

<p>MUNICIPAL COURT, CITY OF BOULDER, COLORADO  Court Address: 1777 6th Street,  Boulder, CO 80302</p> <p><b>PEOPLE OF THE CITY OF BOULDER,  by and on behalf of, PEOPLE OF THE  STATE OF COLORADO, Plaintiff,</b></p> <p><b>vs.</b></p> <p><b>John W. Westwick,  Defendant</b></p>	<p>Case Number: CR-2007-0006332PE  Courtroom: Municipal Court</p>
<p align="center"><b>ORDER IN RE JUDICIAL NOTICE OF DIGITAL CAMERA TECHNOLOGY</b></p>	

This matter comes before the Court on the City's request that the Court take judicial notice of the scientific reliability of the principles underlying the digital camera technology utilized by the City in detecting and documenting red light violations in the City of Boulder. A hearing on this issue was conducted on July 18, 2007. Following the hearing, the Court took the matter under advisement. The Court now issues this Order.

The evidence that the City seeks to introduce in this case, which was obtained through the City's digital red-light camera technology, is dependent on scientific principles. Specifically, it relies on inductive loop technology combined with digital photography and computer software applications.

As a preliminary matter, the Court notes that B.R.C. Section 7-4-74(e)(3) discusses the standard for the admissibility of red-light camera technology in the municipal court. B.R.C. Section 7-4-74 (e) states:

In any proceeding in municipal court to prosecute a violation of Section 7-4-3, "Obedience to Red Signal Required," B.R.C. 1981: (2) The image and related data produced by a red-light camera concerning the violation shall be admissible in court as prima facie evidence of a violation of such section, provided that the person who activated and tested the red-light camera prior to the image being taken testifies as to the placement of the red-light camera and the accuracy of the scene depicted, and further testifies that the person tested the red-light camera for proper operation within a reasonable period of time both before and after the taking of the

image. It shall not be necessary that the same person who did the testing before the taking of the image be the person who testifies concerning the testing which occurs thereafter.

Subsection (e) (3) goes on to state:

Testing and operation in accordance with the manufacturer's specifications shall be, without limitation, sufficient foundation for introduction of the evidence.

Nevertheless, the Court is required to look beyond the Boulder Revised Code in determining the admissibility of evidence. The Constitution and laws of the United States and of the State of Colorado must also be heeded. See B.R.C. Section 2-6-4(e). More specifically, the Court must adhere to the Colorado Rules of Evidence, which apply to all courts in the State of Colorado. C.R.E. 101, 1101(a).

Although mindful of B.R.C. Sec. 7-4-74(e)(3), the Court concludes that the admissibility of this technology is controlled by C.R.E. 702 and *People v. Schreck*, 22 P.3d 68 (Colo. 2001).

Pursuant to *Schreck*, the inquiry surrounding the admissibility of scientific evidence should focus on the reliability of the scientific principles, the qualifications of the witness and the usefulness of the evidence to the trier of fact. In addressing these issues, the trial court may consider the factors set forth in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 593-94, 125 L. Ed. 2d 469, 113 S. Ct. 2786 (1993). *Id.* These factors include (1) whether the technique can and has been tested; (2) whether the technique has been subjected to peer review and publication; (3) the scientific technique's known or potential rate of error, and the existence and maintenance of standards controlling the technique's operation; (4) whether the technique has been generally accepted; (5) the relationship of the technique to more established modes of scientific analysis; (6) the existence of specialized literature dealing with the technique; (7) the non-judicial uses to which the technique are put; (8) the frequency and type of error generated by the technique; and (9) whether such evidence has been offered in previous cases to support or dispute the merits of a particular scientific procedure. *Schreck*, 22 P.3d at 77-78.

### **Summary of Evidence**

During the hearing, the People called three witnesses: Mr. Joseph Paulson, Mr. Rich Kosina and Ms. Diane Wise.

Mr. Paulson is the Transportation Engineer for Signals and Lighting for the City of Boulder. Mr. Paulson was involved in the implementation of the City's red-light camera program in 1998 and has been involved with the program since that time.

Mr. Kosina is the director of engineering for ACS, the company that built, installed and now maintains the digital red-light cameras used by the City of Boulder. Mr. Kosina has a Bachelors degree in Business and Electronics and has been involved with the red-light camera technology for the past ten years.

Ms. Wise is a metrologist in the metrology lab of the Department of Agriculture for the State of Colorado. Ms. Wise has a Bachelor of Science degree and a Masters of Science degree in Geology. She has been employed as a metrologist with the State of Colorado since 1994. Ms. Wise has received specific training from the National Institute of Standards and Technology in Boulder and on-the-job-training from her previous supervisor.

Mr. Paulson testified that the digital red-light camera system now in use in the City works in much the same way as the analog version of the red-light camera system worked in the past. There are no changes in the interface between the traffic signal control system and the photo red light system. In prior testimony before this Court, Mr. Paulson set forth specifically how the system works. This court's summary of that system is now incorporated into this Order. See *People v. Yates, CR 2005-0008295*, In Re Judicial Notice of Camera Red Light Technology (Boulder Municipal Court, October 26, 2005), attached hereto as Exhibit 1.

The digital red-light camera system utilizes in-ground inductive loop metal detectors placed under each lane of the roadway immediately preceding an intersection controlled by a traffic control signal. The loops are symmetric and create a magnetic field approximately six feet in diameter in the center of each lane. Two loops are placed in each lane, approximately six to seven feet apart. A vehicle crossing over the in-ground inductive loops disturbs the magnetic field created by the loops. The computer system controlling the digital red-light camera receives notice of this disturbance. The computer system then determines: (1) whether the traffic control signal is displaying a continuous red light; (2) whether the red light has been displayed for at least four tenths of a second (.4 seconds); and (3) whether the vehicle is traveling at a speed greater than twelve (12) miles per hour. If each of these questions is answered in the affirmative, the computer will direct the camera system to take photographs of the intersection, the vehicle and the driver.

There are a few notable differences between the new digital technology and the analog technology. First, the digital technology transfers a data bar to the bottom of the photographic image, rather than superimposing the data bar into the photographic image, which was the case with the analog technology. This change means that the photographic image does not need to be manipulated in any way to make room for the data bar. In addition, more than one camera is utilized and every photograph has its own attached data bar. The new system is powered by its own power source. The analog system utilized the same power source as that utilized by the traffic control signal.

The most significant differences between the analog and digital system relate to the way the photographs are stored and the number of images taken. In the past, the red-light camera system took two analog photographs, one of the vehicle before it entered the intersection and one of the vehicle and the driver after the vehicle had entered the intersection. According to Mr. Kosina, the new digital red-light camera system takes three photographs. The first photograph displays a wide angle image of the intersection, including images of the traffic signal and the vehicle before the vehicle has entered the intersection. The second photograph displays a close-up of the vehicle license plate and the third photograph displays an image of the driver. In addition, a twelve second video of the scene is created and stored.

The digital photographs are captured electronically at the time that the photographs are created. The file is then encrypted and saved through a software program licensed by ACS. Mr. Kosina testified that the encryption system utilized by ACS prevents manipulation of the stored information, thereby insuring the accuracy of the photographic images and the data attached to those images.

An internal timing mechanism within the microprocessor for the system is utilized to determine the length of time that the traffic signal has displayed a specific color (green, yellow and red). The internal timing mechanism is also utilized in connection with the inductive loops to determine the speed of the vehicle as it travels through the intersection.

### **Testing and Maintenance**

The digital red-light camera system is maintained by field service technicians hired and trained by ACS. According to Mr. Kosina, these field service technicians have the ability to check the system from a remote location (via computer) at any time to determine if the system is operating correctly. This testing is done by remotely initiating the "Test" button for the system. When the "Test" button is initiated, the system conducts a self-test which, if the system is operating correctly, will generate photographs and create a viewable image of the data bar. The technician can view on his or her computer screen the photographs and data generated by the digital red-light camera system. If the system is not working properly, no photograph will be generated.

The manufacturer of the digital red-light camera system has indicated that the site should be visited for maintenance purposes at least twice per year. (As there is no "film" to retrieve and develop, the technicians do not need to visit the site to change film in the cameras.) According to Mr. Kosina, although not required by the manufacturer, the ACS technicians make in person site visits two to three times per week. During these visits, the technicians take test shots through the system and view the images created on the laptop computers that

they have brought with them to the camera location. In addition, the technicians check the system for equipment damage and do a cursory review of the site for graffiti, etc.

Mr. Kosina stated that in his ten years working with this digital red-light camera system, he has not been made aware of any malfunction errors that have resulted in the issuance of “false violations”. Mr. Kosina opined that if maintained and tested according to the manufacturer’s specifications, the digital red-light camera system would provide accurate images of red light violations.

Ms. Wise, a metrologist with the Colorado Department of Agriculture, testified that on May 3, 2007, she conducted a “field” test of the timing mechanism for the City’s digital red-light camera system installed at the southwest corner of 28<sup>th</sup> and Arapahoe. Ms. Wise’s Field Inspection Report (Exhibit A) was submitted into evidence during the hearing. Ms. Wise indicated that, in her professional opinion, the digital-red light camera system is capable of being tested in the field to determine if the system is working within the specifications established by the manufacturer. Although she appeared to acknowledge a preference for “laboratory” over “field” testing, Ms. Wise was confident that the “field” testing conducted on May 3, 2007 was scientifically reliable. Ms. Wise further testified that, based upon her testing on May 3<sup>rd</sup>, it is her opinion that the system was working “well within” the manufacturer’s specifications.

### **Scientific Reliability**

The digital red-light camera system is based upon the combination of well-recognized scientific principles. The inductive loop technology utilized to initiate this system has been used by cities and governmental agencies for decades. The same is true for computer software applications similar to the one used by this digital red-light camera system. According to Mr. Kosina, the photographic technology used in this system is the same as that which has been in public use for over fifty years and has been recognized as reliable in numerous court systems and by the United States Department of Justice. Mr. Kosina testified that over 150 jurisdictions in the United States recognize digital technology as reliable scientific evidence. Mr. Kosina further stated that he is aware of no jurisdiction that has declined to accept evidence generated by digital technology.

Mr. Kosina testified that the manufacturer’s manual sets forth very specific criteria for the maintenance and testing of the digital red-light camera system. In prior testimony before this Court, Mr. Kosina has indicated that other literature regarding red-light camera technology can be accessed on web sites for other companies that manufacture similar systems.

The metrology laboratory at the Colorado Department of Agriculture annually tests the internal clocks in the system, including the timers that are utilized to

calculate the length of time that the traffic lights have displayed the continuous yellow and red signals.

The evidence generated by this technology will be useful to the fact-finder. With the prior red-light camera technology, concerns were raised that can now be addressed with evidence created by the digital red-light camera system.

It should no longer be a concern that a photograph of the defendant's vehicle might be generated by the system when another vehicle changes lanes into the defendant's lane right before the intersection. The digital system creates a photograph that includes an image of both the vehicle and the traffic signal itself. In addition, the system creates a twelve second video which depicts the path of the vehicle as it enters and travels through the intersection. The parties will have access to this evidence to present to the judge or jury, thus eliminating the need for scientific calculations or other complicated explanations.

The new technology also eliminates concern regarding the possibility of a citation being issued when a vehicle behind a defendant's vehicle triggers the system to take a photograph. Again, the creation of the additional images included in the digital photographs and the twelve second video should allow the parties to present evidence during trial that is dispositive on these and other related issues.

Applying the factors set forth in *Schreck* and *Daubert*, the Court concludes that the digital red-light camera system is scientifically reliable and admissible in Boulder Municipal Court cases.


As is true with any admissible evidence, an adequate foundation for admissibility will be required in each case. Foundational elements required to introduce digital red-light camera evidence include:

- a. Proof of the training and certification of the field service technician;
- b. Proof of weekly on-site inspection of the system by a certified field service technician and proof that the system was operating in conformance with the manufacturer's specifications for the system;
- c. Proof of annual certification of the system's internal timing mechanism by the metrology laboratory for the Colorado Department of Agriculture (either laboratory or field test); and
- d. Proof that, at least one time within 24 hours of the creation of the photographic image, the system passed the internal tests generated by the activation of the "Test" button.

This order does not attempt to set forth the other proof necessary to establish a violation of B.R.C. Section 7-4-3.

DATED: Wednesday, August 1, 2007

BY THE COURT:

  
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MUNICIPAL COURT JUDGE  
P.O. Box 8015  
Boulder, CO 80306  
(303) 441-1842

**EXHIBIT 1**

<p>MUNICIPAL COURT, CITY OF BOULDER, COLORADO Court Address: 1777 6th Street, Boulder, CO 80302</p> <p><b>PEOPLE OF THE CITY OF BOULDER, by and on behalf of, PEOPLE OF THE STATE OF COLORADO, Plaintiff,</b></p> <p><b>vs.</b></p> <p><b>Robert Yates, Defendant</b></p>	<p>Case Number: CR-2005-0008295 Courtroom: Municipal Court</p>
<p><b>ORDER 2005-2 IN RE JUDICIAL NOTICE OF CAMERA RED LIGHT TECHNOLOGY</b></p>	

This matter came on for hearing on October 12, 2005. The purpose of the hearing was to determine whether the Court would take judicial notice of the scientific principles underlying the City's red-light camera technology.

**Law**

As a preliminary matter, the People contend that B.R.C. Section 7-4-74(e)(3) governs the admissibility of red-light camera technology. B.R.C. Section 7-4-74 (e) states:

In any proceeding in municipal court to prosecute a violation of Section 7-4-3, "Obedience to Red Signal Required," B.R.C. 1981: (2) The image and related data produced by a red-light camera concerning the violation shall be admissible in court as prima facie evidence of a violation of such section, provided that the person who activated and tested the red-light camera prior to the image being taken testifies as to the placement of the red-light camera and the accuracy of the scene depicted, and further testifies that the person tested the red-light camera for proper operation within a reasonable period of time both before and after the taking of the image. It shall not be necessary that the same person who did the testing before the taking of the image be the person who testifies concerning the testing which occurs thereafter.

Subsection (e) (3) goes on to state:

Testing and operation in accordance with the manufacturer's specifications shall be, without limitation, sufficient foundation for introduction of the evidence.

The People argue that this ordinance disposes of the requirement that the Court conduct an inquiry into the scientific reliability of the red-light camera technology. See *People v. Bowers*, 716 P.2d 471 (Colo. 1986). The Court recognizes the legal principle established in *Bowers*, but believes that a reliability inquiry is still required.

In *Bowers*, the statute at issue specifically stated that the testing methods and design of the devices used to determine blood alcohol levels must be certified by the department of health. *Id.* The *Bowers* court noted that "the purpose of section 42-4-1202(3)(b) is to delegate authority to the State Board of health to prescribe scientifically valid procedures for chemical testing that will not only ensure the safety in the testing process but, as important here, will provide sufficient reliability to the testing method as to avoid the necessity of formal evidentiary proof on this aspect of the testing process." *Id.* at 474. Although judicial notice of the testing method and devices was mandated by the statute, it was done with the expectation that the department of health would establish guidelines that would be followed before the mandate would take effect.

Unlike the statute at issue in *Bowers*, B.R.C. section 7-7-74(e) does not delegate the reliability inquiry to another government agency with relevant scientific expertise. Therefore, *Bowers* is distinguishable.

Further, the Court is required to look beyond the Boulder Revised Code in determining the admissibility of evidence. The Constitution and laws of the United States and of the State of Colorado must also be heeded. See B.R.C. Section 2-6-4(e). More specifically, the Court must adhere to the Colorado Rules of Evidence, which apply to all courts in the State of Colorado. C.R.E. 101, 1101(a).

The Colorado Rules of Evidence provide that the admissibility of evidence shall be determined by the court. C.R.E. 104(a). Implicit in this rule is the notion that the admissibility of evidence can be raised by the judge, and is not dependent on an objection to the evidence by one of the parties.

The evidence in this case, which was obtained through red-light camera technology, is dependent on scientific principles. Specifically, it relies on inductive loop technology combined with photography and computer software applications. Consequently, its admissibility is controlled by C.R.E. 702 and *People v. Schreck*, 22 P.3d 68 (Colo. 2001), not simply B.R.C. Section 7-4-74(e). Applying C.R.E. 702 and the holding of *Schreck* to these cases, the Court now finds that the red-light camera technology is scientifically reliable and is therefore admissible.

## **Summary of Evidence**

The People called two witnesses, Mr. Joseph Paulson and Mr. Rich Kosina. Mr. Paulson is the Transportation Engineer for Signals and Lighting for the City of Boulder. He has a Masters of Science in Transportation Engineering and is a licensed Professional Engineer. Mr. Paulson was involved in the implementation of the City's red-light camera program in 1998 and has been involved with the program since that time. The Court finds that Mr. Paulson is qualified to offer expert opinions regarding the scientific properties underlying this technology.

Mr. Kosina is the director of engineering for ACS, the company that built, installed and now maintains the red-light cameras used by the City of Boulder. Mr. Kosina has a bachelors degree in business and electronics and has been involved with the red-light camera technology for the past eight years. He provides direct training to the technicians that service and maintain the red-light camera system. The Court finds that based upon his education and experience in this field, Mr. Kosina is qualified to offer expert opinions regarding the scientific properties underlying this technology.

Mr. Paulson testified that the red-light camera technology utilizes in-ground inductive loop metal detectors placed under each lane of the roadway immediately preceding an intersection controlled by a traffic control signal. The loops are symmetric and create a magnetic field approximately six feet in diameter in the center of each lane. Two loops are placed in each lane, approximately six to seven feet apart. A vehicle crossing over the in-ground inductive loops disturbs the magnetic field created by the loops. The computer system controlling the red-light camera receives notice of this disturbance. The computer system then determines: (1) whether the traffic control signal is displaying a continuous red light; (2) whether the red light has been displayed for at least four tenths of a second (.4 seconds); and (3) whether the vehicle is traveling at a speed greater than twelve (12) miles per hour. If each of these questions is answered in the affirmative, the computer will direct a camera to take two photographs. The first photograph will display an image of the vehicle before it has entered the intersection and the second photograph will display an image of the vehicle and the driver after the vehicle has entered the intersection.

The City has determined that it will not issue red-light camera citations to drivers who are attempting to stop for the red light, but are unable to stop their vehicle before entering the intersection. Hence, no photograph will be generated of a vehicle traveling at a speed of twelve miles per hour or less as it crosses the second inductive loop.

Neither of the two photographs generated by the system contains an image of the traffic lamps. The red-light camera system determines the color of the light facing oncoming traffic by monitoring the current flowing to the respective traffic lamps. The data box for the red-light camera system is connected to the same

circuit that transmits information to the lamps facing traffic. When the lamps are receiving voltage flow to initiate the various color signals (green, yellow or red), the red-light camera system is simultaneously receiving the same voltage flow. As a result, the red-light camera system is aware of the color of the light being transmitted to oncoming traffic. This information allows the system to determine that the light was red when the vehicle passed the inductive loops and the length of time that the light had been red when the second photograph was taken.

The data box receives this information as well as information regarding the speed of the vehicle that has passed through the two successive inductive loops. The speed is determined through a time over distance analysis. The red-light camera system calculates the speed of the vehicle based upon the amount of time that it took the vehicle to traverse the known distance between the two inductive loops. According to Mr. Kosina, this distance will not vary as the symmetric nature of the loops insures that the magnetic field will be triggered at the same location in each inductive loop. An internal timing mechanism calculates the amount of time that has elapsed over the course traveled by the vehicle and the computer system then calculates the vehicle's average speed.

The data box captures information relating to the length of time that the traffic control signal had been red, the speed of the vehicle traveling through the intersection, the date, time and location of the vehicle. A second shutter in the camera system captures an image of the data box with this information and superimposes that image on the second photograph.

### **Scientific Reliability**

Both Mr. Paulson and Mr. Kosina testified that the inductive loop system utilized to create the magnetic field and which communicates the disturbance message to the computer system is not a new technology. According to these witnesses, this technology has been used by municipalities and other governmental entities for decades as a standard means for detecting the presence of vehicles at traffic control signals. Both testified that the inductive loop technology is an exceedingly reliable means for detecting vehicle presence.

Mr. Kosina testified that the camera and flash system utilized to capture the various depicted images is a regular film camera system that has been in use for over two hundred years. He further testified that the computer software system that controls the operation of the camera has been used by various industries for over sixty years.

Mr. Kosina testified that the manufacturer's manual sets forth very specific criteria for the maintenance and testing of the red-light camera system. Other literature regarding red-light camera technology can be accessed on web sites for other companies that manufacture similar systems.

Mr. Kosina stated that in the eight years that he has been involved with the system, he has not been made aware of any errors created by a system malfunction.

The metrology laboratory at the Colorado Department of Agriculture annually tests the internal clocks in the system, including the timers that are utilized to calculate the length of time that the traffic lights have displayed the continuous yellow and red signals. According to Mr. Kosina, the red-light camera system has passed all of the annual testing performed by the Department of Agriculture.

In addition to the testing performed by the Department of Agriculture, the City maintains and regularly tests the red-light camera system and the traffic control signal. The traffic control signal is run by what Mr. Paulson called a "conflict monitor". Pursuant to standards established by the Institute of Traffic Engineers, each conflict monitor is replaced annually. The removed conflict monitors are then tested and any problems detected during this testing process are noted in a City maintained database.

Mr. Paulson testified that trained technicians conduct inspections and test the red-light camera system approximately twice a week. The technicians that maintain and test the system are trained directly by Mr. Kosina or one of his ACS trainers. The technicians are directed to follow the testing guidelines established by the manufacturer to insure the accuracy of the system. These include the steps set forth in the Field Technician Service and Inspection Log. See People's Exhibit 2.

During each deployment, the technician visually inspects the pole cabinet (which houses the red-light camera), the camera itself and the roadway where the inductive loops are located. The condition of these items is noted on the inspection log and any item that requires repair is noted. The technician then removes the camera and the film and makes notation of the number of photographs taken.

Once the visual inspection and film removal process is complete, the technician initiates the red-light camera's self-testing process. The TEST button is pushed, instructing the system to take a photograph of the next vehicle. The technician notes a successful test if a flash occurs as the next approaching vehicle enters the intersection. The technician then removes the film and memory card and turns the power off.

After this initial inspection and testing process is completed, the technician turns the system's power back on. When the system powers up, it goes through a series of self-tests to insure that it is working properly. Included in these self-tests is a calibration test in which the system simulates a vehicle traveling through the intersection in each lane at a pre-set simulated speed. The system

must calculate this simulated vehicle's speed within a tolerance of plus or minus two miles per hour. If the system fails the internal test, it will not activate.

After the system has been reactivated, the technician checks to insure that the various settings for the system have been set correctly, inserts a new memory card and film and again initiates the system's self-test. The system must again pass its internal testing process before it will activate.

In Mr. Kosina's opinion, if the red-light camera system is maintained and tested in accordance with the manufacturer's specifications, it will accurately capture images of vehicles that have entered an intersection against a red light.

Mr. Kosina indicated that red-light camera systems are in use in over fifty jurisdictions in the United States. Although he did not identify the specific case or court, Mr. Kosina indicated that he had participated as a witness in a hearing in a court in San Francisco, California where the issue was also whether a similar red-light camera system was scientifically reliable. According to Mr. Kosina, that red-light camera system was "accepted" by the court that conducted that hearing.

### **Defense Evidence**

The Court appointed Ms. Ann England of the University of Colorado School of Law's Legal Aid and Defender Program as amicus counsel. Mr. Yates, the only named defendant, represented himself and participated in the hearing. Both Ms. England and Mr. Yates cross-examined the People's witnesses. No witnesses were called for the defense.

Several issues were addressed during cross-examination of the City's witnesses. One issue surrounded whether the system might erroneously take a photograph of one vehicle when another vehicle had actually disturbed the inductive loop force field.

It was suggested that a vehicle changing lanes near the intersection might trigger the system and generate a photograph of a vehicle that had entered the intersection *before* the light turned red. According to Mr. Paulson, the system prevents such a misattribution because no photo will be taken unless a vehicle trips the force fields for both loops in one lane and only if it passes each loop in succession. The two inductive loops in a traffic lane are between six and seven feet apart. It is virtually impossible for one vehicle to perform the lane change contemplated by the hypothetical and generate a photograph of another vehicle in that traffic lane.

Mr. Paulson also noted that the inward shape of the force fields prevents a vehicle that is traveling in one traffic lane to generate a photograph of a vehicle traveling in an adjacent traffic lane. The magnetic field for each traffic lane is at

least 2.5 feet from the edge of the adjacent traffic lane. A vehicle triggering a photograph would have to actually be in that traffic lane to trigger a photograph of a vehicle in that traffic lane.

The defense also raised the question of whether a vehicle that has entered the intersection legally might be depicted in a photograph generated by a second vehicle that is directly behind the first vehicle but passed the inductive loop force fields after the light had changed from yellow to red. Mr. Paulson acknowledged this theoretical possibility, but noted that the second vehicle would have to be right on the bumper of the first vehicle for such an error to occur. Based on the evidence that the Court heard during this hearing, the photograph generated would likely depict both vehicles and thus allow the fact-finder to weigh the possibility that the first vehicle had not violated the ordinance.

The defense also raised its concern that an error in the set up of the circuits between the red-light system and the traffic control signal could result in a citation being issued when no violation had occurred. Mr. Paulson acknowledged the theoretical possibility of an error occurring if the circuits controlling the signals were wired incorrectly. If the circuits controlling the red and yellow lights were inverted, such that the computer system attributed the red light current to a yellow light and the yellow light current to a red light, a photograph would be generated of vehicles legally entering the intersection on a yellow light. According to Mr. Paulson, if such a photograph were generated, it would contain the data from the data box showing that the light had been yellow for an extremely long period of time and showing a red light for a very short period of time. According to Mr. Paulson, this type of data would be inconsistent with the actual timing for the signal. Implicit in his testimony on this point is that the error would be easily detected and rectified.

One other hypothetical involved the possibility that the red-light camera system might be incorrectly connected to the circuit for a different direction of travel. For example, the red-light camera could be connected to the circuitry governing the lamps facing westbound Canyon Boulevard while the camera itself was set to take photographs of northbound 28<sup>th</sup> Street. In this scenario, a photograph might be taken of a vehicle legally entering the intersection on 28<sup>th</sup> Street when a vehicle on Canyon had entered that intersection against a red light. Again, such a circumstance would also generate data regarding the period of time that the light had been yellow and red. According to Mr. Paulson, the error from this type of assembly would also be easily detected and corrected.

The defense also questioned whether the red-light camera system would be able to discern if the yellow or red lamps were working properly. Mr. Kosina acknowledged that if, for example, the lamp for the yellow or red light had burned out, the red-light camera system would still receive a message that the light had been illuminated and would still generate a photograph.

Mr. Kosina also acknowledged that the red-light camera system can not determine if a vehicle was accelerating or decelerating as it proceeded through the inductive loops. Neither party made argument regarding the importance of this point. The red-light camera system utilizes the speed calculation to determine whether a vehicle is traveling at a speed greater than twelve miles per hour. Although the City has decided as a matter of policy not to issue citations when the vehicle is traveling at a speed less than twelve miles per hour, this policy decision has not been made an element of the infraction.

### **Conclusion and Order**

Pursuant to *Schreck v. People*, 22 P.3d 68, 70 (Colo. 2001), the inquiry surrounding the admissibility of scientific evidence should focus on the reliability of the scientific principles, the qualifications of the witness and the usefulness of the evidence to the trier of fact. In addressing these issues, the trial court may consider the factors set forth in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 593-94, 125 L. Ed. 2d 469, 113 S. Ct. 2786 (1993). *Id.* These factors include (1) whether the technique can and has been tested; (2) whether the technique has been subjected to peer review and publication; (3) the scientific technique's known or potential rate of error, and the existence and maintenance of standards controlling the technique's operation; (4) whether the technique has been generally accepted; (5) the relationship of the technique to more established modes of scientific analysis; the existence of specialized literature dealing with the technique; (6) the non-judicial uses to which the technique are put; (7) the frequency and type of error generated by the technique; and (8) whether such evidence has been offered in previous cases to support or dispute the merits of a particular scientific procedure. *Schreck*, 22 P.3d at 77-78.

Red-light camera technology is based upon the combination of well-recognized scientific principles. The inductive loop technology utilized to initiate the red-light camera system has been used by cities and governmental agencies for decades. The same is true for computer software applications similar to the one used by the City's red-light camera system. The photographic technology used in this system is the same as that which has been in public use for over two hundred years and has been recognized as reliable in Colorado courts. *Mow v. People*, 72 P. 1069, 1072 (Colo. 1903). The red-light camera system is in use in over fifty jurisdictions in the United States.

From a conceptual standpoint, the operation of the system is straightforward. The system communicates information obtained through an integrated circuit between the inductive loops on the roadway to the computer system and the camera itself. The components of the system are tested annually and the system is subject to regular inspections by trained technicians.

In addition to the foregoing, Boulder's City Council has indicated its intent that the evidence created by the technology be admissible in municipal court

proceedings. For all of these reasons, the Court concludes that red-light camera technology is scientifically reliable and admissible in Boulder Municipal Court cases.

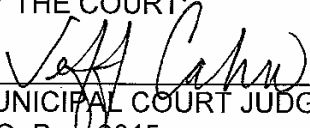
As is true with any admissible evidence, an adequate foundation for admissibility will be required in each case. Foundational elements required to introduce red-light camera evidence include:

- a. Proof of the training of the equipment operator or technician;
- b. Proof of inspection and deployment of the system in accordance with the operator's training and in conformance with the manufacturer's specifications for the system;
- c. Proof of annual certification of the system's internal timing mechanisms by the Colorado Department of Agriculture, metrology laboratory;
- d. Proof that at the deployments immediately preceding and immediately following the creation of the photographic image, the operator changed the film and memory card;
- e. Proof that at the deployments immediately preceding and immediately following the creation of the photographic image, the system passed the internal tests generated by the activation of the TEST button;
- f. Proof that at the deployments immediately preceding and immediately following the creation of the photographic image, the system passed the internal speed calibration test generated when the system's power is activated; and
- g. Proof that the speed threshold setting, camera delay setting and vehicle count settings have been set in conformance with manufacturer specifications.

This order does not attempt to set forth the other proof necessary to establish a violation of B.R.C. Section 7-4-3.

DATED: Wednesday, October 26, 2005

BY THE COURT:

  
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MUNICIPAL COURT JUDGE  
P.O. Box 8015  
Boulder, CO 80306  
(303) 441-1842