



OFFICE OF INSPECTOR GENERAL
City of Chicago



REPORT OF THE OFFICE OF INSPECTOR GENERAL:

RED-LIGHT CAMERA PROGRAM REVIEW

OCTOBER 2014



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To the Mayor, Members of the City Council, City Clerk, City Treasurer, and residents of the City of Chicago:

At the request of the Mayor and the City Council, the Office of Inspector General (OIG) has completed a review of the City of Chicago Red-Light Camera (RLC) program. The requests for review were made in response to unexplained anomalies in red-light citation counts identified by the *Chicago Tribune*.¹

OIG's review focused on the City's management of the RLC program. We specifically worked to determine how anomalies, such as those publicly identified, went either unnoticed or unaddressed. We also sought to respond to public concerns about the City's capacity and willingness to identify and address anomalies in the future.

The attached report summarizes relevant details of current and historical RLC program contracts and explains how the program operates through its various vendors. We hope this effort aids public understanding of the parameters and procedures of the program.

Overall, our review revealed that the City's management of the RLC program with Redflex was fundamentally deficient. The City did not ensure that Redflex was meeting all of its contractual obligations regarding routine maintenance and monitoring of the program. In addition, monthly reviews of RLC system performance by the City and Redflex failed to identify and timely address violation count anomalies and did not examine trends in RLC violations over time. Such analysis would have allowed the City to programmatically assess whether camera systems were functioning according to specifications. As OIG noted in its May 2013 RLC Audit, such trend analysis is also important for determining if the program is achieving its public safety objectives.²

This report also summarizes CDOT's findings as to the causes of the anomalies at the twelve intersections noted by the *Chicago Tribune*. Although CDOT was responsible for performing the analysis of enforcement anomalies, OIG reviewed CDOT's findings and determined that they were consistent with source documentation and available records. To date, the City has been able to identify and demonstrate the likely causes of anomalies at only three intersections. However,

¹ David Kidwell, "Red light cameras tag thousands for undeserved tickets." *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>.

² "Red-Light Camera Installation Audit." City of Chicago Office of Inspector General. May 14, 2013, <http://chicagoinspectorgeneral.org/wp-content/uploads/2013/05/Red-Light-Camera-Audit-Final1.pdf>.

the absence of full historical program records and data makes conclusive identification of the causes of past spikes difficult.

Our review further concluded that CDOT has and continues to take significant steps to improve program management since operations transitioned from Redflex to Xerox, which assumed sole responsibility for the operation of the City's camera systems in February 2014. According to CDOT, Xerox provides the City with a report twice a week containing trends for each individual camera system. Meetings between CDOT, Xerox, and other relevant City departments are more frequent than with Redflex, and access to data is easier. CDOT also stated that they have developed and implemented an early warning system that will flag unusual patterns in violation counts in near real-time.

In its response, CDOT commits to a number of positive actions, including a detailed annual report. Because the transition to Xerox is a recent event, it is too soon for OIG to complete a full audit of CDOT's current program management. However, OIG encourages CDOT to follow through on these improvements. Transparent and attentive program management is critical to restoring the public's trust and meeting the safety goals of the RLC program.

We thank CDOT, the Department of Finance, and the Department of Administrative Hearings for their cooperation in this review. We would also like to thank staff from Redflex, Xerox, and IBM for providing documentation and assisting our office in understanding the RLC program.

Respectfully,

A handwritten signature in blue ink, appearing to read 'J. Ferguson', with a stylized flourish at the end.

Joseph M. Ferguson
Inspector General
City of Chicago

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I. EXECUTIVE SUMMARY

On July 18, 2014, the *Chicago Tribune* published a report detailing “sudden spikes” in the number of violations captured by red-light cameras (RLCs) at some intersections in Chicago.³ According to the *Tribune* report, Chicago Department of Transportation (CDOT) officials were unaware of these anomalies until notified by *Tribune* reporters, and CDOT could not explain the anomalies. The *Tribune* report concluded that “the deviations in Chicago’s network of [384] cameras were caused by faulty equipment, human tinkering or both.”⁴

At the request of the Mayor and members of the City Council, the Office of Inspector General (OIG) reviewed the City’s RLC program to better assess the program generally and the issues identified by the *Chicago Tribune* report in particular.⁵

In order to provide a rapid response to both constituent requests and public concerns raised by the *Tribune* report, OIG conducted a limited scope review rather than a comprehensive audit, which would have required additional months of document and data collection, review and analysis. Our conclusions are therefore limited to the evidence we were able to obtain and verify in this short timeframe. In addition, OIG did not review the validity of individual violations captured during the enforcement anomalies, which was the focus of a separate review the City conducted with the assistance of a contractor retained for that purpose. Rather, OIG’s goals were to,

- determine the contract parameters and document historical management of the RLC program;
- ensure that the system was and is operating pursuant to the applicable contract provisions; and
- ascertain if CDOT is equipped to identify and expeditiously address ticketing anomalies and other problems in the future.

OIG’s review revealed that CDOT’s management of the RLC program as operated by Redflex Traffic Systems, Inc. was insufficient to identify and resolve the types of issues identified in the *Tribune* report. Specifically, CDOT failed to request and review reports from Redflex that may have revealed enforcement anomalies as they occurred and failed to enforce the terms of its contract with Redflex, which required Redflex to evaluate data and identify any anomalies in RLC system activity.⁶

³ David Kidwell, “Red light cameras tag thousands for undeserved tickets,” *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>.

⁴ David Kidwell, “Red light cameras tag thousands for undeserved tickets,” *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>.

⁵ See Appendix A for City Council letter to OIG requesting review.

⁶ The term “RLC system” refers to all of the equipment and software installed at an approach to an RLC intersection. Most RLC intersections have RLC systems installed at two approaches (e.g., northbound and eastbound).

Under its new contract with Xerox State & Local Solutions, Inc., CDOT has taken steps to improve the Department's RLC contract management. OIG encourages CDOT to proactively monitor the program and address issues, including any anomalies, as they arise.

RLC program information OIG reviewed did not contain evidence that the City or Redflex manipulated the RLC program with the intention of improperly increasing red-light violations, although due to missing Redflex maintenance records OIG could not conclusively dismiss this possibility.

During the course of OIG's review, CDOT identified likely proximate causes for three of the twelve intersections specifically named in the *Tribune* report. OIG reviewed CDOT's findings regarding these locations and found them consistent with source documentation and available records. Specifically, CDOT found:

- At the intersection of 119th and Halsted, the trigger speed for the approach dropped from 15 mph to as low as 5 mph for a period of approximately 7 weeks in 2011. This drop resulted in 1,618 additional citations that would not have been issued had the trigger speed remained at 15 mph.⁷
- At the Kimball-Lincoln-McCormick intersection, the detector in the right turn lane was largely non-functional for several years. The "spike" periods identified by the *Tribune* were the brief periods—usually only a few days or a week—when the detector in the right lane was functional. Since Xerox took over operation of the program, the daily violation counts have been generally consistent with those in the "spike" periods, which suggests that the anomalous periods were the only times the system captured events in this lane. OIG estimates that the broken system may have failed to identify as many as 45,444 violations over a four-and-a-half year period.
- For the Halsted-Fullerton-Lincoln intersection, which experienced a two-day enforcement anomaly on August 2 and 3, 2012, one of the traffic signal poles at the location was damaged late on August 1 or early on August 2, 2012, and, as a result, the traffic signals mounted on that pole were reported as not being visible to drivers the next day. The end of the two-day enforcement anomaly appears to coincide with CDOT's August 3 repair of the damaged pole as the affected RLC system captured 33 violations on August 3 prior to the completion of CDOT's repairs and only 1 violation after the repairs. CDOT stated that the increase in RLC violations at the intersection may have resulted from inattentive drivers ignoring the still-functional traffic signal and driving through the intersection during a red phase.

OIG notes that CDOT has thus far been unable to identify a likely proximate cause for the enforcement anomalies at the other nine intersections in significant part because CDOT and Redflex failed to identify the anomalies in a timely fashion and, as a result, CDOT was unable to obtain and analyze relevant data, including the complete set of Redflex maintenance data, for the

⁷ For the purposes of this report, the word "violation" refers to the act of operating a vehicle in violation of Municipal Code of Chicago § 9-8-020(c) and § 9-16-030(c). The word "citation" refers specifically to the notice sent to drivers with evidence of a violation.

relevant locations. Given the passage of time and the unavailability of that data, it is possible that the proximate causes for other enforcement anomalies may never be identified.

This report provides background on the RLC program and its vendors, a description of the specific causes of enforcement anomalies identified by CDOT, OIG conclusions regarding CDOT's management of the RLC program, and detailed OIG suggestions for improving management of the program.

II. BACKGROUND

A. City of Chicago Red-Light Camera Program

On July 9, 2003, the Chicago City Council enacted an ordinance, codified as Municipal Code of Chicago (MCC) § 9-102, authorizing the use of RLCs for automated enforcement of the City's red-light traffic laws.⁸ The preamble to the enabling ordinance stated that "the leaders of the City of Chicago are charged with safeguarding the safety of the public, and therefore... it is appropriate to implement a program to utilize an automatic red-light enforcement system at intersections within the City."⁹

The Chicago Department of Transportation (CDOT) bore responsibility for the management of the RLC program when it began in 2003. In January 2006, the City Council amended the enabling ordinance to transfer responsibility for the program to the Office of Emergency Management and Communications (OEMC). By further amendment enacted in January 2010, the City Council returned responsibility for program management to CDOT.¹⁰

Under this program, vendors install RLC systems, which include a camera, a computer, and any necessary detection equipment, at intersections throughout the City that capture video, still images, and corresponding data of potential red-light violations. According to CDOT, RLC system placement is purportedly based on crash data reflecting comparatively dangerous red-light intersections, though a 2013 OIG audit could not substantiate this claim. Two stages of vendor review evaluate the information captured by the RLC systems to determine if it establishes that a violation occurred. If both levels of reviewers determine that a violation did occur, the City issues a citation to the registered owner of the offending vehicle. Vehicle owners who receive a citation can contest the citation by mail or through an in-person hearing with the Department of Administrative Hearings (DOAH).

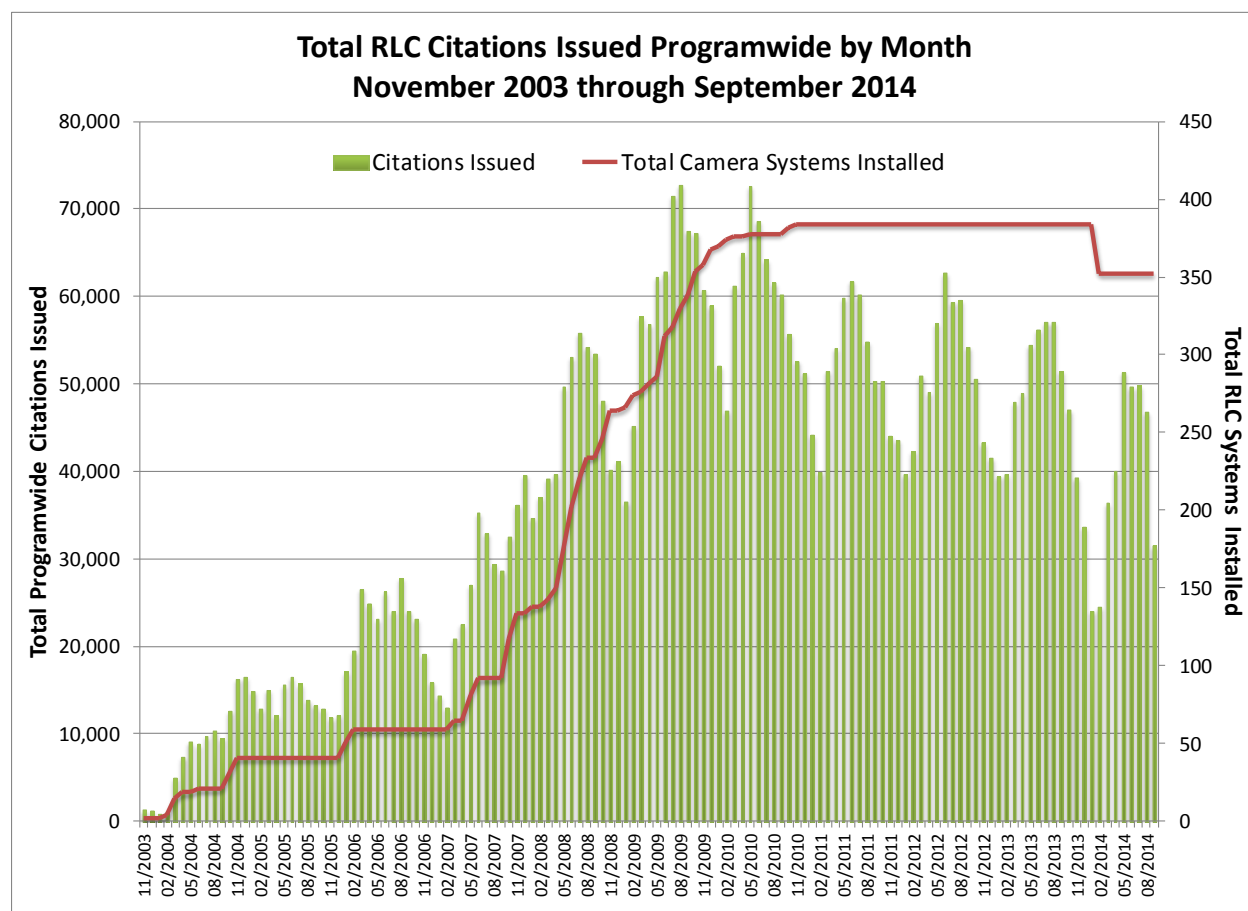
From the start of the program in November 2003 through September 30, 2014, the City has issued 5.0 million RLC citations that have generated over \$520 million in revenue.¹¹ The following graph illustrates the total number of violations programwide as well as the total number of RLC systems installed.

⁸ City of Chicago, Journal of the Proceedings of the City Council, July 9, 2003, 4349, accessed September 15, 2014 http://docs.chicityclerk.com/journal/2003/july09/july09_part3_03optimize.pdf.

⁹ City of Chicago, Journal of the Proceedings of the City Council, July 9, 2003, 4349, accessed September 15, 2014 http://docs.chicityclerk.com/journal/2003/july09/july09_part3_03optimize.pdf.

¹⁰ Although some of the enforcement anomalies described in this report occurred during OEMC's management of the program, this report refers to CDOT's program management throughout because much of the staff responsible for the program during OEMC's management moved over to CDOT with the program in 2010—so many of the responsible parties were the same across both departments. In addition, CDOT is currently responsible for the program and is positioned to address any issues identified within the program.

¹¹ The Department of Finance provided OIG with data detailing total revenue (including paid violations, fines, penalties, and collection costs) for each RLC intersection by month from the start of the program through September 11, 2014. Data is presented by date the citation was issued, not date of payment. This data can be found on OIG's website at http://chicagoinspectorgeneral.org/?attachment_id=6096.



Source: DOF and CDOT

B. RLC Program Vendors and Responsibilities

1. Redflex Traffic Systems, Inc.

Redflex operated the City's RLC program from 2003 to 2013 pursuant to three separate contracts. The City and Redflex entered into the first contract—P.O. 3220—on October 22, 2003 for a term of two years, which the City later extended to October 2008. In February 2008, the City entered into two subsequent agreements with Redflex: P.O. 18031, which covered maintenance and support for existing RLC systems purchased under P.O. 3220; and P.O. 16396, which covered installation, maintenance, and support for new RLC systems. These agreements extended Redflex's operation of the RLC systems through January 2013, but did not materially alter Redflex's obligations or the basic operations of the program. In total, the City paid Redflex \$126 million to operate the RLC program over 10 years.

Under the Redflex agreements, the City purchased and owned the RLC equipment, rather than leasing it, and the City was therefore responsible for non-routine maintenance, including repairs following knockdowns or vandalism.¹² Redflex was responsible for RLC system installation,

¹² In this report, the term "Redflex equipment" means RLC equipment owned by the City of Chicago and operated by Redflex.

contract-specified routine maintenance, and support services.¹³ Pursuant to the contracts, routine maintenance was to consist of a monthly check of each RLC system, which included a check of system hardware and software. Redflex's contracts also required it to conduct a "Daily Operational Systems Check," which included generating an automated report for each RLC system and evaluating "the daily activity of the intersection cameras and the central server to determine if there are any anomalies on the data provided."¹⁴ Neither the contract nor program materials provide a definition for what constituted an anomaly.

Per its contracts with the City, Redflex's compensation was not tied to citation volume or total revenue. Rather, Redflex received payment solely for the installation of each system, monthly fees to perform routine maintenance and operational support, and payments for any non-routine maintenance or repairs requested by the City.

P.O. 3220 required Redflex to deliver upon demand by the City the records created pursuant to the contract, including digital images and data produced by the RLC systems. P.O. 3220 further required that Redflex retain copies of the images and related data for at least two years from their date of creation, and "maintain any such records not delivered to the City or demanded by the City," for five years after the City's final contract payment. Similar requirements appear in both P.O. 16396 and P.O. 18031.

In October 2012, Mayor Emanuel referred to OIG for investigation allegations that Redflex bribed a CDOT official in connection with the RLC program.¹⁵ In January 2013, the City extended Redflex's existing contracts for six months while the City completed a bidding process for a new RLC program contract. In February 2013, an investigation by an outside firm hired by Redflex announced preliminary findings indicating numerous instances of Redflex improperly paying trip and entertainment expenses of the former CDOT official responsible for managing the RLC program.¹⁶ In response, the City declared Redflex ineligible to bid on a new RLC contract.¹⁷

¹³ In return for routine maintenance and operation, Redflex received monthly fees per RLC system of \$3,250 under P.O. 3220, \$5,000 under P.O. 3220 Modification #3, \$3,900 under P.O. 16396, and \$4,395 under P.O. 18031.

¹⁴ City of Chicago, "Digital Automated Red Light Enforcement Program," October 22, 2003, P.O. 3220, 60, accessed September 19, 2014, <https://webapps1.cityofchicago.org/VCSearchWeb/org/cityofchicago/vcsearch/controller/agencySelection/displayAgencyHome.do>.

¹⁵ On May 14, 2014, the US Attorney for the Northern District of Illinois, the Chicago Office of the Federal Bureau of Investigation, the Internal Revenue Service Criminal Investigation Division, and OIG announced the arrest of John Bills, a former City official who managed the RLC program from its start until his retirement in 2011. Bills allegedly received bribes from Redflex. In August 2014, a federal grand jury indicted Bills, former Redflex CEO Karen Finley, and Bills' associate Martin O'Malley on a 23-count indictment alleging that Redflex officials provided Bills with \$570,000 cash and other personal benefits in exchange for inside information and assisting Redflex in obtaining, keeping, and expanding its Chicago contracts that grew to \$124 million. This case is ongoing.

¹⁶ Redflex Traffic Systems, Inc., "Annual Financial Report 2013," 8, accessed September 9, 2014, http://www.redflex.com/2013_Annual_Report.pdf.

¹⁷ David Kidwell, "City dropping red-light camera firm as probe heats up," *Chicago Tribune*, February 8, 2013, accessed September 9, 2014, http://articles.chicagotribune.com/2013-02-08/news/ct-met-chicago-red-light-investigation-0208-20130208_1_redflex-holdings-red-light-camera-redflex-contract.

2. Xerox State & Local Solutions, Inc.

In October 2013, the City awarded Xerox State & Local Solutions, Inc. P.O. 28635, a \$44 million 5-year contract for the “continued provision and implementation of equipment and software, and maintenance, repair and support services” for the RLC program.¹⁸ As part of these responsibilities, Xerox agreed to replace existing RLC systems with Xerox technology. Unlike the Redflex contracts, Xerox owns all RLC equipment, rather than the City, and is responsible for the maintenance and repairs of that equipment.

During the transition from Redflex to Xerox, which continued through February 24, 2014, Redflex remained partially involved in the operation of the RLC system. After February 24, 2014, Xerox assumed sole responsibility for operating the RLC system equipment. The last Redflex RLC system was decommissioned on July 15, 2014.

Like Redflex, Xerox’s compensation is not tied to the number of citations issued or revenue generated. Rather, the City pays the company a flat rate for the operation of each RLC system.

Xerox’s contract requires that it make available to the City upon request all data captured by its RLC systems. Xerox’s contract further provides that it must maintain copies of still photos and video clips of accepted violations for two years and non-image data captured by its RLCs for five years after the City’s final contract payment.

C. How the RLC Program Works

The purpose of this section is to provide a brief description of how a red-light violation is recorded, reviewed, and a citation ultimately issued to the registered vehicle owner. Although the technology used to capture violations has changed as part of the transition from Redflex to Xerox, the process has generally remained the same since the program began in 2003.

1. Photo and Video Captured—Event

An RLC activates and records a potential violation when a vehicle approaches the intersection at or above a set speed as the traffic signal changes from yellow to red. The Redflex RLC systems used in-ground loops to detect approaching vehicles and identify which vehicles were most likely to run a red light based on the speed at which they traveled over the in-ground loops.¹⁹ According to CDOT, the minimum vehicle speed needed to trigger Redflex systems was 15 mph. Xerox’s RLC systems use radar technology to detect approaching vehicles and have a trigger speed of 13 mph.²⁰

When activated, the RLC takes two photos and the RLC system captures 12 seconds of video. Each RLC activation is referred to as an “event”. The RLC system also records other relevant

¹⁸ City of Chicago, “Automated Red Light Enforcement Program,” P.O. 28635, 1, accessed September 10, 2014, <https://webapps1.cityofchicago.org/VCSearchWeb/org/cityofchicago/vcsearch/controller/agencySelection/displayAgencyHome.do>.

¹⁹ The City’s contracts with Redflex define “In-Ground Loop” as “the System sensors that are installed under the street pavement, which activates each System.”

²⁰ CDOT and Xerox stated to OIG that the 13 mph trigger speed for Xerox equipment is functionally equivalent to Redflex’s trigger speed but that differences in the technology and the positioning of equipment mean that the precise numbers differ.

information, including the date and time of the event, the duration of the yellow light, the speed of the vehicle at the time it triggered the system, and the speed limit. Although an RLC takes photos only when a vehicle triggers it, the RLC system captures video 24/7. Under the current Xerox contract, Xerox stores this video for at least 30 days and must make it available to the City upon request. Additionally, the RLCs record traffic count data. Although this was not a requirement under the Redflex contracts, some traffic count data does exist for the time period when Redflex operated the program.

CDOT stated that because the Redflex system relied on in-ground loops, the technology was susceptible to environmental factors such as pavement degradation and roadwork or utility work that required cutting into the pavement. CDOT stated that when roadwork required cuts to the pavement, the in-ground loops were sometimes damaged and had to be replaced. When the loops were damaged, they would not trigger the RLC and the RLC system would not record violations.

The Xerox RLC program uses above-ground radar technology, so the condition of the road surface and sub-surface does not affect the system's ability to detect vehicles.

2. Initial Review—Potential Violation

The RLC vendor is responsible for conducting the initial review of each event to determine whether the photos and video establish that the vehicle violated MCC § 9-8-020(c)(1), which requires vehicles, when facing a “steady circular red signal” to “stop at a clearly marked stop line, but if none, before entering the crosswalk on the near side of the intersection, or if none, then before entering the intersection” and “remain standing until an indication to proceed is shown,” or MCC § 9-8-020(c)(2), which requires vehicles, “when facing a steady red arrow signal,” to “stop at a clearly marked stop line, but if none, before entering the crosswalk on the near side of the intersection, or if none, then before entering the intersection” and “remain standing until an indication permitting the movement indicated by such red arrow is shown,” or MCC § 9-16-030(c), which provides that “[d]rivers may not turn left or right on a steady red signal when official traffic-control devices have been erected indicating that such turns are prohibited.”

The vendor conducts the review pursuant to business rules setting forth the criteria by which the vendor examines the system-generated images and data to determine a violation. The evidence consists of two photos of the event, a photo of the vehicle's license plate, a video clip of the event, and other data including vehicle speed, speed limit, yellow light duration, and time into red phase. The business rules that applied during Redflex's contract tenure consisted of a training document explaining the criteria for evaluation. Xerox's business rules take the form of a manual that details the specific requirements for accepting a violation and state that for a reviewer to accept an event as a *potential violation*, the following conditions must be met:

- “Vehicle position in the Environment 1 [first] photo must be such that the front tires of the violating vehicle are prior to the stop bar
- Vehicle position in the Environment 2 [second] photo must be such that the rear tires of the vehicle are past the stop bar

- If there is not a clearly marked stop bar then the vehicle must stop before entering the crosswalk
- If the rear tires of the vehicle are past the stop bar in Environment 2 but the vehicle does NOT proceed through the intersection—do NOT cite.”

Xerox’s business rules also state that emergency vehicles and funeral processions should not be cited and provide guidance on how to determine whether a violation occurred for various vehicle types and scenarios.

If any of the conditions are not met, the vendor must reject the event and no citation is issued. If the necessary conditions are present, the vendor accepts the event as a *potential violation* and sends it on for a second-stage review by a separate City contractor, IBM Corporation, which has performed this function since the start of the RLC program as described in the next section below.

As part of the vendor review, the reviewer must enter the license plate number of the vehicle captured in the photos. If the photo of the license plate is blurry or otherwise not visible in the photo, no citation can be issued.

Both the Xerox and Redflex contracts require that a certain percentage of the potential violations the vendors accept and refer for second-stage review are “enforceable images,” that is, the events sent on for further review should ultimately provide sufficient basis to issue a citation. The enforceable images rate is designed to ensure that the vendor performs a thorough initial review and refers what it regards to be fully supported violations on for further review. Under the Redflex contract, 85% of accepted images over a 30 day period had to be enforceable, whereas, under the new Xerox contract, 90% must be enforceable. If the vendor fails to meet the required standard for enforceable images, the City assesses liquidated damages, which are deducted from the City’s next payment to the vendor. CDOT stated that it never assessed liquidated damages against Redflex. In the first year of its contract with Xerox, the Department had assessed \$28,867 in damages as of September 2014 for Xerox’s failure to meet specified performance metrics.

3. IBM Review of Potential Violations

Once the RLC vendor reviews and accepts an event as a potential violation, IBM, pursuant to a separate City contract with the Department of Finance (DOF) for general violation program support and noticing, reviews event evidence.²¹ IBM reviewers check the same evidence as the RLC vendor reviewers to confirm the evidence supports that a violation occurred based on the business rules agreed to by the City and the RLC vendor. When IBM accepts a violation, the reviewer must re-key the license plate to ensure that the City holds the correct registered vehicle owner accountable for the offense. IBM stated to OIG that its staff reviews approximately 500,000 potential violations each year.

²¹ DOF oversees the City’s contract with IBM for violation noticing support services. The full contract can be found on the Department of Procurement Services website:
<https://webapps1.cityofchicago.org/VCSearchWeb/org/cityofchicago/vcsearch/controller/agencySelection/displayAgencyHome.do>

If IBM determines that a violation occurred, the RLC vendor sends the violation to the City and IBM uploads it to DOF's data system. The City, through IBM, requests the address of the registered vehicle owner associated with the license plate in the violation photo from the Illinois Secretary of State or the applicable state's Department of Motor Vehicles. IBM sends the citation information and address to a printing vendor, who mails it on behalf of the City.

4. Administrative Hearings Review—Opportunity to Contest

A vehicle owner who receives an RLC citation can request a hearing through the Department of Administrative Hearings (DOAH). A DOAH official stated that 50 to 60 randomly assigned Administrative Law Judges (ALJ) conduct RLC violation hearings either in-person or through the mail. At a hearing an ALJ reviews the citation and the evidence—including an attestation from the IBM reviewer who accepted the violation—to make a determination as to whether a violation occurred. The DOAH official stated that ALJs employ a “more likely than not” standard to make those determinations.

DOAH stated that of the 4.1 million RLC citations issued from 2007 through 2013, 187,379 were contested (4.6%). Of the contested RLC citations, 17,927, or 9.6%, resulted in a “Not Liable” finding.²²

Neither CDOT nor DOF currently reviews DOAH data to identify potential issues in the RLC program, though both Departments meet with DOAH weekly to discuss the program.

D. CDOT Management of RLC Program

Pursuant to MCC § 9-102-010, CDOT is currently responsible for the management of the RLC program and has been since 2010.²³ CDOT's role is to determine the location of the RLC systems,²⁴ ensure that the program functions to specification, and make sure that the program vendors fulfill their duties under applicable agreements.

1. Management of Redflex Contracts

CDOT's primary method for managing the Redflex contracts was a monthly review of Customer Management Reports. These reports included total events processed, total potential violations, and total violation counts at each intersection for the month. CDOT could request other data or reports from Redflex but, according to CDOT and Redflex, it did not do so and relied on the monthly reports. CDOT limited its monthly review of the Customer Management Reports to the top ten and bottom ten citation-generating RLC systems, and focused its analysis and activities

²² See Appendix G for DOAH citation disposition by year, 2007-2013.

²³ CDOT was responsible for the RLC program when it began in 2003. In January 2006, the City Council amended the enabling ordinance to transfer responsibility for the program to OEMC but returned responsibility for the program to CDOT by ordinance in January 2010.

²⁴ OIG completed an audit in May 2013 to determine if RLC locations were selected primarily on CDOT's safety criteria. The limited information CDOT had available did not provide sufficient basis to substantiate its claim that CDOT based its RLC installation decisions on the primary criterion of reducing vehicle angle crash rates. In order to promote integrity and transparency of the program, OIG recommended that CDOT establish and follow clear criteria for its decisions on where to locate automated traffic enforcement systems and retain verifiable documentation of the process for each location decision. City of Chicago Office of Inspector General, “Red-Light Camera Installation Audit,” May 14, 2013, accessed September 19, 2014, <http://chicagoinspectorgeneral.org/wp-content/uploads/2013/05/Red-Light-Camera-Audit-Final1.pdf>.

primarily on low activity and non-functional RLC systems. When a system was non-functional, it was the Department's responsibility to ensure that the equipment was repaired and returned to operable condition. CDOT did not perform any analysis of month-to-month or year-over-year trends. It also did not review these reports for increased or sudden changes in violation counts because, as CDOT staff told OIG, staff saw their role at that time as keeping the systems operational rather than ensuring that the equipment functioned accurately.

However, Redflex's contracts required it to ensure that "the System [was] functioning properly and producing the desired results," and to evaluate daily reports containing event counts "to determine if there are any anomalies on the data provided."²⁵ CDOT explained to OIG that these daily checks were a technical remote check and the Department was not notified of the results unless the results required maintenance at or near an RLC-equipped intersection. Redflex's contracts did not require it to routinely provide records of these daily system checks to CDOT, although Redflex would have been required to make such records available upon request. CDOT acknowledged that it has no records of a request being made to Redflex while it managed its contract with the company.

CDOT also did not collect or analyze any traffic count data collected by Redflex's RLC systems. CDOT has used some traffic count data from Redflex as part of its recent analysis of enforcement anomalies but did not perform any such analysis as part of its routine management of the RLC program.

2. Management of Xerox Contract

CDOT stated that the Department meets with Xerox twice a week, and that CDOT, DOF, Xerox, IBM, and DOAH meet once a week to discuss any developments in the RLC program.

Xerox provides reports to CDOT twice a week with month-to-date violation totals, a comparison to the month-to-date violation totals from the previous year, and total uptime and downtime for each RLC system for the month. Additionally, CDOT may query customized reports of Xerox data.

CDOT and Xerox have recently developed what CDOT has characterized to OIG as an "early warning system" designed to flag unusual patterns so that both CDOT and Xerox identify enforcement anomalies quickly.²⁶ Daily alerts are supposed to notify all parties when violation count deviates significantly from a trailing 60-day average. The alerts will include unusual changes in violation count, violation rate, and traffic count, among other metrics. The system is intended to provide CDOT and Xerox with the information needed to identify and address issues immediately. CDOT and Xerox stated that it is a work-in-progress and will continue to be adjusted as they determine the best ways to identify anomalies.

²⁵ City of Chicago, "Automated Red Light Enforcement Program" P.O. 18031, 44, and P.O. 3220, Exhibit 4, accessed September 15, 2014,

<https://webapps1.cityofchicago.org/VCSearchWeb/org/cityofchicago/vcsearch/controller/agencySelection/displayAgencyHome.do>

²⁶ See Appendix F for parameters of CDOT/Xerox Early Warning System as of September 2014. These parameters are subject to change as the system is implemented and CDOT and Xerox refine the methodology.

E. Chicago Tribune Report on Enforcement Anomalies

On July 18, 2014, the *Chicago Tribune* published a report identifying a series of “sudden spikes” in RLC violations that City officials could not explain.²⁷ The *Tribune* reviewed violations as far back as 2007 and “documented more than 13,000 questionable tickets at 12 intersections.”²⁸ The report also noted that “similar patterns emerged at dozens of other intersections responsible for tens of thousands more tickets.”²⁹

F. City Response to Enforcement Anomalies

1. Additional Review of Violations

In response to the *Chicago Tribune* report, the City announced that it would provide the individuals who received citations for RLC violations captured during enforcement anomaly periods at twelve intersections an opportunity to request additional review of those violations. The City stated that it mailed approximately 16,000 notices with details about the review opportunity to such individuals in July and August 2014.³⁰ The City mailed the notices to the address associated with the original citation and posted information about how to request a review on the City’s website.

To perform this additional review, the City contracted with Grant Thornton LLP on August 22, 2014, to “conduct factual reviews of videos and/or photos” that were previously reviewed by the City’s RLC contractors to “assist the City in determining that a violation occurred or whether certain automated red light violations... should be vacated and dismissed (and, as appropriate, refunds issued).”

OIG’s review did not evaluate the efficacy of the additional review process, because, during the period of our review (and at the time of this report), that process was ongoing. As a result, OIG is unable to offer an informed opinion on the quality or accuracy of that review.

2. RLC Violation Data Posted to City Data Portal

The City began posting daily accepted violation totals to the City Data Portal in September 2014.³¹ This dataset includes daily totals for each RLC system since July 1, 2014, “minus the most recent 14 days.”³² The Data Portal description states that the “data may change due to occasional time lags between the capturing of a potential violation and the processing and

²⁷ David Kidwell, “Red light cameras tag thousands for undeserved tickets,” *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>

²⁸ David Kidwell, “Red light cameras tag thousands for undeserved tickets,” *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>

²⁹ David Kidwell, “Red light cameras tag thousands for undeserved tickets,” *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>

³⁰ See Appendix B for the template of the notification letter sent out to affected vehicle owners.

³¹ The City of Chicago Data Portal is a website that provides public access to datasets containing information on City departments and operations. <https://data.cityofchicago.org/>.

³² The full RLC violation dataset can be found here: <https://data.cityofchicago.org/Transportation/Red-Light-Camera-Violations/spqx-js37>.

determination of a violation.” OIG did not audit or otherwise validate the daily violation data and therefore has no opinion on the accuracy of that data.

III. ANALYSIS OF ENFORCEMENT ANOMALIES

CDOT recently analyzed Redflex invoices, customer service reports for traffic signal work, construction permits, available Redflex maintenance records, and violation data provided by Redflex in an effort to identify the proximate causes of the enforcement anomalies at the twelve intersections the *Tribune* identified. The Redflex violation data includes the date, time, and lane of the violation, as well as the “detected speed” for each violation, which is the recorded speed of the vehicle when it triggered the RLC system. Although CDOT was responsible for performing the analysis of enforcement anomalies, OIG reviewed CDOT’s findings and determined that they were consistent with source documentation and available records.

A. Limitations of OIG Review

In order to provide a rapid response to both constituent requests and public concerns, OIG conducted a limited scope review rather than a comprehensive audit, which would have required additional months of document and data collection, review and analysis. Our conclusions are therefore limited to the evidence we were able to obtain and verify in late July, August, September, and early October 2014.

In addition to the short timeframe, this section notes other limitations that affected the scope and conclusiveness of this review.

1. Lost Maintenance Records

OIG reviewed Redflex and CDOT maintenance records and saw no evidence of intentional changes to the RLC system that would have caused the enforcement anomalies identified by the *Tribune*. However, gaps in Redflex maintenance records prevented OIG from dismissing this possibility entirely.

According to CDOT, Redflex stored some of its maintenance records locally on computers at each RLC intersection in a file saved on the hard drive of the RLC system’s computer rather than in Redflex’s central database. When the RLC program transitioned from Redflex to Xerox, Xerox erased the hard drives of these RLC computers, in order to reuse the computers. Any Redflex maintenance records on the hard drives were erased. As a result, OIG cannot state with certainty the extent to which RLC system parameters were changed, or whether changes were intentional or accidental.

2. Analysis Conducted Years After Anomalies

Determining the proximate cause of the enforcement anomalies at the twelve intersections identified in the *Tribune* report proved difficult because CDOT was unaware of the anomalies at the time they occurred. As a result, many of those anomalies occurred years before CDOT attempted to analyze them. This fact limited the definitiveness of both CDOT and OIG’s determinations regarding the causes it did identify, and in other instances posed an insurmountable hurdle to making any determination regarding the causes of the anomalies.

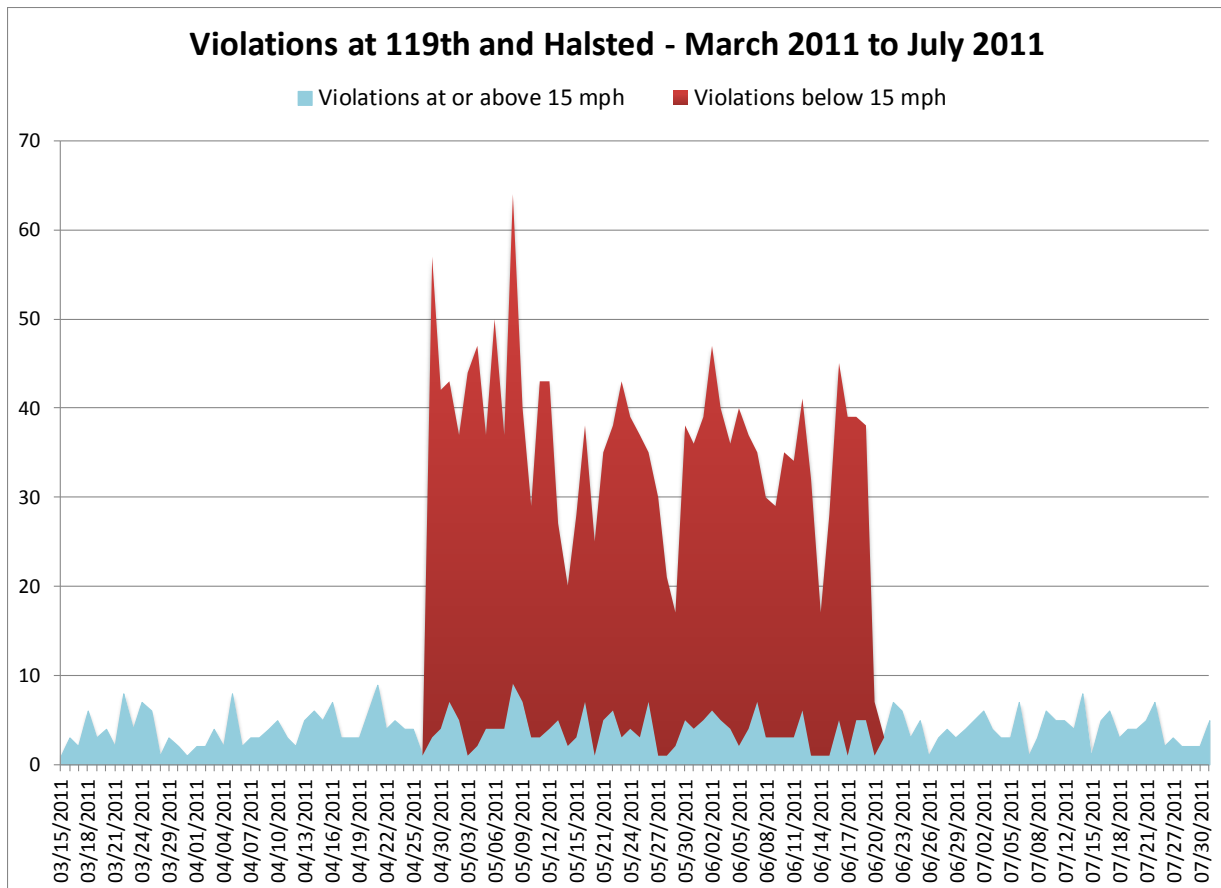
B. Analysis of the Enforcement Anomalies

CDOT was able to identify likely proximate causes for three intersections: 119th and Halsted from April 29, 2011 to June 19, 2011, Kimball-Lincoln-McCormick for various dates over several years, and Halsted-Fullerton-Lincoln from August 2, 2012 to August 3, 2012. A short timetable for analysis, coupled with missing and incomplete records, limited CDOT's ability to determine the causes of the other nine enforcement anomalies.

System data reflects that the increase in RLC violations at the 119th and Halsted intersection appears to have been caused by a reduction in the intersection's trigger speed. The increase in RLC violations at Kimball-Lincoln-McCormick appears to have been the product of a typically inoperative loop detector briefly, but for reasons that could not be identified, becoming operative. Finally, the increase at Halsted-Fullerton-Lincoln appears to have been caused by an external factor—a damaged traffic signal that may have affected driver behavior.

1. Low Trigger Speed at 119th and Halsted

According to CDOT, the minimum trigger speed for all Redflex RLC systems should have been 15 mph. However, Redflex data for the southbound approach at 119th and Halsted shows that between April 29, 2011 and June 20, 2011, the City issued a total of 1,618 violations to vehicles traveling at less than 15 mph. Data for this time period shows that the RLC system triggered for vehicles traveling as slow as 5 mph, suggesting that the trigger speed was set to 5 mph.



Source: CDOT

Redflex's on-site monthly preventive maintenance included a check to "[e]nsure approach specific settings are accurate for the enforcement system being operated," including "trigger speed, speed limits, thresholds, phase configurations, etc." Redflex maintenance records indicate that a technician performed a preventive maintenance check for 119th and Halsted on May 17, 2011 and noted no issues with the trigger speed.³³ Additionally, the Redflex contracts required "daily operational and quality checks" to ensure that "the System [was] functioning properly and producing the desired results." The increased violation counts continued for over seven weeks, and available maintenance records do not document when, why or how the trigger speed was reset to 15 mph or who, if anyone, at CDOT or Redflex was aware of the issue.

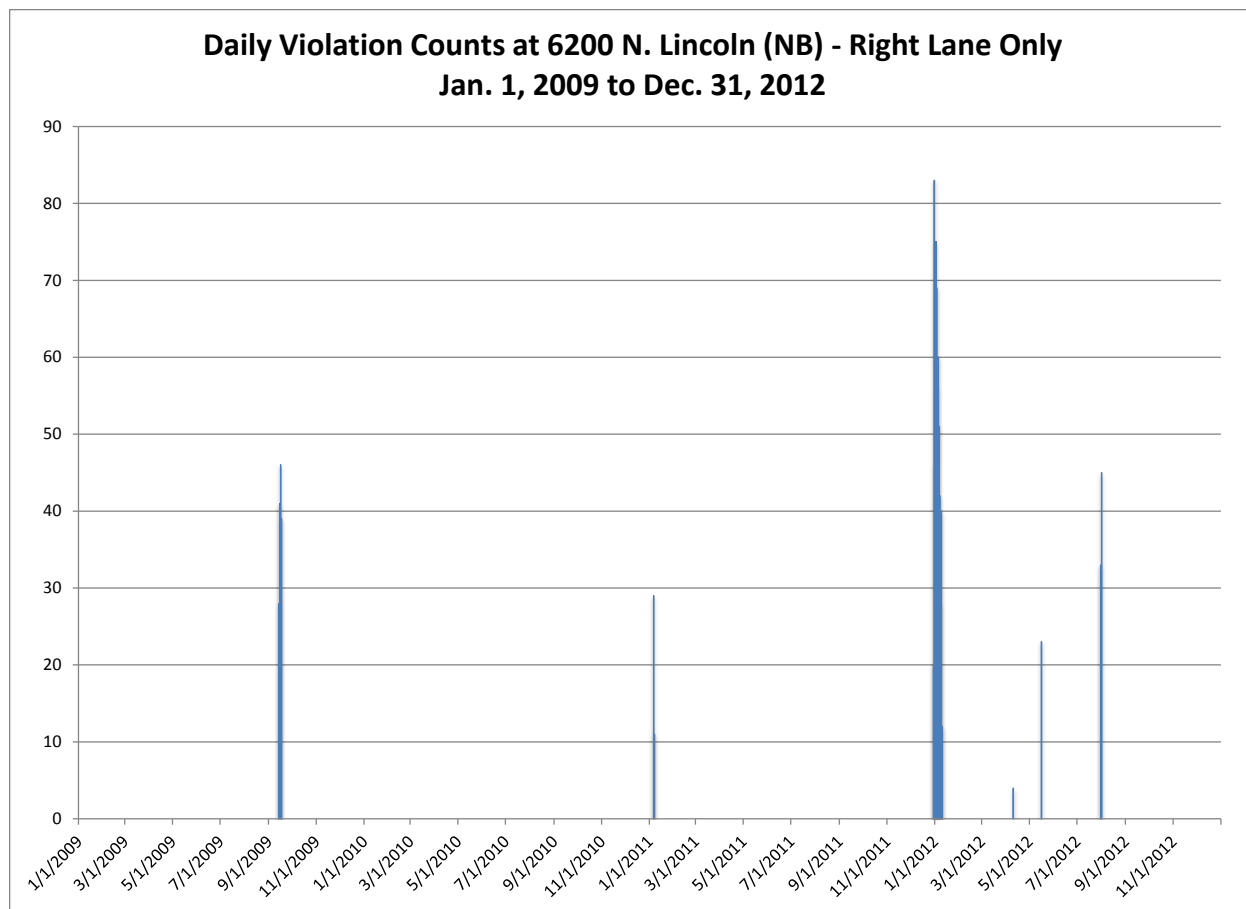
2. Broken Loop Detector at Kimball-Lincoln-McCormick

CDOT analyzed RLC violation data at the Kimball-Lincoln-McCormick intersection by lane and found that the enforcement anomalies identified at this location were likely the result of a broken loop detector in the right turn lane of the northbound approach. Based on a review of daily violation counts by lane, CDOT concluded that the loop detector in the right turn lane, with only a few exceptions, was non-functional from September 2009 until Xerox took over operation of the RLC system and began using its own equipment in March 2014. As a result, the brief periods where the right turn lane loop detector was capturing events show up in the data as enforcement anomalies. Xerox technology now enforces all lanes at this location and current daily violation counts are in line with the totals recorded during the anomalies, which suggests that the City may have under-enforced red-light violations at this intersection for years. CDOT confirmed with former Redflex staff that the right turn lane loop detector was generally non-functional, and Redflex maintenance records reviewed by OIG suggest this was a known issue because Redflex technicians did not test fire the right turn lane during monthly maintenance checks.

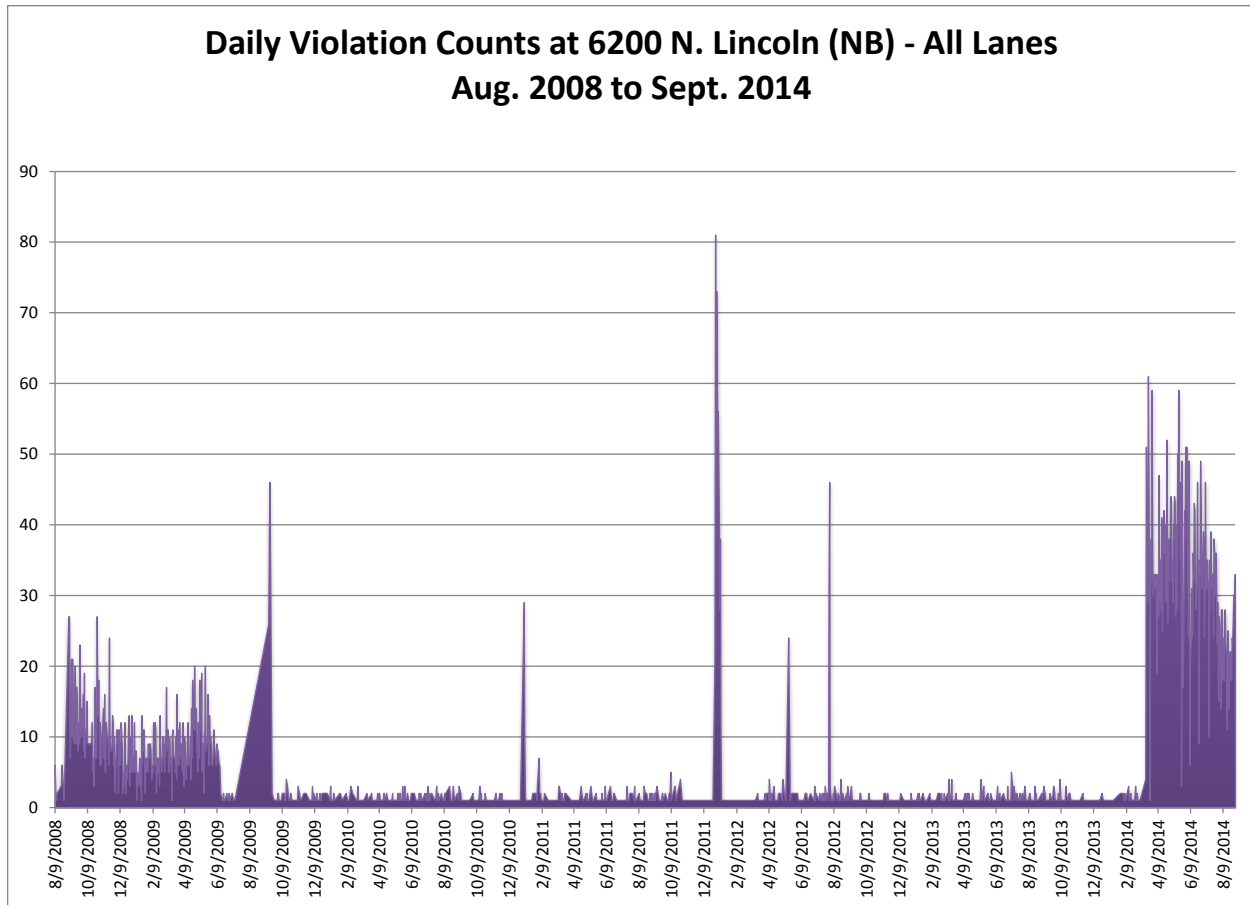
OIG estimated that, because of the broken loop detector at 6200 N. Lincoln, the City may have failed to cite as many as 45,444 violations over a four-and-a-half year period.³⁴

³³ See Appendix C for the preventive maintenance check for 119th and Halsted for May 2011. This maintenance report did note that other lanes at the approach were non-functional at the time, but neither CDOT nor OIG found this to be related to the enforcement anomaly.

³⁴ OIG calculated the daily violation average with Redflex technology (4) and the average violations per day with Xerox technology (32). OIG then took the difference (28) and multiplied it by the total number of days that the loop detector was broken - 28 violations per day for 1,623 days equals 45,444 total violations. At \$100 per violation, this totals \$4,544,400 in missed citations.



Source: CDOT



3. Damaged Traffic Signal at Halsted-Fullerton-Lincoln

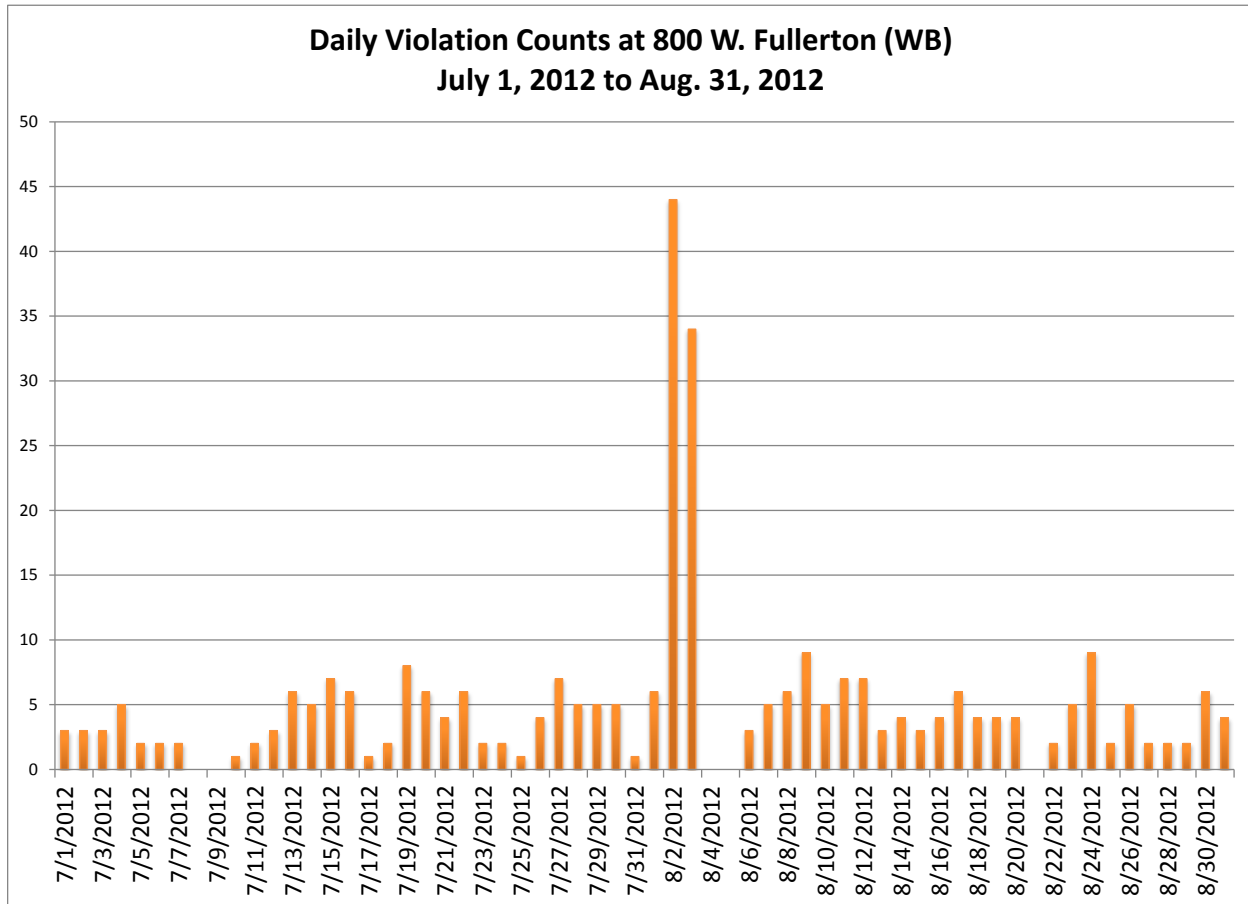
CDOT analysis of the RLC violation counts and CDOT maintenance records for the westbound approach at 800 W. Fullerton, suggest that a damaged traffic signal may have been the cause of the August 2-3, 2012 enforcement anomaly.

According to CDOT records, the traffic signals mounted on the mast arm of the light pole at this intersection were reported via 311 as damaged and not visible to drivers early on August 3. OIG reviewed video of events at this location and determined that one of the light poles at this location had been damaged late on August 1 or early on August 2. The videos of the RLC violations captured at 800 W. Fullerton on August 2 and 3 prior to CDOT repairs show that at least one traffic signal was still visible to traffic despite the damaged post. CDOT work crews completed their repair of the traffic signals around 9:30 p.m. on August 3 and the end of the enforcement anomaly appears to coincide with the completion of that repair work. The RLC system at 800 W. Fullerton captured 33 violations on August 3 prior to the completion of signal repairs and only 1 violation after the repairs that day.

CDOT stated that the increase in RLC violations at the intersection may have resulted from inattentive drivers ignoring the still-functional traffic signal and driving through the intersection during a red phase. CDOT further stated that the working signal head is most visible on video

review, while the damaged signal head is farther in the distance and not as visible on video review.

Other maintenance records for this location do not appear to identify any changes that may have caused an increase in violations and CDOT did not identify any other enforcement anomalies at this location.



Source: CDOT

C. Possible Causes Ruled Out

CDOT determined the likely proximate causes for the RLC enforcement anomalies at the three intersections detailed above, but could not identify the cause or causes of the enforcement anomalies at the other nine intersections identified by the *Tribune*. However, during the course of this review CDOT and OIG were able to eliminate certain potential causes. This section describes the evaluative work that CDOT and OIG performed, as well as the reasons for dismissing these causes.

1. Traffic Count

Early in this review, CDOT officials stated that traffic count fluctuations could cause dramatic changes in the number of RLC violations at a given intersection. A variety of factors, including construction, road closures, detours, sporting events, and street festivals, can impact traffic

counts. If traffic counts increased for a period of time, CDOT expected that the number of RLC violations would increase as well. CDOT subsequently requested any available historic traffic count data from Redflex for the 12 intersections the *Tribune* identified as having the most severe ticketing spikes. Because the RLC agreement did not require Redflex to capture and record traffic count, data does not exist for all intersections and time periods.

OIG and CDOT independently compared available Redflex traffic count data to RLC violation data for these intersections, and both concluded that traffic count likely did not explain the enforcement anomalies. If violation totals increased with traffic count, then the number of violations per vehicle should remain essentially flat. OIG used the traffic count data to calculate a violation rate per 1,000 vehicles and found that the violation rate increased significantly during periods of enforcement anomalies. As such, increased traffic volume does not explain known enforcement anomalies.

2. RLC Violation Review Process

OIG also determined that the RLC violation review process was likely not a cause of the enforcement anomalies. If the review process was the primary cause of an enforcement anomaly, OIG would expect to see the number of RLC events remain relatively static. OIG reviewed monthly Redflex reports and found that during periods of increased violation counts the number of total captured events increased as well, suggesting that the increase occurs at the point that the RLC system triggers and records a potential violation, prior to any review by the RLC vendor or IBM. Therefore, the review process could not be a primary cause of the identified anomalies.

3. Shortened Yellow Light Times

OIG reviewed the City's policies and procedures related to yellow light timing to determine if signal timing could have been a contributing factor in the enforcement anomalies. Based on interviews of CDOT staff and a review of CDOT maintenance records, OIG concluded that CDOT did not alter yellow light times to increase RLC violations at these locations.

CDOT electricians at CDOT's Division of Electrical Operations explained and demonstrated to OIG how the traffic control devices regulate signal phases and demonstrated the safeguards in place with respect to signal timing. Specifically, OIG observed the use of a device known as a conflict monitor that is designed to ensure that yellow light timing never falls below 2.7 seconds. The conflict monitor tracks signal phases and when timing is outside of programmed parameters for any reason the device triggers flashing red lights in all directions. When this happens, CDOT electricians must service the traffic control device and reset signal timing.

OIG found that while the RLC systems record yellow light times, the RLC systems do not and cannot affect the functioning of the traffic control signals. Further, CDOT, Redflex, and Xerox stated that RLC vendor staff do not have access to the traffic control cabinets where light timing is programmed without assistance from CDOT staff. OIG reviewed CDOT work orders related to traffic signal maintenance and repair and saw no evidence that CDOT staff provided RLC technicians access to the traffic control cabinets immediately before, during, or immediately after any of the observed enforcement anomalies.

While yellow light timing was not a cause of the enforcement anomalies, OIG did observe a change in the standard the City and its vendors use to process violations. The Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD) states, “A yellow change interval should have a minimum duration of 3 seconds and a maximum duration of 6 seconds.”³⁵ According to the City, at the City’s request Redflex categorically rejected any captured event with a recorded yellow light time below three seconds. However, after Xerox took over the operations of the RLC program, the City directed Xerox to accept RLC violations with yellow light times above 2.9 seconds.³⁶ CDOT stated that it based this determination on the National Electrical Manufacturers Association (NEMA) Transportation Standards.³⁷ The NEMA TS2 (2008) section 2.2.2 states, “Any interval timed shall not deviate by more than 100 milliseconds [0.1 seconds] from its set value at a power source frequency of 60 hertz.”³⁸ Because of this tolerance, CDOT stated that the City would accept RLC violations with a recorded yellow light time of 2.9 seconds or above as valid violations. However, recently some DOAH ALJs have dismissed RLC violations because of recorded yellow light times under 3.0 seconds. The City’s Law Department has contacted DOAH to set up training for the Department regarding yellow light times, but that training had not yet been scheduled at the time of this report. On September 22, 2014, CDOT directed Xerox to temporarily suspend processing any violations with yellow light times under 3.0 seconds (and under 4.0 seconds for violations where the yellow light time is set at 4 seconds), while the City considered whether or not to continue issuing such citations. As of the writing of this report, the City has not yet made a formal decision.

4. Inconsistent Yellow Light Times

Finally, OIG found no evidence that the yellow light times at the 6200 North Lincoln intersection “fluctuated wildly,” as the *Tribune* reported.³⁹ The *Tribune* report stated that yellow light times recorded on RLC violations captured at 6200 North Lincoln bounced between 3.0 seconds and 4.08 seconds. When asked to explain this apparent inconsistency, CDOT stated that the signal at this intersection has two different signal plans—one for a straight through signal (the “yellow ball”) that is four seconds, and one for a right turn arrow (the “yellow arrow”) that is three seconds. OIG found this explanation consistent with MUTCD, which states that “the duration of a yellow change interval shall not vary... within the same signal plan,” but does allow that yellow light timing “may be different in different signal timing plans for the same controller unit.”⁴⁰ Based on CDOT’s explanation and a review of available maintenance records, OIG

³⁵ Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways*. (2009 ed. with 2012 revisions 1 and 2), 489, accessed September 16, 2014, http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm

³⁶ CDOT and Xerox stressed to OIG that Xerox truncates (rather than rounds) its recorded yellow light times. In some instances a recorded yellow light time of 2.9 seconds may actually be 2.999 seconds.

³⁷ National Electrical Manufacturer’s Association, *NEMA Standards Publication TS2-2003 (R2008): Traffic Controller Assemblies with NTCIP Requirements Version 02.06*. (NEMA, 2012).

³⁸ National Electrical Manufacturer’s Association, *NEMA Standards Publication TS2-2003 (R2008): Traffic Controller Assemblies with NTCIP Requirements Version 02.06*. (NEMA, 2012). Section 2.2.2, “Timing”. See Appendix D for a full explanation of the NEMA standards provided CDOT.

³⁹ David Kidwell, “Red light cameras tag thousands for undeserved tickets,” *Chicago Tribune*, July 18, 2014, accessed August 20, 2014, <http://www.chicagotribune.com/news/ct-red-light-camera-ticket-spikes-met-20140717-story.html#page=1>

⁴⁰ Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways*. (2009 ed. with 2012 revisions 1 and 2), 485, accessed September 16, 2014, http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm

determined this difference in yellow light times at 6200 N. Lincoln was likely not a cause of any enforcement anomalies.⁴¹

IV. CONCLUSIONS AND SUGGESTIONS FOR FUTURE MANAGEMENT

A. CDOT Did Not Sufficiently Manage Its Contract with Redflex

OIG's review found that CDOT did not sufficiently manage the RLC program during the period that Redflex operated the RLC systems. Specifically, the Department did not ensure that Redflex was meeting all of its contractual obligations regarding routine maintenance and monitoring to identify and remedy anomalies in the program. CDOT failed to request and review reports that could have identified enforcement anomalies as they occurred. CDOT limited its monthly review to the top ten and bottom ten citation-generating RLC systems and focused its analysis and activities primarily on addressing systems generating no or few citations. The Department did not perform any kind of broader, more comprehensive, month-to-month or year-to-year review to determine if Redflex was operating the RLC systems as required, and the RLC systems were functioning to specifications.

It is essential that City departments actively manage the programs for which they are responsible in order for the public to have confidence in those programs. In this instance, OIG determined that in the past CDOT did not take appropriate responsibility for the RLC program and passively relied on a vendor, Redflex, to notify the Department of any issues in a public safety and traffic enforcement system for which the Department is responsible to the public.

Suggestions for Future Management:

The integrity of and public confidence in the RLC program depends on CDOT's active management of the program. The Department should routinely monitor violation data to ensure that the RLC program is working as intended and meeting the safety goals set by the Department. The Department should standardize and document procedures for ensuring that the RLC vendor is meeting all contractual requirements. Documenting program management procedures will help to ensure consistent and ongoing management in the event of personnel changes at the Department. Additionally, CDOT should coordinate with DOF and DOAH to analyze all relevant data in order to identify any issues in the RLC program.

As noted previously, CDOT has already taken steps to improve its management of the program with Xerox, the new vendor for the RLC program. OIG noted that CDOT has worked with Xerox to develop more robust and frequent reporting than previously existed under Redflex. CDOT and Xerox have begun implementing a new early warning system that is designed to monitor violation counts on a daily basis and alert program management when the system detects unusual patterns.⁴² CDOT should continue to review the anomalies identified by the early warning system and ensure that unusual activity is explained and identified issues are resolved.

⁴¹ See Appendix E for a full explanation of how Xerox RLC technology records yellow light times.

⁴² See Appendix F for full explanation of CDOT/Xerox Early Warning System parameters.

B. Unannounced Changes to RLC Enforcement Parameters Create the Appearance of Unfairness in the Program

Sudden changes to enforcement parameters, even unintentional changes, can create the appearance of unfairness and have the potential to erode public confidence in the program. CDOT found that the camera at 119th and Halsted captured 1,618 more violations than it would have if the system had operated at the established trigger speed of 15 mph. While these violations may indeed have been violations of the law, the fact that CDOT was unaware of the change remains cause for concern. CDOT should have been routinely monitoring the program to ensure that the program was operating according to specification, which would have allowed the Department to address issues immediately rather than years later. OIG did not see any evidence that the change in trigger speed at 119th and Halsted was intentional, but we could not dismiss the possibility entirely because some maintenance records were missing and the information that was available did not provide details about the change.

Suggestions for Future Management:

In the interests of transparency, accountability and restoration of public confidence, CDOT should consider publishing enforcement parameters for the RLC program, such as trigger speed, and should monitor the program to ensure that all systems operate according to these parameters. Any changes to these parameters should be reported publicly through the Department's website so that residents are aware of any changes to enforcement. This will establish public expectations and will protect the credibility of the program.

CDOT began providing RLC violation count data to the public via the City's Data Portal in September 2014. This is a potentially significant step towards greater transparency of the RLC program, but the Department should also consider making additional documentation available so that the public can evaluate the operating parameters of the system for itself. For example, the City may consider publishing,

- the business rules used by Xerox and IBM for identifying a violation;
- any internal evaluation of the program;
- any documentation of the rationale behind the placement or removal of RLC systems; and
- any other documentation that provides insight into the operation of the RLC program that the Department determines may be of interest to the public.

C. Under-Enforcement of Violations Undermines the Public Safety Objective of the RLC Program

CDOT has stated that the primary objective of the program is safety, but periods of under-enforcement, like those caused by the non-functional detector at the Kimball-Lincoln-McCormick intersection, undermine this objective. OIG estimated that, because of the broken loop detector at this intersection, the City may have failed to cite as many as 45,444 violations over a four-and-a-half year period.

Suggestions for Future Management:

CDOT should routinely analyze RLC data to confirm that the program is meeting its public safety objectives. Thorough analysis of the program's safety outcomes is essential for establishing the credibility of the program and building public confidence in the program.

Further, CDOT should work with Xerox (or any future RLC vendor) to ensure that any downtimes are minimized by identifying and resolving technical and mechanical issues promptly.

D. Unclear Policies Regarding Acceptance of Violations with Recorded Yellow Light Times Under 3.0 Seconds Caused Confusion Between City Departments

OIG concluded that yellow light timing was unrelated to the enforcement anomalies identified by the *Tribune*; however, we did note a change in the way that vendors treat events with yellow light times below 3.0 seconds. At the City's request, Redflex rejected captured events with a recorded yellow light time under 3.0 seconds and did not issue a citation for such events. Since the transition to Xerox, however, both Xerox and the City accept violations with recorded yellow light times of 2.9 seconds and above. This change has resulted in certain ALJs dismissing violations with recorded times below 3.0 seconds despite CDOT assurances that these are acceptable violations.

Suggestions for Future Management:

CDOT should consider directing Xerox to reject any violation with a recorded yellow light time below three seconds in order to improve public confidence in the RLC program.

If CDOT chooses to continue accepting violations with recorded yellow light times below 3.0 seconds, the Department should document this policy and make this documentation available to the public. Clarifying this policy should also resolve any confusion between CDOT, DOF, DOAH, and the public regarding what constitutes an acceptable yellow light time for an RLC violation.

V. APPENDIX A: CITY COUNCIL LETTER TO OIG REQUESTING RLC REVIEW



CITY COUNCIL
CITY OF CHICAGO
COUNCIL CHAMBER
SECOND FLOOR, CITY HALL
TELEPHONE 312-744-6800

July 21, 2014

Mr. Joseph M. Ferguson
Inspector General
City of Chicago Office of Inspector General
740 N. Sedgwick, Suite 200
Chicago, IL 60654

Dear Mr. Ferguson,

In light of the recent Chicago Tribune investigation into the City of Chicago Red Light Camera system, detailing the unaccounted for spikes in ticketing at numerous Red-Light camera locations, several colleagues and I would like to formally request a review into various facets of the City of Chicago Department of Transportation's (CDOT) Red-Light camera program.

As representatives of the citizens of Chicago, it is imperative that we make sure programs such as these work efficiently and fairly for every driver and taxpayer. In a letter to you requesting a review of the Red Light Camera system from 2013 (attached letter Feb 21, 2013), we asked various questions related to right turn angles and oversight of the program. Those questions and the data backing the City's stance on the Red Light Program were never fully answered, in part because data was not made available by CDOT and because no one seemed to be in charge of the program. In the latest Tribune investigation, similar questions about the data and control of the program are raised, as well as what led to the spikes in the present system, where at least 13,000 tickets were issued that were found to be unwarranted by the Tribune investigators.

In light of this continued disorder within the program, we are requesting assistance from your office in providing a review of the red light camera program. Our questions are as follows:

1. Who in the present City Administration has control of the red light camera system? Who at CDOT is in control of the system? Please provide us with a flowchart or spreadsheet of all city staff working on the red light camera program and responsible for the red light camera system? Who were the Redflex employees responsible for the program in each year and what are their titles and oversight roles? Where are said parties operating from and where are they located? Please provide the same for the new vendor Xerox. Please provide this information for all of the years since the inception of the program through the date of this requested review. Please include all public and private staff or outside vendors, including their salaries (if City) and areas of responsibility, including who they reported to in both the public and private spheres.

Page 1 of 2

2. Based on the data, if made available to you from CDOT, are you able to determine how many of the 13000 tickets cited in the tribune investigation were not violations of traffic laws?
3. Does the data revealing these spikes lead to other anomalies in the system or problems not unveiled in your 2013 review or in the Tribune investigation? Of the 4,000,000 tickets written is there indication of other spikes in prior years where the same issues may have occurred?
4. Where are the funds accrued from the ticketing being allocated within the City of Chicago annual budget?
5. Can you provide revenue funds generated by each red light intersection and the amount of those funds that, based on stated objectives of the city officials, were then reinvested in each of the intersections to improve safety?
6. Can you provide information in your review on all intersections with Red-Light Cameras to determine if the yellow light timing was in line with city standards? Do the yellow lights match up to their required timing? Have there been any outside audits or reviews done to determine if all intersections meet city, state or federal standards? If so, what was the result?
7. If possible, please narrow down the cause of the spikes in ticketing; was it a system malfunction, were there unannounced changes to the standards for ticketing or was there direct human intervention that was taking place.
8. If a driver received an unlawful ticket during the spike periods, would they qualify for a refund? If the potential exists for 9,000-13,000 unlawful tickets what is the process the City would need to undergo to refund drivers? What is potential financial liability?
9. What recommendations, if any would you make to improve public transparency, accountability for the Red Light Camera program for the Council and city government to foster public confidence in this program?

Thank you in advance for your assistance on these issues. We look forward to hearing from your office regarding the review of the program.

Scott Waguespack, Alderman 32nd Ward
Robert Fioretti, Alderman 2nd Ward
John Arena, Alderman 45th Ward
Leslie Hairston, Alderman 5th Ward
Rick Munoz, Alderman 22nd Ward
Toni Foulkes, Alderman 15th Ward
Rod Sawyer, Alderman, 6th Ward
Nicholas Sposato, Alderman, 36th Ward

VI. APPENDIX B: THIRD REVIEW NOTIFICATION LETTER TEMPLATE

OPPORTUNITY FOR ADDITIONAL REVIEW OF RED LIGHT VIOLATION

Date

Motorist Name

Motorist Address

Violation Number:

Violation Date:

Violation Location:

The City of Chicago is committed to promoting traffic safety in all of our neighborhoods. The red light program is a key component of that effort. As part of our ongoing commitment to ensure the integrity of the program, it has been determined that your red light violation noted above is eligible for further review by an independent auditor. To request this review, please contact the Department of Finance within 45 days from the date of this notice and simply state that you would like to have your violation reviewed:

- By phone at (312)744-7275 on Monday through Friday during the hours of 7:00 a.m. to 7:00 p.m.
- By email at rlreview@cityofchicago.org
- By mail to:
City of Chicago Department of Finance
PO Box 88292
Chicago, IL 60680-1292
- In person at any Department of Finance Payment Center. For locations and hours of operation, please visit www.cityofchicago.org/finance.

With your request to review, please provide:

1. Name
2. Current contact information (including address, phone number and email address)
3. Violation number listed on this letter.

You will not need to take any additional steps. Upon receipt of your request, an independent auditor will conduct a review within 30 days and you will be notified in writing of the outcome.

- If your violation is found to be invalid, it will be vacated.
 - If the violation is vacated and you have already paid the violation, the City of Chicago will promptly issue a refund to you.
 - If the violation has not been paid, it will be dismissed.
- If your violation is found to be valid, we will provide you with a link to view the evidence of your violation.

If you have any questions, please call the Department of Finance at (312) 744-7275 from Monday through Friday during the hours of 7:00 a.m. and 7:00 p.m.

Sincerely,

Daniel Widawsky
Comptroller, City of Chicago

Rebekah Scheinfeld
Commissioner, Chicago Department of Transportation

Source: DOF

VIII. APPENDIX D: EXPLANATION OF NEMA STANDARD FOR ALLOWABLE DEVIATION IN TRAFFIC SIGNAL TIMING



June 24, 2014

Mr. David Zavattero
Deputy Director
Chicago Department of Transportation
30 N. LaSalle Street, Suite 1100
Chicago, IL 60602

RE: Yellow light timing tolerances

Mr. Zavattero,

In response to your inquiry into what are the industry acceptable tolerances for traffic controllers and timing intervals, I've included reference information below:

Traffic Controller Timing Tolerances-

The traffic controller industry subscribes to the National Electrical Manufacturers Association (NEMA) Transportation Standards (TS), and is one of the standards that the City of Chicago uses in their procurement process. NEMA TS2 standard, last updated in 2008, mandates that a traffic controller keeps its time according to tracking the 60Hz power line rate. This is stated in NEMA TS2 (2008) section 2.2.2. It states:

"2.2.2 Timing

Timing shall be accomplished by digital methods. The setability shall be in discrete increments. The timing shall relate to the power line frequency so that no cumulative or drift errors shall occur in timing intervals. Any interval timed shall not deviate by more than 100 milliseconds from its set value at a power source frequency of 60 hertz."

The tolerance, at a 60Hz line frequency is plus or minus 100 milliseconds (0.1 second). So, if a yellow light interval set to, as an example 3.0 seconds, the acceptable tolerance of the interval would be from 2.9 seconds to 3.1 seconds. This is assuming that the power line frequency was steady at 60Hz during that entire time.

Furthermore, the NEMA TS2 (2008) standard states that the traffic controller must operate within a range of power line frequencies. This is because the national power grid does fluctuate frequency throughout any given period of time. Additionally, the North American Electrical



2906 Corporate Way
Palmetto, FL 34221
Phone: (941) 845-1200
Fax: (941) 365-0837





Reliability Corporation (NERC) that is responsible for the national power grid will from time to time adjust the frequency rate to account for errors to the desired frequency of 60Hz so that the frequency will average 60Hz. The NEMA TS2 (2008) standard sets a range that a traffic controller must operate within and states in section 2.1.3:

"2.1.3 Operating Frequency

The operating frequency range shall be 60 hertz \pm 3.0 hertz."

The operating frequency that the traffic controller must operate within and derive its timing basis can fluctuate plus or minus 0.5% (3 hertz/60hertz). Based on this information, one can calculate the **total cumulative tolerance** taking into consideration both of these sub tolerances. In the case of a yellow time programmed as 3.0 seconds, the actual time could range from 2.89 seconds to 3.12 seconds and be completely within standard tolerances.

Calculations:

3.0 seconds – 0.1 seconds – 0.5% = 2.89 seconds

3.0 seconds + 0.1 seconds + 0.5% = 3.12 seconds

Yellow Light Safety Requirements-

The NEMA standard goes on to address the subject of safety. If a yellow light is too short, it can cause an unsafe driving hazard to motorists. Each traffic cabinet in the U.S. has a safety monitor that monitors various timings and compatibilities. One of the timings that it can monitor is the length of the yellow light. NEMA TS2 (2008) addresses the minimum length of time that the safety monitor will consider safe. It states in section 4.4.5.2:

"4.4.5.2 Yellow Change Interval

*The MMU shall verify that the Yellow Change interval is at least 2.7 \pm 0.1 seconds. When the minimum Yellow Change interval is not satisfied, the MMU shall transfer the **Output** relay contacts to the fault condition. A programming means shall be provided on the programming card to disable Minimum Yellow Change interval monitoring on a per channel basis."*



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A Signal Group Company

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I hope that you find this information and references useful in ensuring that your traffic control equipment are working within tolerances and in a safe manner. If you have any further questions, please do not hesitate to ask.

Regards,

A handwritten signature in blue ink, appearing to read "Ray Deer".

Ray Deer
Chief Technology Officer
Peek Traffic/Signal Group



A Signal Group Company

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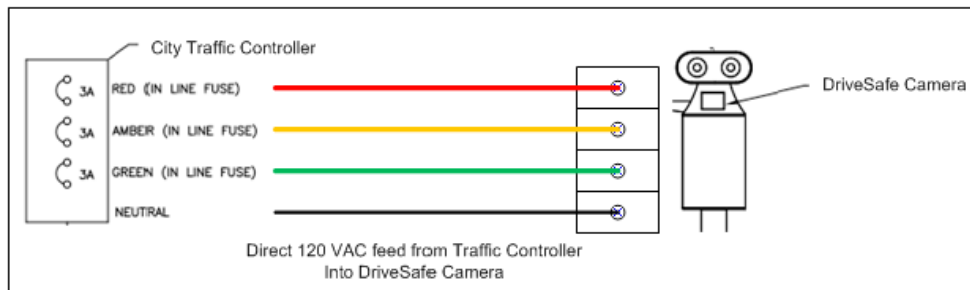
Source: CDOT

IX. APPENDIX E: EXPLANATION OF XEROX DRIVESAFE TECHNOLOGY

September 22, 2014

How the Xerox DriveSafe System Connects to the Traffic Controller

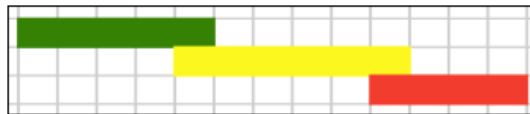
The City of Chicago provides a direct 120 VAC 60Hz power feed for each light phase (green, red, amber) to the Xerox DriveSafe camera system. This connection provides a dedicated power line to measure each traffic light phase color independently to accurately determine the time of each light phase in its entirety. The direct connection to the traffic controller is the most accurate method of monitoring the output of the light phases because no secondary devices like relays or transformers are in between the camera and traffic controller that could add additional delays in measuring the light duration.



How the Xerox DriveSafe System Measures Phases

The DriveSafe measures phase duration to the thousandth of a second and reports measurements truncated to the tenth of a second consistent with International Association of Chiefs of Police (IACP) performance specifications. For example, an amber time measurement of 2.999 seconds is reported as 2.9 seconds rather than rounded to 3.0 seconds. Similarly, a time into red of .499 seconds is reported as .4 seconds rather than rounded to .5 seconds. Per City of Chicago business rules, the DriveSafe camera systems have a red phase grace period of a tenth of a second (i.e., the systems will not capture a potential violation unless the red phase equals or exceeds a tenth of a second, thereby giving the benefit of the doubt to the driver).

As shown in the graphic below, with any relay system there are fractions of a second between transitions (approximately .004-.005 seconds on each end) where power fades on one relay during the same time the next relay energizes.



In order to ensure measurement of the complete amber phase duration, the camera systems currently measure amber time from "edge to edge," which includes these thousandths of

September 22, 2014

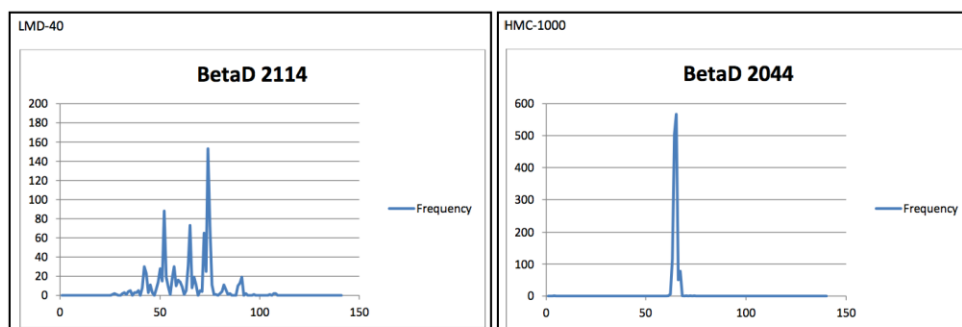
seconds of phase overlap at each end of the relay. Not including these periods of overlap could result in an amber time measurement fractionally less than the traffic controller setting.

Accuracy of the Xerox DriveSafe System Phase Measurements

The DriveSafe Camera system utilizes a crystal oscillator as an electronic timer. The 32.768 KHz crystal oscillator used in the system to measure the duration of each light phase is accurate to 1 millisecond or (+/- .001 seconds).

Comparison of Amber Time Measurements from Different City Controllers

A review of sample data from four camera systems found different distributions of amber time measurements between the two traffic controller types utilized by the City – the HMC-1000 and the LMD-40. The HMC-1000 produces a more consistent amber time output from relay on to relay off. The LMD-40 has a wider distribution, which produces more readings fractionally above or under the traffic controller setting. The graph on the left represents the LMD-40 and the graph on the right represents the HMC-1000. These graphs show frequency of hundreds of measurements of amber times with 50 on the graphs horizontal plane representing 3.0 seconds.



In addition, a review of a total of 25,039 amber time measurements across the four locations showed the following:

- 84% at 2.990 seconds or greater
- 95% at 2.983 seconds or greater
- 97% at 2.980 seconds or greater
- 99.9% at 2.950 seconds or greater

Source: CDOT

X. APPENDIX F: PARAMETERS OF CDOT/XEROX EARLY WARNING SYSTEM

Xerox Early Warning Notification System

Alert Criteria, Research, and Diagnosis of Red Light Camera Systems

Email notifications and findings will be sent to both CDOT and DOF representatives.

Events (Previous Day)	
# of Events Per Day	Trigger Point
< 5	4x AVG & > 10 Events
6-10	2.5x AVG
11-20	2x AVG
> 20	1.5x AVG
Processing will be held up on these events until the following research is completed and DOF approves processing.	
Diagnostic Procedure Post Trigger:	
1) Check for Increase in Traffic Counts	
2) Check Maintenance Records	
- Verify <i>NO</i> Recent Changes in Configuration/Verify Settings	
- Confirm if Repairs have been recently made	
3) Flag this group of events for follow-up post-processing	
4) Notify City of Findings Prior to Processing	
Exported to CANVAS (On a 10 day look back)	
# of Events Per Day	Trigger Point
< 5	4x AVG & > 10 Events
6-10	2.5x AVG
11-20	2x AVG
> 20	1.5x AVG
Diagnostic Procedure Post Trigger:	
1) Check for Increase in Traffic Counts	
2) Verify Processing Accuracy & Report any Inaccuracies to DOF	
3) Check Maintenance Records	
- Verify <i>NO</i> Recent Changes in Configuration/Verify Settings	
- Confirm if Repairs have been recently made	
4) Look for parade/funeral processions/police officer wave thru events/construction activity	
5) Notify City of Findings	
Traffic Count (Previous Day)	
135% of AVG	
1) Record Trigger for future comparisons to alerts above.	

Initial triggers will be delivered to the city contacts through an automated email on a daily basis.

A recap of the month's findings will be provided to the city for their records.

AVG = 60 Day trailing average

Source: CDOT

XI. APPENDIX G: RLC CITATIONS CONTESTED AT DOAH, 2007-2013

RLC Citations Contested at the Department of Administrative Hearings, 2007-2013						
Year*	Citations Issued	Citations Contested	% Contested	Contested Citations Found Liable	Contested Citations Found Not Liable	% of Contested Citations Found Not Liable
2007	332,262	18,282	5.5%	16,822	1,460	8.0%
2008	546,425	28,174	5.2%	26,419	1,755	6.2%
2009	720,117	37,064	5.1%	33,616	3,448	9.3%
2010	711,852	31,330	4.4%	28,321	3,009	9.6%
2011	614,691	25,687	4.2%	22,860	2,827	11.0%
2012	610,261	24,210	4.0%	21,273	2,937	12.1%
2013	572,270	22,634	4.0%	20,141	2,493	11.0%
Total	4,107,878	187,381	4.6%	169,452	17,929	9.6%

*Year the citation was issued. May not be the same year it was contested.

Source: DOAH

CITY OF CHICAGO OFFICE OF INSPECTOR GENERAL

Public Inquiries	Rachel Leven (773) 478-0534 rleven@chicagoinspectorgeneral.org
To Suggest Ways to Improve City Government	Visit our website: https://chicagoinspectorgeneral.org/get-involved/help-improve-city-government/
To Report Fraud, Waste, and Abuse in City Programs	Call OIG's toll-free hotline 866-IG-TIPLINE (866-448-4754). Talk to an investigator from 8:30 a.m. to 5:00 p.m. Monday-Friday. Or visit our website: http://chicagoinspectorgeneral.org/get-involved/fight-waste-fraud-and-abuse/

MISSION

The City of Chicago Office of Inspector General (OIG) is an independent, nonpartisan oversight agency whose mission is to promote economy, efficiency, effectiveness, and integrity in the administration of programs and operations of City government. OIG achieves this mission through,

- administrative and criminal investigations;
- audits of City programs and operations; and
- reviews of City programs, operations, and policies.

From these activities, OIG issues reports of findings, disciplinary, and other recommendations to assure that City officials, employees, and vendors are held accountable for the provision of efficient, cost-effective government operations and further to prevent, detect, identify, expose and eliminate waste, inefficiency, misconduct, fraud, corruption, and abuse of public authority and resources.

AUTHORITY

The authority to produce reports and recommendations on ways to improve City operations is established in the City of Chicago Municipal Code § 2-56-030(c), which confers upon the Inspector General the following power and duty:

To promote economy, efficiency, effectiveness and integrity in the administration of the programs and operations of the city government by reviewing programs, identifying any inefficiencies, waste and potential for misconduct therein, and recommending to the mayor and the city council policies and methods for the elimination of inefficiencies and waste, and the prevention of misconduct.