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CLARK COUNTY
WASHINGTON

COMMUNITY PLANNING

MEMORANDUM

TO: Heath Henderson, Public Works Director
Carolyn Heniges, Transportation Manager

Cc: Gordy Euler, Planning Manager
Juanita Rogers, Chair Clark Communities Bicycle and Pedestrian Advisory Committee
Matt Griswold, Engineering Service Manager

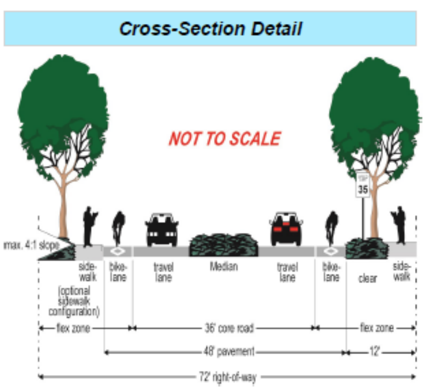
FROM: Gary Albrecht, Planner III, AICP

DATE: May 19, 2017

SUBJECT: NE 99th STREET, CRP #350722

The Bicycle and Pedestrian Advisory Committee are providing design comments in accordance with the April 2014, Policy Statement with Clark County Public Works Department about procedures for bicycle and pedestrian feature reviews.

On March 28, 2017, Clark Communities Bicycle and Pedestrian Advisory Committee had an opportunity to review and discuss the 30% preliminary plan set for NE 99th Street, CRP #350722. According to the 2016-2021 Transportation Improvement Program the project description is to determine new alignment for improved 2-lane minor arterial with a center turn lane/medium, bike lanes and sidewalks as shown in cross-section detail below.



The committee has been told that the design speed of this segment is 40 mph, and also appreciates the opportunity to comment on this county road project. They look forward to providing feedback on future road projects.

Setting Speed Limits in Multi-Modal Environments - Background

Scott Batson, PE

The first question for the general concept of speed zone posting is: What is the desired outcome? If the safe operation of the street system is the primary goal, with mobility as secondary, then, when the choice is between safety or any other criteria, safety should take precedence. Therefore, as increased safety is the ultimate goal, reduced numbers of injury and fatal crashes will be the primary measurements of success.
Beginning from the premise that increased safety is the primary desired outcome for posting speed limits on the transportation network, and further, that *all* users should be considered when deciding speed limits, those users that are most vulnerable in a crash become the primary focus of interventions. The 'safe speed' for any particular road segment in a network should be linked to the types of users on that segment and how they are required to interact with other users. Also, multiple users on a system does not mean more collisions *will* happen, only that the *chances* of a collision have increased.

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The least vulnerable road user, though likely the most numerous, is assumed be an occupant enclosed in a modern vehicle, though even this protection has limitations. Statistics show that the sheer number of road users in vehicles makes them the majority of fatal and serious crash victims. A vehicle occupant is most at risk when their vehicle strikes a fixed object, strikes another vehicle, or is struck by another vehicle. Energy reduction before a crash, along with separation from hazards, will increase a motorist's safety.

The most vulnerable user of a transportation system, and second most common, is a non-motorist (pedestrian or cyclist) with minimal understanding of the system, either due to cognitive naiveté (associated with youth) or cognitive impairment (intoxicants, medical events, and aging).

Motorists and non-motorists represent the greatest difference in mass and velocity between the two most common users in our current road transportation system. The interaction of these two users represents the greatest potential for harm, and should these two users collide, the non-motorist is the one most likely to suffer harm. Therefore, it is the reduction of energy of automobiles and the separation of auto traffic from non-motorist traffic, opposing motorists, and fixed objects that will accomplish the greatest increase in safety on our road system.

There are three primary ways to reduce the energy of an automobile in advance of an impact.

First would be to increase the distance between vehicles and non-motorists, or roadside objects. Added space provides more time for vehicle operators to slow or avoid collisions, though wide open space may provide motorists more comfort operating at higher speeds, so space alone may be insufficient to insure reduced speed before a crash. Space increases take the form of roadside shoulders, parking lanes, planting strips and sidewalks, and should also include enhancements that alert motorists to lane departures. Lane departure tools include raised pavement markers, vertical delineators, profiled rumble strips and other pavement texture changes, roadway material changes and low profile curbing.

Second is to place objects or design features in an errant driver's path to absorb or redirect the energy. Such design features are typically scaled to coincide with the operational speed of the roadway and risk of injury to road users. Roadside depressions, soft ground, vegetation, curbing, medians, cable fencing, guardrail, crash attenuators, and walls are examples of such design features.

Third, reducing the initial travel speed of vehicles will also reduce the vehicle's energy level before a collision, resulting in shorter stopping distances and reduced energy upon impact. From the roadway engineering perspective, reducing a vehicle's speed before a crash involves providing information to road users of potential hazards before a crash occurs and includes: roadway markings (edge or centerline delineation, reflective markers, rumble strips), warning signs, speed limits, and roadway design (in advance or as retrofit).

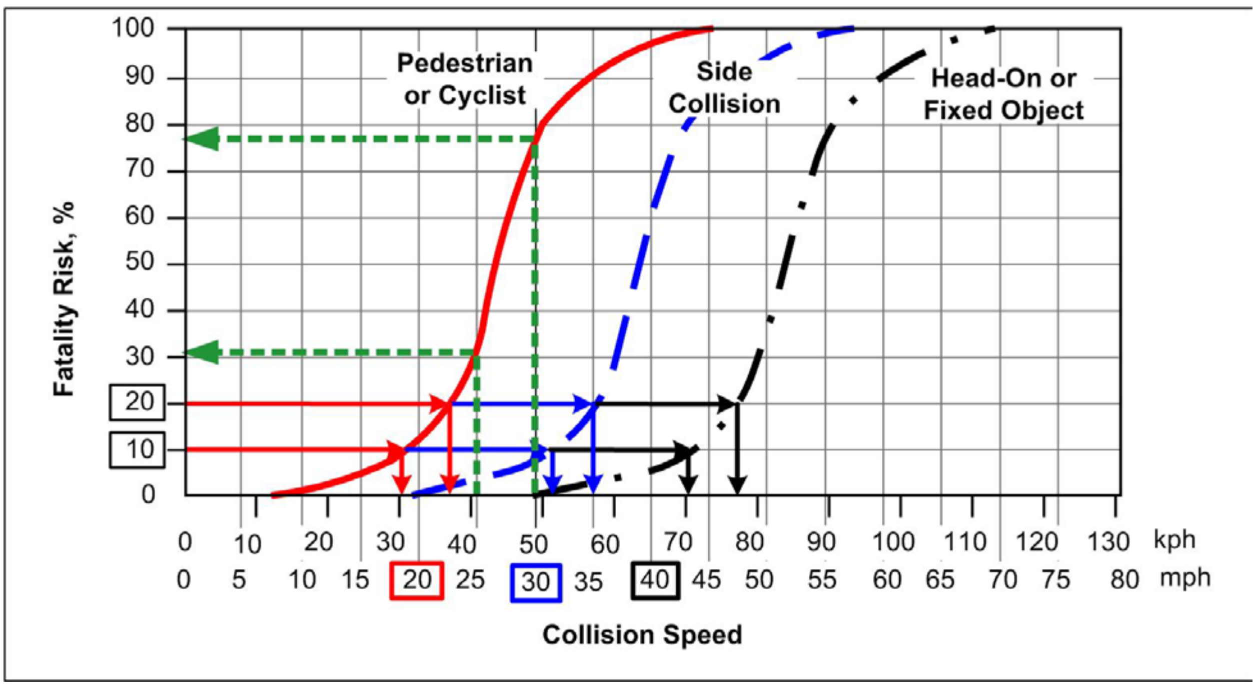
These three primary modes to reducing vehicle energy before to a collision (separation, barriers and lower initial speed) are inter-dependent and identify complementary methods to achieving increased road safety. Where the first two components, separation or barriers (engineered roadway changes), are infeasible, or too expensive, the third, speed reduction methods, should be implemented until the roadway environment can be improved. As many jurisdictions are faced with a lack of funding for the foreseeable future, particularly when compared to past expenditures, the reduction of initial vehicle energy before a crash is often the primary tool to increase safety.

The Alternative Speed Limit Method from a Safe Systems Approach

The Safe Systems/Vision Zero engineering approach to transportation safety begins from the premise that transportation system users will always make mistakes. Roadways and pathways must therefore be designed, constructed and operated to minimize the potential for fatal or serious injury outcomes, and where engineering solutions (designed or operational) are not practical, or are ineffective, lower speed limits should be enacted (5).

In 2005, Wramborg presented a paper on safe street design in urban areas that included the following graph depicting the risk of fatality for three common crash types (Figure 1, below) (6).

Figure 1. Fatality Risk for Three Crash Types as a Function of Vehicle Speed



This graph illustrates the *risk* basis upon which much of the Safe Systems/Vision Zero approach to speed management is founded. As an example, the short dashed lines depict how changing from 30 mph to 25 mph reduces the fatality risk for non-motorist from about 75% to about 30%. While the ultimate goal is to achieve zero *total* fatalities, achieving zero *risk* would be impossible. A common chosen risk goal is the 20% maximum risk for a fatality. As seen in the graphs, a 50% reduction in the standard risk level, from 20% to 10%, requires only a small additional reduction in speed before a crash. Interpreting this revised paradigm (simple minimization of risk) results in the following proposed ideal maximum initial speed standards for achieving the 10% fatality risk level.

1. No street should be posted higher than 40 mph unless it has a barrier separating opposing auto traffic (head-on crash prevention).
2. No street should be posted higher than 40 mph unless roadside objects are set back, have break-away bases, or are shielded by barrier or impact attenuators (roadside fixed object crashes).
3. No street with numerous intersections should be posted higher than 30 mph unless right angle crash mitigations have been installed at collector-collector and higher intersections (angle crashes).
4. No street with pedestrian activity should be posted higher than 20 mph unless the pedestrian pathways are physically separated, and minimum crossing frequencies have been achieved (crosswalk crashes, crash geometry, 65+ years old).
5. No street with pedestrian activity should be posted higher than 30 mph unless the separated pedestrian pathways are shielded by permeable barriers, and marked crossings have been enhanced to accommodate 20 peak hour pedestrian crossings in accordance with NCHRP 562 (7) (crosswalk crashes, crash geometry, teenage pedestrians, 65+ aged pedestrians).
6. No street that cyclists are encouraged to use should be posted higher than 20 mph unless the bicycle pathways are physically separate bike lanes (crash location, rear end crashes).
7. **No street that cyclists are encouraged to use should be posted higher than 30 mph unless the bicycle pathways are shielded by permeable barriers (crash location and geometry).**
8. No street that cyclists are encouraged to use should be posted higher than 40 mph unless the bicycle pathways are shielded by impermeable barriers (crash survivability)

NE 99th Street, NE 94th Ave to SR 503 CRP #350722

Based on these guidelines, the inclusion of bike lanes adjacent to the roadway travel lane on **NE 99th Street** plan as depicted in the 30% Road Mod Set for CRP **#350722**, represents unnecessary risk to cyclists ~~at~~ if the proposed posted speed is 35 mph. When bike lanes are adjacent to an automobile travel lane, the posted speed should not be set higher than 30 mph. Should Clark County wish to achieve a higher mobility standard for automobile traffic, the following mitigation efforts are recommended:

- Construct the bike lane behind the curb line and at a similar elevation with the proposed adjacent bike lane, perhaps even as curb tight shared use pathways on both sides of the street, or,
- Consider providing a narrow center median to the new street, with space reallocated to install a buffer between the road-level bike lane and adjacent auto lane. This buffer could be reduced and eliminated at intersections where left turn pockets are required.
- Place trees, power poles and street light poles behind the pedestrian and bike facilities as far from the curb as possible to minimize risk to lane departure motorists as well as to reduce visibility obstructions between motorists and non-motorists.

References

1. Organisation for Economic Co-operation and Development (OECD) International Road Traffic and Accident Database, http://internationaltransportforum.org/irtadpublic/index.html

2. Haddon, Jr., W. “The changing approach to the epidemiology, prevention, and amelioration of trauma: the transition to approaches etiologically rather than descriptively based “, *Injury Prevention* 1999; 5: 231–236

3. Haddon Matrix, Adapted from: Injury Prevention: Meeting the challenge. AJPM, 1989; Christoffel T. Galagher S. Prevention and Public Health, Gaithersburg, MD. 1999

4. “Intersection Study, Task 5 Report: Generation of Intersection Designs within the Safe System Context”, Monash University Accident Research Center, Victoria, Australia for VicRoads, November 2010, Report No. 316d.

5. “Towards Zero: Ambitious Road Safety Targets and the Safe Systems Approach”, Chapter 5, 2008 from OECD http://www.internationaltransportforum.org/jtrc/safety/targets/targets.html

6. Wramborg, P. (2005) “A New Approach to a Safe and Sustainable Road Structure and Street Design for Urban Areas”, paper presented at Road Safety on Four Continents Conference, Warsaw, Poland.

7. “National Cooperative Highway Research Program report 562: Improving Pedestrian Safety at Unsignalized Crossings (TCRP Report 112)”; Fitzpatrick, Turner, Brewer, Carlson, Ullman, Trout, Park, Whitacre, Lalani and Lord; 2006.