INTELLIGENT TRANSPORTATION SYSTEMS

AE-2

2-5 POINTS

GOAL

Meet economic and social needs and improve mobility without adding capacity, or improve the efficiency of transportation systems.

CREDIT REQUIREMENTS

Include intelligent transportation system (ITS) applications listed in the Federal Highway Administration's (FHWA) Research and Innovative Technology Administration (RITA) Office of Intelligent Transportation Systems *Applications Overview* portion of their ITS website (see at: http://www.itsoverview.its.dot.gov). Table AE-2.1 (opposite page) lists the standard ITS applications and RITA ITS website categories allowable for this credit.

2 points
Install at least 1 application in 2 separate categories.

3 points
Install at least 1 application in 3 separate categories.

4 points
Install at least 1 application in 4 separate categories.

5 points
Install at least 1 application in 5 separate categories.

Details

Additionally, in order for an ITS application to count for this credit it needs to exist within the project limits in a meaningful manner. The FHWA's RITA ITS website separates ITS applications into broad categories. The intention of this credit is to have at least two of these RITA ITS website categories represented with the project limits to earn points. So, if the project is an improvement of an existing facility and that existing facility already includes one or more ITS applications, those existing applications can be counted toward the total points. Additionally, note that in no case can more than 5 points be earned. There must be at least 1 application in 2 separate categories in order for any points to be earned.

DOCUMENTATION

- A list of the ITS applications and their corresponding categories
- Evidence that these ITS applications are physically installed on the project or are applicable to the project area. This evidence can be any one of the following:
  - The page(s) in the project plans and specifications that refer to the application
  - Documentation that shows a particular application is operational in the project area (e.g., the geographic coverage area for the 511 traveler information service, a screenshot of an online dynamic map that identifies the project area and clearly shows the project area is included in the map)
- Photo(s) of each application installed if it is a physical entity.

RELATED CREDITS

- ✓ AE-3 Context Sensitive Solutions
- ✓ AE-5 Pedestrian Access
- ✓ AE-6 Bicycle Access
- ✓ AE-7 Transit & HOV Access
- ✓ MR-6 Energy Efficiency

SUSTAINABILITY COMPONENTS

- ✓ Ecology
- ✓ Equity
- ✓ Economy
- ✓ Extent
- ✓ Expectations
- ✓ Experience
- ✓ Exposure

BENEFITS

- ✓ Reduces Fossil Fuel Use
- ✓ Reduces Air Emissions
- ✓ Reduces Greenhouse Gases
- ✓ Improves Mobility
- ✓ Improves Human Health & Safety
- ✓ Reduces Lifecycle Costs
- ✓ Increases Awareness

Table AE-2.1: Allowable ITS Applications for AE-2

Category	Application
Surveillance	Traffic Infrastructure
Traffic Control	Adaptive Signal Control Advanced Signal Systems Variable Speed Limits Bicycle & Pedestrian Special Events
Lane Management	HOV Facilities Reversible Flow Lanes Pricing Lane Control Variable Speed Limits Emergency Evacuation
Information Dissemination	Dynamic Message Signs (DMS) Highway Advisory Radio (HAR)
Enforcement	Speed Enforcement Traffic Signal Enforcement Ramp Meter Enforcement HOV Facilities Enforcement
Ramp Control	Ramp Metering Priority Access
Warning Systems	Ramp Rollover Curve Speed Warning Downhill Speed Warning Overheight/Overwidth Warning Highway-Rail Crossing Warning Systems Intersection Collision Warning Pedestrian Safety Bicycle Warning Animal Warning
Road Weather Management	Pavement Conditions Atmospheric Conditions Water Level
Transit Management	Dynamic Routing/Scheduling In-Terminal/Wayside Information Dissemination
Traveler Information	Internet/Wireless 511 Telephone
Electronic Payment/Pricing	Toll Collection Transit Fare Payment
Traffic Incident Management	Call Boxes Service Patrols Emergency Vehicle Signal Preemption
Notes: The application nomenclature and definitions come directly from the FHWA's RITA ITS *Applications Overview* web page (http://www.itsoverview.its.dot.gov).	

APPROACHES & STRATEGIES

- The FHWA's RITA ITS website (http://www.its.dot.gov) maintains a current database of ITS benefits, costs, lessons learned and deployment statistics. It is an excellent resource for approaches and strategies.
- ITS America, a not-for-profit organization, also maintains a website (http://www.itsa.org) with substantial documentation on ITS efforts.

Example: How to Calculate Points

3 points

A freeway on-ramp is being upgraded to include a ramp metering system. In addition there are already video surveillance cameras in use that are accessible by the general public through a common traffic website. The area is also covered by a 511 traffic information system and highway advisory radio (HAR). This project would earn 3 points because 3 application categories are represented. Note that a project cannot earn 1 point for this Voluntary Credit. At least 2 categories must be represented to earn the minimum of 2 points.

- **Surveillance**. The traffic cameras are an application in this category.
- **Traveler information**: the 511 service and website are both applications in this category. Although this category is represented by two separate systems, it is still only counted once.
- **Information dissemination**: the HAR is an application in this category.

5 points

An arterial is being upgraded to be more context sensitive. Existing arterial facilities that remain in place include a variable message sign and video traffic signal enforcement. The project is adding timed signal lights and sensors to include it in the area-wide network shown online at the agency's website. Traffic surveillance cameras are also being added. This project would earn 5 points because 5 application categories are represented. Note that a project cannot earn 1 point for this Voluntary Credit. At least 2 categories must be represented to earn the minimum of 2 points.

- **Surveillance**. The added traffic cameras are an application in this category.
- **Traffic control**. The added signal timing is an application in this category.
- **Information dissemination**. The existing dynamic message sign is an application in this category.
- **Enforcement**. The existing traffic signal video enforcement is an application in this category.
- **Traveler information**: the inclusion of this arterial in the agency's online traffic flow map is an application in this category.

Example: ITS Categories

Some examples of ITS use from the RITA's *Intelligent Transportation Systems Benefits, Costs, and Lessons Learned: 2008 Update* are (these are direct quotes from the executive summary, italics added to distinguish from other text):

Arterial Management

Optimizing signal timing is considered a low-cost approach to reducing congestion. Based on data from six separate studies, the costs range from $2,500 to $3,100 per signal per update (Sunkari 2004; TEI Engineering 2005; Harris 2005; NTOC 2005; Luor 2006; Heminger 2006). Based on a series of surveys of arterial management agencies in 78 of the largest U.S. metropolitan areas, half of traffic signals in these metropolitan areas were under centralized control through closed-loop or computer control in 2006.

Freeway Management

There are numerous ITS strategies to improve freeway operations. Metropolitan areas that deploy ITS infrastructure including dynamic message signs (DMS) to manage freeway and arterial traffic,

and integrate traveler information with incident management systems can increase peak period freeway speeds by 8 to 13 percent (Smith and Perez 1992; Birst and Ayman 2000), improve travel time, and according to simulation studies, reduce crash rates and improve trip time reliability with delay reductions ranging from 1 to 22 percent (Smith and Perez 1992; FHWA 1999a; FHWA 1999b; Brist and Ayman 2000; FHWA 2000; FHWA 2001; Jeannotte 2001). In Minneapolis-St. Paul, the benefit-to-cost ratio for a ramp metering system was estimated at 15:1 (Cambridge Systematics 2001).

Crash Prevention and Safety

Downhill speed warning systems have decreased truck crashes by up to 13 percent at problem sites in Oregon and Colorado (Drakopoulos 2006). As part of an evaluation of automated truck rollover warning systems, the Pennsylvania DOT researched systems in other states. The cost of these systems varied significantly, ranging from $50,000 to $500,000, as did their configurations: invasive and non-invasive detection, weight-based versus simplified speed class algorithms, and system calibrations for warnings (Pento 2005). The three most widely adopted systems are curve and ramp speed, rail crossing warning systems and pedestrian safety systems. Next in popularity, and adopted by about half as many states, are downhill warning systems, intersection collision avoidance systems, and animal warning systems.

Road Weather Management

Evaluation data show that 80 to 94 percent of motorists who use traveler information Web sites think road weather information enhances their safety and prepares them for adverse road weather.(FHWA 2004; FHWA 2006). Studies have found that anti-icing programs can lower snow and ice control costs by 10 to 50 percent and reduce crash rates by 7 to 83 percent (Breen 2001; McCormick Rankin Corporation and Ecoplans Ltd. 2004; O'Keefe and Shi 2005).

Electronic Payment and Pricing

On freeways, variable pricing strategies are effective at influencing traveler behavior. Although initial public support for such tolls may be low, research indicates that road users value time savings and are willing to pay a price to avoid congestion and delay (North Central Texas Council of Governments 2005; Douma et al. 2006). In California, for example, public support for variable tolling on State Route 91 was initially low; but after 18 months of operations, nearly 75 percent of the commuting public expressed approval of virtually all aspects of the express lanes program (North Central Texas Council of Governments 2005).

Traveler Information

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 (Vasudevan et al. 2005). Recent evaluation data show that customer satisfaction with regional 511 deployments range from 68 to 92 percent (511 Deployment Coalition 2005). The 511 Deployment Coalition conducted an in-depth cost analysis based on the experience from nine 511 deployers. On average, the statewide systems cost approximately $2.5 million to design, implement, and operate during the first year. Metropolitan systems cost an average of $1.8 million to design, implement, and operate during the first year (511 Deployment Coalition 2006). The two most popular media for distributing traveler information in the 78 largest U.S. metropolitan areas are Web sites and e-mail, followed by automatic telephone and pagers. 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.

POTENTIAL ISSUES

The ITS applications used should provide quantified benefits that justify their cost.

RESEARCH

The FHWA's RITA ITS website (http://www.its.dot.gov) maintains a current database of ITS benefits, costs, lessons learned and deployment statistics. ITS America, a not-for-profit organization, also maintains a website (http://www.itsa.org) with substantial documentation on ITS efforts.

Perceived and Measured Benefits of ITS

The goal area definitions listed below (which can be found at the bottom of this website: http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ByInfo/WhatIsBClassifications#goal) give an overview of the perceived and measured benefits of ITS. The most relevant sustainability components are listed at the end of each goal area description.

Safety

Several specific applications aim to reduce both the number and severity of crashes. This benefit is directly related to the equity component of sustainability. Measures of effectiveness include crash rate, fatality rate, and injury rate. *Equity*

Mobility

Many applications aim to reduce travel delay and travel time. This benefit is related to the equity (improved mobility), economy (lower user cost associated with facility use due to faster travel time) and ecology (more efficient use can but may not always lead to less fuel consumption and fewer emissions). Measures of effectiveness include delay time and variability of travel time. *Ecology, economy*

Productivity

Some applications aim to reduce operating costs and allow productivity improvements. This includes applications that may save time in completing business or regulatory processes, systems that have lower life cycle costs compared to traditional transportation systems, and information collection/aggregation applications that can lead to economic savings or performance improvement. Measures of effectiveness are usually some form of cost savings achieved by using ITS. *Economy, extent, expectations*.

Efficiency

Many applications are designed to improve the efficiency of existing facilities so that mobility, access and other needs can be met with the existing or less physical infrastructure than would otherwise be possible. Traditional methods of measuring capacity (e.g., those in the *Highway Capacity Manual 2000*) often do not account for ITS applications that can improve capacity beyond that for a traditional roadway without ITS. A typical measure of effectiveness is "effective capacity", or the maximum potential rate at which persons or vehicles may traverse a link, node, or network under a representative composite of roadway conditions including weather, incidents, and variation in traffic demand patterns. *Economy, equity, extent, expectations*.

Energy and Environment

Some applications have the secondary effect of improving air quality and lessening energy impacts of transportation because of improved efficiency or other improvement measures. Measures of effectiveness include modeled or simulated reductions in emissions and energy use. *Ecology, economy*.

Customer Satisfaction

Many applications provide improved customer satisfaction by more closely meeting traveler expectations. Typical measures of effectiveness are traveler surveys, product awareness, expectation/realization of benefits and assessment of value. *Equity*.

GLOSSARY

Effective capacity	The maximum potential rate at which persons or vehicles may traverse a link, node, or network under a representative composite of roadway conditions including weather, incidents, and variation in traffic demand patterns.
Intelligent Transportation System	An application of integrated information, telecommunications and computer-based technologies to infrastructure and vehicles in order to improve safety and mobility on surface transportation networks.

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