TRAVELER INFORMATION

ALMOST ALL (93 PERCENT) MAJOR METROPOLITAN AREAS DISTRIBUTE TRAVELER INFORMATION USING INTERNET WEB SITES.

MANAGEMENT AND OPERATIONS

Public and private agencies that collect, process, and broadcast traveler information can help travelers make more informed decisions regarding departure times, route choice, and mode of travel. With timely traveler information, travelers can defer or delay trips, select alternate routes, or use transit services to help reduce congestion. Travelers may also decide to drive a different vehicle or use snow tires or chains based on weather-related traveler information. In recent years, traveler information seekers have come to expect reliable access to timely and detailed information about traffic conditions, weather conditions, transit schedules, work zones, and special events.

ITS applications providing traveler information can provide assistance to travelers prior to their trip or while en route. Pre-trip information includes traffic, road weather, transit, and work zone information most commonly posted on Internet Web sites, made available on 511 or other telephone systems, or broadcast on local media such as radio and TV. En route information can be made available via roadside or in-terminal message signs, or via various devices in the vehicle. These applications include technologies that collect real-time data from one or more agencies or sources, process the data into meaningful information useful to travelers, and then provide the information to travelers.

ITS can support tourism and special events by providing information to travelers in unfamiliar areas as well as travelers and patrons that need guidance during major events such as sporting events or concerts. These types of information services typically focus on traveler convenience and improving access to local businesses. Information provided can include features such as electronic yellow pages, parking availability, and options for electronic payment.

This chapter focuses on traveler information systems that typically draw information from multiple sources across a metropolitan area or region. The chapters on arterial, freeway, transit, traffic incident, and road weather management discuss experiences of agencies collecting information on the system for which they are responsible and providing it to travelers.

The traveler information ITS technologies profiled in this chapter are a key element of the U.S. DOT's Congestion Initiative, as outlined in the May 2006 document *National Strategy to Reduce Congestion on America's Transportation Network*.[436] The Congestion Initiative highlights the need to advance low-cost operational and technological improvements to traveler information in order to reduce congestion.

In addition, the Integrated Corridor Management (ICM) initiative, a major ITS initiative being conducted by the U.S. DOT, seeks to demonstrate that ITS technologies can be used to efficiently and proactively manage the movement of people and goods in major transportation corridors by facilitating integration of the management of all networks in a corridor. The results of the initiative will help to facilitate widespread use of ICM tools and strategies to improve mobility through integrated management of transportation assets.[437]

Additional information on these initiatives is available at the Congestion Initiative and ITS JPO's Web sites: *www.fightgridlocknow.gov* and *www.its.dot.gov/icms*.

TRAVELER INFORMATION CATEGORIES IN THE ITS KNOWLEDGE RESOURCES

Pre-Trip Information
- Internet/Wireless
- 511
- Other Telephone
- TV/Radio
- Kiosks

En Route Information
- Wireless
- 511
- Other Telephone
- Radio
- In-Vehicle Systems

Tourism and Events
- Travel Services
- Advanced Parking

OTHER ITS KNOWLEDGE RESOURCE CATEGORIES RELATED TO TRAVELER INFORMATION

Refer to other chapters in this document.

Arterial Management

Information Dissemination

Freeway Management

Information Dissemination

Transit Management

Information Dissemination

Traffic Incident Management

Information Dissemination

Road Weather Management

Information Dissemination

OPERATIONS/ITS HELPLINE

1-866-367-7487

ITS APPLICATION OVERVIEW

www.itsoverview.its.dot.gov

Findings

Benefits

Evaluation of traveler information services show that these systems are well received by those that use them. Benefits are found in the form of improved on-time reliability, better trip planning, and reduced early and late arrivals. Studies show that drivers who use route-specific travel time information instead of area-wide traffic advisories can improve on-time performance by 5 to 13 percent.[438] Although the overall number of people who use traveler information on a daily basis represents a relatively small portion of travelers in a region, demand can be extremely high during periods of severe weather, emergencies, or special events. Traveler information systems during these periods have recorded extremely high usage. Currently, the most successful traveler information systems are those that have been deployed with significant public sector support.[439] 511 deployments, for example, have been very successful. Recent evaluation data show that customer satisfaction with regional 511 deployments range from 68 to 92 percent (figure 17)[440]

Table 12 summarizes the results of findings in the ITS Benefits Database, noting that traveler information systems have demonstrated the ability to improve mobility for travelers using them. The systems can also enhance network traffic distribution, modestly improving effective capacity and reducing fuel consumption and related emissions. As discussed above, several evaluations have documented positive customer satisfaction ratings for the systems.

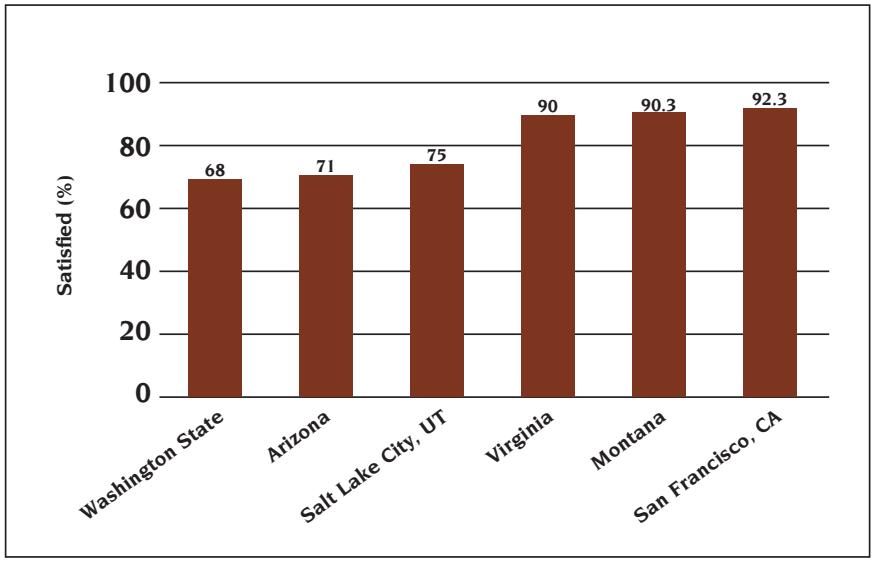

Figure 17 – Traveler Satisfaction with 511 Telephone Traveler Information Systems

CUSTOMER SATISFACTION WITH REGIONAL 511 DEPLOYMENTS RANGES FROM 68 TO 92 PERCENT.

Table 12—Traveler Information Benefits Summary						
	Safety	Mobility	Efficiency	Productivity	Energy and Environment	Customer Satisfaction
Pre-Trip Information		✚	✚		✚	●
En Route Information		✚				●
Tourism and Events						●

● Substantial positive impacts
❍ Negligible impacts
✖ Negative impacts
✚ Positive impacts
✱ Mixed results
blank Not enough data

Costs

The 511 Deployment Coalition conducted an in-depth cost analysis based on the experience from nine 511 deployers. The nine 511 systems include six statewide systems—Utah, Arizona, North Carolina, Virginia, Kansas, and Washington—and three metropolitan/regional systems in Florida: Tampa, Southeast Florida, and Central Florida (see figure 18 below). On average the statewide systems cost approximately $2.5 million to design, implement, and operate during the first year. The range is from just under $1 million to just over $5 million; however, most of the system costs were closer to $1 million to $2 million. On average the metropolitan systems cost $1.8 million to design, implement, and operate during the first year. The range is from just over $1.5 million to just over $2 million.[441]

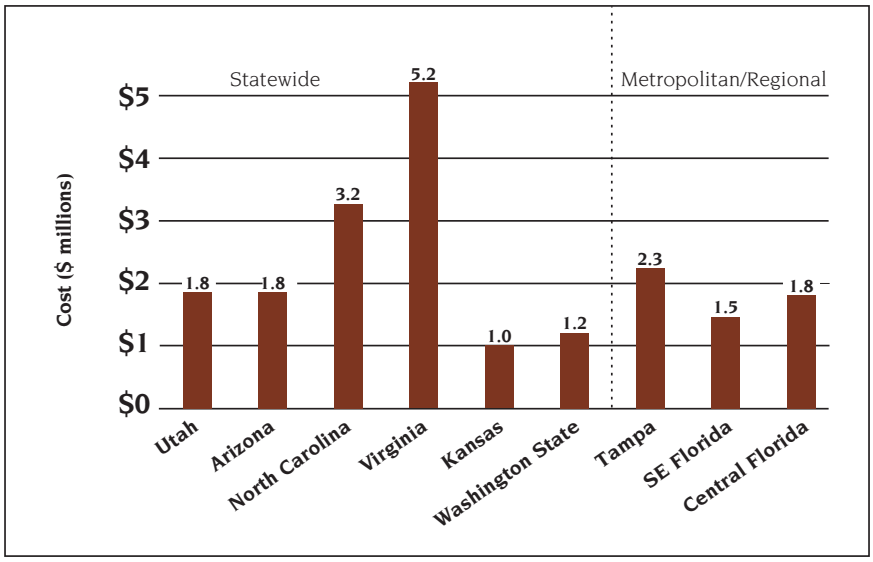

Figure 18 – Total Costs ($ millions) of Nine 511 Deployments

Adapted from 511 *Deployment Costs: A Case Study*, 511 *Deployment Coalition*. November 2006

ON AVERAGE, STATEWIDE 511 SYSTEMS COST APPROXIMATELY $2.5 MILLION TO DESIGN, IMPLEMENT, AND OPERATE DURING THE FIRST YEAR.

Deployment

Figure 19 shows trends for adoption of various traveler information media, based on a multi-year survey of the country's 78 largest metropolitan areas from 2000 to 2006. The two most popular media for distributing traveler information involve the Internet. Almost all of the 78 metropolitan areas use Web sites to distribute traveler information. E-mail is the next most popular medium, followed by automatic telephone and pagers. The use of these media continues to grow, whereas the use of facsimile as a traveler information distribution medium is on the decrease. Thirty (30) of the 78 metropolitan areas use dedicated TV to distribute traveler information and 18 use kiosks, a medium which has seen no growth in recent years.

In 2006, the survey of metropolitan areas was expanded to the country's 108 largest metropolitan areas. This survey is the source of deployment statistics presented later in this chapter unless otherwise stated.

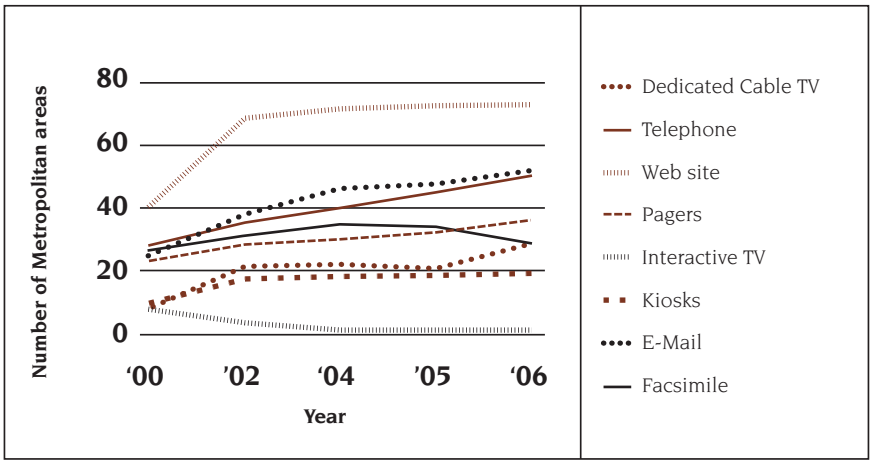

Figure 19 – Trends for Adoption of Traveler Information Media, 2000-2006

OPERATIONS/ITS HELPLINE
1-866-367-7487

ITS APPLICATION OVERVIEW
www.itsoverview.its.dot.gov

Selected Highlights from the ITS Knowledge Resources on Traveler Information

Pre-Trip Information

Pre-trip traveler information provided via Internet Web sites, other wireless devices, 511 telephone numbers, other telephone services, television, radio, or kiosks allows users to make more informed decisions for trip departure, route choice, and mode of travel.

Pre-Trip Information	
Deployment	
The most common medium for disseminating pre-trip information is the Internet, employed by freeway management agencies in 72 metropolitan areas and by arterial agencies in 52 metropolitan areas, out of a total of 108 metropolitan areas surveyed. Next in popularity was TV and radio, reported in 53 metropolitan areas for freeways and 47 for arterials. A 511 telephone information service for pre-trip information was reported in use by freeway and arterial agencies in 39 and 25 metropolitan areas, respectively. Kiosks were in use in 11 metropolitan areas.	
Benefits	
ITS Goals	**Selected Findings**
Mobility	A simulation study in the Washington, D.C. area found that regular users of pre-trip traveler information reduced travelers' frequency of early and late arrivals by 56 and 52 percent, respectively.[442]
Efficiency	***Summary Finding*:** Modeling studies in Detroit, Michigan and Seattle, Washington have shown slight improvements in corridor capacity with the provision of traveler information.[443]
Energy and Environment	In Boston, Massachusetts, a modeling study estimated that changes in travel behavior due to better traveler information would result in a 25 percent reduction in volatile organic compounds, a 1.5 percent decline in nitrogen oxides, and a 33 percent decrease in carbon monoxide.[444]
Customer Satisfaction	During the 2002 Winter Olympic Games in Salt Lake City, Utah, a survey about the CommuterLink Web site showed that 41 percent of visitors and 70 percent of residents were aware of the Web site. Overall, 98 percent of visitors and 97 percent of residents who used the Web site said it worked well for them.[445]

LESSONS LEARNED

Assess what users want when developing a traveler information Web site.

The number of traveler information Web sites has increased over time as has the quality of the sites and the users' expectations. The availability of additional real-time information as a result of the Federal Highway Administration Office of Operations Real-Time System Management Information Program will enable significant improvements in traveler information provision. Based on interviews with developers of top traffic and transit information Web sites, recommendations have been summarized on how developers of such Web sites should assess what their users want. The existing experience with traveler information Web sites should facilitate the dissemination of the information in an efficient and effective manner.

- Check out other existing Web sites.

TRIMARC (*www.trimarc.org*) provides travelers with information for the Interstate highway system within the greater Louisville/Southern Indiana urbanized area. The developers of this site accessed other traveler information sites for ideas to ensure ease of use, and consequently designed the site with the ability to click on signs or cameras to get more detailed information.

(*Continued on next page.*)

Pre-Trip Information
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Information Service Provider subsystem: • Information Service Provider Hardware: $23K-$34K • Information Service Provider Software: $267K-$535K • Information Service Provider Labor: $254K-$363K (annually) Remote Location subsystem: • Informational Kiosk: $11K-$24K Transportation Management subsystem: • Hardware for Traffic Information Dissemination: $3K • Software for Traffic Information Dissemination: $17K-$21K • Integration for Traffic Information Dissemination: $83K-$101K • Labor for Traffic Information Dissemination: $107K-$131K (annually)
Sample Costs of ITS Deployments
Alaska: The Alaska 511 traveler information system under the Condition Acquisition and Reporting System (CARS)/511 pooled-fund consortium cost approximately **$1.210 million** to develop and implement. The system provides near real-time transportation system information. A consultant hosts the Alaska CARS and 511 databases. The Alaska Department of Transportation and Public Facilities pays annual fees to the consultant for these services. Operations and maintenance (O&M) costs were **$136,400**, **$171,500**, and $**170,300** for 2004, 2005, and 2006, respectively.[446] **Arizona:** The Arizona 511 Model Deployment included a number of key enhancements to the previous statewide 511 system. The total capital cost of the enhanced 511 system was approximately **$1.412 million** with annual operating costs for the first year at approximately **$293,000**. Operating costs for future years are estimated at **$210,000 annually**. Federal funding for the model deployment totaled $1.14 million. Remaining funding came from Arizona DOT and its 511 partners.[447]

OPERATIONS/ITS HELPLINE
1-866-367-7487

ITS APPLICATION OVERVIEW
www.itsoverview.its.dot.gov

En Route Information

En route traveler information provided via wireless devices, 511 telephone numbers, other telephone services, radio, and in-vehicle signing allows users to make informed decisions regarding alternate routes and expected arrival times.

En Route Information	
Deployment	
The most common media for disseminating en route information are dynamic message signs (DMS) and highway advisory radio (HAR). DMS are in use to disseminate en route information on freeways in 86 of 108 metropolitan areas, and on arterials in 51 metropolitan areas. HAR was reported on freeways and arterials in 51 and 42 metropolitan areas, respectively. The types of en route information disseminated varied widely. The most common types of messages reported on freeway DMS were incident information (89 metropolitan areas), maintenance and construction information (83), and amber alerts (82). Next in popularity were congestion (59 metropolitan areas), diversions (56), and weather alerts (49). Less common were travel time (27 metropolitan areas), public service announcements (28), and special events (25).	
Benefits	
ITS Goals	**Selected Findings**
Mobility	In Houston, real-time travel time information posted on DMS influenced drivers' route choice. Eighty-five (85) percent of respondents indicated that they changed their route based on the information provided. (Of these respondents, 66 percent said that they saved travel time as a result of the route change, 29 percent were not sure). Overall, drivers were primarily interested in seeing incident and travel time information.[449]
Customer Satisfaction	***Summary Finding:*** Customer satisfaction with regional 511 deployments range from 68 to 92 percent. In 2004, 92.3 percent of users surveyed in the San Francisco Bay Area were satisfied with 511 and, in Montana, 90.3 percent were satisfied. On the I-81 corridor in Virginia, 99 percent of users surveyed said they would call again. In 2005, the 511 model deployment evaluation project in Arizona found that 71 percent of users were satisfied. In Washington, satisfaction levels were at 68 percent and 87 percent of the callers said they would call again.[450]

LESSONS LEARNED

(*Continued from previous page.*)

- Obtain feedback from users.

Developers of successful traveler information Web sites mentioned receiving user feedback and using these comments to address technical issues or update the information provided. Houston TranStar looks for continuous improvement, reviewing the site on a monthly basis and implementing new features every two or three months. Others, such as the Denver Regional Transportation District, have developed beta-test groups of Web site users who try out new features and comment on redesigns.[448]

LESSONS LEARNED

Pursue a vigorous 511 marketing program, especially to promote new types of information targeted to specific user groups.

The Arizona DOT Model Deployment featured a large number of enhancements to the existing statewide Arizona 511 system. Awareness of 511 and its various features is a necessary prerequisite to system utilization and the benefits associated with its usage. Therefore, marketing is a critical activity.

- Use dynamic message signs to advertise 511 systems to reach travelers en route.

The DOT conducted an aggressive marketing campaign using the region's DMS. The message, "Road Conditions, Dial 511," was posted simultaneously on all DMS located on Interstate and state highways throughout the state, 24 hours per day for a seven-day period. During the campaign, daily call volumes increased over 30-fold. The percentage of cellular phone calls also increased dramatically during this period, suggesting that many travelers who saw the DMS message called 511 while still en route.

(*Continued on next page.*)

En Route Information
Costs
Unit Costs Data Examples (See Appendix A for more detail)
Roadside Information subsystem: examples include • Dynamic Message Sign: $48K-$119K Information Service Provider subsystem: • Information Service Provider Hardware: $23K-$34K • Information Service Provider Software: $267K-$535K • Information Service Provider Labor: $254K-$363K (annually) Remote Location subsystem: • Informational Kiosk: $11K-$24K Transportation Management subsystem: • Hardware for Traffic Information Dissemination: $3K • Software for Traffic Information Dissemination: $17K-$21K • Integration for Traffic Information Dissemination: $83K-$101K • Labor for Traffic Information Dissemination: $107K-$131K (annually)
Sample Costs of ITS Deployments
United States: Based on an in-depth cost analysis of the experience of nine 511 deployers, the total costs (to design, implement, and operate for one year) averaged approximately **$2.5 million** among six statewide systems and **$1.8 million** among three metropolitan systems. The nine systems represent conditions that others are likely to experience (e.g., large-scale deployments undergoing major enhancements, a variety of traveler information service offerings, system development from scratch). The average O&M cost ranged from under **$0.50 per call** to just under **$2.50 per call**.[451]

OPERATIONS/ITS HELPLINE
1-866-367-7487

ITS APPLICATION OVERVIEW
www.itsoverview.its.dot.gov

Tourism and Events

Tourism and event-related travel information systems focus on the needs of travelers in areas unfamiliar to them or when traveling to major events such as sporting events or concerts. These services address issues of mobility and traveler convenience. Information provided can include electronic yellow pages as well as transit and parking availability.

Tourism and Events	
Deployment	
In a 2006 survey of state DOTs, 40 states reported having a statewide Web site supporting travel services. Among the types of roadway information provided were work zone/construction (reported by 37 states), road closures (32), incidents (27), weather information (27), road surface conditions (24), closed circuit television images (26), detours (21), congestion (18), alternate routes (16) and speeds (15). Tourism information was also provided: special events (13 states), maps (13), points of interest (8), directions (6), hotel accommodations (6), and restaurants (4). Additionally, advanced parking systems supported travel services in metropolitan areas. In a survey of 108 metropolitan areas in 2006, 15 of the 108 metropolitan areas reported dissemination of parking availability on DMS on freeways and 12 metropolitan areas reported doing so on arterial streets.	
Benefits	
ITS Goals	**Selected Findings**
Customer Satisfaction	In Kentucky, 94 percent of travelers surveyed said they were satisfied with the information provided by 511 Tourism Service operators.[453]
Costs	
Unit Costs Data Examples (See Appendix A for more detail)	
Roadside Information subsystem: • Dynamic Message Sign: $48K-$119K Information Service Provider subsystem: • Information Service Provider Labor: $254K-$363K (annually) Remote Location subsystem: • Informational Kiosk: $11K-$24K Transportation Management subsystem: • Software for Traffic Information Dissemination: $17K-$21K • Integration for Traffic Information Dissemination: $83K-$101K	
Sample Costs of ITS Deployments	
Kentucky: The Kentucky 511 Traffic and Travel Information System was expanded to include tourism information services in southern and eastern Kentucky through ITS Integration Program FY 2002 funds. Implementation costs for the 511 Tourism Service were **$361,760**. The costs to operate and maintain the 511 tourism service for 2003 to 2006 totaled **$4,138,213**.[454]	

LESSONS LEARNED

(*Continued from previous page.*)

- Be sure to market new information to the types of users who would be most interested in that information.

For a traditional roadway-oriented system, the addition of multi-modal information is not enough to stimulate significant usage of that information. The Arizona DOT found that simply adding new information to target other travelers such as transit users was not necessarily sufficient to stimulate use of that information. The lack of utilization of the new information types significantly impacted the ability of the 511 deployers to achieve objectives related to stimulating consideration of transit as an alternate mode. This suggests deployers may not necessarily assume there is latent demand for new information or that interested users will become aware of it without targeted marketing.[452]

430 *Central London Congestion Charging: Impacts monitoring—Fifth Annual Report*, Transport for London. London, England. July 2007. Benefits ID: 2008-00584

431 Douma, Frank, Johanna Zmud, and Tyler Patterson. "Pricing Comes to Minnesota: Baseline Attitudinal Evaluation of the I-394 HOT Lane Project," Paper Presented at the 85th Transportation Research Board Annual Meeting. Washington, DC. 22–26 January 2006. Benefits ID: 2008-00550

432 *Value Pricing on the I-75 HOV/BRT Project*, Prepared by HNTB for the Georgia State Road and Tollway Authority. Atlanta, GA. April 2006. Costs ID: 2007-00128

433 Todd Litman. *London Congestion Pricing: Implications for Other Cities*, Victoria Transport Policy Institute. British Columbia, Canada. 10 January 2006. Costs ID: 2007-00127

434 *Washington State Comprehensive Tolling Study: Final Report—Volume 2: Background Paper #8: Toll Technology Considerations, Opportunities, and Risks*, Prepared by the IBI Group and Cambridge Systematics for the Washington State DOT. 20 September 2006. Lesson ID: 2007-00394

435 *Washington State Comprehensive Tolling Study: Final Report—Volume 2: Background Paper #8: Toll Technology Considerations, Opportunities, and Risks*, Prepared by the IBI Group and Cambridge Systematics for the Washington State DOT. 20 September 2006. Lesson ID: 2007-00394

436 *National Strategy to Reduce Congestion on America's Transportation Network*, U.S. DOT. May 2006.

437 "Integrated Corridor Management (ICM) Quarterly Newsletter—Spring 2007," U.S. DOT ITS Joint Program Office, Web site URL www.its.dot.gov/icms/index.htm. Last Accessed 13 November 2007.

438 Vasudevan, Meenakshy, Karl Wunderlich, James Larkin, and Alan Toppen. "A Comparison of Mobility Impacts on Urban Commuting Between Broadcast Advisories and Advanced Traveler Information Services," Paper Presented at the 84th Annual Transportation Research Board Meeting. Washington, DC. 9–13 January 2005. Benefits ID: 2005-00285

439 "ATIS U.S. Business Models Review," U.S. DOT Federal Highway Administration, Web page URL ops.fhwa.dot.gov/travelinfo/resources/atis_bm.htm. Last Accessed 2 October 2007.

440 *America's Travel Information Number: Implementation and Operational Guidelines for 511 Services Version 3.0*, 511 Deployment Coalition. September 2005. Benefits ID: 2007-00301

441 *511 Deployment Costs: A Case Study*, 511 Deployment Coalition. November 2006. Costs ID: 2007-00125

442 Shah, Vaishali, et al. "An Assessment of the Potential of ATIS to Reduce Travel Disutility in the Washington, DC Region," Paper Presented at the 82nd Annual Meeting of the Transportation Research Board. Washington, DC. 12–16 January 2003. Benefits ID: 2003-00266

443 Sources that support these findings:

Detroit Freeway Corridor ITS Evaluation, U.S. DOT Federal Highway Administration, EDL No. 13586. July 2001. Benefits ID: 2001-00213

ITS Impacts Assessment for Seattle MMDI Evaluation: Modeling Methodology and Results, U.S. DOT Federal Highway Administration, EDL No. 11323. September 1999. Benefits ID: 2001-00199

444 *Air Quality Study of the SmarTraveler Advanced Traveler Information Service*, Tech Environmental. Waltham, MA. July 1993. Benefits ID: 2000-00004

445 *Intelligent Transportation Systems at the 2002 Salt Lake City Winter Olympic Games: Event Study Traffic Management and Traveler Information*, U.S. DOT Federal Highway Administration, Report No. FHWA-OP-03-135, EDL No. 13850. 29 April 2003. Benefits ID: 2006-00290

446 "Costs for the Alaska Traveler Information System," U.S. DOT Federal Highway Administration, ITS Joint Program Office. Washington, DC. 24 July 2006. Correspondence with Ms. Jill Sullivan, ITS/Iways Coordinator, Division of Program Development ADOT&PF. July 2007. Costs ID: 2007-00129

447 *Model Deployment of a Regional, Multi-Modal 511 Traveler Information System: Final Report*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-06-013, EDL No. 14248. 30 September 2005. Costs ID: 2006-00099

448 *Best Practices for Traveler Information Websites: Lessons Learned From Top Traffic and Transit Website Winners*, U.S. DOT Federal Highway Administration. June 2006. Lesson ID: 2006-00317

449 *Travel Time Messaging on Dynamic Message Signs—Houston*, TX, U.S. DOT Federal Highway Administration, Report No. FHWA-HOP-05-051. May 2005. Benefits ID: 2007-00304

450 *America's Travel Information Number: Implementation and Operational Guidelines for 511 Services Version 3.0*, 511 Deployment Coalition. September 2005. Benefits ID: 2007-00301

451 511 *Deployment Costs*: A *Case Study*, 511 Deployment Coalition. November 2006. Costs ID: 2007-00125

452 *Model Deployment of a Regional, Multi-Modal* 511 *Traveler Information System*: *Final Report*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-06-013, EDL No. 14248. 30 September 2005. Lesson ID: 2006-00241

453 Yusuf, Juita-Elena (Wie), Candice Wallace, and Steven Kreis. *Evaluation of the Eastern Kentucky Rural Highway Information Project* 511 *Tourism Service*, University of Kentucky, Kentucky Transportation Center, Report No. KTC-06-10/RS-F2-03-1F, EDL No. 14307. May 2006. Benefits ID: 2007-00306

454 Yusuf, Juita-Elena (Wie), Candice Wallace, and Steven Kreis. *Evaluation of the Eastern Kentucky Rural Highway Information Project* 511 *Tourism Service*, University of Kentucky, Kentucky Transportation Center, Report No. KTC-06-10/RS-F2-03-1F, EDL No. 14307. May 2006. Correspondence with Mr. Wayne Bates, Kentucky Transportation Cabinet. 10 March 2006. Costs ID: 2007-00124

455 *Archived Data Management Systems*: A *Cross-Cutting Study*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-05-044, EDL No. 14128. Washington, DC. December 2005. Costs ID: 2008-00173

456 Furth, Peter G., et al. *Uses of Archived* AVL-APC *Data to Improve Transit Performance and Management*: *Review and Potential*, Transportation Research Board, Transit Cooperative Research Program, Web Document No. 23, Appendix A. Washington DC. June 2003. Benefits ID: 2008-00587

457 Stephens, Jerry, et al. *An Evaluation of Montana's State Truck Activities Reporting System*, Prepared by the Montana State University for the Montana DOT. 11 August 2003. Benefits ID: 2003-00268

458 Sources that support these findings:

National Evaluation of the TMC *Applications of Archived Data Operational Test*—ADMS *Virginia*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-06-014, EDL No. 14250. August 2005. Benefits ID: 2008-00560

Smith, Brian L. and Ramkumar Venkatanarayana. "Usage Analysis of a First Generation ITS Data Archive: Lessons Learned in the Development of a Novel Information Technology Application," Paper Presented at the 85th Annual Transportation Research Board Meeting. Washington, DC. 22–26 January 2006.

459 *Archived Data Management Systems*: A *Cross-Cutting Study*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-05-044, EDL No. 14128. Washington, DC. December 2005. Costs ID: 2008-00173

460 *National Evaluation of the* TMC *Applications of Archived Data Operational Test*—ADMS *Virginia*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-06-014, EDL No. 14250. August 2005. Costs ID: 2008-00174

461 "Cost Estimate for Nevada Archived Data User Service (ADUS)," U.S. DOT Federal Highway Administration, ITS Joint Program Office. Washington DC. May 2001. Costs ID: 2003-00038

462 Liu, Henry X., et al. A *Literature and Best Practices Scan*: ITS *Data Management and Archiving*, University of Wisconsin. Madison, WI. May 2002. Benefits ID: 2008-00559

463 *Archived Data Management Systems*: A *Cross-Cutting Study*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-05-044, EDL No. 14128. Washington, DC. December 2005. Lesson ID: 2007-00385

464 *Archived Data Management Systems*: A *Cross-Cutting Study*, U.S. DOT Federal Highway Administration, Report No. FHWA-JPO-05-044, EDL No. 14128. Washington, DC. December 2005. Lesson ID: 2007-00385

465 Sources that support these findings:

Jones, Crystal. "Perspective on Freight Congestion," Public Roads, Vol. 71, No. 1. July/August 2007.

Wilson, Rosalyn. "Embracing Security as a Core Business Function," 17th Annual State of Logistics Report, Sponsored by the Council of Supply Chain Management Professionals. Washington, DC. 19 June 2006.

466 Richeson, Kim E. *Introductory Guide to* CVISN, Johns Hopkins University Applied Physics Laboratory, Report No. POR-99-7186, Preliminary Version P.2. Laurel, MD. February 2000.

467 Rodier, Caroline J., et al. "Virtual Commercial Vehicle Compliance Stations: A Review of Legal and Institutional Issues," Paper Presented at 85th Annual Transportation Research Board Meeting. Washington, DC. 22–26 January 2006.

468 PrePass statistics from: "PrePass," PrePass, Web site URL www.prepass.com/Pages/Home.aspx . Last Accessed 14 March 2008.

NORPASS statistics from: "NORPASS," NORPASS—North American Preclearance and Safety System, Web site URL www.norpass.net/index.html.Last Accessed 14 March 2008.