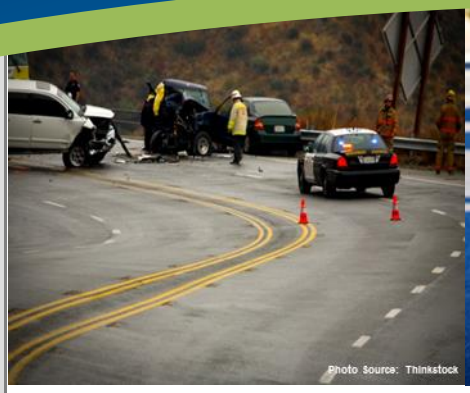
U.S. Department of Transportation

# Traffic Incident Management

## ITS Benefits, Costs, and Lessons Learned: 2017 Update Report





### Traffic Incident Management

**Surveillance & Detection**
**Mobilization & Response**
**Information Dissemination**
**Clearance & Recovery**

### Highlights

- Benefit-Cost analysis of Incident Management Systems show that these systems have high return on investment with B/C ratios ranging from more than 3 to1 to over 38 to 1.
- Integration of Incident Management Programs with Transportation Management Centers, the police, emergency medical services and other emergency services is becoming increasingly more important.
- Next Generation 911 (NG9-1-1) systems use ITS technological advances to allow voice, text, images, and data to be sent to public safety access points (PSAP) to improve efficiency, response time, and allow responders to gather more detailed information about incidents.

## Introduction

*This factsheet is based on past evaluation data contained in the ITS Knowledge Resources database at: www.itskrs.its.dot.gov. The database is maintained by the U.S. DOT's ITS JPO Evaluation Program to support informed decision making regarding ITS investments by tracking the effectiveness of deployed ITS. The factsheet presents benefits, costs and lessons learned from past evaluations of ITS projects.*

Managing traffic incidents is a proven strategy for addressing significant portions of the Nation's traffic congestion problems. Approximately 25 percent of all delay is the result of incidents on roadways [1]. Traffic crashes are the most time-consuming of these incidents, but the more numerous cases of stalled vehicles, roadway debris, and other incidents also contribute significantly to the problem. Traffic incident management strategies have shown significant safety, mobility, efficiency, productivity, and customer satisfaction benefits.

Traffic incident management programs make use of a variety of ITS technologies to successfully detect, manage, and clear traffic incidents; improving safety for travelers by reducing the risk of secondary crashes; and reducing time lost and fuel wasted in traffic backups. These programs also utilize ITS deployed for traveler information, freeway management, and arterial roadway management, and increasingly coordinate their activities with Transportation Management Centers (TMCs), the police, emergency medical services and other emergency services.

**The estimate for the total expected risk-adjusted cost of implementing and operating a nationwide NG9-1-1 system ranges from $82 billion to $86.3 billion over the next 20 years.**

A variety of surveillance and detection technologies can help detect incidents quickly including inductive loop, microwave, acoustic vehicle detectors, and camera systems providing video surveillance of roadways monitored by operators. Mobilization and response may include automated vehicle location (AVL) and computer-aided dispatch (CAD) systems, as well as response routing systems to help incident response teams arrive swiftly. Service patrols are now frequently incorporated into traffic incident management programs. The patrol vehicles and staff supported by an array of other ITS components, such as mobile field reporting, enable significant reductions in the time to respond to and clear incidents.

With the new mandates for performance reporting requirements through MAP-21, incident tracking has become a very important part of traffic incident management programs. Many ITS technologies can be used for both traffic measures as well as emergency response services, creating additional benefits to the traffic incident programs. For example, installing CCTV cameras for traffic monitoring also helps the police achieve more efficient incident response operations.

## Benefits

Traffic incident management programs have demonstrated success and shown high value through benefit-cost ratio analysis. Some sample benefit-cost ratios from incident management programs around the country are shown in Table 1.

**Table 1: Benefit-Cost Ratios for Incident Management Systems.**

| Program | Benefits-Cost Ratio |
|---|---|
| Michigan's traffic incident management-oriented ITS program (2016-01057) | **3.16:1** |
| Safety Service Patrol in Hampton Roads, Virginia (2011-00670) | **4.71:1** |
| Northern Virginia's freeway safety service patrol (2011-00669) | **5. 4:1** |
| A multi-jurisdictional emergency response crew in the Phoenix metropolitan area providing services to six cities (2012-00792) | **6.4:1** |
| Arterial Service Patrol deployed during the re-construction of I-64 in St. Louis (2011-00667) | **8.3:1** |
| Expansion of the St. Louis Motorist Assist (MA) program (2011-00666) | **38.25:1** |

Traffic incident management programs have shown significant benefits under several goal areas of ITS, as summarized in Table 2. The most significant findings are that incident management programs have the ability to significantly reduce the duration and clearance time of traffic incidents.

**Table 2: Selected Benefits for Incident Management Strategies.**

| ITS Goal | Selected Findings |
|---|---|
| **Safety and Mobility** | In 2008, WSDOT implemented a new Incident Response program that provides roving patrols during peak periods, as well as being on call 24 hours a day, 7 days a week. The Incident Response Team was able to clear 98 percent of incidents in under an hour and nearly three quarters in less than 15 minutes. (2012-00801) |
| **Productivity** | In Portland, Oregon, an incident response program, known as COMET has reduced 30 seconds per incident, resulting in a reduction of $711,300 costs of delay, which is equivalent to the cost of operating the incident response program for a year. (2013-00869) |
| **Productivity** | A multi-jurisdictional emergency response crew in the Phoenix metropolitan area provides services to six cities with a benefit-cost ratio of 6.4:1 by increasing responder safety and reducing the number of patrol officers necessary at each crash scene. (2012-00792) |

| | |
|---|---|
| **Productivity** | A value analysis of a Next Generation 9-1-1 (NG9-1-1) system found that over a 20-year lifecycle, NG9-1-1 would likely cost about the same as maintaining the status quo of the current 9-1-1 system, but deliver 80 percent additional value (2011-00755) |

Figure 1 shows ranges of benefits for select entries in the ITS Knowledge Resource database at: http://www.itsknowledgeresources.its.dot.gov/. Benefits include reduction in incident duration time, reduction in incident clearance time as well as collision and secondary crash reduction.

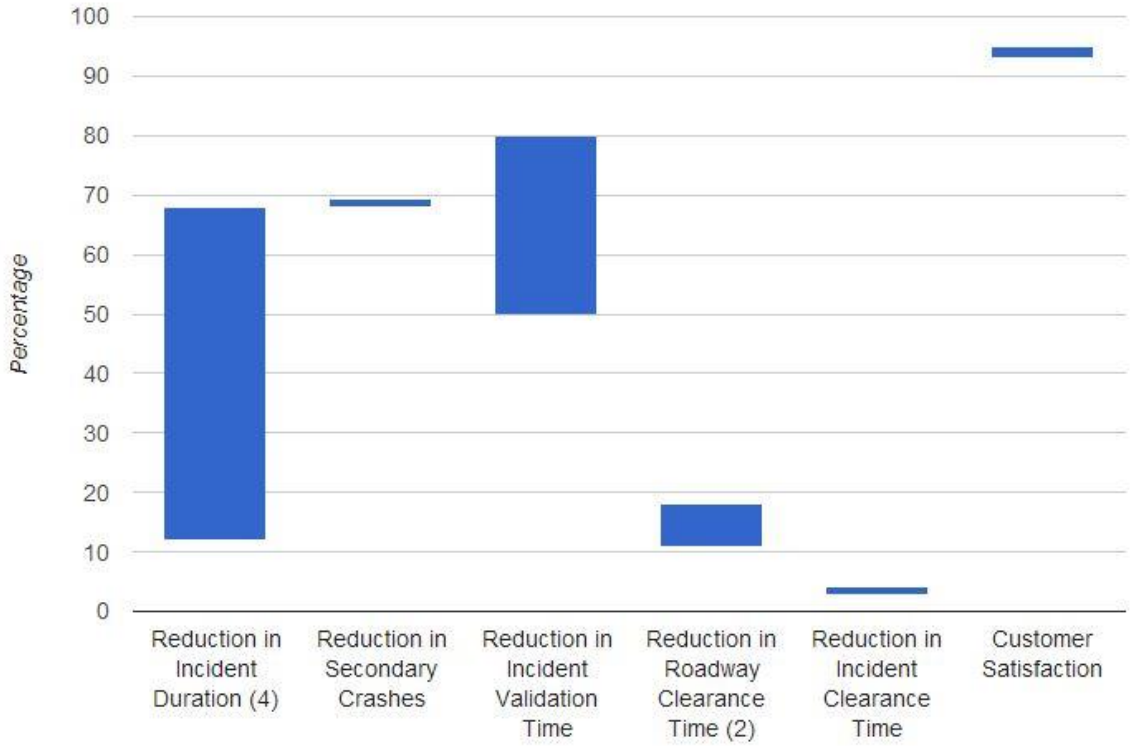



**Figure 1: Range of Benefits of Traffic Incident Management (Source: ITS Knowledge Resources).**

***The online versions of the factsheets feature interactive graphs that contain all the data points included in the ranges. Here, each metric has a number after the text, representing the number of data points used to create the range; no number means only there was only one data point.***

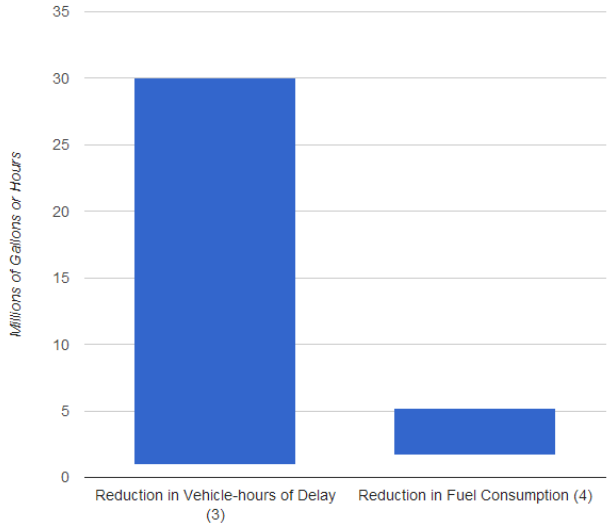



**Figure 2: Range of Vehicle Delay and Fuel Consumption Benefits (Source: ITS Knowledge Resources).**

Traffic Incident Management strategies have also shown significant benefits in reducing vehicle delay and fuel consumption. Figure 2 shows the ranges of these benefits.

## Costs

ITS Knowledge Resource database provides a variety of system costs for incident management strategies that range from small scale local programs to estimates of full nationwide implementations.

The database includes several cases of annual operating costs for motorist assist and highway service patrol programs around the country. Since 2004, annual operating costs for these programs range from less than half a million dollars to over $20 million, depending on location, type of program and number of vehicles. Table 3 shows selected system annual operating costs.

**Table 3: Annual Operating Costs for Incident Management Systems.**

| Incident Management Systems | Annual Operating Costs |
|---|---|
| Motorist Assistance and Safety Services in Arizona (2013-00289) | $389,000 |
| Florida DOT Road Ranger program (2006-00103) | $1,133,085 |
| Northern Virginia (NOVA) Safety Service Patrol (2011-00208) | $1,193,511 |
| The St. Louis, Missouri Motorist Assist Program in 2008 (2011-00206) | $2,015,378 |
| The St. Louis, Missouri Motorist Assist Program in 2009 (2011-00206) | $2,075,839 |
| The Safety Service Patrol (SSP) in Hampton Roads, Virginia (2011-00207) | $2,353,238 |
| A Southeast Michigan freeway service patrol program in 2005 (2006-00105) | $2.4 million |
| A Southeast Michigan freeway service patrol program in 2004 (2006-00104) | $2.5 million |
| Tennessee DOT's HELP Program for FY 2004-2005 (2006-00096) | $5.6 million |
| Tennessee DOT's HELP Program FY 2005-2006 (2007-00119) | $6.5 million |
| Los Angeles County Metro service patrol program (2006-00102) | $20.5 million |

## Lessons Learned

The ITS Knowledge Resource database identifies several lessons learned from deployed traffic incident management strategies. Many of these lessons apply not only to incident management programs, but are also useful in other areas such as road weather operations and freeway operations management.

A report on the experience of the Utah DOT's integration of their Road Weather Information Systems (RWIS) Program with Traffic Operations discussed several lessons learned including:

- **Use weather information from sensors and forecasts to improve incident response times and only having crews on call when weather events are looming.** The availability of up to 10 forecast updates during a storm allows the Incident Management Team (IMT) to place crews in areas where they will most likely be needed before the weather worsens. Flexible staffing has been made possible through the use of forecasts to increase staff only when necessary. Additionally, because the RWIS program staff provides weather reports to Traffic Operations Center (TOC) staff at least twice daily (and more frequent updates during weather events), the IMT no longer needs to spend staff time looking for weather updates (2012-00634).

The I-95 Corridor Coalition developed a white paper on the benefits of using vehicle probes to monitor traffic cost-effectively, manage incidents and queues proactively, reduce delays, and increase traveler satisfaction along a multi-state transportation corridor. Lessons learned from the experience of several State departments of transportation (DOT) are discussed in the white paper, including an experience from New Jersey's DOT (NJDOT) on using vehicle probe data for incident management:

- **Enhance incident management efficiency by using vehicle probe data** (New Jersey). During a surprise snowstorm in October 2008, NJDOT TOC was reviewing an accident on I-80 via a closed circuit television (CCTV) camera. The Vehicle Probe Project (VPP) monitoring site identified a second incident where CCTV coverage was not available that involved multiple jack-knifed tractor-trailers along I-80. The knowledge gained from the VPP about the second incident enabled responders to attend to the second incident nearly an hour sooner than would have been possible without the VPP. A NJDOT executive stated at the 2008 ITS World Congress and ITS America Annual Joint Meeting that the expedited response to the second incident translated into an estimated $100,000 savings in user delay costs (2010-00557).

## Case Study – Mobile Field Reporting/Arizona Public Safety

One of the biggest challenges facing traffic incident management strategies is to reduce the incident response and clearance times to prevent secondary crashes and alleviate congestion. First responders are required to collect information from drivers involved in a collision and develop an incident report.


In the past, the Arizona Department of Public Safety (DPS) would collect incident and driver information and prepare manual paper reports that included information on the drivers and incident. In addition to the incident report, the officer would also give a citation to the driver at fault, which contained much of the same information that the officer had to manually copy. If the vehicles involved needed towing, the officer on the scene would also have to copy that same information one more time for the towing report.

Following the last recession, Arizona lost 25 percent of their personnel overall and up to 60 percent in some districts. At the same time, new mandates for the police were creating more paperwork and increasing administrative responsibilities for officers, thus taking away from response times and preventative activities.

To combat these trends, the Arizona DPS started implementing mobile field reporting activities. In 2008 the Arizona DPS started using electronic crash reports so that the crash data can more efficiently and accurately be moved from the field officer standing on the road to the DOT. By 2009, mobile field reporting was being used by approximately 700 road officers. The officer uses bar code scanners to scan information from registrations and drivers licenses. This information then auto-populates into the crash form, citation and tow sheets. The benefits of mobile field reporting have proven to be significant, decreasing the incident reporting and clearance time from 1.5 hours to approximately 15 to 30 minutes. The automated field reporting also improved time at traffic stops, which decreased from 20 minutes to between 5 and 10 minutes.

Besides time savings on the field, mobile field reporting in Arizona has also improved the quality of incident reports and reduced processing time. Previously, a supervising officer had to review most of these reports for accuracy, but the new software includes validation rules that are built in the software to prevent mistakes. The supervisor reads the electronic data on the screen and accepts it. Daily crash reports are now sent to the DOT and, if needed, these reports could be submitted on demand. The crash reports are used for crash analysis, planning purposes, FARS and other databases. The process for a crash report to be included in the DOT's database also decreased from taking several months to only taking eight days.

## References

[1] *National Strategy to Reduce Congestion on America's Transportation Network*, Prepared by the U.S. DOT. May 2006.

[2] Shah, Vaishali et al. "Longitudinal Study of ITS Implementation: Decision Factors and Effects – Final Report", FHWA-JPO-13-067, April 2013, available at: http://www.its.dot.gov/research/pdf/longitudinal_study.pdf