

CITY OF SEQUIM

Spring 2007

COMPREHENSIVE REVIEW OF TRAFFIC SPEED ZONES

*Coordinated by the Sequim Police Department in
Partnership with the Sequim Public Works
Department*



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May 5, 2007

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Comprehensive Review of Traffic Speed Zones

Coordinated by the Sequim Police Department in Partnership with the Sequim Public Works Department

Purpose and Scope of this Review

In fiscal year 2006, the Sequim City Council approved the funding to create a Traffic Safety Program within the Police Department. That program was to emphasize both education and enforcement. A third key component to police traffic safety programming is engineering – working with our Public Works Department, this review of traffic speed zones in the City was undertaken in order to improve the smooth flow of traffic, be attentive to collision data, and to ensure that industry standards are being followed in the setting of speed zones.

So why this extensive report to update speed limits in Sequim? Simple, both the National Criminal Justice Association (NCJA) and the National Highway Traffic Safety Administration (NHTSA) have identified the need for local law enforcement to place greater emphasis on traffic safety, speed enforcement and collision reduction efforts. The management of speed zones is a critical foundational step that guides education and enforcement actions by local police.

The purpose of the Sequim Police Department's Traffic Safety Program is to enhance both the safety and quality of life within residential neighborhoods. This can be achieved through the following means:

- **Education:** Increase awareness of residents in neighborhoods that there are traffic-related safety concerns such as excessive speeds, non-local (cut-through) traffic, and accidents.
- **Enforcement:** Encourage compliance with speed limits on local streets through speed reducing tactics provided by the Hilliard Police Department, which include, but is not limited to, traditional enforcement, the Neighborhood Speed Watch Program, and the use of speed trailers.
- **Engineering:** Evaluate the affected street for speeding, traffic volume, and accidents to determine if traffic-calming measures are warranted.

Objectives are as follows:

- Reduce vehicle speeds on residential streets
- Reduce number and severity of accidents
- Discourage non-local, or cut-through, traffic
- Encourage pedestrian and bicycle activities
- Create and/or enhance attractive streetscapes
- Establish clear guidelines of the process and procedures to evaluate traffic calming requests
- Partner with residents for the best overall program for the affected street

Because of the continuing growth of the community, new retail trade and extensive new sub-divisions, the community is facing growing stress upon its roadway system. Additionally, the number of daily vehicle trips on arterial roadways is now common to

range from 4,000 to 6,000 to 10,000 vehicles per day, depending on the specific location and time of year. Ensuring that speed zones are correctly set and that enforcement is tied to common sense enforcement standards are important expectations that the community will expect from city government.

Setting Speeds: How's That Happen?

The Washington Administrative Code (WAC) sets specific recommendations that should be used whenever a municipality sets speed limits beyond the state standard for city street speeds, which is 25 mile per hour (mph). WAC 468-95-045 cites the following information should be considered, while these are not absolutes, each of these items has been considered by City staff in reviewing each of the listed speed zones.

- The 85th percentile speed of vehicles traveling on the road;
- Road characteristics, shoulder condition, grade, alignment, and sight distance;
- The pace speed;
- Roadside development and environment;
- Parking practices and pedestrian activity;
- Reported crash experience for at least a 12 month period; and
- Other factors such as route development or comprehensive plans.

The 85th Percentile Rule

In the United States, traffic engineers may rely on the 85th percentile rule to establish speed limits. The speed limit should be set to the speed that separates the bottom 85% of vehicle speeds from the top 15%. The 85th percentile is slightly greater than a speed that is one standard deviation above the mean of a normal distribution.

The theory is that traffic laws that reflect the behavior of the majority of motorists may have better compliance than laws that arbitrarily criminalize the majority of motorists and encourage violations. The latter kinds of laws lack public support and often fail to bring about desirable changes in driving behavior. An example is the federally-mandated 55 mph (90 km/h) speed limit that was removed in part because of notoriously low compliance.

Most U.S. jurisdictions report using the 85th percentile speed as the basis for their speed limits, so the 85th-percentile speed and speed limits should be closely matched. However, a review of available speed studies demonstrates that **the posted speed limit is almost always set well below the 85th-percentile speed by as much as 8 to 12 mph**. According to the National Cooperative Highway Research Program, most agencies nationwide report using the 85th percentile speed as the basis for their speed limits, so the 85th percentile speed and speed limits should be closely matched. However, **a review of available speed studies demonstrates that the 85th percentile speed is only used as a "starting point," with the posted speed limit being almost always set below the 85th percentile value by as much as 8 to 12 mph.**

The Pace Speed

Another term which the WAC refers to and is the highest speed within a specific range of speeds that represents more vehicles than in any other like range of speed. The range of speeds typically used is 10 km/h or 10 mph.

Identifying the Difference Between Traffic Calming Initiatives verse Traffic Enforcement Goals

Traffic calming initiatives include:

- Center Island Narrowing.** A center island narrowing is a raised island located along the centerline of a street that narrows the travel lanes in each location.
- Chicanes.** Chicanes are curb extensions that alternate from one side of the street to another, forming S-shaped curves.
- Chokers.** Chokers, or “bump-outs,” are curb extensions at mid-block locations that narrow a street by widening the sidewalk or tree lawn area. Chokers also provide shorter crosswalks for pedestrians.
- Protected Parking.** Protected parking consists of parking spaces and centerline striping used to narrow the perceived roadway width from curb to curb.
- Traffic Circles.** Traffic circles are raised islands, placed in intersections, around which traffic circulates. Traffic circles used in traffic calming are distinctly different from modern roundabouts, which carry much higher volumes of traffic.
- Speed Humps.** Speed humps are rounded, raised areas placed across the roadway. They are generally 10 feet to 14 feet long (in the direction of travel), making them distinctly different from the shorter “speed bumps” that are used in parking lots.
- Raised Crosswalks.** Raised crosswalks are flat-topped speed humps, often constructed with brick or textured materials on the flat section, with crosswalk markings and signage to channel pedestrians.
- Raised Intersections.** Raised intersections are flat, raised areas covering an entire intersection, with ramps on all approaches and often with brick or other textured materials on the flat section.
- Rumble Strips.** Rumble strips are textured pavement that use stamped pavement or alternate paving materials to create an uneven surface for vehicles to traverse.

Landscaping elements can be incorporated into the use of some of the above-listed traffic calming devices, particularly the horizontal measures, which have the added benefit of street beautification. If it directly pertains to the installation of traffic calming devices, landscaping may be included as part of a neighborhood traffic calming plan, if warranted.

Speed Enforcement initiatives include:

Voluntary Compliance. Among the primary objectives enforcement is encouraging motorists and pedestrians to comply voluntarily with the laws and ordinances.

Deterrence. This is a multi-function objective – consistent enforcement by law enforcement not only raises the awareness of the driving public at the individual violator level, but it also raises awareness to the driving public as they see a police unit stopping vehicles. A secondary, but important factor is that consistent and active traffic enforcement is also a deterrent to other criminals and criminal activity who observe active law enforcement in-progress.

Radar Speed Trailers. The police department also deploys a mobile radar speed trailer that helps to alert drivers to their speed. The trailer is deployed based on citizen complaints, crash data and traffic volume.

Temporary Speed Enforcement Signage. The police department has purchased large temporary construction type signs that have been deployed during emphasis patrols that alert drivers that they are entering a “police traffic safety check area.” This is a pro-active attempt to warn drivers that police are actively making enforcement efforts. Again the emphasis is to generate voluntary compliance from the driving public.

Coordinated Emphasis Enforcement. Working in conjunction with other local law enforcement agencies, the police department participates in coordinated emphasis patrols that are coordinated statewide with the Washington Traffic Safety Commission. Some of these endeavors in the past involved using state grant dollars for officer

overtime, or regional approaches to safety such as the Highway 101 Safety Corridor which had officers from throughout the county working enforcement on the entire length of the 32 mile safety corridor and the associated arterial streets that connected to Highway 101. In Sequim this allowed enforcement off Highway 101 onto Washington Street, Sequim Avenue and River Road.

See Appendix C for additional research data on Speed Enforcement.

Multiple Speed Limits can Cause Confusion

Standardization is recommended now to avoid growing driver confusion.

Initially, this project looked at using multiple types of speed zones throughout the community ranging from 15, 20, 25, 30, 35 and 40 mph zones. Frankly, the police staff recommends against this type of confusing zoning because the average driver will find themselves in multiple zones with limited signing, placing themselves at risk of ticketing when in-fact they may just not realize what speed zone they are in.

Consequently, there was significant police staff comment and debate about limiting the number of speed zone speeds to the minimum necessary to safely move traffic through town. As a result the following speed zones are recommended:

Special Zones:

- **Alleys** 15 mph. This is a state standard and should remain.
- **School Zones** 20 mph from 7:30am to 4:30pm, Monday through Friday from September through May. The staff would also support a year round enforcement approach, but were uniformly against limiting enforcement only during a school day since that becomes confusing to the community and diffuses consistency which is important in gaining voluntary compliance by drivers.
- **Construction Zones** Variable and set by the City Engineer.

General City Speed Limit

- **25 mph** State law sets all municipal speed limits automatically at 25 mph unless otherwise posted by the City.

Arterial and Collector Speed Zone

- **30 mph** Police Staff recommends that a standard arterial speed is adopted and implemented as necessary for selected arterial and collector streets. Having multiple speed limits beyond this is unnecessary and would contribute to driver confusion and higher speed since enforcement would also be reduced. Other communities, including Seattle use this arterial speed.

Speed Zone

- **40 mph** There is only one piece of roadway that the police staff believed that this speed zone limit was applicable to at the present time – and with future development this may change. The stretch of East Washington Street from Simdars to Rhodefer includes a highway off-ramp from westbound Highway 101 that proceeds down a long straight length of roadway that presently has no significant cross traffic. In the future there will be a motel, restaurant, large apartment complex, strip mall, and Cineplex complex that may require this speed zone to be re-evaluated. Police staff found no other city roadway that could safely support this high speed.

Speed Zone Recommendations By Location

Currently Posted 20 Zones



North Blake Avenue.

Currently posted at 20 mph – Recommend change to a 25 mph residential zone..



Sequim Avenue from Washington St to Daytona. (School Zone)

Currently posted as a 20 mph School Zone from 7:30am to 4:30pm – Recommend retention of School Zone of 20 mph M-F 7:30am to 4:30pm otherwise posted as 30mph.



Sequim Avenue from Washington St to Spruce Street (School Zone)

Currently posted as 20 mph Zone from 7:30am to 4:30pm – Recommend shortening of School Zone to begin at Spruce Street. .



North 5th Street from Cedar St to Old Olympic (School Zone)

Currently posted as a 20 mph School Zone from 7:30am to 4:30pm – Recommend dropping School Zone designation and post as a 30mph arterial.



Fir St from 5th to Sequim Avenue (School Zone)

Currently posted as a 20 mph School Zone from 7:30am to 4:30pm – Recommend retention of School Zone of 20 mph M-F 7:30am to 4:30pm otherwise posted as 30mph

Hendrickson St from 5th to Sequim Avenue (School Zone)

Currently posted as a 20 mph School Zone from 7:30am to 4:30pm – Recommend retention of School Zone designation of 20 mph M-F 7:30am to 4:30pm otherwise posted as 25mph zone.

Currently Posted 25 Zones



South 3rd Avenue from Brownfield to Reservoir Rd
Currently posted as a 25 mph zone – Recommend change to 30 mph arterial.



South Sequim Ave from Brownfield to Miller Road
Currently posted as a 25 mph zone – Recommend change to 30 mph arterial.



Miller Road from East City Limits to South Sequim Avenue.
Currently posted as a 25 mph zone – Recommend change to 30 mph arterial.

Currently Posted 30 Zones



East Washington Street from Brown Road to Sequim Avenue.
Currently posted as a 30 mph zone – Recommend change to a 25 mph zone (Business District).

West Washington Street from Sequim Avenue to 9th Avenue
Currently posted 30 mph – Recommend change to a 25 mph zone (Business District).



West Washington Street from 9th Avenue to River Road.
Currently posted as a 30 mph zone – Recommend no change

Currently Posted 35 Zones



Sequim Avenue from Daytona to Old Olympic Highway.
Currently posted at 35mph – Recommended Change to 30 mph arterial.



East Washington Street from Rhodefer Street to Brown Rd
Currently posted as a 35 mph zone – Recommend change to a 30 mph arterial.



River Road from West Washington Street to Silberhorn or South City Limits.
Currently posted as a 35 mph zone – Recommend change to a 30 mph arterial.



Northbound Sequim Avenue from Old Olympic Highway to the north city limits.
Currently a split zone for 25 mph northbound and 35 mph southbound – Recommend change to a 30 mph arterial.

40 mph Speed Zones



East Washington Street from Simdars Road to Rhodefer Street.
Currently posted as a 35 mph zone – Recommend change to 40 mph zone.

Detailed Speed Zone Data By Speed Zone Type and Location

Speed Zone Location & Description	Proposed Speed	Justifications in Accordance with WAC Recommendations
CURRENTLY POSTED 20 mph		
North Blake Avenue	25 mph	A. 85th percentile: 20 to 25 mph B. Road characteristics: [] shoulder condition, <i>Curbs and sidewalks</i> [] grade, <i>Flat and straight</i> [] alignment, and [] sight distance; <i>Straight no obstructions</i> C. Pace speed; <i>20 to 25 mph</i> D. Roadside development and environment: <i>East side Blake storage and open field, Church, drive way Skateboard park driveway Carried Blake park driveway, Water reuse park driveway. West side has 6 connecting side streets, and all residential single family dwellings.</i> E. Parking practices: <i>Authorized</i> F. Pedestrian activity: <i>Consistent with a popular multi-use park, including a dog park walking trails, children equipment play ground, and picnic area. Very high volume of foot traffic.</i> G. Crash data for 12 month period: <i>None</i> H. Other Factors: <i>Not a thru street</i>
Sequim Ave from Washington St to Daytona	20 mph School Zone & 30 mph	A. 85th percentile: <i>Study not done.</i> B. Road characteristics: [] shoulder condition, <i>None, vehicles that stall usually partially block lane of traffic</i> [] grade, <i>Flat and level</i> [] alignment, and [] sight distance; <i>Straight no curves</i> C. Pace speed; <i>30 to 35 mph</i> D. Roadside development and environment: <i>4 church driveways, 4 private drives, on west side pasture land on east side with proposed 238 housing project to replace cow pasture. Hardy's Market currently located with a driveway to Sequim ave. just south of the round-a-about.</i> E. Parking practices: <i>Posted No Parking</i> F. Pedestrian activity: <i>No side walks, pedestrians walk on the roadway.</i> G. Crash data for 12 month period: <i>3 crashes in round a about</i> H. Other Factors: <i>Due to limited shoulders no sidewalks, pedestrians in roadway and future development and currently is the main road to the High School from the north.</i> Discussion on whether to enforce School Zone M-F verse all week/all year.
Sequim Ave from Washington St to Spruce St	30 mph	Modification to posted School Zone which would be removed from Washington to Spruce on Sequim Ave. Refer to same data as above.
North 5 th St from Cedar St to South of Old Olympic	20 mph School Zone & 30 mph	A. 85th percentile: <i>No study completed</i> B. Road characteristics: [] shoulder condition, <i>Curbs and sidewalks</i> [] grade, <i>Straight wide and flat</i> [] alignment, and [] sight distance; <i>Unlimited unobstructed view.</i> C. Pace speed; <i>30 to 35</i> D. Roadside development and environment: <i>Limited access residential areas, professional offices and Churches.</i> E. Parking practices: <i>No parking</i> F. Pedestrian activity: <i>Medium with school age children during afternoon, with most crossing the street.</i> G. Crash data for 12 month period: <i>8 crashes</i>

TRAFFIC SAFETY IN SEQUIM: EDUCATION + ENFORCEMENT + ENGINEERING

		<p>H. Other Factors: <i>A traffic control light will be installed and Hendrickson and 5th for safe crossing. District Court Judge Porter does not support the school zone on fifth as it does not meet the criteria of being within 300 feet of a school.</i></p> <p><i>The only location where there is no sidewalk and where pedestrians either walk into parking lot to in the street is The City of Sequim Public Works building.</i></p> <p>Discussion on whether to enforce School Zone M-F verse all week/all year.</p>
Fir St from 5 th to Sequim Ave.	20 mph School Zone & 30 mph	<p>A. 85th percentile: <i>No study completed</i></p> <p>B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Curbs and sidewalks</i> <input type="checkbox"/> grade, <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Straight and flat</i></p> <p>C. Pace speed; 25 to 30</p> <p>D. Roadside development and environment: <i>School zone, Girls and Boys club and residential</i></p> <p>E. Parking practices: <i>Curb side parking</i></p> <p>F. Pedestrian activity: <i>Majority of young children and teens.</i></p> <p>G. Crash data for 12 month period: <i>3 crashes</i></p> <p>H. Other Factors: <i>Roadway surface in poor condition.</i></p> <p>Discussion on whether to enforce School Zone M-F verse all week/all year.</p>
Hendrickson St from 5 th to Sequim Ave	20 mph School Zone & 25 mph	<p>A. 85th percentile: <i>No study completed</i></p> <p>B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Curbs and Sidewalks</i> <input type="checkbox"/> grade, <i>Flat and straight</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance;</p> <p>C. Pace speed; <i>25 to 30</i></p> <p>D. Roadside development and environment: <i>Olympic Trail on north side Middle School on Southside</i></p> <p>E. Parking practices: <i>Limited parking on south side east of Middle School</i></p> <p>F. Pedestrian activity: <i>Day time students and walkers</i></p> <p>G. Crash data for 12 month period: <i>5 crashes</i></p> <p>H. Other Factors: Discussion on whether to enforce School Zone M-F verse all week/all year.</p>
CURRENTLY POSTED 25 mph		
So 3 rd Ave from Brownfield to Reservoir Rd (So City Limits)	30 mph	<p>A. 85th percentile: 30 to 34 mph</p> <p>B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Gravel/grass</i> <input type="checkbox"/> grade, <i>Steep grade continuous to Happy Valley</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Unlimited and unobstructed</i></p> <p>C. Pace speed; 35 to 40</p> <p>D. Roadside development and environment: <i>Residential with some independent driveways</i></p> <p>E. Parking practices: <i>No parking</i></p> <p>F. Pedestrian activity: <i>Low</i></p> <p>G. Crash data for 12 month period: <i>3 crashes</i></p> <p>H. Other Factors: <i>South City Limits connects to posted 35 mph on Sequim Avenue in the County. This stretch of road has also been the subject of numerous citizen complaints requesting that the speed limit be raised.</i></p>

TRAFFIC SAFETY IN SEQUIM: EDUCATION + ENFORCEMENT + ENGINEERING

<p>So Sequim Ave from Brownfield to Miller Rd</p>	<p>30 mph</p>	<p>A. 85th percentile: <i>No study completed in the area</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Gravel shoulder south 101</i> <input type="checkbox"/> grade, <i>From 101 south drops to Alpine and then raises to Miller RD</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Unlimited unobstructed south of 101</i> C. Pace speed; <i>30 to 35</i> D. Roadside development and environment: <i>Limited access to Alpine Loop subdivision</i> E. Parking practices: <i>No parking</i> F. Pedestrian activity: <i>low</i> G. Crash data for 12 month period: <i>4 crashes</i> H. Other Factors:</p>
<p>Miller Road from East City Limits to South Sequim Ave</p>	<p>30 mph</p>	<p>A. 85th percentile: <i>Results of study not available yet</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>No shoulder</i> <input type="checkbox"/> grade, <i>East bound gradual upward grade to Bell Hill subdivision</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Straight and unobstructed view</i> C. Pace speed; <i>30 to 40</i> D. Roadside development and environment: <i>Residential and pasture land</i> E. Parking practices: <i>No parking</i> F. Pedestrian activity: <i>None</i> G. Crash data for 12 month period: <i>1 crash</i> H. Other Factors: <i>Two block portion of roadway from Token east is not in city limits.</i></p>
<p>CURRENTLY POSTED 30 mph</p>		
<p>East Washington St from Brown Road to Sequim Ave</p>	<p>25 mph</p>	<p>A. 85th percentile: <i>No study completed</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Sidewalks and curbs</i> <input type="checkbox"/> grade, <i>Flat</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Gradual long curve from Brown to Sunnyside</i> C. Pace speed; <i>25 to 30</i> D. Roadside development and environment: <i>Commercial businesses</i> E. Parking practices: <i>On street parking</i> F. Pedestrian activity: <i>high volume</i> G. Crash data for 12 month period: <i>15 crashes</i> H. Other Factors: <i>The downtown core is often the center of traffic congestion in town and is also pedestrian laden. An arterial level speed for a Downtown Business District given the close confines of vehicles, parking, pedestrians and congestion is a safety issue and arterial speeds in this area are unenforceable.</i></p>
<p>West Washington St from Sequim Ave to 9th Ave</p>	<p>25 mph</p>	<p>A. 85th percentile: <i>No study completed</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Curbs and sidewalks</i> <input type="checkbox"/> grade, <i>None</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Straight and unobstructed</i> C. Pace speed; <i>20-25</i> D. Roadside development and environment: <i>Commercial businesses</i> E. Parking practices: <i>On street parking</i> F. Pedestrian activity: <i>High volume</i> G. Crash data for 12 month period: <i>91 crashes</i> H. Other Factors: <i>Majority of the collisions occurred in the area of Safeway.</i></p>

TRAFFIC SAFETY IN SEQUIM: EDUCATION + ENFORCEMENT + ENGINEERING

		<p>The downtown core is often the center of traffic congestion in town and is also pedestrian laden. An arterial level speed for a Downtown Business District given the close confines of vehicles, parking, pedestrians and congestion is a safety issue and arterial speeds in this area are unenforceable.</p> <p><i>There may be some discussion on whether the area between 5th and 9th should remain as a posted 30 zone.</i></p>
West Washington St from 9 th Ave to River Rd	30 mph	<p>A. 85th percentile: 25 to 34</p> <p>B. Road characteristics:</p> <ul style="list-style-type: none"> <input type="checkbox"/> shoulder condition, <i>asphalt shoulder, extension of roadway</i> <input type="checkbox"/> grade, <i>Flat and straight</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Unlimited unobstructed</i> <p>C. Pace speed;</p> <p>D. Roadside development and environment: <i>2 Banks, Costco, Home Depot, Wal-Mart, Petco 2 strip malls and turn a about.</i></p> <p>E. Parking practices: <i>No Parking</i></p> <p>F. Pedestrian activity: <i>Low</i></p> <p>G. Crash data for 12 month period: <i>24 crashes</i></p> <p>H. Other Factors: <i>High density commercial access with future expansion and current construction of additional commercial property.</i></p>
CURRENTLY POSTED 35 mph		
Sequim Ave from Daytona to Old Olympic Hwy	30 mph	<p>A. 85th percentile: <i>Study not done.</i></p> <p>B. Road characteristics:</p> <ul style="list-style-type: none"> <input type="checkbox"/> shoulder condition, <i>None, vehicles that stall usually partially block lane of traffic</i> <input type="checkbox"/> grade, <i>Flat and level</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Straight no curves</i> <p>C. Pace speed; <i>30 to 35 mph</i></p> <p>D. Roadside development and environment: <i>4 church driveways, 4 private drives, on west side pasture land on east side with proposed 238 housing project to replace cow pasture. Hardy's Market currently located with a driveway to Sequim ave. just south of the round-a-about.</i></p> <p>E. Parking practices: <i>Posted No Parking</i></p> <p>F. Pedestrian activity: <i>No side walks, pedestrians walk on the roadway.</i></p> <p>G. Crash data for 12 month period: <i>3 crashes in round a about</i></p> <p>H. Other Factors: <i>Due to limited shoulders no sidewalks, pedestrians in roadway and future development and currently is the main road to the High School from the north.</i></p>
East Washington St from Rhodefer St to Brown Rd	30 mph	<p>A. 85th percentile: <i>No study completed</i></p> <p>B. Road characteristics:</p> <ul style="list-style-type: none"> <input type="checkbox"/> shoulder condition, <i>Gravel</i> <input type="checkbox"/> grade, <i>slight from east to west</i> <input type="checkbox"/> alignment, and <i>Straight</i> <input type="checkbox"/> sight distance; <i>Unlimited unobstructed</i> <p>C. Pace speed <i>35 to 40</i></p> <p>D. Roadside development and environment: <i>New home, apartments, theater and current QVC market</i></p> <p>E. Parking practices: <i>No parking</i></p> <p>F. Pedestrian activity: <i>Olympic trail</i></p> <p>G. Crash data for 12 month period: <i>12 crashes</i></p> <p>H. Other Factors: <i>High volume of left turns to West Sequim Bay from Washington.</i></p>

TRAFFIC SAFETY IN SEQUIM: EDUCATION + ENFORCEMENT + ENGINEERING

<p>River Rd from West Washington St to Silberhorn and South City Limits</p>	<p>30 mph</p>	<p>A. 85th percentile: <i>No study completed</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>No shoulders curbs and side walks north of 101</i> <input type="checkbox"/> grade, <i>Straight and flat</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Unlimited and unobstructed view</i> C. Pace speed; D. Roadside development and environment: <i>Business, Hotel, Restaurants for one block, residential to Silberhorn with future subdivisions on the east side of River Rd.</i> E. Parking practices: <i>No parking</i> F. Pedestrian activity: <i>Low</i> G. Crash data for 12 month period: <i>7 crashes</i> H. Other Factors:</p>
<p>N/B Sequim Ave from Old Olympic Hwy to North City Limits</p>	<p>30 mph</p>	<p>A. 85th percentile: <i>39 to 44</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Gravel</i> <input type="checkbox"/> grade, <i>Straight and flat</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>unobstructed view</i> C. Pace speed; <i>35 to 40</i> D. Roadside development and environment: <i>Church, two new limited access subdivisions, two connecting local streets.</i> E. Parking practices: <i>No parking</i> F. Pedestrian activity: <i>Increased pedestrians walking from Sun Land area to Hardy's market, joggers and bicyclists</i> G. Crash data for 12 month period: <i>1 crash</i> H. Other Factors: <i>Before this was annexed into the city and increased construction the speed was 50 mph, the citizens who have live north in the county have had a difficult time slowing down to 25 mph at the city limits.</i></p>
<p>40 mph SPEED ZONES</p>		
<p>East Washington Street from Simdars Rd to Rhodefer St</p>	<p>40 mph</p>	<p>A. 85th percentile: <i>35 to 44 mph</i> B. Road characteristics: <input type="checkbox"/> shoulder condition, <i>Gravel and Asphalt</i> <input type="checkbox"/> grade, <i>Slight grade upward from west to east</i> <input type="checkbox"/> alignment, and <input type="checkbox"/> sight distance; <i>Straight and unobstructed view</i> C. Pace speed; <i>35 to 45</i> D. Roadside development and environment: <i>Olympic trail, proposed new Hotel, restaurant.</i> E. Parking practices: <i>No parking</i> F. Pedestrian activity: <i>Olympic trail walkers, bicyclists, and joggers.</i> G. Crash data for 12 month period: <i>1 crash</i> H. Other Factors:</p>

Speed Enforcement: Enforcement Tolerances

Rarely are enforcement criteria discussed outside of the law enforcement community. Whether it is because no one wants to publicly notify the driving public of exactly what speed might trigger an enforcement contact or the issuance of a citation, or the reality that the law grants police officers the ability to look at the totality of the circumstances present for each potential contact and citation or if law enforcement has been slow to share this data – this report broaches this topic since enforcement - fair, common sense enforcement is a targeted goal for the police department's traffic safety program.

Traffic enforcement in Sequim is based upon the simple premise of having police officers use the lowest level of enforcement to gain the highest level of voluntary compliance to the law by the driving public. In this environment, verbal warnings, written warnings and citations are given equal value.



"Enforcement is just aspect of our community's traffic safety program. Having a common sense, coordinated speed posting program based on thoughtful research and involvement by citizens, elected officers and professional staff is a key to the rest of our safety and policing efforts."

Sgt Ken Almberg Traffic
Traffic Program Manager

Speed limit enforcement often begins at a small amount above the speed limit. For example, speeding citations for 1 unit (mph or km/h) above the limit are exceedingly rare. In certain cases, such as Houston, Texas, only 1% of speeding citations are for less than 10 mph (16 km/h) above the speed limit (Houston Chronicle, "It's really true: Drivers going less than 10 mph over limit rarely ticketed", November 24, 2002).

In the United States, speeding enforcement tolerance is usually up to the discretion of the arresting officer. A small tolerance is almost always allowed even where traffic signs advise "NO TOLERANCE." Some states have official tolerances, such as Pennsylvania. As per state law, one cannot be cited by an officer using a radar/laser gun for traveling less than 10 mph over a speed limit of less than 55 mph or for traveling less than 6 mph over a speed limit of 55 mph or greater.

In Taiwan, even though the Regulations on Establishing Traffic Signs and Indicating Lines define the speed limit signs to show *absolute* limits, the police agencies have generally agreed a tolerance of up to 10 km/h.

In the United Kingdom ACPO guidelines recommend a tolerance level of the speed limit "+10% +2 mph" (e.g. a tolerance level in a 30mph zone of 35mph). However, each police force or safety camera partnership has the ability to use their discretion when setting the levels at which drivers will be prosecuted.

Road safety improvements in the Australian state of Victoria are largely contributed to infrastructure improvements and speed management including tougher tolerances and enforcement. Low level speeding is targeted because of the overall population effects. This is best explained by the recent Auditor General's independent review which cites:

The relative risk of casualty crash involvement for vehicles traveling only a few km/h above the speed limit is lower than for those traveling a greater amount above the limit. However the contribution of "low level speeders" to the total number of casualty crashes is high because of the high number of motorists traveling at these speeds. Therefore, "low level speeding" represents a substantial risk across the road network.

Victoria has some of the tightest speeding tolerances in Australia, with 3km/h if the speed is under 100km/h, or 3% if over 100km/h. This is despite the fact that the Australian Design Rules stipulate that a car's speedometer must be accurate within a 10% tolerance.

Speed limits, actual speeds, and aggregate safety

The 1998 *Synthesis of Safety Research Related to Speed and Speed Management* sponsored by the US Federal Highway Administration found, "on freeways and other high-speed roads, speed limit increases generally lead to higher speeds and crashes." Increasing a speed limit by 4 mph (6 km/h) would increase the average speed by 1 mph (1.6 km/h) and increase injury accidents by 5%. The report cautions that "changing speed limits on low and moderate speed roads appears to have little or no effect on speed and thus little or no effect on crashes." The report noted that traffic calming significantly reduced speeds and injuries in treated areas but that the decrease may be due to reduced traffic volumes. The report also suggests that "variable speed limits that adjust with traffic and environmental conditions could provide potential benefits" as most of the speed related crashes involve speed too fast for conditions.

The report noted the landmark study (D. Solomon, "Accidents on Main Rural Highways Related to Speed, Driver, and Vehicle", Federal Highway Administration, Washington, DC, July 1964) that observed a "U-shaped curve" of crash probability versus speed, where crash rates were lowest for travel speeds near the mean speed of traffic, and increased with greater deviations above and below the mean. Subsequent research has found that "The occurrence of a large number of crashes involving turning maneuver partly explains the increased risk for motorists traveling slower than average and confirms the importance of safety programs involving turn lanes, access control, grade separation, and other measures to reduce conflicts resulting from large differences in travel speeds."

Speed and crash factors

Some safety factors are not always under the full control of the driver, such as driver alertness and distractions, road conditions, weather, daylight availability, actions and alertness of other drivers, and wildlife. While these factors are not directly related to vehicle speed, the effects of these factors can be more severe with more speed. For example, a deer running across the road has no consequences to a parked vehicle but could have disastrous consequences for a vehicle traveling at 100 mph (160 km/h). This suggests that lower speeds can reduce the frequency and severity of crashes; lower speeds can give the driver more time to respond appropriately in the face of unexpected dangers, and it can reduce the severity of a crash should one happen. However, since the efficacy of speed limits in restraining driver speed is subject to debate, it is not clear how well speed limits can ameliorate these other factors.

Another view is that, while speed can play a part of the causal chain which leads to crashes, speed's role is mostly to magnify the consequences of other unsafe acts. This viewpoint is reinforced by the fact that speed is rarely the sole crash factor. In many cases, removing the other crash factors, such as a right of way violation, would have absolutely prevented the collision. While reducing the speed could have a beneficial effect on the severity and probability of the crash, it usually cannot guarantee crash prevention.

Most 'speed-related' crashes involve speed too fast for conditions such as limited visibility or reduced road traction, rather than in excess of the posted speed limit. Most speed-related crashes occur on local and collector roads with relatively low speed limits. However, most speed-related traffic citations involve speeds in excess of posted maximum speed limits. Variable speed limits

(q.v.) offer some potential to reduce speed-related crashes, but due to the high cost of implementation exist primarily on motorways. Speed-related crashes can occur on high speed limit roads at low speeds, e.g. below 30 mph; for example, truck rollovers on exit ramps.

APPENDIX

Appendix A – TRAFFIC CALMING: <http://www.drivers.com/article/122/>

Appendix B – National Highway Traffic Safety Administration Review on Traffic Calming:

<http://www.nhtsa.dot.gov/people/injury/research/HeedSpeedWeb/pages/2Background.htm>

Appendix C – Monash University Accident Research Centre in Australia conducted an extensive review of traffic safety data with the following conclusions (<http://www.monash.edu.au/muarc/reports/muarc053.html>)

Appendix D – International Association of Chiefs of Police (IACP)

http://www.theiacp.org/Resolutions/index.cfm?fuseaction=dis_public_view&resolution_id=246&CFID=9548397&CFTOKEN=4230634

Appendix A – TRAFFIC CALMING: <http://www.drivers.com/article/122/>

"It looks like they're designing more and more streets with 4 X 4s in mind."

-- Motorist

Many North American drivers have never heard of "traffic calming", but it's a term they will become increasingly familiar with in the near future. In Europe, calming has been around for a while, particularly in the Netherlands, Denmark and Germany, which implemented schemes as early as the 1970s. It's a growing trend in North America.



Put simply, calming is a strategy of adding design features to roadways that cause drivers to slow down. The features include such devices as speed bumps, lane narrowing, center islands, raised portions of pavement, streetscaping (trees, hedges, etc.), and regulatory signs*. Amongst people raised on automobility, and hooked on its speed and convenience, it is not surprising that many drivers regard calming as a major irritant. In some quarters it is characterized more as a plot against drivers than a legitimate road safety strategy.

Looked at in a positive light, calming provides drivers with the cues they need to adjust their speed to a particular road environment. Looked at negatively, it's a territorial tactic by neighborhoods to keep other drivers out. As traffic density grows and the battle for roadway territory and rights intensifies, calming will undoubtedly be the focus of increasing debate.

What traffic calming does

It will help this debate if all the parties involved understand the principles behind traffic calming. Research evidence shows that most drivers adjust their speed more readily in response to road and traffic conditions than to speed limit signs and the often remote possibility of enforcement penalties. Roadway features such as narrow lanes, certain kinds of road markings, bridge abutments, hidden areas, surface problems and traffic activity result in fairly predictable reductions in speed, whereas a 25 mph (40 km/h) speed limit on a wide open four-lane road will bring in a rich harvest of speeding-ticket revenue if police choose to enforce it.

The "85th percentile" method of setting speed limits (according to the speed normally adopted by 85% of drivers) is based on observations that 85% of drivers tend to adopt a sensible speed for prevailing road conditions.

A roadway that lacks the kinds of cues mentioned above tends to have faster traffic. In urban residential and business areas, the removal of physical clues to appropriate speed can create a sort of self-fulfilling prophecy in which faster traffic banishes competing activities from the road space and street life diminishes. A good way to get rid of street life is to make the street one-way, and clear away physical obstacles such as center islands, bollards and traffic lights.

The fact that drivers go faster on more open roads is not because they are all uncaring or contemptuous of the rights of others. They usually have other things on their minds and unconsciously respond naturally to the physical cues presented to them. Drivers have long argued that low speed limits on a roadway that is straight and wide open are unfair because they invite speed and then penalize drivers with enforcement and fines. A 25 mph (40 km/hr) speed limit on a street that has space for four lanes, and few obstacles to faster speeds, is little more than an unfair means of taxing drivers, these motorists will say, and they have a point.

Advocates of higher speed limits will argue that drivers are capable of managing their speed and that higher speed does not cause crashes. They can quote research to back their claim. However, safety and lack of crashes are not the same thing. If faster traffic does not have greater crash rates (the evidence is mixed on this) it may not be because faster traffic is just as safe, but rather because pedestrians, cyclists, children, animals, and even slower drivers have been frightened off roadways used by faster traffic. By way of example, an elderly pedestrian will have great difficulty crossing a four-lane roadway on which the speed limit is 40 mph (60 km/hr) and some vehicles are traveling at 70, 80 or even more. Elderly pedestrians will simply avoid crossing, and perhaps even be forced to avoid the entire area.

A benign way of looking at calming is that it offers a better way of letting drivers know about the activities (or needs, if that's a better way to put it) of other road users in a particular area.

The negative view

Looked at negatively, calming is seen as a means of thwarting drivers in their efforts to get from A to B. An article on the National Motorists Association's web site describes calming as "simply a device to put a favorable spin on tactics used to obstruct, divert and slow traffic."

Proponents of these tactics, says the NMA, "are usually persons who live along urban or suburban streets and object to motor vehicle traffic passing by their homes. The NMA web site offers a guide for beleaguered motorists who feel they are victims of such tactics and wish to actively fight them.

The NMA guide makes some points in its list of arguments against calming. In addition to increasing vehicle wear and tear, air pollution, and noise, "braking and accelerating in response to speed bumps, speed, stop signs, and traffic signals increases fuel consumption and emissions. This can contradict other efforts to reduce emissions and contribute to a community becoming or remaining a 'non-attainment' air quality zone, thereby being subjected to federal mandates and restrictions, increased response times for emergency vehicles and increased street maintenance costs," says the article.

The NMA may have a better point when it suggests that calming techniques such as speed bumps, obstacles and narrowed lanes simply serve to shift traffic problems to other streets. Calming can easily become a neighborhood politics issue in which groups simply assert control over their territory at the expense of others.

A better strategy, the NMA suggests, is to encourage traffic to move to major streets by "raising speed limits, synchronizing traffic lights, removing four-way stop signs, and improving access to roadside businesses" on these streets. This, suggests the NMA, can be presented to planners as a win-win solution. However, it's naive of the NMA to suggest that volume of traffic is the only problem and that providing fast arterial roadways will restore safety on neighborhood streets. Some drivers will still speed at rates that make life dangerous and uncomfortable for other street users. This motoring trait is exacerbated by modern cars that provide power and acceleration while using hi-tech suspension and handling features to mask the physical feedback that speed normally brings. Drivers who are unschooled in the effects of what they do, and the rights of other road users, add greatly to the problem.

In opposition to the NMA's unqualified support of drivers is an increasing desire on the part of communities to create friendly environments in which street life, with its many facets, can thrive, and livable neighborhoods flourish. In many ways it's a desire to return to the days before automobiles devastated urban life and suburban shopping malls became the only communal people-places available to dispersed populations of auto-mobile citizens living in bleak expanses of detached housing.

What's at stake

There's no doubt that the battle for rights on the roadway is going to heat up. Environmentalists have pointed out that making roadways more efficient for automobiles encourages reliance on automobile transportation as opposed to mass transportation. Improving a highway with better surfaces and extra lane space makes it easier and more economical for drivers to use their cars to commute, and harder for public transit to compete. And the extra lanes fill up as drivers factor the extra convenience into their commuting calculations, so traffic congestion problems are not resolved.

The stakes in the roadway battle are quality of life, rights of different road users, effects on the environment, the automobility and convenience most of us are addicted to, and the frustration and rage that can surge to the surface during conflicts for space and rights.

The NMA and other advocates for the automobile lose credibility when they ignore the larger issues and claim, as the NMA does, that traffic calming advocates are invariably local residents who use "a collection of politically correct excuses" such as "it's for the children" to keep other traffic off their streets. Drivers are going to have to look beyond selfish concerns in order to remain a credible influence on the future of traffic management. This means understanding the principles of traffic calming, knowing what's at stake, and providing reasoned input rather than a knee-jerk reaction to anything that impedes their speedy passage along roadways.

Appendix B – National Highway Traffic Safety Administration Review on Traffic Calming:
<http://www.nhtsa.dot.gov/people/injury/research/HeedSpeedWeb/pages/2Background.htm>

2. BACKGROUND

Two activities provided background information for the study. One consisted of a literature review on vehicle speeds to update an earlier review performed for NHTSA by Leaf and Preusser (1999). The second involved the selection of a panel of experts in traffic calming and speed management and conduct of a workshop to explore the speed problem, possible countermeasures, and possible evaluation measures. Each of these activities is described below.

2.1 Literature Review Approach and Relevant Findings

A review of the relevant literature was performed to help guide the study effort. There were two separate areas of focus. The first was an update of an extensive review previously performed for NHTSA (Leaf and Preusser, 1999). The second was a search for references that could relate speed reductions to specific pedestrian safety benefits.

2.1.1 Update of Previous Review

The purpose of this effort was to identify relevant materials that had been produced since NHTSA's previous report on the effects of speeding (Leaf and Preusser, 1999) was compiled. Searches were made of the Transportation Research Board Transportation Research Information Services (TRIS) database to identify studies published after 1998 on the topics of traffic calming, speed, enforcement, education, and pedestrian safety. In addition, contact was made with selected NHTSA and Federal Highway Administration (FHWA) representatives, with bicycle and pedestrian professionals, and with contributors to the vehicle speed report to request additional references and materials. Finally, Web sites of cities with known traffic calming programs were accessed to obtain additional reports and information. Appendix A contains the entire letter report of the literature review. Its highlights are presented below.

In all, over 175 documents were identified, and abstracts of each were read. Based on the abstracts, hard copies of 60 of these documents were obtained and reviewed. The subject matter of the reviewed documents ranged widely and included descriptions of specific traffic calming techniques, legal aspects of traffic calming, crime issues, property value issues, and others. Although all hard-copy documents that were received were read, the major interest was in identifying evaluative studies of methods of traffic calming, especially those that might have combined education and enforcement with engineering. Very few evaluative studies were located. However, reports that summarized and quoted results of evaluative studies were found and proved useful (see Appendix A).

Two major documents were produced since the publication of NHTSA's speed report (Leaf and Preusser, 1999). One was an Institute of Transportation Engineers (ITE) report on the state of the practice of traffic calming (Ewing, 1999). Among other topics, it provides a brief history of traffic calming, a toolbox of traffic calming measures, engineering and aesthetic issues, impacts of traffic management measures, legal authority and liability issues, warrants, project selection procedures, public involvement, traffic calming on other than neighborhood and collector streets, and traffic calming in new developments. Twenty United States traffic calming programs are featured in the document. Specifications proposed by certain jurisdictions or professional groups for selected measures are included.

A second major document of specific interest to the present effort was a synthesis of safety research related to speed and speed management sponsored by the Federal Highway Administration (FHWA) (Stuster, Coffman, and Warren, 1998). This report covers speed-safety relationships, factors influencing speed, speed limits and speeds, speed limits and safety, enforcement and engineering measures.

The supplementary literature review revealed very little new information germane to the present study beyond what was contained in NHTSA's vehicle speed report (Leaf and Preusser, 1999). However, much of the new information served to confirm or amplify information contained in the NHTSA report. Across all of the literature examined, the following points of relevance to the current study were culled or inferred:

- Although some professional groups and jurisdictions have proposed standards, there are no national standards for design and use of traffic calming measures.
- The most effective traffic calming methods involve vertical treatments to the roadway. Humps have been proven to be very effective, and the public believes they are effective in reducing speeding. This was confirmed by the fact that the test sites for the present study chose vertical treatments for all of the physical calming measures employed.
- Traffic circles such as those employed in Seattle have been proven not to induce vehicle-to-vehicle crashes. They are, however, quite expensive and therefore are not widely used. Neither test site in the present study employed traffic circles in the studied neighborhoods.
- There are rubber humps that can be used as a temporary traffic calming measure. Other measures can be created for temporary use, for example, permitting parking on opposite sides of the street for each block to create a chicane and using planters as bulbouts. The expert panel and officials at the chosen test sites, however, were opposed to using these temporary approaches because they could mar the aesthetics of the test neighborhoods.
- Data on the effectiveness of roadway perceptual devices are inconclusive. Although street narrowing decreases speeding, there are data that suggest that it increases crashes. Some data show that street width must be reduced to 20 feet or less before speed reductions are noted. As it turned out, street narrowing was not an option in any of the test neighborhoods.
- No studies were found in which education alone was used as a traffic calming measure. Typically, education programs consist of citizen watches combined with enforcement. Success in reducing speeding has been reported anecdotally, but no rigorous evaluation studies were found.
- Enforcement is effective but may be impractical on low volume streets. Compliance is greatest in the vicinity of the police vehicle. This is also true of speed display boards. The public finds enforcement effective in reducing speeding. Again, although these concepts were promulgated by several authors, no definitive evaluation study was uncovered.
- Anecdotal reports and limited scale studies indicate that photo radar has been successful in reducing speeds when deployed in neighborhoods in Europe. Some success has also been reported in the United States but the technique still has problems with political acceptability. The public apparently believes that photo radar is effective in reducing speeds. Photo radar was not permitted to be used at either of the test sites. As discussed below, however, speed trailers, that tell drivers the speed at which they are traveling without taking any automated enforcement actions, were used.
- Measures of effectiveness for traffic calming are typically 85 th percentile speed, average speed, percent exceeding posted speed, percent "x" miles per hour above posted speed and volume. Crashes are included sometimes. Only one study (Cambridge , 2000) was located that used pedestrian-related measures – it used number of drivers yielding to pedestrians.
- Some jurisdictions use "hidden" measures for traffic calming, e.g., changes in traffic lights, prohibiting turns, making a "maze-like" path by creating a series of one-way streets. The two test communities chose not to employ these in the present study.

2.1.2 Pedestrian Safety Benefits of Speed Reduction

Relatively few references were located that provided a quantitative link between speed reduction and pedestrian safety benefits. Many of the references cited in Appendix A allude to the presumed benefits in terms of both injury reduction and crash avoidance, but there is a paucity of specific studies that confirm these links.

The case for the injury reduction benefits of lower speeds is perhaps more fully documented because both biomechanical analyses and epidemiological studies are relevant. For example, Leaf and Preusser (1999) report on the effects of vehicle speed on pedestrian fatalities and cite several studies that show that the risk of a fatality increases exponentially with striking vehicle speed. One study reported from England shows that 5 percent of pedestrians struck at 20 mph will die, compared with 45 percent at 30 mph, and 85 percent at 40 mph (Department of Transport, 1997).

Other methodological development studies have proposed complex formulas for calculating the crash reduction potential of diminished travel speeds (cf., Navin, Chow, and Kwan, 2001; Davis, 1998). While these studies clearly support the general notion that lower speeds are associated with reduced crash risk, they do not provide a specific method in the context of the present study to translate any speed reduction obtained into an estimate of crashes avoided.

Perhaps the most direct evidence for the pedestrian crash reduction potential of reduced speeds comes from a study by Tester et al. (2004). The study examined the protective effectiveness of speed humps in reducing child pedestrian injuries in residential neighborhoods. This case-control study showed that children living on streets where speed humps had been installed had lower odds of being injured within their neighborhoods and being struck by a motor vehicle in front of their homes. While this study provides excellent support for the crash-reducing potential of successful speed countermeasures, it does not provide a direct formula for estimating the benefits of any particular application.

A recent article (Lindenmann, 2004) examines crash quantification tools and aids in the context of all highway crashes, not just pedestrians. The overwhelming evidence reported is that lowering speed produces a reduction in crashes. Lindenmann (2004) cites a study from Finland (Kallberg, 1997) that concluded that an increase in the average speed of traffic by 1 km/h (0.62 mph) increases the number of injury crashes by approximately 3 percent. This equates to an increase of about 4.8 percent for a speed increase of 1 mph. The study also points out that crash costs increase by about twice as much since the higher speeds increase severity. Obviously, pedestrians are included in this overall estimate, although no way is reported to separate out the specific pedestrian crash or injury risks.

Thus, there is a widely held and partially proven theory that lowering speeds in residential neighborhoods will produce safety benefits both in terms of crashes avoided and by lessening injury severity when a crash does occur. This suggests that measures of both the mean or average speed and of those traveling at the highest speeds are needed in order to assess countermeasure programs such as those mounted in the current project.

2.2 Workshop on Speed-Reducing Countermeasures

A panel of experts was assembled for a workshop to discuss existing speed reduction approaches and brainstorm new ideas. In addition to the authors and the NHTSA task order manager, the panel included practitioners from a cross-section of jurisdictions and specialists on speed countermeasures, pedestrian safety, the state-of-the-practice of traffic calming, traffic enforcement, and education. The workshop was held on May 10-11, 2001, at the FHWA Learning Center in Arlington, Virginia. The complete letter report of the workshop is included as Appendix B to this report. A summary of the key results follows.

TRAFFIC SAFETY IN SEQUIM: EDUCATION + ENFORCEMENT + ENGINEERING

The workshop participants were challenged to enumerate candidate test conditions, evaluation paradigms, and possible test locations for the study. The aim was to identify a reasonable (in terms of cost and time) and sufficiently general test or tests that could answer the question posed by the main objective of the study, i.e., to determine if a speed-reduction benefit is obtained by adding education and/or enforcement to more traditional traffic calming approaches.

The workshop was initiated by asking participants to identify speed-reducing countermeasures in the three E's—engineering, enforcement, and education. Constraints and positive aspects were then noted for each. In an exercise in which participants attempted to identify a desirable set of countermeasures from those identified, no consensus was reached. However, the following principles, guidelines, and considerations that could be applicable to any project that attempts to reduce neighborhood speeds emerged from this activity:

- A countermeasure can trick the senses but it can't be deceitful (e.g., an artificial construction zone).
- A countermeasure cannot devalue the neighborhood; it should improve the neighborhood.
- Neighbors might not like to be the "bad guys" (e.g., participate in a trial by peers).
- There should be a valid punitive value in any sanctions employed (e.g., a trial by peers may not be a deterrent if there is no meaningful punishment possible).
- There must be places in the area to mount the countermeasure (e.g., there are few red lights in residential areas).
- A countermeasure must not be annoying or contribute to neighborhood litter (e.g., windshield wiper flyers).
- A countermeasure must be legal (e.g., mounting flyers on utility poles is illegal in many jurisdictions).
- A countermeasure must be easily targeted (e.g., in-car cameras are tough to target).
- The implementation and maintenance costs must be reasonable (e.g., cameras are expensive).
- A countermeasure should not generate any privacy issues (e.g., people don't want to feel watched).
- Providing a good model for children is desirable (e.g., sending materials home from school).
- Crime reduction can be an added benefit to some of the countermeasures used (e.g., added police patrols, increased lighting).
- Sufficient space must be available (e.g., a street must be sufficiently wide to install a median).
- It is preferable that residential countermeasures not limit access to homes and driveways (as would a median; however, short medians could be installed).
- Appropriate data must be available or collectible to evaluate the actions.
- Neighborhood involvement is advisable (e.g., a neighborhood speed watch program).

The guidance represented by these principles was helpful in selecting and implementing countermeasures in Peoria and Phoenix . All of them were considered and applied to the extent applicable in each of the participating test neighborhoods. This list can also be helpful to anyone attempting any type of neighborhood-based programs.

Although there was no consensus on specific countermeasure approaches, the workshop participants did agree that the project should work with permanent installations of engineering treatments whenever possible. It was noted that temporary installations, e.g., rubber speed humps, are often not aesthetically pleasing and can therefore engender negative reactions based on appearances alone. This can cause a backlash and make it difficult to generalize from temporary to permanent installations.

With regard to process, it was considered desirable that the project start from the beginning and look at transition from a non-calmed to a calmed neighborhood. Since it was acknowledged that this might not be possible under the constraints of the study, it was agreed that using an already calmed location with available "before" data was a viable alternative.

In a discussion of meaningful speed reduction, it was agreed that 85 th percentile and average are not the most representative measures of what people are concerned about. People want the excessive speeders eliminated. It was proposed that the project focus on overall comfort level and unacceptably high speeds. The primary aim would be to eliminate speed outliers. Thus, the project should focus on the high tail of the speed distribution as well as the mean. To follow this recommendation, the study would require accurate speed data on each vehicle, not class interval or "bin" data.

A brief discussion was held on possible test sites for the program. The sites mentioned included those where pre- and post-studies have not had optimum results as well as those that have good process and treatments pending. Although participants mentioned several possible test sites, there was no consensus on an ideal test site for the study. Therefore, an independent site selection effort was mounted to find an appropriate test location.

The literature review and the expert panel session suggested that the study needed test sites that have implemented (or are in the process of implementing) traffic calming in the form of permanent rather than temporary physical changes. It was also considered desirable to select locales that would be willing to attempt some innovative treatments that might provide compelling visual stimuli without constituting an impediment to the transit of emergency vehicles. As discussed in the next section, the study was fortunate in finding two contiguous sites that met these basic criteria and were interested in helping to develop and test the ***Heed the Speed*** program.

Appendix C – Monash University Accident Research Centre in Australia conducted an extensive review of traffic safety data with the following conclusions (<http://www.monash.edu.au/muarc/reports/muarc053.html>)

GENERAL CONCLUSIONS ON TRAFFIC LAW ENFORCEMENT

The success of enforcement is dependent on its ability to create a meaningful deterrent threat to road users. To achieve this, the primary focus should be on increasing surveillance levels to ensure that perceived apprehension risk is high.

- once this has been achieved, increasing penalty severity and the quick and efficient administration of punishment can further enhance the deterrent effect.

Significantly increasing the actual level of enforcement activity is the most effective means of increasing the perceived risk of apprehension.

The use of periodic, short-term intensive enforcement operations (blitzes) is a more cost effective enforcement option, however, the effect on road user behaviour may be reduced.

The use of selective enforcement strategies, designed to specifically target high risk road user behaviour and traffic accident locations is another cost effective alternative.

Automated enforcement devices provide the most cost effective means of significantly increasing apprehension risk and should be adopted as a matter of priority.

The use of publicity to support enforcement operations should be adopted as a means of increasing enforcement effectiveness.

- it is essential that road users actually observe the publicised increase in the level of enforcement activity otherwise behavioural changes are usually only short-term.
- publicity as a stand alone measure can increase community awareness of road safety issues, however, it has only a minimal effect on actual road user behaviour.

If the risk of apprehension is high then the use of legal sanctions, such as licence suspension and revocation procedures, can be an effective deterrent.

The use of point demerit schemes provides an effective means of linking less serious repeat offences to more severe penalties.

CONCLUSIONS ON SPEED ENFORCEMENT

The primary focus of speed enforcement should be on increasing surveillance levels, and hence the actual and the perceived risk of detection.

Traditional vehicle based enforcement methods should focus on increasing the visibility and unpredictability of traffic policing operations.

- highly visible stationary enforcement operations have the greatest deterrence potential when using police vehicle deployment methods.
- these activities should also be supported by the use of both marked (visible) and unmarked (non-visible) mobile speed enforcement operations in order to increase the unpredictability of where, how and when enforcement will be encountered.

Primary consideration should be given to the implementation of strategies based around the intensive use of automated speed enforcement devices.

- to maximise the benefits and community acceptance of speed camera operations it is important that enforcement is primarily targeted at accident locations where speed is known to be a causal factor.

The use of new automated digital imaging systems can increasing the apprehension effectiveness of speed camera operations.

The use of both fixed (unmanned) and temporary site (manned) speed camera operations can maximise the system wide effectiveness of speed enforcement operations.

The development of strategies designed to ensure better spatial deployment of available policing resources can increase the efficiency of enforcement operations.

The use of publicity to support speed enforcement activities is an essential requirement to raise community awareness and improve the effectiveness of enforcement operations.

Reducing the size of enforcement tolerance levels on speed limits can reducing the level of speeding behaviour and ensuring greater adherence to posted speed limits.

Behavioural feedback strategies such as the public posting of speed information displays and incentive programs can increase the effectiveness of speed enforcement operations.

Greater emphasis should be placed on the use licence suspension / revocation procedures.

The implementation of strategies designed to target and deter repeat offenders, such as point demerit systems, should be given a high priority.

In order to be effective, speed limits must be perceived by road users as being appropriate for the existing road environment conditions.

- emphasis should be placed on increasing the credibility of speed zones so as to ensure greater acceptance and adherence, by road users, to the posted speed limits.
- the use of 'expert' systems for speed zoning classification and the use of variable speed limits are possible methods of increasing speed limit credibility.

Enforcement should not be relied upon as the sole means of reducing the level of speeding behaviour. Preventative strategies which target the "agents" of speeding, namely the vehicle and roadside environment should be considered as an alternative or supplementary means of reducing the level of speeding behaviour.

- the use of speed limiting devices and measures designed to physically modify the roadside environment have considerable potential.
- the use of perceptual speed countermeasures may also offer a low cost means of reducing the level of speeding behaviour.
- vehicle design characteristics to improve the accident avoidance capability of vehicles, as well as the level of protection provided to vehicle occupants, can potentially reduce the injury consequences of speeding behaviour.

Appendix D – International Association of Chiefs of Police (IACP)

http://www.theiacp.org/Resolutions/index.cfm?fuseaction=dis_public_view&resolution_id=246&CFID=9548397&CFTOKEN=4230634

IACP Resolutions

Highway Safety

The Importance of Enforcement to the Reduction of Speed-Related Crashes

Submitted by Highway Safety Committee

WHEREAS, speed-related crashes, deaths, and injuries have not declined in the past decade, despite roadway and vehicle safety improvements; and

WHEREAS, today's motor vehicles are capable of being operated at extremely high speeds that exceed the design criteria for both highways and safety devices, with drivers traveling at those high speeds in relative comfort and silence; and

WHEREAS, there is a great disparity in the weights and sizes of vehicles on roadways today, making speeding by heavy commercial vehicles particularly dangerous; and

WHEREAS, our streets and highways have become increasingly congested and in need of repair; and

WHEREAS, our contemporary culture is one in which many drivers are rushing to get from one destination to another, and this may lead to excessive driving speeds, which in turn could lead to aggressive driving and road rage, speed-related crashes, deaths, and injuries; and

WHEREAS, vehicle stopping distances increase and effective maneuvering space decreases exponentially as speed increases; and

WHEREAS, the extent to which law enforcement officers and their agencies allow tolerances when enforcing speed limits can encourage or discourage speed violations; now therefore be it

RESOLVED, that the International Association of Chiefs of Police joins with the National Highway Traffic Safety Administration, the Federal Motor Carrier Safety Administration and the Federal Highway Administration in urging all state, county, local and tribal law enforcement agencies and individual officers assigned to patrol duties to place a renewed emphasis on the management of speeds on our streets and highways; and be it

FURTHER RESOLVED, that law enforcement agencies join the effort to reduce speed-related deaths, injuries and property damage by making speed enforcement a high priority; by encouraging the public, through education and enforcement, to reduce their travel speeds to the speed limit; and by encouraging departments and officers to re-examine carefully the extent to which their approach to speed enforcement tolerances impact travel speeds.

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