

**The Objections to Speed Humps (Submission to the
London Assembly)**

**Published by the Bromley Borough Roads Action
Group (B.B.R.A.G.)**

October 2003

Author: Roger W. Lawson

PO Box 62, Chislehurst, Kent, BR7 5SB,

UK Telephone: 020-8295-0378

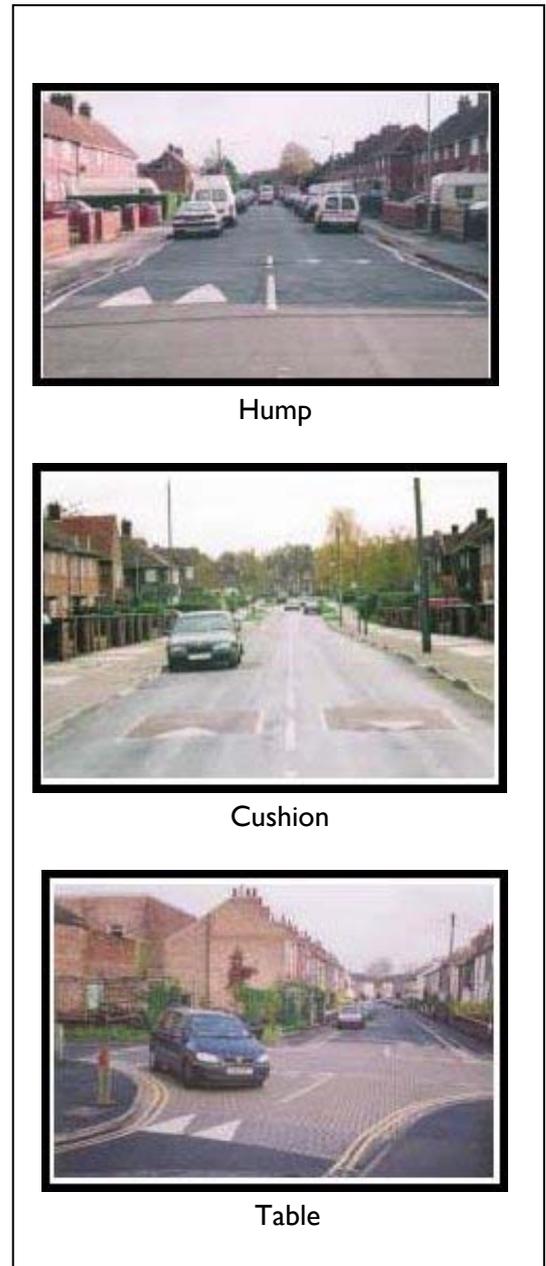
I. Introduction

Speed humps have been introduced in the last few years in an attempt to reduce traffic accidents. For example, in the London Borough of Bromley there are now over 400 speed humps, so there must be at least several thousand in London as a whole.

There has also been a demand from local residents to “calm” their streets by the use of speed humps. Although it is not always obvious what “calming” means, it usually implies reduced noise and reduced traffic speeds with the objective of making the road more “pedestrian friendly”. Often though this demand is motivated by the general increase in traffic levels in recent years, which speed humps do nothing to reduce. The author would argue that street “calming” is better tackled by general policies to reduce traffic levels and by such techniques as the development of “home zones”.

Note that simply slowing traffic will not bring back the quiet roads of yesteryear. But in one respect though, speed humps have truly reverted our society to a bygone age. This is the only example of where infringing the law in the UK now receives corporal punishment. If you exceed the speed limit in a road (or in many cases, even approach it), you are now chastised by pain and discomfort.

The following note attempts to put the arguments for and against speed humps onto a more rational basis, and includes references to much of the academic literature on this subject.



2. Objections to Speed Humps

What are the objections to speed humps? These can be summarised as follows:

2.1 They are uncomfortable, or indeed painful to many people. As Transport Research Laboratory (TRL) Report 417 makes clear, speed humps only work when they are uncomfortable. Unfortunately, many people who suffer from medical conditions such as back problems (one of the most common medical complaints), recent abdominal surgery or other disabilities find them extremely painful. For more information and reported experiences of medical problems go to the section below headed [Speed Humps and Medical Conditions](#).

2.2 Speed humps are a major problem for emergency vehicles such as ambulances and fire engines. Apart from the major discomfort to ambulance passengers, they also delay response times substantially. This can be as much as 10 seconds per device, and in a study done in the USA it was calculated that more deaths would arise from delayed arrival of ambulances than could ever be saved by any possible accident reduction. For more information on this, go to section below headed Ambulance_Delays.

2.3 They are a very blunt instrument. In fact, different vehicles respond very differently with heavy vehicles such as HGVs, buses and other public service vehicles being particularly prone to discomfort unless humps are traversed at very low speeds. It is simply impossible to design a speed hump that is negotiable comfortably at a reasonable speed by all vehicles and which is not painful to the occupants. For more details on this go to the section below entitled Speed Hump Comfort and Design.

2.4 Speed humps have been known to cause accidents and injuries. For example there was the case of the motorcyclist who hit a speed hump in Wood Lane, Isleworth in 2001 at much less than 30 mph. He was ejected from the bike and suffered serious injuries from which he is now paralyzed from the waist down. Unfortunately there appears to have been no research undertaken on this issue, but clearly if a motorcyclist or cyclist hits a hump at speed and without seeing it in advance then they are likely to be ejected or diverted into the incoming traffic stream. This problem is particularly acute when there is snow on the ground as it can completely conceal speed humps and cushions, and their associated road markings.

2.5 They frequently cause damage to vehicles, even at normal speed levels, but it is legally very difficult to make a claim against a local authority as a result. This problem particularly affects older, heavier vehicles or those with low ground clearance. Again no research has been undertaken on this subject, although from anecdotal evidence it seems that suspension components are having to be replaced more often at considerable expense, and damage to front spoilers and other bodywork components is common.

2.6 Speed humps cause atmospheric pollution from the speeding up and slowing down of traffic between the humps (see TRL report No. 482 on this subject). For example, TRL reports a 59% increase in CO, about 50% increase in HC and about 25% in CO₂ from petrol catalyst vehicles averaged over all types of traffic calming measures, with even higher numbers over more "severe" measures such as speed humps.

2.7 In addition the use of humps and cushions seems to encourage the use of larger vehicles which are more polluting. For example, wider track vehicles such as SUVs and larger saloons, can straddle cushions without difficulty so they do not have to slow down at all. One of the commonest types of vehicle that exceeds the speed limit in residential roads, the "white" delivery van, is often not slowed at all by these devices. In addition the longer the wheelbase and the larger the suspension travel (as in larger vehicles), the smoother the ride will be over speed humps. There is therefore a strong incentive to purchase larger and less environmentally friendly vehicles, and indeed this trend is apparent already in the car marketplace. Car design is also negatively influenced by speed humps as softer suspensions are introduced, ride heights increased and front spoilers reduced in size which all lead to worse road holding and less safe cars.

2.8 Speed bumps can actually create additional traffic noise, although this tends to depend on the type of vehicle. HGVs and other goods vehicles would typically generate substantially more noise than before, while cars will generate less noise, although the variability of the noise level as vehicles slow down before bumps and accelerate afterwards can mean that the noise is more noticeable than before. Noise from goods vehicles tends to result from vehicle body or load shaking, and HGVs and buses generate road "thumps" from tyre impacts -

hence the recently reported case of Ian Beesley who dug up a hump after being kept awake all night. See TRL reports 186, 313 and 416 for more information on this subject area. The apparent reduction in noise some schemes simply results from the effects of traffic diversion, thus increasing the noise levels for other people.

Note that in extreme cases heavy vehicles riding over speed humps can create subsidence of the road and buildings alongside due to the ground pressure waves that are created. This seems to occur mainly on particular types of soils. See TRL report 416 for more information.

2.9 Speed humps create additional road maintenance costs because the road surface before and after a hump tends to develop potholes or subsidence after a couple of years. This results in much heavier maintenance costs than normal. In addition to fully resurface the road it is often necessary to remove and replace the speed humps, which also adds to the cost. These costs are rarely taken into account, and indeed there is little information on this subject available.

2.10 Do speed humps actually reduce accidents? In reality there is very little evidence to support this. Where accident reductions have occurred it can mainly be attributed to diverting traffic (which can be as high as 50%). Most accidents are not caused by speed but by careless driving, or a multitude of other factors that are not affected by speed humps. In London where over the last few years there has been a lot of expenditure on speed humps and speed cameras, the number of people killed in accidents has barely dropped at all. Speed humps are a very poor accident prevention mechanism in terms of cost effectiveness, in comparison with other possible accident prevention approaches. For more information on this subject, go to Accident Reduction Data and Cost Effectiveness below.

2.11 One good objection to speed humps is that people simply do not like them. Although residents of the streets in which speed bumps or cushions are installed sometimes show a majority in favour of them, this is usually the result of biased consultation processes and there is often a sharp division of opinion. In some particular schemes, they have even had to be removed because of local opposition. The numbers in favour also tend to be lower after installation than before, which shows they are often “over-sold” on the benefits of the scheme. Residents in surrounding roads are generally opposed, and even more so if a wider area is considered (see TRL report 311 et al). For example, in Bromley when road users were surveyed about replacement of speed bumps which had temporarily been removed in Murray Avenue, 74% said they disliked travelling over road humps. Similarly when consulted about a number of schemes in Bromley recently (Elmstead Lane, Poverest Road, etc), there was a majority vote even by local residents against the speed hump scheme and more in favour of alternative road safety measures.

Even if speed bumps were an economic and effective way of reducing traffic accidents, that would not necessarily justify their implementation. There are many ways in which lives could be saved by government diktat, for example by outlawing smoking or the sale of unhealthy foods, but few people consider that it would be justified to overrule public opinion in those areas. If people are generally opposed to the use of speed bumps, then they should not be used.

Even if speed bumps were effective, many people might not accept them. Some people might prefer to take on the statistically rare risk of death or serious injury so as to avoid the frequent moderate discomfort they will experience from speed bumps. In much the same way as smokers currently accept the extra risks they run.

3. Common Questions and Answers on Speed Humps

3.1 Do road users have to be consulted on their installation? For a traffic calming scheme, road users, or bodies that are known to represent them (and for example B.B.R.A.G. would come into this category) legally have to be consulted. In addition, details would normally be published in a local paper. There will usually be small signs placed on the street and a consultation leaflet circulated to local residents. However, it is quite likely that most road users will not be aware of such notices and will not be consulted. In reality, the views of local residents will often take priority and road user's views are likely to be ignored. This is a very undemocratic approach and we believe that all people affected by such schemes (whether residents or road users) should be consulted and their views equally considered. What matters is surely the good of the community as a whole. Note however that for individual humps or speed tables, there are no legal obligations for consultation.

3.2 What are the regulations on hump size and spacing? Most humps are now 75 mm high, although legally they can be higher. There are also government guidelines on the shapes of humps and their spacing. Go to the following web page for full details on the legal background to speed humps and traffic calming, and the consultation requirements:
http://www.bromleytransport.org.uk/Legal_basis_of_traffic_calming.htm

3.3 Is reducing the number of humps by increased spacing a good idea? No. Increasing the spacing simply causes vehicles to speed up and slow down in between them, thus adding to atmospheric pollution and generally destroying the speed reduction effect.

3.4 What do they cost? About £2,000 upwards for a speed hump, and maybe £10,000 for speed tables which are more complex and larger. A typical traffic calming scheme can easily cost £100,000 in a fairly short stretch of road.

3.5 Why are speed tables or cushions used sometimes? Speed tables are used at junctions (a hump cannot normally be near a junction) or under zebra crossings or mini-roundabouts. Cushions (a euphemism for split humps) are used where buses or other PSVs are likely to use the route (speed humps are simply too uncomfortable) - such vehicles can in theory straddle a cushion, but in reality often the presence of parked cars alongside stops this. Also the use of three across cushions which is quite common on wider roads encourages people to drive down the centre of the road which is dangerous. Cushions are good in theory, but bad in practice.

Speed tables have also been used as a more comfortable alternative to humps, particularly on bus routes, as they are generally more acceptable to heavier vehicles if the ramp incline is sufficiently gentle, but they tend to be innocuous to vehicles with more sophisticated suspensions such as most modern cars. This is a symptom of the basic design problem with speed humps and tables, that it is impossible to design them such that they have similar effects on all vehicles.

3.6 Do speed humps reduce traffic speeds? Speed bumps do reduce traffic speed, and how much it is reduced relates to the aggressiveness of the humps. But contrary to government pronouncements, speed is not the primary or most significant cause of road traffic accidents. For real statistics on this subject, refer to TRL report 323 where speed is shown to be a major factor in only 7% of accidents. Most accidents are caused by driver inattention or misjudgement. It might actually be more cost effective to spend money on driver education and training.

In the case of pedestrian injuries, which are clearly a major target for traffic calming, most are caused not primarily by motor vehicles leaving the road or being driven recklessly, but

by pedestrians recklessly walking into the road or failing to look. This is of course a particular problem with children and the elderly.

Reducing traffic speeds may reduce reported injuries and the severity of injuries - it does not necessarily reduce accidents but they tend to become so minor that they are not reported and hence not included in the statistics - at least that is the argument put forward by many people although the true effect seems to be very minor as otherwise one would see a greater reduction in accidents than in fact occurs. In any case it may be more cost effective to try and directly reduce the accidents by other measures and certainly this is the only sure way to avoid some fatal cases where even relatively low speed collisions can result in death.

3.7 Are there alternatives to using speed humps to cut dangerous traffic speeds, e.g. near known hazards? Yes. At junctions (which are often the location of many accidents), mini-roundabouts or speed tables can be used. The former do tend to result in minor vehicle damage accidents however. The latter can be more comfortable than speed humps, but still very effective at cutting speeds (as in Blackbrook Lane, Bickley for example). Other alternatives are improved signage (e.g. hazard warning signs, speed limit repeaters, "slow" signs), "gateway" treatments of various kinds including width restrictions, rumble strips, and other devices. As to which is most appropriate depends on the nature of the road and the hazards present in it. In fact, it is usually cheaper and more effective to make minor changes to road markings, kerb lines, improve sight lines and signage to tackle particular road safety problems, although unfortunately putting in speed humps is often seen as a cheaper and simpler option (they require less thought) than really tackling the source of accidents in a proper manner.

3.8 Why do local residents sometimes vote for speed humps? Firstly because the local authority normally doesn't offer them any alternatives and writes the consultation leaflet in a way that biases the result. Residents are often told that their local area is a particularly dangerous zone, when it is not, or are told that the measures are justified on road safety grounds, when they are not. They are also not told about alternatives, and the implication is almost always that council staff know best what is good for the local inhabitants.

Secondly, a major reason for the call for traffic calming schemes is a selfish desire by residents to have traffic diverted elsewhere, which results in someone else suffering from the noise and pollution. Also residents are often more concerned about damage to parked cars in their street than they are about reducing road traffic injuries. In fact, almost everyone hates speed bumps elsewhere, but often like them down their own street. Such anti-social and hypocritical behaviour should be discouraged.

3.9 Are speed cameras an alternative to speed humps? In most cases no. Speed cameras are very expensive (up to £50,000 each), but are also only effective on a very short stretch of road - people quickly learn where they are, slow down before and speed up afterwards. Therefore they are best positioned at accident black spots. Obviously the "running" costs of a speed camera are also much higher.

3.10 Who pays for them? A silly question - you do of course, as a taxpayer. In London they are mainly now funded by programmes from Transport for London (a part of the GLA which is partly funded by local London councils) and/or from central government funds.

3.11 What is the experience in other countries? For information on the legal status and objections to speed humps in the USA, go to the Appendix.

4. Speed Humps and Medical Conditions

Speed humps have a major impact on people suffering from some medical conditions, such as back problems (some 2.5 million people in the UK report that they regularly suffer from back pain). Any complaints are often ignored or belittled. The following are extracts from letters received by B.B.R.A.G. from local residents in Bromley over the last few years:

"My mother lives next door here in Raggleswood. She has osteoporosis and finds it very painful when she is driven in a taxi along Watts Lane over the speed humps." A.S.

"I am a sufferer from Motor Neurone Disease, now needing the use of a wheelchair. The introduction of calming measures, and in particular the proposed road humps, would add unnecessary obstructions to my (and other wheelchair users) safe and comfortable progress around Chislehurst. I feel no approach has been made to obtain the views of car passengers travelling in wheelchairs when making these decisions. Speed humps add considerably to the discomfort of such passengers." M.J.B.

"The humps in the road (Watts Lane and Manor Park Road). Whilst my wife was negotiating these, having had an operation on her back, she had considerable leg spasms. These can cause personal physical damage....." J.C.S.

"As a kidney transplant recipient, and formerly on peritoneal dialysis, I can assure you that any major abdominal operation results in discomfort for some time afterwards when riding over a speed hump at any speed at all. Peritoneal dialysis also results in discomfort when travelling over speed humps." R.W.L.

"My elderly mother was returning from hospital in an ambulance after dislocating her jaw, and when the ambulance went slowly over a speed hump it dislocated again." G.P.Y.

"Personally, I have a brain cyst and going over humps hurts." B.B.

If you complain about such problems to road safety experts they simply say you should take another route, or slow down more. The former is often not possible, and is effectively discrimination against disabled people, and the latter does not work in most cases. In any case, if you are using public transport such as buses, ambulances or taxis, it is not always possible to tell them to slow down, or even if you do they may not take heed, or may simply not notice a hump in time.

Note that speed bumps create particular discomfort in bus passengers, ambulance users and similar vehicles, because of the nature of such vehicles. This tends to discourage bus operators from running buses on certain routes, and discourages certain people from using buses, which is contrary to other social and environmental policies.

Emily Wilcox, who lives in Berkeley, California, suffers from a spine deformity. She finds driving over speed humps painful at any speed above zero. She has campaigned against their use for many years, and managed to get a moratorium against more installations in Berkeley.

Another US example she has identified is that of Courtney Wickard who suffers from osteogenesis imperfecta, a genetic bone defect. Her arm and bones in her spine were broken when a school bus she was in hit a speed hump.

She points out that vertical deflection devices are typically designed to generate loadings of 0.69 g on road users, whereas US government publications recommend 0.3 g as a “high” maximum for wheelchair users, so there is clearly a contradiction.

Emily, and others, are petitioning the Secretary of the US Department of Transportation to stop this restriction on road access to disabled Americans. To quote “Unfortunately, no matter who we approach and no matter how we protest, the serious negative impact that vertical deflection devices are having on our ability to access our own homes and communities, let alone our right to travel freely, are largely being ignored.”

5. Speed Humps and Ambulance Delays

The Chairman of the London Ambulance Service, Sigurd Reinton, recently claimed that speed humps are killing hundreds of Londoners by delaying 999 crews. He said “For every life saved through traffic calming, more are lost because of ambulance delays.”

There are about 8,000 heart attack victims in London every year, and London has a particularly poor survival rate. One reason is no doubt because even a small delay increases the death rate enormously. For example 90% of victims survive if treated within 2 minutes, but it falls to 10% if treatment is delayed for 6 minutes. So for every additional minute of delay caused, up to an extra 800 victims of cardiac arrest could die. This compares with a total of 300 people who die from traffic accidents.

Mr Reinton complained that the increasing number of anti-car measures such as speed humps, road closures, road narrowing and throttle points caused significant delays in responding to emergencies. Ambulances had to go even slower if carrying a critically ill patient.

Note that Kevin Knight, who is responsible for local London Ambulance services in Bromley, also recently spoke against speed humps using the same arguments at a council meeting. He said they were now meeting the government target of reaching 75% of life threatening calls within 8 minutes, but it was getting more and more difficult to do so and even a few seconds delay could impact the chance of survival for heart attack victims. Traffic calming features caused significant delays - for example 50% of the ambulances from one station would have had to go through the proposed Leasons Hill “throttle” in Bromley where there would almost certainly be queuing traffic.

Research in the USA supports these claims. One report from Boulder, Colorado suggests that for every life saved by traffic calming, as many as 85 people may die because emergency vehicles are delayed. It found response times are typically extended by 14% by speed-reduction measures. Another study conducted by the fire department in Austin, Texas showed an increase in the travel time of ambulances when transporting victims of up to 100%.

Note that Kathleen Calongne who lives in Boulder, Colorado has produced a note that gives more detail references to the above mentioned research. A copy of her note is included as an Appendix to this report (the original sources can also be supplied upon request).

6. Speed Hump Comfort and Design

The Transport Research Laboratory (TRL) have published a report entitled "Traffic calming: Passenger and rider discomfort at sinusoidal, round-top and flat-top humps" (TRL Report 417). The TRL organisation is an independent research body who produce reports on traffic matters, usually as a result of commissions from the DfT. They are widely seen as being fair and non-judgemental. Report 417 describes the results of studies on various kinds of speed hump and their impact on road users of different types. It also compares the effect of different "hump profiles" on perceived discomfort.

Here are a few points of interest:

- There are some differences between the comfort of different hump profiles, ie. road users can go faster with the same "comfort level" over some humps, but as that would defeat the object of introducing the humps there seems little point in it.
- Hump profile affects different types of users (e.g cars, buses, HGVs, cyclists, motorcyclists) in different ways so there is no one ideal shape.
- The discomfort experienced by bus passengers substantially increased as speeds across the hump profiles increased from 15 to 20 mph. Driving at speeds over 15 mph is likely to cause unnecessary discomfort. In fact, from the statistics given for a "Midibus", even 10 mph can be uncomfortable over some humps.
- HGVs were also uncomfortable at any but very slow speeds.
- The degree of discomfort and subsequent speed reduction can be altered by using different hump heights and ramp gradients, but the report makes it very clear that the only way speed humps work is by actually causing discomfort. It is simply not possible to design a speed hump that is comfortable for all road users, and yet has a significant impact on traffic speeds. In fact, if there is to be any speed reduction, then a major proportion of road users are going to suffer some discomfort, if not pain.

Two glaring omissions from this report are that:

- a - Only three cars were tested (a Ford Fiesta, Escort and Mondeo). It ignores the problems of people with older vehicles, those with firmer or less effective suspensions, etc.
- b - It ignores the discomfort experienced by people with medical conditions (such as bad backs which is a very common problem, recent abdominal surgery, etc).

7. Accident Reduction Data and Cost Effectiveness

Government policy has been to encourage the introduction of speed humps as an accident prevention measure following studies in the 1970s and subsequently (see Transport Research Laboratory (TRL) reports 878, 1017, 186, 312, etc.). These studies showed that traffic speeds were reduced significantly by using speed humps, the amount depending on the type of hump, their height, shape and other factors. As an example in Bromley, even the use of relatively “non-aggressive” tables in Blackbrook Lane, Bickley substantially reduced average traffic speeds. For this reason they are often perceived by local residents as an effective “traffic calming” measure.

However the statistics on accident reduction are less clear cut. Although from the reports published there does appear to be significant accident reduction this is typically a relatively minor percentage (sometimes as low as 10%). In addition the figures are biased in four ways.

First they tend not to take account of traffic diversion. Although such diversion depends to a large extent on the practicality of alternative routes, it can be very substantial and probably averages about 25% (see TRL report 186 for examples). Figures reported by ROSPA (whose “Traffic Engineering Manual” is used by many local authorities) show “before” and “after” accident figures for many of the schemes they have been involved with, but do not incorporate any adjustment for traffic diversion, which is a gross distortion. The end result is that expectations of accident savings for hump schemes based on the ROSPA methodology can be grossly inflated. In Bromley for example, in one of the few examples where there was no practical alternative diversion route, accidents actually rose in years after humps were installed (Crofton Lane).

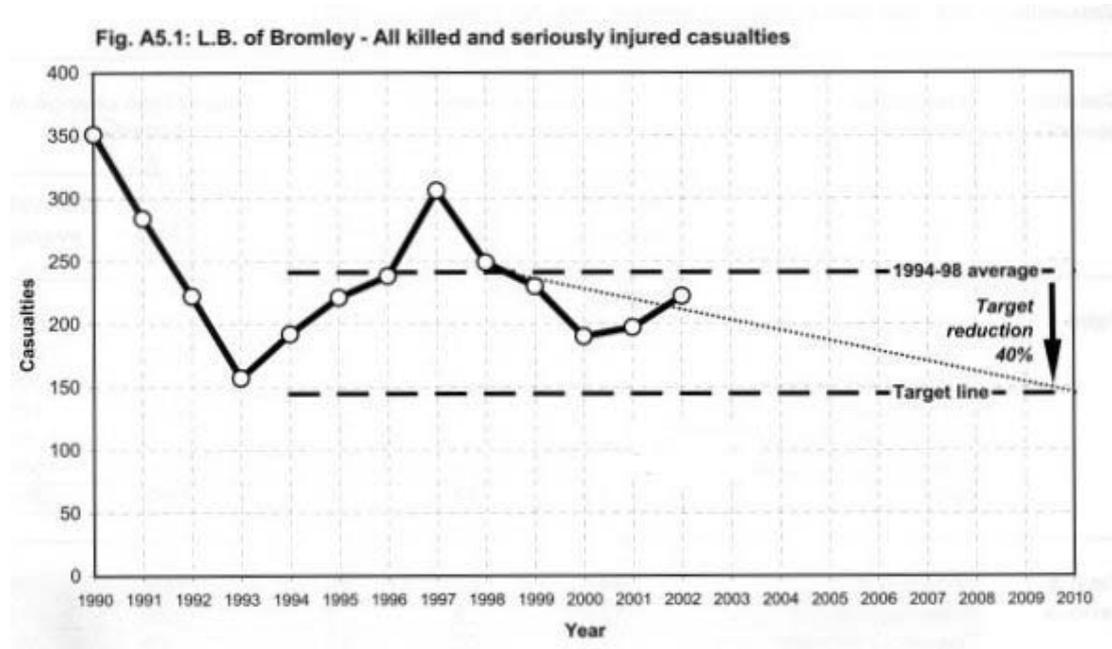
Second they tend to ignore the short term effect of disruptions to the environment, with “after” figures often only covering a one year period. It is a well known fact that any perceived change to the road design or associated environment will cause drivers to take more care until they become familiar with the new layout. Therefore you would expect to see a short term reduction in accidents which would gradually wear off. In addition there is the psychological impact known as the “Hawthorne Effect” where human behavior is influenced simply by telling people that a change will have a positive effect. This effect is well known in industrial psychology and can be quite long lasting.

Third there is the problem of bias in the data collection - not all accidents are recorded necessarily and human interpretation of even such matters as accident location can distort the results. In the case of the data reported by TRL and other bodies, the results are obtained from interpretation of the police STATS19 data by the local authorities and typically by the same staff who were involved in design and justification of the scheme. The STATS19 data is also known to be very unreliable with probably as many as 30% of accidents not reported (see recent TfL Safety report on this subject), and trends in reporting levels, particularly of minor accidents, could be distorting the data significantly.

Fourth, the impact of speed humps are usually impossible to separate out from other road design changes made at the same time. Even simple things like putting up warning signs can significantly reduce traffic speeds, and often major changes to kerb design, street furniture, road markings, pedestrian crossings and even road closures are done at the same time.

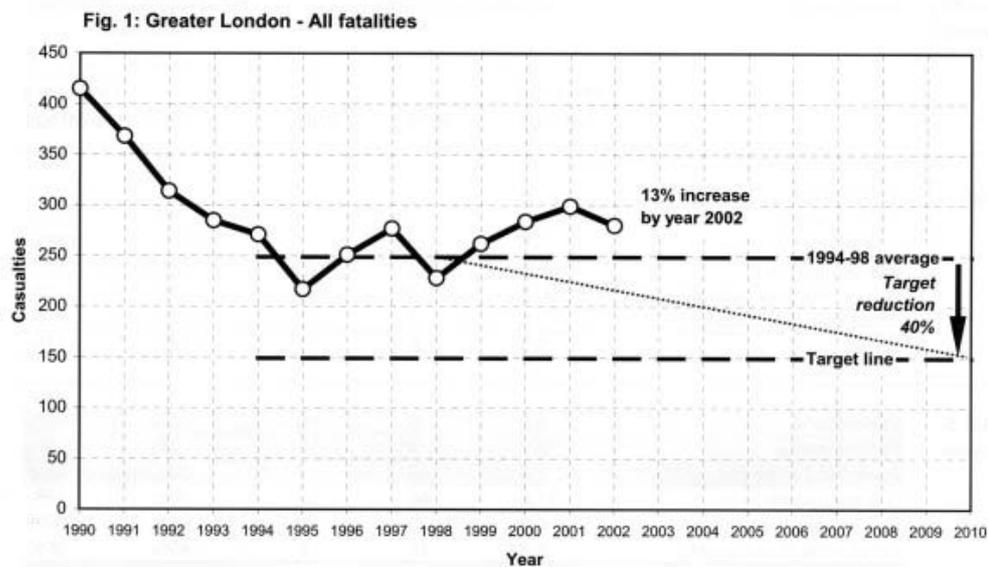
These four effects mean that the accident reduction figures that are shown in some TRL reports and are typically reported by local authorities are likely to be totally misleading. There has never a proper, scientifically controlled study of the impact of speed humps.

If you take the example of the London Borough of Bromley, there have been over 400 humps of various kinds installed over the last few years at a total cost of over £1 million (look at web site page http://www.bromleytransport.org.uk/Hump_List.htm for a complete list and cost breakdown). The major argument put forward by the advocates of speed humps is that they will save lives, or reduce serious injuries, but the following is the trend for KSI (Killed and Seriously Injured) in Bromley (taken from the recent London Accident Analysis Unit report):



In the above graph, the line drawn in is the target reduction, but you can see that after an initial fall in the early 1990s, the recent numbers show no positive trend at all when hump installations have been escalating. It would clearly be wrong to presume that there has been any clear impact on road accident statistics by the £1 million investment in speed humps.

Or to take the more specific case of fatalities in London as a whole, the following graph shows the trend in the last few years:



Again there is demonstrably no correlation between the enormous expenditure on traffic calming schemes and the number of fatal accidents. You should bear in mind that according to local authorities (as reported by PACTS Chairman Robert Gifford recently in the Times newspaper) an expenditure of £100,000 on traffic calming can save one life. But there has been probably over £20 million spent in the last few years on speed hump schemes in London so there should have been 200 lives saved. Clearly that cannot be so from the above data. It appears that the enormous expenditure on such schemes has apparently been wasted.

Let's look at some of the figures in Bromley where the specifics are known. Firstly take the Blackbrook Lane scheme for example. Although there was a significant reduction in traffic speeds, there was no reduction in accident numbers although the period of post implementation review was relatively short. There are some three year "before" and "after" figures for a number of schemes, and these seem to show substantial reductions in accidents, but the numbers are so low that there is doubt that they are statistically significant and most of them are roads where significant traffic diversion has probably taken place. If you look at Crofton Lane, Orpington which is a road used as a local distributor route by through traffic and for which there are few practical diversion routes, in fact accidents actually increased. In addition of course, these traffic calming schemes also included other measures apart from speed humps so it would be unfair to attribute any success in particular roads solely to speed humps.

Speed humps are of course relatively expensive to construct, at a cost ranging from about £2,000 for a small basic hump to £10,000 for a large speed table. One of the key questions is whether this is the most cost effective accident reduction method, as clearly if the same amount of money could be spent to gain more accident reduction then it would be better to consider the alternatives. Or if you have a limited amount of money to spend, as is always the case, then should you spend it on a few expensive speed humps in one local area, or some cheaper and more cost effective techniques over a wider area - clearly the latter.

Now again there is data available in Bromley which gives figures on some other schemes where simple things were introduced like pedestrian refuges (Crofton Road), "signs and lines" (Chelsfield Lane) and speed limits (Jackass Lane). These measures seem to have been just as good at reducing accidents, and certainly more cost effective.

Note that such alternative measures can be particularly effective at reducing accidents to pedestrians, which is a major priority and where speed humps are claimed to be most useful.

With thought and careful design, there are many alternatives to speed humps that will both reduce traffic speeds and improve road safety. Simple warning signs at danger spots can be an effective, low cost measure. Changing kerb alignments, junction layouts, improving lighting and other measures can significantly reduce accidents more cheaply than using speed humps.

Incidentally, such approaches do of course require study of the accident incidents, drawing on local knowledge and applying more thought to the design of traffic calming schemes. Unfortunately with the amount typically spent on drawing up proposals for traffic calming schemes, the consultants employed usually have little incentive to give them much thought with the result that they tend to propose the simple solution of speed humps.

In conclusion, there are many other ways of reducing accidents that are more cost effective and have fewer negative impacts than using speed humps.

Appendix A - Speed Humps in the USA

PROBLEMS ASSOCIATED WITH TRAFFIC CALMING DEVICES

By Kathleen Calongne
Boulder, CO
January, 2003

Traffic calming devices, such as speed humps and traffic circles are spreading to communities across the United States, without regard to their risks. The U.S. Department of Transportation (USDOT) has avoided the examination of the problems associated with intentionally imposing vertical and horizontal deflection on vehicles and vehicle passengers, in order to encourage the proliferation of devices on city streets.

Deflection devices built to slow passenger vehicles, create even greater delays to emergency response vehicles. The longer wheel-base, stiff suspension, high vehicle weight, as well as the sensitive equipment and injured victims transported by these vehicles, require drivers to slow almost to a stop to negotiate the devices safely.

An unethical attempt has been made to silence the objections of rescue personnel to delays to emergency response by deflection devices. Fire chiefs, as city appointees, fear professional retribution and often will not voice concern until the level of risk becomes intolerable. Emergency calls are *not* the rare events some members of transportation and city staff would like to believe. The City of Houston, Texas for example, responds to an average of 150,000 emergency medical calls and 100,000 fire calls per year. There is an average of 250,000 deaths from sudden cardiac arrest (SCA) alone each year in the United States. American Heart Association (AHA) statistics indicate that 90% of these incidents occur outside of the hospital environment. By comparison, there are approximately 5,000 pedestrian deaths per year in the United States. Few of these occur on local neighborhood streets. A ten-year study of pedestrian deaths by the U.S. Department of Health and Human Services, 1982 - 1992 found 35% of pedestrian victims were intoxicated. National Highway Traffic Safety Administration (NHTSA) statistics, Safety Facts 2000, found similar results with intoxication on the part of 31% of pedestrian victims. AHA statistics for SCA, show survivability is directly related to the response times of cities. For example, an AHA study in 1996 showed that Seattle with a response time of less than 7 minutes saved 30% of its SCA victims. New York, with an average response time of 12 minutes saved only 2%.

While delay from individual devices is sometimes measured, the cumulative effect of *series of devices* is often ignored. Series of devices turn seconds of delay into minutes, as vehicles fail to regain cruising speed between the devices. Calming devices impose permanent, 24-hour delays to emergency response, unlike traffic congestion which occurs periodically. A study conducted by the fire department of Austin, Texas, 1997, showed an increase in the travel time of ambulances of up to 100% transporting victims.

Members of city councils and transportation divisions often portray delay to emergency response by calming devices as simply a tradeoff for increased safety from speeding cars. They avoid making the analysis which shows which risk is greater. Ronald Bowman, a scientist in Boulder, Colorado developed an analysis to compare these risks. The results show that even minor delay to emergency response by calming devices imposes far greater risk on the community than vehicles, speeding or not. The result of Bowman's analysis, showed a risk factor of 85 – 1 from an additional one minute of delay (predicted to result from the installation of all the devices proposed for the City of Boulder at the time) before one life might be saved by the devices -- if it can be shown that the devices do save lives. Bowman's analysis, based on the curve of survivability for victims of cardiac arrest and severe trauma

(AHA) has been verified by a professional mathematician and can be viewed online at: <http://members.aol.com/raybowman/risk97/eval1.html>

The Bowman analysis was applied to the City of Austin, Texas by Assistant Fire Chief, Les Bunte, with similar results. The report can be viewed online at: http://home.cfl.rr.com/gidusko/texts/tfc_calm.pdf

The results of these analyses show that deflection devices are **a tradeoff of the perception of increased safety from speeding vehicles for the real risk to citizen survivability from delay to emergency response.** While the Institute of Transportation Engineers' (ITE) Guidelines for the Design and Application of Speed Humps, 1997, states humps should never be placed on emergency response routes, humps and physical devices of all kinds have been installed on critical emergency response routes in cities where these projects exist. The proliferation of devices has resulted in temporary or permanent moratoriums on devices in cities such as Berkeley California, Boulder Colorado, Portland Maine and Portland Oregon.

People with disabilities complain of lasting pain and injury caused by traveling over deflection devices in vehicles. Significant testimony about the physical and psychological barrier deflection devices make to access to public rights-of-way has been given to the U.S. Access Board in Washington DC. A web site addressing the problems of the disabled with deflection devices such as speed humps, speed tables and raised crosswalks can be found at: <http://www.digitalthreads.com/rada> .

Calming devices have been used to divide communities along racial and socioeconomic lines. The U.S. Department of Housing and Development (HUD) identified gates implemented as part of a traffic calming project in Houston, Texas as discriminatory, ordering them removed. Gates were replaced with speed humps to create a similar, though less obvious, barrier between neighborhoods.

While calming devices are built on the premise they will reduce accidents, a comprehensive study commissioned by the ITE and the Federal Highway Administration (FHWA) on traffic calming projects in the United States concludes:

“Traffic calming in the U.S. is largely restricted to low volume residential streets. Collisions occur infrequently on such streets to begin with, and any systematic change in collision rates tends to get lost in the random variation from year to year. This limits our confidence in drawing inferences about safety impacts of traffic calming.

(Traffic Calming: State of the Practice, Reid Ewing, 1999, P. 123)

The USDOT defines traffic calming devices as *geometric design features of the roadway*, rather than *traffic control devices*. The USDOT recommends standards for the design and warrants for the use of devices that are approved traffic control devices in the Manual on Uniform Traffic Control Devices (MUTCD). The definition of traffic calming devices as geometric design features of the road has allowed devices to proliferate on city streets as a decision of local governments.

An increase in accidents has occurred after some installations. Experimental speed humps placed on a street at a school in Portland, Maine registered an increase in accidents of 35%. Accidents increased *100%* after the installation of an experimental traffic circle in Boulder, Colorado. However, the circle in Boulder and the humps in Portland *remain on the street today.*

People across the United States are opposing the installation of deflection devices on city streets that damage vehicles, injure vehicle passengers, increase pollution and gas

consumption and delay emergency response. I have researched traffic calming projects since 1996, and have compiled my research into a 400-page report on the “Problems Associated with Traffic Calming Devices.” I offer the report to all interested individuals at my cost. The following is a summary of some of the issues addressed in my report.

SUMMARY OF PROBLEMS ASSOCIATED WITH TRAFFIC CALMING DEVICES IN THE UNITED STATES

By Kathleen Calongne

Boulder, CO

January 2003

EMERGENCY RESPONSE CONCERNS -- Delay to emergency response vehicles by traffic calming devices has resulted in moratoriums as well as removal of devices in cities around the country. Fire Departments warn of the increased risk caused by the proliferation of devices once a calming project has begun. A video taped discussion by the Fire Department of Portland, OR states the department was denied participation in the implementation of Portland's calming project, and in fact was prevented by its Transportation Division from voicing concerns publicly. An analysis by Ronald Bowman of Boulder, CO shows that communities are at far greater risk from delayed emergency response by calming devices than from vehicles. The analysis, verified by a professional mathematician, can be viewed online at: <http://members.aol.com/raybowman/risk97/eval1.html>

The Bowman analysis was applied to the City of Austin, TX by Assistant Fire Chief, Les Bunte with similar results. The Bunte report can be viewed online at:

http://home.cfl.rr.com/gidusko/texts/tfc_calm.pdf

Delay caused by humps on a street in Gaithersberg, MD may have contributed to the death of a child in a burning home. A firefighter descended into the basement of the home to rescue a child when "flashover" occurred, forcing his exit from the building. A resident of Houston, TX is brain dead after paramedics, unable to open a gate installed as part of calming project, were forced to take a longer route to the victim's home. Gates on some Houston streets have been ordered open because of concerns for emergency response. So many humps were installed in one direction on a street leading from a Houston fire station that fire trucks only turn the opposite direction out of the station, regardless of the location of the call.

There are documented injuries of firefighters who have hit the roofs of their cabs, encountering speed humps unexpectedly. Some injuries have placed firefighters on temporary or permanent disability.

CIVIL RIGHTS VIOLATIONS -- Residents in Houston filed a complaint with HUD that gates installed as part of a calming project were used to segregate communities along racial and socioeconomic lines. HUD found the City of Houston in violation of the civil rights of its residents, ordering the gates removed. The gates were replaced with humps to effectively, though less overtly, discourage access to the neighborhoods.

VIOLATION OF THE FEDERAL CLEAN AIR ACT -- Funds allocated for a traffic calming experiment by the Congestion Mitigation and Air Quality (CMAQ) Program to the City of Portland, ME were rescinded when it was shown that the project of humps increased emissions by 48% *without taking into consideration increased emissions from braking and acceleration required to negotiate the devices*. The State of Maine has been ordered under the federal Clean Air Act to show evidence of compliance in reducing pollutants. Section 113, "Federal Enforcement," states fines including imprisonment will be levied against entities responsible for knowingly increasing the release of pollutants into the air in cities on federal notice to improve air quality. The experiment has not been removed.

An Austrian study, in 1994, using a mobile exhaust fume measuring-device registered an increase in vehicle emissions of ten times on streets with speed humps.

The Transport Research Laboratory (TRL), a research agency of the Department of Transportation in the United Kingdom, conducted emissions tests in 1997 on streets with road humps and found the following results as reported in TRL Report 307:

“Schemes with a 75 metre hump spacing . . . showed increases in CO and HC of around 70 – 80% and 70 – 100% respectively, and an increase in CO₂ of around 50-60%. No_x emissions were predicted to be about 0-20% lower after calming.”

To calculate the possible effect of smoother driving after the installation of humps (without braking and acceleration) the TRL measured the change in emissions associated with moving from a constant speed of 30 mph to a constant speed of 20 mph and found the following results:

CO and HC increased by 40 – 80%, CO₂ by 30 – 40% and NO_x by 20 – 30 %.

A more recent study by the TRL, Report 482 in 2001, registered increases in all emission pollutants after traffic calming:

For petrol catalyst vehicles: CO 59%, HC 54%, NO₂, 8%, CO₂ 26%

The study states that speed humps created the largest increase in pollutants of all calming devices tested.

VIOLATION OF THE ADA -- A moratorium on speed humps is presently in effect in Berkeley, CA because of emergency response concerns and because of complaints from the disabled community. Persons with some disabilities state the lasting pain and injury caused by deflection devices makes them virtual barriers to accessibility. The Department of Justice regulations for Title II of the Americans with Disabilities Act (ADA) define “facility” to include “roads”. Title II states an alteration to a facility must make the facility accessible and usable to the *maximum extent feasible*.

The report, [Building a True Community](#), 2001 by the Public Rights-of-Way Access Advisory Committee of the U.S. Access Board in Washington D.C, acknowledges significant testimony from people with a variety of disabilities that vertical and horizontal deflection devices are not only painful, but worsen existing conditions while traveling by vehicle. The U.S. Access Board publication, [Accessible Rights of Way: sidewalks, street crossings, other pedestrian facilities](#), 1999, states that drivers with disabilities report the jarring from crossing speed humps even at low speeds can be painful and dangerous, resulting in the devices being “a barrier to roadway use.” Both publications suggest, in the absence of research, that entities consider other traffic calming measures. A lawsuit was filed against the City of Bethesda, MD by a disabled resident for placing speed humps on streets providing access to his home. Speed humps were removed from streets in San Diego County, CA because of problems experienced by disabled residents. A website addressing the concerns of the disabled with deflection devices can be found at: <http://www.digitalthreads.com/rada> .

LIABILITY AND LAWSUITS -- In August 1998, Florida Judge Robert Bennet ruled in favor of two residents of the City of Sarasota who filed suit against the city for placing devices on city streets that are not approved traffic control devices in the federal Manual on Uniform Traffic Control Devices (MUTCD). States have adopted the MUTCD as a guide for the recommended placement and design of devices that are approved traffic control devices. Compliance with warrants for the devices provides protection from liability. The decision was overturned on appeal, on the basis that the plaintiffs did not have standing to sue, not on the merits of the ruling.

The legal departments of some cities have reasoned the absence of standards and warrants for the design and use of traffic calming devices from the MUTCD indicates lack of authorization for cities to build the devices on streets.

Calming devices are typically marked with the yellow diamond shaped sign, recommended in the MUTCD to warn drivers of street hazards. Cities are required to keep streets free of hazards. Drivers can injure themselves and their vehicles driving over the devices at posted speed limits. Devices are typically designed to lower speeds *below* posted speed limits. The legal department of Sunnyvale CA expressed concern cities could be liable not only for injury caused by a device, but for injury and property damage resulting from actions taken by drivers because of a device, such as swerving around them. Legal departments express concern cities could be liable for personal injury and property loss wherein response to an emergency situation was delayed by calming devices.

CONFLICT -- It has been said that "traffic calming" has become "people calming." Even pro-calming data acknowledges the volatility of the debate. Diversion of traffic to other streets always accompanies an installation of devices. Residents who must travel over the devices are often irate about the discomfort of the devices, the increased vehicle noise from loads shifting over devices and the visual pollution of the signs and pavement markings needed to warn drivers of devices. Division and angst often remain in the neighborhood, long after an installation is complete.

Kathleen Calongne
CalongneK@aol.com

RESOURCES

ARTICLES

Reuben Castenada and Steven Gray, "Maryland Boy, 13, Dies in Fire at Friend's Sleepover," THE WASHINGTON POST, June 15, 1998 (Firefighter Stottlemeyer descends into basement to rescue child as flashover occurs forcing his exit from the home.)

Jen Chaney, "Fatal fire renews speed hump debate," GAITHERSBERG GAZETTE, July 8, 1998 (Impact of delay caused by humps on street on rescue of child.)

Dwight Daniels, "Encinitas protesters' parked vehicles hinder laying of speed bumps," THE SAN DIEGO UNION TRIBUNE, Aug. 13, 1998

Editorial, "Meeting air standards Maine's obligation too," PORTLAND PRESS HERALD, October 17, 1997 (Ruling of EPA)

Editorial, "Street Fights," THE HOUSTON CHRONICLE, July 12, 1994 (Closures foster exclusivity rather than community.)

Dan Feldstein, "Brown has 911 gate removed," THE HOUSTON CHRONICLE, August 18, 1998 ("Closure denies emergency access.")

Dan Feldstein, "Subdivision struggles with great barrier rift," THE HOUSTON CHRONICLE, February 22, 1999

Kristen Green, "It's neighbor vs. neighbor over Santee speed bumps," THE SAN DIEGO UNION TRIBUNE, March 7, 2000

Kristen Green, "Disabled woman wins fight to remove speed bumps on her street," THE SAN DIEGO UNION TRIBUNE, May 12, 2000

Jean-Martin Kuntscher, "Speed bumps cause ten times more air pollution," ALLIANCE INTERNATIONALE DE TOURISME, FEDERATION INTERNATIONALE DE L'AUTOMOBILE, September 6, 1994

Lisa Marshall, "Circles called hazards," THE DAILY CAMERA, Boulder CO, December 12, 1996

Paul Marston, "Humps increase exhaust fumes," UK NEWS, ELECTRONIC TELEGRAPH, January 14, 1998

Bruce Nichols, "Houston hits the brakes on speed-humps," THE HOUSTON CHRONICLE, ("Deterrent for drivers raises worries about police, fire response.") August 1, 1999

Amy Reinholds, "Whittier attempts mediation ...Neighbors square off on traffic issue" THE DAILY CAMERA, Boulder CO, January 21, 1997

Amy Reinholds, "Slip-sliding away at Pine St. traffic circle", THE COLORADO DAILY, Boulder, CO, November 20, 1996

Judith Scherr, "Berkeley's bumpy battle," BERKELEY DAILY PLANET, March 27, 2000 (Berkeley Commission on Disability takes stand against humps.)

Mark Shanahan, "Federal government pulls funds from traffic-slowing experiment," PORTLAND PRESS HERALD, August 18, 1998

Matt Schwartz, "HUD labels Dian Street gate discriminatory, asks removal," THE HOUSTON CHRONICLE, October 15, 1998

Joanne B. Walker, "Speed bumps, tables meet legal obstacle," ST. PETERSBURG TIMES, August 1998 (Judge Bennett rules in favor of two Florida residents who filed suit against city for placing devices on streets used for traffic control which are not approved traffic control devices in the Manual on Uniform Traffic Control Devices.)

John Williams, "Street Warfare" (Intersection sealing brings racism calls.) THE HOUSTON CHRONICLE, July 10, 1994

John Williams, "Probe of bias and street closings looks at use of federal money," THE HOUSTON CHRONICLE, December 16, 1994

REPORTS / PAPERS

Accessible Rights-of-Way: Sidewalks, street crossings, other pedestrian facilities, U.S. Architectural and Transportation Barriers Compliance Board, U.S. Access Board, November 1999.

"All Vehicle VOC and NO_x Emission Factors by Speed, Summer and Winter," graph provided by Ron Severence, Maine Department of Environmental Protection, 1997

An Analysis of Leadership, Politics and Ethics in the Stevens Avenue Traffic Calming Project, Part III, Ethics in the Stevens Avenue Project" by Scott Landry, Scot Mattox, Sara & Celeste Vigor, May 14, 1998 (Graduate paper for Muskie Institute at University of Maine Law School)

Boulder Fire Department Master Plan, Kevin Klein for City of Boulder CO, 1996

Building a True Community Final Report, Public Rights-of-Way Access Advisory Committee, U.S. Access Board, January 10, 2001

Deaths Expected from Delayed Emergency Response Due to Neighborhood Traffic Mitigation, Ronald R. Bowman, April 3, 1997

An Evaluation of the Speed Hump Program in the City of Berkeley, October 1997 (Damage to vehicles, impact on ambulance and fire services and people with disabilities.)

Guidelines for the Design and Application of Speed Humps, Institute of Transportation Engineers, 1997

The Impacts of Traffic Calming Measures on Vehicle Exhaust Emissions, United Kingdom, Transport Research Laboratory Report 482, PG Boulter, AJ Hickman

"Motor-Vehicle-Related Deaths Involving Intoxicated Pedestrians" – United States, 1982—1992," Morbidity and Mortality Weekly Report, Vol. 43 / No. 14

911 Emergency Gate Review, Fire Chief Les Tyra, City of Houston Fire Department, November 17, 1998

Possible Neighborhood Traffic Calming Methods, Report to city council of Sunnyvale, CA, February 4, 1997 (Potential liability.)

Speed Hump/UC Plan Presentation Outline, draft report, Susan Sanderson, Transportation Planner, City of Berkeley, (Emergency response concerns from proliferation of speed humps. Humps not the tool felt they were.) 1995.

Sudden Cardiac Arrest, The American Heart Association, 1996

A Survey of Traffic Calming Practices in the United States, Institute of Urban and Regional Development by Asha Weinstein and Elizabeth Deakin, University of California at Berkeley, March 1998, (Conflict in neighborhoods.)

Stevens Avenue Traffic Calming Project, DeLuca-Hoffman Associates Inc., May 27, 1998, Portland, Maine (Increased accidents and pollution from traffic calming project.)

Traffic Calming: State of the Practice, Reid Ewing, ITE/FHWA, 1999

Traffic Calming and vehicle emissions: A literature review, Transport Research Laboratory Report 307, United Kingdom, P. G. Boulter and D. C. Webster, 1997

FEDERAL DOCUMENTS

Americans with Disabilities Act, Title II, State and Local Government, Justice regulations, 28 CFR, 35.151, "New construction and alterations."

Clean Air Act, EPA, Title 1, Part A, Air Quality and Emission Limits, Sec. 113 Federal Limits

Manual on Uniform Traffic Control Devices, Millennium Edition, USDOT/FHWA, 2000

Traffic Safety Facts 2000, National Highway Traffic Safety Administration, USDOT

TIME TRIALS

"An Analysis of Speed Hump Effects on Response Times," City of Austin, TX Fire Department, January 20, 1999

"The Effects of Speed Humps and Traffic Circles on Responding Fire-Rescue Apparatus in Montgomery County, Maryland," Montgomery County Fire and Rescue Commission, August 1997

"The Influence of Traffic Calming Devices on Fire Vehicle Travel Times," Portland Bureau of Fire, Rescue and Emergency Service, January 1996

Memorandum from Nels Tahti, Administrative Analyst, City of Roseville, CA Fire Department (Time trials on streets with series of speed humps), June 4, 1991

LETTERS

Letter from Earl Noe, "I have disabled your car ... because you have so little regard for laws," THE BOULDER PLANET, October 9 – 15, 1996 (Opponent of devices has tires slashed.)

Letter from Karen Craig, Chair, Commission on Disability, Berkeley CA to Berkeley Mayor and City Council, November 10, 1998 (Problems of the disabled with vertical deflection devices.)

Letter from Special Transit of Boulder, CO to Boulder City Council, April 3, 1997 (Problems of disabled riders with vertical and horizontal deflection devices.)

Letter from Steven Beningo, Division Transportation Planner, USDOT, to Commissioner John Melrose, Maine DOT, August 13, 1998, (Rescinds funds for Portland's traffic calming project because of increased emissions.)

LEGAL DOCUMENTS

Affidavit of Settlement for Permanent Disability for fire fighter, George Gosbee, Montgomery County, MD, 1998 (Settlement of \$ 3,000 per month for life for injury sustained when hit speed hump traveling to scene of emergency.)

Appellant's Brief in, Slager v. Duncan and Montgomery County MD to U.S. Court of Appeals, Fourth Circuit (Unpublished opinion, sets no precedent by rules of the court.)

Final Judgment, Twelfth Circuit Court of the State of Florida, June 29, 1998 (Judge Robert B. Bennet rules in favor of Windom and Hartenstine of Sarasota, FL)

Opinion of Attorney General, State of Maryland, No. 86-021, April 2, 1986 (Potential liability.)

Opinion of Thomas R. Powell, Senior Assistant City Attorney, The City of Wichita, KS April 1, 1986 (Potential liability.)

OTHER

Housing Discrimination Complaint, filed by Calvin Hummer, President, Meadow Walk Town Home Association, Houston TX, May 28, 1997

"The Other Pine Intersections," Ronald Bowman, 1996 (Graph showing increase in accidents at intersections with traffic circles on Pine St., Boulder CO.)

Program Application for CMAQ (Congestion Mitigation and Air Quality) funds from City of Portland, July 1994. (City agrees to remove temporary measures if CMAQ determines emissions are not lowered by project.)

VIDEO

"Traffic Calming Devices," 1996, Portland Bureau of Fire, Rescue and Emergency Services, 55 SW Ash St., Portland, OR 97204