

Analysis of yellow signal times at red light camera approaches in the City of St. Petersburg

by Matt Florell 2013-04-02

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The St. Petersburg data in the analysis below comes directly from the raw red light camera citation data for citations issued within the City of St. Petersburg from October 29, 2011 to November 30, 2012. Information from the city's December 2012 red light camera program report is also included.

It was determined that right turn violations are not significantly impacted by yellow signal time because the average amount of red time for right turn on red violations was 13.9 seconds, which is more than three times the length of the average yellow signal in the city. For straight through and left turn red light violations the amount of yellow time has a much more significant impact because the average amount of red time for those two types of violations put together is 1.6 seconds. For the purposes of this report, only straight through and left turn red light violations will be analyzed.

According to the December 2012 red light camera report released by the St. Petersburg Traffic and Parking Department, more than half of the red light camera approaches in the city have their yellow signal time set to the bare minimum duration time as defined by the ITE(Institute of Transportation Engineers) formula using only the posted speed limit. Twelve of the 22 red light camera approaches have no extra yellow signal time above the minimum. For these approaches, the average non-right-turn violation happens after the light is red for only 1.2 seconds. If the yellow signal time at these minimum duration approaches had been just one second longer, there could have been an 87% reduction in red light violations. If the yellow signal time at these approaches had been just a half-second longer, there could have been a 63% reduction in red light violations at those 12 approaches.

It has been stated repeatedly by St. Petersburg city staff members that if yellow signal times were lengthened, drivers would adjust to the longer yellow signal times and that red light running rates would go back up to the same rate over the long term. The professional research on this subject, examples from other cities around the country and the data here in St. Petersburg all contradict this claim made by city staff. The details on each of these are shown in the sections below.

Professional Research on Yellow Signal Lengths

A 2001 report by the U.S. House of Representatives on traffic safety showed, “This report suggests there is something that can be done to address this hazard. It cites examples of problem intersections where yellow times have been raised by about 30 percent and the number of people entering on red fell dramatically. It cites, in addition, controlled scientific studies that confirm the hypothesis that longer yellows are better.”

<http://www.thenewspaper.com/rlc/docs/finalreport.pdf>

A 2003 study by the Texas Transportation Institute specifically on yellow signal timing concluded, "an increase of 0.5 to 1.5 s in yellow duration (such that it does not exceed 5.5 s) will decrease the frequency of red-light-running by at least 50 percent; drivers do adapt to the increase in yellow duration; however, this adaptation does not undo the benefit of an increase in yellow duration".

<http://www.motorists.org/red-light-cameras/TRB2004-1228.pdf>

A year later in 2004, another Texas Transportation Institute study found, "an increase in yellow interval duration decreases severe crashes. For example, an increase in yellow duration of 1.0 s is associated with an MF(Modification Factor) of about 0.6, which corresponds to a 40 percent reduction in crashes. This reduction is consistent with the effect of yellow interval duration on red-light violation frequency".

<http://tti.tamu.edu/documents/0-4196-2.pdf>

In 2012, a study by Virginia Tech on calculating yellow signal times was published. This study concluded that ITE minimum yellow signal times proved to be inadequate in their tests, “Traditionally, the recommended yellow time for the 72.4 km/h speed limit(45mph) is 4.3 s... using the proposed 1-second PRT(Perception-Reaction Time) and 3 m/s² deceleration level requires an 85th-percentile yellow time of approximately 4.53 s, which is longer than the 4.3-second recommended yellow time. The recommended yellow time corresponds to only a 12.6 percentile, which means that most of the drivers will encounter a yellow time that is shorter than what is needed; i.e., they will be trapped in a dilemma zone. In order for these drivers to be able to avoid being in a dilemma zone, they either need to react faster (have short PRTs) and/or brake harder (have higher deceleration levels)”.

<http://bit.ly/10r8zCG>

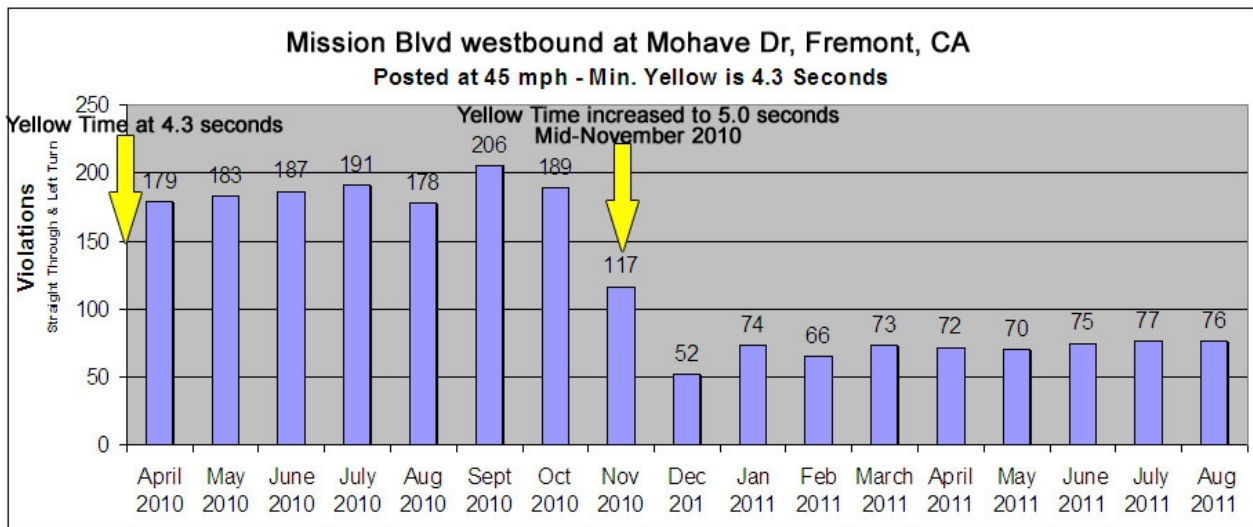
Later in 2012, the University of New Mexico released a study about increasing yellow signal times at 20 Albuquerque, New Mexico intersections which showed, “These findings generally support the literature which notes that at intersections where yellow light timings are increased and all-red clearance intervals are implemented red-light running crashes are reduced.”.

<http://www.thenewspaper.com/rlc/docs/2012/nm-longeryellow.pdf>

Other Cities Extra Yellow Signal Time

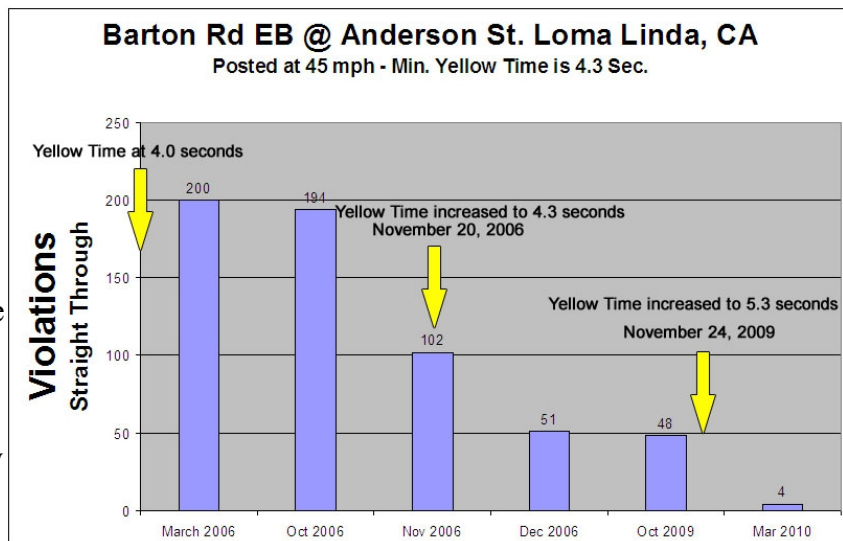
Below is a list of other cities around the country in the last few years that have seen red light violations go down dramatically after raising the yellow signal time by 0.5 seconds to 1.5 seconds,

CITY	VIOLATION REDUCTION
Milton, FL	60%
Arnold, MO	70%
Loma Linda, CA	92%
Fremont, CA	60%
Dalton, GA	68%
Duluth, GA	75%
Decatur, GA	66%
Gwinnett, GA	44%
Lilburn, GA	80%
Norcross, GA	80%
Rome, GA	78%
Suwanee, GA	81%



The above graphic shows the red light violations at an intersection in Fremont, California for a 17 month period covering the time when the yellow signal time was raised by 0.7 seconds and saw a sustained 60% drop in red light violations. There are many other graphics that look like this one that show a very similar effect of raising yellow signal times above the ITE minimum calculated length.

The graphic on the right shows the sustained reduction in red light violations over multiple years at an intersection in Loma Linda, California after the yellow signal time was raised two separate times, resulting in a 75% drop, and then a 98% drop when compared to the number of violations when the yellow signal was at its shortest length.



St. Petersburg Extra Yellow Signal Time Examples

In St. Petersburg, the red light violation data shows the clear difference between the minimum yellow signal approaches and the extra yellow time signal approaches. Adjusting for traffic volume on each approach, the 10 approaches with extra yellow signal time saw a 16% lower rate of straight and left-turn red light violations proportionally compared to the 12 approaches that had minimum yellow lengths. The amount of extra yellow time was from 0.2 to 1.0 seconds, with the average being less than half a second of extra yellow time for the 10 extra yellow signal time approaches.

The difference becomes more significant when comparing two similar intersections on the same street, 66th Street at Tyrone Blvd. and 66th Street at 38th Ave. N, but with the second intersection having a much higher proportional yellow signal time. Both intersections have two red light camera approaches. The Tyrone intersection is at ITE minimum yellow signal time for all approaches, and the 38th Ave. intersection a mile away has an average of 0.85 seconds of extra yellow signal time for its approaches. After adjusting for traffic volume, the 38th Ave. N. intersection has 73% fewer straight and left-turn red light violations than the Tyrone Blvd. Intersection. City staff has stated that the 38th Ave. N. intersection has had these longer yellow signal times “for several years”, yet the consistently low red light violation rate has not increased to the rates of the similar nearby intersections, it remains significantly lower.

Suggested changes to St. Petersburg Yellow Signal Times

1. Standardize left turn yellow signal times with the straight through yellow signal times at the same approach. More than half of the red light camera approaches in the city already have the same minimum yellow signal times for straight and left-turn signals, but there are several that have up to one second less yellow time on the left turn signal than the straight through signal. This is currently true even at some approaches which are already at the ITE minimum yellow signal time, putting the left turn yellow signal well below the ITE minimum for the posted speed limit.
2. Use 85th percentile speed, based upon the actual speed of vehicles approaching the intersection at non-congested times of the day, if it is higher than the posted speed limit. This will lead to a more fitting yellow signal length based upon how fast vehicles are traveling, not only by what the posted speed limit is.
3. Add up to one additional second to the yellow signal time at all red light camera approaches in the city. Ten approaches already have added yellow signal time, but the amount of extra yellow signal time should be adjusted to a net of one additional second above the ITE recommended minimum yellow time as calculated on the 85th percentile speed or the posted speed limit, whichever is higher. This will allow for more time to stop or pass through the intersection, reducing the dilemma zone for drivers coming up to the approach and making the intersection safer by greatly reducing red light violations.