Transportation system management and operations (TSM&O) is the front-line of a transportation system. It is one of the areas that is most visible and noticeable to the traveling public—possibly second only to resurfacing, restoration, and rehabilitation (3R) projects in terms of public visibility. Likewise, TSM&O forms the core of how the traveling public interacts with the travel environment, for all modes of transportation. By its very nature, TSM&O presents numerous opportunities to address safety performance through the integration of substantive safety.

Daily decisions in TSM&O often are made with the belief that they are improving the “safety” of the road. That very well may be true. For many safety strategies, the science of traffic safety has progressed to a point where operations staff can look to numerous resources and have a quantitative understanding of the expected safety performance, rather than simply believing that “safety will happen.”

This does not mean incorporating substantive safety into transportation projects is simple or straightforward. Clearly, one key factor is providing operations staff with resources and information on safety strategies and their performance. However, one area that may often be overlooked is setting in place a process for operations staff to provide input and value to other divisions of the agency.

The definition of TSM&O is very broad, but the intent is to encourage and promote the safe and efficient management and operation of integrated, intermodal surface transportation systems. For this report, it is important to understand that the definition of TSM&O does not include maintenance activities (such as plowing after a snowstorm) or pavement maintenance. A key element to understanding the difference between the two is that maintenance relates to maintaining a state of good repair, whereas TSM&O is focused on management of the traveling public.
TRAFFIC OPERATIONS
A commonly identified area for systems operations is the management of corridors and traffic signals. Approaches may range from implementing simple signing or pavement marking treatments of at-risk locations (from rural horizontal curves to urban pedestrian crossings) to managing advanced signal systems in urban areas. A range of geometric treatments (for example, turn lanes and median closings) present additional opportunities for operations to improve safety performance.

DEMAND AND INCIDENT MANAGEMENT
State departments of transportation and large cities have long been using technology and programs to help manage and operate their freeway systems in order to maintain efficient operations.

Freeway management may include high occupancy vehicle (HOV) lanes, toll lanes, ramp metering, variable speed limits (VSLs), bus shoulders, incident response teams, variable message signs (for travel time information or queue warning), and dynamic lane assignment. Because some of these strategies are not widely used across the country or are unstudied, little is known regarding their safety performance. However, when international experience is included, there is good basis to believe that many operational strategies may improve safety performance. However, caution is needed. Some research indicates that a few strategies (such as hard shoulder running) may lead to an increase in total crashes but with a decrease in crash severity.

MULTIMODAL OPERATIONS
A growing safety interest in the area of multimodal transportation is eliminating, reducing, or minimizing the conflict between pedestrian, bicycle, and transit modes and passenger vehicles. Operations staff can implement various projects that may accomplish these goals. Areas with the greatest concentration of pedestrians or bicycles will have the greatest potential for a crash. These may include commercial areas, schools and colleges, downtown districts, parks, and bus stops, transit routes, and transit centers. In these situations, a complete streets project may help identify preferred treatments.

ENFORCEMENT
Highway agencies often overlook the important support role they play in traffic enforcement. Properly setting and posting speed limits in corridors can minimize speeding and other driver behaviors that bring about the need for law enforcement. Another traditional solution that supports traffic enforcement is to provide safe areas for officers to make traffic stops. Roads with narrow shoulders, especially high-speed roads, can present dangers to officers while outside their patrol vehicles. Instead of widening shoulders along the entire corridor, a lower-cost option is to work with law enforcement to identify locations where pullout areas could be constructed.

SAFETY PERFORMANCE
Monitoring the safety performance is an important part of the TSM&O of any facility. The key is to be able to compare actual crash occurrences against either predicted or expected values (such as average crash rate, average crash frequency/density, or predicted crash frequency) to identify locations where the safety performance indicates a potential need for improvement. In order to produce reliable analyses of safety performance, it is necessary for agencies to maintain accurate and timely crash information, including location information.

TOOLS AND RESOURCES
Many resources available to operations staff are described in the report. These include NCHRP Reports 500 (Guidance for Implementation of the AASHTO Strategic Highway Safety Plan), 600 (Human Factors Guide), and 622 (Effectiveness of Behavioral Highway Safety Countermeasures). Each resource contains example strategies that can be applied to improve the safety performance of an area, corridor, or intersection. They also include processes and checklists to help select strategies based on crash patterns, as well as expected change in crash frequency based on research.