STC Research Project Description

Project Title: Guidance on Safe Implementation of Unconventional Arterial Designs

Principal Investigator: Joseph E. Hummer

University: North Carolina State University

Telephone: 919-515-7733 Email Address: Hummer@eos.ncsu.edu

External Project Contact: North Carolina State University

Address: Department of Civil Engineering

City: Raleigh State: NC Zip: 27695-7908

Telephone: 919-515-7206 Email Address: Charity_cartwright@ncsu.edu

Project Start Date: 8/1/00 End Date: 7/31/01

Other Milestones, Dates: n/a

Project Objective:.The purpose of this project is to develop guidance on how highway agencies can safely implement unconventional arterial designs. Good implementation will likely include three major elements traffic control devices, public relations, and enforcement. This project will end up with recommendations on how each of those should be used to overcome that potential driver confusion. That is, we will recommend: (1) Which signs and markings are effective for particular designs (the MUTCD only provides general guidance in this area), (2) What public relations activities are most effective in informing drivers of the unusual new intersection, and (3) What type and magnitude of enforcement is needed to discourage violations. The project scope will be limited to the unconventional designs with the most potential for widespread implementation in the short term. There is currently a menu of 10 unconventional designs for arterials that do not require a grade separation; all the items on this menu have been built somewhere or have been analyzed in the literature. However, several items on that menu are at the earliest stages in research or are meant for very specialized situations. Thus, this project will provide guidance for the safe implementation of: Median u-turns, Superstreets (a form of median u-turn that reroutes cross street through movements), Continuous flow intersections, Bowties (a form of median u-turn using roundabouts instead of median crossovers), and Jughandles (all turns from the arterial made from ramps on the right, as used extensively in New Jersey).

Project Abstract: Unconventional arterial designs like median u-turns, superstreets, and continuous flow intersections have the potential to significantly reduce delay compared to conventional arterial designs of similar size. One of the reasons designers cite for not using the unconventional designs, however, is concern that drivers will not understand how to negotiate their way through the intersections, particularly when they are new. The purpose of the proposed project is to explore this concern and highlight ways in which it can be alleviated. The research team will examine case studies from the southeast and elsewhere where agencies opened new designs. The team will look at traffic control devices, enforcement levels, and public relations tools used by those agencies. The research team will also work with a focus group of typical drivers to gather detailed reactions to those devices and tools. The result from the project will be recommendations to designers considering unconventional designs on the best ways to avoid or overcome driver misunderstandings.

Task Description: The project will be conducted in five tasks as outlined below. The tasks provide a logical flow to the work and provide milestones against which we can judge our progress.

Task 1. Contact States, August 2000-January 2001. As described above, during this task we will make telephone contacts with the state DOTs in the Southeast and other state DOTs across the U.S. known for implementing new designs. The purpose of the calls will be to gather information on how these states used traffic control devices, public relations, and enforcement to implement new designs. We will contact state design engineers, state traffic engineers, state signing engineers, highway patrol officers, and/or personnel in division or district offices to gather information about particular cases. When relevant, we will ask for reports, photos, plans, standards, and other printed material that may be helpful. The main point is this task, though, is the opinion of the responsible engineers and officers about what worked, what did not work, and what they would try next time to achieve a safe implementation.

Task 2. Data Collection Trips, October 2000-January 2001. As described above, during this task the research team will visit four states (Michigan, New York, New Jersey, and Maryland) with a history of implementing new arterial designs. We will collect information at particular sites and we will meet with the highway agency and enforcement personnel responsible for the most recent implementations. As in Task 1, written material and photos will be gathered but the most important data will be the opinions of the engineers and officers on what worked and what did not work. The trip to Michigan will likely occur during October or November, before the weather becomes too unstable in that region, while the trip to New York, New Jersey, and Maryland will likely be combined with a trip to the TRB Annual Meeting (and more chances to gather information) in January.

Task 3. Focus Groups, February 2001-March 2001. As noted above, focus groups are an efficient way to gather detailed feedback on complex issues. During these focus groups, we will collect the reactions and ideas of a sample of "typical" drivers in two areas traffic control devices and public relations activities. To spark reactions, we will display photos and drawings of signs and markings based on information from previous tasks. We may also distribute sample newspaper stories to spark discussion on effective public relations.

We anticipate three focus groups at this point, including primarily older drivers, primarily younger drivers, and a third group from a wide age range. We will recruit the older driver group from a senior center, and the younger driver group from a university student club or group. We will recruit the broad age group from a citizen advisory group or panel. All groups will convene in the Raleigh, NC area, which is generally representative of the Southeast and has no unconventional arterial designs in place. We will not pay focus group participants. We will develop informed consent forms and will protect participant anonymity in reports and papers. A one-hour meeting should allow sufficient time to discuss both topics with a group of 6 to 10 participants. The PI will moderate the focus group while the graduate research assistant will record comments.

Task 4. Develop Guidance, April 2001-May 2001. The objective in this task is to bring together the information gathered in previous tasks to write guidance on safe implementation of unconventional arterials. As discussed above, the guidance will emphasize realistic, cost-effective standards. Hopefully by the time we are conducting this task the latest version of the MUTCD will have been published and we can check our guidance on traffic control devices against it.

Task 5. Technology Transfer, May 2001-July 2001.

Task 5. Technology Transfer, May 2001-July 2001. As noted above, this final task is critical to the success of the project. If we do not find an effective way to reach the relevant highway agency personnel, the project will have been futile.
The list of technology transfer products shown below is long. Some of these papers and presentations will be completed after the project deadline expires on July 31, 2001. However, the track record of the PI is such that STC can be confident that such papers will be written and presentations delivered.

The dissemination of results to AASHTO noted below is important. State representatives on the relevant AASHTO committees are in prime positions to distribute information around their agencies. Since most higher-level state DOT personnel now have e-mail access, distributing a summary to the AASHTO representatives this way should be effective and inexpensive.
Another unique technology transfer idea listed below is the creation of an "unconventional arterial design" web site, and the posting of the guidance developed here to that site. This type of site is something the PI has had in mind for some time, but has not done due primarily to lack of research assistant support in this area. We will start the site simple and small, with this project's results and some other public sector material from previous projects, and hope to have the site grow in scope and complexity in future years.

Total Budget: $20,000

Student Involvement (Thesis, Assistantships, Paid Employment): We anticipate assistance from Ms. Cipriana Thompson, a Masters student, for three months on this project.

Relationship to Other Projects: The proposed P.I. has conducted a previous project for the NCDOT in this area.

Technology Transfer Activities: Extensive; noted above in the description for Task 5.

Potential Benefits of Project: The research will lead to guidance on how highway agencies should safely implement unconventional arterial designs. The potential benefits for highway agencies and the public from this guidance include safer arterials, more efficient uses of enforcement and public relations resources, and more efficient arterial operations. The research will result in safer arterials if highway agencies use the guidance developed in this project to specify the best traffic control devices to accompany an unconventional design. Traffic control devices cannot cure a poor design, but the right devices in the right places can prevent many collisions. Because the potential for confusion is greater than at a conventional intersection, the potential pay-off (in terms of collisions prevented) from good traffic control devices is higher than normal.

The research should allow highway agencies to specifically tailor their public relations and enforcement activities that accompany the opening of a new unconventional intersection or arterial. Will the agency need press releases? Will the agency need television news exposure? Will the agency need to station officers near the intersection from the day it opens or can they wait for indications that bad driving habits are developing? Can automatic enforcement play a role in an unconventional design? The research will provide answers to key questions like these.

Finally, the research should provide some agencies with the confidence they need to use an unconventional design. Travel time and delay savings will only materialize if agencies overcome their implementation concerns and build such an intersection. If the research can demonstrate that the safety risks at implementation are minimal and manageable, a large pay-off is possible in terms of reduced delay and travel time.

TRB Keywords: safety, arterial, geometric design, traffic control device