Technical Memorandum No. 2

ITS Needs Model:

ITS Corridor Master Plans for Florida's Principal FIHS Limited-Access Corridors

Prepared for:

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List of Acronyms

AHS ..... Automated Highway System
APTS ..... Advanced Public Transportation System
ATIS ..... Advanced Traveler Information System
ATMS ..... Advanced Traffic Management System
AVC ..... Automatic Vehicle Classification
AVI ..... Automatic Vehicle Identification
AVLS ..... Automated Vehicle Location System
AVSS ..... Advanced Vehicle Safety System
CAD ..... Computer-Aided Dispatch
CCTV ..... Closed-Circuit Television
CVO ..... Commercial Vehicle Operations
DMS ..... Dynamic Message Signs
DSRC ..... Dedicated Short-Range Communications
E-911 ..... Enhanced 911
EMC ..... Emergency Management Center
EPS ..... Electronic Payment Systems
ETC ..... Electronic Toll Collection
FDOT ..... Florida Department of Transportation
FIHS ..... Florida Intrastate Highway System
GPS ..... Global Positioning System
HAR ..... Highway Advisory Radio
HAZMAT ..... Hazardous Materials
HEFT ..... Homestead Extension of Florida's Turnpike
HOV ..... High Occupancy Vehicle
HPMS ..... Highway Performance Monitoring System
HRI ..... Highway Rail Intersection
ICC ..... Interstate Commerce Commission
IMS ..... Incident Management System
ISP ..... Information Service Provider
ITS ..... Intelligent Transportation System
MCO ..... Maintenance and Construction Operations
MPH ..... Miles Per Hour
NAFTA ..... North American Free Trade Agreement

NITSA ..... *National ITS Architecture*
ORT ..... Open Road Tolling
PAHS ..... Partially Automated Highway System
RWIS ..... Road Weather Information System
SIS ..... Strategic Intermodal System
SITSA ..... *Statewide ITS Architecture*
SUL ..... Special-Use Lane
TDM ..... Traffic Demand Management
TMC ..... Traffic Management Center
USDOT ..... United States Department of Transportation
VMT ..... Vehicle-Miles Traveled
WIM ..... Weigh-in-Motion

1. Purpose

The purpose of this document is to summarize the ITS needs model for the *ITS Corridor Master Plans* as part of the *ITS Program Plan* that includes a "straw architecture" or "future big picture" for intelligent transportation systems (ITS) deployment. The purpose of developing a straw architecture is to provide an initial concept of full ITS deployment along the corridors. This *ITS Needs Model* addresses Florida's five principal corridors on the Florida Intrastate Highway System (FIHS): Interstate 4 (I-4), Interstate 10 (I-10), Interstate 75 (I-75), Interstate 95 (I-95), and Florida's Turnpike.

This *ITS Needs Model* is comprised of the following six sections:

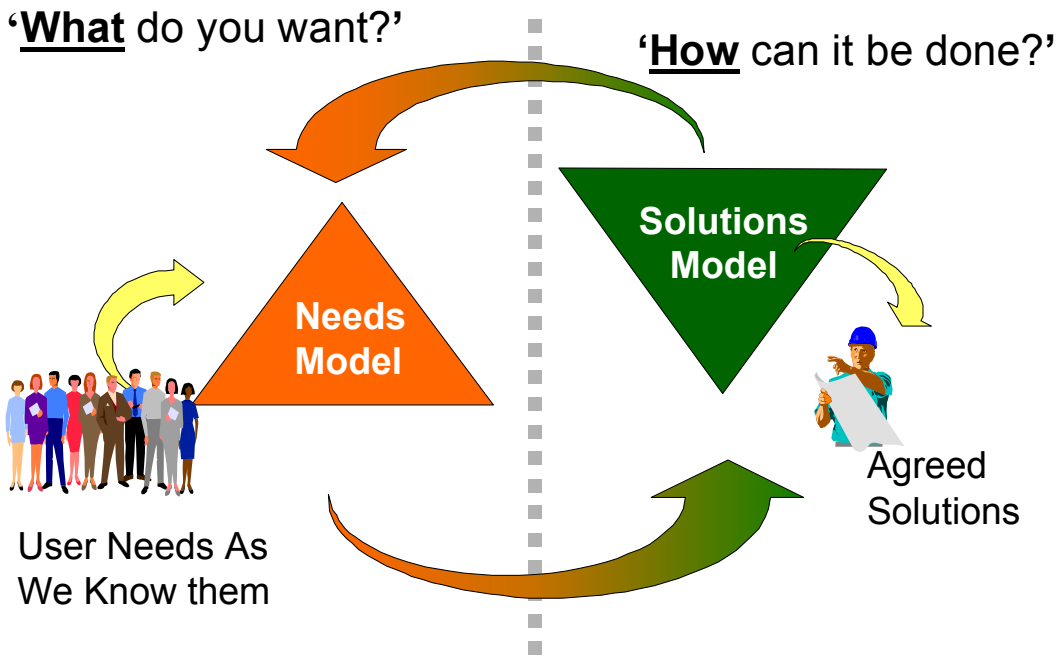
- Mission;
- Vision;
- Goals and Objectives;
- User Services;
- Themes and Strategies; and
- Market Packages.

During the ITS architecture development process, an ITS needs model is prepared to define the "what" – what the users or customers need from ITS services to alleviate existing transportation problems and concerns and to provide an integrated, efficient transportation system within the State of Florida. The ITS needs identified in the model are developed from the transportation trends and issues presented in *Technical Memorandum No. 1 – ITS Legacy Catalog*. These needs are represented in the user services, which define what services will be necessary for a successful system. These user services are mapped to the system goals and objectives to reveal the relationship between the goals and objectives and the needs, and to illustrate which user needs were selected to satisfy specific goals and objectives.

The themes, strategies, and market packages represent the "how" – how the system will meet the users' needs. Initially, themes and strategies are developed to address the needs and then broken down into more specific ITS services, called market packages. These market packages are the first step in identifying actual ITS projects for deployment. Market packages represent a high-level conceptual framework for how the needs will be addressed. At this level, the market packages identified in the straw architecture model are conceptual and will be refined in the ITS solutions model as alternative ITS solutions are evaluated. The market packages are then mapped to the user services to illustrate how the conceptual ITS will satisfy the user services or needs.

The solutions model, which is the next step of the ITS architecture process, identifies ITS services and projects for deployment. It represents a finely balanced model of ITS solutions to meet the user needs in a manner that ensures a balanced resource investment and risk. Figure 1.1 illustrates the relationship between the needs model and the solutions model in the ITS process.

Figure 1.1 – ITS Needs Model and Solutions Model Relationship



Ultimately, this needs and solutions model work effort will be used in the development of *ITS Corridor Implementation Plans* for each corridor. The *ITS Corridor Master Plans* will define the needs, alternatives, and recommended implementation of ITS along each of the corridors and, as appropriate, the associated diversion or bypass routes. The results of these *ITS Corridor Master Plans* will be combined into a statewide *ITS Program Plan* for the deployment of a coordinated, integrated, and interoperable system. This *ITS Program Plan* will identify the anticipated ITS project needs, funding, and recommended sequence of projects for programming on a statewide basis along these key corridors.

2. Corridors Considered

The FIHS is the priority system of streets and highways that are designed to provide high-speed and high-volume traffic movements in Florida. The Florida Legislature established the FIHS system in 1990. Approximately 3,780 miles of roadways have been designated FIHS corridors since that time. Specifically, this project will address the following main thoroughfares and associated bypass or diversion routes:

- I-4;
- I-10;
- I-75;
- I-95; and
- Florida's Turnpike, also known as the Ronald Reagan Turnpike.

Each of these corridors intersects a number of other major transportation facilities. These related facilities were considered to the extent of the requirements for interfaces to the existing and proposed ITS design.

- *I-4 Corridor* – The limits of the I-4 corridor are from I-275 in Hillsborough County to I-95 in Volusia County.

- *I-10 Corridor* – The limits of the I-10 corridor are from the Alabama State Line to I-95. This corridor will also include I-110 in Escambia County.

- *I-75 Corridor* – The limits of the I-75 corridor are from the Palmetto Expressway in Miami-Dade County to the Georgia State Line. This corridor will also include I-275 from Manatee County to north Hillsborough County.

- *I-95 Corridor* – The limits of the I-95 corridor are from the southern terminus of U.S. 1 in Miami-Dade County to the Georgia State Line. This corridor will also include I-195 and I-395 in Miami-Dade County, I-595 in Broward County, and I-295/9A around Jacksonville in Duval County.

- *Florida's Turnpike* – The limits of Florida's Turnpike corridor include the Homestead Extension of Florida's Turnpike (HEFT) and the Turnpike Mainline to milepost 0X. The corridor will also include the Sawgrass Expressway, the Seminole Expressway, and the sections of SR 417 (the Florida Greeneway) and SR 528 (the Bee Line Expressway) that are controlled by the Florida Department of Transportation (FDOT).

3. Methodology

The straw architecture drew upon the corridor needs assessment resulting from the inventory of existing services and related elements including other corridor master plans completed along these corridors. The product is a "straw architecture" for ITS deployment.

A straw architecture outlines an initial concept of the full deployment of ITS. The intent of this architecture being a straw architecture model is to present the concepts for review and refinement by stakeholders and decision makers along the corridors. An alternate definition is a "future big picture" of what ITS implementation may be in twenty years. The straw architecture leverages the experience of previous ITS implementations and planning efforts to describe a possible solution that can be used as a vehicle for communicating with stakeholders. The straw architecture focuses on the driving needs, issues, problems, objectives, and themes of implementation, rather than the details of design or systems engineering typically discussed in the formal ITS architecture. It is intended to be rough, incomplete, and disposable.

3.1 Step 1 – Derive Needs, Issues, Problems, and Objectives

The basic process was to derive needs, issues, problems, and objectives for which ITS may be an appropriate solution along the corridors. There are sets of needs, issues, problems, and objectives common to all of the corridors, such as the need to provide incident management, and a series of needs, issues, problems, and objectives that are unique to some corridors, such as the need for electronic toll collection (ETC) along the Turnpike.

3.2 Step 2 – Derive ITS User Services

In Step 2, these needs, issues, problems, and objectives were then related to a series of "ITS user services". User services document what ITS should do from the user's perspective. A broad range of users is considered, including the traveling public as well as many different types of system operators. Thirty-one user services formed the basis for the *National ITS Architecture* (*NITSA*) development effort. These user services were jointly defined by the United States Department of Transportation (USDOT) and ITS America with significant stakeholder input. The concept of user services allows system or project definition to begin by establishing the high-level services that will be provided to address identified problems and needs. In Florida, additional user services have been identified along with the user services in the *NITSA*. These additional services include:

- Evacuation Coordination – services to support evacuation planning, route guidance, traffic management, and traveler information on traffic, shelter, and weather information; and
- Pedestrian Safety Crossings – services to support elderly and disabled pedestrians at crossings.

3.3 Step 3 – Define Mission, Vision, Goals, and Performance Measures

In Step 3, the needs, issues, problems, and objectives were related to the mission, vision, goals, and objectives for each of the corridors. Similar to the user services, a set of basic goals and measures were identified for all corridors and specific goals and measures were identified for individual corridors as appropriate.

3.4 Step 4 – Themes and Strategies

Once the mission, vision, goals, and objectives were identified, a potential set of strategies were identified that can be grouped or bundled into a "theme" for implementation. These themes are defined in non-technical terms that stakeholders can understand and may not follow strict technical definitions. Some flexibility is planned for use of the themes and strategies as a communications tool to explain the ultimate deployment in the vision. In Step 5, more rigid technical definitions are used.

3.5 Step 5 – Identify Market Packages

The fifth step is to identify market packages as specified in the *NITSA* that can be used to meet the needs and problems and complete the "future big picture" of what ITS deployment will be in the study horizon. The market packages are the technical architecture terms that define the themes and strategies. This step is usually performed following confirmation of the needs, issues, problems, and objectives, and after user services have been defined by the stakeholders but prior to development of the logical architecture.

The market packages provide an accessible, deployment-oriented perspective to the architecture. They are tailored to fit, separately or in combination, real-world transportation problems and needs. Market packages consolidate equipment packages (technologies) that must work together to deliver a given transportation service and the architecture flows that connect them and other important external systems. In other words, they identify the pieces of the physical architecture that are required to implement a particular transportation service. Because they were evaluated during the architecture development, supporting benefits and costs analyses are also available for the market packages.

4. Needs, Issues, Problems, and Objectives

The following needs, issues, problems, and objectives were identified for ITS deployment in Florida along the major corridors. The needs, issues, problems, and objectives were organized based on FDOT's Mission Statement as follows:

> Florida will provide and manage a safe transportation system that ensures the mobility of people and goods, while enhancing economic competitiveness and the quality of our environment and communities.

From this mission, FDOT derived four primary goals to carry out the mission. Associated with each goal are a number of objectives for implementation.

4.1 Safe Transportation – Moving People and Goods Safely

- In 1999, 2,290 people died on Florida's highways resulting in a fatal accident rate (2.1 per million vehicle-miles) higher than the national average (1.5 per million vehicle-miles). Less than one percent of these crashes were due to road-related conditions. Strategies are needed to provide a safer driving environment and to improve vehicular safety to reduce the potential for driver errors and severe accidents.

- FDOT's *FIHS Cost-Feasible Plan* will be implemented as proposed, resulting in significant capacity improvement projects, interchange modifications, and related programs on a statewide basis along each of the major corridors. These programs will result in a significant number of construction work zones along these major corridors.
- Providing safe work zones and maintaining traffic along these high-traffic volumes is a priority needed to support FDOT's mission to provide "safe" transportation services.

- Highway-rail crossings are dangerous for vehicular and rail passengers. At-grade rail crossings near interchanges along I-95 at several locations present a safety problem as a result of queue formation along the mainline and within interchanges.

- The safety of commercial vehicle operators is dependent on reliable and predictable traffic flows at interchanges, weigh and inspection stations, and gates for intermodal facilities – such as rail, port, and airport cargo facilities. The formation of queues on these corridors is a safety concern for the commercial vehicle operators and other vehicles.

- Commercial vehicle operators seek safe environments at our rest and weigh stations where vehicles can be parked overnight to satisfy rest requirements of the Interstate Commerce Commission (ICC).

- Innovative technologies are needed to enhance the coverage and accuracy of inspection and enforcement of commercial vehicle safety requirements.

- Florida has the greatest risk of landfall of hurricanes in the nation requiring residents and visitors to respond quickly to events requiring evacuation. Based on the average since 1900, a named storm is anticipated to land in Florida once per year and a storm that requires a major evacuation is likely once every three years. Services are needed that can:

    - Support pre-planning for evacuations;
    - Manage traffic during evacuation scenarios;
    - Manage demand through communications with shelters and other safe harbors;
    - Provide route guidance information and information on traffic/travel conditions and weather including winds, rainfalls, and storm surge;
    - Support remote configuration management of highways during evacuation conditions or other emergencies;
    - Provide accurate and timely traveler information regarding incidents on evacuation routes;
    - Share emergency information among local and regional traffic management centers (RTMCs) and emergency management facilities; and
    - Detect, verify, respond, and clear incidents and manage traffic around accidents, emergencies, and other incidents.

- A number of other weather and natural events affect traffic and transportation including flooding, fog, tornados, wildfires, and heavy rainfalls where unsafe driving conditions may exist or diversions of major corridors are required. Surveillance and information of when these unsafe conditions exist are needed to improve driving conditions and manage traffic.

- Improve and expand our ability to identify motorists in need and verify and respond to their needs in an efficient and cost-effective manner.

- Reduce the risk of accidents and other incidents by warning drivers of approaching congestion, inclement weather, steep downgrades, sharp curves, and other hazardous conditions.

4.2 System Management – Preservation and Management of Florida's Transportation System

- Four of Florida's metropolitan areas are severely congested and rank among the nation's fifty most congested areas: Miami, Orlando, Tampa, and Jacksonville. (Source: 2000 Urban Mobility Study, Texas Transportation Institute.) In Florida's seven largest urbanized counties (those with 500,000 or more in population including Miami-Dade, Broward, Palm Beach, Pinellas, Hillsborough, Orange, and Duval), the amount of traffic that is congested along these corridors doubled from 1990 to 1999. (Source: Florida's Mobility Performance Measures Program.) In order to manage the efficiency of the transportation system, the following objectives are needed:

    - Improve travel times along the corridors;
    - Improve predictability and reliability of travel times;
    - Reduce accidents and other incidents during normal flows that result from congestion and delays that result from "rubber necking" during incidents;
    - Reduce congestion-related delays by reducing queues and spillback from other facilities;
    - Reduce delays caused by congestion in construction work zones;
    - Manage traffic accessing these major corridors at interchanges to improve through-put and traffic flow;
    - Reduce unnecessary delays at tolls booths; and
    - Reduce unnecessary delays at the gates of intermodal facilities.

- In addition to managing traffic flows, additional alternatives are needed to enable coordinated regional transportation operations by sharing information among regional traffic operations centers and agencies to maximize efficiency of the system and demand between modes. Information to support and promote transit and other multi-modal use and manage transit vehicles or fleets has the potential to reduce congestion on highways and increase mobility.

- Commercial vehicles present a considerable loading on our roadway infrastructure and proper enforcement is needed to eliminate illegally over-weight vehicles that cause damage to pavement and bridges.

- Improve our abilities to detect, verify, respond, and clear incidents to minimize the impacts on traffic flow.

- Improve traveler information to better manage traffic and inform travelers of delays and breakdowns (even when no alternative can be offered to divert or re-route travelers to other modes or roadways exists) is needed in our largest metropolitan areas. Traveler information services are valuable communications tools that can help us manage our system more efficiently by modifying driver behavior and increasing awareness of traffic conditions.

- Technologies are needed to support the operations and management of alternate highway configurations such as special-use lanes (SULs) that serve high-occupancy vehicles (HOVs), operate as express toll lanes, provide preferences to commercial vehicles or transit vehicles, open road tolling (ORT), and other alternative configurations and management plans to promote the efficiency and effectiveness of our infrastructure.

- During the course of ITS corridor and program deployments nationally and in Florida, there is an increasing need for data and information sharing to better manage and operate the system by:

    - Supporting system evaluation and alternative analysis of future ITS deployments to ensure we are deploying resources efficiently and effectively;
    - Supporting and supplementing other data collection programs such as the 200-highest hour report, highway performance monitoring system (HPMS), and design traffic factors for geometric and pavement design;
    - Supporting highway operational performance reporting, modeling simulation, and other techniques for the operations and management of the system; and
    - Providing "before" and "after" studies for ITS deployments. Many current programs are unable to assess their benefits or effectiveness because no data was collected on conditions and performance prior to the installation of ITS.

4.3 Economic Competitiveness – A Transportation System that Enhances Florida's Economic Competitiveness

- Commercial vehicles form the backbone of the state's freight transportation network. All aspects of the economy rely on commercial vehicles to meet their transportation needs. The trucking industry is an active participant in all of Florida's economy. Motor carriers haul 77 percent of all shipments originating in Florida (by weight), have a combined value of $154 billion, and provide the landside link to all of our intermodal facilities. The following objectives are needed to support Florida's economic competitiveness:

    - Ensure efficient landside access to intermodal, port, airport, and truck terminal facilities;
    - Ensure efficient intermodal transfer of people and goods;
    - Promote safe and efficient access of vehicles to markets; and
    - Expedite permitting and clearance of commercial vehicles at weigh and agricultural inspection sites to keep commerce moving.

- Tourism is one of Florida's top industries and providing a safe, efficient, and easily navigable transportation network to support more than 60 million visitors each year is essential to Florida's long-term economic prosperity. The following objectives are needed to support Florida's economic competitiveness:

- Ensure efficient access to major activity centers such as tourist attractions, state parks, and other areas of interest; and
- Provide safe and efficient tourist travel and reduce vehicle miles traveled (VMT) through the provision of accurate and timely traveler information.

- FDOT, along with its partners, is currently considering the designation of the Strategic Intermodal System (SIS). Each of the five principal transportation corridors will likely be part of this SIS because of their roles in regional, statewide, and national transportation linkages.

4.4 Quality of Life – Increasing Mobility Options for a More Livable Florida

- To ensure we provide more livable communities in Florida, the planning and design of transportation systems should support communities' visions and be compatible with corridors of statewide and regional significance. The following is needed to support this objective:

  - Provide efficient statewide ITS services with autonomy for decision-making to support local needs and regional cooperation to promote efficiency and regional and statewide goals;
  - Improve interoperability of ITS services through the development of statewide uniform device standards and specifications;
  - Support integration of ITS into local planning processes, programs, and capacity projects;
  - Provide name recognition of key ITS-related services through branding that will instill trust and confidence in traveler information services, roadside assistance, electronic payment services, and other strategic services;
  - Provide easy access and central data warehousing capabilities for transportation planning and design for all partners to support decision-making; and
  - Provide accurate real-time data to technology, business, and operational users for effective and responsive transportation operations.

- Improve the quality of the environment by reducing the air quality impacts of mobile source emissions through a more efficient and reliable transportation system.

- Reduce impacts of hazardous materials (HAZMAT) incidents by providing response systems that provide first responders with access to information on the content of vehicles and vehicle locations so they can quickly respond and clear areas.

- Improve the availability of weather, traveler, and shelter information during natural and man-made disasters.

- Provide safe and efficient travel routes for freight carriers to reduce potential HAZMAT incidents in densely populated areas.

5. Mission and Vision

The ITS Mission and Vision statements were developed for the *ITS Corridor Master Plans* and *ITS Program Plan* to assist in defining the ultimate twenty-year ITS for the interstate corridors and to guide the selection of appropriate solutions to fulfill the ultimate ITS vision.

5.1 Mission

Provide effective ITS services for the five principal FIHS corridors that enhance the safety and mobility of people and goods, economic competitiveness, and the quality of our environment and communities.

5.2 Vision

Two decades into the 21st century, travelers and shippers of goods along Florida's limited-access transportation corridors are benefiting from infrastructure, and information and communications technologies that improve the safety, mobility, economic competitiveness, and livability of communities in Florida. Information is available that assists travelers and shippers in route planning, predicting travel times, and scheduling their trips/shipments to reduce delays and arrive at scheduled times. When congestion is severe along specific facilities, alternate routes and modes of travel will be suggested that may be more reliable or cost-effective. During their trip, information of travel conditions is provided in real-time so that scheduling and diversions can be planned if needed as a result of an incident. If an incident occurs, automated information technologies are capable of verifying the location and assessing the appropriate response to incidents. If necessary, emergency personnel or roadside assistance is dispatched, arriving in a short period of time. Traffic flow is restored quickly and delays minimized.

During normal operations, traffic flow is managed within the corridor to keep traffic moving. Information on weather conditions is provided to an in-vehicle information service that alerts the driver when visibilities are compromised and advises a safe travel speed. If a natural disaster is impending, information is provided on appropriate local shelter locations, routes for travelers choosing to drive to another area, and other modes of travel that are available instead of driving.

The economy is thriving as a result of world-class access to international markets at ports, airports, and railheads from our agricultural, mining, and manufacturing industries and efficient deliveries of goods and services at the local level. Decisions on the operations, management, and future improvements to the corridors are made through a number of key partners. These decisions are based on measured benefits and a record of the performance of various technologies and elements are customized for communities to reflect their unique values and priorities. However, similar services are available statewide and on related arterial systems and are easily recognized by elderly drivers or visitors since strong name recognition exists for traveler information, roadside assistance, electronic tolls, and other essential services. FDOT is viewed as an ITS powerhouse and a model for how to cost-effectively deploy ITS services and partner with other public agencies and the private sector to create win-win agreements for the benefit of the citizens of Florida.

6. Goals and Objectives

1. Move People and Goods Safely

- 1.1. Reduce accident rates.
  - 1.1.1. Reduce accident rates caused by driver errors and the severity of accidents.
  - 1.1.2. Reduce accident rates and severities in construction work zones.
  - 1.1.3. Reduce accident rates at highway-rail grade crossings.
- 1.2. Reduce queuing on mainlines.
  - 1.2.1. Reduce queues on limited-access roadways from highway-rail grade crossings.
  - 1.2.2. Reduce queues at weigh and inspection stations along the corridors.
  - 1.2.3. Reduce queues at intermodal facilities that impact corridor operations.
- 1.3. Improve the safety of commercial vehicle operators in rest areas.
- 1.4. Provide evacuation coordination services and emergency management.
  - 1.4.1. Provide pre-trip planning information for evacuation conditions.
  - 1.4.2. Provide traffic management during evacuation conditions.
  - 1.4.3. Manage demand through communication with shelters and other safe harbors.
  - 1.4.4. Provide route guidance information and information on traffic/travel conditions and weather including winds, rainfalls, and storm surges.
  - 1.4.5. Support remote configuration management of highways during evacuation conditions or other emergencies.
  - 1.4.6. Provide accurate and timely traveler information regarding incidents on evacuation routes and updated weather information.
  - 1.4.7. Share emergency information among local and regional traffic management centers (TMCs) and emergency management facilities.
  - 1.4.8. Detect, verify, respond to, and clear incidents and manage traffic around accidents, emergencies, and other incidents.
  - 1.4.9. Support infrastructure security through surveillance at critical structures and interchanges.

2. Preserve and Manage the System

- 2.1. Enhance mobility and efficiency.
  - 2.1.1. Improve travel times along the corridors.
  - 2.1.2. Improve predictability and reliability of travel times.
  - 2.1.3. Reduce accidents and other incidents during normal flows that result from congestion and delays that are caused by "rubber-necking" during incidents.
  - 2.1.4. Reduce congestion-related delays by decreasing queues and spillback from other facilities.
  - 2.1.5. Reduce delays caused by congestion in construction work zones.
  - 2.1.6. Manage traffic accessing these major corridors at interchanges to improve mainline throughput and traffic flow.
  - 2.1.7. Reduce unnecessary delays at tollbooths.

2.1.8. Reduce unnecessary delays at the gates of intermodal facilities.
2.1.9. Provide traveler information services with route and mode choice information.
2.2. System Preservation
2.2.1. Improve enforcement of illegally overweight vehicles.
2.3. Incident Management
2.3.1. Improve ability to detect, verify, respond to, and clear incidents.
2.3.2. Improve incident-related traveler information.
2.3.2.1. Predict delays and clearance times.
2.4. Manage Special-Use Lanes (SULs)
2.5. Provide Data Archiving and Warehousing
2.5.1. Conduct system evaluation and alternative analysis
2.5.2. Support and supplement other statewide data collection programs
2.5.3. Support highway operational performance reporting, modeling simulation and other techniques for operations and management of the system.
2.5.4. Develop before and after studies for ITS deployments.

3. Enhance Economic Competitiveness
3.1. Ensure efficient landside access to intermodal, port, airport, and truck terminal facilities.
3.2. Ensure efficient intermodal transfer of people and goods.
3.3. Promote safe and efficient access of vehicles to markets.
3.4. Expedite permitting and clearance of commercial vehicles at weigh and agricultural inspection sites to keep commerce moving.
3.5. Ensure efficient access to major activity centers such as tourist attractions, state parks, and other areas of interest.
3.6. Provide safe and efficient tourist travel and reduce vehicle-miles traveled (VMT) through the provision of accurate and timely traveler information.
3.7. Support the designation of corridors as strategic intermodal corridors and funding for ITS deployments.

4. Enhance Quality of Life and the Environment
4.1. Provide efficient statewide ITS services with autonomy for decision-making to support local needs and regional cooperation to promote efficiency and support regional and statewide goals.
4.2. Improve interoperability of ITS services through the development of statewide uniform device standards and specifications.
4.3. Support integration of ITS into local planning processes, programs, and capacity projects.
4.4. Provide name recognition of key ITS-related services through branding that will instill trust and confidence in traveler information services, roadside assistance, electronic payment services, and other strategic services.
4.5. Provide easy access and data mining capabilities for transportation planning and design for all partners to support decision-making.
4.6. Provide accurate real-time data to technology, business and operational users for effective and responsive transportation operations.

4.7. Reduce air-quality emissions from mobile sources.
4.8. Reduce the potential for impacts from hazardous materials' (HAZMAT) incidents.
  4.8.1. Improve HAZMAT response systems.
  4.8.2. Improve the availability of traveler, weather, and shelter information during man-made and natural disasters.
  4.8.3. Provide safe routes for HAZMAT that avoid densely populated areas.

5. Deploy an Integrated, Effective System
5.1. Provide research and development for technologies to support deployments.
5.2. Develop statewide standards and specifications for ITS field devices.
5.3. Develop statewide standards for TMC software.
5.4. Develop a communications architecture and backbone for statewide deployment.
5.5. Develop standard procedures for operations and management.
5.6. Develop statewide information exchange network standards and criteria.
5.7. Brand all critical statewide services such as traveler information, interactive voice response (IVR) systems (511 or 1-800 services), Road Ranger (RR) Service Patrols, ***SunPass***®, Pre-Pass, etc.
5.8. Standardize performance measures and archive data to produce a history of trends and establish benchmarks.
5.9. Develop statewide procurement guidelines.
5.10. Develop a statewide systems engineering process for design, integration, and testing that includes regular updates and enhancements of statewide architecture.
5.11. Develop statewide procurement contracts to leverage economies of scale.
5.12. Develop an ITS asset management program to track and program replacement parts, migrate legacy systems, and manage the life-cycle of deployments.
5.13. Establish a statewide-managed funding program for ITS with project decision recommendations made by the ITS Office.
5.14. Dedicate a percent of all FDOT funds, statewide-managed and district-allocated, for operations and management of ITS deployments.
5.15. Update work program instructions to develop traceability with the *Statewide ITS Architecture (SITSA)*.
5.16. Increase the professional capacity of the public and private sector in Florida to support planned deployments.
5.17. Promote public-public partnerships to leverage financial and human resources.
5.18. Promote public-private partnerships to leverage financial and human resources.

7. User Services

Table 7.1 documents the relationship between the user services and the ITS goals and objectives. Table 7.2 identifies the applicable near-term and future big picture deployments of the user services. The future big-picture user services represent full ITS deployments along the corridor that are likely to be implemented over the next twenty years and the near-term user services represent those ITS deployments that are likely to occur in the next few years, given the legacy ITS deployments and the corridors' programmed transportation improvements. These users services were derived from the *NITSA* and *SITSA*.

Table 7.1 – Mapping of Goals and Objectives to User Services[1]

		User Services																																
Goals and Objectives		Travel and Traffic Management	Pre-Trip Travel Information	En-Route Driver Information	Ride Matching and Reservation	Traveler Services Information	Traffic Control	Incident Management	Travel Demand Management	Highway Rail Intersection	Public Transportation Management	Public Transportation Management	En-Route Transit Information	Personalized Public Transit	Public Travel Security	Electronic Payment	Electronic Payment Services	Commercial Vehicle Operations	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-Board Safety Monitoring	Commercial Vehicle Administrative	Hazardous Materials Incident Response	Emergency Management	Emergency Notification and Personnel	Emergency Vehicle Management	Evacuation Coordination	Information Management	Archived Data	Maintenance and Construction Operations	Maintenance Vehicle Fleet Management	Roadway Management	Maintenance Work Plan Dissemination	Smart Work Zones
1	**Move People and Goods Safely**																																	
1.1.	Reduce accident rates		●	●	●	●	●	●	●	●						●			●	●	●	●	●		●	●	●	●			●		●
1.2.	Reduce queuing onto mainlines		●	●		●	●	●	●	●						●									●	●	●	●			●		●
1.3.	Improve the safety of commercial vehicle operators in rest areas														●						●				●	●							
1.4.	Provide evacuation coordination services and emergency management		●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●		●	●	●	●			●	●	●
2	**Preserve and Manage the System**																																	
2.1.	Enhance mobility and efficiency		●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●		●	●	●	●			●	●	●
2.2.	System preservation										●	●	●	●	●				●	●	●	●	●					●			●	●	●
2.3.	Incident management		●	●	●	●	●	●	●	●	●	●	●	●	●										●	●	●				●		●
2.4.	Manage special use lanes		●	●	●	●	●	●	●	●	●	●	●	●	●				●	●	●	●	●		●	●	●	●			●		●
2.5.	Provide data archiving and warehousing		●	●	●	●	●	●	●	●		●	●			●			●	●	●	●			●	●	●	●		●			●
3	**Enhance Economic Competitiveness**																																	
3.1.	Ensure efficient landside access to intermodal, port, airport and truck terminal facilities		●	●	●	●	●	●	●	●									●	●	●	●	●								●		
3.2.	Ensure efficient intermodal transfer of people and goods		●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●	●	●				●			●	●		●
3.3.	Promote safe and efficient access of vehicles to markets		●	●	●	●	●	●	●	●																				●	●		●
3.4.	Expedite permitting and clearance of commercial vehicles at weigh and agricultural inspection sites to keep commerce moving		●	●	●	●	●	●	●	●									●	●	●	●	●										
3.5.	Ensure efficient access to major activity centers such as tourist attractions, state parks, and other areas of interest		●	●	●	●	●	●	●	●		●	●	●	●												●					●	●
3.6.	Provide safe and efficient tourist travel and reduce vehicle-miles of travel through the provision of accurate and timely traveler information		●	●	●	●	●	●	●	●		●	●	●	●				●	●	●	●	●				●			●	●	●	●
3.7.	Support designation of corridors as strategic intermodal corridors and funding for ITS deployment		●	●	●	●	●	●	●	●																	●						●
4	**Enhance Quality of Life and The Environment**																																	
4.1.	Provide an efficient statewide ITS system with autonomy for decision-making to support local needs and regional cooperation to promote efficiency and regional and statewide goals.																												●		●	●	●	
4.2.	Improve interoperability of ITS systems through the development of statewide uniform device standards and specifications.																												●					
4.3.	Support integration of ITS into local planning processes, programs, and capacity projects.										●	●	●	●															●		●	●	●	●
4.4.	Provide name recognition of key ITS-related services through branding that will instill trust and confidence in traveler information services, roadside assistance, electronic payment services, and other strategic services.																																	
4.5.	Provide easy access and data mining capabilities for transportation planning and design for all partners to support decision-making.																												●		●			
4.6.	Provide accurate real-time data to technology, business, and operational users for effective and responsive transportation operations		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●	●		●	●	●
4.7.	Reduce air-quality emissions from mobile sources		●	●	●	●	●	●	●	●	●	●	●			●			●			●			●	●	●	●			●		●
4.8.	Reduce the potential for impacts from HAZMAT incidents		●	●	●	●	●	●	●	●									●	●	●	●	●		●	●	●	●			●		●
5	**Deploy An Integrated, Effective System**																																	
5.1.	Provide research and development for technologies to support deployments		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●					●
5.2.	Develop statewide standards and specifications for ITS field devices		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.3.	Develop statewide standards for traffic management center software		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.4.	Develop a communications architecture and backbone for statewide deployment		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.5.	Develop standard procedures for operations and management		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.6.	Develop statewide information exchange network standards and criteria		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.7.	Brand all critical statewide services such as traveler information, interactive voice response systems (511 or 1-800 services), Road Rangers, SunPass, Pre-Pass, etc.		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.8.	Standardize performance measures and archive data to produce a history of trends and establish benchmarks		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.9.	Develop statewide procurement guidelines		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.10.	Develop a statewide system engineering process for design, integration, and testing that include regular updates and enhancements of statewide architecture		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.11.	Develop statewide procurement contracts to leverage economies of scale		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.12.	Develop an ITS asset management program to track and program replacement parts, migrate legacy systems, and manage the life cycle of deployment		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.13.	Establish a statewide management funds program for ITS with project decision recommendations made by the ITS Office		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.14.	Dedicate a percent of all FDOT funds, statewide managed and district allocated, for operations and management and ITS deployment		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.15.	Update work program instructions to develop traceability with statewide ITS architecture		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.16.	Increase the professional capacity of the public and private sector in Florida to support planned deployments		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.17.	Promote public-public partnerships to leverage financial and human resources		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●
5.18.	Promote public-private partnerships to leverage financial and human resources		●	●	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●		●	●	●	●			●	●	●

[1] For legibility purposes, this page must be printed on 11" x 17" paper.

Table 7.2 – Timing of Deployment of User Services

User Services		Applicable (Big Picture)	Applicable (Near-Term)
1.0	**Travel and Traffic Management**		
1.1	**Pre-Trip Travel Information**		
1.1.1	Travel Services	✓	✓
1.1.2	Current Conditions	✓	✓
1.1.3	Trip Planning	✓	✓
1.1.4	User Access	✓	✓
1.2	**En-Route Driver Information**		
1.2.2	Driver Advisory	✓	✓
1.2.3	In-Vehicle Signing		
1.3	Route Guidance		
1.3.1	Provide Directions	✓	✓
1.3.2	Static Mode	✓	✓
1.3.3	Real-Time Mode	✓	
1.3.4	User Interface	✓	
1.4	**Ride Matching and Reservation**		
1.4.1	Rider Request (Demand)	✓	
1.4.2	Transportation Provider Services (Supply)	✓	
1.4.3	Information Processing (Marrying Supply and Demand)	✓	
1.5	**Traveler Services Information**		
1.5.1	Information Receipt	✓	✓
1.5.2	Information Access	✓	✓
1.6	**Traffic Control**		
1.6.1	Traffic Flow Optimization	✓	✓
1.6.2	Traffic Surveillance	✓	✓
1.6.3	Control Function	✓	✓
1.6.4	Provide Information	✓	✓
1.7	**Incident Management**		
1.7.1	Incident Identification	✓	✓
1.7.2	Response Formulation	✓	✓
1.7.3	Response Implementation	✓	✓
1.7.4	Predict Time and Location of Hazardous Conditions	✓	✓
1.8	**Travel Demand Management**		
1.8.1	Increase Efficiency of Transportation System	✓	✓
1.8.2	Provide Wide Variety of Mobility Options	✓	✓
1.9	**Emissions Testing and Mitigation**		
1.9.1	Wide Area Pollution Monitoring	✓	
1.9.2	Roadside Pollution Assessment	✓	
1.10	**Highway-Rail Intersection (HRI)**		
1.10.1	Standard Rail Subservice (<80 MPH Trains)	✓	✓
1.10.2	High-Speed Rail Subservice (80 to 125 MPH Trains)	✓	
2.0	**Public Transportation Management**		
2.1	**Public Transportation Management**		
2.1.1	Operation of Vehicles and Facilities	✓	✓
2.1.2	Planning and Scheduling Services	✓	✓
2.1.3	Personnel Management		
2.1.4	Communications	✓	✓

Table 7.2 (Continued)

User Services		Applicable (Big Picture)	Applicable (Near-Term)
2.2	**En-Route Transit Information**		
2.2.1	Information Distribution	✓	✓
2.2.2	Information Receipt	✓	✓
2.2.3	Information Processing	✓	✓
2.3	**Personalized Public Transit**		
2.3.1	Rider Request		
2.3.2	Vehicle Assignment		
2.3.3	Data Collection		
2.3.4	Information Processing		
2.3.5	Communications		
2.4	**Public Travel Security**		
2.4.2	Security Sensors Function	✓	✓
2.4.3	Personal Sensors Items		
2.4.4	Security Management and Control	✓	✓
3.0	**Electronic Payment**		
3.1	**Electronic Payment Services**		
3.1.1	Electronic Toll Collection (ETC)		
3.1.2	Electronic Fare Collection	✓	
3.1.3	Electronic Parking Payment		
3.1.4	Electronic Payment Systems (EPS) Integration		
3.1.5	Roadway Pricing	✓	
4.0	**Commercial Vehicle Operations (CVO)**		
4.1	**Commercial Vehicle Electronic Clearance**		
4.1.1	Fixed Facility	✓	✓
4.1.2	Vehicle System	✓	
4.2	**Automated Roadside Safety Inspection**		
4.2.2	Roadside Facility	✓	✓
4.2.3	Vehicle System	✓	
4.3	**On-Board Safety Monitoring**		
4.3.1	Fixed Facility		
4.3.2	Vehicle System		
4.4	**Commercial Vehicle Administrative Processes**		
4.4.1	Electronic Purchase of Credentials	✓	✓
4.4.2	Automated Mileage and Fuel Reporting and Auditing	✓	✓
4.4.3	International Border Electronic Clearance		
4.5	**Hazardous Materials (HAZMAT) Incident Response**		
4.5.1	HAZMAT Incident Notification	✓	✓
4.5.2	Operational Focal Point	✓	✓
4.5.3	Communications	✓	✓
4.6	**Commercial Fleet Management**		
4.6.1	Real-Time Routing		
4.6.2	Real-Time Communications		

Table 7.2 (Continued)

User Services		Applicable (Big Picture)	Applicable (Near-Term)
5.0	**Emergency Management**		
5.1	**Emergency Notification and Personnel**		
5.1.1	Driver and Personal Security (Manual)	✓	✓
5.1.2	Automated Collision Notification	✓	✓
5.2	**Emergency Vehicle Management**		
5.2.1	Fleet Management	✓	✓
5.2.2	Route Guidance	✓	✓
5.2.3	Signal Priority	✓	✓
5.3	**Evacuation Coordination**		
5.3.1	Evacuation Guidance	✓	✓
5.3.2	Evacuation Travel Information	✓	✓
5.3.3	Evacuation Traffic Management	✓	✓
5.3.4	Evacuation Planning Support	✓	✓
5.3.5	Evacuation Resource Sharing	✓	✓
6.0	**Advanced Vehicle Safety Systems**		
6.1	**Longitudinal Collision Avoidance**		
6.1.1	Rear-End		
6.1.2	Backing		
6.1.3	Head-On/Passing		
6.2	**Lateral Collision Avoidance**		
6.2.1	Lane Change/Merge		
6.2.2	Single Vehicle Roadway Departure		
6.3	**Intersection Collision Avoidance**		
6.3.1	Advisory System		
6.3.2	Driver Action System		
6.3.3	Automatic Control System		
6.4	**Vision Enhancement for Crash Avoidance**		
6.4.1	Enhanced Vision System		
6.5	**Safety Readiness**		
6.5.1	Driver Monitor		
6.5.2	Vehicle Condition		
6.5.3	Infrastructure Condition		
6.6	**Pre-Crash Restraint Deployment**		
6.6.1	Automatic Activation System		
6.7	**Automated Vehicle Operation**		
6.7.1	Automated Highway System (AHS)		
6.7.2	Partially Automated Highway System (PAHS)		

Table 7.2 (Continued)

User Services		Applicable (Big Picture)	Applicable (Near-Term)
7.0	**Information Management**		
7.1	**Archived Data**		
7.1.1	Historical Data Archive	✓	✓
7.1.2	Operational Data Control	✓	✓
7.1.3	Data Import and Verification	✓	✓
7.1.4	Automatic Data Historical Archive	✓	✓
7.1.5	Data Warehouse Distribution	✓	✓
7.1.6	ITS Community Interface	✓	✓
8.0	**Maintenance and Construction Operations (MCO)**		
8.1	**Maintenance Vehicle Fleet Management**	✓	✓
8.2	**Roadway Management**	✓	✓
8.3	**Roadway Maintenance Conditions and Work Plan Dissemination**	✓	✓
8.4	**Smart Work Zones**	✓	✓

In addition, an Evacuation Coordination User Service has been added that provides the capability to efficiently manage an evacuation and provide evacuees with information they need during the evacuation, as well as reentry. It consists of five major functions:

- Evacuation Guidance;
- Evacuation Travel Information;
- Evacuation Traffic Management;
- Evacuation Planning Support; and
- Evacuation Resource Sharing.

For further information regarding the Evacuation Coordination User Service, an issue paper was developed as part of the *I-4 ITS Corridor Study* that summarizes this ITS user service in greater detail. This issue paper is attached as Appendix A. This new Evacuation Coordination User Service is also included in the *SITSA*.

In addition, the USDOT issued a Maintenance and Construction User Service in February 2001 that will be evaluated for use in these corridors. The *NITSA* has also issued ten market packages under the Maintenance and Construction User Service. Detailed documentation of this new user service is contained in Appendix B. The purpose of the Maintenance and Construction User Service is to effectively manage, monitor, operate, and improve the physical condition of the roadway, the associated infrastructure equipment on the roadway, and the available resources to conduct these activities. It consists of the following four major functions:

- Maintenance Vehicle Fleet Management;

- Roadway Management;
- Work Zone Management and Safety;
- Roadway Maintenance Conditions and Work Plan Dissemination; and
- Roadway Weather Information Data Collection Processing and Distribution.

To ensure that the selected user services are consistent with the previously identified system goals and objectives, a traceability matrix was prepared which maps one element to the other. Goal number 5 (Deploy an Integrated, Effective System) can be mapped to each of the user services. This goal represents high-level ITS policy initiatives that will eventually be implemented by FDOT as a comprehensive, statewide ITS Plan that addresses all long-term ITS Plan needs.

8. Themes and Strategies for Implementation

Based on these goals and objectives, the following themes and strategies summarize the desired outcomes of the ITS deployments along the five principle FIHS limited-access corridors. These themes and strategies are intended to describe the desired outcomes in non-technical terms that stakeholders can understand and may not follow strict technical definitions.

8.1 Coordinated Operations

- Facilitate, support, and enhance the coordination and implementation of interagency efforts in response to the needs of intercity travel, major incidents or special events of regional significance along the corridor, and the security of the transportation infrastructure.

- Promote coordination and cooperation among all organizations involved in incident management including state, county, and local transportation departments, toll road authorities, law enforcement agencies, emergency service providers, and other operating agencies within the corridor.

- Foster and facilitate continued development and implementation of regional incident management initiatives and educate the public and responders to the benefits of incident management.

- Encourage technology and resource sharing by coordinating the development of training programs to support member agencies' incident management programs and activities.

- Demonstrate and evaluate the application of innovative procedures and technologies to enhance incident management activities.

- Provide regional solutions for serving intercity travel by promoting the through movement of vehicles.

- Provide procedures and coordination during evacuation and other emergency situations to make the best use of system resources.

- Promote coordination among agencies in the notification and implementation of maintenance and construction.

8.2 Active Facilities Management

- Support traffic management along all facilities in a coordinated way.
- Support incident management for the detection of, response to, and clearance of accidents and other major incidents such as freeway service patrols and Mayday / E-911 support, development of incident response scenarios and traffic diversion plans, incident response centers or command posts, and traffic surveillance technologies.
- Provide transit management, including bus, commuter rail, and park-and-ride facilities, as well as other transit-related activities and manage SULs, such as high-occupancy toll or other value pricing, reversible lane control for high occupancy vehicle (HOV) facilities, and transit or emergency vehicle signal preemption systems.
- Improve the ability to monitor, schedule, and dispatch maintenance, construction, special services, or other public/community transportation fleets.
- Manage traffic flow and safety during evacuations related to hurricanes, fires, and other emergencies.
- Serve commercial vehicle operations (CVO), such as electronic screening systems, to verify the compliance of motor carriers with size, weight, safety and credentials regulations, and emergency response systems.
- Promote the use of electronic toll collection (ETC) and electronic payment systems (EPS) to improve traffic flow efficiencies and reduce infrastructure requirements.
- Implement procedures and systems that cost-effectively manage work zone activities.
- Manage lane closure prediction and scheduling.
- Collect/Maintain data on work zone locations and delay and alternate routing for mainlines and standard diversion or evacuation routes.
- Automate speed enforcement and variable speed limits in work zones.
- Support advanced traveler information systems (ATIS).
- Provide evacuation guidance that includes basic information to assist potential evacuees in determining whether evacuation is necessary. Once the decision is made to evacuate, the services will also assist evacuees in determining destination routes to shelters and other lodging options. This function will also provide guidance for returning to evacuated areas, information regarding clean up, and other pertinent information to be distributed from federal, state, and local agencies.

- Provide evacuation travel information that will benefit evacuees in planning their evacuation trip once that decision has been made. This function will also allow travelers to change course during the trip based on route and destination conditions.

- Provide evacuation traffic management to assist evacuation coordination personnel in the management of evacuation operations on the transportation network.

- Provide evacuation planning to support the evacuation process by providing information, current and historical, to emergency management planning personnel.

- Promote evacuation resource sharing to allow information and resource sharing between agencies involved in the evacuation including transportation, emergency management, law enforcement and other emergency service agencies.

- Improve the coordination of construction activity and other roadway activities with maintenance.

- Provide infrastructure security against terrorist attacks.

8.3 Information Sharing

- Coordinate data collection and information processing, management, and distribution.

- Coordinate data collection programs and sensor installation/operations.

- Inform and exchange data through coordinated operations.

- Centralize information processing, management, and storage.

- Open access to information delivery and use.

- Coordinate information report development.

- Coordinate transportation management strategy development.

Table 8.1 maps the ITS User Services to each of the Themes and Strategies outlined above.

Table 8.1 – Mapping of Themes and Strategies to User Services[2]

Themes and Strategies	User Services: Travel and Traffic Management	Pre-Trip Travel Information	En-Route Driver Information	Route Guidance	Ride Matching and Reservation	Traveler Services Information	Traffic Control	Incident Management	Travel Demand Management	Highway Rail Intersection	Public Transportation Management	Public Transportation Management	En-Route Transit Information	Personalized Public Transit	Public Travel Security	Electronic Payment	Electronic Payment Services	Commercial Vehicle Operations	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-Board Safety Monitoring	Commercial Vehicle Administrative	Hazardous Materials Incident Response	Commercial Fleet Management	Emergency Management	Emergency Notification and Personnel	Emergency Vehicle Management	Evacuation Coordination	Advanced Vehicle Safety Systems	Longitudinal Collision Avoidance	Lateral Collision Avoidance	Intersection Collision Avoidance	Vision Enhancement for Crash Avoidance	Safety Readiness	Pre-Crash Restraint Deployment	Automated Vehicle Operation	Information Management	Archived Data	Maintenance and Construction Operations	Maintenance Vehicle Fleet Management	Roadway Management	Maintenance Work Plan Dissemination	Smart Work Zones
Coordinated Operations																																												
Facilitate and enhance interagency coordination						●	●	●				●		●		●		●							●	●	●												●			●	
Promote coordination between incident management agencies								●						●											●	●	●													●		●	●
Foster and facilitate implementation of regional incident management								●		●															●	●																●	●
Encourage technology and resource sharing								●				●																										●					●
Demonstrate application of innovative procedures to enhance incident management								●		●																				●	●	●	●	●	●	●			●		●	●	●
Provide regional solutions for serving intercity travel					●		●		●				●																											●		●	
Provide procedures and coordination during evacuation																									●	●	●														●		
Promote coordination between agencies in notification and implementation of maintenance and construction activities																																							●	●	●	●
Active Facilities Management																																											
Support traffic management in a coordinated manner					●		●		●																					●	●	●	●	●	●	●				●		
Support incident management for response to and clearance of accidents and incidents																									●	●															●		●
Provide transit and special use lane management					●						●	●	●	●																													
Ability to monitor, schedule, and dispatch maintenance vehicles																																								●	●	●	●
Serve commercial vehicle operations									●									●	●	●	●	●	●	●																			
Manage traffic flow and safety during evacuations						●																						●														●	●
Promote the use of electronic toll collection and payment																●																											
Implement procedures and systems for work zone management		●		●		●			●																																●	●
Manage lane closure prediction and scheduling						●																																			●	●
Collect and maintain data on work zone locations, delay and alternate routing						●																																			●	●	●
Automate speed enforcement and variable speed limits in work zones																																									●		●
Support advanced traveler information systems		●	●			●		●					●																														●
Provide evacuation guidance for pre- and post-hurricane		●	●	●		●																																				●
Provide evacuation travel information for alternative routes						●																																				●	●
Provide evacuation traffic management to assist personnel							●																			●	●	●														●	●
Provide evacuation support to emergency management personnel																										●	●	●														●	●
Promote evacuation resource sharing between agencies																										●	●	●														●	
Improve coordination of construction and maintenance activities																																									●	●	●	●
Information Sharing																																											
Coordinate data collection, processing, management and distribution																●																								●			●		
Coordinate data collection and sensor installation/operations																●																								●			●		
Inform and exchange data through coordinated operations																●																								●			●	●	
Centralize information processing, management, and storage																●																								●					
Open access to information delivery and use																																								●					
Coordinate information report delivery																																								●					
Coordinate transportation management strategy development					●				●																														●			●	●

[2] For legibility purposes, this page must be printed on 11" x 17" paper.

9. Market Packages

In the previous section, the user services were identified as the "what" – what the ITS needs to be successful. The market packages recommended in the straw architecture represent the "how" – how the system will be designed to address the needs and user services. There are standardized terms for ITS solutions which represent the building blocks for the ITS architecture. Market packages are organized around certain system functions or capabilities that can be deployed to satisfy user needs.

The identification of applicable market packages for a set of specified user needs is developed through an iterative process. First, a general menu of standard market packages is derived from the *NITSA*. This menu is then tailored to reflect ITS deployments along the corridors as identified in legacy systems, short-term and long-term FDOT plans or programs, and potential new ITS deployments identified from the goals and objectives.

Table 9.1 exhibits the standard market packages from the *NITSA, Version 3.0,* and those selected as applicable for the five major corridors statewide. These market packages, grouped into eight general categories, will support ITS deployments for the five major corridors over the long-term.

Table 9.1 – Recommended Market Packages for the *ITS Corridor Master Plans* from the *NITSA,* Version 3.0

MP NO.	Market Package Name	Applicable	Included in the *SITSA*
Advanced Public Transportation Systems (APTS)			
APTS1	Transit Vehicle Tracking	✓	✓
APTS2	Transit Fixed-Route Operations	✓	✓
APTS3	Demand Response Time Operations	N/A	✓
APTS4	Transit Passenger and Fare Management	✓	✓
APTS5	Transit Security	✓	✓
APTS6	Transit Maintenance	N/A	✓
APTS7	Multi-Modal Coordination	✓	✓
APTS8	Transit Traveler Information	✓	✓
Advanced Traveler Information Systems (ATIS)			
ATIS1	Broadcast Traveler Information	✓	✓
ATIS2	Interactive Traveler Information	✓	✓
ATIS3	Autonomous Route Guidance (ARG)	N/A	
ATIS4	Dynamic Route Guidance (DRG)	N/A	
ATIS5	ISP-Based Route Guidance	N/A	
ATIS6	Integrated Transportation Management/Route Guidance	N/A	
ATIS7	Yellow Pages and Reservation	✓	
ATIS8	Dynamic Ridesharing	✓	✓
ATIS9	In-Vehicle Signing	N/A	
Advanced Traffic Management Systems (ATMS)			
ATMS01	Network Surveillance	✓	✓
ATMS02	Probe Surveillance	✓	✓
ATMS03	Surface Street Control	N/A	✓
ATMS04	Freeway Control	✓	✓
ATMS05	HOV Lane Management	✓`	✓
ATMS06	Traffic Information Dissemination	✓	✓
ATMS07	Regional Traffic Control	✓	✓
ATMS08	Incident Management System (IMS)	✓	✓
ATMS09	Traffic Forecast and Demand Management	✓	✓
ATMS10	Electronic Fare Collection	✓	
ATMS11	Emissions Monitoring and Management	N/A	✓
ATMS12	Virtual TMC and Smart Probe Data	N/A	
ATMS13	Standard Railroad Grade Crossing	✓	✓
ATMS14	Advanced Railroad Grade Crossing	✓	
ATMS15	Railroad Operations Coordination	✓	
ATMS16	Parking Facility Management	✓	✓
ATMS17	Reversible Lane Management	✓	✓
ATMS18	Road Weather Information System (RWIS)	✓	✓
ATMS19	Regional Parking Management	N/A	
FL ATMS20	Speed Management	✓	

Table 9.1 (Continued)

MP NO.	Market Package Name	Applicable	Included in the *SITSA*
Advanced Vehicle Safety Systems (AVSS)			
AVSS01	Vehicle Safety Monitoring	N/A	
AVSS02	Driver Safety Monitoring	N/A	
AVSS03	Longitudinal Safety Warning	N/A	
AVSS04	Lateral Safety Warning	N/A	
AVSS05	Intersection Safety Warning	N/A	
AVSS06	Pre-Crash Restrain Deployment	N/A	
AVSS07	Driver Visibility Improvement	N/A	
AVSS08	Advanced Vehicle Longitudinal Control	N/A	
AVSS09	Advanced Vehicle Lateral Control	N/A	
AVSS10	Intersection Collision Avoidance	N/A	
AVSS11	Automated Highway System (AHS)	N/A	
Commercial Vehicle Operations (CVO)			
CVO01	Fleet Administration	N/A	
CVO02	Freight Administration	✓	
CVO03	Electronic Clearance	✓	✓
CVO04	Commercial Vehicle Administrative Process	✓	✓
CVO05	International Border Electronic Clearance	N/A	
CVO06	Weigh-In Motion (WIM)	✓	✓
CVO07	Roadside CVO Safety	✓	✓
CVO08	On-Board CVO Safety	✓	✓
CVO09	CVO Fleet Maintenance	✓	
CVO10	HAZMAT Management	✓	✓
Emergency Management			
EM1	Emergency Response	✓	✓
EM2	Emergency Routing	✓	✓
EM3	Mayday Support	✓	✓
FL EM4	Evacuation Management	✓	
Archived Data and Management			
AD1	ITS Data Mart	✓	✓
AD2	ITS Data Warehouse	✓	✓
AD3	ITS Virtual Data Warehouse	✓	✓
Maintenance and Construction Operations (MCO)			
FL MCO1	Maintenance and Construction Management	✓	

Note: N/A – Not Applicable

To ensure that the selection of specific market packages adequately addresses the statewide ITS needs, market packages were mapped to the system themes and strategies and user services. The selected user services characterize the problems, needs, policies, and objectives of the system and must be directly and specifically addressed by the selected market packages. However, the relationship between market packages and user services is not necessarily one to one. Many user services can be addressed by one market package and several market packages may be applicable to one user service. Figure 9.1 illustrates their relationship. Similarly, the themes and strategies represent a logical grouping of selected ITS solutions. These market packages must specifically address these ITS solutions. Tables 9.1 and 9.2 illustrate the relationship between market packages and themes and market packages and user services.

Figure 9.1 – Relationship Between User Services and Market Packages

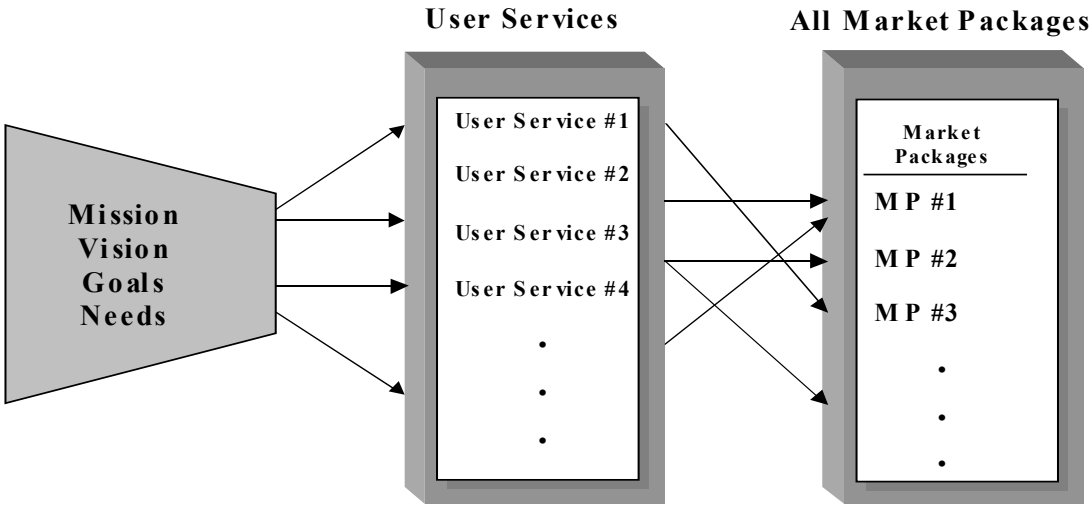


Table 9.2 – Mapping of Market Packages to User Services[3]

Market Packages	Evacuation Coordination	Maintenance Vehicle Fleet Management	Roadway Management	Roadway Maintenance Conditions and Work Plan	Smart Work Zones	Archived Data Function	Emergency Vehicle Management	Emergency Notification and Personal Security	Commercial Fleet Management	Hazardous Material Incident Response	Commercial Vehicle Administrative Process	On-Board Safety Monitoring	Automated Roadside Safety Inspection	Commercial Vehicle Electronic Clearance	Electronic Payment Service	Public Travel Security	Personalized Public Transit	En-Route Transit Information	Public Transportation Management	Highway Rail Intersection	Travel Demand Management	Incident Management	Traffic Control	Traveler Service Information	Ride Matching and Reservation	Route Guidance	En-Route Driver Information	Pre-Trip Travel Information	Longitudinal Collision Avoidance	Lateral Collision Avoidance	Intersection Collision Avoidance	Vision Enhancement for Crash Avoidance	Safety Readiness	Pre-Crash Restraint Development	Automated Vehicle Operation
ATMS																																			
Network Surveillance	●		●		●																		●											
Probe Surveillance	●				●																●		●											
Freeway Control	●				●																●	●	●											
HOV Lane Management	●				●																		●											
Traffic Information Dissemination	●				●															●			●											
Regional Traffic Control																							●											
Incident Management System	●		●		●																	●												
Traffic Forecast and Demand Management	●														●						●		●											
Electronic Toll Collection																				●														
Standard Railroad Grade Crossing																				●														
Advanced Railroad Grade Crossing	●				●															●														
Railroad Operations Coordination	●																			●														
Parking Facilities Management																					●		●					●						
Reversible Lane Management	●																					●	●											
Road Weather Information System	●		●		●																	●	●				●							
Speed Management					●																		●											
APTS																																		
Transit Vehicle Tracking	●															●																		
Transit Fixed-Route Operations																	●																	
Transit Passenger and Fare Management																		●																
Transit Security																			●															
Multi-modal Coordination	●																																	
Transit Traveler Information	●																																	
ATIS																																		
Broadcast Traveler Information	●				●																													
Interactive Traveler Information	●				●																													
Yellow Pages and Reservation	●																																	
Dynamic Ridesharing	●																																	
CVO																																		
Freight Administration												●																						
Electronic Clearance													●	●																				
Commercial Vehicle Administrative Processes													●	●																				
Weigh-In-Motion														●																				
Roadside CVO Safety														●	●																			
On-Board CVO Safety															●																			
CVO Fleet Maintenance															●	●																		
HAZMAT Management													●			●						●												
EM																																		
Emergency Response	●				●				●	●																								
Emergency Routing	●				●					●													●											
Mayday Support	●				●				●	●																								
Evacuation Management	●				●				●	●													●											
AD																																		
ITS Data Mart			●			●																												
ITS Data Warehouse			●			●																												
ITS Virtual Data Warehouse			●			●																												
MCO																																		
Maintenance and Construction Management		●				●																												

[3] For legibility purposes, this page must be printed on 11" x 17" paper.

Table 9.3 – Market Packages Mapped to Themes and Strategies

Market Packages		Themes		
MP No.	Market Package Name	Coordinated Operations	Active Facilities Management	Information Sharing
APTS1	Transit Vehicle Tracking		•	
APTS2	Transit Fixed-Route Operations		•	
APTS4	Transit Passenger and Fare Management		•	
APTS5	Transit Security		•	
APTS7	Multi-Modal Coordination	•	•	
APTS8	Transit Traveler Information		•	•
ATIS1	Broadcast Traveler Information			•
ATIS2	Interactive Traveler Information			•
ATIS7	Yellow Pages and Reservation			•
ATIS8	Dynamic Ridesharing		•	•
ATMS01	Network Surveillance		•	
ATMS02	Probe Surveillance		•	
ATMS04	Freeway Control		•	
ATMS05	HOV Lane Management		•	
ATMS06	Traffic Information Dissemination	•	•	•
ATMS07	Regional Traffic Control	•	•	
ATMS08	Incident Management System (IMS)	•	•	
ATMS09	Traffic Forecast and Demand Management		•	•
ATMS10	Electronic Fare Collection	•	•	•
ATMS13	Standard Railroad Grade Crossing		•	
ATMS14	Advanced Railroad Grade Crossing		•	
ATMS15	Railroad Operations Coordination	•	•	
ATMS16	Parking Facility Management	•	•	
ATMS17	Reversible Lane Management	•	•	
ATMS18	Road Weather Information System		•	•
FL ATMS20	Speed Management		•	
CVO02	Freight Administration		•	
CVO03	Electronic Clearance	•	•	•
CVO04	Commercial Vehicle Administrative Process	•	•	
CVO06	Weigh-In-Motion (WIM)		•	
CVO07	Roadside CVO Safety		•	
CVO08	On-Board CVO Safety		•	
CVO09	CVO Fleet Maintenance		•	
CVO10	HAZMAT Management	•	•	
EM1	Emergency Response	•	•	
EM2	Emergency Routing	•	•	
EM3	Mayday Support	•	•	
FL EM4	Evacuation Management	•	•	
AD1	ITS Data Mart			•
AD2	ITS Data Warehouse			•
AD3	ITS Virtual Data Warehouse			•
FL MCO1	Maintenance & Construction Management	•	•	•

9.1 Market Package Descriptions

This section addresses market package benefits to end-users of ITS services. End-users may include the traveling public, technical operations and support, and the business community. The following text includes a description of each selected market package as detailed in the *NITSA, Version 3.0*.

APTS1 Transit Vehicle Tracking

This market package provides for an automated vehicle location system (AVLS) to track the transit vehicle's real-time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle [i.e., through a global positioning system GPS)] and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communications link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed-route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the ISP Subsystem via a wireline link.

APTS2 Transit Fixed-Route Operations

This market package performs automatic driver assignment and monitoring, as well as vehicle routing and scheduling for fixed-route services. This service uses the existing AVLS database as a source for current schedule performance data and is implemented through data processing and information display at the Transit Management Subsystem. This data is exchanged using the existing wireline link to the ISP where it is integrated with that from other transportation modes (i.e., rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.

APTS4 Transit Passenger and Fare Management

This market package allows for the management of passenger loading and fare payments on vehicles using electronic payment methods. The payment instrument may be either a stored value or credit card. This package is implemented with sensors mounted on the vehicle to permit the driver and central operations to determine vehicle loads and readers located either in the infrastructure or on-board the transit vehicle to allow fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem using existing wireless infrastructure.

APTS5 Transit Security

This market package provides for the physical security of transit passengers. An on-board security system is deployed to perform surveillance and warn of potentially hazardous situations. Public areas (i.e., stops, park-and-ride lots, stations) are also monitored. Information is communicated to the Transit Management Subsystem using the existing or emerging wireless (vehicle to center) or wireline (area to center) infrastructure. Security related information is also transmitted to the Emergency Management Subsystem when an emergency is identified that requires an external response. Incident information is communicated to the ISP.

APTS7 Multi-Modal Coordination

This market package establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Intermodal coordination between transit agencies can increase traveler convenience at transfer points and also improve operating efficiency. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.

APTS8 Transit Traveler Information

This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.

ATIS1 Broadcast Traveler Information

This market package provides the user with a basic set of ATIS services and its objective is early acceptance. It involves the collection of traffic conditions, advisories, general public transportation, toll and parking information, incident information, air quality and weather information, and the near real-time dissemination of this information over a wide area through existing infrastructures and low cost user equipment (i.e., FM subcarrier, cellular data broadcast). Different from the market package ATMS6 (Traffic Information Dissemination), which provides the more basic Highway Advisory Radio (HAR) and Dynamic Message Sign (DMS) information capabilities, ATIS1 provides the more sophisticated digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles, and other sources.

ATIS2 Interactive Traveler Information

This market package provides tailored information in response to traveler requests. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, transit services, ride-share/ride-match, parking management, and pricing information. A range of two-way wide-area wireless and wireline communications systems may be used to support the required digital communications between the traveler and the ISP. To access information prior to a trip or en-route, a variety of interactive devices including phone, kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices may be used by the traveler. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, probe vehicles, or other means.

ATIS7 Yellow Pages and Reservation

This market package enhances the Interactive Traveler Information Market Package by making infrastructure-provided yellow pages and reservation services available to the user. The same basic user equipment is included. This market package provides multiple ways for accessing information either while en-route in a vehicle using wide-area wireless communications or pre-trip via wireline connections.

ATIS8 Dynamic Ridesharing

This market package enhances the Interactive Traveler Information Market Package by adding an infrastructure-provided dynamic ride-share/ride-match capability. In terms of equipment requirements, ATIS8 is similar to ATIS7.

ATMS01 Network Surveillance

This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and wireline communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally, as when traffic detectors are connected directly to a signal control system or remotely, as when a closed-circuit television (CCTV) system sends data back to the Traffic Management Subsystem. The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long-range planning. The collected data can also be analyzed and made available to users and the ISP Subsystem.

ATMS02 Probe Surveillance

This market package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this market package: 1) wide-area wireless communications between the vehicle and ISP are used to communicate current vehicle location and status and 2) dedicated short-range communications (DSRC) between the vehicle and roadside are used to provide equivalent information back to the Traffic Management Subsystem. The first approach leverages wide-area communications equipment that may already be in the vehicle to support personal safety and ATIS. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short-range communications applications identified within the architecture. The market package enables traffic managers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, roadside beacons and wireline communications for the short-range communications option, data reduction software, and utilizes wireline links between the Traffic Management and ISP Subsystems to share the collected information. Both "opt out" and "opt in" strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required in this market package that include the ability to identify and filter out-of-bounds or extreme data reports.

ATMS04 Freeway Control

This market package provides the communications and roadside equipment to support ramp control, lane controls, and interchange control for freeways. Coordination and integration of ramp meters are included as part of this market package. This package is consistent with typical urban traffic freeway control systems. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option. This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a TMC; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en-route.

ATMS05 HOV Lane Management

This market package manages HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatment is given to HOV lanes using special bypasses, reserved lanes, and exclusive rights-of-way that may vary by time of day. Vehicle occupancy detectors may be installed to verify HOV compliance and to notify enforcement agencies of violations.

ATMS06 Traffic Information Dissemination

This market package allows traffic information to be disseminated to drivers and vehicles using roadway equipment such as DMS or HAR. This package provides a tool that can be used to notify drivers of incidents; careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a TMC to the media (for instance via a direct tie-in between a TMC and radio or television station computer systems), transit management centers, emergency management centers (EMCs), and ISPs.

ATMS07 Regional Traffic Control

This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated inter-jurisdictional traffic control. This market package provides for the sharing of traffic information and control among TMCs to support a regional control strategy. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and wireline communications capabilities to implement traffic management strategies that are coordinated between allied TMCs. Several levels of coordination are supported from sharing of information through sharing of control between TMCs.

ATMS08 Incident Management System (IMS)

This market package manages both predicted and unexpected incidents so that the impact to the transportation network and traveler safety is minimized. Requisite incident detection capabilities are included in the Freeway Control Market Package and through regional coordination with other TMCs, EMCs, weather service entities, and event promoters supported by this market package. Information from these diverse sources are collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package provides the Traffic Management Subsystem the equipment that supports traffic operations personnel in developing an appropriate response in coordination with emergency management and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications and presentation of information to affected travelers using the Traffic Information Dissemination Market Package. The same equipment assists the operator by monitoring incident status as the response unfolds. The coordination with emergency management might be through a computer-aided dispatch (CAD) system or through other communications with emergency field personnel. The coordination can also extend to tow trucks and other field service personnel.

ATMS09 Traffic Forecast and Demand Management

This market package includes advanced algorithms, processing, and mass storage capabilities that support historical evaluation, real-time assessment, and forecast of the roadway network performance. This includes the prediction of travel demand patterns to support and better link travel time forecasts. The source data would come from the Traffic Management Subsystem itself as well as other TMCs and forecasted traffic loads derived from route plans supplied by the ISP Subsystem. In addition to short-term forecasts, this market package provides longer-range forecasts that can be used in transportation planning. This market package provides data that supports the implementation of transportation demand management (TDM) programs and policies managing both traffic and the environment. Information on vehicle pollution levels, parking availability, usage levels, and vehicle occupancy is collected by monitoring sensors supporting these functions. Demand management requests can also be made to the Toll Administration, Transit Management, and Parking Management Subsystems.

ATMS10 Electronic Toll Collection (ETC)

This market package provides toll operators with the ability to collect tolls electronically and detect and process violators. Variations in the fees that are collected enable implementation of demand management strategies. DSRC between the roadway equipment and the vehicle is required as well as wireline interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Vehicle tags of toll violators are read and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable regional, and ultimately national, interoperability for these services. The population of toll tags and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.

ATMS13 Standard Railroad Grade Crossing

This market package manages highway traffic at HRI's where operational requirements do not dictate more advanced features (i.e., where rail operational speeds are less than 80 mph). Both passive (i.e., the crossbuck sign) and active warning systems (i.e., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the Roadway Subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to HRI activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the Traffic Management Subsystem. Similar interfaces and services are provided for other types of multi-modal crossings (i.e., draw bridges).

ATMS14 Advanced Railroad Grade Crossing

This market package manages highway traffic at HRI's where operational requirements demand advanced features (i.e., where rail operational speeds are greater than 80 mph). This market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems supported by this market package include positive barrier systems that preclude entrance into the intersection when the barriers are activated. Like the Standard Railroad Grade Crossing Market Package, the HRI equipment is activated on notification by wayside interface equipment that detects or communicates with the approaching train. In this market package, the wayside interface equipment also provides additional information about the arriving train so that the train's direction of travel, its estimated time of arrival, and the estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This market package also includes additional detection capabilities that enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.

ATMS15 Railroad Operations Coordination

This market package provides an additional level of strategic coordination between rail operations and TMCs. Rail operations provide train schedules, maintenance schedules, and any other forecast events that will result in HRI closures. This information is used to develop and forecast HRI closure times and durations which may be used in advanced traffic control strategies or to enhance the quality of traveler information.

ATMS16 Parking Facility Management

This market package provides enhanced monitoring and management of parking facilities. The included equipment assists in the management of parking operations, coordinates with transportation authorities and supports electronic collection of parking fees. This is performed by sensing and collecting current parking facilities' status, sharing the data with ISPs and traffic operations, and automatic fee collection using short-range communications with the same in-vehicle equipment utilized for ETC.

ATMS17 Reversible Lane Management

This market package provides for the management of reversible lane facilities. In addition to standard surveillance capabilities, this market package includes sensory functions that detect wrong-way vehicles and other special surveillance capabilities that mitigate safety hazards associated with reversible lanes. The package includes the field equipment, physical lane access controls, and associated control electronics that manage and control these special lanes. This market package also includes the equipment used to electronically reconfigure intersections and manage rights-of-way to address dynamic demand changes and special events.

ATMS18 Road Weather Information System (RWIS)

This market package monitors current road and weather conditions and forecasts the same using a combination of weather service information and data collected from environmental sensors deployed on and about the roadway. The collected road weather information is monitored and analyzed to detect and forecast environmental hazards such as icy road conditions, dense fog, and approaching severe weather fronts. This information can be used to more effectively deploy road maintenance resources, issue general traveler advisories, and support location specific warnings to drivers using the Traffic Information Dissemination Market Package.

FL ATMS20 Speed Management

This market package will collect roadside weather, incident, and construction information and provide dynamic speed limit displays to warn drivers of upcoming speed zones in construction areas and other critical roadway segments.

CVO02 Freight Administration

This market package tracks cargo and the cargo condition. This information is communicated with the Fleet and Freight Management Subsystem via the existing wireless infrastructure. Interconnections are provided to intermodal shippers and intermodal freight depots for tracking the cargo from source to destination.

CVO03 Electronic Clearance

This market package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration Subsystem over wireline to retrieve infrastructure snapshots of critical carrier, vehicular, and driver data to be used to sort passing vehicles. This package allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and DSRC to the roadside. The roadside check facility may be equipped with automatic vehicle identification (AVI), weighing sensors, transponder read/write devices, and computer workstation processing hardware, software, and databases.

CVO04 Commercial Vehicle Administrative Processes

This market package provides for electronic application, processing, fee collection, issuance, and distribution of CVO credential and tax filing. Through this process, carriers, drivers, and vehicles may be enrolled in the electronic clearance program provided by a separate market package that allows commercial vehicles to be screened at mainline speeds at commercial vehicle checkpoints. Through this enrollment process, current profile databases are maintained

in the Commercial Vehicle Administration Subsystem and snapshots of this database are made available to the commercial vehicle check facilities at the roadside to support the electronic clearance process.

CVO06 Weigh-in-Motion (WIM)

This market package provides for high-speed weigh-in-motion with or without AVI attachment. Primarily, this market package provides the roadside with additional equipment, either fixed or removable. If the equipment is fixed, it is thought to be an addition to the electronic clearance and would work in conjunction with the AVI and automatic vehicle classification (AVC) equipment in place.

CVO07 Roadside CVO Safety

This market package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the Commercial Vehicle Check roadside element. The capabilities for performing the safety inspection are shared between this market package and the On-Board CVO Safety Market Package that enables a variety of implementation options. The basic option, directly supported by this market package, facilitates safety inspection of vehicles that have been pulled in, perhaps as a result of the automated screening process provided by the Electronic Clearance Market Package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure that is used to support the safety inspection and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations, supported by the On-Board CVO Safety Market Package, utilize additional vehicle safety monitoring and reporting capabilities in commercial vehicles to augment the roadside safety check.

CVO08 On-Board CVO Safety

This market package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety Market Package and includes roadside support for reading on-board safety data via tags. This market package uses the same communications links as the Roadside CVO Safety Market Package and provides the commercial vehicle with a wireless link (data and possibly voice) to the Fleet and Freight Management and the Emergency Management Subsystems. Safety warnings are provided to the driver as a priority with secondary requirements to notify the Fleet and Freight Management and Commercial Vehicle Check roadside elements.

CVO09 CVO Fleet Maintenance

This market package supports maintenance of CVO fleet vehicles through close interface with on-board monitoring equipment and AVLS capabilities within the Fleet and Freight Management Subsystem. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.

CVO10 HAZMAT Management

This market package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT and any related incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management Subsystem is notified by the commercial vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.

EM1 Emergency Response

This market package provides the CAD systems, emergency vehicle equipment, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification and coordinated response between agencies. Existing wide-area wireless communications are utilized between the Emergency Management Subsystem and an emergency vehicle to enable an incident command system to be established and supported at the emergency location. The Emergency Management Subsystem includes hardware and software for tracking the emergency vehicles. Public safety, traffic management, and many other allied agencies may each participate in the coordinated response managed by this package.

EM2 Emergency Routing

This market package supports dynamic routing of emergency vehicles and coordination with the Traffic Management Subsystem for special priority on the selected route(s). The ISP Subsystem supports routing for the emergency fleet based on real-time traffic conditions and the emergency routes assigned to other responding vehicles. In this market package, the ISP Subsystem would typically be integrated with the Emergency Management Subsystem in a public safety communications center. The emergency vehicle would also optionally be equipped with DSRC for local signal preemption.

EM3 Mayday Support

This package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user and determine the appropriate response. The Emergency Management Subsystem may be operated by the public sector or by a private sector provider. The request from the traveler needing assistance may be manually initiated or automated and linked to vehicle sensors. The data is sent to the Emergency Management Subsystem using wide-area wireless communications with voice as an option. Providing user location implies either a location technology within the user device or location determination within the communications infrastructure.

FL EM4 Evacuation Management

This market package involves systems to efficiently operate and manage evacuation process and to provide evacuees with real-time information for both pre- and post-disaster assistance. This market package includes real-time information dissemination for routing to emergency shelters, lodgings, and other destinations, including information for evacuees returning to disaster areas regarding clean-up, security, and road closures. It also encompasses systems that assist and support evacuation coordination and emergency management personnel to better manage evacuation operations and share resources between agencies.

AD1 ITS Data Mart

This market package provides a focused archive that houses data collected and is owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.

AD2 ITS Data Warehouse

This market package includes all the data collection and management capabilities provided by the ITS Data Mart Market Package and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and central data warehousing features that are also included in this market package in addition to the basic query and reporting user access features offered by the ITS Data Mart Market Package.

AD3 ITS Virtual Data Warehouse

This market package provides the same broad access to multi-modal, multidimensional data from varied data sources as in the ITS Data Warehouse Market Package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse Market Package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.

FL MCO1 Maintenance and Construction Management

This market package involves systems that monitor maintenance and construction vehicle locations, support enhanced routing/scheduling and dispatching functions, and use on-board diagnostic systems to assist vehicle operation and maintenance activities. Additionally, this market package includes systems that disseminate maintenance and construction activity information and coordinate work plans to affected personnel, public agencies, and private sector firms.

10. Summary

This straw architecture presents an initial view of the "future big picture" for ITS deployments along the five principal FIHS limited-access corridors. This straw architecture is intended to stimulate discussion that leads to a greater understanding of the functional requirements that will drive the ITS deployments along these significant statewide facilities. This straw architecture will be refined in the development of the logical and physical architectures for the five principle limited-access corridors.

Traceability was demonstrated through a number of tables that ensure consistency between the:

- Needs, Issues, Problems, and Objectives as documented in the Goals and Objectives;
- ITS User Services;
- Themes and Strategies; and
- ITS Market Packages.

Appendix A

Evacuation Coordination User Service Development

Working Paper #1

INTERSTATE 4 ITS CORRIDOR FRAMEWORK PHASE II

WORKING PAPER #1

EVACUATION COORDINATION USER SERVICE DEVELOPMENT

Prepared for:

FDOT

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INTERSTATE 4 ITS CORRIDOR FRAMEWORK PHASE II

Evacuation Coordination User Service Development

SECTION 1.0: INTRODUCTION

The developers of the National ITS Architecture identified a three-level structure for defining the requirements of any ITS system: ITS User Service Bundles, ITS User Services, and ITS User Service Requirements.

User Service Bundles are at the highest level of this structure. Thirty-one (31) user services were packaged into 7 groups, or User Service Bundles, which categorize the user services logically by stakeholder area.

ITS User Services are the core of requirements definition and document, at a lower level than User Service Bundles, what an ITS system should do from a user's perspective. A user might be the public, a public system operator or a private system operator. In the National ITS Architecture development effort, the U.S. DOT and ITS America, with significant stakeholder input, have defined 31 user services to date.

And finally, a number of functions are required to accomplish each of these user services. To reflect this, each of the user services was broken down into successively more detailed functional requirements, called User Service Requirements.

A subset of the National ITS User Services was selected for implementation along the I-4 Corridor ITS in Phase I of this project. This subset was selected based on input from the Corridor stakeholder input. In addition, the I-4 corridor stakeholders for the corridor identified several new user services, not currently defined in the National ITS Architecture. These services are:

- Evacuation Coordination,
- Emergency Management Coordination,
- Weather Information Applications,
- Intermodal Freight, and
- Work Zone/Construction Traffic Management.

The I-4 Corridor stakeholders decided to take the lead in developing the Evacuation Coordination user service, while monitoring any future development of the other four new user services and potential in the future development. The proposed Evacuation Coordination user service would fit appropriately under the Emergency Management User Service Bundle.

This technical memorandum outlines the problems, needs and user service requirements associated with the Evacuation Coordination user service.

SECTION 2.0: PROBLEMS AND NEEDS

I-4 is the major evacuation route between east, central and west Florida. The traffic demands, which must be accommodated by the corridor during Hurricane evacuation, create a major challenge to the agencies involved in the evacuation process.

In 1999, Hurricane Floyd skirted the East Coast of Florida making landfall in North Carolina. Over 3 million people were evacuated as a result of the hurricane. This evacuation resulted in overloading of evacuation routes, causing several hours of delays and exposing evacuees to personal risk. In South Carolina, in-state trips took six times longer than normal. Reports of 16 to 18-hour trips from Charleston to Columbia were commonplace. This drive normally takes less than two-hours. In Florida, Interstate 10 motorists traveling out of Jacksonville reported traveling just 35 miles in seven hours.

Citizens and government officials expressed their dissatisfaction with the management of the evacuation process and the lack of information regarding travel conditions and services along the routes and at evacuation destinations.

In this study, several needs were identified for the I-4 evacuation process based on information gathered from meetings organized by the Florida Governor's Task Force on Hurricane Evacuation in November 1999 and also based on what was reported in the media in the aftermath of Hurricane Floyd. These include:

- Better management of the evacuation process is needed. Strategies to reduce the demand must be considered including building shelters near evacuation origins and perform the evacuation in shifts rather than all at once.
- Better management of evacuation routes is needed to accommodate various levels of evacuation (for different storm categories, storm time frame and affected areas). The capacity of evacuation routes shall be increased and efficiently utilized to reduce the potentials for operational failures during evacuation. As stated above, operational failures during recent evacuation operations caused gridlock, long hours of delays, overheated cars, frustrated travelers and significant risks to the evacuees.
- There is a need for better management of the local streets that provide access to and from evacuation routes. The capacity of these streets need to be increased and efficiently utilized to prevent creating bottlenecks at the access points. In recent evacuation operations, queues from surface streets extended to limited access facilities resulting in a decrease in the capacities of evacuation routes.
- It is necessary to provide travelers with real-time information regarding the services available at the evacuation destinations and routes. In recent evacuation operations, motorists were frustrated with the unavailability of information regarding hotel rooms, gas, bathrooms, eateries, and shelters.
- It is necessary to provide travelers with real-time information regarding the evacuation route conditions such as the expected travel time to their destinations, incidents, road closures, lane closures, weather, the route to a certain destination, and the availability of alternative routes. In recent evacuation operations, motorists were left without information regarding what to expect on their trips while waiting for hours in traffic.

- There is a need to provide real-time information to evacuees regarding the conditions expected at their selected destination. In hurricane Floyd evacuation, evacuees spent hours finding rooms, shelters and/or services after reaching their destinations. In addition, evacuees were not informed about accommodations for people with special needs (e.g., disabled, elderly and pets).
- Alternative evacuation destinations need to be provided to evacuees that request this information. In Hurricane Floyd evacuation, many motorists left their homes without knowing where they are going.
- It is necessary to provide coordination between various evacuation agencies (such as transportation, emergency management and law enforcement agencies) at the county, multi-county, and multi-state levels. This coordination must include the evacuated counties (evacuation origins), host and response counties (evacuation destinations and counties that provide assistance in the evacuation process) and counties on evacuation routes. Counties must work as a team during evacuation. Multi-state response is also important to ensure that evacuees from one state do not compound evacuation problems in another state.
- Evacuation route designs need to be examined and modified if necessary to accommodate evacuation management strategies. For example, reversible lane operations and the use of shoulders as an additional lane might require modifications to interchange designs.
- The efficiency of detecting, responding to and clearing incidents on evacuation routes must be maximized. The drop in evacuation route capacities due to incidents could result in the failure of the evacuation process even if the analysis performed during the hurricane evacuation planning indicates that the routes can accommodate the traffic in non-incident conditions.
- It is important to provide information to evacuees at evacuation destinations regarding conditions at their counties. This has been a problem because the media at evacuation destinations is not normally interested in broadcasting information about counties which are not in their coverage areas.
- It is necessary to ensure efficient, safe and secure reentry of the evacuees to their counties. This includes preventing people that are not authorized to enter a hurricane-damaged area, clearing dangerous debris and restoring electricity. The reentry decisions shall balance safety and security with the public's desires to return home.
- There is a need to reduce the time required for implementing and setup of various evacuation strategies due to the short time period available for evacuation. For example, lane reversal might not be a feasible alternative if it takes a long time to setup the operation.

- There is a need for the development of evacuation plans at the county, state and multi-state levels. Data must be collected and archived for the development of these plans and to ensure the validation of the models used in developing the plans. The data shall include items such as traffic flow, speed, occupancy, traveler behavior, and log of events.
- Policies need to be established regarding the lifting of the toll fees. During Hurricane Floyd evacuation, delays in lifting the toll fees in South Carolina increased the dissatisfaction of the evacuees.
- There is a need to provide safe and secure re-entry after evacuation.

SECTION 3.0: EVACUATION COORDINATION USER SERVICES

Based on the problems and needs identified above, the Evacuation Coordination User Service was developed and added to the Emergency Management User Service Bundle. Following the same structure as the National ITS Architecture, user service requirements were developed to define system functions that are required to provide the Evacuation User Service. They are presented below.

3.0 ITS shall provide an Evacuation Coordination (EC) service. EC provides the capability to efficiently manage an evacuation and provide evacuees with information they need during the evacuation, as well as reentry. It consists of five major functions: (1) Evacuation Guidance, (2) Evacuation Travel Information, (3) Evacuation Traffic Management, (4) Evacuation Planning Support and, (5) Resource Sharing.

3.1. EC shall include an Evacuation Guidance (EG) function. This function is provided to benefit the public. EG will provide basic information to assist potential evacuees in determining whether evacuation is necessary. Once the decision is made to evacuate, the EG will also assist evacuees determine destination, routes to shelters and other lodging options. This function will also provide guidance for returning to evacuated areas, information regarding clean-up, and other pertinent information to be distributed from Federal, State, and Local agencies.

3.1.1. EG shall be accessible to users from multiple distributed locations, including, but not limited to, (a) homes, (b) media, (c) public buildings, (d) evacuation shelters, (e) other evacuation destinations, (f) rest areas along evacuation routes, (g) hotels, (h) restaurants, (i) airports and other mode terminals, and (j) wireless devices.

3.1.2. EG shall provide shelter-in-place information if evacuation is not necessary.

3.1.3. EG shall provide a list and graphical depiction of mandatory and voluntary evacuation zones and the categories of people to be evacuated in each zone.

3.1.4. EG shall provide a list of alternative evacuation destinations upon request.

3.1.4.1. EG shall provide alternative evacuation destinations based on historical evaluation of the services available at the destinations.

3.1.4.2. EG shall provide alternative evacuation destinations based on current and forecast conditions at the destinations.

3.1.4.3. EG shall provide alternative evacuation destinations based on current and forecast availability of services at destinations and along the routes to these destinations.

3.1.4.4. EG shall provide alternative evacuation destinations based on traveler specified parameters including the general location of the destinations and the desired services.

3.1.4.5. EG shall provide alternative evacuation destinations based on the current and forecast conditions on evacuation routes.

3.1.5. EG shall provide recommended evacuation and reentry route(s) for user-selected evacuation origin and destination pairs.

3.1.5.1. Recommended routes shall be based on an evaluation of historical operational characteristics of the alternative routes.

3.1.5.2. Recommended routes shall be based on real-time and forecast route conditions.

3.1.5.3. Recommendation of routes shall be based on traveler-specified route parameters.

3.1.6. EG shall provide the recommended evacuation and reentry start time for user-selected evacuation origin and destination pairs.

3.1.6.1. The recommended start time shall be based on the travel time required for the trip, given existing and forecast conditions on those routes.

3.1.6.2. The recommended start time shall take into account the capability of the evacuation network to handle evacuation demands based on a historical evaluation of the network and current and future network conditions.

3.1.6.3. The recommended start time shall be based on the existing and forecast conditions at evacuation origin.

3.1.6.4. The recommended start time shall be based on the existing and forecast conditions at evacuation destination.

3.1.6.5. The recommended reentry time shall ensure the safety and security of travelers and their properties.

3.1.7. EG shall provide information regarding evacuation shelters in areas specified by users.

3.1.7.1. EG shall provide the locations of evacuation shelters.

3.1.7.2. EG shall provide the time at which evacuation shelters are in operation.

3.1.7.3. EG shall provide the occupancy levels at evacuation shelters.

3.1.7.4. EG shall provide the facilities available at evacuation shelters, including those shelters that will accommodate people with special needs, such as pets, disabilities and elderly.

3.2. EC shall provide an Evacuation Travel Information (ETI) function. This function will benefit evacuees in planning their evacuation trip once that decision has been made. This function will also allow travelers to change course during the trip based on route and destination conditions.

3.2.1. ETI shall provide the capability for users to access information from multiple distributed locations, including, but not limited to, (a) homes, (b) vehicles, (c) rest areas along evacuation routes, (c) evacuation shelters, (d) hotels, (e) restaurants, (i) airports and other mode terminals, and (j) wireless devices.

3.2.2. ETI shall provide information about traffic conditions on evacuation routes.

3.2.2.1. ETI shall provide the current speed/travel time on evacuation routes.

3.2.2.2. ETI shall provide an estimate of future speed/travel time on evacuation routes, taking into consideration current evacuation decisions and traveler behavior.

3.2.2.3. ETI shall provide information regarding incident conditions on evacuation routes.

3.2.2.4. ETI shall provide real-time road, bridge and lane closure information.

3.2.2.5. ETI shall provide a list of roads that should be avoided due to hazardous conditions, such as flooding, malfunctioning traffic signals, debris and falling objects.

3.2.3. ETI shall provide the current and forecast weather conditions for evacuation origins, destinations and routes.

3.2.4. ETI shall provide information regarding transportation modes including buses, airlines, trains and ships.

3.2.4.1. ETI shall provide information regarding the availability of transportation mode services.

3.2.4.2. ETI shall provide arrival and departure information, including location, for those services available.

3.2.5. ETI shall provide general evacuation guidance information to travelers, including guidance/tips for trip preparation, trip duration and trip return.

3.2.6. ETI shall provide information regarding lodging available along evacuation routes and at evacuation destinations.

3.2.6.1. ETI shall provide the capability for travelers to request and receive information regarding lodging, including (a) room availability, (b) facilities, (c) conditions, and (d) pricing information.

3.2.7. ETI shall provide information regarding services available along evacuation routes, at evacuation origins and at evacuation destinations.

3.2.7.1. ETI shall provide real time information relating to (a) the conditions, (b) status, and (c) availability of traveler services described in this section.

3.2.7.2. ETI shall provide the capabilities for travelers to request and receive information regarding restaurants and stores, including (a) hours of operation and any changes to these hours, (b) availability of special items (such as water, non-perishable foods, wood, and batteries), and (c) pricing information.

3.2.7.3. ETI shall provide the capabilities for travelers to request and receive information regarding local hospitals and other medical services.

3.2.7.4. ETI shall provide the capabilities for travelers to request and receive information regarding gas stations, including (a) location, (b) operation status, (c) pricing information, and (d) the expected waiting time.

3.2.7.5. ETI shall provide information regarding rest areas, telephone and restroom availability.

3.2.8. ETI shall provide information regarding school and office closures.

3.3. EC shall provide an Evacuation Traffic Management (ETM) function. This function will assist evacuation coordination personnel manage evacuation operations on the transportation network.

3.3.1. ETM shall have a real-time data collection process to assist in the selection of evacuation strategies and to monitor the operations of the selected evacuation strategies.

3.3.2. ETM shall have a demand forecasting function that takes into consideration current traffic flows, current and historical evacuation trends, the size of the area to be evacuated and expected human responses.

3.3.3. ETM shall include a strategy selection function that maximizes efficiency during evacuation and reentry operations.

3.3.3.1. The strategy shall integrate the control of freeways and surface streets.

3.3.3.2. The strategy selection function shall consider traffic movement over the entire evacuation network.

3.3.3.3. The strategy selection function shall be responsive to current demand as well as the forecast demand.

3.3.3.4. The strategy selection function shall optimize the movement of emergency and law enforcement vehicles.

3.3.3.5. The strategy selection function shall allow easy access of emergency and law enforcement vehicles to traffic on evacuation routes.

3.3.3.6. The strategy selection function shall consider the operation of the access to and from the evacuation routes.

3.3.3.7. The strategy selection function shall consider the impacts to local traffic along evacuation routes.

3.3.3.8. The strategy selection function shall consider the time available for evacuation, time required for evacuation and time required for implementing the evacuation strategy.

3.3.3.9. The strategy selection function shall consider the availability of the resources required for the evacuation strategy.

3.3.3.10. The strategy selection function shall consider the severity of the expected disaster and the size of the area affected by the disaster.

3.3.3.11. The strategy selection function shall consider the feasibility of using transit and school bus fleet during mandatory evacuations.

3.3.4. ETM shall provide the control of devices as required by the evacuation management plan, including: (a) traffic signals, (b) dynamic message signs, (c) ramp meters, (d) reversible lane signs, (e) turning restriction signs, (f) road closure devices, (g) lane closure devices, (h) HAR, (i) TiRNd, (j) shoulder use signs.

3.3.5. ETM shall provide the operator with the capability to manually override the system automatic control.

3.3.6. ETM shall have an incident management function for evacuation routes.

3.3.7. ETM shall have the capability to eliminate tolls upon command.

3.3.8. ETM shall have a lane reversal management function.

3.3.8.1. It shall be possible to collect real-time data for traffic moving in all traveling lanes, with and without lane reversal.

3.3.9. ETM shall have archiving capabilities.

3.4. EC shall provide an Evacuation Planning Support (EPS) function. This function will support the evacuation planning process by providing information, current and historical, to emergency management planning personnel.

3.4.1. EPS shall provide archived evacuation data, such as traffic flows, travel speed, vehicle occupancy, road closures, network geometry, traveler behavior, travel origins, travel destinations and evacuation traffic management strategies.

3.4.2. EPS shall support the development of regional and multi-regional evacuation plans.

3.4.3. EPS shall assist in identifying required modifications to transportation network geometry to accommodate evacuation strategies.

3.4.4. EPS shall assist in defining the required resources for evacuation strategies.

3.5. EC shall provide a Resource Sharing (RS) Function. This function shall allow information and resource sharing between agencies involved in the evacuation including transportation, emergency management, law enforcement and other emergency service agencies.

3.5.1. RS shall allow information sharing between agencies.

3.5.1.1. RS shall facilitate information sharing between various agencies at local, state and federal levels.

3.5.1.2. RS shall provide communication capabilities among personnel of the agencies involved in the evacuation and between these personnel and the agency centers.

3.5.1.3. RS shall provide coordination and information sharing between agencies from all states affected by the evacuation.

3.5.1.4. RS shall provide information to assist evacuation management personnel in making evacuation decisions.

3.5.1.5. RS shall provide information to assist evacuation management personnel in making decisions regarding shelter operations.

3.5.2. RS shall assist evacuation management personnel in making decisions regarding deployment of resources and sharing of resources based on existing and forecast demand for these resources.

3.5.2.1. RS shall identify the resources required for the current and forecast evacuation scenarios.

3.5.2.2. RS shall identify the resources required to implement alternative evacuation management strategies.

3.5.2.3. RS shall identify the resource deployment stages, in time and space, for each evacuation scenario.

3.5.2.4. RS shall assist local, state and multi-state agencies in sharing resources between agencies.

3.5.2.5. RS shall identify the resource deployment stages, in time and space, for each evacuation scenario.

3.5.2.6. RS shall assist local, state and multi-state agencies in sharing resources between agencies.

Appendix B

Maintenance and Construction Operations User Service