Mid-Block Speed Control: Chicanes and Speed Humps

by John C. Marek and Shauna Walgren

As the City of Seattle's arterial routes get congested, motorists look for quicker routes, often choosing to use non-arterial streets through residential neighborhoods. This has led to increased demand from communities for traffic calming devices to be installed on their neighborhood streets.

Seattle has had an active Neighborhood Traffic Control Program since the early 70's. To date, the City has installed over 700 traffic control devices, mostly traffic circles. Although a traffic circle may be the preferred traffic calming device, there are some locations where traffic circles are not a viable option. At these locations, Seattle has looked to other devices for mid-block speed control to address community concerns. Two of these devices are chicanes and speed humps.

To date, Seattle has installed chicanes at thirteen locations and speed humps at eight locations Using information gathered from case studies, this paper will present information on Seattle's experience with chicanes and speed humps.

CHICANES

Chicanes are a series of two or three curb bulbs, placed on alternating sides of the street and staggered to create a curved one-lane segment of roadway. Chicanes help reduce vehicular speeds by requiring motorists to maneuver through the curb bulbs, one vehicle at a time. The spacing between the curb bulbs and the distance they extend into the roadway determine how easily motorists will be able to maneuver through the chicanes. Chicanes can also have a calming effect on streets (particularly if they are landscaped) by creating a visual narrowing of the street that enhances the local neighborhood appearance.

This section will present detailed information on the following three case studies:

- NE 70th Street between 12th Avenue NE and 15th Avenue NE
- NW 55th Street and NW 56th Street between 3rd Avenue NW and 1st Avenue NW
- NE 98th Street between 20th Avenue NE and 23rd Avenue NE

NE 70th Street

In 1983, residents on NE 70th Street began an organized effort to reduce the negative impacts on their street caused by high volumes and speeds. Much of this traffic was cutting through the neighborhood rather than using the arterial streets a few blocks to the north and south. City staff worked with the community to evaluate various options, including turn restrictions or a full street closure. Because of the negative impacts, City staff recommended the installation of chicanes as a less restrictive device.

In 1984, two sets of chicanes were installed. Each set consisted of three curb bulbs extending approximately 13 feet into the street (figure 1). The bulbs were spaced 50' to 80' apart, with the two sets of chicanes located 420 feet apart.

Figure 1. Chicanes on NE 70th Street

NE 55th and 56th Streets

In the summer of 1991, the West Phinney Ridge Neighborhood began creating an operational plan for traffic calming devices on Phinney Ridge. The community was particularly concerned with NW 55th St. and NW 56th St. as these streets were being used by cut-through traffic rather than the arterial one block to the south.

In June of 1992, two sets of chicanes were installed on these streets. Each set consists of three landscaped curb bulbs spaced approximately 60 feet apart, narrowing the roadway to a 12 foot travel lane. The distance between the sets of chicanes is approximately 300 feet. The chicane design was somewhat problematic due to the slope, curvature of the road, and number of driveways.

NE 98th Street

In March of 1988, a traffic circle was installed at the "T" intersection of 20th Ave. NE and NE 98th St. to calm the high traffic speeds and discourage cut-through traffic. Even with the installation of the traffic circle, studies showed high volumes and speeds. As a result, the City installed a chicane in 1994. The chicane was installed 450 feet east of the existing traffic circle and consisted of three landscaped curb bulbs. The bulbs were spaced approximately 75 feet apart. This chicane was also somewhat problematic as it was installed on a 23 foot wide unimproved asphalt street (figure 2.

Figure 2. Chicanes on NE 98th Street

SUMMARY OF CHICANE RESULTS

Table 1 illustrates the results of the before and after speed studies. It can be seen that chicanes have significantly reduced speeds of vehicles traveling through the device. The 85th percentile speeds were reduced by 8 to 12 mph. Because an "After" study was not conducted at the chicane on NE 98th Street, data was not available to compare the initial change in speeds. However, based on a study completed in 1998, these speeds were reduced by 13 mph. Results of the 1998 studies for the remaining locations, show that while there was a slight increase in speeds of 1 to 3 mph after the chicanes had been in place for a few years, speeds remained 18 to 35% lower than before installation. The slight increase may reflect motorists familiarity with the devices after having driven through them repeatedly.

Table 1. Before and After Speeds Within the Chicane Case Studies

SPEEDS INSIDE CHICANES 85th Percentile (MPH)					
Location	Before (mph)	After (mph)	Change (mph)	1998 (mph)	Change (mph)
Northeast 70th Street	26	16	-10	18	-8
Northwest 55th Street	31	19	-12	20	-11
Northwest 56th Street	28	20	-8	23	-5
Northeast 98th Street	39	na	na	26	-13

Table 2 shows that chicanes reduce speeds between sets of devices. While not as great as within the device itself, the speeds between sets of chicanes have been reduced up to 8 mph, or 28%. Northwest 55th and 56th Streets show the greatest change with reductions of 6 to 8 mph. This may be due in part to the relative close spacing between the curb bulbs and the short distance between chicanes. As with speeds inside the chicanes, the speeds outside the chicanes increased slightly for two of the locations after having been in place for a few years. However, all of the speeds are lower than before installation and close to the 25 mph speed limit.

Table 2. Before and After Speed Studies Outside the Chicane Case Studies

SPEEDS OUTSIDE CHICANES 85th Percentile (MPH)					
Location	Before (mph)	After (mph)	Change (mph)	1998 (mph)	Change (mph)
Northeast 70th Street	28	29	1	27	-1
Northwest 55th Street	28	20.2	-7.8	23	-5
Northwest 56th Street	30	24	-6	26	-4
Northeast 98th Street	39	36	-3	33	-6

Volume Results

Traffic volumes were monitored before and after the chicanes were installed. As shown in table 3, chicanes proved to be very effective at reducing the volumes on some of the streets. On NE 70th Street, the average weekday traffic (AWDT) dropped 909 vehicles per day, a 48% decrease. There may have been several factors which contributed to this large reduction. Maneuvering through the chicanes may have reduced the comfort level of some motorists, encouraging them to take an alternative route. The curb bulbs also altered the visual appearance of the street, giving some motorists the impression that the street may have been closed. While volumes on NE 70th were significantly reduced, the adjacent streets experienced little or no change. The lack of traffic diverted to adjacent streets may be attributed to the easy alternative routes on nearby arterials.

Table 3. Before and After Volumes for Chicane Case Studies

VOLUMES ON CHICANE ROUTES Average Weekday Traffic (AWDT)					
Location	Installation Date	Before (AWDT)	After (AWDT)	Change vpd*	Change %
Northeast 70th Street	10-'84	1902	993	-909	-48
Northwest 55th Street	06-'92	1900	1300	-600	-32
Northwest 56th Street	06-'92	1380	790	-590	-43
Northeast 98th Street **	12 -'94	1965	1993	28	1

* Vehicles per Day (vpd)

** "Before" volume based on EB volume and historic split of EB and WB volumes

It is interesting to note that the volume on NE 98th Street remained relatively unchanged. This may be explained by the fact that there are no easy alternative routes. Motorists continue to use this route, but at a lower speed.

Table 3 also shows that volumes dropped substantially on both NW 55th and 56th Street. On NW 55th Street, the AWDT was reduced by 600 vehicles per day (vpd). Similarly, the AWDT on NW 56th Street dropped by 590 vpd. For this case study, before and after data was also collected on several nearby local streets. The results shown in figure 3 indicate that some of these streets experienced a slight increase in traffic. However, similar to NE 70th Street, the volumes remained below the city-wide average and no complaints were received from residents. It is believed that traffic was not diverted for two reasons, 1) other traffic calming devices were installed on adjacent neighborhood streets and 2) there is a relatively easy arterial alternative route.

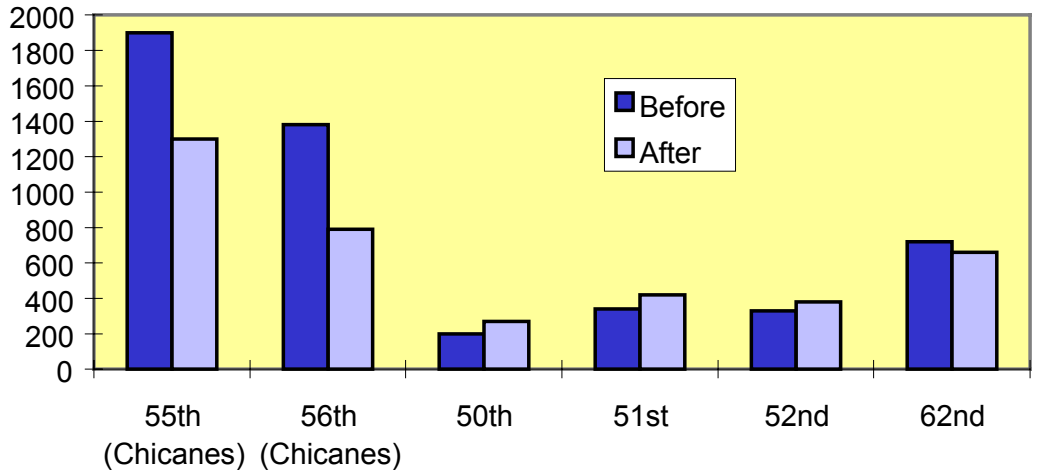

Figure 3. Before and After Volumes for the 55th and 56th St. Chicane Case Studies

An important observation in the speed analysis for the chicanes on NW 55th and 56th Street is the reduction in high end speeders, shown in figure 4. The number of motorists exceeding the speed limit of 25 mph dropped from 50% to 19% on NW 55th Street and from 39% to 3% on NW 56th Street. This is due to the fact that the chicanes

require motorists to make a turning maneuver to travel through the chicanes, making it more difficult to pass through them at higher speeds.

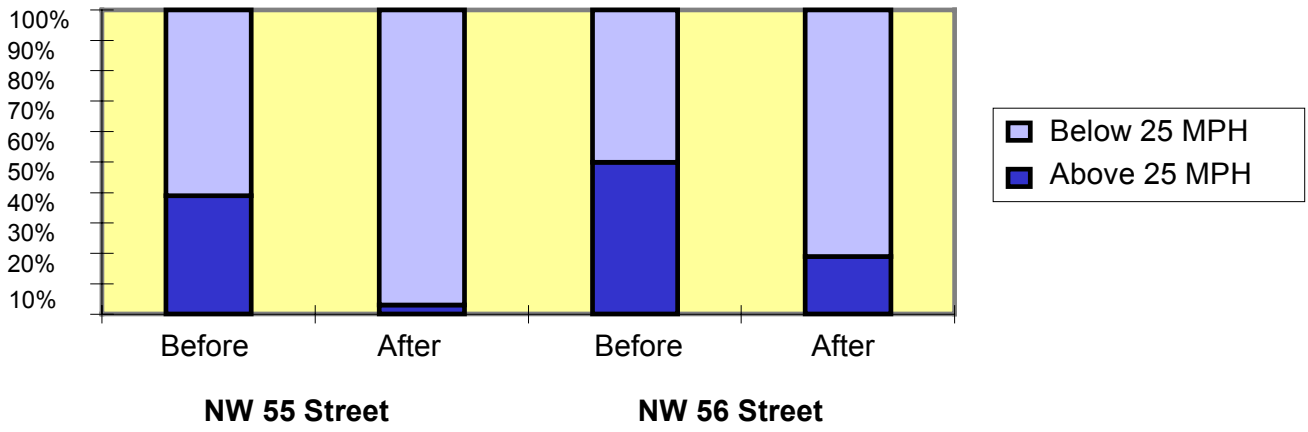

Figure 4. Before and After Speeds at the NW 55th and 56th Street Chicanes

SPEED HUMPS

In 1993, the City of Seattle began experimenting with speed humps. Similar to other jurisdictions, Seattle tested 2 types of humps, the Seminole and Watts style humps. The Seminole humps have six foot long ramps rising to a ten foot long, three inch high, level center. The Watts humps are 12 feet long with a three inch rise in the center. Both styles of humps extend the width of the roadway and taper for drainage at the curbs or street edge

Seattle has installed a series of speed humps at eight locations. This section will present information on the following four case studies:

- Fremont Avenue N between N 105th Street and N 112 Street

- First Avenue NE between NE 85th Street and NE 92nd Street
- 18th Avenue SW between SW Myrtle Street and SW Dawson Street
- 21st Avenue SW between SW Myrtle Street and SW Dawson Street

Fremont Avenue N

In February of 1993, four Watts speed humps were installed on Fremont Ave. N. The installation was part of a test conducted by the City to determine the effectiveness of speed humps. The location was chosen because of excessive speeds and cut-through traffic. In addition, the intersections along this route were not typical four-way intersections where traffic circles could be installed. The humps were installed 326 feet to 553 feet apart on this level, 22.6 foot wide asphalt street. Each hump was marked with chevron striping and an advanced warning sign. Posts were installed on the shoulder at those locations where motorist might attempt to drive around the hump.

First Avenue N

In conjunction with the installation of speed humps on Fremont Ave. N, First Ave. N was also selected to participate in the City's testing of speed humps. Similar to Fremont Ave. N, the community was concerned with excessive speeds and cut-through traffic. In February of 1993, four Seminole speed humps were installed on this level, 23.3 foot wide street. The humps were spaced 371 feet to 482 feet apart.

18th Avenue SW

As part of an operational plan for the neighborhood, the City of Seattle considered installing traffic control devices on 18th Ave. SW between SW Myrtle St. and SW Dawson St. This 19.7 foot wide asphalt street was experiencing cut-through traffic as motorists used the street to bypass a nearby parallel arterial. Because of the relatively few number of intersections on this route, speeds were high and traffic circles were eliminated as an option. In 1994, ten Watts humps were installed 330 feet to 973 feet apart.

21st Avenue SW

In conjunction with the speed humps installed on 18th Ave. SW, speed humps were also installed on 21st Ave. Similar to 18th Ave. SW, the community was concerned with excessive speeds and cut-through traffic from motorists bypassing the nearby arterial. In 1994, 12 speed humps were installed on this street. Ten of these were the Watts style and two were the Seminole style. The humps were spaced 371 feet to 482 feet apart on this level, 23.3 foot wide street.

SUMMARY OF SPEED HUMP RESULTS

Table 4 illustrates the results of before and after speed studies taken between speed humps. The table illustrates that reduction in speeds between humps is similar for the Seminole and Watts humps. The Seminole humps on 1st Ave. NE reduced the 85th

Percentile speeds by 2 to 6 mph. Similarly, the Watts humps produced a consistant decrease in speeds of 4 to 7 mph.

Table 4. Speed Reduction Between Speed Hump After Installation

SPEEDS BETWEEN THE SPEED HUMPS 85 Percentile					
Location	Type of Speed Hump	Direction	Before (mph)	After (mph)	Reduction
1 Av NE	Seminole	North	38	36	2 mph (5%)
		South	41	35	6 mph (15%)
Fremont Av N	Watts	North	35	29	6 mph (17%)
		South	35	31	4 mph (11%)
21 Av SW	Mixed	North	36	30	6 mph (17%)
		South	35	29	6 mph (17%)
18 Av SW	Watts	North	38	31	7 mph (18%)
		South	35	29	6 mph (17%)

Table 5 shows the speed at which motorists travel over the speed humps. This table shows that the Watts style speed humps, installed on Fremont Ave. N, appear to be more effective at reducing speeds at the hump. The Watts humps decreased speeds at the hump by 11 mph compared to the Seminole humps speed reduction of 9 mph.

Table 5. Speeds On and Between Speed Humps

	Speeds (mph)	
Speed Humps	**Before Speed**	**On humps**
1 Av NE	38	29
Freemont Av N	35	24

VOLUMES

Traffic volume studies were conducted before and after speed hump installation. The results of the changes in the AWDT are shown on Table 6. These results indicate that volumes were significantly reduced at two locations, Fremont Ave. N and 21st Ave. SW. Watts humps were installed at both of these locations. The reduction in volume on Fremont Ave. N may have been caused by the relatively easy alternative arterial routes. The Seminole humps installed on First Ave. NE appear to have had little effect on volumes. Because these locations did not appear to have alternative non-arterial routes, any traffic diverted was assumed to have moved to the arterial routes.

Table 6. Volume Reduction After Speed Hump Installation

Volumes at Speed Hump Locations Average Weekday Traffic (AWDT)				
Location	Type of Speed Hump	Before	After	Reduction
1 Av NE	Seminole	475	433	9%
Fremont Av N	Watts	1506	859	43%
21 Av SW	Mixed	879	632	28%
18 Av SW	Watts	1359	1343	1%

EMERGENCY VEHICLE RESPONSE FOR MIDBLOCK CONTROL

The Seattle Fire Department conducted tests on the NE 70th St. chicanes to study the effect the devices had on emergency vehicles. The Fire Department concluded that the chicanes increased their response time and they could experience major delays should they meet another vehicle negotiating the chicane. In addition, access for the Fire Department's larger trucks was limited due to residents parking within the chicane and the wooden barriers which were placed on the curb bulbs.

As a result of the input from the fire department, future chicanes were constructed with 2 foot wide mountable curbing,(figure 5) to allow emergency vehicles to drive over the curb more easily if needed. In addition, parking is not allowed inside the chicanes. All chicanes are run by the fire department, and to date, they have not expressed concern on other locations.

Figure 5. Two Foot Mountable Curb

The City of Seattle conducted a drive through test on the speed humps located on 1st Ave. NW and Fremont Ave. NW. The test evaluated the comfort level of various types of vehicles, including emergency vehicles, traveling over the two types of humps. Based on a 25 mph speed, the fire department rated the Seminole-style hump as uncomfortable to drive over, while the Watts style hump was rated as extremely uncomfortable. Although the studies did not measure the effect on emergency response time, the fire department is concerned with the number of traffic control devices and reviews every speed hump location.

COMMUNITY PERCEPTION OF EFFECTIVENESS

Because most of Seattle's mid-block traffic control devices included extensive work with the community, the resident's perception of the effectiveness of these devices is very important. After the construction of the chicanes on NE 70th St, residents were surveyed on the effectiveness of the devices. The surveys had a 68% return rate and indicated the following:

- 79% thought that chicanes reduced speed
- 53% thought that chicanes reduced volumes
- 64% thought that chicanes increased safety
- 58% favored permanent installation

It is interesting to note that the majority of the residents thought that speeds were reduced, while the studies indicated the speeds did not change. Also, only 53% of the residents believed that the volumes were reduced, when the studies showed that, in fact, volumes had been reduced by 48%.

The majority of residents on NW 55th Street and NW 56th Street were also satisfied with the chicanes installed on their street. However, one set of chicanes on NW 56th Street was eventually removed. Some community members were unhappy with this set, primarily because they had difficulty entering and exiting their driveway. Other residents eventually supported the removal after a car slid on some ice, went through the chicane, and into a parked car.

A resident survey was also conducted after the installation of the Seminole humps on First Ave. NE and the Watts humps on Fremont Ave. N. The survey return rate was 77% for the Seminole humps and 73% for the Watts humps. The survey shown in table 7, indicates that only 41% of the residents with the Watts speed humps believed volumes were reduced. This is surprising because the traffic volume actually decreased 43 percent. The survey also indicated that 47% of residents felt that noise levels decreased with the installation of the Watts humps, compared to only 10% of the residents adjacent to the Seminole humps.

Table 7. Survey Responses of Seminole and Watts Speed Humps

Resident Survey for Speed Humps		
	Seminole	Watts
Reduced Speeds	60%	94%
Reduced Volume	20%	41%
Increased Safety	65%	75%
Increased Noise	5%	19%
Decreased Noise	10%	47%
Favor Keeping Humps	80%	84%

CONCLUSION

Both chicanes and speed humps are used in Seattle as mid-block speed control. Although one is not necessarily better than the other, there are advantages and disadvantages to each. Based on our experience with chicanes we have found they have been very effective at reducing high-end speeders and bringing mid-block speeds closer to the non-arterial limit of 25 mph. Chicanes have also lowered cut-through traffic and encouraged motorists to use nearby arterial routes. Another important characteristic of chicanes is that they visually change the appearance and character of a street, thus changing driver's perception.

Some of the disadvantages of chicanes are that they are relatively expensive devices to install. The cost for installing chicanes is approximately $14,000 for one set of 3 concrete bulbs and $8,000 for 3 bulbs constructed with precast traffic curb and asphalt. Chicanes can also be problematic to design, especially with regards to curb bulb location and driveways. Other disadvantages include increasing emergency response time and reducing available on-street parking.

Seattle's experience with speed humps has shown that the Watts style hump is also an effective tool for reducing speeds on local streets. Speed humps may also reduce volumes if an easy alternative arterial route is available. Speed humps are easier to locate and less likely to conflict with driveway locations. The relative low cost of speed humps also make them more feasible to install.

One disadvantage with speed humps that Seattle has experienced is that, when compared with chicanes, speed humps are not as effective at reducing high end speeders. Also, speed humps do not change the appearance of the street to the same extent as chicanes. Similar to chicanes, speed humps could also increase emergency response time.

Seattle has learned that, as with any traffic control devices, it is important to identify and understand what problems you are attempting to solve and to educate the community on the various trade-offs involved when making the choice installing chicanes or speed humps.

ACKNOWLEDGEMENTS

I wish to express my thanks to Jim Mundell for providing valuable assistance with this report.

John C. Marek
Traffic Engineer
Seattle Transportation
410 Municipal Building
600 Fourth Avenue
Seattle, Washington 98104-1879

Phone: 206-684-5069
Fax: 206-470-6961
E-mail: john.marek@ci.seattle.wa.us

Shauna Walgren
Transportation Planner
City of Seattle / Seattle Transportation
410 Municipal Building
600 Fourth Avenue
Seattle, Washington 98104-1879

Phone 206-684-8681