Pennsylvania's Neighborhood Traffic Calming Resource
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THE EFFECTIVENESS OF TRAFFIC CALMING

This section discusses the effectiveness of traffic calming. It cites experiences from towns across the country and worldwide, presents quantitative results on a few of the most popular traffic calming measures, and discusses some of the overall issues that should be considered when implementing traffic calming.

Experiences From Communities With Traffic Calming

This section contains excerpts from traffic calming studies that highlight experiences and comments from towns that have employed traffic calming. It focuses on some of the more popular traffic calming measures such as speed humps, neighborhood roundabouts, neighborhood traffic circles, median islands, and curb extensions. This section introduces both positive and negative experiences so that towns considering employing traffic calming are aware of, and can plan for, different public responses.

Colorado - Speed Humps, Median Islands, Curb Extensions, and Traffic Circles

Studies of permanent and trial installations in some Colorado communities provide positive results on the use of various traffic calming devices and emphasize the need for community support and involvement throughout the whole traffic calming process. In particular, the City of Golden, Colorado found that speed humps used in series resulted in a 13 to 15 mph reduction in the 85th percentile speed and at least a 14 mph reduction in the maximum speed observed. In spite of these impressive speed reductions, the speed humps were removed and replaced with a combination of median

islands, curb extensions, and a traffic circle, all of which were landscaped. These new features were not quite as effective in reducing the 85th percentile speeds (9 to 12 mph reductions) but were actually more effective in reducing the highest speeds observed. The final result was a much more livable roadway and a pleased community. (Noyels and Fox 5) This example is testament to the importance and need of community support and involvement throughout the whole traffic calming process. (See Chapter 4 *Community Involvement*.)

San Leandro, California – Successful Speed Humps

San Leandro conducted tests on speed humps with good results. The speed hump tests showed an average 9 mph reduction in speeds, practically eliminating all speeds above 35 mph. It was also discovered that in their installation, speed humps did not divert traffic onto nearby parallel streets. (Noyels and Fox 5)

Boulder, Colorado - Traffic Circles

Testing on collector roadways with over 10,000 vehicles per day showed that after the installation of traffic circles, the average speed was reduced up to 8mph at the midpoint between two circles. In one instance, before the implementation of traffic calming the percentage of motorists exceeding the posted speed limit was over 90 percent; after traffic circles were installed, less than 40 percent exceeded the posted speed limit. (Noyels and Fox 5)

Florida & Maryland - Roundabouts

In 1997 a study conducted by Flannery et al. reviewed five single-lane roundabouts in Florida and Maryland. The roundabouts had average daily traffic (ADT) values from 7,600 to 17,800 vehicles. Crashes dropped by about 75% on each of four of the intersections, but rose slightly at the fifth; overall, injury crashes dropped from 20 in the two years prior to conversion to just one in the two years after. Typical traffic delays dropped sharply at four intersections and rose at the fifth.(Leaf 33)

The Netherlands - Roundabouts

In the Netherlands, Schoon and Van Minnen examined the changes in safety at 181 intersections converted from standard geometry to roundabouts. Motor vehicle traffic on the roundabouts varied from about 4,000 ADT to nearly 18,000 ADT, and bicycle traffic from about 200 per day to over 6,000 per day. The study yielded some powerful results. From 5 years prior to 2 years after the conversion, fatal crashes dropped 76 percent and fatalities dropped 72 percent (results are adjusted for national drops in fatal crashes and fatalities over the same time period); pedestrian crashes dropped 73 percent and pedestrian casualties dropped 89 percent.(Leaf 32)

Seattle, Washington - Traffic Circles

Seattle has made extensive use of traffic circles, constructing over 600 circles in the last 20 years. Experience there shows that even though some drivers express frustration in negotiating the circles, they usually appreciate the resulting safety benefits. (Cline 5)

Beverly Hills, California - Speed Humps

In the early nineties, Beverly Hills adopted a program to install speed humps on residential streets. A Watts type design was selected using a 3.5-inch profile. After a couple humps were installed, the communities began complaining about the noise associated with the 3.5-inch humps. As a result of the noise complaints, the City elected to experiment with a less severe hump. A profile less than 3 inches was selected for the remainder of the humps. The city elected to remove the original 3.5-inch profile humps because of the noise factor and utilized the less severe humps. (Cline 2)

Cota De Caza, California - Speed Humps and Speed Bumps

Another community in California was enthusiastic about traffic calming, but ran into some problems. A gated community in Orange County has embraced a speed *bump* program to slow drivers on the private residential streets. The exact *bump* profile is unknown. On October 7, 1998, the *Los Angeles Times,* Orange County edition, featured a front-page article entitled "Controversy Putting Brakes On The Use of Speed Bumps." The article addressed emergency vehicle response times. According to the *Times* report, the Orange County Fire Authority demand that the nearly 30 speed humps be removed from the "hilly" streets in Cota De Caza. The article cited that Berkeley, California, and Boulder, Colorado, placed moratoriums on speed hump construction because of their impact on vehicle response times. (Cline 2) This experience in Orange County shows that it is critical that emergency response times be considered when implementing traffic calming. The local emergency services need to be included in the traffic calming planning process from the start to avoid situations like this one. A study in Portland (See

Issues to be Considered below) yields insights on ways to integrate traffic calming and viable emergency vehicle response times through planning.

Boulder, Colorado - All-Way Stop Signs

All-way stop signs have been less effective than traffic calming at reducing travel speeds. Recent tests of vehicle speeds one-half block from all-way stop intersections indicated the average speed changes ranged from 1 mph decrease to a 4 mph increase after all-way stops were installed. (Noyels 5) It should be noted that all-way stop intersections are not usually considered a traffic calming solution. In fact, the *Manual of Uniform Traffic Control Devices* (MUTCD) states that, "STOP signs should not be used for speed control."(qtd. in McCourt 5)

Quantitative Results on the Effectiveness of Popular Traffic Calming Measures

This section contains excerpts from traffic calming before and after studies that include quantitative results on vehicle speeds and/or volumes. A large amount of data exists on speed humps and other common speed reduction techniques. The figure below includes speed reduction measures for which significant research is available on performance data. (McCourt 2)

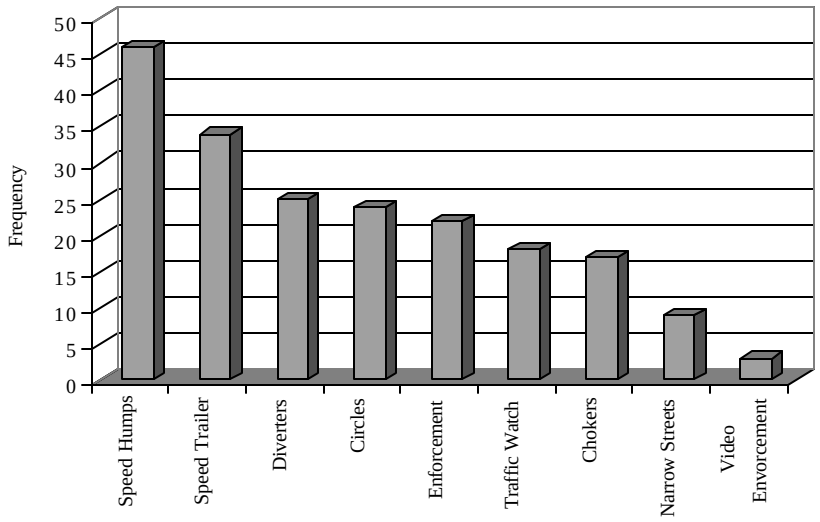


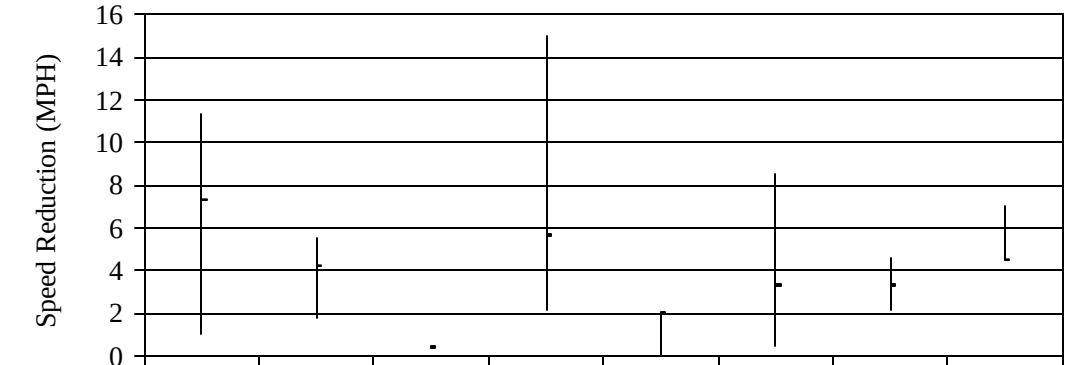
Figure 1 - Number of Agencies With Data on Various Neighborhood Traffic Calming Management Measures

Study One

One traffic calming before and after study investigated in this report, *Survey of Neighborhood Traffic Management Performance and Results*, was compiled from surveys completed by "…about 120 agencies representing 27 states in the USA, five provinces in Canada and one agency in New Zealand." (McCourt 1) Data was gathered on speed reduction, volume reduction, public satisfaction, and lawsuits associated neighborhood traffic management measures. The results are organized into the following groups:(McCourt1)

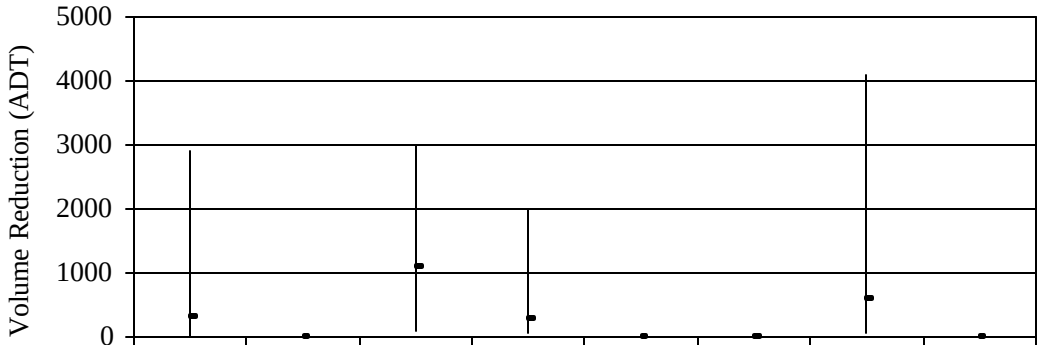
- Speed Humps;
- Traffic Circles;
- Chokers, Curb Extensions, and Road Closures;
- Narrow Streets;
- Neighborhood Traffic Watch Programs;
- Traffic Enforcement Programs; and
- Speed Trailer and Reader board Programs.

Charts 2 & 3 below show the range, average speed, and volume reduction resulting from neighborhood traffic management measures.



	Speed Humps	Speed Trailer	Diverters	Circles	Police Enforce	Traffic Watch	Chokers	Narrow Streets
Low	1	1.8		2.2	0	0.5	2.2	5
High	11.3	5.5		15	2	8.5	4.6	7
Average	7.3	4.2	0.4	5.7	2	3.3	3.3	4.5

Figure 2 - 85th Percentile Speed Reduction (MPH)



	Speed Humps	Speed Trailer	Diverters	Circles	Police Enforce	Traffic Watch	Chokers	Narrow Streets
High	2922	0	3000	2000	0	0	4100	0
Low	0	0	85	50	0	0	45	0
Average	328	0	1102	280	0	0	597	0

Figure 3 - Volume Change (ADT)

Figure 4 shows the public satisfaction with each of the neighborhood traffic management measures covered in the survey.

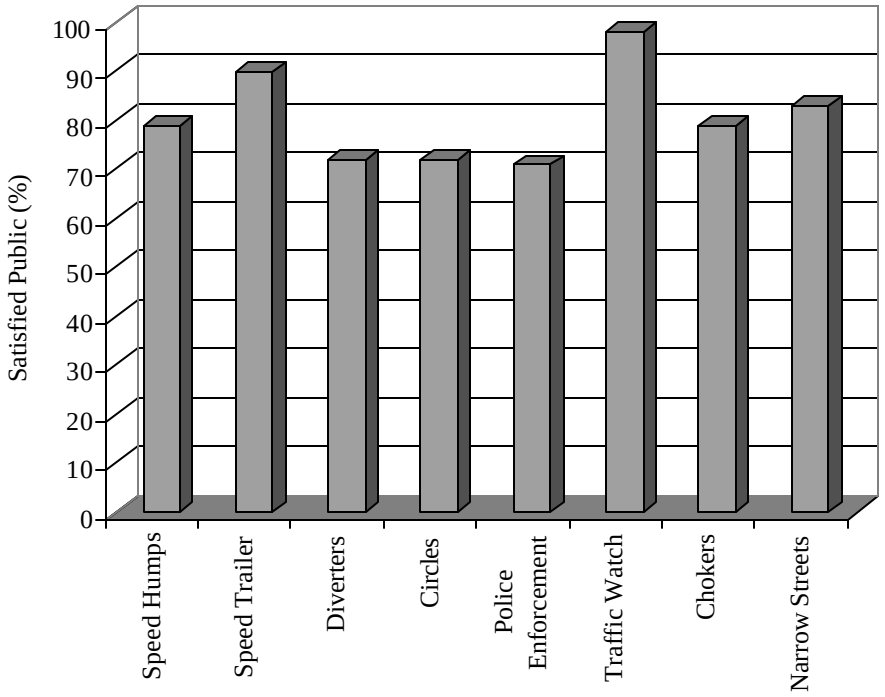


Figure 4 - Public Satisfaction

Based on the above information, the survey found that:

- "Speed humps appear to produce the greatest speed reduction and have high public satisfaction;
- Circles and narrow streets produce the next highest speed reduction;
- Management measures like speed trailers and traffic watch programs produce significant speed reductions." (McCourt 3)

The results stated above are composed of a compilation of measures from different areas of the US and world where no universal design standard exists.

Study Two

Another study entitled *Evaluation of Neighborhood Traffic Calming Techniques in Residential Areas* takes a close look at the effectiveness of speed humps. The charts below show the percent reduction of the 85th percentile speed at locations in Manatee County, Florida.

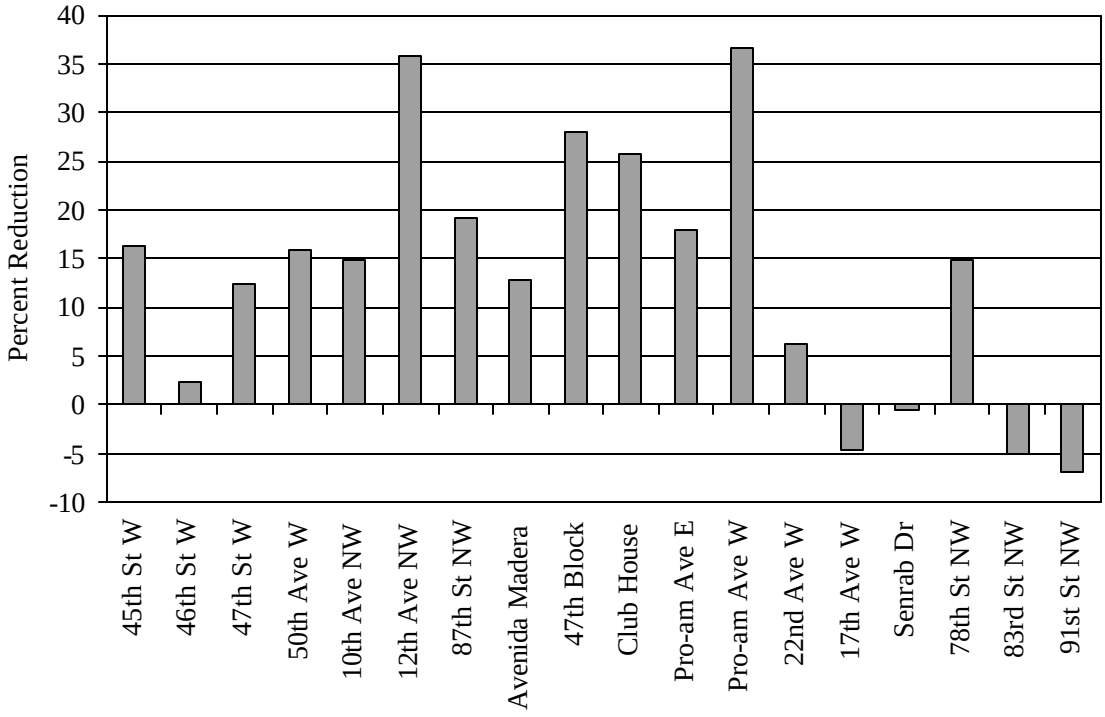


Figure 5 - Percent Reduction in the 85th Percential Speeds

Using the same data above, the chart below displays the mean 85th percentile speeds before and after the implementation of speed humps.

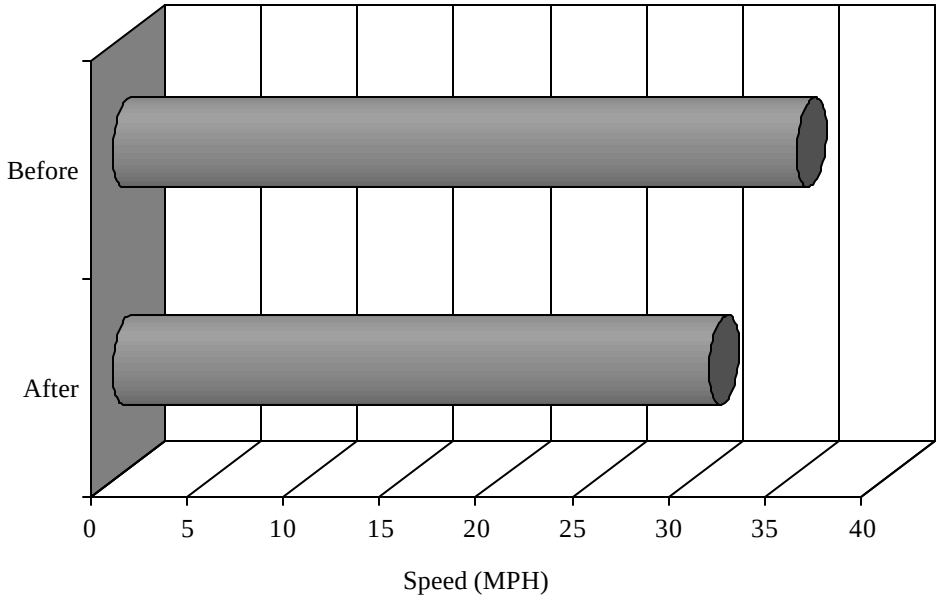


Figure 6 - Mean 85th Percentile Speeds

With the implementation of speed humps at the above 18 locations, the mean 85th percentile speed was reduced from 35.5mph to 30.96mph. This is a reduction of 4.54mph.

This study concludes and recommends the following:

1. The speed at midpoints between the humps and the overall reduction was due to the installation of speed humps.
2. Traffic volumes also were reduced in some locations; however, in other locations either it remained the same or increased slightly. The opportunity to divert to an alternate route is probably the key factor affecting traffic volume changes.

3. The spacing between humps remains a variable without much uniformity among various users.
4. The locations where the lanes were narrowed did not prove to be effective in reducing the speed of drivers.
5. Further study is necessary to develop a relationship between approach speed, desirable midpoint speed, hump cross-section and length.
6. Use of grade or alignment may not be necessary since approach speed observation will include the effect of such geometric characteristics.
7. The data for this study was collected during the off-season when the average daily traffic is low. It is recommended that the data be collected during the peak season when the ADT is considerably higher.
8. Speed humps as a traffic-calming device have proven to be effective at these locations.(Aburahman and Assar 5)

Study Three

A study entitled *Portland's Successful Experience with Traffic Circles* examines the effectiveness of traffic circles. The following chart displays typical speeds on a roadway without the installation of a traffic circle, and vehicle speeds around an installed traffic circle. As displayed in the figure 7, (Stein et al.)[i] vehicles reduce their speeds as they approach the traffic circle, experience the slowest speeds while navigating the circle, and then increase their speed once clear of the circle.

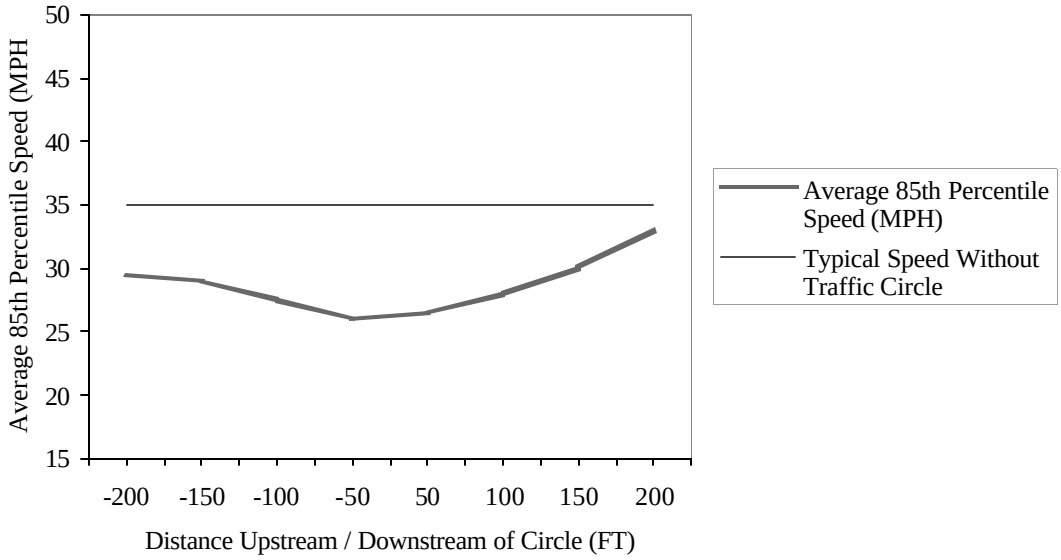


Figure 7 - Vehicle Speeds Around Traffic Circles

After navigating the traffic circle, the vehicles reach mid-block between intersections or circles; Figure 8 displays the typical change in mid-block vehicle speeds with and without the installation of a traffic circle. The circle graphs

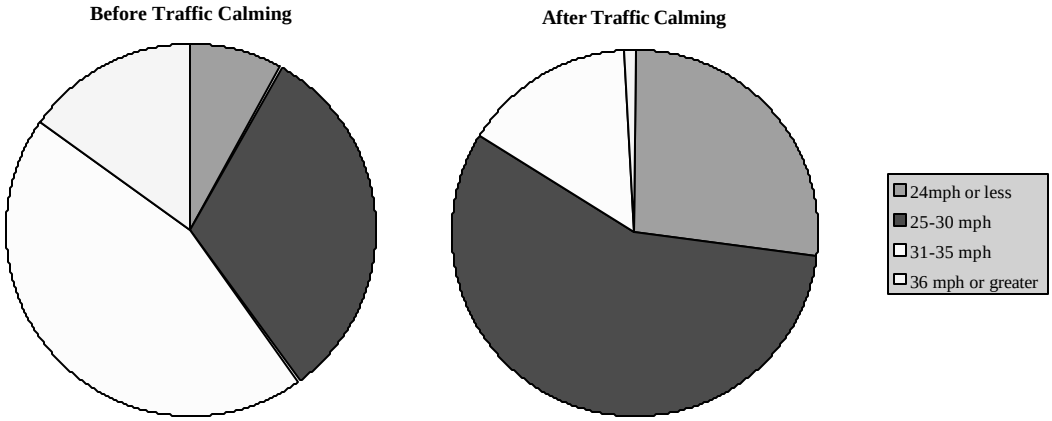


Figure 8 - Typical Change in Mid-Block Vehicle Speeds with Traffic Calming

represent the original mid-block speeds without a traffic circles; the outer circle-graph represents the mid-block speeds of vehicles on a street with installed traffic circles. Chart #8 above shows that the percent of vehicles traveling at very high speeds were significantly reduced. After the installation of the traffic circle, 60% of the vehicles were traveling at 28mph or less. (Stein et al. 41) Also, after the circle was installed, more uniform speeds were present along the roadway; "a reduction in the variability of vehicle speeds is generally considered by traffic engineers as beneficial for traffic operations and safety." (Stein et al. 41)

In addition to investigating the speeds of vehicles, Portland's traffic circle study investigated reported crash rates before and after the installation of traffic circles. The results of the study show that the installation of traffic circles have almost eliminated reported crashes. The average monthly rate of reported crashes was reduced by 58% after the installation of traffic circles. Prior to the installation of the circle, "multiple vehicle crashes, in particular angle collisions such as those that were occurring at the study intersections, often resulted in an injury and/or extensive damage to the vehicles."(Stein et al. 42) The study discovered a small rise in single vehicle fixed object crashes; some of these crashes occurred when a vehicle struck the traffic circle. This drawback can likely be eliminated or reduced by increasing the long-range and short-range visibility of the circle to drivers, both during the day and especially at night. The street corners (especially the far side curb) should be kept free of all objects including parked cars that could be dangerous if struck by a vehicle.

Issues to be Considered When Employing Traffic Calming Measures

Emergency vehicle response times and the legal issues associated with traffic calming are two important issues that should be considered when employing traffic calming. In a study entitled, *The Influence of Traffic Calming Devices Upon Fire Vehicle Travel Times*, the Portland Department of Transportation investigated the effects of three popular types of traffic calming measures on six types of emergency vehicles.

Table #1 - Emergency Vehicles Included in This Study			
Vehicle	**Overall Length**	**Wheel-base**	**Weight (lbs)**
Truck 41	37'6"	16'9"	42,100
Truck 4	57'0"	13'0"	53,960
Truck 1	48'0"	21'0"	53,000
Squad 1	27'0"	14'6"	23,170
Rescue 41	21'0"	11'6"	na
Engine 18	29'10"	15'5"	34,860

Figure 9 shows the range of time delays encountered during the study as the

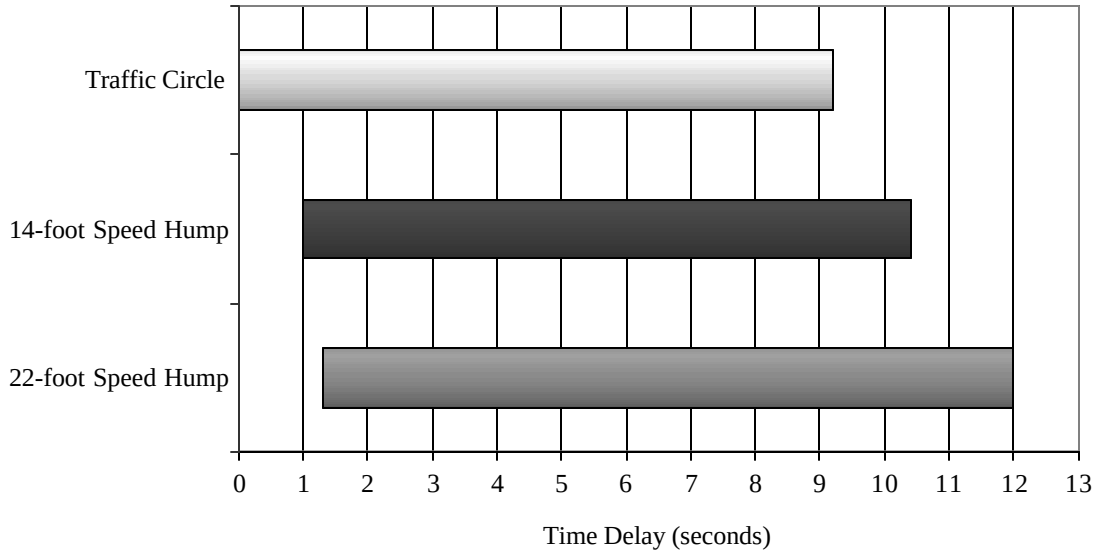


Figure 9 - Range of Time Delays Created by Various Traffic Calming Measures

vehicles navigated the various traffic calming measures. Chart #10 goes into greater detail displaying the typical average travel time delay of the six emergency vehicles as they traverse various traffic calming measures.

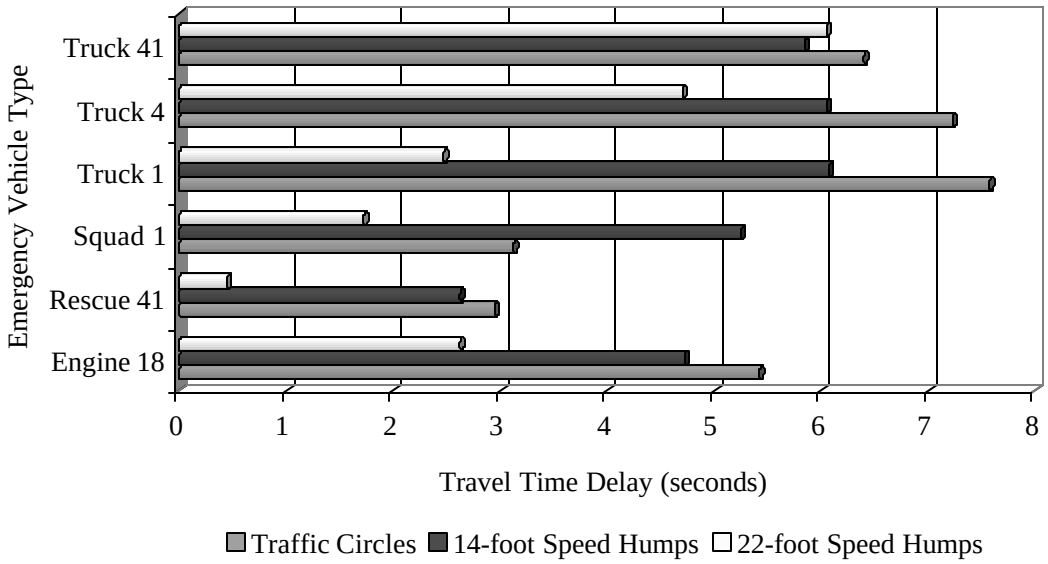


Figure 10 - Typical Average Travel Time Delay of Emergency Vehicles Navigating Various Traffic Calming Measures

The results from this study showed that overall, the 22-foot speed humps had the least impact on travel times. "For the longer heavier vehicles the traffic circles impacted travel times most. For the shorter more maneuverable vehicles the 14-foot bumps had the most impact." (Coleman 4) When considering implementing traffic calming measures the local emergency services should be contacted and involved in the planning process as early as possible. It is also important to remember that the delay caused by any one measure may not be too significant, but a series or system of devices has the potential to cause a more significant delay to an emergency response route. The results in this study can be used to

estimate the impacts of one or more traffic calming devices on fire response times. (Coleman 4)

The legal issues surrounding neighborhood traffic calming are not weighty. From a study mentioned earlier in this chapter, *Survey of Neighborhood Traffic Management Performance and Results,* "…out of over 1,000 speed humps represented by nearly 50 agencies in the survey, only two lawsuits have been raised regarding speed humps based upon survey findings,"(Ransford and McCourt 4) and only one of these suits resulted in a claim/settlement. The table below shows the results of the survey on neighborhood traffic management lawsuits.

Table #2 - Neighborhood Traffic Management Lawsuits

Measure	Number of Devices Reported	Agencies Reporting Lawsuits		Paid Claims
		Yes	No	
Speed Humps	807	2	41	1
Circles	30	0	29	0
Chokers/Medians	46	2	21	1
Narrow Streets	2	0	15	0
Diverters	19	2	24	0

As stated in many parts of this document, it is important to involve the community and as many affected parities as possible in the traffic calming process. It is likely possible to lessen the chance of a lawsuit from within the community if everyone is involved in the process from the start and has the opportunity to realize the outcome of the implemented traffic calming measures. (See Chapter 4 - *Effectively Implementing Traffic Calming*)

Bibliography and Endnotes

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[i] Data for Figure 7 and Figure 8 was extrapolated for demonstration purposes from Figure 2 and Figure 3 p. 44 in: Stein, Kittelson, Newton, and Hottmann. "Portland's Successful Experience with Traffic Circles." *ITE 1992 Compendium of Technical Papers*. 1992