WASHINGTON Traffic Safety COMMISSION

Automated Speed Enforcement Pilot Project Evaluation

Final Report as Submitted to the Legislature

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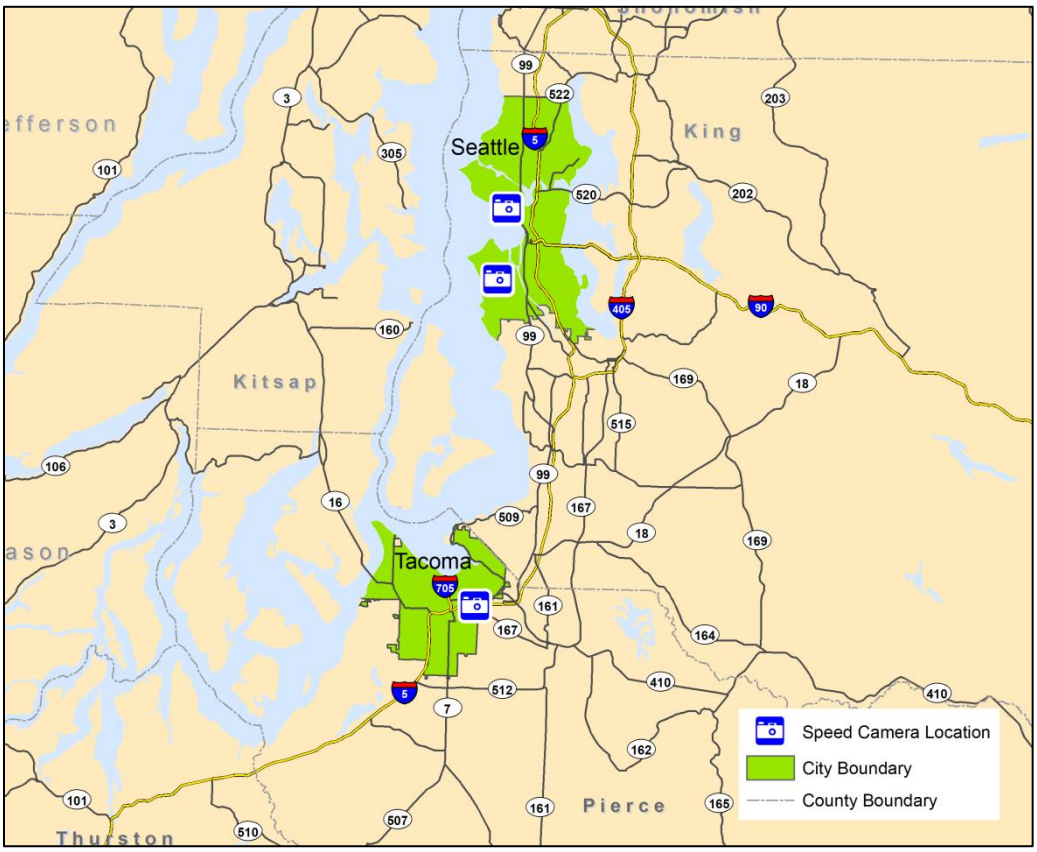
Automated Speed Enforcement Pilot Sites in Seattle and Tacoma



GLOSSARY OF TERMS

Mean Speed: The average (mean) speed of all vehicles during the data collection period.

Trigger Speed: The threshold speed (MPH) at which the camera is set to take a photo. A vehicle traveling at or above this speed is deemed to be in violation.

Violation: Occurs when a vehicle travels at or above the camera trigger speed.

Violation Percent: The percentage of vehicles triggering the automated enforcement camera.

Infraction: For the purposes of the automated speed enforcement pilot evaluation, when a violation occurs that meets the requirements under RCW 46.63.170(1)(e), a notice of traffic infraction is mailed to the registered owner of the vehicle.

Speed Adaptation: A well-documented phenomenon (also known as 'velocitization) in which a driver leaving a higher-speed road (i.e., posted for 60-70 MPH) for a lower-speed road (e.g., 35 MPH) will continue to drive at a higher speed than if the same driver were leaving a 25 MPH road for a 35 MPH one. In other words, drivers become habituated to driving at a higher rate of speed and unconsciously continue driving at that higher speed.

EXECUTIVE SUMMARY

Introduction and Background

Traffic crashes involving speeding drivers are a major source of traffic fatalities and serious injuries. The societal cost of speeding-related fatal and serious injury crashes in Washington exceeded $850 million in 2011 alone. Washington currently allows automated speed enforcement in school and construction zones to detect speeding vehicles. To explore the use of this technology in other types of locations, the Washington State Legislature passed a 2009-2011 transportation budget proviso, which was extended through the 2011-2013 biennium, for automated speed enforcement pilot projects in Seattle and Tacoma. The proviso directed the Washington Traffic Safety Commission (WTSC) to evaluate the pilot projects and report to the Legislature on the use, public acceptance, outcomes, and other relevant issues regarding automated speed enforcement cameras. The 2011 Evaluation Report to the legislature contains the pilot project's initial 18-month results. The current report presents the updated results through the 2012 project period.

Project Summary

Both Tacoma and Seattle passed city ordinances (required under RCW 46.63.170), selected treatment and control sites, set fine schedules, planned for revenue distribution, and made additional administrative adjustments. Major differences between the Seattle and Tacoma pilot projects included the type of camera system used, camera trigger speed setting, and camera enforcement operation hours and duration.

Tacoma installed a fixed camera system on the East Bay Street curve in November 2009. Full speed enforcement operations began December 1, 2009 after an initial two-week warning period. The camera takes photos of vehicles traveling 10 MPH or more over the posted speed limit of 35 MPH and has operated around-the-clock up to the present (except for a single month in 2011 when the camera was vandalized), thereby providing continuous speed enforcement at that site.

Seattle has used one mobile speed camera unit and has alternated enforcement between the two pilot project locations, Elliot Avenue W and 35th Avenue SW, since beginning operations in March 2010 (except for two six-week 'hiatus' periods resulting from equipment problems—one in November-December, 2011, and the second in April-May, 2012). Construction at the Elliot Avenue W site limited the van use resulting in only two deployments in 2012. The camera takes photos of vehicles traveling 8 MPH or more over the posted speed limit of 35 MPH.

Outcomes

Project outcomes for the Tacoma site demonstrated a reduction in average speed, an initial decrease in the percentage of vehicles triggering the camera (i.e., violations), and a decrease in crashes resulting in injuries. Average speeds decreased from 30.3 MPH at the 2010 baseline, to 27.8 MPH in quarter two of 2012; however, these average speeds are below the posted limit of 35 MPH, meaning that the decrease may also be attributed to other factors, such as traffic

congestion and seasonal weather. The number of monthly violations decreased steadily in 2010, and leveled off in 2011 and 2012. The number of crashes resulting in injury decreased from six during the last half of 2009 to just one during the first half of 2012, though the small size of the numbers involved prevents us from reaching statistically-valid conclusions.

Project outcomes for the Seattle sites did not show a reduction in average speeds at either site; however this may be due to the use of a mobile speed unit (rather than a fixed camera) that alternated between the sites (and other non-project sites). It is important to note that average speeds at both sites remained consistently between 34 and 36 MPH. The number of infractions issued each month is dependent on the number of days, hours, and time of day the mobile unit is deployed, so it was not possible to determine if the number of infractions issued is decreasing as a result of deploying the mobile unit.

Public Acceptance and Other Relevant Issues

A 2012 survey of Seattle and Tacoma residents measured public knowledge and attitudes about the use of automated speed enforcement in their cities. Survey results indicated:

- Respondents in both cities favored the use of automated speed enforcement cameras in 'school zones' (71.6% in Seattle, 69.8% in Tacoma) and on 'roads with a high number of speeding deaths and serious injuries' (68.6% in Seattle, 71.0% in Tacoma). However, general support for automated speed enforcement has declined since the first survey was conducted in 2010.
- 35% of respondents felt excess infraction revenues should go into a 'City Traffic Safety Project Fund', 22% chose a 'City Law Enforcement Fund', and 19% thought excess revenues should be directed to a 'City General Fund'.

INTRODUCTION AND BACKGROUND

Introduction

In 2009, the Washington State Legislature passed a transportation budget with a proviso specifying that the Washington Traffic Safety Commission "may oversee pilot projects implementing the use of automated traffic safety cameras to detect speed violations within cities west of the Cascade mountains that have a population over one hundred ninety five thousand". This budget proviso was first introduced in the 2009-2011 transportation budget (ESSB 5352, §201(2)) and was extended through the 2011-2013 biennium (ESHB 1175, §201(2)). This language effectively designates Seattle and Tacoma as the only cities eligible to conduct such pilot projects. The proviso required the WTSC to "comply with RCW 46.63.170 in administering the projects," limited qualifying cities to "one traffic safety camera" each, and further directed that "by January 1, 2013, the commission shall provide a report to the legislature regarding the use, public acceptance, outcomes, and other relevant issues regarding automated traffic safety cameras demonstrated by the projects". Requirements under RCW 46.63.170 are outlined in the table below.

Table 1. Overview of Automated Speed Enforcement Pilot Project Requirements

Requirement under RCW 46.63.170	Seattle	Tacoma
Authorizing ordinance enacted by city	Yes	Yes
Vendor compensation based only on value of equipment and services provided or rendered in support of system	Yes	Yes
Camera location clearly marked by signs indicating traffic laws enforced by automated traffic safety camera	Yes	Yes
Photos only of vehicle and vehicle license plate and only while infraction occurs	Yes	Yes
Law enforcement officer review of photos prior to issuing infraction notice	Yes	Yes
Photos used only for speeding violation enforcement	Yes	Yes
Photos retained no longer than necessary to enforce law	Yes	Yes
Infraction not part of registered owner's driving record	Yes	Yes
Pilot project fine amount—cannot exceed city parking fine (note: state standard speeding fine range is $124 – $411)	$124 – $247	$124
City parking fine range	$24 – $250	$15 – $450
Infraction notice mailed within 14 days	Yes	Yes
Photo made available for inspection and admission into evidence in a proceeding	Yes; on infraction notice and online	Yes; on infraction notice and online

Accordingly, WTSC employees met with representatives from the House and the Senate Transportation Committees, OFM, and representatives of the law enforcement, budget, and data operations sections from Tacoma and Seattle. As a result, representatives agreed upon a number of operational definitions, legal requirements and potential problems and solutions related to those requirements, overall project design, data acquisition, and outcome evaluation. The project was implemented in both Tacoma and Seattle in 2009. In 2010, WTSC staff conducted site visits with project representatives to ensure legal compliance and to review the automated speed enforcement camera photos. More information about this process is available in the 2011 Evaluation Report.

Background

Traffic injuries and fatalities related to speeding drivers have long been a major public safety problem in Washington. From 2009 through 2011, speeding-involved deaths ranked second behind impaired driving-involved deaths as a major cause of traffic fatalities in Washington State. Speeding-involved collisions also rank second as a cause of serious injuries. Between 1994 and 2011, 4,117 people lost their lives in speeding-involved crashes on Washington roadways, an average of 229 fatalities every year. Forty percent of those deaths resulted from crashes on roads with posted speed limits of 35 MPH or less, and 58% of Washington's speeding-involved deaths – as well as 59% of speeding-involved serious injuries – resulted from crashes on local roads (i.e., city streets and county roads).

After remaining virtually flat between 1994 and 2005, the trend in Washington's speeding-involved fatalities has declined steeply since then. However, in order to meet our state's Target Zero goal of zero traffic deaths by 2030, Washington must pursue initiatives that will successfully mitigate the harmful effects of speeding. Moreover, speeding-involved crashes are expensive. Using collision-cost estimates provided by the Federal Highway Administration (FHWA), we calculate that speeding-involved fatality and serious-injury crashes cost Washingtonians more than $850 million dollars in 2011 alone.[1]

Although enforcement of speeding laws by police in the course of normal traffic operations have proven to be a very effective deterrent in areas receiving regular and ample patrols, major problems exist with this traditional approach to speed enforcement. In essence, law enforcement patrols can amply and regularly cover only a small portion of the roadway miles needing their attention because very few police agencies have sufficient manpower and other resources to deter speeding effectively. As public agency budgets shrink further, this problem will only become magnified. Consequently, in recent years the use of automated speeding enforcement systems has become increasingly attractive to law enforcement agencies around the world because it offers the lure of more-effective deterrence coupled with the inherent attractiveness of requiring offenders themselves to pay for the enforcement program.

1 The FHWA cost figure is based on a 2005 traffic crash societal cost estimate of $4,008,900 for fatalities and $216,000 for serious injuries, which is then multiplied by an implicit price deflation factor of 1.0973 (Bureau of Economic Analysis Table 1.1.9, Implicit Price Deflators for Gross Domestic Product) for a 2011 per-crash cost estimate of $4.4 million and $237,000 respectively. In 2011, Washington incurred 169 fatal and 470 serious injury speeding-related crashes = $854,990,000. (*Highway Safety Manual – 1st Edition, 2009*)

PROJECT SUMMARY

Tacoma Project

On July 21, 2009, the Tacoma City Council passed an ordinance authorizing the Tacoma Police and Public Works Departments to conduct a pilot automated speed enforcement project in cooperation with the WTSC under the terms laid out in the budget proviso. Collaboration between the Tacoma Police Department, Tacoma Public Works, and staff members of the WTSC resulted in the formulation of a reasonable site-selection process. More information about the site-selection process is available in the 2011 Evaluation Report.

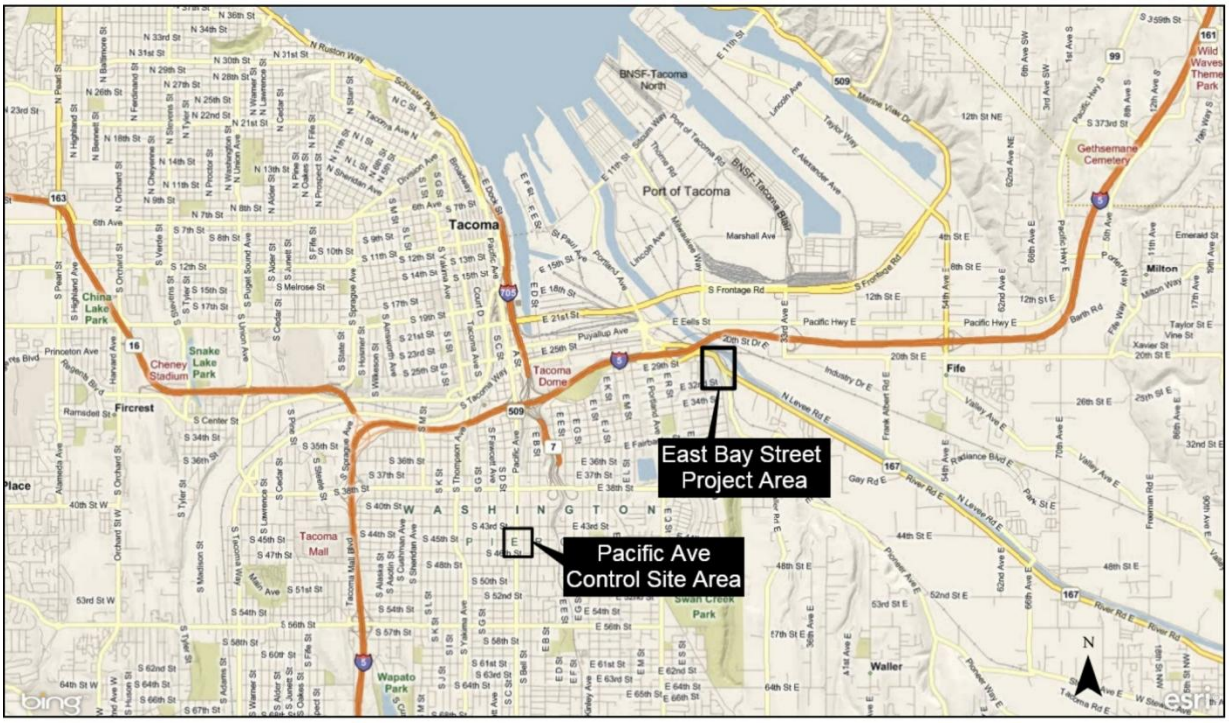
As a result of the site selection process, the Tacoma Police Department chose to install a fixed-camera on East Bay Street (westbound), a divided connector arterial with two lanes in each direction, at a site just beyond where East Bay Street emerges from River Road (see Figure 1, p. 6). River Road has a posted speed of 50 MPH before slowing to 35 MPH four-tenths of a mile before the fixed camera. A 25 MPH 'advisory speed' is posted on East Bay Street just ahead of a significant (roughly 60˚) curve to the northwest where eastbound traffic from East 28th Street merges onto East Bay Street (East Bay Street is essentially the terminal section of westbound SR-167 before it merges into city traffic on East 26th Street and East R Street). The site does not allow for traditional law enforcement patrols because it lacks adequate roadway shoulders and also features limited sight distance as well as heavy volumes of traffic traveling at high speeds. A control site was selected based on the same criteria and similarity to the test site, a stretch of Pacific Avenue between South 43rd Street and South 46th Street.

A 12-hour (9:30 a.m.– 9:30 p.m.) speed study of the site in June 2009 documented 859 vehicles traveling above 45 MPH (10 MPH over the posted speed) in the eastbound direction but only 359 such violators in the westbound direction. Part of this discrepancy between eastbound and westbound violation numbers certainly stems from the well-documented phenomenon of *speed adaptation*, in which drivers are less likely to 'adapt' their speeds to lower posted levels (i.e., 25-35 MPH) when entering them from highways than from other lower-speed roads.

ENFORCEMENT

The Tacoma Police Department decided to set the speed camera 'trigger' speed at 45 MPH, or 10 MPH above the posted speed limit. Enforcement operations on East Bay Street began on November 17, 2009, with a two-week warning period, followed by the onset of the infraction period in the first week of December 2009. In terms of the fines, Tacoma initially decided on a single per-infraction rate of $101 to be assessed for photo-radar speeding violations. Based on a proposal to mitigate projected budget shortfalls in Tacoma, the city council approved an increase to the fine to $124, effective December 25, 2011, which brought the City of Tacoma in alignment with other state jurisdictions utilizing automated speed enforcement. The camera has operated continuously from that time through the present, except for most of September, 2011, when the camera was vandalized by a gunshot. Speeding infractions recorded by the camera were reviewed three times by camera vendor employees for license plate legibility, visual clarity, and other factors before being approved and passed on to the Tacoma Police Department's Traffic Division for an additional review by line traffic patrol officers.

Figure 1. Tacoma Automated Speed Enforcement Project Area



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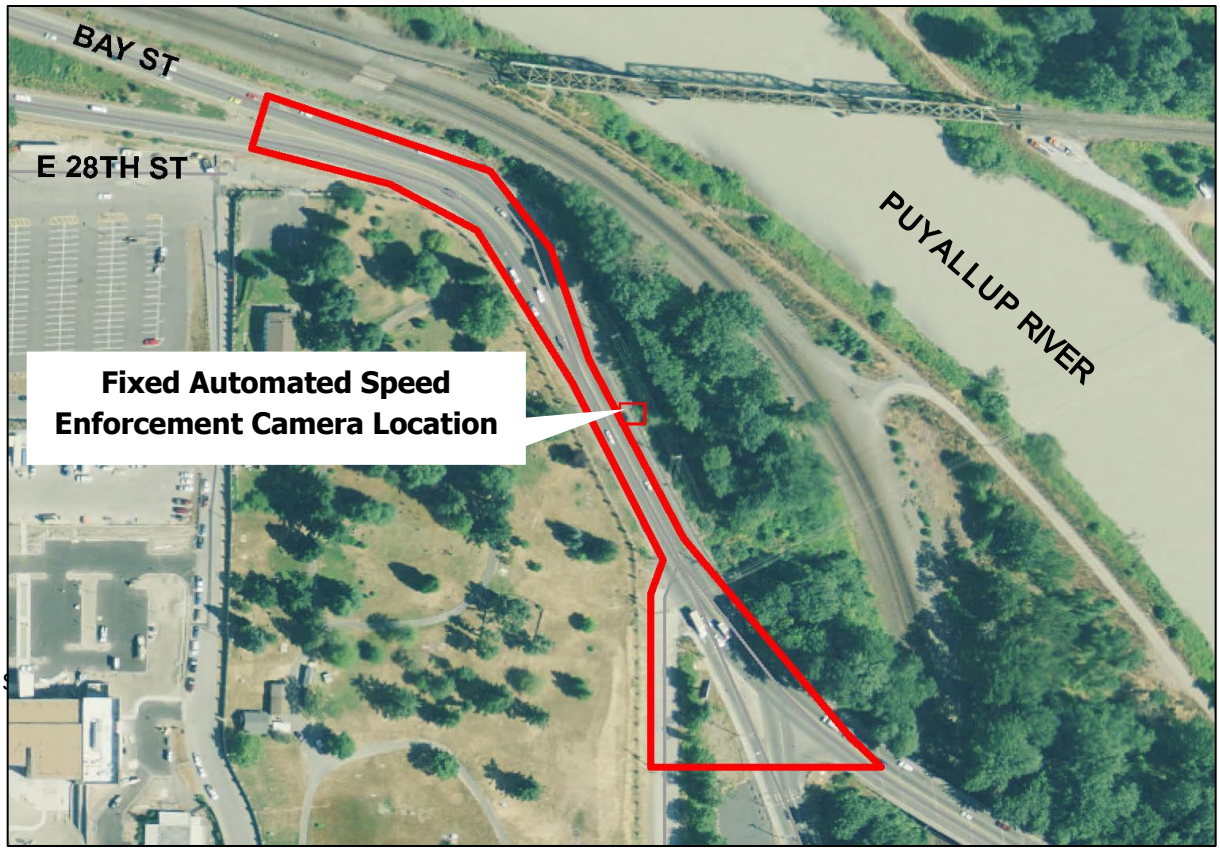

Seattle Project

On November 23, 2009, the Seattle City Council unanimously approved the necessary ordinance to conduct the automated speed enforcement project, signed by the Mayor on December 1, 2009. While the legislative effort was proceeding, Seattle continued to plan for the deployment of its mobile speed enforcement photo-radar van, which had been acquired in 2008 for speed enforcement in school zones. The WTSC-approved Seattle project was developed by a previously-created Interdepartmental Team (IDT), whose members were drawn from the police, the municipal court, the legal office, the budget office, and the transportation department. In order to maximize resources, the IDT decided to use their existing speed-camera capability, a mobile van equipped with a photo-enforcement unit. Seattle's site-selection process was based on selection criteria selected by the IDT and the ability to safely deploy the mobile van to a location. More information about the Seattle site-selection process is available in the 2011 Evaluation Report.

Based on this process, the IDT chose two treatment sites, one on Elliott Avenue West (SB) between the Magnolia Bridge and 6th Avenue West, and the other on 35th Avenue SW (NB), between SW Brandon St and SW Hudson St. The selection of the two sites partly reflected a Seattle Police Department resource-management need to use the mobile unit more economically by coupling deployment at the 35th Avenue SW site with deployment in a nearby school zone. The IDT also picked two control sites, Aurora Avenue North (NB) between North 85th St and North 105th St, and Holman Road NW (NWB) between 7th Avenue NW and 9th Avenue NW. All four sites are classed as 'principal arterial,' all are posted for 35 MPH, and all feature two traffic lanes in each direction except Aurora, which has three traffic lanes in each direction. One project site (Elliott Avenue West) and one control site (Aurora) are situated in commercial/mixed-use areas, while the remaining project site (35th Avenue SW) and control site (Holman) are each located in areas zoned as residential. Thus, each treatment site was paired with a control site that is similarly zoned.

ENFORCEMENT

The IDT made the decision to set the camera 'trigger' speed at 43 MPH, or eight MPH above the posted speed limit. Under the terms of Seattle's enabling ordinance, fines resulting from operation of the mobile camera unit would be graduated along the same line as standard statewide speeding fines, i.e., in terms of MPH increments above the posted speed limit. The highest fine proposed by the IDT was $247, just short of Seattle's largest parking-ticket fine of $250, whereas the statewide schedule tops out at $411 for traveling 70 MPH or more on a road posted for 35 MPH.

Table 2. Seattle project fine schedule

MPH above posted speed	*Fine Amount*
6-10 MPH	$124
11-15 MPH	$154
16-20 MPH	$195
21+ MPH	$247

Following the acquisition of baseline measurements at each project site and at control sites, Seattle's mobile speed unit initiated a 'warning' period at the Elliott Avenue site, beginning April 19, 2010, and ending May 3, 2010. Because the onset of the warning period coincided with several media stories publicizing the beginning of automated speed enforcement on Elliott Avenue SW, Seattle project personnel determined that no warning period would precede the start of photo-enforcement on May 14, 2010, at the 35th Avenue SW site. In addition, signs were posted at each site to inform drivers that photo-enforcement was taking place. The Seattle Police Department's mobile traffic unit alternated between the two project sites (among other locations) for the duration of the project period. Infractions in Seattle are first reviewed by the mobile unit vendor and then by the Seattle Police Department. Approximately 75% of all violations photographed by the speed-camera unit at both of the project sites combined resulted in infraction notices being sent to vehicle-owner addresses.

Figure 2. Seattle Automated Speed Enforcement Project Areas

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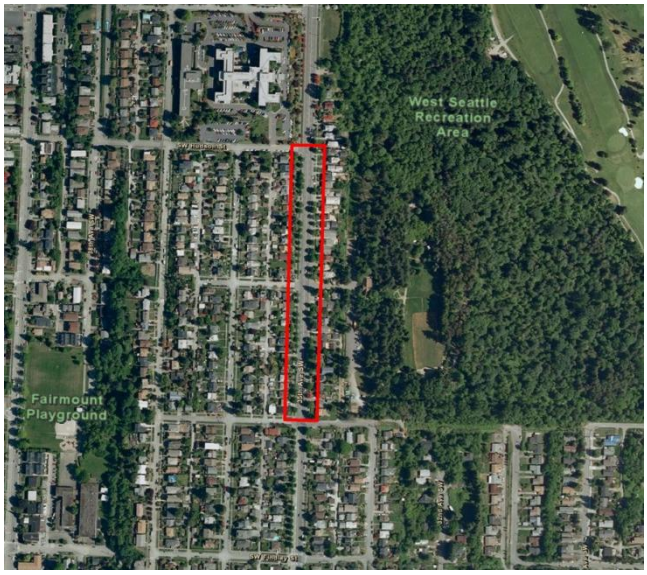
Elliott Ave W, Seattle

35th Ave SW (& SW Dawson St), Seattle



Source: ©2010 Google

OUTCOMES

The results for the initial 18-month project period are available in the 2011 Evaluation Report.

Tacoma Results

No follow-up data was provided for the Pacific Avenue control site, so site comparisons for the Tacoma fixed automated speed camera were not possible. In March 2009, the baseline measurement of average speed at Pacific Avenue was 35.1 MPH.

VIOLATIONS

The Bay Street automated speed enforcement camera issued 19,063 infractions that were filed by the court between January 2011 and June 2012. Since the beginning of the project November 2009, approximately 16% of all Bay Street infractions are dismissed by the court, mainly because the registered vehicle owner was not driving at the time of the infraction (reported February 2012). A small amount (0.2%) of infractions were dismissed because it was found that a violation was not committed. The total number or percent of infractions appealed was not provided. Monthly infractions generated from the Bay Street camera, compared with monthly revenue, are presented in Figure 5. An average of 0.16% of drivers passing the Bay Street camera received infractions. The number of monthly infractions issued decreased in 2010, but remained stable in 2011 and 2012.

AVERAGE SPEEDS AND TOTAL CRASHES

Results from the Bay Street project area indicate that both average speeds and crashes resulting in injury are decreasing. Overall, total crashes decreased through 2011, but then increased slightly again in 2012 (Figure 3). During the first part of 2012, Washington experienced extreme inclement weather that may have contributed to the increase in crashes. Regarding average speeds, it is important to note that all quarterly figures are *below* the posted speed limit of 35 MPH (Figure 4), so the decrease in average speeds may also partly result from other factors, such as congestion and season, and cannot be attributed to the placement of an automated speed camera alone. However, data does show that average speeds decreased at the Bay Street location since the baseline measurement recorded September – November 2010.

Figure 3. Traffic Crashes in the Bay Street ASE Project Area

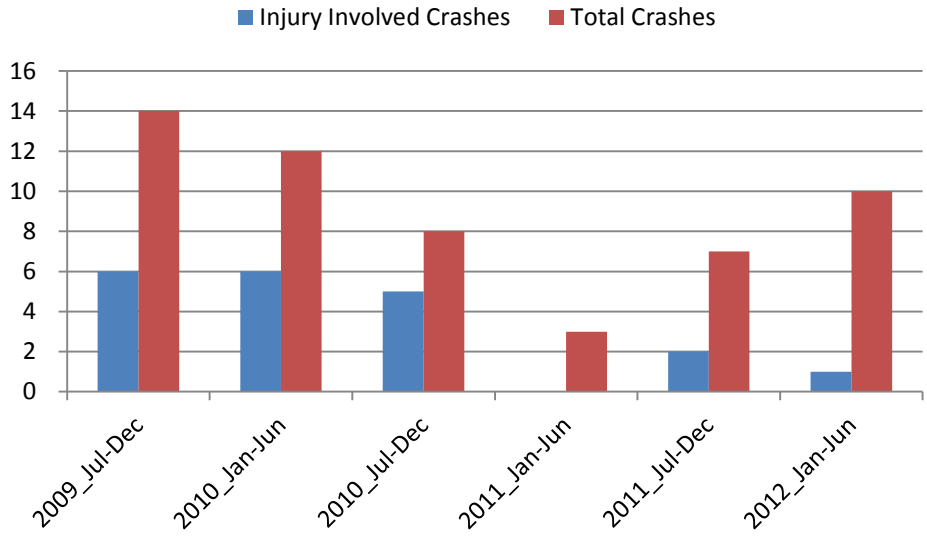
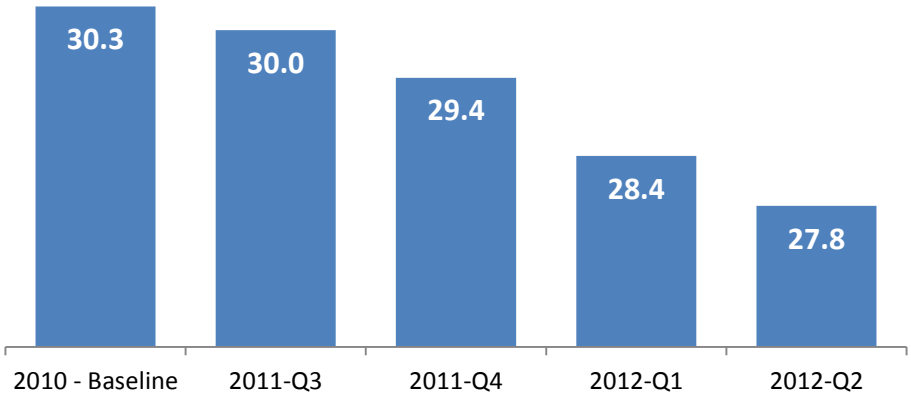


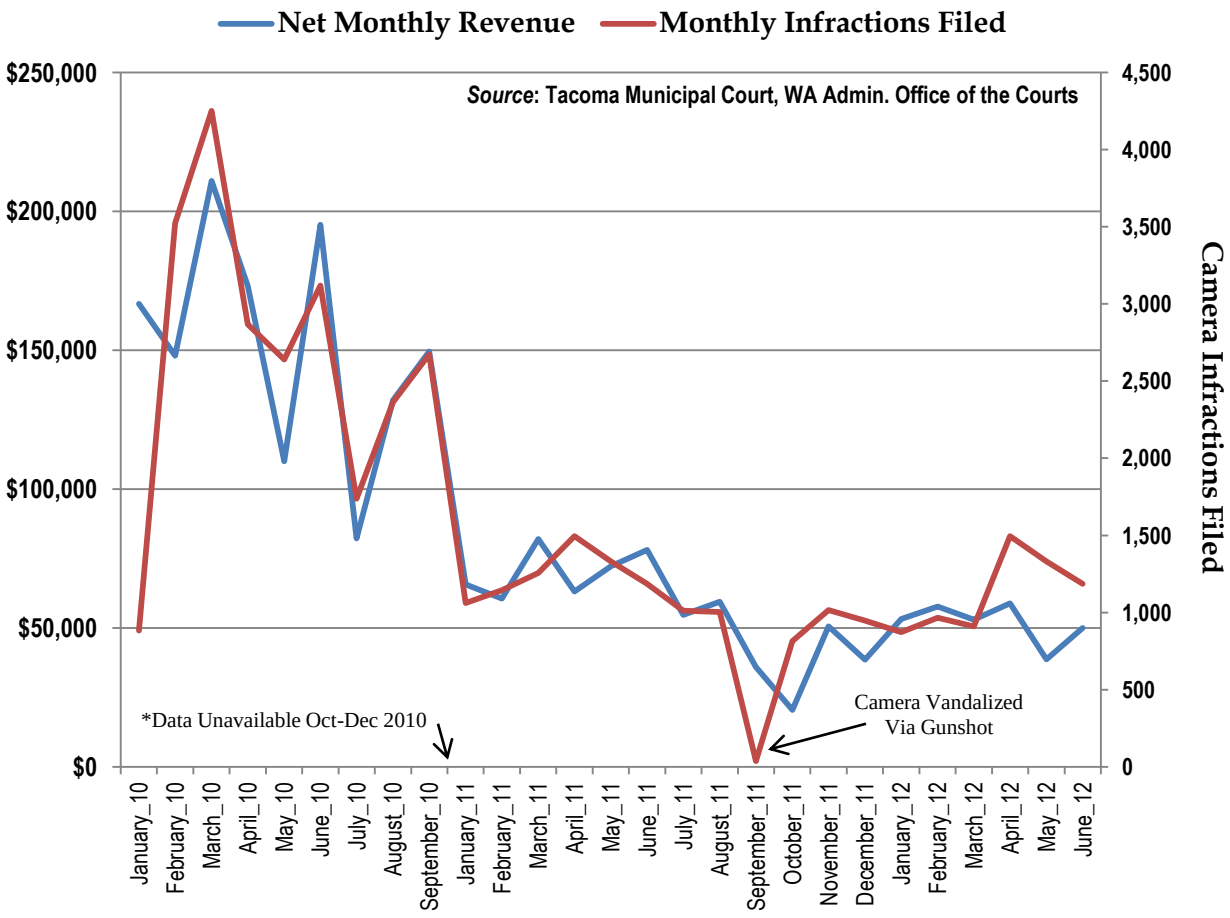
Figure 4. Average Speeds at the Bay Street Project Site



REVENUE

The Bay Street camera has a fixed monthly cost of $6,870, through the camera vendor RedFlex. During the initial 18-month project period January 2010 through June 2011, average monthly net revenue was $119,297. During the follow-up period July 2011 through June 2012, average monthly net revenue was $47,619. Monthly revenue compared with monthly infractions is presented in Figure 5. Revenue is approximately linear to the number of citations issued each month; however the revenue lag varies due to appeals, court proceedings, and late payers, causing some revenue to be generated in the months following the citation issuances. Overall, total project revenue January 2010 – July 2012 was $2,360,883. All revenue generated by the speed enforcement project is placed into the Traffic Enforcement, Engineering, and Education Fund, which includes funds for salaries of the Tacoma Police Department Traffic Unit, designated Municipal Court employees, and Public Works staff.

Figure 5. Bay Street Camera Monthly Infractions and Revenue



Seattle Results

Seattle used a speed enforcement mobile unit between two test sites (among other locations not included in this project) for the ASE pilot. As such, the data presented below is based only on days/hours that the mobile unit was deployed at each location.

VIOLATIONS

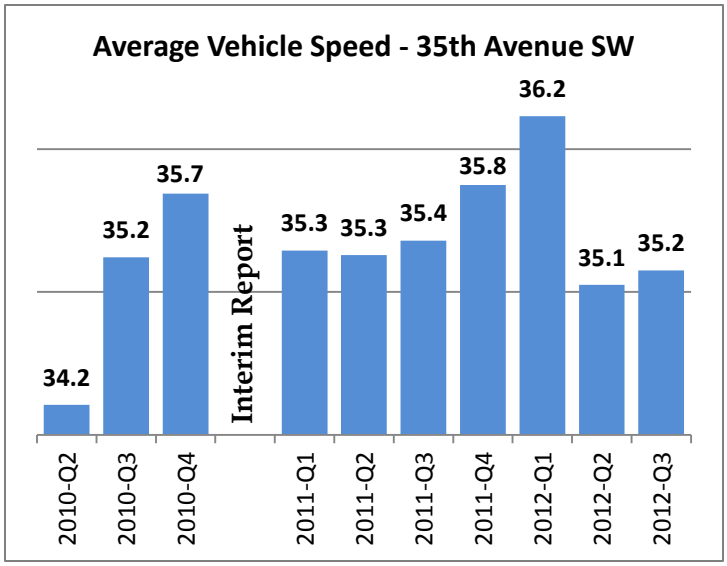
During July 2011 – June 2012, the mobile unit was stationed at the Elliot Avenue West location for a total of 85 days and issued 621 infractions. An average of 0.4% of drivers passing the mobile unit received infractions. In 2012, the mobile unit was deployed to the Elliot Avenue West site only twice due to construction. Nine out of the 85 days, there were no infractions issued, which may indicate that the equipment was not functioning properly.

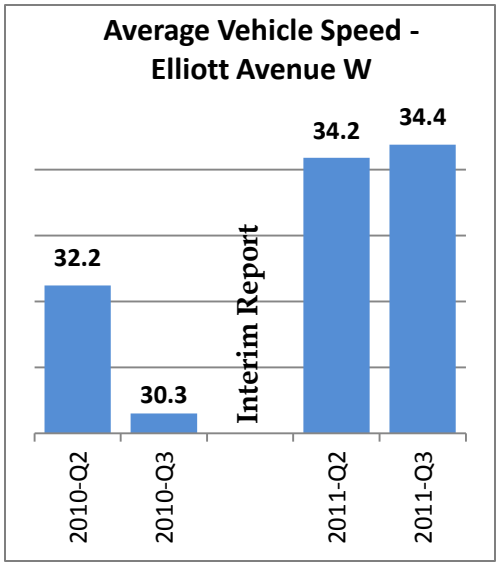
During July 2011 – September 2012, the mobile unit was stationed at the 35th Avenue SW location for a total of 112 days and issued 597 infractions. An average of 0.9% of drivers passing the mobile unit received infractions. Fifteen out of the 112 days, no infractions were issued. Information about the total number of infractions appealed and the percent dismissed was not provided for either pilot site.

AVERAGE SPEEDS AND TOTAL CRASHES

Average speeds did not change significantly during the pilot project. However, given the transitory nature of the mobile unit, a continuous assessment of average speeds was not possible. At the Elliot Avenue West site, average speeds remained below the posted speed of 35 MPH. At the 35th Avenue SW site, average speeds remained between 34 and 36 MPH throughout the duration of the project. This information is presented in Figure 6 (Source: Seattle PD Mobile ASE Camera). Crash figures were not provided for either site.

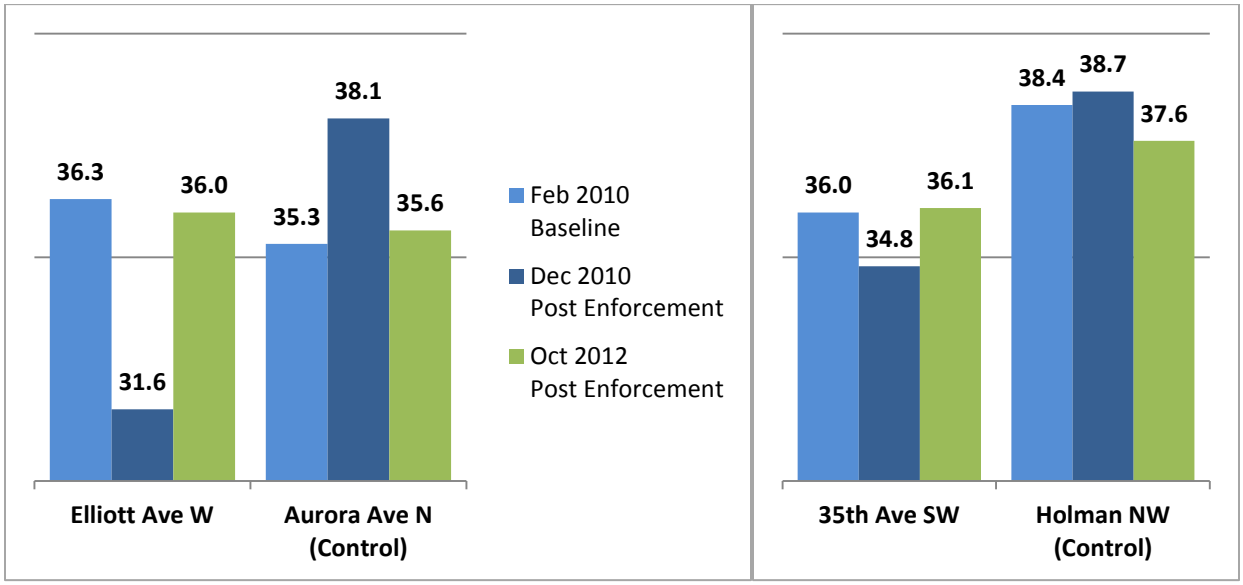
Figure 6. Seattle ASE Locations Average Speeds





Average speeds were compared between the pilot sites and control sites based on single day measurements via hand-held radar (Figure 7). The baseline measurements were recorded on February 26, 2010 prior to the project implementation (van deployment). Post enforcement measurements were taken on the same day of the week, during the same hours, in December 2010 and October 2012. During the initial period between February and December 2010, average speeds increased at each control site, and declined at the pilot sites. By 2012, average speeds at the pilot sites increased to close to baseline values. During the same time period, mean speeds at the control sites decreased. Several issues prevented the deployment of the mobile unit to the test sites in 2012, so the initial decrease in average speeds is promising, based on more frequent deployment of the unit prior to 2012.

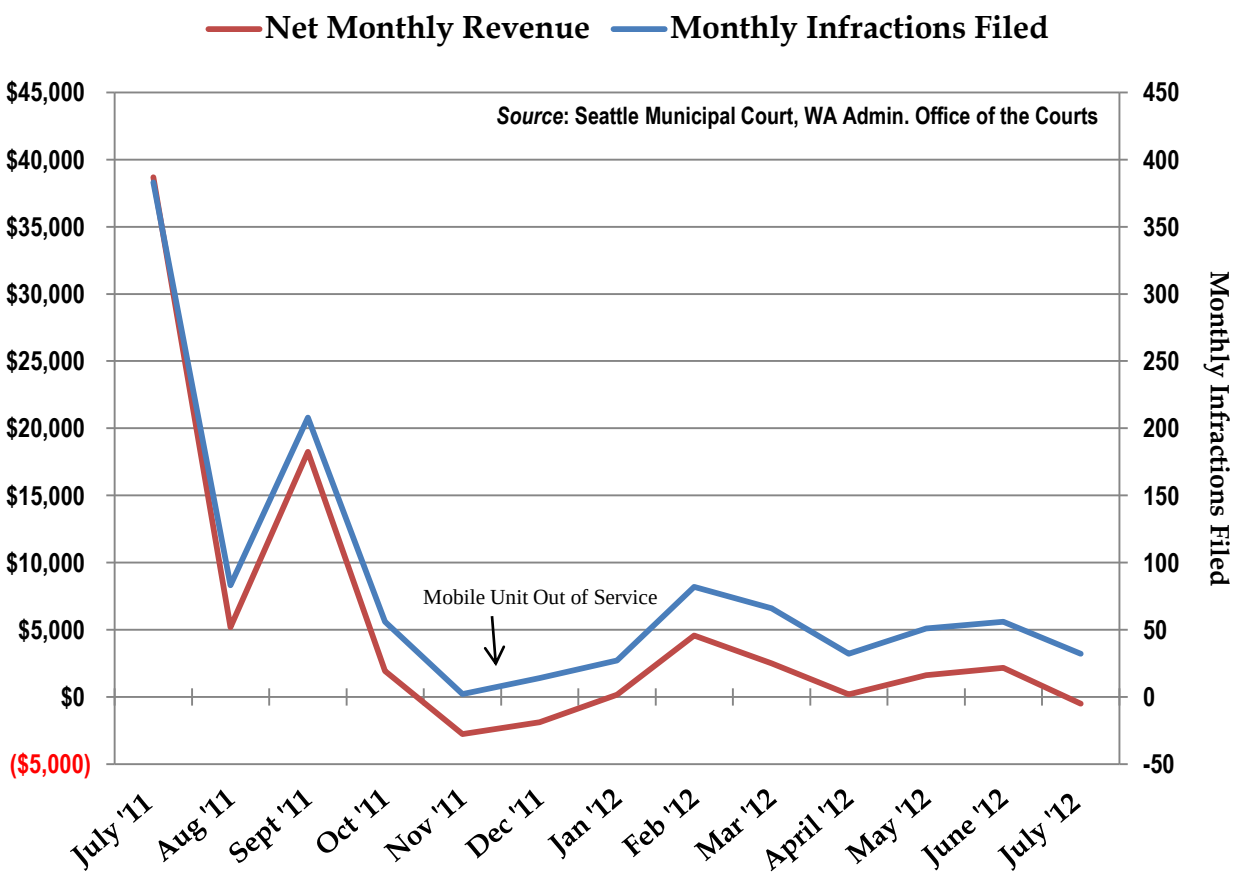
Figure 7. Seattle ASE Pilot Locations Average Speeds vs Control Sites



REVENUE

The Seattle mobile unit has a monthly fixed cost of $3,000, in addition to a variable monthly supplemental fee. Revenue information was not provided in the initial project period. From July 2011 - September 2012, the average total monthly cost was $3,873. Between July 2011 and July 2012, the average monthly net revenue from the mobile unit deployed at the test sites was $9,367; however monthly revenue was variable ranging from a low of $234 to a high of $46,167. Revenue generated from the mobile units is placed in the Seattle General Fund. Monthly revenue compared with monthly infractions is presented in Figure 6. The number of infractions issued each month is dependent on the number of days, hours, and time of day the mobile unit is deployed, so it is not possible to determine if the number of infractions issued is decreasing as a result of deploying the mobile unit.

Figure 8. Seattle ASE Pilot Locations Monthly Infractions and Revenue



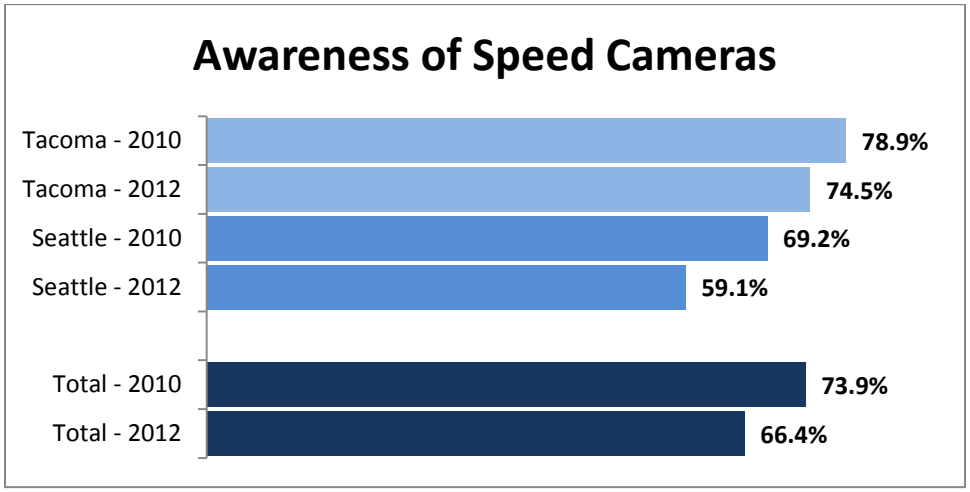
OTHER RELEVANT ISSUES

Public Acceptance

WTSC worked closely with Gilmore Research to design and implement a survey questionnaire for assessing public attitudes and opinions in Seattle and Tacoma about their automated speed enforcement projects. Data was collected between September and October in 2010 and 2012. Pre-notification letters were sent to 1,000 randomly-selected households in both Seattle and Tacoma. Three days after that mailing, Gilmore sent a copy of the survey instrument to each household where they had mailed a pre-notification letter. Recipients had three options to choose: (1) complete and return the survey directly back to Gilmore by mail, (2) call the Gilmore phone center and complete the survey on the phone, or (3) complete the survey online at a Gilmore-sponsored website. This survey method resulted in high overall response rates in both 2010 (72%) and 2012 (76%).

Responses from the 2012 survey to each question for both cities are shown in Appendix B. Over 700 citizens from both cities combined responded to at least one question in the survey (about 53% of them from Seattle households and 47% from Tacoma households). Question 1 asks, "In your opinion, how much of a safety problem is speeding in the City?" About 50% of Seattle respondents (49.5%) selected 'Somewhat of a problem' while another 17.5% replied, 'A big problem'. By comparison, 51.3% of Tacoma respondents selected ''Somewhat of a problem' and 22% selected 'A big problem'. Seattle respondents were less likely to think that a driver speeding would receive a ticket (42.4%) than Tacoma respondents (51.4%). Awareness about the use of automated speed enforcement was generally high, 66.4% overall. However, awareness has decreased since the 2010 survey, and in Seattle, awareness decreased by 10 percentage points between 2010 and 2012 (Figure 7). This may be partially explained by the increased media coverage during the pilot launch and during the passing of the city ordinances in 2010.

Figure 9. Awareness About the Use of Speed Enforcement Cameras



Clear majorities of respondents in both cities favored (either 'Somewhat' or 'Strongly') the use of automated speed enforcement cameras in 'school zones' (71.6% in Seattle, 69.8% in Tacoma), on 'roads with a high number of speeding deaths and serious injuries' (68.6% in Seattle, 71.0% in Tacoma), and in locations where 'traffic enforcement is difficult or dangerous for police officers' (50.9% in Seattle, 60.5% in Tacoma). On the other hand, the proportion of respondents who *opposed* using automated speed enforcement cameras on 'residential streets' and on 'streets with a speed limit of 35 MPH' was higher compared to the proportion of respondents who *favored* using speed cameras in these areas. In 2010, opposition to using speed cameras on 'residential streets' and on 'streets with a speed limit of 35 MPH' was roughly equal to support for using speed cameras in these areas; however, in 2012, opposition surpassed support.

Public opposition to the use of speed enforcement cameras is increasing, regardless of the location where use is proposed. Opposition is stronger and increasing faster in Seattle than in Tacoma, although opposition is growing in Tacoma as well.

Figure 10. Support for Speed Enforcement Cameras by Type of Location – Tacoma

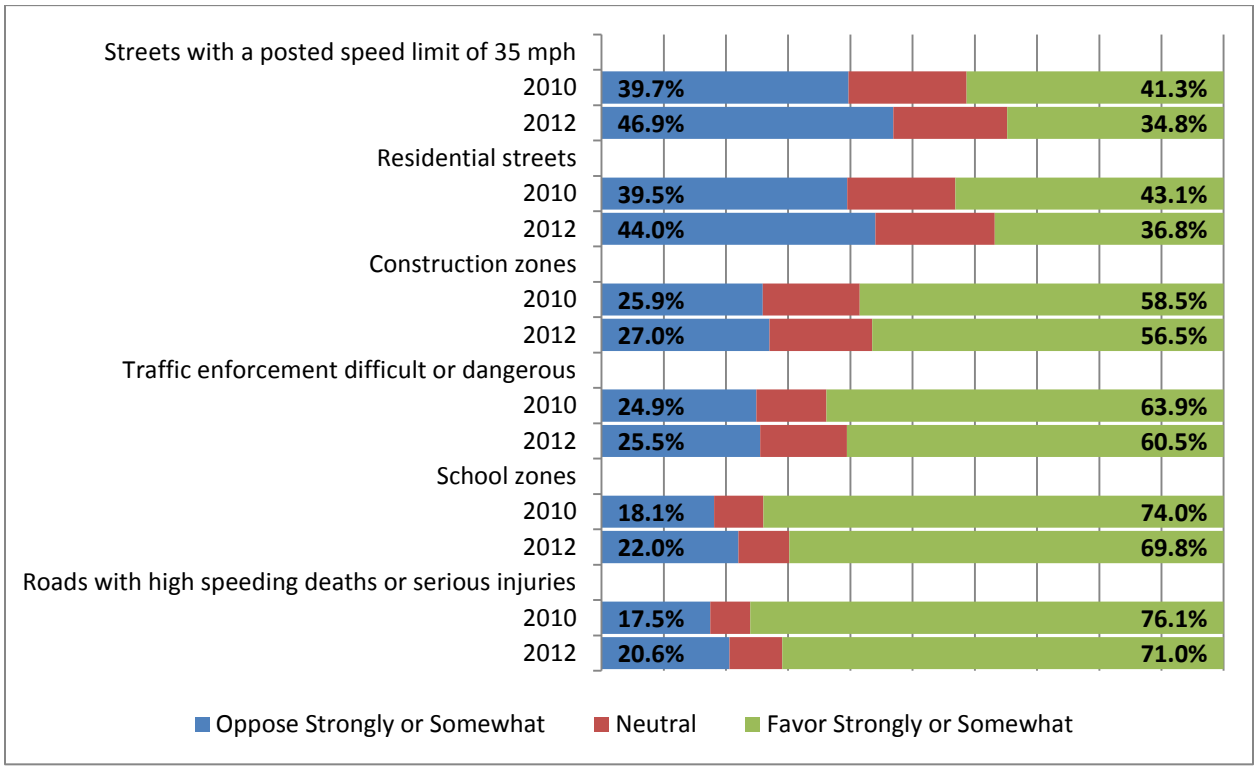
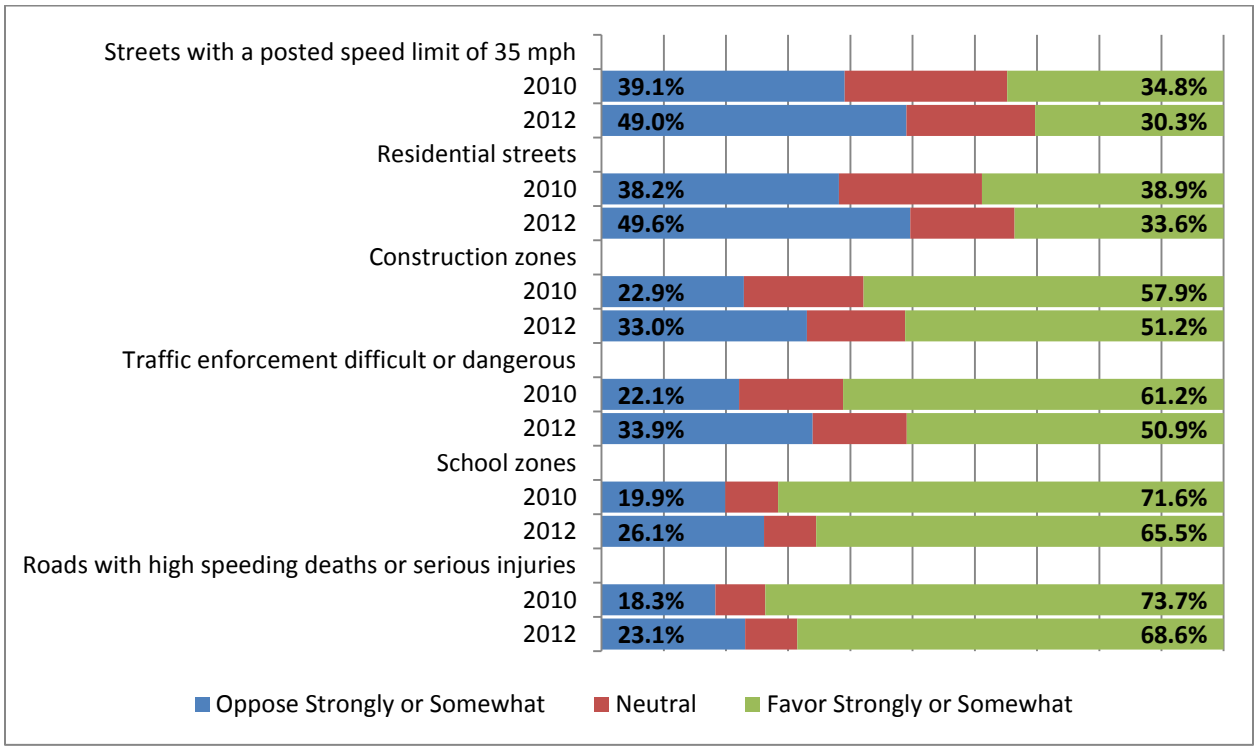


Figure 11. Support for Speed Enforcement Cameras by Type of Location – Seattle



In 2012, when respondents were asked if they had any comments regarding the use of automated speed enforcement cameras in Seattle/Tacoma that they would like to share, over half opted to share additional comments. A synopsis of respondent comments is provided in table 5. Comments suggest that respondents are opposed to the use of speed cameras to generate excess revenue. There is general support for using the cameras in restricted areas, particularly school zones, but only during hours when speed is restricted in those zones. Several respondents suggested that electronic speed signs (that inform the drivers of their current speeds, but without financial penalty) are an equally effective speeding deterrent without the negative perception of city revenue generation. Finally, concerns about privacy, camera accuracy and calibration, offender (driver) identification, and safety (cameras causing accidents) were expressed.

Table 3. Major Themes of Survey Respondent Comments, 2012

Major Theme	Summary	N=436*
General Support	Comments indicate general support – no justification	74
General Opposition	Comments indicate general opposition – no justification	57
Neutral	Neither support or opposition – no justification	29
Revenue	Cameras should NOT be used to generate revenue; general perception that revenue generation is greater than gains in traffic safety	53
Use in Restricted Areas	Support use of speed cameras in restricted areas, the majority indicate school zones (ONLY during active school zone hours)	48
Police	Cameras should not replace police presence/jobs; if revenue is generated, then use for improving/increasing police force	43
Signage/Transparency	Areas where speed cameras are placed should be clearly marked; more transparency about gains in traffic safety, revenue generation, and use of revenue generated	37
Privacy/Legal Rights	Perception of a violation of privacy (photos); violations should only be issued by a law enforcement officer	36
Functionality of Cameras	Concerns about how accurate the cameras are; transparency about how they are calibrated (MPH above speed limit	33
Driver Identification/ Circumstances	Inability of the cameras to identify the offender (identifies registered owner); the circumstances regarding the violation are unknown	31
Safety Issue	Perception that the presence of cameras pose more of a safety issue than an improvement (slamming on breaks, congestion)	24

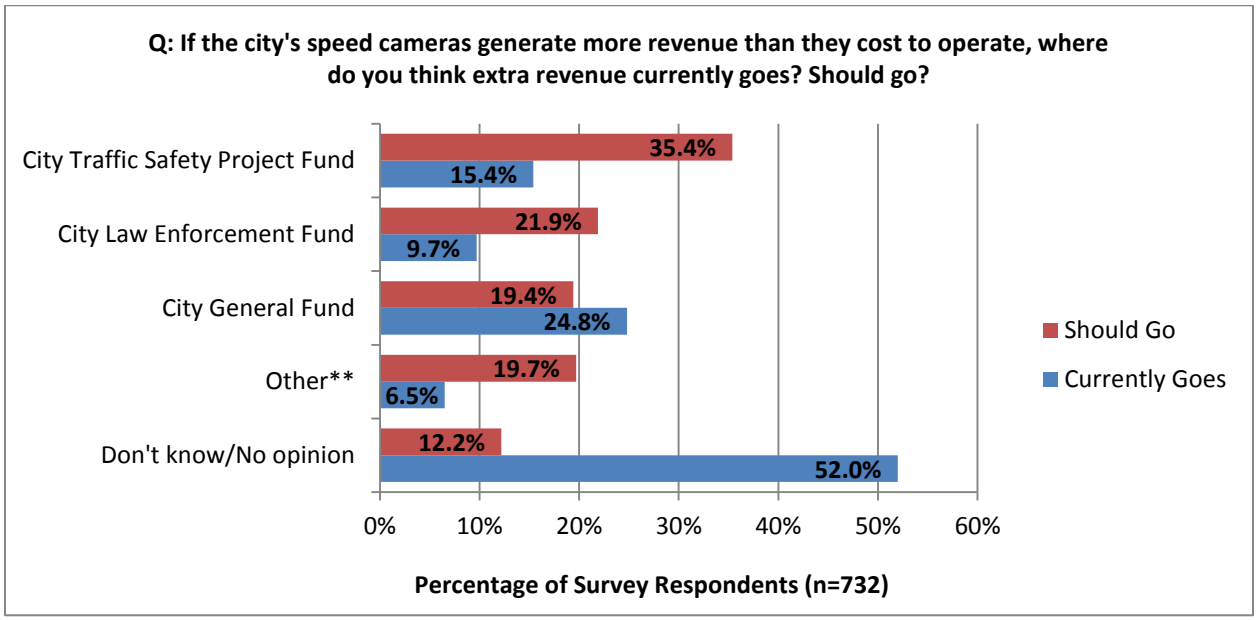
*Counts will not equal the total N as some comments were excluded related to red light cameras, and several themes may have been present in a single respondent comment (up to 3).

Public Perception of Revenue

One salient issue surrounding this project specifically, and automated traffic enforcement in general, is the question of what happens to the money generated via the collection of fines resulting from violations.

In 2012, approximately half of surveyed residents from each city believe that the speed-camera programs generate revenue in excess of what they cost to operate. Although a majority in each city (53.7% in Seattle, 50.0% in Tacoma) also acknowledges not knowing *where* the revenue actually goes, a majority in each city (54.1% in Seattle, 60.7% in Tacoma) believes that the excess revenue ought to go into either a 'traffic safety fund' or a general 'law enforcement fund'. Conversely, only about one-fourth of Seattle respondents (23.1%) and less than one-sixth of Tacoma respondents (15.3%) felt that excess revenues should go into a city 'general fund'.

Figure 12. Seattle and Tacoma Residents Opinions on Excess Revenue Distribution, 2012



*Respondents may have selected more than one response; therefore, percentages will total more than 100%.
**The most frequent "Other" responses written in by respondents were road and sidewalk maintenance (6.6%, n=48) and education/schools (4.6%, n=34)

SUMMARY

The Tacoma automated speed enforcement fixed camera led to reductions in the number of citations issued and crashes resulting in injuries over the course of the pilot project (2009-2012). The Tacoma Bay Street pilot site also showed consistent decreases in average speeds, however the changes still resulted in averages remaining below the posted speed limit, making it difficult to attribute these changes to automated speed enforcement cameras alone. Control site data (Pacific Avenue) was not provided, so a comparison for changes in average speeds was not possible.

Since the Seattle project utilized a mobile unit equipped with an automated speed enforcement camera, resulting in inconsistent and sporadic data collection, the same assessments could not be made. Seattle did provide data for the control sites for an assessment of average speeds. Initially (February – December 2010), the average speeds at the test sites decreased, whereas the control sites average speeds increased. By October 2012, average speeds at the test sites increased to approximately baseline values. The initial decrease is promising, as several issues prevented the deployment of the mobile unit to the test sites in 2012, indicating the presence of the mobile unit, however sporadic, was having an impact on average speeds.

As expected, whether the automated speed camera is fixed or mobile, revenue is parallel to the number of citations issued. Both Tacoma and Seattle locations showed a decrease in the number of citations issued. However, for the Seattle mobile unit, the number of citations is directly related to the hours/days the mobile unit is deployed, whereas the Tacoma fixed camera is more likely to serve as a speeding deterrent over time.

According to a public opinion survey conducted in Tacoma and Seattle in 2010 and 2012, there is high public support for the use of speed cameras in school zones and in areas with a high number of speeding-related serious injuries and fatalities, however overall support for automated speed enforcement has declined since 2010. The majority of respondents think that revenue generated from automated speed enforcement should go to a City Traffic Safety Project Fund.

APPENDIX A: Survey of Seattle and Tacoma Residents

Survey Methods 2010-2012

The purpose of the survey was to ascertain public acceptance regarding the use of automated speed enforcement cameras. The Washington Traffic Safety Commission contracted with Gilmore Research to conduct a multi-mode survey of households in the automated speed enforcement camera pilot project cities. The increase in cell phone-only households has made it difficult to reach a representative random sample of the population in a specific geographic area using the traditional random digit dialing (RDD) approach. To overcome phone coverage issues and provide more than one method of contact, Address Based Sampling was used. This sampling technique involves drawing a probability based sample of households within the target geographic area.

Mail, web, and phone survey modes were utilized to improve response rates and increase the validity and reliability of the estimates obtained. Pre-notification letters were mailed to households in the survey sample followed three days later by a questionnaire and cover letter. Respondents were given the option of completing the survey by mail, online, or phone. One week later, the survey contractor mailed a post card reminding non-responders to complete the survey and thanking those who had already completed the survey. Phone calls to non-respondents with a phone listing began one week following the reminder post cards.

The 20 question survey asked residents about speeding behavior, how much they favored or opposed using speed cameras by type of location, and opinions on where to place extra revenue generated. The complete 2012 questionnaire with final frequencies are available in Appendix B. Data tables including 95% confidence intervals are available upon request. In 2012, the overall survey response rate was 76% or 732 completed questionnaires. The majority of respondents (74%) completed the survey by mail. The remaining respondents completed the survey by phone (10%) or online (16%). The final survey sample disposition for each city is shown in the table on the next page. Seattle and Tacoma had nearly the same response rate (78% and 73%, respectively).

Survey Sample Disposition by City, 2012

Survey Sample Disposition	Seattle	Tacoma	Total
Initial Survey Sample	1,000	1,000	2,000
Non-response (unreachable)	74	70	144
Refused/Returned Blank	32	57	89
Not Qualified	508	527	1,026
Completed Survey by web	77	40	117
Completed Survey by mail	273	269	541
Completed Survey by phone	36	38	74
Total Completed Surveys	386	346	732
Response Rate	**78%**	**73%**	**76%**

Response rate = completes / (completes + refusals + unreachable + non response)

*Includes non-respondents with a valid address but no phone listing.

APPENDIX B: 2012 Questionnaire with Final Frequencies

Survey Question Responses by City

Question	Response	Seattle N	Seattle %	Tacoma N	Tacoma %	Total N	Total %
1. In your opinion, how much of a safety problem is speeding in the City?	Not a problem	112	29.3%	63	18.3%	175	24.1%
	Somewhat of a problem	189	49.5%	177	51.3%	366	50.3%
	Big problem	67	17.5%	76	22.0%	143	19.7%
	Don't Know	14	3.7%	29	8.4%	43	5.9%
	Total Responses	**382**	**100.0%**	**345**	**100.0%**	**727**	**100.0%**
2. How likely do you think it is that a driver speeding in the City will receive a ticket?	Very Unlikely	73	19.0%	43	12.5%	116	15.9%
	Somewhat Unlikely	117	30.4%	91	26.5%	208	28.5%
	Somewhat Likely	125	32.5%	126	36.6%	251	34.4%
	Very Likely	38	9.9%	51	14.8%	89	12.2%
	Don't Know	31	8.1%	31	9.0%	62	8.5%
	Refused	1	0.3%	2	0.6%	3	0.4%
	Total Responses	**385**	**100.0%**	**344**	**100.0%**	**729**	**100.0%**
3. Are you aware that the City uses speed cameras (also known as photo radar or automated speed enforcement) to issue tickets to vehicles exceeding the speed limit?	Yes	227	59.1%	257	74.5%	484	66.4%
	No	157	40.9%	88	25.5%	245	33.6%
	Total Responses	**384**	**100.0%**	**345**	**100.0%**	**729**	**100.0%**
4a. How do you feel about the use of speed cameras in construction zones?	Oppose Strongly	83	21.9%	65	19.1%	148	20.6%
	Oppose Somewhat	42	11.1%	27	7.9%	69	9.6%
	Neutral	60	15.8%	56	16.5%	116	16.1%
	Favor Somewhat	86	22.7%	71	20.9%	157	21.8%
	Favor Strongly	108	28.5%	121	35.6%	229	31.8%
	Total Responses	**379**	**100.0%**	**340**	**100.0%**	**719**	**100.0%**
4b. How do you feel about the use of speed cameras where traffic enforcement is difficult or dangerous for police officers?	Oppose Strongly	89	23.6%	58	17.2%	147	20.6%
	Oppose Somewhat	39	10.3%	28	8.3%	67	9.4%
	Neutral	57	15.1%	47	13.9%	104	14.6%
	Favor Somewhat	88	23.3%	83	24.6%	171	23.9%
	Favor Strongly	104	27.6%	121	35.9%	225	31.5%
	Total Responses	**377**	**100.0%**	**337**	**100.0%**	**714**	**100.0%**
4c. How do you feel about the use of speed cameras on streets with a posted speed of 35 MPH?	Oppose Strongly	134	35.5%	101	29.8%	235	32.8%
	Oppose Somewhat	51	13.5%	58	17.1%	109	15.2%
	Neutral	78	20.7%	62	18.3%	140	19.6%
	Favor Somewhat	56	14.9%	48	14.2%	104	14.5%
	Favor Strongly	58	15.4%	70	20.6%	128	17.9%
	Total Responses	**377**	**100.0%**	**339**	**100.0%**	**716**	**100.0%**
4d. How do you feel about the use of speed cameras in school zones?	Oppose Strongly	71	18.7%	49	14.4%	120	16.6%
	Oppose Somewhat	28	7.4%	26	7.6%	54	7.5%
	Neutral	32	8.4%	28	8.2%	60	8.3%
	Favor Somewhat	95	25.0%	69	20.2%	164	22.7%
	Favor Strongly	154	40.5%	169	49.6%	323	44.8%
	Total Responses	**380**	**100.0%**	**341**	**100.0%**	**721**	**100.0%**
4e. How do you feel about the use of speed cameras on residential streets?	Oppose Strongly	140	36.7%	102	30.1%	242	33.6%
	Oppose Somewhat	49	12.9%	47	13.9%	96	13.3%
	Neutral	64	16.8%	65	19.2%	129	17.9%
	Favor Somewhat	65	17.1%	50	14.7%	115	16.0%
	Favor Strongly	63	16.5%	75	22.1%	138	19.2%
	Total Responses	**381**	**100.0%**	**339**	**100.0%**	**720**	**100.0%**
4f. How do you feel about the use of speed cameras on roads with a high number of speeding deaths and serious injuries?	Oppose Strongly	66	17.3%	49	14.4%	115	15.9%
	Oppose Somewhat	22	5.8%	21	6.2%	43	5.9%
	Neutral	32	8.4%	29	8.5%	61	8.4%
	Favor Somewhat	86	22.5%	77	22.6%	163	22.5%
	Favor Strongly	176	46.1%	165	48.4%	341	47.2%
	Total Responses	**382**	**100.0%**	**341**	**100.0%**	**723**	**100.0%**

Question	Response	Seattle N	Seattle %	Tacoma N	Tacoma %	Total N	Total %
5. Do you think the City's speed cameras currently generate more revenue than they cost to operate?	Yes	203	53.7%	168	49.7%	371	51.8%
	No	141	37.3%	131	38.8%	272	38.0%
	Don't Know	34	9.0%	39	11.5%	73	10.2%
	Total Responses	**378**	**100.0%**	**338**	**100.0%**	**716**	**100.0%**
IF YES, where do you think the extra revenue currently goes? (Please select all that apply)	City General Fund	52	25.6%	40	23.8%	92	24.8%
	City Law Enforcement Fund	19	9.4%	17	10.1%	36	9.7%
	ty Traffic Safety Project Fund	29	14.3%	28	16.7%	57	15.4%
	Don't Know	109	53.7%	84	50.0%	193	52.0%
	Other	12	5.9%	12	7.1%	24	6.5%
	Total Respondents*	**203**	*****	**168**	*****	**371**	*****
6. If the city's speed cameras generate more revenue than they cost, where do you think the extra revenue should go? (Please select all that apply)	City General Fund	89	23.1%	53	15.3%	142	19.4%
	City Law Enforcement Fund	68	17.6%	92	26.6%	160	21.9%
	ty Traffic Safety Project Fund	141	36.5%	118	34.1%	259	35.4%
	Other	76	19.7%	68	19.7%	144	19.7%
	No Opinion/Don't know	42	10.9%	47	13.6%	89	12.2%
	Total Respondents*	**386**	*****	**346**	*****	**732**	*****
*Respondents may have selected more than one response; therefore, percentages will total more than 100%.							
7. On a local road with a speed limit of 35 MPH, how often do you drive 45 MPH or faster?	All of the time	1	0.3%	3	0.9%	4	0.6%
	Most of the time	9	2.4%	4	1.2%	13	1.8%
	Some of the time	124	32.5%	87	25.5%	211	29.2%
	None of the time	247	64.8%	246	72.1%	493	68.3%
	Refused	0		1	0.3%	1	0.1%
	Total Responses	**381**	**100.0%**	**341**	**100.0%**	**722**	**100.0%**
8. In the past year, have you received any speeding tickets?	Yes	34	8.9%	26	7.6%	60	8.3%
	No	349	91.1%	316	92.4%	665	91.7%
	Total Responses	**383**	**100.0%**	**342**	**100.0%**	**725**	**100.0%**
IF YES, did you receive any speeding tickets from a speed camera?	Yes	11	36.7%	34	65.4%	45	54.9%
	No	17	56.7%	17	32.7%	34	41.5%
	Don't Know	2	6.7%	1	1.9%	3	3.7%
	Total Responses	**30**	**100.0%**	**52**	**100.0%**	**82**	**100.0%**
9. Are you a licensed driver?	Yes	370	96.9%	324	94.2%	694	95.6%
	No	12	3.1%	20	5.8%	32	4.4%
	Total Responses	**382**	**100.0%**	**344**	**100.0%**	**726**	**100.0%**
10. What is your age?	18-24	8	2.1%	8	2.3%	16	2.2%
	25-34	81	21.0%	42	12.1%	123	16.8%
	35-44	54	14.0%	48	13.9%	102	13.9%
	45-54	70	18.1%	67	19.4%	137	18.7%
	55-64	79	20.5%	69	19.9%	148	20.2%
	65-74	58	15.0%	62	17.9%	120	16.4%
	75+	28	7.3%	38	11.0%	66	9.0%
	unreported	8	2.1%	12	3.5%	20	2.7%
	Total Respondents	**386**	**100.0%**	**346**	**100.0%**	**732**	**100.0%**
	average age (mean)	50.4 yrs.		54.2 yrs.		52.2 yrs.	
11. What is your gender?	Male	204	52.8%	170	49.1%	374	51.1%
	Female	178	46.1%	171	49.4%	349	47.7%
	unreported	4	1.0%	5	1.4%	9	1.2%
	Total Respondents	**386**	**100.0%**	**346**	**100.0%**	**732**	**100.0%**
13. Do you have any comments regarding the use of speed cameras in the City that you would like to share with us?	Yes	151	39.1%	145	41.9%	296	40.4%
	No	235	60.9%	201	58.1%	436	59.6%
	Total Responses	**386**	**100.0%**	**346**	**100.0%**	**732**	**100.0%**

APPENDIX C: Related Research and Literature

Speeding Research

The precise mechanisms by which speeding causes harm to motorists are well known to researchers. First, as vehicle speed increases, the probability of a crash occurring also increases (Evans L, 2004, pp. 206-236). Second, in the event of a crash, all other factors being equal, higher vehicle speeds will result in greater injury severity owing to a rise in "the kinetic energy transferred to the vehicle occupants" (Friedman LS, Hedeker D, and Richter ED, 2009). Rune Elvik, long-time traffic safety researcher and current Co-Editor of *Accident Analysis and Prevention*, has combined these two principles into a 'power model' that uses six equations to predict/estimate the effects of changes in speeds on both the number of crashes and the severity of injuries resulting from those crashes. His data "show that there is a strong statistical association between speed and road safety" (2004, p. 4).

Automated Speed Enforcement Research Summary

Automated speed enforcement (a.k.a. 'Speed Camera Enforcement') has been used and evaluated in numerous jurisdictions around the world. We have summarized findings from several automated speed enforcement program evaluation studies and systematic reviews.

Safety Effects

A recent 2010 Cochrane Review of 35 before and after studies on the impact of speed cameras concluded that speed cameras are effective at reducing the number of road traffic injuries and deaths. Compared to control sites, speed camera sites demonstrated an 11% to 44% reduction in fatal and serious injury crashes, 1% to 15% relative reduction in average speed, and 14% to 65% reduction in the proportion of vehicles speeding. The magnitude of this effect has not been determined due to variations in programs and lack of consistency in evaluation methods (Wilson 2010).

Similarly Pilkington and Kinra (2005) reviewed 14 speed camera studies and concluded that research consistently showed that speed cameras were effective in reducing traffic crashes and related casualties. At camera sites, reductions in crashes ranged between 5% and 69%; injuries fell 12% to 65%; and fatalities decreased by 17% to 71%. Montgomery County, Maryland, implemented the state's first automated speed enforcement on residential streets with speed limits of 35 mph or less and in school zones. The result was a 70% decrease in the proportion of vehicles traveling 10 mph or more above the posted speed (Retting, Farmer, and McCartt 2008).

Willis (2006) conducted a literature review of speed camera studies and concluded that speed cameras reduce crashes and injury severity. In addition to reviewing the findings of Wilson et al and Pilkington and Kinra, the review described a study by Gains, Heydecker, Shrewsbury, and Robertson (2004), which found site-specific reductions of 40% for fatalities and serious injuries, 33% for injury collisions, and 35% for pedestrian fatalities and serious injuries.

In a study of mobile speed cameras in South Wales, UK found a 73% reduction in injury crashes within 328 feet of the sites. The decrease in injury crashes lessened as the distance from the site increased. Injury crashes decreased by 24% within 328 to 984 feet of the mobile camera sites (Christie et al 2003). In France, speed enforcement cameras were first introduced in November of 2003, and total over 4,000 cameras today. Since 2002, the country has experienced a 40% decrease in motor vehicle fatalities and authorities assert over 12,000 lives saved since the cameras were implemented (Carnis, 2011).

Other Relevant Issues

Public Opinion

Public opinion and public acceptance has been identified as a key element to an automated enforcement program's success. Public opinion surveys, conducted over the past 20 years, indicate that the majority of respondents support automated enforcement.

A 1998 national survey by NHTSA found that over two-thirds of all drivers felt it was a good idea to use photo enforcement to reduce speeding, not obeying stop signs and running red lights. Those who thought photo enforcement was a good idea said it would decrease the occurrence of these unsafe actions and that it would provide solid proof of the violation. Conversely, those who thought it was a bad idea, cited privacy concerns (26%) and a preference for personal interaction (29%). When asked about using photo enforcement in specific locations, 68% felt the devices would curtail added congestion from the "pullover" scene, particularly in places where it is hazardous to stop. An even higher number of drivers supported the implementation of the photo enforcement devices in locations where crashes frequently occurred (77%) and in school zones (89%).

A 1992 Michigan survey of 1,209 drivers in communities where automated speed enforcement was being used showed the general public favors use of automated speed enforcement in select situations, particularly in school zones (59.4%), in areas where traffic enforcement is dangerous for police (52.2%), for heavy trucks (49.5%), and in construction zones (49.3%). The survey also showed opposition to automated speed enforcement use on freeways (41.5%), on bridges (34.5%), and on all roads (46.8%). In general, observed speeders and persons who reported having multiple citations in the previous two years were in greater opposition to the use of automated speed enforcement than the general population (Streff and Molnar 1995).

Implementation Considerations

Turner and Polk (1998) identified the following key elements important to the success of automated enforcement programs worldwide: public education and awareness, involvement of the local judiciary, and the passing of enabling legislation. The authors concluded "The ultimate success of automated enforcement will not rely on the technology so much as how the technology is applied and how transportation professionals interact with state and/or local legislators, local judiciary, and most importantly the public when implementing automated enforcement."

After reviewing speed camera programs in Great Britain and New Zealand, Delany et al (2005) suggested U.S. jurisdictions planning to implement speed camera programs should draw upon lessons learned from other countries. The authors stressed the importance of educating the public about the dangers of speeding and communicating that the purpose of the program is to improve safety, not generate revenue.

Methodological Issues

The majority of studies have found speed cameras effective at reducing speeds and fatal and serious injuries. However, the magnitude of these effects is unknown, primarily due to methodological issues and varying program standards. Several systematic reviews conducted on speed cameras have mentioned the need for more consistent study methods (Pilkington 2005, Wilson 2010). The 2010 Cochran Review suggested agreeing upon international standards for collecting and reporting speed and crash data and standard methods for controlling for bias in studies so studies can be compared across states and countries providing stronger evidence for the effects of speed cameras (Wilson 2010).

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