

Memo

To: MUTCD Experimentation Approval Team

From: Shauna Hallmark and Neal Hawkins

Project: Evaluation of Traffic Calming Treatments for Rural Communities Phase II

Subject: Description of Traffic Calming Plan for Hazelton, Iowa

Date: August 26, 2011

1. Background

This memo is to request MUTCD approval for a traffic calming treatment which will be implemented in Hazelton, Iowa. The traffic calming is being implemented as part of an Iowa Highway Research Board (IHRB) and Iowa DOT project which is evaluating the effectiveness of low-cost traffic calming strategies on reducing speeds along major roads through small communities. This project is being conducted by the Center for Transportation Research and Education (CTRE) at Iowa State University (ISU). This project is the second phase of a project which also evaluated a number of rural traffic calming treatments.

In the first phase, the research team evaluated several traffic calming treatments that were appropriate for small rural communities. That research was funded by the Iowa DOT, the Iowa Highway Research Board, and Federal Highway Administration (<http://www.intrans.iastate.edu/research/detail.cfm?projectID=-226410767>). Several types of treatments were shown to be effective while a few of the others were not. However, each treatment was only applied in one location. As a result, firm conclusions could not be drawn about whether the effectiveness or lack of effectiveness was due to the treatment itself or was related to other factors. Additionally, since traffic calming in rural communities is relatively unknown in the US, there are a several other treatments which may have been effective but could not be evaluated under the scope of that project. There have also been subsequent requests from Iowa agencies and other communities nationally for additional guidance in selecting and applying traffic calming in small communities.

In the current project (Phase II), CTRE is evaluating the effectiveness of additional low cost treatments at the entrance to small rural communities. The focus is on the main road within a small community which also serves as the major state or county highway outside the community. As a result, drivers frequently enter the community at high speeds which poses a safety problem within the community. The objective of rural community traffic calming is to remind drivers traveling along major state or county highways that they are entering a community and need to adjust their speed accordingly.

The treatment described in this request was selected by carefully considering traffic calming treatments that have been effectively used in other countries for small rural communities, as well as using the information gained from the first phase of the project.

2. Description of Community

The traffic calming treatment will be installed in Hazelton, Iowa (Figure 1). The population is 892. Traffic calming is proposed along the main road east/west road through community C-57. The team is working with the Buchanan County Engineer for installation and monitoring.

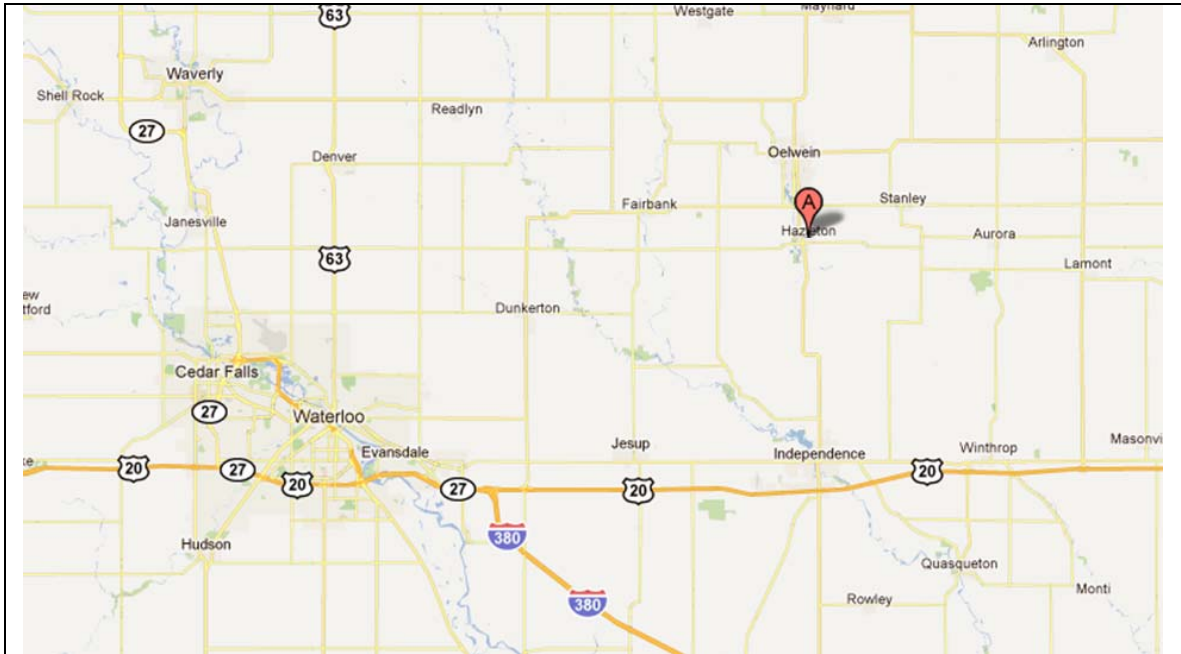


Figure 1: Location of Hazelton, Iowa

3. Nature of the Problem (Step 1 of the Experimentation Request)

C-57 serves as the main route east/west route through Hazelton as shown in Figure 2. A number of residential areas are located long both sides of the roadway. The speed limit is 55 mph outside of the community and drops to 25 mph at the community entrance on the east (760 vpd) and west (820 vpd). The community entrances were of the most concern so initial speed studies were conducted at those locations. The mean and 85th percentile speeds for both entrances were more than 10 mph over the posted speed limit. The site was recommended by the Buchanan County engineer who was concerned about speeding and safety.

The proposed treatment is requested since few strategies are available for rural traffic calming.

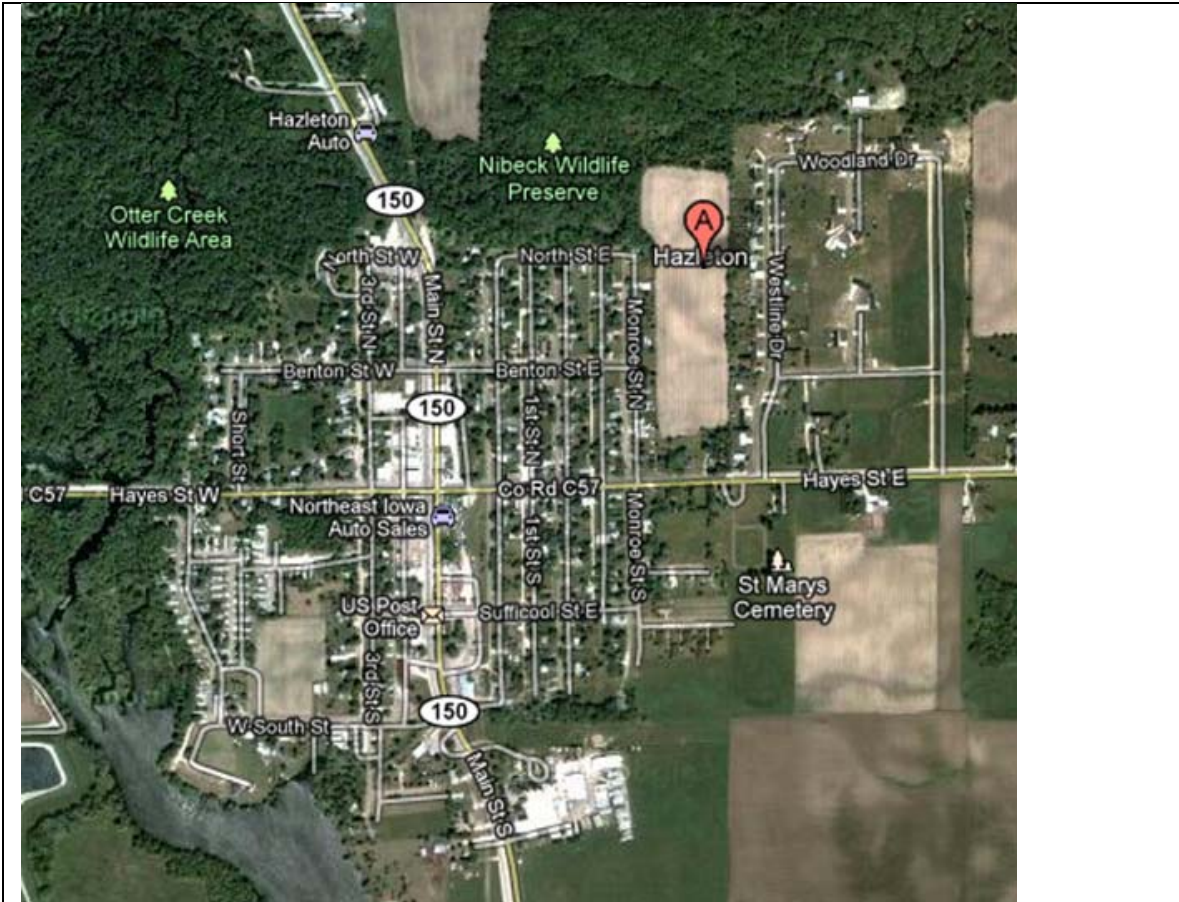


Figure 2: Schematic of Hazelton, Iowa (image source: Google)

4. Description of the Treatment (Step 2 of the Experimentation Request)

The following describes how the treatment was selected, describes the treatment, and outlines how it deviates from the MUTCD.

4.1 Development of Treatment and Deviation from the MUTCD

As noted in the background section, treatments in general were selected based on a review of what has been successfully implemented in Europe or was evaluated in the first phase of a rural traffic calming project. Consideration was also given to cost since rural communities have constrained resources for traffic management.

The treatment was based on the concept of speed reduction markings which are covered in Section 3B.22 of the MUTCD. The transverse markings by themselves were only moderately effective in an earlier phase of this study. The proposed treatment was modified to provide more visual effect. Additionally the middle bar provides additional visual contrast for the driver. The bar spacing also encourages drivers to place their vehicle which is expected to cause drivers to slow down as they concentrate on the driving task.

4.2 Design and Placement

The treatment design is shown in Figures 3 and 4. The proposed treatment consists of a series of 3 bars as shown in Figure 4. The bars are spaced at intervals so that drivers are able to position their vehicle within the wheel paths. The treatment is spaced for approximately 100 feet before the first posted speed limit where drivers are encouraged to slow down. The bars can be placed moving sequentially closer to provide the illusion that drivers are speeding up. Approximate spacing is 10 to 12 feet.

The treatment will be used at the east community entrance on W-57. The treatment will be set to terminate at the beginning of the 25 mph speed limit since this is where it is desirable to slow people down. A speed table will be used for the west community entrance which does not require MUTCD approval.

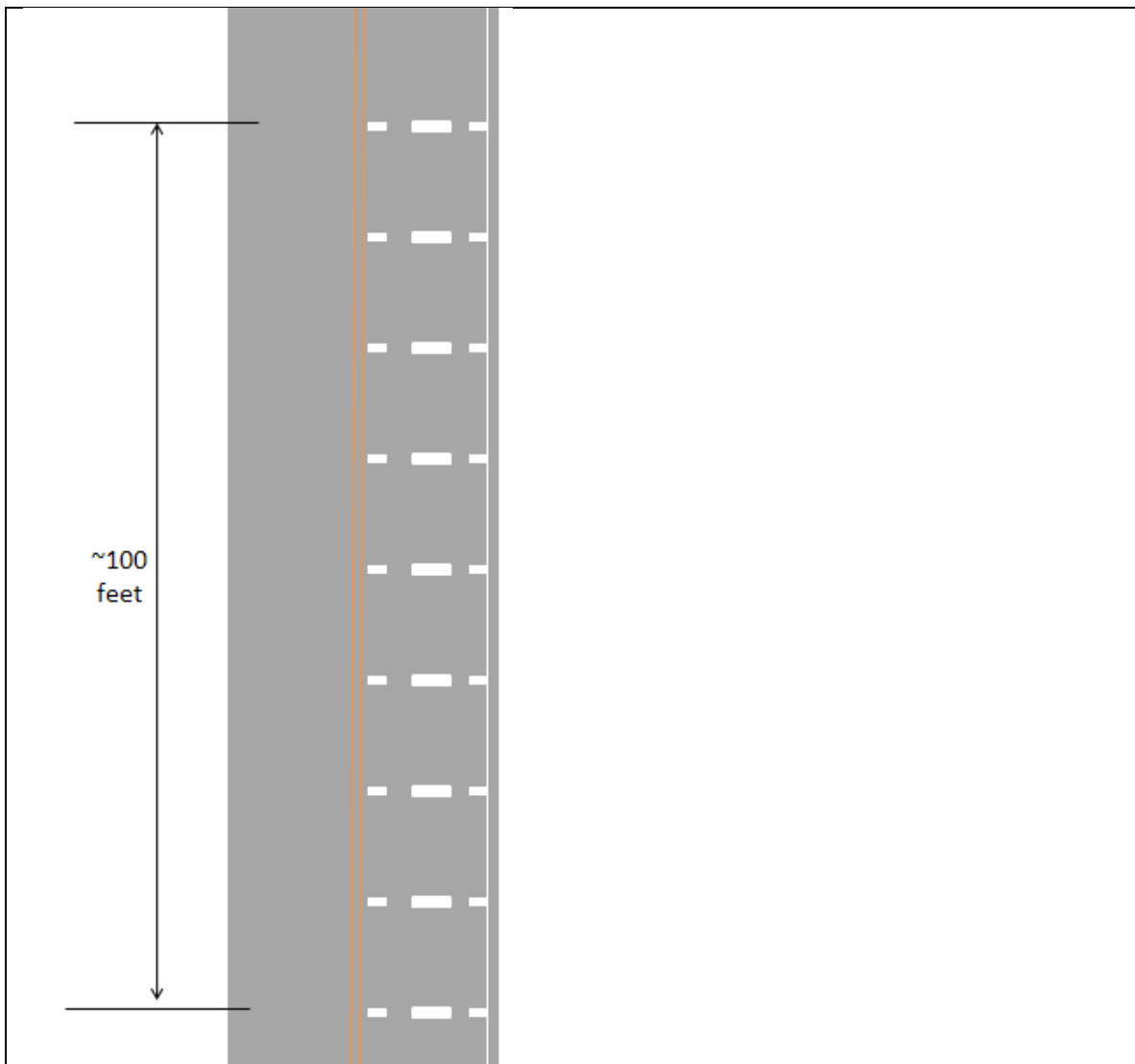


Figure 3: Schematic of Overall Treatment

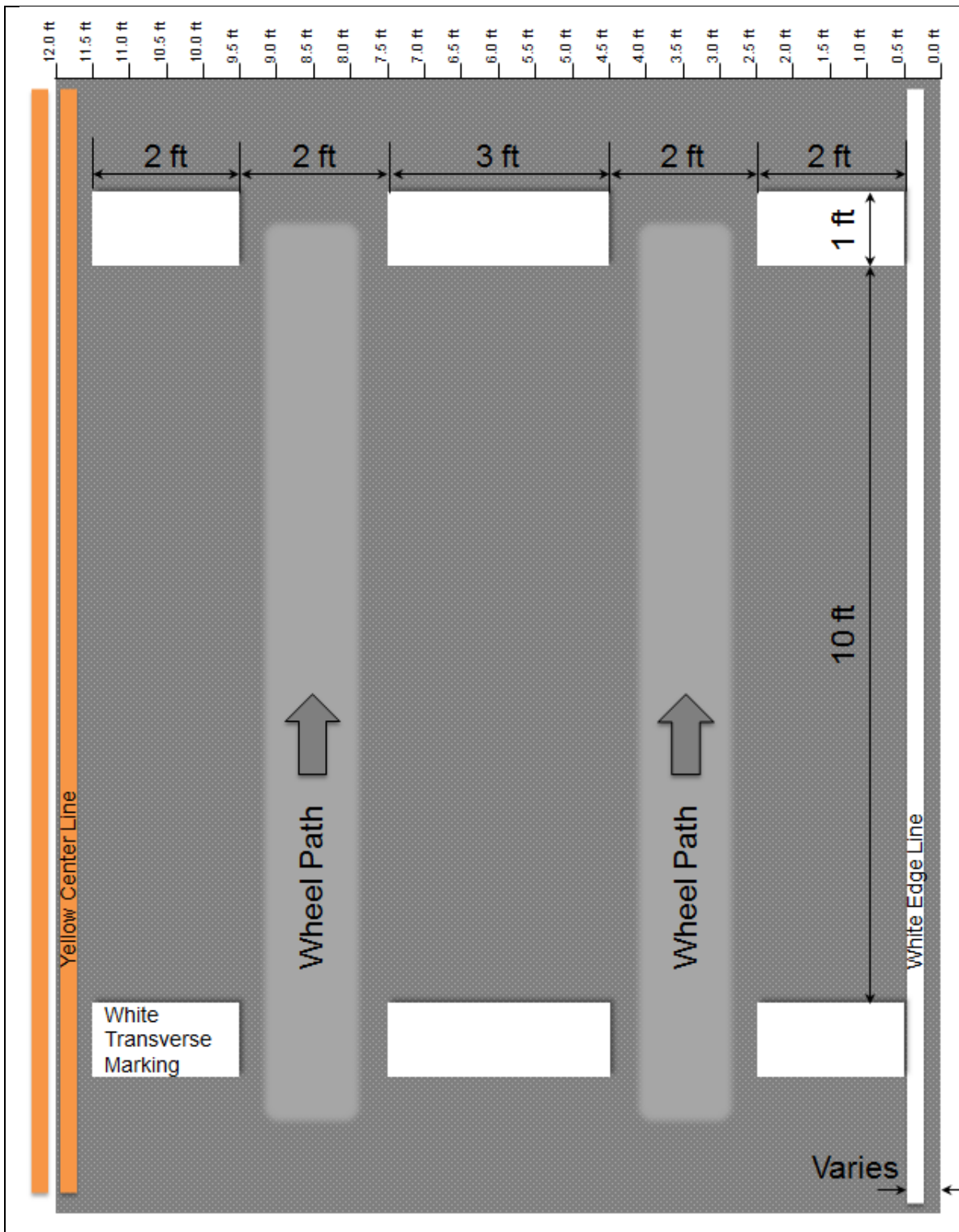


Figure 4: Details of Treatment

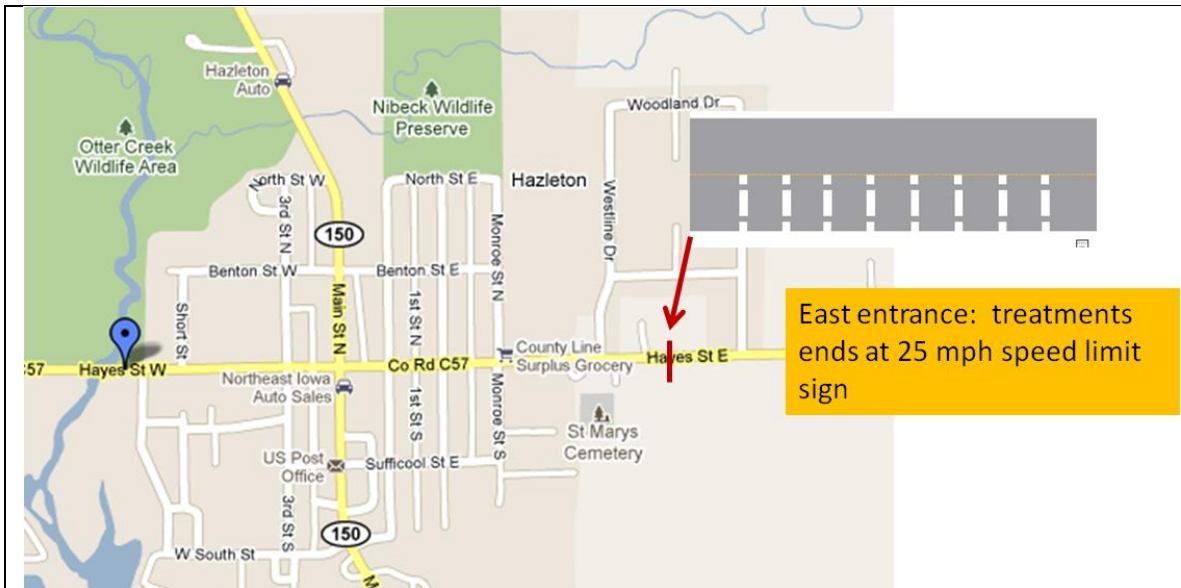


Figure 5: Location of Treatment (image source: Google)

5. Illustration of the Traffic Control Device (Step 3 of the Experimentation Request)

See Figures 3 and 4.

6. Effectiveness (Step 4 of the Experimentation Request)

Katz (2004) reported on use of the peripheral transverse markings at sites in New York (freeway exit), Mississippi (two-lane road) and Texas (two-lane road on curve). Overall he found a 4 mph reduction in average speeds and 5 mile reduction in 85th percentile speed. Differences were statistically significant.

Speed reduction markings were used at the entrance to Union, Iowa along State Highway 215 and D-65. The treatment resulted in a reduction in mean speeds up to 1.9 mph and reductions in 85th percentile speeds up to 2 mph. The percentage of vehicles traveling 5 or more mph over the posted speed limit was reduced by up to 5% and the percentage of vehicles traveling 10 or more mph over the posted speed limit was reduced by up to 8.5 % (Hallmark et al, 2007).

7. Copyright (Step 5 of the Experimentation Request)

CTRE developed the design. Consequently the device is not protected by patent or copyright. The transverse bar design is shown in Section 3B.22 and it is assumed that the transverse bar design is not copyrighted.

8. Proposed Time and Location of Experiment (Step 6 of the Experimentation Request)

The treatments will be installed by fall of 2011. The duration of the test study will be approximately 12 months. Location of the experiment is described in Section 4.2.

9. Evaluation Plan (Step 7 of the Experimentation Request)

We plan to install the treatments in the fall 2011. An initial speed study was conducted to make a preliminary determination as to whether a speeding problem existed. However, only 25 vehicles were collected with a radar gun which is not a representative sample. A full scale speed study will be conducted before implementation of the traffic calming devices to establish a baseline “before” case. “Before” data will be collected no more than one month before implementation of the gateway treatments. Data will be collected within one month after the devices are installed and at one year. “After” data will be compared with “before” data and across time to determine effectiveness over time. Data will be collected for at least 24-hours using pneumatic road tubes (JAMAR brand counters).

We expect to use the t-test, F-test, or tests of proportionality to compare speed data. A 95% level of confidence will be used for statistical tests. If data are not normally distributed (which we expect is unlikely given the large sample sizes), the appropriate non-parametric test, such as the Wilcoxon signed rank test will be used.

We anticipate comparing the following data in order to determine whether the treatments were effective:

- average speed
- 85th percentile speed
- % vehicles 5, 10, 15, and 20 mph over speed limit
- volume

The after period will only be one year. This is not sufficient time to conduct a crash analysis so study results will be based on the assumption that reducing speeds will have a safety impact in the community.

10. Removal of Treatment (Step 8 of the Experimentation Request)

Without refreshing the pavement markings during the study, we expect given Iowa’s harsh winter climate and use of snow plows and de-icing agents, the pavement markings will have faded within 24 months.

If the team, Iowa DOT, Buchanan County, or FHWA determines that the treatment constitutes a safety hazard, the treatment will be removed before the end of the study.

11. Agreement to provide semiannual progress reports (Step 9 of the Experimentation Request)

A final project report and tech brief will be provided to the Office of Transportation Operations at the conclusion of the project.

12. References

Hallmark, Shauna L., Eric Peterson, Eric Fitzsimmons, Neal Hawkins, Jon Resler, and Tom Welch. Evaluation of Gateway and Low-Cost Traffic-Calming Treatments for Major Routes in Small Rural Communities. Nov. 2007.
<http://www.intrans.iastate.edu/research/detail.cfm?projectID=-226410767>