DRISI
Caltrans Division of Research, Innovation and System Information

Research Results

# Determining the Effects of Transportation Corridor Features on Driver and Pedestrian Behavior and on Community Vitality

Identify defensible measures for community enhancing roadside design features.

Design and Construction

**December 2012**

**Project Title:**
Determining the Effects of Transportation Corridor Features on Driver and Pedestrian Behavior and on Community Vitality

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## WHAT IS THE NEED?

Over the past decade, Departments of Transportation have committed to implementing Complete Streets principles, making streets public places that reflect the balanced needs of the community and multi-modal transportation networks. Landscape Architects often lead planning and design efforts to better incorporate Complete Streets elements such as enhanced pedestrian and bicycle facilities, landscaping and other streetscape improvements. In order to ensure that Complete Streets are successful, there needs to be a robust system of performance measures including new measures for environmental stewardship, non-motorized safety and mobility, and economic vitality.

## WHAT WAS OUR GOAL?

1) explore the relationship between landscape and roadside features and road user safety, behavior, and economic vitality of an area; 2) create a framework of performance measures for pedestrian and bicyclist safety and mobility, and environmental sustainability; and 3) examine driver behavior and safety.

## WHAT DID WE DO?

This research project has been conducted in three phases: a literature review, performance measure development, and field-testing of the performance measures.

For the literature review, the research team examined approximately 165 studies dealing with the effects of transportation corridor design features on user safety; walkability, bikability, and physical health; psychological well-being; community and economic vitality; and varying environmental

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concerns. The cumulative literature review research findings point to some key guidelines to make the design of urban arterials more accommodating to non-motorized travelers and environmental stewardship. The literature review was published in 2008 under the title "The Effects of Transportation Corridor Roadside Design Features on User Behavior and Safety, and Their Contributions to Health, Environmental Quality, and Community Economic Vitality: A Literature Review."

Based upon the findings of the literature review, the research team developed performance measures within a framework that is directed toward conventional highways. Research and observation suggests these are the roadways on which the greatest conflicts between motorized and non-motorized traffic occur, and where local quality of life is most impacted by roadway design. The proposed performance measure framework is modeled on a current Department of Transportation performance measurement system. The document "Performance Measures for Complete Green Streets: a Proposal for Urban Arterials in California" was published in 2010.
The final phases of the research project focused on field testing the proposed performance measures for validity and reliability. This entailed gathering data on multiple aspects of two key urban arterial conventional highway corridors: San Pablo Avenue in the East San Francisco Bay Area, and Santa Monica Boulevard in the Los Angeles area. The analyses looked at street design features; rates of pedestrian, bicyclist, and driver injuries and fatalities; jurisdictional policies pertaining to non-motorized transportation; and user perceptions of safety and mobility. Finally, baseline data, including street design features and intercept surveys, were collected along a portion of Highway 82 in San Jose in the South San Francisco Bay Area where Complete Street improvements are anticipated over the next few years.

## WHAT WAS THE OUTCOME?

Urban arterials that include design features such as street trees, landscaping, street lighting, bicycle lanes, trash receptacles, public art and other beautification measures attract all user groups (drivers, pedestrians, bicyclists, and transit users) to the area more often, contributing to improved economic vitality along the corridor. Clean, well-maintained roadways and sidewalks were also found to attract all user groups to visit urban arterial corridors more often and further improve economic vitality.

Intercept surveys, which were completed by people who had stopped at some point along the corridor, revealed that increased mobility and perceived safety along urban arterial corridors can be attained for all user groups (pedestrians, drivers, bicyclists, and transit users) through the installation of bicycle lanes, improved pedestrian crossings, slower traffic and improved driver behavior, more traffic signals, and increased street lighting.

Cities, counties, and state agencies that have aggressively pursued pedestrian and bicycle improvements in transportation plans correspond with a greater number of pedestrian and bicycle facilities than those agencies that do not, indicating that policies and plans do positively affect the design of highway corridors. This indicates that agencies should review and update all of their roadway planning and design guidance as necessary to address bicycle and pedestrian policies and improvements.

Several of the proposed performance measures concerning pedestrian and bicycle safety were deemed valid and fitting within current practices for driver safety. These new measures will require the collection of pedestrian and bicyclist volumes and the calculation of pedestrian and bicycle crash rates. Departments of Transportation should begin to use the capabilities of their existing data collection processes to collect pedestrian and bicyclist data. New data collection processes should also be developed and deployed as

necessary to implement these performance measures.

Some findings show limits to when combinations of design features should be used. Notably, countdown signals coupled with potential visual obstructions in the intersection "sight triangle" should be avoided when possible. Also, context sensitive crosswalks are best used where vehicle speeds are low and where pedestrians will not be tempted to wander into the roadbed inattentively.

## WHAT IS THE BENEFIT?

Caltrans and other agencies can use the proven performance measures to aid decision making during prioritization of projects. In addition, the literature review, guidance on developing complete street plans, and findings on design feature interactions are tools that can be used to design optimal roads for living communities.

The mix of factors that affect safety on an urban corridor is complex. Studies suggest that there are roadside design features that can encourage pedestrians and bicyclists to visit an area, but the effects of these features may be completely mitigated if the speed limit is beyond a certain level, or if automobile traffic volumes are so high that pedestrians and cyclists consistently feel at risk of being hit by a car. Research in this area could be furthered by: (1) developing and validating various composite measures that account for the effects of multiple elements; (2) improving measurements of pedestrian and bicycle exposure; (3) understanding how the needs of through traffic (which does not stop) and traffic that does stop along the corridor overlap and/or differ in their desire for corridor roadside design; and (4) observing pedestrian, driver, and bicycle behavior in the context of various design, facility, and countermeasure features.

## LEARN MORE

To view the evaluations:
Literature review
http://uctc.net/research/papers/878.pdf