of authority. Although section 166.401, Florida Statutes (1989), purports to authorize municipalities to exercise eminent domain powers, municipalities could exercise those powers for a valid municipal purpose without any such 'grant' of authority." *Ocala v. Nye*, 608 So. 2d 15, 17 (Fla. 1992) (footnote omitted).

Maintaining the safety of residents upon public roadways is entirely consistent with home rule authority recognized within the Florida Constitution to protect safety and welfare of citizens. In *Miami Shores Village v. Cowart*, 108 So. 2d 468, 472 (Fla. 1958), this Court considered whether home rule authority allowed Dade County to establish uniform traffic control and enforcement throughout the metropolitan area. This Court concluded that traffic control and enforcement was "in accord with the intent and purpose of the constitutional authority granted by the Home Rule Amendment." *Id.* This Court relied upon its decision in *Cowart* in *State v. Dade County*, 142 So. 2d 79, 85 (Fla. 1962), when it concluded that the purchase and operation of a county-wide transit system in connection with the development of public services and utilities was "[o]ne of the obvious purposes of metropolitan government."

Moreover, because public services and transportation is an obvious purpose of local government, it cannot be said that the municipalities are preempted by any state action or legislation on red light cameras as they pertain to traffic enforcement.

> Preemption is implied when the legislative scheme is so pervasive as to evidence an intent to preempt the particular area, and where strong public policy reasons exist for finding such an area to be preempted by the Legislature. . . . Implied preemption is found where the state legislative scheme of regulation is pervasive and the local legislation would present the danger of conflict with that pervasive regulatory scheme.

Sarasota Alliance For Fair Elections, Inc. v. Browning, 28 So. 3d 880, 886 (2010) (internal citations and quotation marks omitted). "Florida courts have not found an implied preemption of local ordinances which address local issues." *Id.* at 887. So it is here. The municipality's interest in addressing traffic—a uniquely local concern—is not preempted by legislation concerning red light cameras. The circumstances presented to this Court now reflect an appropriate exercise of home rule authority in accordance with the importance of maintaining the safety of public roads.

It remains only to note that courts in other jurisdictions have readily affirmed the enactment and enforcement of intersection safety camera programs as a reasonable and proper use of a local government's home rule and police powers.

In *Mendenhall v. City of Akron*, 881 N.E.2d 255, 258 (Ohio 2008), for example, the Supreme Court of Ohio addressed the following question certified by the District Court for the Northern District of Ohio, Eastern Division: "Whether a municipality has the power under home rule to enact civil penalties for the offense of violating a traffic signal light or for the offense of speeding, both of which are criminal offenses under the Ohio Revised Code." The Ohio Supreme Court answered that question "with a qualified yes. A municipality has the power under home rule to enact civil penalties for the offense of violating a traffic light . . . provided that the municipality does not alter statewide traffic regulations." *Id.* at 265. The court reasoned that "[i]t is well established that regulation of traffic is an exercise of police power that relates to public health and safety, as well as to the general welfare of the public" and "[t]he city ordinance and state law may target identical conduct . . . but the city ordinance does not replace traffic law. It merely supplements it." *Id.* at 260, 264.

In *Idris v. City of Chicago*, 552 F.3d 564 (7th Cir. 2009) , the United States Court of Appeals for the Seventh Circuit upheld the City of Chicago's intersection safety camera program against due process and equal protection challenges. In finding Chicago's program to be a rational exercise of municipal power, Judge Easterbrook, writing for the court, observed that "[a] camera can show reliably which cars and trucks go through red lights" and concluded that "[a] system of photographic evidence reduces the costs of law enforcement and increases the proportion of all traffic offenses that are detected. . . ." *Id.* at 566.

Many other decisions have affirmed the power of local governments to protect their citizens through the use of intersection safety camera programs. *See, e.g.*, *City of Knoxville v. Brown*, 284 S.W.3d 330, 338-39 (Tenn. Ct. App. 2009) (upholding municipality's use of intersection safety cameras against claim that such use constituted an "ultra vires act of police power" and was unconstitutional); *Sevin v. Parish of Jefferson*, 621 F. Supp. 2d 372, 387 (E.D. La. 2009) (upholding municipal ordinance creating intersection safety camera program against facial constitutional challenges); *City of Davenport*, 755 N.W.2d at 538-44 (upholding intersection safety camera program as a valid exercise of municipal police power notwithstanding differences between municipal ordinance and state traffic law); *Agomo v. Fenty*, 916 A.2d 181, 183 (D.C. 2007) (upholding intersection safety camera program against due process challenges).

Because this Court should "indulge every reasonable presumption in favor" of a local government's constitutional exercise of its home rule powers, *Lowe*, 766 So. 2d at 1203 (internal quotation marks omitted), the Fifth District's decision should be quashed.

II. SOCIAL SCIENCE STUDIES DEMONSTRATE THAT INTERSECTION SAFETY CAMERA PROGRAMS PROVIDE REAL SAFETY BENEFITS.

The decisions by scores of local governments within and without Florida to exercise their home rule authority and police powers to promote public safety through the use of intersection safety camera programs is fully justified by the available social science facts and studies. These are incontestably programs implicating a municipality's power to protect the health, safety, and welfare of its citizens.

On December 28, 2012, the Florida Department of Highway Safety and Motor Vehicles released its *Red Light Camera Program Analysis*. Seventy-three agencies responded to the survey and "entered data specific to red light camera utilization between July 1, 2011, and June 30, 2012." *See* Fla. Dep't of Highway Safety and Motor Vehicles, *Red Light Camera Program Analysis* (2013). (App. 1 at 1). The Department's analysis of those responses concluded as follows: "With regards to crash data, the most common outcome was a decrease in rear-end and side impact crashes. In fact, a majority of agencies reported decreases in the total number of crashes at red light camera intersections. Lastly, agencies reported that in addition to the decrease in total crashes, traffic safety improved throughout the jurisdiction as drivers were more cautious when approaching all intersections." (App. 1 at 5).[1]

Further, the *Tampa Bay Times* reported, on January 5, 2013, that "[c]rashes at intersections with red light cameras fell by nearly a third the year after Tampa officials installed the technology, police records show." *See* Richard Danielson, *Crashes Drop 29 Percent at Tampa's Red Light Camera Intersections*, TAMPA BAY TIMES, Jan. 5, 2013. (Available online at the following address: http://www.tampabay.com/news/publicsafety/accidents/article1268963.ece).

"'These cameras save lives,' Mayor Bob Buckhorn said Friday." *Id.* "'When we set out a year ago to do this, our goal was to change behavior and to minimize the risk that our citizens and neighbors and friends and family members would get killed by someone busting a red light at these intersections,' the mayor said. 'I think we have changed behaviors, and I think it was the right decision, and I think the data proves it.'" *Id.*

This recent data is consistent with earlier reports.

For example, Troy D. Walden, Ph.D., of the Crash Analysis Program of the Center of Transportation Safety, Texas Transportation Institute, The Texas A&M University System, wrote "Analysis on the Effectiveness of Photographic Traffic Signal Enforcement Systems in Texas," in November 2008. (App. 4 at 1). This

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1 References to the appendix will be in the form "(App. x at y)," where "x" represents the tab number and "y" represents the page number.

study was prepared for the Traffic Operations Division of the Texas Department of Transportation. (App. 4 at 1).

Dr. Walden's evaluation considered 56 separate intersections in the data set. (App. 4 at 2). Each community reported pre- and post-installation crash data that was annualized for a 12-month period of time. (App. 4 at 2). Based on the pre- and post-installation crash data, there were 586 annualized collisions across all intersections. (App. 4 at 2). In contrast, 413 annualized crashes were reported during the same time period following installation, which resulted in an average decrease of 30%. (App. 4 at 2).

With regard to red light violation crashes, there were 265 annualized right-angle collisions prior to the installation of the camera system. (App. 4 at 2). By way of comparison, an annualized total of 151 post-installation collisions occurred for a crash reduction of 114 events. (App. 4 at 2). This 114 collision difference represents a 43% annualized decrease in right-angle collisions at the intersection locations.[2] (App. 4 at 2).

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2 It should be noted that there were 106 annualized rear-end crashes that occurred at intersections prior to the installation of the camera systems. Post-installation, there were 111 annualized rear-end collisions. Although the number of overall rear-end crashes increased slightly (5% or 5 crashes), 66% of the intersections decreased or maintained the same frequency of rear-end crash events. (App. 4 at 2).

Moreover, Synetics Safety Specialists published an "Evaluation of the Effectiveness of the Calgary Police Service Red-Light Camera Program" in January 2009. (App. 3 at 1). That study reported a 48.2% reduction in right-angle collisions at intersections where the safety camera program was implemented.[3] (App. 3 at 7). Moreover, this study found that there is some spillover effect at other intersections without safety camera devices installed in the period after intersection safety cameras are installed at certain intersections. (App. 3 at 9). These results are considered statistically significant. (App. 3 at 7, 9).

And the Federal Highway Administration published a report, "Safety Evaluation of Red-Light Cameras," in April 2005. (App. 2 at 1 (Executive Summary)). The FHWA examined 132 intersections with safety cameras in seven jurisdictions across the United States. (App. 2 at 1). The study revealed that right-angle crashes decreased 24.6% due to the effectiveness of intersection safety camera programs in reducing crashes.[4] (App. 2 at 4).

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3 Contrary to the slight increase in rear-end collisions found in the Texas study, this study found a decrease of 39.6% in rear-end collisions, although it noted that this number was not statistically significant. (App. 3 at 8).

4 As occurred in the Texas study, an increase in rear-end collisions also occurred in this study, albeit at a frequency increase of 14.9%. (App. 2 at 4).

III. PUBLIC OPINION POLLS DEMONSTRATE THAT INTERSECTION SAFETY CAMERA PROGRAMS ARE FAVORED BY LARGE MAJORITIES.

Given these statistics, it is not surprising that recent public opinion polls show that the majority of citizens favor intersection safety camera programs in Florida and across the country.

As a recent example, FrederickPolls polled 800 registered Florida voters in January 2012. (App. 5 at 1). Seventh-one percent of voters support the use of intersection safety cameras to detect red-light runners. (App. 5 at 2). Sixty-seven percent of the respondents support allowing local communities to keep red-light traffic enforcement cameras at busy intersections, even when presented directly with the arguments some members of the Legislature have made against the use of such cameras. (App. 5 at 3).

Opponents of intersection safety camera programs complain that intersection safety cameras are "Orwellian" and that their use is for revenue generation. These concerns are not serious and are outweighed by the safety benefits derived from the use of red-light cameras. Indeed, radar detection by police officers was attacked as "Orwellian" when first introduced, yet this is now a standard law enforcement tool that indisputably promotes public safety. *See City of Davenport*, 755 N.W.2d at 536. Moreover, imposing fines upon violators—thus raising revenue for the local government collecting them—is hardly atypical as a means of securing compliance with the law. As Judge Easterbrook observed in *Idris*, "[a] system that simultaneously raises money and improves compliance with traffic laws has much to recommend it. . . ." 552 F.3d at 566.

At bottom, such criticisms are really complaints that violators have been caught running red lights, and they are not consonant with public opinion generally.

CONCLUSION

The decision of the Fifth District Court of Appeal should be quashed.

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I HEREBY CERTIFY that a true and correct copy of the foregoing amici curiae brief has been furnished via e-mail (.pdf) to: *Charles T. Wells* (charles.wells@gray-robinson.com) and *Richard E. Mitchell* (rick.mitchell@gray-robinson.com), GrayRobinson, P.A., P.O. Box 3068, Orlando, Florida 32802; *Jason D. Weisser* (JWeisser@shw-law.com), Schuler, Halvorson & Weisser, P.A., 1615 Forum Place, Suite 4D, West Palm Beach, Florida 33401; *Bard D. Rockenbach* (bdr@FLAppellateLaw.com and fa@FLAppellateLaw.com) and *Andrew A. Harris* (aah@FLAppellateLaw.com and jew@FLAppellateLaw.com), Burlington & Rockenbach, P.A., 444 W. Railroad Avenue, Suite 430, West Palm Beach, Florida 33409; *David B. King* (dking@kbzwlaw.com) and *Thomas Zehnder* (tzehnder@kbzwlaw.com), King, Blackwell, Zehnder & Wermuth, P.A. 25 E. Pine St., P.O. Box 1631, Orlando, Florida 32802-1631; and *Erin Jane O'Leary* (eoleary@orlandolaw.com), Brown, Garganese, Weiss, & D'Agresta, P.A., P.O. Box 2873, Orlando, Florida 32802, this 24th day of January, 2013.

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CERTIFICATE OF COMPLIANCE

I hereby certify that this amicus brief was prepared in Times New Roman, 14-point font, in compliance with Rule 9.210(a)(2) of the Florida Rules of Appellate Procedure.

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IN THE

Supreme Court of Florida

Case No.: SC12-1471
L.T. Case Nos.: 5D11-720, 09-CA-26741

CITY OF ORLANDO, FLORIDA,
Petitioner,

vs.

MICHAEL UDOWYCHENKO, etc., et al.
Respondents.

APPENDIX TO BRIEF *AMICI CURIAE* OF FLORIDA LEAGUE OF CITIES, INC., AMERICAN TRAFFIC SOLUTIONS, INC., AND XEROX STATE & LOCAL SOLUTIONS, INC., IN SUPPORT OF PETITIONER

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Tab Description

1. Fla. Dep't of Highway Safety and Motor Vehicles, *Red Light Camera Program Analysis* (December 28, 2012).

2. Federal Highway Administration, "Safety Evaluation of Red-Light Cameras," Research, Development, and Technology, Turner-Fairbank Highway Research Center (FHWA-HRT-05-048 April 2005).

3. Synetics Safety Specialists, "Evaluation of the Effectiveness of the Calgary Police Service Red-Light Camera Program," Calgary Police Service, City of Calgary (January 2009).

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5. Summary of January 2012 Public Opinion Polls by FrederickPolls

TAB 1

DEPARTMENT OF HIGHWAY SAFETY AND MOTOR VEHICLES

RED LIGHT CAMERA PROGRAM ANALYSIS

A SAFER FLORIDA
HIGHWAY SAFETY AND MOTOR VEHICLES

December 28, 2012

INTRODUCTION

Section 316.0083, Florida Statutes, directs the Department of Highway Safety and Motor Vehicles (DHSMV) to provide a summary report on the use of traffic infraction enforcement detectors (red light cameras) used to enforce red light violations. The statute specifies three areas to be addressed in the report; statistical data, enhancement to traffic safety, and procedural information. This summary is a compilation of information the DHSMV received from local counties and municipalities (agencies) through an on-line questionnaire.

METHODOLOGY

Agencies were requested to participate by completing an online questionnaire which captured selected activities and agency data. The online *Florida Red Light Camera Annual Report Survey* was the primary instrument used to gather data for this report and consisted of 9 multiple choice and 15 free form data elements. Each agency entered data specific to red light camera utilization between July 1, 2011 and June 30, 2012. In total, 73 agencies responded to the online survey in accordance with reporting requirements set forth in Florida Statute.[1] The information requested specific to red light camera implementation and program operations included:

- Rating factors used to select red light camera locations
- Number of intersections utilizing red light cameras
- Comparison of intersection data before and after red light camera installation for:
  - Total crashes
  - Side-impact crashes
  - Rear-end crashes
- Number of Notices of Violation issued
- Personnel responsible for Notices of Violation
- Number of Notices of Violation challenged
- Personnel responsible for reviewing notice of violation challenges
- Number of Notices of Violation dismissed after challenged
- Number of Uniform Traffic Citations issued for red light camera violations
- Personnel responsible for issuing Uniform Traffic Citations
- Policies regarding enforcement of red light violations while making right-hand-turns

ANALYSIS

Seventy-three agencies reported collectively throughout the State of Florida there are 404 intersections with red light cameras installed. During the reporting period of July 1, 2011 through June 30, 2012, these agencies reported issuing 999,929 Notices of Violation.

Agencies also captured data regarding Notices of Violation challenged and reported 20,064 challenges. Of those violations challenged, 14,065 were dismissed. Thus, nearly 70% of violations challenged are dismissed. (950 challenges pending at the time of this report)

Florida Statutes provides for the issuance of a Uniform Traffic Citation (UTC) when a notice of violation is not paid within 30 days of receipt. In all, 66 agencies issued 265,783 UTCs based on red light camera violations.

Each agency surveyed was asked to rate the factors below, from most to least important, used in selecting an intersection for red light camera installation.

Table 1
Factors Used to Select Intersections for Camera Installation (rated 1-5 by importance)

	Most (1)	(2)	(3)	(4)	Least (5)	Response Count
[redacted]						
Traffic Citation Data	4	18	18	20	11	71
[redacted]						
Law Enforcement Officer Observations	7	18	22	22	2	71
[redacted]						

While a majority of agencies listed traffic crash data as the primary consideration for placement of the cameras, the data demonstrates that 44% did not consider this first when placing cameras.

However as depicted in Tables 2, 3 and 4, the most common outcome since the installation of red light cameras is a decrease in traffic crashes. Forty-three percent noticed a reduction in side-impact crashes, 41% of the agencies surveyed experienced a reduction in rear-end crashes, while 56% of the agencies experienced a total reduction in crashes at red light camera intersections.

Table 2
Red Light Camera Side-Impact Crash Outcome

	Response Percent	Response Count
Increased	11.0%	[illegible]
Decreased	43.8%	32
Remained the same	15.1%	11
No data available	30.1%	22
Respondents		73

Table 3
Red Light Camera Rear-End Crash Outcome

	Response Percent	Response Count
[redacted]		
Decreased	41%	30
[redacted]	6.8%	5
No data available	30%	22
Respondents		73

Table 4
Red Light Camera Total Number of Crashes Outcome

	Response Percent	Response Count
[redacted]		
Decrease	56.2%	41
[redacted]		
No data available	19.2%	14
Respondents		73

Continued

Agencies were asked to provide information regarding additional improvements in traffic safety stemming from the implementation of red light cameras. The most common improvements cited were: reductions in drivers running red lights at intersections using cameras; reductions in red light violations observed by law enforcement at all intersections; and an increase in cautious driving, jurisdiction-wide.

Agencies were asked to provide a breakdown of personnel issuing Notices of Violation, reviewing challenges to Notices of Violation, and issuing UTCs. Nearly 70% of the agencies reported some participation by sworn law enforcement officers for each of these functions. These results are depicted in Tables 5-7 below.[2]

Table 5
Personnel Issuing Notices of Violation

	Response Percent	Response Count
[redacted]		
Non-Sworn Government Employee	23.2%	17
[redacted]		
Other	5.5%	4

Table 6
Personnel Reviewing Notice of Violation Challenges

	Response Percent	Response Count
[redacted]		
Non-Sworn Government Employee	27.3%	20
[redacted]		
Other	12.3%	9

Table 7
Personnel Issuing Uniform Traffic Citations

	Response Percent	Response Count
[redacted]		
Non-Sworn Government Employee	19%	14
[redacted]		
Other	11%	8

Pursuant to s. 316.0083, F.S. "A notice of violation and a traffic citation may not be issued for failure to stop at a red light if the driver is making a right-hand turn in a careful and prudent manner at an intersection where right-hand turns are permissible." Agencies were asked whether they issued such notices for right-hand turn violations and had a policy defining "careful and prudent manner". The results are depicted in Tables 8 and 9.

Table 8
Notices of Violation & Citations for Right-Hand Turns on Red Lights

	Response Percent	Response Count
[redacted]		
No	37.5%	27
Respondents		72

Table 9
Agency Policy Defining "Careful and Prudent Manner"

	Response Percent	Response Count
[redacted]		
No	77.5%	55
Respondents		71

Several agencies utilized the Careful Driving statute, s. 316.1925, F.S. to define "careful and prudent manner." Others agencies utilized a more objective process and determined that drivers proceeding in a careful manner, not violating the right of way of other vehicles or pedestrian traffic, were acting in a careful and prudent manner.

CONCLUSIONS

Agencies reported that historical traffic crash data and law enforcement observation were the top two factors used to select red light camera locations. In most cases, Notices of Violation were issued and reviewed by sworn agency employees. And while violations were rarely challenged, more than 70% of those challenged were ultimately dismissed. In cases where Notices of Violation were not paid or dismissed, sworn employees were responsible for issuing the majority of Uniform Traffic Citations.

Section 316.0083, F.S. states that "a notice of violation and a traffic citation may not be issued for failure to stop at a red light if the driver is making a right-hand turn in a careful and prudent manner at an intersection where right-hand turns are permissible." Of the 73 agencies which submitted data, 44 actively issue Notices of Violation and citations for right-hand turns on red signals. However, only 16 agencies reported having a policy defining "a careful and prudent manner".

With regards to crash data, the most common outcome was a decrease in rear-end and side-impact crashes. In fact, a majority of agencies reported decreases in the total number of crashes at red light camera intersections. Lastly, agencies reported that in addition to the decrease in total crashes, traffic safety improved throughout the jurisdiction as drivers were more cautious when approaching all intersections.

Prepared by:
Florida Highway Patrol
Office of Strategic Services
December 28, 2012

[1]*Agencies using red light cameras are required to report summary data annually to the Department of Highway Safety and Motor Vehicles. To ensure that all required data was reported in a timely manner, the Department attempted to identify jurisdictions with active red light camera programs by compiling lists of the following:*

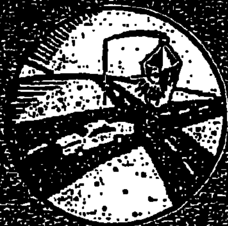
- *agencies which requested UTC's specifically related to red light camera violations*
- *agencies which submitted UTC's for red light camera violations;*
- *agencies identified by the Department of Revenue as having received revenue from red light camera citations.*

Identified agencies were provided with instructions and a link to the on-line questionnaire. The Florida Sheriff's Association and Florida Police Chiefs Association were provided data reporting procedures for distribution the member agencies. In addition, a red light camera vendor informed participating client agencies of the Department's reporting guidelines.

[2]*Note: Agencies were asked to select all applicable personnel categories and as such, there are more responses than respondents. Percentages, however, remain indicative of total respondents.*

TAB 2

EXECUTIVE SUMMARY



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Safety Evaluation of Red-Light Cameras—Executive Summary

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This document is an Executive Summary of the report *Safety Evaluation of Red-Light Cameras*, FHWA-HRT-05-048, published by the Federal Highway Administration in April 2005.

Abstract

The fundamental objective of this research was to determine the effectiveness of red-light-camera (RLC) systems in reducing crashes. The study involved an empirical Bayes (EB) before-after research using data from seven jurisdictions across the United States to estimate the crash and associated economic effects of RLC systems. The study included 132 treatment sites, and specially derived rear end and right-angle unit crash costs for various severity levels. Crash effects detected were consistent in direction with those found in many previous studies: decreased right-angle crashes and increased rear end ones. The economic analysis examined the extent to which the increase in rear end crashes negates the benefits for decreased right-angle crashes. There was indeed a modest aggregate crash cost benefit of RLC systems. A disaggregate analysis found that greatest economic benefits are associated with factors of the highest total entering average annual daily traffic (AADT), the largest ratios of right-angle to rear end crashes, and with the presence of protected left-turn phases. There were weak indications of a spillover effect that point to a need for a more definitive, perhaps prospective, study of this issue.

Introduction and Background

RLC systems are aimed at helping reduce a major safety problem at urban and rural intersections, a problem that is estimated to produce more than 100,000 crashes and approximately 1,000 deaths per year in the United States.[1] The size of the problem, the promise shown from the use of RLC systems in other countries, and the paucity of definitive studies in the United States established the need for this national study to determine the effectiveness of the RLC systems jurisdiction-wide in reducing crashes at monitored intersections. This study included collecting background information from literature and other sources, establishing study goals, interviewing and choosing potential study jurisdictions, and designing and carrying out the study of both crash and economic effects. A description of all project efforts is in the complete report summarized by this document and, to a lesser extent, in two Transportation Research Board (TRB) papers that were also prepared.[2,3]

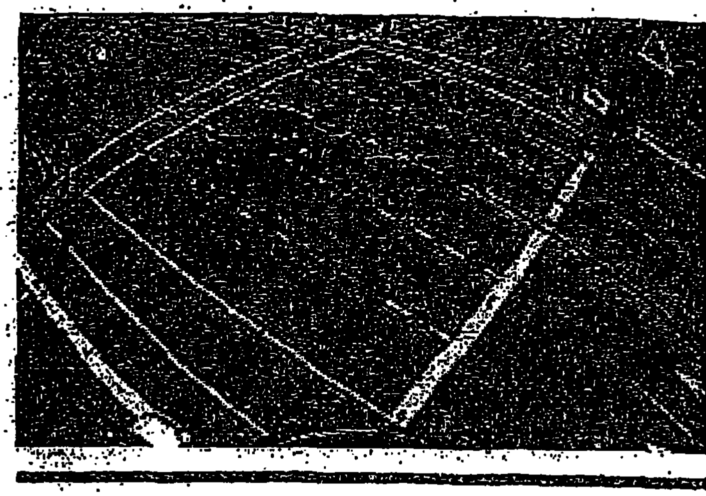

Figure 1: A photo taken from a camera of a crash involving red-light running.

A literature review found that estimates of the safety effect of red-light-running programs vary considerably. The bulk of the results appear to support a conclusion that red light cameras reduce right-angle crashes and could increase rear-end crashes; however, most of the studies are tainted by methodological difficulties that would render useless any conclusions from them. One difficulty, failure to account for regression to the mean[1] (RTM), can exaggerate the positive effects, while another difficulty, ignoring possible spillover effects[2] to intersections without RLCs, will lead to an underestimation of RLC benefits, more so if sites with these effects are used as a comparison group.

While it is difficult to make definitive conclusions from studies with failed methodology validity, the results of the review did provide some level of comfort for a decision to conduct a definitive, large-scale study of installations in the United States. It was important for the new study to capitalize on lessons learned from the strengths and weaknesses of previous evaluations, many of which were conducted in an era with less knowledge of potential pitfalls in evaluation studies and methods to avoid or correct them.

The lessons learned required that the number of treatment sites be sufficient to assure statistical significance of results, and that the possibility of spillover effects be considered in designating comparison sites, perhaps requiring a study design without a strong reliance on the use of comparison sites. Previous research experience also pointed to a need for the definition of the term, "red-light-running crashes," to be consistent, clear, and logical and for provision of a mechanism to aggregate the differential effects on crashes of various impact types and severities.

Methodological Basics

The general crash effects analysis methodology used is

[1] "Regression to the mean" is the statistical tendency for locations chosen because of high crash histories to have lower crash frequencies in subsequent years even without treatment.

[2] Spillover effect is the expected effect of RLCs on intersections other than the ones actually treated because of jurisdiction-wide publicity and the general public's lack of knowledge of where RLCs are installed.

different from those used in past RLC studies. This study benefits from significant advances made in the methodology for observational before-after studies, described in a landmark book by Hauer.[4] The book documented the EB procedure used in this study. The EB approach sought to overcome the limitations of previous evaluations of red-light cameras, especially by properly accounting for regression to the mean, and by overcoming the difficulties of using crash rates in normalizing for volume differences between the before and after periods.

The analysis of economic effects fundamentally involved the development of per-crash cost estimates for different crash types and police-reported crash severities. In essence, the application of these unit costs to the EB crash frequency effect estimates. The EB analysis was first conducted for each crash type and severity and site before applying the unit costs and aggregating the economic effect estimates across crash types and severity and then across jurisdictions. The estimates of economic effects for each site allowed for exploratory analysis and regression modeling of cross-jurisdiction aggregate economic costs to identify the intersection and RLC program characteristics associated with the greatest economic benefits of RLC systems.

Details of the development of the unit crash-cost estimates can be found in a recent paper and in an internal report available from FHWA.[5,6] Unit costs were developed for angle, rear end, and "other" crashes at urban and rural signalized intersections. The crash cost to be used had to be keyed to police crash severity based on the KABCO[3] scale. By merging previously developed costs per victim keyed on the AIS injury severity scale into U.S. traffic crash data files that scored injuries in both the Abbreviated Injury Scale (AIS) and KABCO scales, estimates for both economic (human capital) costs and comprehensive costs per crash were produced. In addition, the analysis produced an estimate of the standard deviation for each average cost. All estimates were stated in Year 2001 dollar costs.

Data Collection

The choice of jurisdictions to include in the study was based on an analysis of sample size needs and the data available in potential jurisdictions. It was vital to ensure that enough data were included to detect that the expected change in safety has appropriate statistical significance. To this end, extensive interviews were conducted for several potential jurisdictions known to have significant RLC programs and a sample size analysis was done. The final selection of seven jurisdictions was made after an assessment of each jurisdiction's ability to provide the required data. The jurisdictions chosen were El Cajon, San Diego, and San Francisco, CA; Howard County, Montgomery County, and Baltimore, MD; and Charlotte, NC.

Data were required not only for RLC-equipped intersections but also for a reference group of signalized intersections not equipped with RLCs but similar to the RLC locations. These sites were to be used in the calibration of safety performance functions (SPFs) used in the EB analysis and to investigate possible spillover effects. To account for time trends between the period before the first RLC installation and the period after that, crash and traffic volume data were collected to calibrate SPFs from a comparison group of approximately 50 unsignalized intersections in each jurisdiction.

Following the site/jurisdiction selection, the project team collected and coded the required data. Before the actual data

[3] The KABCO severity scale is used by the investigating police officer on the scene to classify injury severity for occupants with five categories: K, killed; A, disabling injury; B, evident injury; C, possible injury; O, no apparent injury.[7] These definitions may vary slightly for different police agencies.

Table 1. Combined results for seven jurisdictions

	Right angle crashes		Rear end crashes	
	Total crashes	Definite injury	Total crashes	Definite injury
EB estimate of crashes expected in the after period without RLC	1,542	351	2,521	131
Count of crashes observed in the after period	1,163	296	2,896	163
Estimate of percentage change (standard error)	-24.6 (2.9)	-15.7 (5.9)	14.9 (3.0)	24.0 (11.6)
Estimate of the change in crash frequency	-379	-65	375	32

Note: A negative sign indicates a decrease in crashes.

analyses, preliminary efforts involving file merging and data quality checks were conducted. This effort included the crash data linkage to intersections and the defining of crashes expected to be affected by RLC implementation. Basic red-light-running crashes at the intersection proper were defined as "right-angle," "broadside," or "right- or left-turning-crashes" involving two vehicles, with the vehicles entering the intersection from perpendicular approaches. Also included were crashes involving a left-turning vehicle and a through vehicle from opposite approaches. "Rear end crashes" were defined as a rear end crash type occurring on any approach within 45.72 m (150 ft) of the intersection. In addition, "injury crashes" were defined as including fatal and definite injuries, excluding those classified as "possible injury."

Results

Because the intent of the research was to conduct a multijurisdictional study representing different locations across the United States, the aggregate effects over all RLC sites in all jurisdictions was of primary interest. Table 1 shows the combined results for the seven jurisdictions. There is a significant decrease in right-angle crashes, but there is also a significant increase in rear end crashes. Note that "injury" crashes are defined by severity as K, A, or B crashes; but the frequencies shown do not contain a category for "possible injury" crashes captured by KABCO-level C; thus, these crashes could better be labeled "definite injury" crashes.

As seen in table 2, the direction of these effects (and the magni-

Table 2. Results for individual jurisdictions for total accidents

Jurisdiction number* (in random order)	Percent change in right-angle crashes (standard error)	Percent change in rear end crashes (standard error)
1	-40.0 (5.4)	21.3 (17.1)
2	0.8 (9.0)	8.5 (9.8)
3	-14.3 (12.5)	15.1 (14.1)
4	-24.7 (8.7)	19.7 (11.7)
5	- 34.3 (7.6)	38.1 (14.5)
6	- 26.1 (4.7)	12.7 (3.4)
7	- 24.4 (11.2)	7.0 (18.5)

*The identification of jurisdictions is not provided because of an agreement with the jurisdictions; such information is irrelevant to the findings.

Note: A negative sign indicates a decrease in crashes.

Table 3. Unit crash cost estimates by severity level used in the economic effects analysis

Crash severity level	Right-angle crash cost	Rear end crash cost
O (standard deviation)	$8,673 (1,285)	$11,463 (3,338)
K+A+B+C (standard deviation)	$64,468 (11,919)	$53,659 (9,276)

tude to a lesser degree) was remarkably consistent across jurisdictions. The analysis indicated a modest spillover effect on right-angle crashes; however, that this was not mirrored by the increase in rear end crashes seen in the treatment group, which detracts somewhat from the credibility of this result as evidence of a general deterrence effect.

For the analysis of economic effects, it was recognized that there were low sample sizes of fatal and serious (A-level) crashes in the after period for some intersections. In addition, the initially developed cost estimates for B- and C-level rear end crashes indicated some anomalies in the order (e.g., C-level costs were higher, very likely because on-scene police estimates of "minor injury" often ultimately include expensive whiplash injuries), the B- and C-level costs were combined by Pacific Institute for Research and Evaluation (PIRE) into one cost. Considering these issues and the need to use the same cost categories across all intersections in all seven jurisdictions, two crash cost levels were ultimately used in all analyses: Injury (K+A+B+C) and Non-injury (O). These unit costs are shown in table 3 along with the standard deviation of these costs.

Table 4 shows the results for the economic effects including and excluding property-damage only (PDO) crashes. The latter estimates are included in recognition of the fact that several jurisdictions considerably under-report PDO collisions. Those estimates (with PDOs excluded) show a positive aggregate economic benefit of more than $18.5 million over approximately 370 site years, which translates into a crash reduction benefit of approximately $50,000 per site year. With PDOs included, the benefit is approximately $39,000 per site year. The implication from this result is that the lesser severities and generally lower unit costs for rear end injury crashes together ensure that the increase in rear end crash frequency does not negate the decrease in the right-angle crashes targeted by red-light-camera systems.

Further analysis indicated that right-angle crashes appear slightly more severe in the after period in two jurisdictions, but not in the other five. Because such an effect would mean that the benefits in table 4 are slightly overestimated, an attempt was made to estimate the possible size of the benefit reduction. If such a shift were real, and if its effects could be assumed to be correctly estimated from individual KABCO unit costs already deemed to be inappropriate for such purposes, the overall cost savings reported in the last row of table 4 could be decreased by approximately $4 million; however, there would still be positive economic benefits, even if it is assumed that the unit cost shifts were real and correctly estimated.

Table 4. Economic effects including and excluding PDOs (Using a combined unit cost for K+A+B+C)

	All severities combined			PDOs excluded		
	Right Angle crash	Rear end crash	All crashes	Right Angle crash	Rear end crash	All crashes
EB estimate of crash cost before RLC installation	$66,814,067	$69,347,624	$161,843,021	$61,687,367	$52,681,148	$134,407,104
Recorded cost of crashes after RLC installation (370 site years)	$48,319,090	$75,222,760	$147,470,550	$43,868,392	$53,944,539	$115,901,685
Percentage of change in crash cost (s.e.)	27.7 (0.6)	8.5 (0.7)	8.9 (0.4)	28.9 (0.6)	2.4 (0.8)	13.8 (0.5)
Crash cost decrease (per site year)	[illegible]	[illegible]	$14,372,471 ($38,845)	[illegible]	[illegible]	$18,505,419 ($50,015)

* A negative number indicates a decrease.

Examination of the aggregate economic effect per after-period year for each site indicated substantial variation, much of which could be attributable to randomness. It was reasonable to suspect that some of the differences may be due to factors that impact RLC effectiveness; therefore, a disaggregate analysis, which involved exploratory univariate analysis and multivariate modeling was undertaken to try to identify factors associated with the greatest and least economic benefits. The outcome measure in these models was the aggregate economic effect per after period site year.

The disaggregate analysis found that greatest economic benefits are associated with the highest total entering AADTs, the largest ratios of right-angle to rear end crashes, higher proportions of entering AADT on the major road, shorter cycle lengths and intergreen periods, and with the presence of protected left-turn phases. The presence of warning signs and high publicity levels also appear to be associated with greater benefits. These results do not provide numerical guidance for trading off the effects of various factors. The intent of identifying these factors is that in practice RLC implementers would identify program factors such as warning signs that increase program effectiveness and give the highest priority for RLC implementation to the sites with most or all of the positive binary factors present (e.g., left-turn protection) and with the highest levels of the favorable continuous variables (e.g. higher ratios of right-angle to rear end crashes).

Conclusions

This statistically defendable study found crash effects that were consistent in direction with those found in many previous studies, although the positive effects were somewhat lower that those reported in many sources. The conflicting direction effects for rear end and right-angle crashes justified the conduct of the economic effects analysis to assess the extent to which the increase in rear end crashes negates the benefits for right-angle crashes. This analysis, which was based on an aggregation of rear end and right-angle crash costs for various severity levels, showed that RLC systems do indeed provide a modest aggregate crash-cost benefit.

The opposing effects for the two crash types also implied that RLC systems would be most beneficial at intersections where there are relatively few rear end crashes and many right-angle ones. This was verified in a disaggregate analysis of the economic effect to try to isolate the factors that would favor (or discourage) the installation of RLC systems. That analysis revealed that RLC systems should be considered for intersections with a high ratio of right-angle crashes to rear end crashes, higher proportion of entering AADT on the major road, shorter cycle lengths and intergreen periods, one or more left turn protected phases, and higher entering AADTs. It also revealed the presence of warning signs at both RLC intersections and city limits and the application of high publicity levels will enhance the benefits of RLC systems.

The indications of a spillover effect point to a need for a more definitive study of this issue. That more confidence could not be placed in this aspect of the analysis reflects that this is an observational retrospective study in which RLC installations took place over many years and where other programs and treatments may have affected crash frequencies at the spillover study sites. A prospective study with an explicit purpose of addressing this issue seems to be required.

In closing, this economic analysis represents the first attempt in the known literature to combine the positive effects of right-angle crash reductions with the negative effects of rear end crash increases and identify factors that might further enhance the effects of RLC systems. Larger crash sample sizes would have added even more information. The following primary conclusions are based on these current analyses:

Even though the positive effects on angle crashes of RLC systems is partially offset by negative effects related to increases in rear end crashes, there is still a modest to moderate economic benefit of between $39,000 and $50,000 per treated site year, depending on consideration of only injury crashes or including PDO crashes, and whether the statistically non-significant shift to slightly more severe angle crashes remaining after treatment is, in fact, real.

Even if modest, this economic benefit is important. In many instances today, the RLC systems pay for themselves through red-light-running fines generated. However, in many jurisdictions, this differs from most safety treatments where there are installation, maintenance, and other costs that must be weighed against the treatment benefits.

The modest benefit per site is an average over all sites. As the analysis of factors showed, this benefit can be increased through careful selection of the sites to be treated (e.g., sites with a high ratio of right-angle to rear end crashes as compared to other potential treatment sites) and program design (e.g., high publicity, signing at both intersections and jurisdiction limits).

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TAB 3

THE CITY OF CALGARY

CALGARY POLICE SERVICE

EVALUATION OF THE EFFECTIVENESS OF THE CALGARY POLICE SERVICE RED-LIGHT CAMERA PROGRAM

Project Summary Report

synectics

January 2009

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1.0 INTRODUCTION

1.1 Purpose of Evaluation

The purpose of a red-light camera (RLC) program is to improve the safety of signalized intersections by reducing the numbers of collisions related to red-light running. Following six years of operation, the Calgary Police Service (CPS) sought to determine the safety performance and cost effectiveness of Calgary's Automated Intersection Enforcement Camera (Red-Light Camera) program. Synectics Transportation consultants were retained by the CPS to evaluate the effectiveness of red-light cameras (RLC) at decreasing collisions associated with red light running, and determine the societal savings (injury and fatality reduction) relative to program expenditures.

1.2 Red Light Running and Automated Intersection Enforcement

In the United States during the 1990s, the rate of fatality collisions at traffic signals increased by 18%, more than tripling the growth rate of all other fatality collisions. It has been estimated that 200,000 people are injured and 850 killed annually in red-light running (RLR) incidents, with the total fatalities for 1992-1998 approaching 6,000. An international review of automated traffic enforcement found that jurisdictions using RLC systems reported reductions in red-light violations, and often collisions.

Red-light running has been defined as entering and proceeding through an intersection, either intentionally or unintentionally, after the signal has turned to red. Traditional enforcement procedures involve a patrol car positioned at/near an intersection waiting for a violation to occur. Australia was one of the earliest countries to adopt automated enforcement measures with the implementation of a RLC program in 1979 citing between 35%-60% reduction in red-light running behaviours. Since the 1970s, red-light cameras programs are known to have been implemented in at least 33 countries, including Australia, the United Kingdom, and the USA.

1.3 Calgary Police Service Red Light Camera Program

In 1999, 769 collisions were recorded at Calgary intersections. Five people were killed and 289 injured due to drivers running red lights. The Calgary Police Service (CPS) sought to improve safety at signalized intersections through the reduction of RLR violations and associated collisions. Due to budget constraints and personnel limitations, it is impossible for police officers to patrol high risk (collision likely) intersections 24 hours per day. Red-light cameras provide the ability to effectively monitor intersections on an ongoing basis.

Following inception in 1998, The Calgary Police Service - Intersection Enforcement Camera Program underwent planning and analysis to determine a feasible number of cameras needed to be effective and identify potential site locations. Intersection selection was based upon factors associated with high risk collisions, including number of collisions, violation rates, and vehicle volumes within the City of Calgary. Project objectives were to reduce collisions, reduce offences, and to create awareness in motorists that "red means stop" through a combination of education and enforcement. Program operations and administration is wholly conducted by the Calgary Police Service's Specialized Traffic Enforcement Unit.

Operation of the RLC program began with the inaugural camera, installed at MacLeod Trail and 162nd avenue SW, on April 6th 2001. Driver education was launched parallel to camera implementation, creating driver awareness through the "Red Means Stop" media awareness campaign. Over the following three years the program was expanded to 43 additional locations, with the most recent camera installation on December 1st, 2004. In total, the Calgary Police Service Red Light Camera Program monitors 44 sites through the rotation of 40 pole mounted digital cameras (see **APPENDIX A**).

A partnership was created with the City of Calgary Roads Division to assist with the construction of RLC intersections, by installing sensors in the roadway that are connected to the red light camera controller. The sensors are designed to be activated when the red light signal is displayed for traffic proceeding in that direction. The sensors are only activated after the traffic signal turns red. Should a vehicle enter the intersection on the red light, the red light camera will take a photo of the offender at the stop bar and again as the vehicle proceeds through the intersection. The camera digitally captures the images and allows for writing of the record/image file onto a DVD at the site. The DVD is read at the Traffic Office and offences are reviewed by a photo analyst. When the analyst confirms that the evidence indicates a violation, an offence notice is generated and it is transmitted electronically to the 'Field Data Unit' of the CPS at which time a summons is generated and mailed to the registered owner of the offending vehicle along with a copy of the offence notice, which includes two photos of the offending vehicle running the red light.

1.4 Evaluation Overview

Determining the effectiveness and efficiency of a Red-Light Camera (RLC) program involves a multi-approach assessment that includes: (1) evaluating the safety performance on collision occurrences and (2) an economic appraisal that quantitatively assesses program benefits versus expenditures.

2.0 SAFETY EVALUATION

The most important direct benefit gained from installation of Red Light Cameras (RLC) is expected to be net reduction in right angle collision at intersections, and by extension, a decrease in injuries and fatalities that are associated with this type of collision. Secondary benefits associated with reductions in traffic fatalities and injuries are also expected, including societal savings in resources that are not expended for healthcare, police enforcement, and other emergency services in responding to preventable deaths and injuries.

Annual program evaluations, conducted by the Calgary Police Service (CPS) have shown positive trends in overall collision reduction, including the reduction of right-angle collisions (a key indicator of red-light running). Previous data have also shown that there is a decline in injuries, relative to red light running at the intersections, at RLC equipped intersections.

Alberta provincial guidelines for automated enforcement (Alberta Solicitor General and Public Security, 2006) required external evaluation of Calgary's Red Light Camera Program. The goals for this evaluation were to assess impacts on traffic safety and determine the overall societal benefits.

The present report provides a summary of the evaluation process and results. Please reference Technical Memorandum #1 for a comprehensive discussion of work complete within this phase.

2.1 Procedure

Methodology

Evaluating the safety performance of the RLC program involved developing a methodology that identified necessary and available data, and associated assessment techniques. Experimental design factors and primary variables for analysis were established through an extensive literature review of RLC programs and reported red light running issues.

The safety performance, as an effect of the RLC program on intersection collisions, can be represented by the number and type of collisions that occur with and without the treatment. As the name suggests, an **observational before-after study** assesses differences in a variable from the before period to the after period. The effect of red-light cameras on collisions at intersections is a directly measurable factor, and as such was used as the primary variable of analysis.

Collision data collected prior to initiation of the treatment is used for the before period, where the after period was populated with data acquired following implementation. Data for before and after periods are collected for the *treatment group* (RLC equipped intersections) and a *comparison group* (unsignalized intersections) from which collision patterns are compared. Using data from these study periods allow a before-after analysis to account for 'background' changes that could affect the frequency of collisions, such as a population increase, and statistically derives an expected change in collisions due to the treatment. The change in collision rate is the *safety effect* of the treatment.

In addition to assessing the safety performance at camera equipped intersections, a second before-after analysis was conducted that examined program effects at untreated signalized junctions. Red-light camera programs have been shown to reduce collisions at signalized intersections that are not equipped with RLC's, a consequence which is refer to as a "halo" or spillover effect. Similar to evaluating camera equipped intersections, the spillover analysis compares a treatment group to a comparison group using a before-after study. However, where RLC equipped intersections are retained as the treatment group, the comparison group is comprised of non-equipped signalized 4-legged intersections. The results of the spillover analysis were then compared to the results of the initial safety performance evaluation. The difference between the results of the two tests represents the *spillover effect* of the RLC program.

Data

Required project data were obtained from the Calgary Police Service and City of Calgary. Each institution maintains specific traffic related information, with enforcement data (collisions and violations) kept by the CPS, and the City being responsible for roadway characteristics, intersection controls, and traffic volumes.

The CPS provided ten years (1998-2007) of Calgary collision data, which included information on type, severity, location, and date for each incident. Treatment locations were identified as the 44 intersections equipped with red-light camera units. For the safety performance evaluation unsignalized 4-legged intersections comprised the comparison group (group #1), whereas the spillover assessment used non-RLC equipped 4-legged intersections (group #2). These data were screened for corrupt information (i.e. missing data) and midblock collisions, retaining only collision data that was known to have occurred at intersections. In total, less than 2% of data was excluded.

Study Periods – Before and After

Previous evaluations using before-after studies have determined that a before period comprised of three (3) or more consecutive years of data is methodically ideal for such an analysis. As such, the CPS Red-Light Camera Program before period was defined as January 1998 to December 2000.

Selection of the after period should be limited to years where it can be confidently assumed that the treatment has remained consistently active. As such, the after-period was defined as beginning the month following the last camera installation, January 2005, and ending with the most recent available data, December 2007. This provided equally weighted before and after durations (3 years).

Target Variables (Collisions)

Collision type and frequency were identified as the variables representing the measure of intersection safety. Previous research has shown that RLCs have the potential to affect right angle and rear-end collisions at signalized intersections.

Right angle collisions at signalized intersections involve two separate vehicles traveling in perpendicular directions, which proceed straight through an intersection, resulting in a collision. Since vehicle movements are separated by traffic signal phasing that prohibits conflicting through movements, one of the vehicles involved in the collision would have proceeded through on a red signal display. Therefore, the frequency of this collision type is an indicator of red-light running. These collisions are the targets for reduction with RLC installations.

Conversely, there is a concern that rear-end collisions of vehicles approaching the intersection will increase if RLC installations are in place. Rear-end collisions may increase as vehicle slow or stop to avoid a red light running violation, given the presence of the RLC.

Evaluation

Estimates of program effects on intersection safety was determined by comparing the expected number of targeted collisions (right-angle and rear-end collisions), as if the treatment had not been applied, to the actual observed number of targeted collisions. A total of 156 unsignalized intersections were used as the comparison group, which allowed for the study to account for 'background' changes in traffic safety performance within the before and after periods. This procedure facilitates a more accurate prediction of what the safety at intersections would have been if the RLC program had not been implemented, and consequently, provides greater probability that the treatment effects at the RLC intersections are, in fact, attributable to the RLC program.

Previous research has also identified the existence of 'halo' effects, where a reduction in right angle collisions is observed in the after period at non-RLC equipped signalized intersections. This is considered to be a beneficial spillover effect resulting from a RLC program. The procedure and rationale for the safety evaluation also applies to assessment of the spillover effects. The difference between the two analyses being the use of comparison group, where 406 non-RLC signalized intersections were used instead of the unsignalized junctions, to determine whether or not safety improved more than predicted in the comparison group as a result of the treatment at other intersections.

2.2 Results: Safety Effects at Red-Light Camera Treated Intersections

Results of the analysis show decreases in both right-angle collisions and rear-end collisions at the RLC treated intersections.
Right Angle Collisions

A **48.2% reduction** in right-angle collisions at RLC intersections was found (see **Table 2**). This decrease represents 241 fewer collisions than expected had the treatment not been applied. Results were statistically significant at a 5% confidence level, which indicates that 19 times out of 20 the results are due to the treatment, rather than some other factor. It has been identified that due to collision impact geometry right angle collisions are associated with higher rates of injuries and fatalities, of which sustained injuries are of a greater severity, as compared to other RLR related collisions (i.e. rear-end). These findings indicate that a primary objective of the CPS automated enforcement program, enhanced intersection safety, has been achieved through the reduction of right-angle crashes at RLC equipped intersections. An extrapolation of the results related to a reduction in right angle collisions can provide an estimate of the decrease in different collision severities. Assuming a consistent distribution of collision severities as experienced in Calgary over 10 years (1998-2007), these findings suggest that within the 48.2% reduction of right angle collisions the potential distribution of right-angle property damage only collisions would be 39.44%, injury collisions 8.68% and fatal collisions 0.08%. The results of this analysis for right angle collisions were similar in direction to those documented by studies in other jurisdictions, but showed a greater magnitude in reduction.

Rear-End Collisions

A decrease of 39.6% in rear-end collisions was found. The reduction was not statistically significant at a 5% confidence level. Because the results for the rear-end collisions failed to achieve statistical significance it is not possible to state that the effect of the RLC program on rear-end collisions is conclusive. However, as compared to other evaluations of other RLC programs, which typically have found increases of rear-end collisions, these results are encouraging. Assuming a consistent distribution of collision severities as experienced in Calgary over 10 years (1998-2007), these findings suggest that within the 39.6% reduction of rear-end angle collisions, the potential distribution of rear-end property damage only collisions would be 34.08%, injury collisions 5.52% and fatal collisions 0.01%.

It is not an uncommon practice for safety performance studies to set the starting point for the after period as early as 6 months following RLC installation. Conversely, the present study chose an after period populated with data from the 5th to 7th years of operation. The difference between previously published results and present findings may indicate that motorists have altered their behaviour at RLC intersections as a result of the length of time the program has been operational prior to evaluation. Future research is required to confirm this.

Table 2: Results for the comparative safety evaluation on collisions

Description	Right-Angle	Rear-End
Expected # of collisions without treatment for treated group in after period	645	3,136
Observed # of collisions for treated group in after period	404	2,570
Collision Differential	- 241	- 566
Percent Change (R)	48.2% reduction	39.6% reduction
Significant (at 5% confidence level)	Yes	No

2.3 Results: Spillover Effects of Red-Light Cameras

Examination of possible spillover effects of the RLC program also demonstrated a moderate, yet significant, effect on right angle collisions (see **Table 3**). Collisions at non-RLC equipped signalized intersections were found to significantly **decrease by 8.6%** in the after-period, representing a reduction of 25 right angle incidents. This result indicates that the RLC program has contributed to a broader modification driver behaviors in a desired manner.

The benefit of reduced rear-end collisions was not observed to spill over to other intersections, as a statistically significant (5% confidence level) increase of 8% was found. Considering no research has examined whether spillover effects change over an extended period, as with safety effects at treated locations, further assessment needs to be conducted to explain this result.

Table 3: Spillover effects on collisions

Description	Right-Angle	Rear-End
Expected # of collisions without treatment for treated group in after period	429	2376
Observed # of collisions for treated group in after period	404	2,570
Collision Differential	- 25	+ 193
Percent Change (R)	8.6% reduction	8% increase
Significant (at 5% confidence level)	Yes	Yes

3.0 ECONOMIC APPRAISAL

A benefit-cost analysis relates program benefits and costs expressed as a monetary representation through an economic investigation. To meet the project objectives set forth by the CPS, the purpose of the present benefit-cost analysis is to compare the societal savings associated with reductions in red light running to the overall cost of the RLC program. Please reference Technical Memorandum #2 for a comprehensive discussion of work complete within this phase.

3.1 Methodology

Benefit and cost (B/C) calculations were based on a combination of societal costs of collision savings (benefits), one-time costs program costs, and on-going expenditures. All values were calculated in actual dollar amounts. As RLC program benefits are primarily associated with injury and collision reductions, and do not typically involve generated revenue, it was necessary to derive monetary values to conduct the analyses (procedure described in section 3.2). Program costs were wholly provided by the CPS. Determination of appropriate benefit and cost values were established by correcting benefit and cost values for variances in currency type and inflation. The Bank of Canada's inflation calculation software, accessible on their website, was used to compute these conversions. Total benefits and costs were tabulated as separate calculations, the results of which were combined to yield a Benefit-Cost Ratio.

3.2 Treatment Benefits

A benefit is a beneficial outcome or impact for society of a certain activity or occurrence. The RLC program benefits were represented numerically (monetary value), and were determined using two factors; (1) change in number of collisions (increase or decrease) as a result of the treatment, and (2) the value of specific collision types.

As identified through the safety evaluation the occurrence of two types of collisions are affected by RLC programs:

1. Right angle collisions
2. Rear-end collisions

Value of Collisions

Assigning a monetary value to a collision involves estimating the societal cost of such incidents. Societal collision costs for the present assessment were based on work conducted in 2005 by the FHWA. At present, data derived from the FHWA methodology is considered the most compressive calculation of motor vehicle collisions, and provides significant estimation flexibility such that precise values can be attributed to a collision when knowledge of collision characteristics (i.e. severity, velocity, geometry) is available.

Change in Collision Rates

The results of the Observational Before-After analysis indicated Calgary's RLC program was effective at reducing right angle and rear-end collisions, 240.7 and 565.9 respectively, within the study period of January 2005 to December 2007. These expected collision reduction rates were used to provide a quantifiable collision factor for the benefit analysis.

Benefit Calculation

A monetary total for each collision (severity by type) was determined by applying corrected FHWA values to the predicted changes right angle and rear-ends collisions. Correcting FHWA totals involved currency conversions and inflation adjustments, transforming FHWA costs (2001 US dollar values) into appropriate study period costs (2005 Canadian dollar values). Right angle and rear-end collision values, separated by severity are presented in Table 4.

Table 4. Collision Cost Estimates Corrected for 2005 Canadian Dollars

Severity	Type	Canadian Dollars (January 2005)
Right Angle	Fatal	$ 2,139,834.64
	Injury	$ 76,063.13
	Property Damage Only	$ 12,325.77
Rear-End	Fatal	N/A
	Injury	$ 57,378.98
	Property Damage Only	$ 15,530.83

One final cost adjustment was required to harmonize collision type and severity data. As described above, benefits are determined through application of social costs (FHWA cost estimates) to predicted collision rate change (safety evaluation results). However, where FHWA data provides information based on collision *Severity* (fatal, injury, and PDO), the previous RLC safety evaluation assessed changes in collision *Type* (right angle or rear-end). Reconciliation of these data was required to conduct the benefit analysis. It was deemed most appropriate to convert predicted collision change frequencies from type into severity, as FHWA provides specific numbers for this format without need of further calculations. Calculation of a severity ratio was required to determine appropriate weighting. Collision data for three years prior to the RLC program initiation, January 1998 to December 2000, were used as a model to determine the ratio of collision severity within each collision type (right angle and rear-end). These severity weights were used to determine the overall cost of a single collision, per collision type. Details for right angle and rear-end collision are explained below.

Right Angle Collisions

The societal cost for a right angle collision is:

$ 2,139,834.64	(est. Fatal collision cost)	x	0.89 %	(weight)	+
$ 76,063.13	(est. Injury collision cost)	x	23.16 %	(weight)	+
$ 12,325.77	(est. PDO collision cost)	x	75.99 %	(weight)	=
$ 45,331.07	Cost per right angle collision (weighted)				

Findings from the previous safety evaluation (discussed above), predicted 240.7 right angle collisions were avoided in the study period (January 2005 to December 2007) as a result of the RLC program. Thus, the societal cost saved as result of reduced right angle collisions for the study period is:

$ 45,331.07	Weighted (severity) collision social cost	x
240.7	Right angle collisions avoided	=

$ 10,911,188.01

Rear-End Collisions

As no fatalities occurred as a result of rear-end collisions it was removed from the benefit calculation. The societal cost of a rear-end collision social costs is:

$ 57,378.98	(est. Injury collision cost)	x	17.27 %	(weight)	+
$ 15,530.83	(est. PDO collision cost)	x	82.73 %	(weight)	=
$ 22,758.76	Cost per rear-end collision (weighted)				

Findings from the previous safety evaluation predicted 565.9 rear-end collisions were avoided in the study period (January 2005 to December 2007) as a result of the RLC program. Thus, the social cost saved as result of reduced collisions for the study period is:

$ 22,758.76	Weighted (severity) collision social cost	x
565.9	Right angle collisions avoided	=

$ 12,879,179.58

3.3 Net Benefits

Net benefits of the Calgary Police Service RLC program are summarized in Table 5, demonstrating an estimated benefit total of **$23.8 million.**

Table 5. Summary of estimated net benefits expressed as a monetary sum

Collision Classification	Benefit Value
Right Angle	$ 10,911,188.01
Rear-End	$ 12,879,179.58
Total Estimated Benefits	**$ 23,790,367.59**

3.4 Treatment Costs

Red-Light Camera program costs include *Capital* (one-time disbursements) and *Operational* (on-going expenditures) costs. All cost data were provided by the Calgary Police Service.

3.4.1 Capital Costs

Capital expenditures included costs incurred from:

- initial RLC system purchase
- processing equipment acquisition
- film to digital camera upgrade

Red-Light Camera System

The one-time cost of each RLC purchase included the camera, camera housing, mounting pole, piezos, and all associated connectivity hardware. Also factored into each RLC purchase were fees for installation including City services, supplier services, and roadway infrastructure involvement. A total of $100,000 per site was used as the 2001 inaugural unit cost. Additional RLC installations occurred between 2002 and 2004 (see **APPENDIX A**), for which costs were correct to account for inflation.

Cost total = **$ 414,000.00**

Processing Equipment

An in-house facility dedicated to processing images captured from RLC units was established. This facility was implemented within an existing Calgary Police compound and is run exclusively by CPS staff, which negated overhead costs and extraneous administration costs.

This cost does not need any corrections as the equipment set up was a single fee, and includes five PC workstations, program development, and personnel training.

Cost total = **$ 62,500.00**

Film to Digital Upgrade

In 2005 all film RLC units were upgraded to digital format. The upgrade covered all required hardware, software, and installation expenses. Additionally, CPS personnel received re-training associated with the upgrade. This expenditure was a one time cost, and as such no cost corrections were necessary.

Cost total = **$ 190,000.00**

3.4.2. Operational Costs

Operational costs are on-going expenses that can be calculated as annual totals. These costs include:

- program overhead
- system operation labour
- system maintenance

Program Overhead

General program costs for 2005, including vehicle maintenance, vehicle fuel the ticket control unit (TCU), and a 5% shared cost for the traffic office (NSC) fees, were provided in detail. Cost data for 2006 and 2007 were unavailable. Printing and postage costs were calculated according to an estimated 150,000 annual piece of mail. A subtotal overhead cost value was calculated for 2005. This subtotal was used as the base cost from which 2006 and 2007 annual values were extrapolated by correcting for inflation. Consumer Price Index (CPI) rates, retrieved from the Bank of Canada website, were used to calculate inflation corrections. A total overhead cost for the study period (2005-2007) was derived by summing the individual annual subtotals.

Cost total = **$ 391,077.00**

Salaries and System Operation

The budgeted annual expenditures for salaries and operation of the RLC program were approximated at $150,000 per year. No known budget increases occurred during the study period, and therefore was calculated as a consistent annual flat rate without correction. Included in this cost is labour incurred from retrieval of RLC flash memory cards, violation identification, and summons generation.

Cost total = **$ 450,000.00**

System Maintenance

Definitive system maintenance data was unavailable for this calculation. Through discussion with the CPS, this cost category was assumed to include all types of activities associated with program problem resolutions (i.e. site visits, processing equipment repair, facility maintenance), with annual maintenance calls estimated at 44. Unit maintenance costs were calculated at the highest reported rate, $5,000 per call, accounting for the greatest potential cost while limiting possible under estimation.

All data involved in calculating system maintenance costs were estimated, rather than specified or derived data, and therefore it was not justifiable to correct for annual inflation.

Cost total = **$ 660,000.00**

3.5 Net Costs

Net costs of the Calgary Police Service RLC program are summarized in **Table 6**, demonstrating an estimated cost total of **$2.17 million**.

Table 6. Summary of estimated net costs expressed as a monetary sum

Cost Classification	Expenditure
Capital	
RLC purchase and installation	$ 414,000.00
RLC processing equipment	$ 62,500.00
Film to digital upgrade	$ 190,000.00
Operational	
Program overhead	$ 391,077.00
Salaries and system operation	$ 450,000.00
System Maintenance	$ 660,000.00
Total Estimated Costs	**$ 2,167,577.00**

3.6 Results: Benefit-Cost Ratio

The total calculated benefits from **Section 3.3** (see **Table 5**) and calculated costs from **Section 3.5** (see **Table 6**) are summarized in **Table 7**. For the study period, January 2005 to December 2007, the benefit-to-cost ratio was calculated to be **10.98**, which represents $10.98 in societal savings for every $1 expended on the RLC program.

Table 7. Benefit-to-cost ratio

Estimated Net Benefits and Costs	
Total net benefits	$ 23,790,367.59
Total net costs	$ 2,167,577.01
Benefit-to-Cost Ratio	**10.98**

* Estimated net benefits and costs for the study period of January 2005 to December 2007.

4.0 CONCLUSION

The City of Calgary Red-Light Camera program has been shown to be a valuable traffic safety initiative touting a 48.2% reduction in right-angle angle collisions at RLC equipped intersections, and by extension, injuries and fatalities. This effect has also spilled over to right angle collisions at non-RLC signalized intersections, though to a lesser degree, identified by an 8.6% reduction. Additionally, an unexpected 8% reduction of rear-end collisions at RLC intersections was observed, albeit this result was statistically non-significant. In addition to reducing intersection collisions, the RLC program was also found to be financially beneficial to society. Results of the economic evaluation, demonstrating a 10.98 ratio, have shown that operation of the program has a greater benefit to society as compared to incurred costs by generating a societal savings of $10.98 for every dollar spent.

APPENDIX A

Phase	Intersection Name	Date Operational
1	MacLeod TR & 162 AV SW	2001/04/06
	MacLeod TR & 12 AV SE	2001/06/22
	John Laurie BV & 53 ST NW	2001/06/25
	68 ST & 16 AV NE	2001/07/05
	Sarcee TR & Richmond RD SW	2001/07/06
	4 ST & 6 AV SW	2001/07/05
	61 AV & Barlow TR SE	2001/07/05
2	Crowchild TR & 24 AV NW	2002/05/23
	11 AV & 4 ST SW	2002/08/05
	11 AV & 14 ST SW	2002/06/28
	17 AV & 44 ST SE	2002/05/23
	14 ST & Northmount DR NW	2002/07/11
	64 AV & 4 ST NE	2002/08/05
	Anderson RD & Acadia DR SE	2002/08/05
	9 AV & 11 ST SW	2002/08/21
3	Centre ST & 20 AV NE	2002/12/10
	14 ST & Heritage DR SW	2002/12/10
	Barlow TR & 32 AV NE	2002/12/10
	52 ST & 32 AV NE	2002/12/10
	Bowness RD & Shaganappi TR NW	2002/12/10
	Canyon Meadows DR & Bow Bottom TR SE	2003/08/14
	Southland DR & Acadia Dr SE	2003/08/14
	Fairmount DR & Southland Dr SE	2003/08/14
	Elbow DR & Southland DR SW	2003/08/14
4	Beddington BV & Centre ST N	2003/09/23
	Falconridge BV & 64 AV NE	2003/09/23
	1 ST & 17 AV SE	2003/10/07
	McKnight BV & Barlow TR NE	2003/10/09
	Barlow TR & Centre AV NE	2003/10/09
	Shaganappi TR & Northland DR NW	2003/10/24
	Blackfoot TR & 42 AV SE	2003/10/09
	Memorial DR & 52 ST SE	2003/10/09
5	16 AV & 10 ST NW	2003/10/24
	Edmonton TR & McKnight BV NE	2003/11/05
	Memorial DR & 28 ST SE	2004/01/15
	MacLeod TR & 7 AV SE	2003/11/15
	Bow TR & 33 ST SW	2004/10/19
	17 AV & 33 ST SW	2004/10/19
	Elbow DR & Heritage DR SW	2004/10/19
	Country Hills BV & Beddington TR NW	2004/10/19
6	Glenmore TR & Barlow TR SE	2004/12/01
	McKnight BV & Falconridge BV NE	2004/12/01
	Macleod TR & 25 AV SE	2004/12/01
	Country Hills BV & 14 ST NW	2004/12/01

*** Red Light Camera Phases with Implementation Dates**

THE CITY OF CALGARY

CALGARY POLICE SERVICE

CALGARY POLICE SERVICE RED-LIGHT CAMERA PROGRAM: EFFECTIVENESS EVALUATION SYNOPSIS

Safety improvement of signalized intersections, through the reduction of collisions related to red-light running, is the primary goal of Canadian automated intersection enforcement programs. The Calgary Police Service (CPS) hired Synectics Transportation Consultants Inc. to evaluate the effect on collisions at locations where red light cameras have been used and to assess the benefits and costs of Calgary's red-light camera (RLC) program. Results were based on program operation for January 2002 through December 2007.

Key Findings

1) Right angle collisions were found to be reduced by 48.2%.

-Road user safety is significantly enhanced when these collisions are reduced. Results were statistically significant with a 95% probability that the finding is accurate. The distribution of collision severities can be estimated using historical collision data, ard suggest that within the 48.2% right angle collision reduction 39.44% are expected to be property damage only collisions, 8.68% injury collisions, and 0.08% fatal collisions.

2) Rear-end collisions were found to be reduced by 39.6%.

-In contrast to other automated enforcement assessments, which have identified a trend of increased rear-end collisions with the introduction of RLC intersections, findings in Calgary demonstrate an opposite trend. The duration of program operations at the time of assessment is thought to account for this difference between previous RLC evaluations and the present assessment. Results approached statistical significance, but did not achieve significance at the 95% confidence level, meaning program effects on rear-end collisions are not conclusive. Though not significant, the same method used to calculated proportional collision severity for right angle incidents can be applied for rear-end collisions, suggesting that the 39.6% decrease is estimated to involve 34.08% property damage only collisions, 5.52% injury collisions, and less than 0.01% fatal collisions.

3) RLC safety effects were found to spillover to non-RLC equipped intersections.

-An 8.6% reduction in right angle collisions was found at non Red Light Cameras unsignalized intersections. This finding indicates safety enhancements achieved at RLC intersections are estimated to generalize across other intersections in Calgary. Results were statistically significant with a 95% probability that the result is accurate.

4) Beneficial societal effects and program efficiency were indicated by an 11:1 benefit-cost ratio.

-Program expenditures were compared to savings associated with collision reductions, such as medical costs, emergency services, injury, property damage, and lost productivity. For each $1 expended on the RLC program, the societal savings to Calgarians equaled $11.

5) The Calgary RLC Program is shown to be an effective and beneficial safety tool.

-Safety is enhanced on Calgary roads through a reduction of right angle collisions associated with red light running behaviours. Additional safety improvements are seen in decreased rear-end crashes at RLC intersections, potentially due to program longevity.

TAB 4

ANALYSIS ON THE EFFECTIVENESS OF PHOTOGRAPHIC TRAFFIC SIGNAL ENFORCEMENT SYSTEMS IN TEXAS

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ATS000001

Executive Summary

The 80th Texas Legislature enacted House Bill 1052 and Senate Bill 1119 giving local communities the authority to install red light camera enforcement systems. The Texas Transportation Code requires the Texas Department of Transportation to annually publish the reported collisions that occur at local community intersections that are monitored by red light camera enforcement systems. This report intentionally explored the potential impact that camera systems have on crash frequency at reported Texas intersections. Second, the report focuses on crashes that occur when drivers disregard traffic signals causing right angle and rear end crashes. Finally, the report is intended to fulfill the Texas Transportation Code legislative reporting requirements for the Texas Department of Transportation.

This evaluation considered 56 separate intersections in the data set. Each community reported pre and post-installation crash data that was annualized for a 12 month period of time. Based on the pre and post-installation crash data, there were 586 annualized collisions across all intersections. In contrast, 413 annualized crashes were reported during the same time period following installation which resulted in an average decrease of 30%.

In regards to red light violation crashes, there were 265 annualized right angle collisions prior to the installation of the camera system. By way of comparison, an annualized total of 151 post-installation collisions occurred for a crash reduction change of 114 events. This 114 difference represents a 43% annualized decrease in right angle collisions at the treatment intersection locations.

There were 106 annualized rear end crashes that occurred at intersections prior to the installation of the camera systems. Post-installation, there were 111 annualized rear end collisions that occurred. Although the number of overall rear end crashes increased slightly by 5% or approximately 5 crashes, 66% of the intersections decreased or maintained the same frequency of rear end crash events.

While these results cannot conclusively determine that red light cameras are responsible for the overall reduction in crashes, it does appears that the presence of the treatment provided some effect on the frequency of crashes at the selected intersections for the limited time period of this analysis. Table 1 provides a simple crash summary of the annualized collision events that were reported by local authorities over the reported period.

Table 1: Crash Summary

	Pre-Installation Crashes	Post-Installation Crashes	Change in Number of Crashes	Change in Annualized Crashes
Right Angle Collisions	265	151	-114	-43%
Rear End Collisions	106	111	+5	+5%
Other Collisions	215	151	-64	-30%
Annualized Crash Total	586	413	-173	-30%

Disclaimer

The opinions and conclusions expressed in this document are those of the staff of the Center for Transportation Safety of the Texas Transportation Institute and do not represent those of the State of Texas, the Texas Department of Transportation or any political subdivision of the State or Federal government.

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Introduction

Background

The Federal Highway Administration (FHWA) recognizes red-light running as a national safety problem resulting in as many as 176,000 injuries and 950 fatalities annually. Conservatively, the economic loss associated with red light running collisions is estimated to be $14 billion dollars annually (FHWA, 2001). Intersection crashes constitute 35% of the nation's traffic-related fatalities with 22% of all urban crashes being a direct result of drivers disobeying red signals (NHTSA, 2005). Injuries occur at 45% of all red light running crashes as compared to 30% with others (Retting, Williams, Farmer, &Feldman, 1995).

Retting, Williams, Preusser, & Weinstein (2005) determined that 56% of collisions that occur take place in intersections with a majority of those intersection collisions being right angle or rear end events. While 99% of surveyed drivers acknowledged the dangers of red light running, they perceived a low likelihood of receiving a citation for the violation (ITE, 2003). Even with injury events being significant, 56% of Americans who drive admit to running steady red signals at intersections (FHWA, 2001). Boyle, Dienstfrey, and Sothoron (1998) observed that 83% of the respondents they interviewed considered running a red traffic signal as being dangerous. Porter and Berry (1999) reported that 28% of respondents they interviewed indicated that they would speed up to beat a red traffic signal with the most common reasons given being that the driver was in a rush (35%), saving time (34%), being frustrated with having to stop (12%), and enjoying the thrill of beating the light cycle (3%).

Doerzaph, Neale, Bowman & Wiegand said:

"Relative to other roadway segments, intersections occupy an underrepresentation of the overall infrastructure; however, they represent the location for a significant percentage of the annual automotive crashes in the

United States. Thus, intersections are inherently dangerous and are prime locations for vehicle conflict" (p. 2).

The Texas Strategic Highway Safety Plan (SHSP) recognizes that driver behavior involving disregard of intersection signal authority is a significant and recognized traffic safety problem demanding attention. The plan calls for reducing the fatal and serious injury crash rate by 10% over the next 5 years and provides the use of red light cameras by municipalities as a potential countermeasure (Texas Department of Transportation SHSP, 2007).

So why is it that so many drivers choose to risk losing their life or chance sustaining serious injury by running red signals? The choice may be due to a belief that a collision will not happen to them or if encountered it can be avoided. The choice may be based upon the driver's failure to observe cross traffic, misjudge speed, perceive distance or direction of approaching traffic incorrectly, or have a faulty assumption that other vehicles will yield to their vehicle. Whatever the causes are for crash events, the disproportional number of red light running crashes at signal-controlled intersections must be addressed.

Causation

The subject of what constitutes a crash variable is a complex question to answer. In many ways, the classification of a crash variable is arbitrary leading the investigator to draw a subjective conclusion based upon one possible explanation for the event. There are many different layers and interactions among differing crash variables that complicate the effort to define any one aspect of the crash as the single definitive cause (Quiroga, Kraus, Schalkwyk, and Bonneson, 2003). In order for the results of a crash study to be rigorous, one must consider which factor(s) significantly contribute to the collision event. Unfortunately, the chain of events and circumstances that lead up to the collision are not always known. The presence and or absence of crash variables that potentially contributed to the event may also be unknown. These unknowns make it difficult at best to determine the harmful events that make up the crash.

Collision variables that must be considered and accounted for in any signal controlled intersection crash analysis are traffic flow rates, frequency of signal cycles, vehicle speed, travel distance to the stop line, type of signal control(s), duration of yellow interval, approach grade and visibility. Each variable, in and of itself or in combination with others, can directly influence the potential for red light running and the crash event. Unfortunately, limitations in research design of traditional crash investigations make it complicated, if not impossible, to deduce causality particularly in instances where traffic safety countermeasures are installed as treatments and are evaluated for crash reduction effectiveness. This is especially true when a wide variety of crash variables exist which play significant roles in the occurrence of crash events at intersections.

Nonetheless, a comprehensive investigation of crash variables should strive to consider issues involving human factors, traffic engineering, vehicle design, roadway design, enforcement, environment, and annual daily traffic (Quiroga et al, 2003). Enhancing the quality of crash data by eliminating unrelated variables contributes to the robustness of the safety countermeasure analysis. This ultimately leads to defendable conclusions about the use of the traffic safety treatment at the intersection. By accounting for the crash variables that contribute to running the red signal, the investigative findings can provide a more reasonable conclusion regarding the effectiveness of red light cameras as traffic safety countermeasures. Identifying countermeasures that contribute positively to intersection safety ultimately save lives and reduces injuries and property damage.

Scope

Beginning in 2003 local authorities in Texas contracted with vendors to install the first photographic traffic enforcement camera systems at signal controlled intersections that had a high frequency of crashes specific to red signal violations. Over the past five years, The State of Texas has averaged approximately 3,700 traffic fatalities and over 100,000 serious injury crashes annually (Texas Department of Transportation, 2008). In 2006, The State of Texas recorded more than 48,000 injury and 400 fatal crashes that were intersection related. Over 60% of those intersection crash fatalities, involved right angle collisions.

The Texas Department of Transportation is responsible for publishing the legislative report on crash information provided by local authorities with red light camera systems. The fundamental purpose of this research was to determine the effectiveness of the red light camera systems and their impact on the frequency and severity of crashes at reported monitored intersections.

Red Light Violation

Red light running is a violation of the law and is considered an illegal act. According to the Texas Transportation Code Section 544.007 (d) "Traffic Control Signals in General",

> *"An operator of a vehicle facing only a steady red signal shall stop at a clearly marked stop line. In the absence of a stop line, the operator shall stop before entering the crosswalk on the near side of the intersection. A vehicle that is not turning shall remain standing until an indication to proceed is shown. After stopping, standing until the intersection may be entered safely, and yielding right of way to pedestrians lawfully in an adjacent crosswalk and other traffic lawfully using the intersection, the operator may: turn right; or turn left, if the intersecting streets are both one way streets and a left turn is permissible".*

A driver who decides to stop before entering an intersection may do so as long as they maintain a minimum distance from the intersection and control for factors such as approach speed, timing of the yellow signal interval, and regulating perception and reaction. A red signal violation occurs when a driver cannot stop because of failing to control for one or more of these factors. Once the light changes to red, if the vehicle enters the intersection and continues to cross, the driver is considered to have run the red signal (Quiroga et. al, 2003, Texas Transportation Code Section 544.007).

Typically, a law enforcement officer must observe the red light violation which in most cases, requires them to directly view the same traffic signal that the violator runs. Upon viewing the infraction, the officer must pursue the violator into the intersection several seconds after the signal has turned steady red. Gaining compliance is often difficult because the dynamics associated with traditional enforcement requires police officers to pursue violators through red intersections and into harm's way in order to make the traffic stop. The dangerous action of pursuing vehicles in areas of high vehicle density can endanger motorists, pedestrians, and the officers. Because of this risk, conventional traffic enforcement in some communities is being supplemented with red light camera technology (Retting et al. 1998, Freedman and Paek, 1992).

While increased enforcement may moderately reduce the incidence of red light running, it is not a permanent solution to this ongoing problem. Cooper (1975) evaluated the effects of increased enforcement and the impact it has on red light violations at signal controlled intersections. Observations of the intersections took place for two weeks in which base line data was gathered. After the two-week observation period ended, enforcement was increased to determine the effects the treatment had on red light running. Increased enforcement continued for four weeks and at the end of this time period, enforcement was reduced back to normal levels. Two weeks after the decreased enforcement effort, the intersections were again observed for red light running violations and data was collected to be compared against the base line information that was previously recorded. While there was a dramatic decrease in the number of red light running violations during the enhanced enforcement period, the number of violations increased after the enforcement stopped suggesting that drivers fell back into pre-enforcement driving behavior.

Cooper's discovery suggests that enforcement has a significant relationship regarding the frequency of red light running events that occur at intersections. The evidence also suggests that without a continuous deterrent presence in place that causes compliance, violations of the law are more prone to occur. Clearly, there is a need for some form of continual enforcement to be present at intersections in order to maintain driver compliance. Photographic traffic enforcement of red light violations at intersections is one method to enhance existing law enforcement strategies that are already in place.

Automated Enforcement Systems as a Traffic Safety Countermeasure

Porter and England (2000) suggest that the greatest challenge concerning intersection collisions is not whether the issue of traffic safety is important but rather how traffic safety countermeasures can be developed that truly change risky driving behavior. Countermeasure is simply defined as an action taken that counters or offsets other opposing acts. In the case of red light camera systems, the adverse action of a driver running a red signal is countered by the opposing reaction which is usually in the form of a citation. This causes the original action to diminish or cease altogether. In theory, the driver's fear of receiving a citation is not worth the risk of violating the law.

Automated enforcement systems act as a persistent reminder to drivers that there is a system in place holding them accountable for risky driving behavior. In the case of red light running, automated enforcement systems provide a 24-hour a day 7 day a week monitor of driving behavior which in theory, holds the motorists accountable for their actions while encouraging them to comply with the law. While it is true that red light camera systems cannot stop the driver from violating the law, it does provide a general deterrence effect and a punishment for drivers who make poor driving choices.

The aim of the traffic safety countermeasure is to ensure that the implemented treatment action taken is appropriate for reducing the violation risk. The function is to modify dangerous driver behavior by utilizing general deterrence and threat of punishment as a means for getting drivers to comply with the law. Ultimately, the goal of the countermeasure is to eliminate crashes and significantly reduce the number of injury, serious injury, and fatal crashes from occurring.

Automated Red Light Running Enforcement

Red light camera systems cover a broad range of electronic devices and systems that are used to detect and photograph vehicles engaged in traffic violations. The Texas Transportation Code defines a "photographic traffic signal enforcement system" under Section 707.001;

> *"Photographic traffic signal enforcement system means a system that: consists of a camera system and vehicle sensor installed to exclusively work in conjunction with an electrically operated traffic-control signal; and is capable of producing at least two recorded images that depict the license plate attached to the front or the rear of a motor vehicle that is not operated in compliance with the instructions of the traffic-control signal".*

The technology can include radar or laser detection devices, electromagnetic loops embedded in the road, pole-mounted or portable cameras, microprocessors, and networking devices. Older systems usually capture the red light violation on 35mm film while newer models utilize digital photography. The 35mm film must be routinely extracted from the older units, while the newer systems employ digital and video cameras which send the captured information to the enforcement authority over data networks.

Detection of the violation is usually made by sensors (electromagnetic loops) that are buried in the pavement and tied into the timing system of a traffic signal and a pole-mounted camera. Because the camera's position is fixed, only one direction of traffic flow is monitored at the intersection unless other additional cameras are installed. Once the signal changes from yellow to red, the system activates with a small red light enforcement tolerance of between 0.1 to 0.3 seconds. After the system activates, any vehicle crossing the loops will trigger the camera unit to take two photographs (Burkey & Obeng, 2004).

The first photograph is taken of the vehicle as it enters into the intersection. The second photograph is taken when the vehicle is within the intersection. The captured image includes the license plate, the traffic control signal and the vehicle as it is in the intersection. Upon review of photographic evidence usually by a qualified law enforcement agent, a civil citation is issued to the registered owner of the vehicle. Those charged with traffic offenses have the opportunity for judicial review (USDOT/FHWA, 2006, Texas Transportation Code Section 707.011, Texas Transportation Code Section 707.001).

Infrastructure

The Texas Transportation Code Section 707.003 indicates that a county, municipality, or other local entity authorized to enact traffic laws under the laws of this state (local authority) that wishes to install a red light camera system(s) must take preliminary steps before the system can be installed for use. First, a traffic engineering study of the approach to the intersection must be made to determine whether in addition to or as an alternative to the system, a design change to the approach or a change in signalization may reduce the number of red light violations. Selection of the intersection must be based on traffic volume, collision history at the approach, the frequency of red light violations at the intersection, traffic engineering and other safety criteria.

The Texas Department of Transportation does provide an "engineering analysis template" that may be used as a basis for the traffic engineering study referenced in the statutory language under the Texas Transportation Code Section 707.003. The Texas Department of Transportation engineering analysis template is specific and details intersection and signal data, signal timing and traffic data, crash and enforcement data, and other supporting information that is considered in a traffic engineering study. The engineering analysis template is included as Attachment A.

After the engineering analysis of the intersection is complete, the local authority must report the findings to a "citizen advisory committee" consisting of one citizen appointed by each member of the governing body (city council, etc.). Unless this procedure is conducted the local authority may not impose a civil penalty for violation of the system. (Texas Transportation Code Section 707.003).

The local authority must also ensure that the yellow change interval meets the minimum standards for steady yellow in accordance with the Texas Manual Uniform Traffic Control Devices (TMUTCD) (Texas Transportation Code Section 707.005). The MUTCD provides guidance that a yellow-change interval should have a duration of approximately 3 to 6 seconds, with the longer intervals reserved for use on approaches with higher speeds. The TMUTCD also reference the Manual of Traffic Signal Design published by ITE. Attachment D provides an example of the TMUTCD that addresses yellow signal change interval recommendations.

The local authority must also have an ordinance in place that provides recourse in the form of a hearing to persons who are charged with the running the red signal (Texas Transportation Code Section 707.009). The ordinance must also provide a time period in which the hearing must be held, provide for the appointment of a hearing officer and designate the department, agency or office of the local authority that is responsible for enforcement/administration of the ordinance (Texas Transportation Code Section 707.009). The ordinance must also regulate the fine for the violation (civil infraction) which can be no greater than $75 with a late payment fee that cannot exceed

$25 (Texas Transportation Code Section 707.007). Attachment C provides an example of a red light camera system ordinance.

Finally, the local authority must erect signs along each roadway that leads to a photographically enforced intersection. The signs are required to warn motorists that the approaching signalized intersection is being photographically enforced. Each warning sign must be easily readable and be no less than 100 feet from the intersection (Texas Transportation Code Section 707.003 and Section 544.001).

The local authority must also have on file with the Texas Department of Transportation an "amendment to the municipal maintenance agreement" (MMA) when requesting a red light camera system placed on state highway right of way. Attachment B is a copy of the Texas Department of Transportation MMA. Without an MMA in place, the Texas Department of Transportation will not allow any camera system to be operated on State right of way. The Texas Department of Transportation reviews the installation plans and inspects the installation of the cameras even though a city or a contractor may be performing the work.

Objective

In 2007, the 80th Texas Legislature enacted House Bill 1052 and Senate Bill 1119 giving local authorities the authorization to install red light camera enforcement systems at qualified intersections. The local authorities who installed red light camera enforcement systems were required to report pre and post-installation crash data to the Texas Department of Transportation. Local authorities with red light camera enforcement systems were required to record the number of crash events and the types of collisions that occurred within each separate camera monitored intersection. This collected data was intended to define the nature of the crash problem in order to determine whether red light camera enforcement systems positively or negatively influence crash frequency and severity levels.

As a condition of an Interagency Cooperation Contract, the Texas Transportation Institute was granted the opportunity to assist the Texas Department of Transportation in compiling, analyzing, and evaluating community intersection crash data that was submitted from around the State of Texas. The research objective was to investigate and determine the impact that red light camera enforcement systems had on right angle crashes, rear end crashes and total crashes. This objective was addressed by analyzing the crashes of all reporting local authorities where data was available.

Reporting Requirements

Pre-Installation Crash Reporting

The reporting period covers the time in which the camera first becomes active in an enforcement capacity. The pre-installation reporting requirements are specific to camera-controlled intersections that became active January 1, 2008 and forward.

The Texas Transportation Code Section 707.004 requires that the local authority submit a written report to the Texas Department of Transportation detailing the frequency and injury severity of crashes that occurred at the intersection 18 months prior to the installation of the enforcement camera system. The report must be submitted to the Texas Department of Transportation no later than 6 months after the camera becomes active for enforcement purposes. However, if the camera became active on or before December 31, 2007, there is no requirement for the local authority to provide a report to the Texas Department of Transportation concerning the 18 months of pre-installation crash data even if the system remains active in 2008. However, the Texas Department of Transportation asked the local authorities to submit the data.

This presents a problem in reporting since some local authorities reported pre-installation crash data while others did not. This made the process of analyzing the effectiveness of the red light camera system difficult to perform since no base line data was present for some local authorities. In short, there was no metric to determine the rise, fall or static percent difference in crash rates at some of the reported treatment intersections.

Post-Installation Crash Reporting

The Texas Transportation Code Section 707.004 requires local authorities to monitor and file an annual report to the Texas Department of Transportation that lists the number and type of traffic crashes at the red light camera monitored intersection in order to determine if the system results in reducing the frequency of crashes and their severity. This post-installation report is due to the Texas Department of Transportation no later than August 31 annually.

The post-installation report is required to include data collected from crashes that occurred in the photo-enforced intersections from July 1, 2007 to June 30, 2008. This report is mandatory regardless of whether the photo enforcement system had been installed on, before, or after December 31, 2007.

Since this is the first year that the law requires a post-installation report to be generated, some local authorities will provide more crash data than others depending on when their camera(s) went active. For instance, if College Station activated their cameras on January 1, 2008, then they would not have 12 months worth of post-installation crash data on record for the photo enforced intersection. Instead, College Station would only be able to report post-installation crash data up to June 30, 2008 (according to the Texas Department of Transportation report instructions) which is only 6 months. Another example would be if Grapevine activated a camera on March 1, 2007, they would only be required to report post-installation crash data from July 1, 2007 to June 30, 2008 (required Texas Department of Transportation time frame) and none of the data dating back to the day the camera was activated.

The requirements for reporting are directly affected by when the photographic enforcement system went active. The magic date for reporting pre-installation crash data is December 31, 2007. Any pre-installation crash data on or before this date, is not required to be reported to the Texas Department of Transportation for the report. Systems that went active January 1, 2008 forward do require the pre-installation crash data report detailing the past 18 months of pre-installation crash data.

All local authorities must provide a post-installation report for each camera controlled intersection according to when the system went active. Reporting applies to all photographic enforcement systems to varying degrees. Camera's that were active

December 31, 2007 or earlier have no required pre-installation crash data requirements while those that were activated January 1, 2008 forward require the pre-installation crash data. Regardless of the pre-installation crash data requirements, all local authorities must report post-installation crash data annually to the Texas Department of Transportation (due no later than August 31, 2008).

Data Analysis

The Texas Transportation Code Section 707.004 requires local authorities with red light camera systems to report to the Texas Department of Transportation the frequency and severity of pre and post-crash events that occurred at camera monitored intersections. The Texas Department of Transportation made local authorities aware through a notice in the Texas Register, that each community with a red light camera system was required to report pre and post-installation crash data no later than August 31, 2008. The Texas Department of Transportation required the data be submitted electronically through a collection site located on the Departments website.

The data used in this analysis was the collection of self-reported information submitted by local authorities prior to the August 31, 2008 deadline. Intersection crash data that was submitted after the August 31, 2008 deadline was not considered in this analysis.

There were 26 local authorities reporting red light camera enforcement activity to the Texas Department of Transportation. In addition to the 26 cities that had red light cameras in place, 58 other local authorities were considering or were in the process of installing systems at the time of this report.

There were 12 local authorities that provided pre-installation intersection crash data. Of the 12 local authorities that provided pre-installation crash data, all but 2 provided post-installation intersection crash data. Table 2 represents the local authorities and the number of intersections that reported pre-installation intersection crash data to the Texas Department of Transportation.

Table 2: Local Authorities Reporting Pre-Installation Data

Local Authority	Number of Intersections Pre-Installation
Arlington	1
Baytown	8
Bedford	3
Fort Worth	5
College Station	4
Frisco	2
Grand Prairie	4
Houston	51
Irving	6
Jersey Village	8
Rowlett	3
Terrell	2

Twenty four (24) local authorities reported post-installation intersection crash data to the Texas Department of Transportation. Of the 24 cities that provided post-installation intersection crash data, 14 failed to provide pre-installation crash data. Table 3 represents the local authorities and the number of intersections that reported post-installation intersection crash data to the Texas Department of Transportation.

Table 3: Local Authorities Reporting Post-Installation Data

Local Authority	Number of Intersections Post-Installation
Amarillo	11
Arlington	8
Baytown	1
Cedar Hill	5
Bedford	3
Dallas	52
Garland	8
Mesquite	3
College Station	6
Coppell	2
Corpus Christi	10
Dalworthington	1
Duncanville	5
Farmers Branch	7
Frisco	3
Grand Prairie	12
Houston	66
Irving	7
North-Richland-Hills	7
Plano	19
Richardson	3
Richland Hills	5
Rowlett	5
Terrell	2

Ultimately, there were 10 local authorities that provided pre and post-installation intersection crash data. The information provided represented 56 different intersections within these 10 reporting communities. Table 4 represents the local authorities that provided pre and post-installation crash data to the Texas Department of Transportation.

Table 4: Local Authorities Reporting Pre and Post-Installation Data

Local Authority	Number of Intersections Pre Post-Installation
Arlington	1
Baytown	1
Bedford	3
College Station	4
Frisco	2
Grand Prairie	4
Houston	31
Irving	6
Rowlett	2
Terrell	2
Total Intersections	56

This report provides an analysis of data from 56 intersections that installed red light cameras in an effort to reduce the frequency and severity level of crashes in their communities. Table 5 represents all reported intersection crashes by frequency and community. Due to the short time period of analysis, no conclusions may be inferred from the pre or post-analysis with any statistical confidence.

Table 5: Intersection Frequency by City

City	Number of Intersections Pre-Installation	Number of Intersections Post-Installation	Number of Matched Intersections
Amarillo	0	5	0
Arlington	1	8	1
Baytown	8	1	1
Coppell	0	2	0
Cedar Hill	0	5	0
City of Bedford	3	3	3
City of Plano	0	14	0
College Station	4	4	4
Corpus Christi	0	9	0
Dallas	0	49	0
Dalworthington	0	1	0
Duncanville	0	4	0
Farmers Branch	0	7	0
Fort Worth*	5	6	4
Frisco	2	2	2
Garland	0	8	0
Grand Prairie	4	11	4
Houston*	51	65	32
Irving	6	6	6
Jersey Village	8	0	0
Mesquite	0	2	0
North Richland	0	7	0
Richardson	0	3	0
Richland Hills	0	1	0
Rowlett*	3	5	3
Terrell	2	2	2
Totals	**97**	**230**	**62**

Note (*): Several local authorities were not included in the detailed analysis since the data provided was not complete.

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Results

The results section is divided into three areas to provide the reader with a better understanding of how red light cameras influenced the crash rates in the intersections where data was reported for the period of July 1, 2007 through June 30, 2008. The first area addresses the impact of the installation on the overall frequency of crashes at the identified intersections. The second area speaks to the results according to crash type and the third area explored how different types of intersections, based on crash frequencies, were affected by the installation of the red light cameras.

Since some red light cameras were installed at different times after the reporting period had began, there was a significant difference in the number of months where crash information was provided. In some cases local authorities reported 12 months of post-installation crash data while others reported less. In addition, some local authorities were required to provide pre-installation crash data for 18 months prior to the installation of the red light camera system while other local authorities were not required to report pre-installation crash data at all.

In order to make the data sets comparable, the crash rates included in this study were annualized. This was performed so that each intersection that was investigated possessed the same number of months in which the crash rates could be compared. By calculating the frequency of crash events at intersections by months and then projecting the cash rate over a 12 month period, the method allowed for a uniformed approach at comparing crash rates across the year. Since the crash data for the intersections were annualized there were some crash rate percentages that possessed decimal fractions while others did not. These decimal fractions represent the percentage of crashes that were accounted for as a result of annualizing the data sets. The decimal fractions were rounded to the next highest or lowest interval in order to make the report more practical for the reader.

For the purposes of this analysis, only those intersections where the local authority reported both pre and post-installation crash data were included in the data set. The data reported by intersection and an overall summary analysis has been included in this section of the report.

Impact of Camera Installation on the Overall Frequency of Crashes

Based on the pre and post-installation crash data submitted to the Texas Department of Transportation, there were 586 annualized crashes at the intersections identified in the data set. After the red light cameras were installed, local authorities reported 413 crashes for a 30% decrease in the number of annualized crashes.

Additionally, there were 265 annualized pre-installation right angle crashes that occurred prior to the installation of the cameras. By way of comparison, 151 annualized post installation right angle crashes occurred after the cameras were installed. This represented a 43% decrease in right angle collisions.

Finally, 106 annualized pre-installation rear end crashes occurred at intersections prior to installation of the cameras. A total of 111 annualized post-installation rear end crashes occurred after installation which represented an average increase of 5% for those events. Pre and post-installation collision data for total annualized crashes are summarized in Table 6.

TAB 5

A. Registered to Vote/Party ID.

Democrat	328	41%
Republican	288	36%
Independent	184	23%

1. In general, do you think that the State of Florida is headed in the right direction or the wrong direction?

Right direction	256	32%
Mixed	95	12%
Wrong direction	357	45%
DK/Refused	93	12%

2. How would you rate the job Rick Scott is doing as Governor?

Excellent	43	5%
Good	267	33%
Not so good	206	26%
Poor	224	28%
DK/Refused	61	8%
Total Positive	310	39%
Total Negative	429	54%

3. How would you rate the job the Florida State Legislature is doing?

Excellent	15	2%
Good	225	28%
Not so good	279	35%
Poor	167	21%
DK/Refused	115	14%
Total Positive	239	30%
Total Negative	446	56%

4. If this year's Presidential election in November is a choice between Barack Obama, the Democrat and Mitt Romney, the Republican, which one would you vote for?

Barack Obama/Democrat	315	39%
Mitt Romney/Republican	331	41%
Undecided/DK/Refused	154	19%

5. Now, changing topics for a minute, how much have you recently seen, read or heard about the issue of cameras being used at busy intersections for the enforcement of traffic safety laws? Is it a lot, only some, not very much, or nothing at all?

A lot	317	40%
Only some	293	37%
Not very much	130	16%
Nothing at all	46	6%
DK/Refused	14	2%

6. As you may know, Florida currently allows local communities to install red light cameras at busy intersections to enforce traffic laws. Florida is the third most deadly state in the nation for red light running related fatalities. Since 2006, more than 350 Floridians have been killed in red light running related collisions and thousands injured. Do you Support or Oppose this?

Strongly support	410	51%
Somewhat support	159	20%
Somewhat oppose	50	6%
Strongly oppose	142	18%
DK/Refused	39	5%
Total Support	570	71%
Total Oppose	192	24%

7. Some members of the Florida State Legislature in Tallahassee say that red light cameras are a bad idea because they violate driver's personal privacy, represent big government and are used more as a way for Government to grab more money than to promote highway safety?

Do you agree with these critics who want to REPEAL the red light camera law.	215	27%
Do you support allowing local communities to KEEP red light traffic enforcement cameras at busy intersections.	533	67%
DK/Refused	52	6%

8. Next, I will read you a short set of statements that SUPPORTERS of keeping red light cameras in Florida might make. Tell me if you think each as either a very positive, somewhat positive, neutral or negative reason to keep red light cameras operating in Florida. Here's the first one.

a. Florida is one of the most deadly states in the nation for traffic-related deaths to pedestrians and bicyclists at intersections; use of red light safety cameras can work to save lives at the most deadly intersections across the state.

Very positive	412	52%
Somewhat positive	140	18%
Neutral	80	10%
Negative	142	18%
Don't Know	25	3%
Total Positive	553	69%

b. Using red light cameras to catch and fine red light runners means that limited police patrol resources in our local communities can be put to work on other safety and crime fighting activities.

Very positive	358	45%
Somewhat positive	188	23%
Neutral	85	11%
Negative	141	18%
Don't Know	28	4%
Total Positive	546	68%

c. Red light violations generate over 100 million dollars a year to local and state government in Florida. In these tight budget times, this money would be hard to replace if red light cameras were outlawed.

Very positive	245	31%
Somewhat positive	156	19%
Neutral	138	17%
Negative	208	26%
Don't Know	53	7%
Total Positive	401	50%

d. Currently, local communities make the decision whether red light safety cameras are right for them or not; it makes no sense for Tallahassee politicians to dictate a "one size fits all" policy for all the different parts of Florida on this issue.

Very positive	294	37%
Somewhat positive	169	21%
Neutral	131	16%
Negative	162	20%
Don't Know	43	5%
Total Positive	464	58%

e. By law, money generated from red light violations goes directly to fund spinal cord injury research, brain injury research and emergency room trauma centers throughout Florida.

Very positive	374	47%
Somewhat positive	157	20%
Neutral	92	12%
Negative	139	17%
Don't Know	38	5%
Total Positive	531	66%

f. Red light safety cameras are a proven way to change dangerous driving behavior and make Florida's busy intersections safer. Since cameras have been installed, the number of red light running violations is down in some communities by as much as 67 percent.

Very positive	442	55%
Somewhat positive	148	18%
Neutral	69	9%
Negative	106	13%
Don't Know	35	4%
Total Positive	590	74%

9. Having heard this information about Florida's red light cameras from both sides, how would you prefer your State Legislator in Tallahassee vote on this issue?

To REPEAL and get rid of red light cameras in Florida.	187	23%
To KEEP the current law allowing local communities to use red light safety cameras at busy intersections.	579	72%
DK/Refused	34	4%

9a. IF KEEP IN Q9: And if your State Legislator voted the other way to REPEAL and get rid of red light cameras, is this an issue that would make you consider VOTING AGAINST them in the next election or not?

Yes, vote against	287	36%
No, not change mind	233	29%
DK/Refused	59	7%
Not Asked	221	28%

10. Lastly, on a slightly different issue. A new traffic safety device has been developed to catch drivers who illegally pass a stopped and loading school bus. This device is similar to an intersection red light camera system but instead, is mounted on a school bus and is activated to catch violators driving past a loading school bus when its stop sign arm is turned on, swung open, and blinking. In general, do you SUPPORT or OPPOSE the use of this school bus camera device in Florida?

Support	638	80%
Oppose	110	14%
DK/Refused	52	6%

D1. Gender.

Male	395	49%
Female	405	51%

D2. Age.

18-29	27	3%
30-39	45	6%
40-49	80	10%
50-59	145	18%
60-64	117	15%
65-Up	372	46%
Refused	15	2%

D3. Do you consider yourself to be a member of the Tea Party movement?

Yes	114	14%
No	645	81%
DK/Refused	40	5%

D4. Political Ideology.

Very liberal	68	8%
Somewhat liberal	95	12%
Middle-of-the-road	244	31%
Somewhat conservative	203	25%
Very conservative	144	18%
DK/Refused	46	6%
Total Liberal	162	20%
Total Conservative	347	43%

D5. Cuban.

Yes	26	3%
No	757	95%
DK/Refused	17	2%

D5a. IF NO/DK: Other Hispanic/Latino.

Yes	27	3%
No	732	95%
DK/Refused	16	2%

D6. African American/Black.

Yes	66	9%
No	666	89%
DK/Refused	16	2%

Actual sample:	800	8

Media Market

Pensacola	42	5%
Tallahassee	18	2%
Jacksonville	70	9%
Gainesville	14	2%
Orlando-Daytona	158	20%
Tampa-St. Pete	180	23%
West Palm Beach	91	11%
Ft. Myers	65	8%
Miami-Ft. Lauderdale	162	20%

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing appendix has been furnished via e-mail (.pdf) to: *Charles T. Wells* (charles.wells@gray-robinson.com) and *Richard E. Mitchell* (rick.mitchell@gray-robinson.com), GrayRobinson, P.A., P.O. Box 3068, Orlando, Florida 32802; *Jason D. Weisser* (JWeisser@shw-law.com), Schuler, Halvorson & Weisser, P.A., 1615 Forum Place, Suite 4D, West Palm Beach, Florida 33401; *Bard D. Rockenbach* (bdr@FLAppellateLaw.com and fa@FLAppellateLaw.com) and *Andrew A. Harris* (aah@FLAppellateLaw.com and jew@FLAppellateLaw.com), Burlington & Rockenbach, P.A., 444 W. Railroad Avenue, Suite 430, West Palm Beach, Florida 33409; *David B. King* (dking@kbzwlaw.com) and *Thomas Zehnder* (tzehnder@kbzwlaw.com), King, Blackwell, Zehnder & Wermuth, P.A. 25 E. Pine St., P.O. Box 1631, Orlando, Florida 32802-1631; and *Erin Jane O'Leary* (eoleary@orlandolaw.com), Brown, Garganese, Weiss, & D'Agresta, P.A., P.O. Box 2873, Orlando, Florida 32802, this 24th day of January, 2013.

Joseph Hagedorn Lang, Jr.
Florida Bar Number 059404

Masone v. City of Aventura, **Case No. SC12-644**

CERTIFICATE OF SERVICE

On April 27, 2013, the undersigned served an unopposed motion by the Florida League of Cities, Inc., American Traffic Solutions, Inc., and Xerox State & Local Solutions, Inc., seeking leave to adopt the *amici curiae* brief they filed in *City of Orlando v. Udowychenko*, Case No. SC12-1471 (Fla.), in this case. On May 13, 2013, that motion was granted by the Court.

On July 24, 2013, the Clerk's Office requested that the *amici curiae* brief be resubmitted through the Court's e-Portal as a separate document, not as an attachment to the unopposed motion. That has now been done.

I HEREBY CERTIFY that a true and correct copy of the resubmitted *amici curiae* brief has been furnished via e-mail (.pdf) to: *Edward G. Guedes*, Weiss Serota Helfman Pastoriza Cole & Boniske, 2525 Ponce de Leon Blvd., Suite 700, Coral Gables, Florida 33134 (EGuedes@wsh-law.com), and *Bard D. Rockenbach, Esq.* and *Andrew A. Harris, Esq.*, Burlington & Rockenbach, P.A., 444 W. Railroad Avenue, Suite 430, West Palm Beach, FL 33409 (bdr@flappellatelaw.com; aah@flappellatelaw.com; fa@flappellatelaw.com), this 25th day of July, 2013.

/s/Joseph Hagedorn Lang, Jr.
Florida Bar No.: 059404