Inventory of Local and Collector Street Traffic Calming Measures

I. Introduction

In Palo Alto, traffic calming is defined as the combination of physical, educational, and enforcement measures that reduce the negative effects of motor vehicle use, alter driver behavior, improve safety for non-motorized street users, and improve neighborhood livability.

The following pages describe and illustrate physical traffic calming measures that may be used on local and collector streets in Palo Alto. For a variety of reasons, not all measures may be acceptable or desirable in all situations. Some measures are not acceptable for use on collector streets or on certain local streets determined by the Fire Department to be important emergency response routes. The determination of which measures best suit which application will be worked out between neighborhood residents, the Transportation Division and Fire Department, following the guidelines and qualifying criteria described in the Neighborhood Traffic Calming Program document. Many of the measures described herein may be used in combination with each other, and there are also many design variations of each measure. Residents are encouraged to see and experience traffic calming measures that are installed in Palo Alto and nearby communities—some locations are included in the description of each measure. The Transportation Division has an extensive library of traffic calming books and photographs that residents can peruse. Additionally, the World Wide Web sites listed at the end of this inventory provide extensive additional information and illustrations.

The traffic calming measures in this inventory are listed generally in order of increasing effectiveness at reducing the volume of shortcutting traffic and/or speeds. The least effective measures are usually "passive," meaning that drivers can choose whether or not to obey them. The most typical examples of passive measures are traffic signs and striping. The next level is the "active" measures that physically constrain the driver to certain paths or areas in the roadway. The most desirable and effective active measures are those that force drivers into horizontal or vertical movement, therefore causing drivers to reduce speed--the primary objective of traffic calming. Reduced speed translates into increased travel time that, in turn, may decrease traffic volumes because drivers may abandon a slower route. Some examples of these measures are traffic circles and speed humps. The most drastic active measures are those that partially or completely block traffic movements, with dramatic effects on traffic volume and the incidence of speeding. Partial and full street closures are examples of this type of measure.

For further information, please contact the City of Palo Alto Transportation Division at (650) 329-2552.

Inventory of Neighborhood Traffic Calming Measures
For Local and Collector Streets

Table of Contents

1. WARNING AND SPECIALTY SIGNS

Warning signs are standard signs prescribed by the State to warn of specific obstacles and conditions, such as curves, bumps, driveways, pedestrian crossings, advisory speed, etc. Usually such a sign would be installed only because of the existence of the particular condition. Many traffic calming devices require installation of warning signs to warn drivers of the impediment. Warning signs by themselves are usually not considered to be traffic calming devices.

Other warning signs are non-standard in that they are not recognized by the State. Some can be termed “specialty” signs, and may carry messages such as "Residential Street", "Children Playing", or novel messages such as odd speed limits and other non-standard messages. Some non-standard signs may be necessary to warn drivers of unusual traffic calming devices. Novel messages may catch the driver’s eye a few times, but after a while novelty wears off. In general, the impact of the messages of all these signs can wear off quickly on regular drivers on a particular route, whether they are local residents or shortcutting drivers. Palo Alto discourages non-standard signs except where they must be used to warn of an unusual device. Some specialty signs warn of conditions that most drivers should presume to exist in every neighborhood and/or are inherently obvious. Examples are the two given above. If such signs were used extensively, but not everywhere, drivers could come to think that their absence indicates that those conditions are not present when they might actually be present. In general, specialty or novel signs can be considered to be traffic calming devices, but their long-term impact is minimal in all respects. Each sign installation costs approximately $150.

2. STOP SIGNS

A stop sign is not considered to be a traffic calming device, but is included here because stop signs could be included in a traffic calming plan under certain circumstances and because many residents request installations of stop signs for traffic calming purposes. The purpose of a stop sign is to assign right-of-way at intersections with significant traffic volumes or safety problems. Official warrants describe the conditions under which stop signs should be installed. Because it assigns right-of-way, the stop sign is the most important regulatory sign in traffic engineering. If drivers disregard it, severe consequences for drivers can result. In order to maintain driver respect for the stop sign and to not dilute its importance, it must not be used inappropriately or too frequently. Nevertheless, stop signs have been installed for neighborhood traffic calming purposes, often at the insistence of residents and often without the recommendation of the City traffic engineer. Ironically, a common resident complaint is drivers running stop signs. Stop signs are appropriate in traffic calming projects at some locations where accidents occur due to unresolvable visibility or right-of-way problems. The best example of stop signs used primarily for traffic calming purposes is Palo Alto's "guard and go" stop sign system that was implemented Citywide in 1961.

Traffic Volume	Isolated stop signs are not effective at reducing volumes. If a series of stop signs is installed, and if there is an alternative and faster collector or arterial route, the volume of non-neighborhood traffic can be reduced.
Speed	• Palo Alto's 1976 stop sign study showed that, with stop signs installed every other block, 85th percentile speeds ranged from 23-37 mph between stop signs, with speeds at or less than the 25 mph residential speed limit at only 3 out of 60 locations. The conclusion of the study was that speeds with the guard and go system were as fast as, or faster, than they would be without it. • If stop signs were installed at every block, mid-block speeds might be reduced further than noted above, but widespread disobedience of stop signs would be expected. Even with stop signs every other block, the stop sign study found that over 70 percent of traffic does not come to a full stop at intersections, with speeds through the intersection ranging from 2.5 to 10 mph. • Speeds are reduced within about 200 feet of the intersection at which they are installed.
Noise, Air Quality, Energy Consumption	Stop signs increase emissions, fuel consumption and noise.
Traffic Safety, Emergency Response	As noted in the stop sign study, safety is compromised by too many stop signs, because of the disobedience caused by having to stop frequently for no apparent reason. Minimal impact on emergency response.
Aesthetics	As with any traffic sign, aesthetics is usually degraded. A single sign has minimal negative visual impact. Pavement legends (stop bar and stop legend) contribute to the negative visual impact.
Maintenance	Maintenance for a single sign and stop bar is relatively small, but compounds for a series of signs.
Approximate Cost	$200 for new sign and legend installation.
Other	Generally unpopular with bicyclists, because a series of complete stops can substantially lower average speed.

3. SPEED LIMIT SIGNS

All residential local and collector streets in Palo Alto have a prima facie speed limit of 25 mph, which is typically not posted on local streets. Residents often request the posting of speed limit signs for traffic calming purposes. Usually this request is denied, as most drivers know that the residential speed limit is 25 mph. Furthermore, if signs were posted on some local streets but not others, drivers could think that only the posted streets had the 25 mph limit. 25 mph speed limit signs might be posted on major collector streets if the physical characteristics of the street communicate to drivers that a higher speed would be acceptable. In general for all types of signs, their passive nature and the fact that regular drivers of a route may eventually not consciously notice them, the result is typically insignificant impact on driver behavior.

Traffic Volume	No impact.
Speed	Studies and field observations in Palo Alto and other cities show that drivers' speeds include relatively little consideration for the posted speed limit. Absent sustained police enforcement, drivers tend to travel at a speed at which they feel is comfortable for the circumstances. However, this may not be the speed that residents of the street feel is comfortable and safe while they are engaging in "residential activities" not in their vehicles. Usually more active devices than signs are needed to encourage or force drivers to slow down.
Noise, Air Quality, Energy Consumption	Minimal impact.
Traffic Safety, Emergency Response	Minimal impact on traffic safety. No impact on emergency services.
Aesthetics	Incremental negative aesthetic impact from each additional sign.
Maintenance	Incremental increase in maintenance for a single sign.
Approximate Cost	$150 per new sign installation.

4. GATEWAYS

A gateway consists of an architectural or roadway feature on each side and/or in the center of a roadway used primarily to indicate to drivers that they are entering a special area, in the case of traffic calming--usually a residential neighborhood. The most effective gateways include vertical elements such as trees or columns. Gateways may be formed by curb bulbouts, fences, poles, signs, artwork, and other features that can be combined with each other. If the gateway were narrow, it would reduce speed at that point and could reduce through traffic. Local examples: Fair Oaks neighborhood near Atherton; entrance to Lindenwood neighborhood, Atherton; Cambridge west of El Camino Real, and University south of Middle in Menlo Park. Gateways are similar to Measure #8, Bulbouts.

Traffic Volume	Reduction in traffic volume would normally be small because gateways do not occur in a series, nor do they typically reduce speeds. The narrower the gateway, the greater the opportunity for some volume reduction.
Speed	If a gateway is substantially narrower than the normal roadway width, some speed reduction is possible only at the gateway. Refer also to above comments about volume reduction.
Noise, Air Quality, Energy Consumption	Typically there would be minimal impacts on noise production, air quality or energy consumption. If the gateway were particularly narrow, especially if two-way traffic could proceed in only one direction at a time, some increased noise could result from braking and acceleration in the gateway area.
Traffic Safety, Emergency Response	Accident data is generally inconclusive. There is some evidence indicating that accidents may be reduced with gateway treatments, even extremely narrow ones. Minimal impact on the emergency services.
Aesthetics	Normally, gateways add to the aesthetic appeal of the area, due to the architectural features or landscaping. Special signing that would reduce aesthetic appeal is usually not required unless the width of roadway is reduced to a one-way crossection.
Maintenance	All traffic calming devices require maintenance. Gateways usually do not create interference with roadway surface work. For landscaped gateways, refer to maintenance descriptions for landscaped devices.
Approximate Cost	There is a wide range of costs for gateways depending on their design. A simple wooden fence such as used in the Fair Oaks area could be constructed for approximately $1000. Designs involving curb bulbouts would cost from $20,000 to $40,000. High-quality designs involving architectural features such as columns and portals could cost around $100,000.

5. TEXTURED CROSSWALKS

Crosswalks, whether midblock or at intersections, can be textured by means of special pavers or other treatment. When used as part of a larger traffic calming project, the primary intention is to impart a message to the driver that the area being traversed has some special identity, such as an area where pedestrian traffic is frequent, and/or that requires special driving attention. A textured crosswalk can be used in isolation, usually for the specific purpose of calling greater driver attention to the specific crosswalk. Local examples: University Avenue between Cowper and High (Palo Alto), Downtown Redwood City and Menlo Park (none are neighborhood calming projects).

Traffic Volume	No change in traffic volume would normally be expected.
Speed	Only minor reduction in speeds would be expected, if any.
Noise, Air Quality, Energy Consumption	Depending on the type of textured treatment, some amount of increased noise is likely. No impact on air quality and energy consumption.
Traffic Safety, Emergency Response	No data is available on traffic safety impacts. No impacts on emergency response.
Aesthetics	Special pavement treatments add to aesthetic appeal of a street or intersection. Additional signing is not required for the sole purpose of converting typical asphalt to special paving.
Maintenance	Increased maintenance, possibly including stockpiling of special materials, is required for special pavement treatments. Removal and replacement may be required for street resurfacing.
Approximate Cost	$10,000
Other	By themselves, textured crosswalks are not particularly effective traffic calming devices. They are best used in conjunction with other traffic calming measures, such as bulbouts, raised crosswalks and raised intersections. Another method of calling attention to a crosswalk is the use of lights installed in the pavement that are activated when a pedestrian wishes to cross. However, such a device is usually used as a specific crosswalk safety device, rather than for the broader purpose of traffic calming.

6. SPECIAL STRIPING/NARROW LANES

Some geometric design features employing islands and circles to calm traffic can be installed with traffic striping and/or pavement markers to form the island or circle. Such installations are relatively inexpensive, low-maintenance, and do not interfere with drainage and street sweeping. However, because they can be driven over, and because they produce no visual obstruction when seen from a distance, they have relatively small impact on driver speeds and volumes. In this regard, use of striping to achieve traffic calming can be considered a "passive" measure, like installing signs, because drivers are not physically forced to change their behavior. Regular Police Department enforcement is usually required to produce effective results from such passive devices.

Traffic lanes may be narrowed merely by changing the striping layout to reduce, for example, 12-foot lanes to 10-foot lanes. If appropriate, bicycle lanes can be added to a street, with consequent reductions in width of the other lanes. Narrower lanes may give drivers the impression of a narrower street and/or less room for maneuvering, thereby potentially reducing speeds. The lack of physical width restrictions (such as raised islands, landscaping, parked cars) results in substantially less impact on driver behavior than the other physical measures.

Traffic Volume	A narrow lane on some major arterial streets in Palo Alto does not appear to have reduced traffic volumes noticeably. Minimal impact expected from devices created by striping only.
Speed	A narrow lane on some major arterial streets in Palo Alto does not appear to have reduced traffic speeds noticeably. Minimal impact expected from devices created by striping only.
Noise, Air Quality, Energy Consumption	Minimal impacts would be expected.
Traffic Safety, Emergency Response	Minimal impacts would be expected.
Aesthetics	No impact on aesthetics if the amount of striping remains the same. If new striping were added, the impact on aesthetics would be moderately negative.
Maintenance	Any additional striping requires increased maintenance for striping. Street resurfacing becomes more costly with increased replacement striping.
Approximate Cost	Cost depends on the length of striping removed and installed and varies depending on the overall size of the project. Removal and replacement of thermoplastic striping costs approximately $1.00 per linear foot.

7. ON STREET PARKING

Reduction in width of traffic lanes, especially when physical objects are brought closer to the outside edge of the traffic lane, can reduce driver speeds, as drivers perceive that there is less width for maneuvering and sight distance is reduced. Parked cars are especially conducive in this regard, as they indicate numerous hazards, such as the possible presence of pedestrians, car doors opening, cars pulling out, children appearing suddenly from between cars, and the "wall effect" causing drivers to feel that the lane is narrower than it really is. A row of parked cars also provides a buffer between pedestrians on the sidewalk and moving vehicles. Adding on-street parking is usually only possible if the demand is already present and parking has heretofore been prohibited. On-street parking areas can be created on alternating sides of the street, with traffic lanes shifting back and forth to accommodate the parking areas (refer to description of "serpentine street"). If sufficient width is available, diagonal parking can be introduced, producing a different "feel" to the neighborhood.

Traffic Volume	No data specific to this measure is available.
Speed	No data specific to this measure is available.
Noise, Air Quality, Energy Consumption	Minimal impacts would be expected.
Traffic Safety, Response	Minimal negative impacts on driver safety would be expected. In some cases of very narrow lanes, drivers may become more conscious of opposing traffic and, in combination with reduced speeds, safety may increase. Heavy on street parking, however, introduces safety problems for cyclists: narrower lanes may not allow a cyclist and a driver to share the lane, and the probability that a driver will open a door into the path of a passing cyclist is increased. Minimal impacts on emergency services, unless the combination of high traffic volume and narrow lane widths is such that emergency vehicles cannot find enough room to pass waiting cars.
Aesthetics	Heavy on-street parking, to most observers, has negative aesthetic impacts, such as increased number of signs, reflections from metal and glass, blocked views of landscaping, damaged trees, and increased noise and litter.
Maintenance	Increased maintenance is required for any signs and striping used to control on-street parking, and special signs and programs must be introduced if street sweeping is to be conducted without parking present.
Approximate Cost	The cost depends on how it is instituted. Typically, the primary cost would be for new signs at approximately $150 each.

8. BULBOUTS, CHOKERS, CURB EXTENSIONS

Bulbouts, bumpouts, curb bulbs, chokers, curb extensions and neckdowns are synonymous terms for an extension of the curb into the former paved street area, typically for the width of a parallel parking space. The low-cost (budget) design does not literally extend the curb line; rather a gap remains between the former curb line and the new islands, in order to maintain gutter flow. Bulbouts may be installed at intersections or midblock, on one or both sides of the street. They usually do not impede or redirect traffic flow; rather, they typically reduce the width of the traveled way to the minimum required for two-way traffic (in Palo Alto, they will not be used to narrow the street to less than the minimum of 20 feet required for two-way traffic, unless used only for one-way traffic). They may be used for numerous purposes, including (i) reducing curb radii at intersections to slow turning traffic, (ii) enhancing pedestrian safety and visibility at pedestrian crossings, (iii) providing extra space for landscaping and sidewalk amenities; (iv) possibly reducing driver speed by creating a sense of narrowness, and (v) creating a neighborhood gateway feature (refer to Measure #4, Gateways). For bulbouts used on one side of the street in conjunction with offset centerlines, refer to discussion for serpentine streets and chicanes. Bulbouts may be short (e.g. about one car length), and could be much longer (e.g., a large portion of a city block). Examples of intersection bulbouts: University Avenue (Downtown Palo Alto); Santa Cruz Avenue (Downtown Menlo Park). Example of longer bulbouts: Park Boulevard between Grant Avenue and Lambert Avenue (Palo Alto). None of the above examples are neighborhood traffic calming projects.

Traffic Volume	Studies have shown that bulbouts reduce traffic volumes only if they narrow the street to less than two lanes with two-way traffic, or are installed frequently along a considerable length of street. Thus, in most installations, bulbouts are not considered to be a serious volume reduction measure.
Speed	The effect on speeds is similar to the above discussion on volumes. In most installations, bulbouts are not considered to be a serious speed reduction measure, except for turning traffic when bulbouts are used to shorten corner radii at intersections.
Noise, Air Quality, Energy Consumption	No substantial effects have been identified.
Traffic Safety, Emergency Response	When used at intersections and other pedestrian crossings, pedestrian safety and visibility is enhanced by bringing waiting pedestrians out closer to the traffic lane, and shortening the crossing distance. On higher-volume streets, bicyclists may be adversely affected when they are forced to share the narrow travel lane with drivers. Providing bicycle lanes through the bulbouts essentially defeats the primary purpose of bulbouts, which is to substantially narrow the traveled way. Bulbouts do not noticeably interfere with movement of emergency vehicles, provided that the minimum turn radii are provided at intersections.
Aesthetics	Bulbouts may be landscaped, adding greenery where asphalt was formerly present. Required signs and reflective devices may be unattractive.
Maintenance	Every traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Depending on the design, bulbouts may interfere with street sweeping and gutters may clog.
Approximate Cost	Budget design (not attached to curbs): $19,000 per pair. High aesthetic/low maintenance design (attached to curb): $40,000 per pair (higher or lower depending on new storm drainage construction). The above estimates are for short bulbouts as might be used at intersections. Longer bulbouts would cost proportionately more.
Other	Parking spaces will be eliminated in bulbout locations, but may be less at intersections where parking may already be prohibited. At intersection, minimum corner radii requirements for small trucks and emergency vehicles may reduce the potential for shortening pedestrian crossing distance.

9. MEDIAN ISLAND SLOW POINTS

Raised islands can be installed along the centerline of a street, narrowing the street and lane widths, either at intersections or midblock. Traffic lanes will be offset towards the curbs. The resulting narrowing and horizontal deflection can lower speeds in the vicinity of the median. Speed reduction depends on the amount of horizontal deflection. This measure may be used on collector streets. Curb bulbouts could be used in conjunction with median islands to create a greater feeling of constriction, thus reducing speeds more. The median islands can be used in conjunction with crosswalks, with the median serving as a pedestrian refuge. Another variation is the angled slow point, where the median island and corresponding bulbouts are angled to produce greater horizontal deflection, thus greater speed reduction.

Traffic Volume	Traffic volumes may be reduced by about ten percent if a series of slow points is installed.
Speed	Speeds may be reduced by about five percent, depending on the "before" speed and the severity of the horizontal offset.
Noise, Air Quality, Energy Consumption	Minimal changes in noise, air quality and energy consumption.
Traffic Safety, Emergency Response	When used as pedestrian refuges, median slow points improve pedestrian safety by slowing traffic and breaking the crossing into two segments. If the medians are used on higher volume streets that are also bicycle routes (e.g. exceeding about 4000 vpd), bicyclists may be adversely affected when they have to share the travel lane with vehicles to pass through a constricted area. Bike lanes could be maintained through the slow point, but the added width offsets the effectiveness of the narrowing in slowing down vehicles. Median slow points may be used on emergency response routes. The angled slow point cannot be used on emergency response routes because of the more severe narrowing and horizontal deflection. For medians longer than 30 feet, the Fire Department requires a minimum unobstructed one-way width of 16 feet between the median and the curb. Otherwise, the Fire Department will accept a width as little as 10 feet. These widths are the minimum required by the Fire Department for emergency access and by the Transportation Division for normal traffic flow.
Aesthetics	Median islands may be landscaped, adding greenery where asphalt was formerly present. From a distance, trees may lead drivers to believe that the street is somehow obstructed, and therefore may help reduce volumes. New signs are required, adding visual clutter.
Maintenance	Each traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Because medians are located in the center of streets, drainage and street sweeping are not affected.
Approximate Cost	The standard minimum-width median design includes landscaping and automatic irrigation, at about $25,000 for a 40-foot length. A hardscape design would cost about $20,000. Longer medians would cost proportionately more.
Other	Medians used at intersections must be designed to allow for turns by large vehicles, possibly affecting the location and effectiveness of the medians. Parking will probably have to be prohibited in the vicinity of the medians.

10. RAISED INTERSECTIONS

A raised intersection is somewhat analogous to a midblock speed table (Measure #13) as a speed reduction technique. The entire intersection is raised from three to six inches above grade, and may be given a special pavement treatment. This technique has been used extensively in Europe. In the U.S., they have more often been used as enhancements for pedestrian safety and aesthetics in shopping areas, rather than for neighborhood traffic management. Local examples: Main entrance to Andronico's Market (Stanford Shopping Center); Central Park Area (Stanford West Apartments).

Traffic Volume	No data is available, but the volume reduction should be less than for speed humps and tables, due to the greater length of the plateau in the direction of travel.
Speed	Minimal available data indicates minimal overall speed reduction, except at the raised intersection itself.
Noise, Air Quality, Energy Consumption	Noise can increase due to braking, acceleration, crossing textured pavement, and bouncing cargo in trucks. Minimal impact on air quality and energy consumption.
Traffic Safety, Emergency Response	Pedestrians benefit at raised intersections because the street is raised to the same grade as pedestrians, making the area pedestrian territory and encouraging drivers to take extra care. Due to the long raised plateau of raised intersections, and their location at intersections, this measure is acceptable for use on collector streets. Fire trucks and paramedic vans will have to slow to cross the raised intersection, but they usually slow anyway at intersections.
Aesthetics	Potential for improved aesthetics if special pavement treatment is used. Warning signs may be required, which would degrade aesthetics.
Maintenance	Additional maintenance is required, especially for special pavement treatments. Raised intersection interferes with street overlays, and may have to be removed for a resurfacing project.
Approximate Cost	Actual data is not available. A rough estimate is $30,000 - $60,000 for asphalt construction, including drainage work; and $40,000 - $70,000 for concrete/paver construction, including drainage work. Over half of the above costs represents drainage work.

11. TRAFFIC CIRCLES

As used for traffic calming purposes, traffic circles are relatively small circular or oval islands (usually landscaped) placed at the center of intersections of local and/or collector streets. Their primary purpose is to reduce speeds through an intersection or, if used in a series, reduce speeds for several blocks. Depending on their design, traffic circles can also reduce conflicts at intersections. Because they are located in the middle of two streets, they may give drivers on both streets the impression that the streets may not be "through". They can be used with and without stop signs. Traffic circles are different from "roundabouts", the latter being a more formalized version of a circle which are usually installed on higher-volume streets. Though roundabouts reduce speeds through an intersection, their primary purpose is to facilitate traffic flow rather than discourage it. Local examples: Addison/Bryant, Lytton/Fulton, and Park Blvd/Park Ave intersections (Palo Alto); Fair Oaks Neighborhood (near Atherton).

Traffic Volume	Reduced speeds and the appearance of obstructions in the roadway will reduce volumes by about 20 percent for a series of circles; minimal reduction for a single circle.
Speed	Speeds are reduced about 100-200 feet before and after the circle, compared to no previous traffic controls at intersection. Speeds are reduced to about 15 mph at the circle. A series of circles at several intersections will reduce speeds between intersections to 25-30 mph, depending on spacing.
Noise, Air Quality, Energy Consumption	If a circle replaces stop signs, noise, fuel consumption and emissions will decrease. A series of circles, by reducing overall speeds, will have the same effects over a length of street.
Traffic Safety, Emergency Response	Intersection accidents can be decreased where circles completely replace stop signs. For pedestrians, they may increase hazards or a feeling of discomfort, as vehicles are forced close to (but not into) the pedestrian crossing area. If the circles are used on higher volume streets that are also bicycle routes (e.g. exceeding about 4000 vpd), bicyclists may be adversely affected when they have to share the travel lane with vehicles around the circle. With a series of circles, bicyclists may benefit from overall speed and volume reductions. Some drivers, especially those of large vehicles, may turn left in front of the circle and therefore encroach into the oncoming traffic lane. Circles do not block access to any street. They will reduce speeds of emergency response vehicles, but emergency response vehicles must reduce speeds anyway at intersections. Circles may be used on emergency response routes.
Aesthetics	Circles may be landscaped, adding greenery where asphalt was formerly present. From a distance, trees may lead drivers to believe that the street is not a through street. New signs are required, adding visual clutter.
Maintenance	Every traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Because circles are located in the center of streets, drainage and street sweeping are not affected.
Approximate Cost	The standard traffic circle design for Palo Alto includes landscaping and automatic irrigation, costing approximately $30,000. A hardscape design costs about $25,000.
Other	In order to provide passage for large fire trucks, it is likely that parking will be prohibited within about 50 feet of the intersection on all sides of the two affected streets. Utilities in the center of many streets may not allow planting of trees, may add to cost, and may cause other complications.

12. SERPENTINE STREETS, CHICANES

A serpentine street or chicane is an artificially created curving two-way street on a naturally straight road section. The curves can be created by offset centerline striping, a series of bulbouts or parking areas installed on alternating sides of the street, or by varying the size or shape of a series of median islands. The length of the curve and the amount of side-to-side offset can be varied to obtain more or less reduction in speed. May be used midblock or at intersections. In addition to forced speed reduction, a serpentine alignment that is created by landscaped islands gives the appearance that a street may not be a convenient shortcut, thus possibly causing such drivers to avoid the route. If raised islands do not force the lane offsets, many drivers would easily "straighten the curves" by not staying in the proper lane in the transition area, thus reducing the effectiveness of this measure. Lanes usually need to be narrowed in order to further reduce the ability of drivers to straighten the curves. In some cities, chicanes that are only a single lane wide for two-way traffic are used. Such severe artificial narrowing is discouraged at this time in Palo Alto installations.

Traffic Volume	If the design speed of the offset transition is similar to that for other devices such as speed humps or traffic circles, and if a series of offsets is used, volume reduction similar to a series of those devices should occur, i.e., up to about 20 percent.
Speed	The offset transition can be designed for any amount of speed reduction. If the horizontal offset is similar to that for other devices such as traffic circles, and if a series of offsets is used, speed reduction similar to a series of those devices should be obtainable, i.e., down to about 15 mph at the offset and down to 25-30 mph between offsets. Effectiveness of this measure is reduced if drivers are able to "straighten the curves".
Noise, Air Quality, Energy Consumption	Noise could increase due to braking, accelerating, and passing over centerline pavement markers at the curves. Noise would be reduced between curves due to slower speeds. Minimal impact on air quality and energy consumption.
Traffic Safety, Emergency Response	If the offsets are used at intersections, vehicles will be forced toward the curb close to (but not into) the pedestrian crossing area. This could degrade pedestrian safety or comfort. Drivers may not stay in the proper lane in the transition area, thus posing potential safety problems. If lanes are narrowed, bicycles and motor vehicles may be forced together in the transition areas, which could be a problem on higher volume streets. For a short segment of serpentine street with mild and/or infrequent horizontal offsets, the impact on emergency services response times should not be great, as emergency vehicle drivers can legally "straighten the curves" by driving down the center of the roadway. Long sections may impact emergency services and thus may not be appropriate for collector streets. A minimum width of 20 feet for two-way travel will be maintained, as required by the Fire Department for emergency access and by the Transportation Division for normal traffic flow.
Aesthetics	Raised islands can be landscaped, adding greenery where asphalt was formerly present. Painting of curbing may be required, and warning signs and reflectors are required, decreasing aesthetic appeal.
Maintenance	Every traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Depending on the design, bulbouts may interfere with street sweeping and gutters may clog.
Approximate Cost	Cost depends heavily on length of serpentine street segment and types of devices used to create the horizontal offsets. Refer to costs for devices such as bulbouts and median island slow points.
Other	This measure may be combined with other measures, such as speed humps, creating a "slow street" (refer to Measure #15). Parking spaces will be eliminated in bulbout locations, but may be less at intersections where parking may already be prohibited.

13. SPEED TABLES AND RAISED CROSSWALKS

Speed tables and raised crosswalks are a gradual rise and fall in the pavement—typically to a maximum height of three inches over a distance of 22 feet in the direction of travel. The central 10-foot section of the table is flat. They may be used singly for a raised crosswalk, or in a series of two or more for the purpose of speed reduction. When used as a raised crosswalk, the table should extend all the way to the curb, possibly requiring new storm drainage construction, thus increasing cost considerably. Speed tables and humps usually taper down to street grade at the gutter, thus leaving the gutter open for normal drainage. The long length of speed tables allows long wheelbase vehicles to cross with substantially less jolting than with the 12-foot humps, permitting higher speeds. Their longer profile results in higher speeds across and between the devices compared to speed humps. Thus these devices may be used on collector streets where speeds are usually higher, and which may also be emergency vehicle and bus routes. Usually, speed tables and raised crosswalks are placed midblock, but a raised crosswalk may be permitted at an intersection under certain circumstances. Local examples: Terman Drive, Bryant Court (Palo Alto); Campus Drive between Quarry Road and Ross Way (Stanford); Stanford Avenue east of Junipero Serra (Stanford); Bay and Van Buren Roads between Willow Road and Ringwood Avenue (Menlo Park).

Traffic Volume	Because speed tables do not reduce speeds as much as speed humps, volume reduction (due to discomfort) and slower travel times are less. A series of speed tables will typically reduce volumes by about 10 percent. This minimal traffic diversion to other streets makes tables acceptable for use on collector streets.
Speed	Speed reduction depends on the spacing of tables. At the closest spacing of 200 feet, 85^{th} percentile speeds average about 30–33 mph between tables. 85^{th} percentile speeds at the tables themselves is reduced to about 25—30 mph. The less abrupt speed reduction of tables makes them acceptable for use on collector streets, where speeds are generally higher.
Noise, Air Quality, Energy Consumption	Slower speeds result in lower noise levels between tables. Noise levels at the tables themselves may increase due to braking, accelerating and bouncing of cargo in trucks. Minimal change in air quality and energy consumption.
Traffic Safety, Emergency Response	Speed tables have not caused safety problems or liability claims. Long wheelbase vehicles can more easily cross 22-foot tables than 12-foot humps, making them acceptable for use on collector streets. If speed tables were to proliferate on collector streets, this could eventually create a cumulative negative impact on emergency response times, restricting their further installation.
Aesthetics	Speed tables have nearly the same negative aesthetic impacts as speed humps, except that the flat portion of the table may be constructed with pavers or textured concrete. The choice of acceptable materials may be limited by the need to withstand the heavy vehicle loading that occurs due to the vertical deflection and heavier traffic loads on collector streets.
Maintenance	Every traffic calming device requires maintenance. In addition, speed tables interfere with street resurfacing and may have to be removed and replaced for such projects. Any special pavement treatment on top of speed tables may require more frequent and expensive maintenance than asphalt.
Approximate Cost	About $5,000-$8,000 per table when constructed of asphalt. Special textured pavement treatments on top of the table and/or the ramps can approximately double this cost. For raised crosswalks that extend across the gutters, an additional $5000-$10,000 per location would be required, depending on the extent of new storm sewer connections.
Other	The use of raised traffic calming measures on collector streets should be done with restraint, due to impacts on the response times of fire and paramedic services. The Fire Department may not permit the use of too many such measures because collector streets are part of the emergency response street network. Parking is allowed on and next to speed tables. Parking may be removed in advance of raised crosswalks for visibility purposes.

13. SPEED TABLES AND RAISED CROSSWALKS

14. SPEED HUMPS FOR LOCAL STREETS

Speed humps are a gradual rise and fall in the pavement surface, usually with a circular profile, to a maximum height of three inches over a distance of 12 feet in the direction of travel. Typically they are installed in a series of two or more separated by about 200 feet. This type of speed hump is installed only on local residential streets. The primary purpose of speed humps is to produce sufficient discomfort to a driver to reduce travel speed to 15 mph, which is posted as the advisory speed. The spacing of speed humps is such as to result in an average 85th percentile speed of 25 – 30 mph between humps, depending on the spacing. This design causes drivers to reduce speed, yet allows them to maintain control of their vehicles. Drivers of longer wheelbase vehicles, such as trucks and buses, will normally have to reduce speeds to less than 15 mph to avoid discomfort. For this reason, this type of speed hump is not usually installed on transit, truck, or emergency response routes. A primary characteristic of speed humps is their high-speed control effectiveness at minimal cost. Local examples in Palo Alto: Cowper Street and Ross Road south of Oregon Expressway, Marion and Colorado Avenues east of Cowper Street, Guinda Street north of University Avenue, Palo Alto Avenue between Seneca and Chaucer Streets.

Traffic Volume	A series of at least three speed humps will typically reduce traffic volumes by about 10 – 20 percent, with the reduction usually being in "through" traffic that can shift to other routes.
Speed	Speed reduction depends on the spacing of humps, ranging from approximately 200--600 feet. With the closest spacing, the 85th percentile speed is usually reduced to about 25 mph between humps. The 85th percentile speed at the humps themselves is reduced to about 15 to 20 mph.
Noise, Air Quality, Energy Consumption	Slower speeds result in lower noise levels between humps. At humps themselves, noise can increase due to braking, accelerating and bouncing of cargo in trucks. There is minimal change in air quality and energy consumption.
Traffic Safety, Emergency Response	Humps have not caused safety problems or liability claims. Long wheelbase vehicles, including fire trucks, must cross humps very slowly to avoid significant jolting. Drivers may drive in the gutter to partially avoid the humps. A series of bumps will cause substantial delay in emergency response times, but will not reduce access to streets. Palo Alto Fire Department has experienced at least one injury to a firefighter who hit his head on the roof of the truck while passing over a hump. While the Fire Department will allow humps to be placed on local streets, proliferation of humps on many local streets may eventually cause a cumulative negative impact on emergency response times. This impact may restrict further installation of humps in the future.
Aesthetics	Because speed humps cannot be landscaped and must be clearly marked with signing and striping, their negative visual impact is substantial.
Maintenance	Every traffic calming device requires maintenance. In addition, humps interfere with street resurfacing and may have to be removed and replaced for such projects.
Approximate Cost	$3500 per hump, including signing and striping.
Other	Speed humps are very common in California cities, with some cities having hundreds of installations. Speed humps can be longer than 12 feet and have a flat top, in which case they are referred to as raised crosswalks and speed tables (refer to Measure #13). Parking is allowed on and next to speed humps.

15. SLOW STREETS

The slow street employs a combination of traffic calming devices. On Milvia Street in Berkeley, the slow street employs road bumps, bike lanes, a serpentine centerline, stop signs, and a one-way closure at one end. The purpose of the design is to slow traffic. Refer also to Measure #12, Serpentine Streets.	
Traffic Volume	Volume can be reduced by 10 – 20 percent in a 1 – 3 block segment of slow street.
Speed	Speed reduction will depend on the individual traffic calming devices used. Speeds will normally be reduced to about 25 –30 mph between devices and 15 – 20 mph at the devices.
Noise, Air Quality, Energy Consumption	There is minimal impact on air quality and fuel consumption. Noise impacts from speed humps as described for that device.
Traffic Safety, Emergency Response	The effects on safety and emergency services depend on the mix of devices used (refer to individual descriptions). A slow street may be acceptable on emergency response routes if speed humps are not employed.
Aesthetics	Impacts on aesthetics are the same as for the various devices used. The density of measures used may result in a heavy concentration of signs and striping which will degrade aesthetics. Use of landscaped islands adds greenery where asphalt was formerly present.
Maintenance	Every traffic calming device requires maintenance. Refer to maintenance requirements for the individual devices used.
Approximate Cost	The cost is the sum of costs for the various devices employed. Refer to costs for individual devices such as bulbouts, speed humps, speed tables, and median islands.

16. TURN PROHIBITION SIGNS

The basic purpose of turn prohibition signs is to prohibit certain turns in order to improve safety or prevent congestion on main streets. As used in neighborhood traffic calming, "No Right Turn" or "No Left Turn" signs, with or without specified hours of the day, can be used to block or break up shortcutting traffic patterns on residential streets. Since these are passive devices, their success as traffic calming measures depends on the amount of police enforcement and the driver demand for the prohibited turn (usually proportional to the degree of congestion on the main route). Without enforcement, driver violation rates can be high. Even with regular enforcement, violation rates are typically 20 percent, and generally lead to resident complaints. Turn prohibition signs are an inexpensive way to achieve volume reductions similar to diverters, median barriers and street closures, but driver violation and requests for enforcement are usually nagging problems. Local examples: Churchill at Alma (Palo Alto), Willow Road between Middlefield and U.S. 101 (Menlo Park). Side streets on the south side of eastbound University Avenue (East Palo Alto).

Traffic Volume	Significant volume reduction is possible, up to 70 percent. Potential large undesired diversion of traffic to other nearby streets. Best used where this diversion is to arterial or major collector streets.
Speed	If the movement being prohibited had formerly been used by a driver population as a speedy through route, substantial reduction in the incidence of speeding is possible. Speed of remaining traffic is not affected.
Noise, Air Quality, Energy Consumption	Noise reduction is proportional to volume reduction. Emissions and fuel consumption will decrease on street where the restriction is located, but could be offset by minor increase due to detours of residential traffic in the nearby area.
Traffic Safety, Emergency Response	Accident reduction is expected if the prohibited movement had been an accident problem. No impacts on emergency services.
Aesthetics	A single sign has an incremental negative aesthetic impact.
Maintenance	Maintenance for a single sign is minimal.
Approximate Cost	$150 per installation.
Other	Limited experience in Palo Alto suggests that regular Police enforcement must be provide to prevent flagrant violation. Because such enforcement is usually not possible, this measure is usually not recommended for traffic calming purposes. If channelization (raised islands) are used in conjunction with a turn prohibition sign, compliance is increased, along with cost, reducing the need for Police enforcement.

17. DIAGONAL DIVERTERS, FORCED TURN CHANNELIZATION, MEDIAN BARRIERS

Forced turn channelization refers to one or more raised traffic islands at intersection approaches or within intersections, designed to force traffic to make or forego certain movements. There are numerous variations of design and placement of islands depending on which movements are being allowed or prevented. A diagonal diverter forces all traffic onto an intersecting street. These measures break up through routes, making vehicle travel through a neighborhood difficult, while not actually preventing it. Thus, these devices are more forgiving than street closures. The primary purpose of these measures is to reduce or eliminate through traffic movements. Residents must adopt a new driving route to access the affected street. Bicycle and pedestrian access is usually maintained. Similar restrictions in traffic movements may be accomplished by regulatory signing only, but the raised islands provide a physical deterrence that signing by itself cannot provide. Local examples in Palo Alto: Park Boulevard at Margarita Avenue, Bryant Street at Embarcadero Road, E. Meadow Drive and Charleston Road at Park Boulevard, Charleston Road at Louis Road.

Traffic Volume	Up to 70 percent reduction possible, depending on how many movements are restricted. Potential large undesired diversion of traffic to other nearby streets. Best used where this diversion is to arterial or major collector streets.
Speed	Reduces speeds in the vicinity of the device and may also reduce or eliminate the driver population that had previously used the street as a speedy through route. Thus, the incidence of speeding may be reduced.
Noise, Air Quality, Energy Consumption	Reduces noise if volumes are reduced. Emissions and fuel consumption may decrease on street where the device is located, but may be offset by minor increases in emissions and fuel consumption caused by detours of residential traffic in the nearby area.
Traffic Safety, Emergency Response	Reduces accident potential in the immediate vicinity, but may shift the potential to other streets. If an opening in the closure provides emergency access with a raised block in the center ("pan basher"), fire and paramedic vehicles will encounter minimal delay, but police vehicles will not be able to pass. If access requires the unlocking of a removable bollard, delay will be substantial, and emergency drivers will usually use an alternate route. New closure designs are being pursued that should minimize delay to emergency vehicles, while greatly limiting private vehicle access. One design is an automatic retractable bollard. A minimum width of 20 feet for two-way travel will be maintained. For one-way sections (such as where a median splits the two travel directions), a minimum width of 16 feet will be maintained for one-way travel where the one-way sections are longer than 30 feet. Where the one-way section is less than 30 feet long, a minimum width of 10 feet will be maintained for one-way travel. These widths are the minimum required by the Fire Department for emergency access and by the Transportation Division for normal traffic flow.
Aesthetics	Islands may be landscaped, adding greenery where asphalt was formerly present. Required signs and reflective devices may be unattractive.
Maintenance	Every traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Depending on the design, half closures may interfere with street sweeping and gutters may clog.
Approximate Cost	Costs will vary widely depending upon the size, number and location of raised islands. For a diverter, a budget design (not attached to curb): $12,000. High aesthetic/low maintenance design (attached to curb): $40,000 (varies depending on new storm drainage construction). Landscaped median barrier with automatic irrigation: $25,000.
Other	Depending on the design, drivers may drive around the channelized area and make illegal turns or U-turns. Drivers of high-clearance private vehicles may drive through the pan-basher type of opening, generating resident complaints and the need for occasional enforcement. Parking spaces may be eliminated in the vicinity of these devices.

17. DIAGONAL DIVERTERS, FORCED TURN CHANNELIZATION, MEDIAN BARRIERS

18. ONE-WAY (HALF) STREET CLOSURES

A one-way closure is a closure to traffic in one direction only, while permitting two-way traffic on either side. This closure is best installed to prohibit entry to a street segment, rather than to prohibit exit. Its primary purpose is to eliminate shortcutting or through traffic in one direction. Access for emergency vehicles and bicycle and pedestrian access are maintained. Residents must adopt a new driving route to access the affected street. Many of the characteristics of full street closures apply to half-closures, but the latter are less extreme because they allow traffic flow in one direction. Half street closures can take the form of a simple barricade or landscaped islands. Because they only block half of the street, they are easily violated, thus generating resident complaints. Local examples: Park Boulevard north of College Avenue, Park Boulevard south of Lambert Avenue.

Traffic Volume	Eliminates all but local residential access traffic in one direction on the street on which it is installed. Potential large undesired diversions of traffic to other nearby streets. Best used where this diversion is to arterial or major collector streets.
Speed	Does not reduce speeds, per se, but eliminates part of the driver population that previously had used the street as a speedy through route. Thus, the incidence of speeding may be dramatically reduced
Noise, Air Quality, Energy Consumption	Due to reduced traffic volume on the street, noise and emissions are reduced on that street. Emissions and fuel consumption may increase due to minor detours of residential traffic.
Traffic Safety, Emergency Response	Reduces accident potential in the immediate vicinity, but may shift the potential to other streets. Emergency vehicle access is not impaired, as drivers can enter the open side of the street. For one-way sections, a minimum width of 16 feet will be maintained for one-way travel where the one-way sections are longer than 30 feet. Where the one-way section is less than 30 feet long, a minimum width of ten feet will be maintained for one-way travel. These widths are the minimum required by the Fire Department for emergency access and by the Transportation Division for normal traffic flow.
Aesthetics	Half closures may be landscaped, adding greenery where asphalt was formerly present. Required signs and reflective devices may be unattractive.
Maintenance	Every traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Depending on the design, half closures may interfere with street sweeping and gutters may clog.
Approximate Cost	Budget design (not attached to curbs): $6,000. High aesthetic/low maintenance design (attached to curb): $20,000 (higher or lower depending on new storm drainage construction).
Other	Ease of driver violation (driving the wrong way around the half closure) may result in resident complaints and may require Police Department enforcement Parking spaces eliminated in half closure locations.

19. FULL STREET CLOSURE

A street closure is a complete closure of a street either at an intersection or midblock. Its primary purpose is to eliminate shortcutting or through traffic on the local street on which it is installed. Ideally, through traffic will be mostly rerouted to streets intended for that purpose (arterials and, to a lesser degree, collectors). Access for emergency vehicles can be provided across the closure. Bicycle and pedestrian access is maintained. This is perhaps the most extreme traffic management measure in that it requires a complete detour for all drivers. Residents must adopt a new driving route to access the affected street. Street closures are discouraged by Policy T-33 of the City's Comprehensive Plan ("Keep all neighborhood streets open unless there is a demonstrated safety or overwhelming through traffic problem and there are no acceptable alternatives, or unless a closure would increase the use of alternative transportation modes.") Street closures are controversial because (i) unless carefully sited, they unbalance the traditional traffic street grid, easily diverting large volumes of traffic onto other residential streets; and (ii) they impose significant detours for local residents. Multiple street closures can create a cul-de-sac pattern similar to new suburban subdivisions, except that access is retained for cyclists, pedestrians and emergency vehicles. Street closures can take the form of a simple barricade, landscaped islands, a cul-de-sac, or a mini-park. Local examples in Palo Alto: Evergreen Park and College Terrace neighborhoods, Bryant Street at Lowell and El Verano Avenues, various locations adjacent to Embarcadero Road.

Traffic Volume	Eliminates all but local residential access traffic on the street on which it is installed. Potential large undesired diversion of traffic to other similar streets. Best used where this diversion is to arterial or major collector streets.
Speed	Does not reduce speeds, per se, but eliminates the driver population that previously had used the street as a speedy through route. Thus, the incidence of speeding is dramatically reduced.
Noise, Air Quality, Energy Consumption	Due to reduced traffic volume on the street, noise and emissions are reduced on that street. Emissions and fuel consumption may increase due to minor detours of residential traffic.
Traffic Safety, Emergency Response	Reduces accident potential in the immediate vicinity, but may shift the potential to other streets. If an opening in the closure provides emergency access with a raised block in the center ("pan basher"), fire and paramedic vehicles will encounter minimal delay, but police vehicles will not be able to pass. If access requires the unlocking of a removable bollard, delay will be substantial, and emergency drivers will usually use an alternate route. New closure designs are being pursued that should minimize delay to emergency vehicles, while greatly limiting private vehicle access. One design is an automatic retractable bollard.
Aesthetics	Closures may be landscaped, adding greenery where asphalt was formerly present. Required signs and reflective devices may be unattractive.
Maintenance	Every traffic calming device requires maintenance. Automatic irrigation decreases the need for landscaping maintenance and watering. Depending on the design, closures may interfere with street sweeping and gutters may clog.
Approximate Cost	Budget design (not attached to curbs): $12,000. High aesthetic/low maintenance design (attached to curb): $40,000 (varies depending on new storm drainage construction). Mini-park design: $100,000+
Other	Closures with emergency vehicle openings created by a low concrete block ("pan basher") may be violated by high clearance non-emergency vehicles, generating resident complaints and need for occasional police enforcement. Parking spaces eliminated in closure locations.

A Review of Current Traffic Calming Techniques By T. Harvey (HETS)

http://www.its.leeds.ac.uk/projects/primavera/p_calming.html

Contents, Abstract, Introduction, Background, Traffic Calming Techniques, Traffic calming on links, Traffic calming at junctions, Gateways Traffic management measures, Traffic calming on main roads, Effectiveness of Traffic Calming Measures, Speed reduction, Accident reduction, Noise reduction, Air, pollution, Public Consultation, The Cost of Traffic Calming, Conclusions, References, Appendix A: Examples of Traffic Calming on Main Roads Appendix References

Canadian Guide to Neighborhood Traffic Calming

http://www.tac-atc.ca/programs/calming/calming.htm

- Chapter 1 provides an introduction to traffic calming, highlighting the key issues affecting planning, design and implementation.
- Chapter 2 describes how the community, elected officials and municipal staff can participate in a meaningful and effective way in a traffic calming study.
- Chapter 3 provides information and a process to assist in screening and selecting the most appropriate measures to resolve a particular transportation problem. The chapter describes 25 different measures currently used by Canadian municipalities to calm traffic, which include vertical deflection, horizontal deflection, obstruction and signing measures.
- Chapter 4 provides detailed design guidelines for the 16 traffic calming measures carried forward from Chapter 3. The chapter begins with a discussion of the general factors to be considered in the design phase, including the implications of grades, long vehicles, surface drainage, maintenance, materials, street-scaping, and temporary installations. The remainder of the chapter provides detailed geometric, signing and pavement marking design guidelines.

Citizens Alliance for Livable Municipalities, Wakefield Chapter

http://ourworld.compuserve.com/homepages/kbarrett/calmwake.htm

- Improving the quality of life through formation of a safer, community-enriching and environmentally friendly transportation system
- How to Start a Traffic Calming Group in Your Town
- A group of concerned Wakefield Massachusetts citizens working to preserve and restore the peacefulness, vitality, attractiveness, and safety of our community, which is threatened by excessive speed and volume of automobile traffic.
- Advocate for: traffic calming for slower, safer speeds, reducing the volume of traffic and demand for parking, improving conditions for walking and bicycling.
- Issues and Potential Projects
- Send email to CALM Wakefield (74650.120@compuserve.com)

City of Albuquerque, New Mexico

Neighborhood Traffic Management Program

http://www.cabq.gov/streets/ntmp.html

- Citizen Involvement, Policies, Objectives, Types of Projects : (1) Local Street Improvement Projects, (2) Neighborhood Area Studies, (3) Collector Speed Control Projects

City of Austin, Texas

Transportation Department

http://www.ci.austin.tx.us/roadworks/

City of Bellevue, Washington

http://www.ci.bellevue.wa.us/transportation/Traffic/neighbor.htm

- What is the Neighborhood Traffic Control Program?
- Why would our neighborhood want to participate?
- Possible Phase I solutions
- What types of physical devices are used in Phase II?

City of Berkeley, California

Public Works Department

http://www.ci.berkeley.ca.us/pw/traffic/traffic.html

- Traffic: Design Features, Traffic Calming Devices
- Parking: Parking Restrictions, Parking Requirements – Plan, Residential Permit
- Parking Program
- Other: Speed Limit, Block Party Activity
- Traffic Volume Counts
- Map
- Truck Routes

City of Boulder, Colorado

Neighborhood Traffic Mitigation Program

http://www.ci.boulder.co.us/publicworks/depts/tr7.html

- Your Neighborhood Traffic Mitigation Program
- About the NTMP - General Information
- Background Information
- NTMP Educational Resources
- Enforcement - Photo Radar And Photo Red Light Information
- Traffic Mitigation Device Explanations & Evaluations
- Traffic Mitigation Device Locations

City of Broken Arrow, Oklahoma

Traffic Calming Program

http://www.city.broken-arrow.ok.us/trafcalm.htm

City of Buffalo, New York

Neighborhood Traffic Calming

http://www.buffnet.net/~allemand/TC.html

City of Cambridge, Massachusetts

Cambridge Traffic Calming Program

http://www.ci.cambridge.ma.us/~CDD/envirotrans/trafcalm/index.html

- Current and Previous Projects
- Bibliography of Traffic Calming Works

City of Cupertino, California

Neighborhood Traffic Management

http://www.cupertino.org/traffic/NTM.html

- Neighborhood traffic management is a high priority goal for the Cupertino City Council. We want to have livable neighborhoods that are free from traffic impacts. Staff is available to help neighborhoods to resolve their traffic concerns in a public review process.
- Traffic calming goals
- Traffic calming objectives

City of Fairfax, Virginia

http://www.ci.fairfax.va.us/Services/PublicWorks/NeighborhoodTraffic.htm

- Policy For Use Of Traffic Calming On City Streets - City of Fairfax, Virginia
- Installation of Residential Traffic Calming (RTC) Devices
- Residential Traffic Calming Devices

City of Fort Worth, Texas

Department of Public Works
Speed Humps Project

http://ci.fort-worth.tx.us/tpw/speedhumppilot2.htm

City of Houston, Texas

Department of Public Works and Engineering

http://www.ci.houston.tx.us/departme/works/

- Speed Hump Policies and Procedures

City of Las Vegas, Nevada

Department of Transportation
Speed Humps

http://www.ci.las-vegas.nv.us/speed_bumps.htm

City of Missoula, Montana

Traffic Calming Program

http://www.ci.missoula.mt.us/publicworks/calming.htm

City of New York, New York

http://www.ci.nyc.ny.us/html/dot/html/faq/faqs.html#slowing_down_traffic

FAQ: Slowing Down Traffic: Traffic Calming Information
Q: What is the difference between a speed hump and a speed bump?
Q: How can I get a speed hump installed on my block?
Q: How can I have a mid-block crosswalk installed on my street?

City of Portland, Oregon

Traffic Calming Program

http://www.trans.ci.portland.or.us/Traffic_Management/trafficcalming/

- How it Works
- Traffic Calming Devices
- Portland Project Evaluations
- Traffic Calming and the Law
- Current and Future Projects
- New Traffic Calming Research
- Studies and Reports
- Traffic Calming Calendar
- Program Info and Staff

City of San Buenaventura, California

Neighborhood Traffic Management and Calming Program

http://www.ci.ventura.ca.us/cityhall/publicworks/bro_traffmanage.htm

What You Need To Know About The Neighborhood Traffic Management and Calming Program

City of San Francisco, California

- Livable Streets Program
- Traffic Calming Guidelines

http://www.ci.sf.ca.us/dpt/livablests.htm

City of Tempe, Arizona

Traffic Management Program

http://www.tempe.gov/traffic/trafmgnt.htm

- This plan has the goals, policies, guidelines for placing traffic calming devices in the city.

Federal Highway Administration

Flexible Design/ Traffic Calming

http://www.fhwa.dot.gov/environment/calming2.htm

- To help meet that challenge, the FHWA has prepared a guide, "Flexibility in Highway Design", for the purpose of provoking innovative thinking for fully considering the community values and scenic, historic, aesthetic, and other cultural values, along with the safety and mobility needs of our highway transportation system. The Guide does not establish any new or different geometric design standards or criteria for highways and streets in scenic, historic, or otherwise environmentally or culturally sensitive areas, nor does it imply that safety and mobility are less important design considerations. Instead, it should be used as a companion to the AASHTO "Green Book" helping highway project managers accommodate these various and often conflicting values when solving transportation needs.

Fehr & Peers Associates. Inc - Transportation Consultants

http://www.trafficcalming.org/

- Your complete guide to traffic calming and neighborhood traffic management, and how they can be used to reduce speeds, reduce traffic volumes, and improve safety in residential neighborhoods.

  This informational traffic calming site is provided as a pubic service to city and county public works officials, residents, motorists, and anyone else interested in finding out about traffic calming: what it is, where it has been one, how well it works, etc.

  How is Fehr & Peers Associates involved in Traffic Calming? The information on this site is drawn primarily from Traffic Calming State of Practice, by Reid Ewing, written for the Institute of Transportation Engineers with funding from the Federal Highway Administration.

Institute of Transportation Engineers

http://www.ite.org/traffic/index.html

- Calming Measures, Library, Seminar Materials, Events, Selected Materials, Discussions, Other Links

Linden Hills Neighborhood - Traffic Calming and Bicycle Plan

http://freenet.msp.mn.us/ip/nhoods/mpls/linden/transtop.htm

- Part I: Purpose and Background Information - pages 1-13
- Part II: Problems, Neighborhood-Suggested Solutions & Staff Recommendations: pages 14-41

Montgomery County, Maryland

Maryland Department of Public Works and Transportation
Residential Traffic Calming Program

http://www.dpwt.com/TraffPkgDiv/triage.htm

- Speeding and unsafe driving practices on residential streets have become increasing concern to County residents and to the government agencies charged with ensuring traffic safety. Excessive speeds jeopardize both the safety and "liveability" of our neighborhoods. The Department of Public Works and Transportation (DPWT) and the Department of Police have cooperatively implemented a comprehensive residential speed control program which enlists community residents in helping to solve the speeding problem and improve the residential environment. The program includes the three components necessary to successfully reduce speeding: education, engineering and enforcement.

- DPWT and the police provide traffic safety services for over 1600 miles of residential streets. In order to provide the most effective service for these streets given resources, we have developed a triage system for addressing excessive speed on residential streets: Low Volume: Local Traffic Streets, Moderate Volume: Collector Streets, Higher Volume: Collector Streets.

Neighborhood Traffic Calming Program For Residential streets

http://ftp.std.com/NE/brookline/tcexcerpt.html

Town of Brookline, Massachusetts, September 1995 Author: Nancy Sabol Conger

- This document was part of a Community Service Fellowship which studied the concept of Traffic Calming as initiated by the Salisbury Road/Corey Farm Neighborhood Association. The fellowship was funded by the Harvard University Graduate School of Design, The Town of Brookline Public Works Department, the Salisbury Road/Corey Farm Neighborhood Association (SRCFNA) and the Brookline Community Fund.

TLCNET: The Transportation for Livable Communities Network

http://www.tlcnetwork.org/resource.html

On-line resources:

- Institute of Transportation Engineers, American Association of State Highway and Transportation Officials*, Bicycle Federation of America/Bicycle and Pedestrian Clearinghouse Surface Transportation Policy Project*, Train Riders Northeast Transportation Alternatives (Greater New York City bicycle and pedestrian advocates) Flora Community Web Site Metro Magazine's Transit Center National Trust for Historic Preservation Transportation Research Board U.S. Department of Transportation*, Cars and Their Environmental Impact Federal Transit Administration American Public Transit Association Local Government Commission/Center for Livable Communities Sustainable Communities Network LUTRAQ (1000 Friends of Oregon's Land Use, Transportation, Air Quality Project) Pedestrian Network*, Congress for the New Urbanism City of Portland Traffic Calming Information Site
- Email Listserv
- New and Commentary on Transportation
- Community Bulletins

Traffic Calming in Australia, Canada, and Europe

http://www.usroads.com/journals/p/rilj/9801/ri980105.htm

- Traffic calming truly has become an issue of international significance. It has been a focus of debate in the United States, Australia, Canada, and many European countries. Transportation professionals from several countries discussed their approach to traffic calming in the July 1997 issue of the *ITE Journal*.

TRANSPEED

Transportation Partnership in Engineering Education Development
Traffic Calming – Techniques and Management

http://www.engr.washington.edu/~uw-epp/Transpeed/trc.html

Web cams of Traffic Sites

http://www.looksmart.com/eus1/eus53832/eus62416/eus328828/eus142577/eus277666/eus290108/r?l&izl&pin=991228x5c2be87663f4bd0baa1&

Americans Against Traffic Calming

http://www.io.com/~bumper/ada.htm

This Traffic calming website is produced in Austin Texas and is for all Americans and the world. We are citizens from all walks of life putting out the call for much needed Traffic Calming "Reform"

Traffic Calming in Charlottesville

http://www.charlottesville.org/government/trafcalm.html

- What is traffic calming?
- What are the objectives of traffic calming?
- What traffic calming measures are available?
- What is the procedure for requesting traffic calming measures?
- Who to contact about traffic calming?
- Link to Institute of Transportation Engineers Traffic Calming for Communities web site.

Extensive Traffic Calming Bibliography

http://www.ci.cambridge.ma.us/~CDD/envirotrans/trafcalm/bibliography.html

Search Results Page for Traffic Calming Web Sites

http://google.yahoo.com/bin/query?p=Traffic+Calming&hc=0&hs=4