

# Research and Technology REVIEW

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RESEARCH DIVISION

## Research Bulletin

### Research Underway to Prevent Snow Accretion on Traffic Sign Surfaces

Snow cover on signs can decrease or obliterate the sign message thereby posing a danger to motorists during snow conditions, particularly in the heavy snow areas. NDOT has a particular concern about critical message signs such as "Wrong way," "Do not enter," or signs at median barrier breaks directing motorists to the right side of the rail. A research project has been initiated to address this concern.



Signs installed facing different directions

Fifteen ground-mounted signs were randomly installed on the frontage road of Washoe Valley. They were installed tilted forward at 0, 3, 6, 9, and 12 degrees. There were three signs for each degree (treatment) facing north, south and west, respectively. Observations will be made during or immediately after snow on the amount of snow on the sign surface and sign conspicuity. Photos will be taken during each visit. Based on the test results, a procedure will be developed for installing signs tilted at a certain degree to prevent snow from sticking to sign surfaces in the heavy snow areas.



Signs being installed at Washoe Valley

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Debra Starnes, District II Traffic Engineer, and Tom Lumpkin, Maintenance Supervisor II, serve as principal investigators for this project. NDOT Chief Traffic Engineer, Scott Thorson; Assistant Chief Safety Engineer, Kelly Anrig; District II Traffic Engineer, Michael Fuess; Research Coordinator, Tie He; and FHWA representative, Andrew Soderborg, are on the project panel to direct the research.

### Development of Criteria to Identify Pedestrian High Crash Locations in Nevada

Nevada has experienced over 40 pedestrian fatal crashes per year over the last six years. Likewise, Nevada also has experienced over 800 pedestrian injury crashes per year during the same period. There is a critical pedestrian safety issue on many urban streets in Nevada. The main objective of this research project is to develop criteria to identify "pedestrian high crash locations" so as to target the allocation of resources to enhance pedestrian safety. Specifically, such efforts help to allocate funds under the Federal Highway Safety Improvement Program (HSIP).

The evaluation and identification of high pedestrian crash locations is primarily based on the statewide crash

database maintained by the Nevada Department of Transportation (NDOT). Crash reports filed by law enforcement agencies provide the basis for the database. The database was developed and maintained to serve the needs of engineers and planners in determining high crash locations and problem areas.

Pedestrian crashes over a five-year period (1998 to 2002) were considered for analysis and development of the criteria to identify pedestrian high crash locations. Data show that there were 4,844 pedestrian crashes in the state of Nevada between 1998 and 2002. Of the 4,844 pedestrian crashes, 3,627 pedestrian crashes occurred in Clark County, 877 pedestrian crashes occurred in Washoe

County, 126 pedestrian crashes occurred in Carson City, 60 pedestrian crashes occurred in Elko County, and 36 pedestrian crashes occurred in Douglas County. The pedestrian crashes in these five counties account for 97.6% of the total pedestrian crashes in the State of Nevada.

Pedestrian crashes in the aforementioned counties were geo-coded in a Geographic Information Systems (GIS) environment. As an example, Figure 1 shows geo-coded pedestrian crashes in Washoe County. Pedestrian crash density maps were then generated using the Kernel method with a search radius of 400 feet to identify locations with concentrations of crashes. Figure 2 shows pedestrian crash concentrations in the City of Reno.

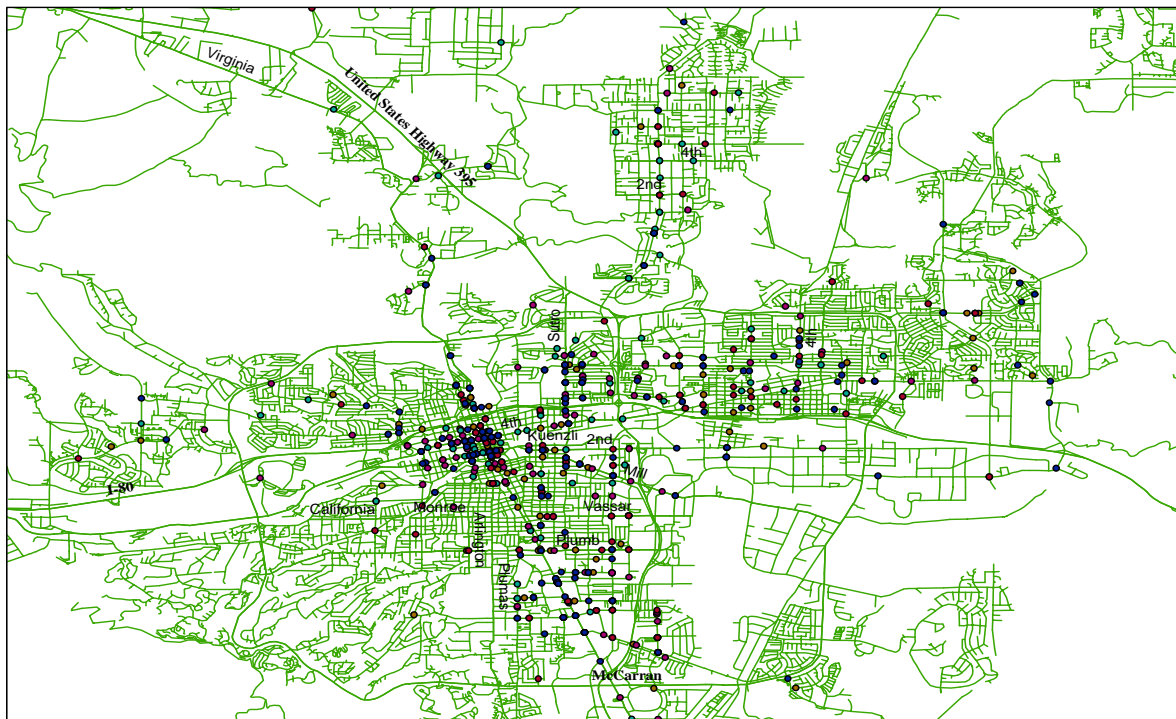
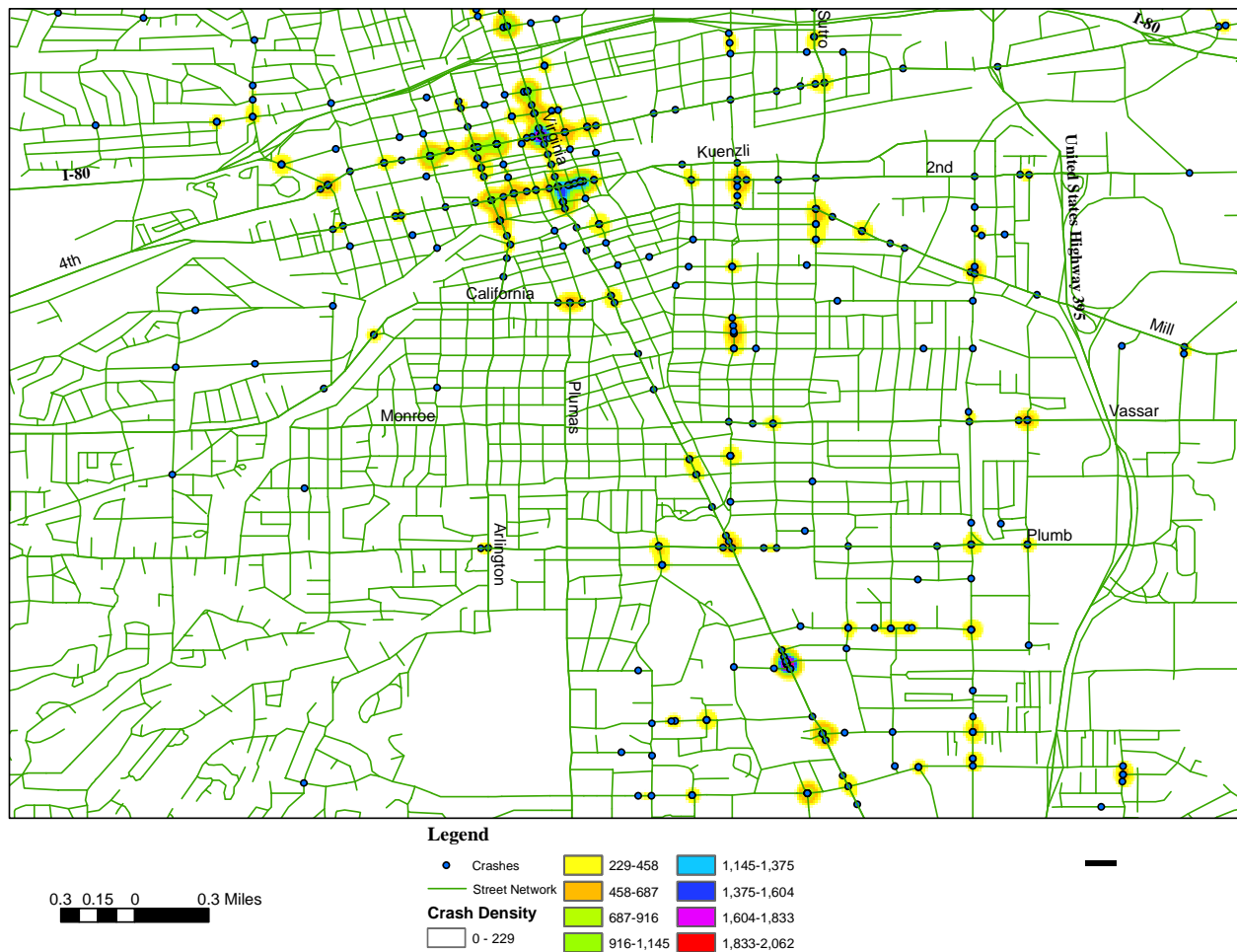


Figure 1: Spatial Distribution of Pedestrian Crashes in Washoe County (1998-2002)

1 0.5 0 1 Miles

- 2002 Crashes
- 2001 Crashes
- 2000 Crashes
- 1999 Crashes
- 1998 Crashes
- Street Network

(Criteria to Identify Pedestrian Crash Locations continued from page 2)



**Figure 2: Pedestrian Crash Concentrations in the City of Reno**

Next, locations with a high number of crashes were identified and criteria were developed to rank these locations from a safety and risk perspective. The criteria to rank high crash locations involve the computation of crash indices based on the number of pedestrian crashes and pedestrian exposure. Accurate estimation of pedestrian exposure is an interesting concern. Should it be based on demographic characteristics such as resident population? If so, how are pedestrian trips involving visitors in places such

as Las Vegas to be accounted for? Should different types of crashes be weighted differently or those involving different age groups be weighted differently? If so, how should these weighing factors be estimated? These are some important questions which need to be and will be addressed in the process.

The end product will be a set of criteria to assist the system managers not only in Nevada, but also nationally, in better understanding the cause of the crashes and identifying appropriate operating strategies

to enhance pedestrian safety. For more information about the project, please contact Dr. Srinivas S. Pulugurtha via email at [pss@trc.unlv.edu](mailto:pss@trc.unlv.edu) or Dr. Shashi S. Nambisan via email at [shashi@ce.unlv.edu](mailto:shashi@ce.unlv.edu).



**Dr. Srinivas S. Pulugurtha**

# Product Evaluation Committee (PEC) Meeting Recap

## APPROVED

### A Change to NDOT Specifications for Flexible Guide Posts

The PEC approved a change to NDOT requirements for flexible guide posts. The department has discussed the acceptance criteria for flexible guide posts at various times for the past 10 years. With the inception of the National Transportation Product Evaluation Program (NTPEP) in the mid 1990s, the discussion centered on how to use the NTPEP testing of flexible guide posts as acceptance criteria for NDOT's approved products list. Since the existence of NTPEP, vendors have approached the department with requests for pre-qualification based on the proposed product being tested by NTPEP; however, the department was unable to use the NTPEP test data because there are no pass/fail benchmarks associated with flexible guide posts data. Meanwhile, two flexible guide posts (from Carsonite International and Bunzl-Extrusion) were removed from the QPL recently due to poor performance in the field, although these products met our acceptance criteria.

Recently, the department undertook a one-year research project to address the poor performance of flexible guide posts. This study focused on improving our specifications so that they are a better predictor of actual performance with a particular emphasis on wind-load criteria. The researchers used data collected from maintenance field crews to determine the prevailing type of failure in the field and actual performance of the products. Also, a large volume of field and laboratory data generated by the NTPEP testing program were used to re-qualify those flexible guide posts. The research resulted in new acceptance criteria for this type of product. The recommended pre-qualification criteria address the following modes of failures: 1) impact failures, 2) wind-load, 3) reflective sheeting delamination and 4) discoloration. Based on these new criteria the revised QPL includes two flexible guide posts of tubular shape - Carsonite CGDU and Safe-Hit 248 GP3. The new first pre-qualification requirement is that all flexible guide posts to be considered for placement on the QPL must be tested by NTPEP.

## APPROVED

### QPL for High Mast Head Frame Assembly

The PEC approved a proposal from the Traffic/Safety division that a QPL for high mast head frame assemblies be established under current standard specification section 623.02.12c.

High mast lighting is associated with two elements – spun aluminum reflector luminaries and lowering assemblies. The high mast frame assembly is the complete ring assembly that supports the luminaries, guide mechanism, cable sheaves, and cable and includes the internally mounted lowering winch. The lowering gear allows the head assembly to be lowered to perform maintenance on lamps and cleaning of the luminaries.

Presently, the intent is to use only bottom-latching devices because in the past there were problems with top latching devices that wouldn't release to permit lowering of the head frame assembly for maintenance or repair. Establishment of a QPL will help to eliminate poor performing products and to ensure that maintenance forces are able to select quality bottom-latching type devices. The manufacturers/vendors will be directed to submit their proposal for acceptance of their product on NDOT projects. Based on Traffic's recommendation, products can be added to the QPL.



The Research Division administers the Department's research, development and technology transfer program and serves as the "clearing-house" for product evaluations

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Is published quarterly by the NDOT Research Division. Its purpose is to provide the latest information on the NDOT research activities including product evaluation and other pertinent research topics.

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