Broward County ITS Intermodal Plan

Final Report

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Broward County ITS Intermodal Plan

prepared for

Broward County Metropolitan Planning Organization

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Executive Summary

Introduction

For the past several years, the Broward County Metropolitan Planning Organization (BCMPO) has been working to develop and implement a freight program. Work began in the mid 1990s with an industry outreach initiative designed to identify freight transportation needs. This was followed by a comprehensive Freight and Goods Movement Study (FGMS), completed in 2002. The FGMS was adopted as the first ever freight component of the 2025 Long-Range Transportation Plan Update, setting the stage for an ongoing freight program. When this project was completed, it became clear that there was a need for further work in the freight arena. Specifically, the application of Intelligent Transportation Systems (ITS) to freight security and mobility was identified as a key focus point. The development of the Broward County ITS Intermodal Plan was initiated to address this need. This was a logical next step, given the extensive ITS program under development in southeast Florida and the State, and given the new focus on security following September 11, 2001.

The initial activities of the ITS Intermodal Plan consisted of summarizing the existing ITS components in the region and identifying best practices of ITS for freight in the U.S. This was followed by the development of a detailed needs and deficiencies statement. Based on the region's needs, specific ITS project concepts were developed as potential mitigating strategies. These project concepts were evaluated as part of an alternatives analysis. Specific benefit/cost calculations were completed where data were available. Based on the results, a preferred alternative was developed, based on the most successful components of each alternative. Finally, an implementation plan was developed for the recommended alternative.

Region's Needs and Deficiencies

The ITS Intermodal Plan developed a detailed needs and deficiencies statement that summarized the freight transportation conditions in Broward County and southeast Florida. These needs drove the development of improvement scenarios. The following lists the major categories of needs that were identified:

- Significant congestion in key freight corridors;
- Limited access for freight movements;

- Balance of freight operations and security;
- Freight-specific management issues;
- Need for improved regional communications and coordination;
- Infrastructure limitations; and
- Political and institutional barriers to freight mobility.

■ Defined Alternatives

The identified needs and deficiencies were mapped to ITS strategies. These strategies were grouped into the following six alternatives:

- Port Everglades Access Improvements;
- Rail-Related Improvements;
- Incident Management Improvements;
- Outreach and Communication Improvements;
- Better Use of Data; and
- Traffic Management Improvements.

Using the ITS Deployment Assessment System (IDAS) to measure the impact of each strategy, an evaluation was completed that provided benefit/cost ratios for each individual strategy as well as the grouped alternatives.

■ Recommended Alternative

Upon completing the evaluation of the strategies and alternatives, a recommended alternative was developed based on the strongest strategies within each of the six alternatives. This approach was used to provide a Plan that addressed a cross section of the region's needs, as opposed to one focused area. The selection of strategies was based on a set of decision rules, including benefit/cost ratio, cost, impact on safety and security, and strategies that were necessary to implement other high-ranking strategies. Table ES.1 presents the eight strategies selected for inclusion in the recommended alternative.

Table ES.1 Improvements Recommended for Implementation

Recommended Strategy	Criteria Met	Lead Organization	Next Steps
1. Speed warning system at I-595 terminus	High B:C (130:1) and Safety	FDOT D4, BC TED	Funds allocated; developing RFP
2. Optimize signals for freight movements	High B:C (18:1) and Low Cost	BC TED, FDOT D4	Identify freight movements; adjust signal timings
3. Clearance equipment sharing	High B:C (18:1) and Low Cost	FDOT D4, Turnpike	Form MOU; design and implement system
4. Traveler info via DMS at port exits	High B:C (8:1) and Security	Port Everglades, BC TED	Form MOU; design and implement system
5. Real-time train locations to fire/rescue	Safety/Emergency Issue (2:1)	FEC, CSX, BC Fire/Rescue	Form MOU; design and implement in both rail corridors
6. Appointment system for cruise deliveries	Low Cost and Security (5:1)	Port Everglades, Private Industry	Form MOU; design and implement system
7. Integrate data into central database	Low Cost (4:1)	BC MPO, BC TED, FDOT	Identify data; integrate sources
8. Outreach, communications, and info sharing	Necessary for implementation of others	BC MPO	Establish freight stakeholders committee; promote regional programs; develop out-reach and education programs

Summary of Implementation Plan

An implementation plan was developed for the eight strategies within the recommended alternative. The implementation plan is intended to provide guidance for the Broward County MPO and their affiliated regional stakeholders to implement the projects and realize their potential benefits. It is essentially a recipe book that provides directions for making each of the selected project concepts into reality. The Implementation Plan includes the following elements for each of the projects and programs recommended for the Broward County ITS Intermodal Plan:

- Definition of the Preferred Alternative;
- Recommendations for identifying project and program ownership and stakeholder roles and responsibilities;
- Recommendations for project phasing (i.e., short-term, medium-term, etc.) and program development;
- Cost estimates and potential funding sources;
- Integration, resource and information sharing, and coordination opportunities;

- Recommendations for future planning and performance assessments;
- Operations and maintenance considerations; and
- Recommendations for compliance with the regional ITS architecture.

In order to kick-start, establish and sustain an effective ITS-for-freight program, the following action items are recommended:

- Identify project leaders and establish project teams;
- Establish specific goals and a mission for ITS projects;
- Adopt criteria for the performance of ITS systems and develop tools to measure those criteria;
- Establish a regional freight stakeholders committee with public and private participants to identify and assess performance of projects, strategies, and initiatives (such as ITS) that address freight mobility;
- Create a stable funding source for ongoing operations and maintenance; and
- Increase awareness among stakeholders, staff responsible for project implementation, local officials and decision-makers about ITS and its benefits.

The ITS Intermodal Plan will guide all MPO-led initiatives for freight ITS applications. For this Plan to be successful, it is important to have a process for incorporating existing and new projects into the program. As such, the Plan provides guidance for the monitoring and inclusion of existing and future ITS initiatives.

1.0 Introduction

The Broward County Metropolitan Planning Organization (BCMPO) completed the Freight and Goods Movement Study (FGMS) in mid-2002, a project that defined the framework of a regional freight plan and program for Broward County. With support from the Florida Department of Transportation (FDOT) District 4, the BCMPO initiated a new project to complement that study, the development of the Intelligent Transportation Systems (ITS) Intermodal Plan. The ITS Intermodal Plan was motivated by a need for an integrated ITS intermodal program for the County, and by homeland security imperatives that affect key freight generators, such as ports, airports, and railroad terminals. Prior to this new effort, Broward County already had undertaken several significant freight and ITS initiatives, but these were individual, discrete efforts to address specific topics or areas. Building on the results of the FGMS, this standalone ITS Intermodal Plan provides a more comprehensive freight program for the County and the Southeast Florida region, and will offer an opportunity to complement the ongoing security plans taking place at Port Everglades.

Although this project is focused on freight and ITS in Broward County, the BCMPO stressed the importance of including, where possible, the entire tri-county region (Broward, Palm Beach, and Miami-Dade counties). This allows a more complete approach for resolving intermodal issues, particularly since freight problems characteristically involve long-distance trips across county borders. Given the large number of ITS projects currently in development, coordination and integration is critical to guide improvements to southeastern Florida's transportation system.

This report encapsulates the work completed for the ITS Intermodal Plan for Broward County. The report is organized as follows:

- **Section 1.0, Introduction.** This section provides a summary of activities and describes the organization of this technical report.

- **Section 2.0, Review of ITS Applications and Programs.** A comprehensive literature review was conducted, in conjunction with interviews with freight and ITS stake-holders, as part of an effort to obtain available information and data on existing and planned ITS applications. This section presents a summary of ITS applications that have been considered and incorporated as appropriate into the ITS Intermodal Plan.

- **Section 3.0, Needs and Deficiency Statement.** Based on the literature review and interviews with regional ITS and freight stakeholders, an analysis of the collected information and data was used to construct a list of transportation issues affecting Broward County and Southeast Florida. The issues were then consolidated by themes into a comprehensive needs and deficiency statement.

- **Section 4.0, Development of Alternatives and Measures.** Section 4.0 works to address the issues identified in the Needs and Deficiencies statement through the development of a comprehensive set of possible ITS solutions. This includes matching the needs and deficiencies with operational mitigation measures, and incorporates, as appropriate, ITS applications identified in Section 2.0. This section presents six alternatives.

- **Section 5.0, Evaluation of Alternatives.** This section includes steps to prioritize the needs and their possible solutions. A meeting held in early 2003 with the Freight Technical Advisory Committee (FTAC) started the process of prioritizing the possible solutions/mitigation measures summarized in Section 4.0.

- **Section 6.0, Implementation Plan.** Based on the evaluation of alternatives described in Section 5.0, a preferred alternative was developed that cut across the six alternatives evaluated. This section presents an implementation plan for this seventh alternative.

- **Section 7.0, Summaries of Selected Projects.** The implementation plan defined in Section 6.0 provides a functional overview of the projects included in the recommended alternative. This section provides project-based summaries to facilitate consensus-building with lead agencies.

2.0 Review of ITS Applications and Programs

A critical first step in the development of the Broward County ITS Intermodal Plan was to review the types of ITS applications that are already in use in Broward County, the region, the state, and nationally. This was important for two reasons. First, the existing local deployments provide the backbone on which new systems should be built. Second, looking nationally at the state-of-the-art applications helps identify new systems that may enhance or improve the Broward County system. For a detailed description of this literature review, readers are referred to the ***Needs and Deficiencies Statement Technical Memorandum,*** completed in December 2002; for further discussion on the available ITS applications, readers are referred to the ***Potential ITS Solutions Technical Memorandum,*** completed in May 2003. This section provides an overview of the local, state, and national ITS components identified.

2.1 ITS Technology in Broward County and Florida

Florida's economy relies heavily on its transportation infrastructure to move people and goods; and ITS/CVO provides a basis for optimizing existing infrastructure, improving safety, and making the motor carrier and motor coach industries – as well as the government agencies that regulate them – more efficient. Using ITS to improve the efficiency of these operations will improve the economic productivity of Florida's businesses.

Florida's commitment to improving its transportation system through the use of technology is well documented. Some key examples include:

- **E-Screening/Pre-Pass.** Electronic screening at Florida's weigh stations is being operated by Pre-Pass. Vehicles of qualified carriers are precleared by weigh stations in participating states using advanced technologies to verify the carrier's safety and credential status. As of December 2000, Florida had 19 operational and committed Pre-Pass sites.

- **Electronic Toll Collection Systems.** Florida's electronic toll collection systems include SunPass, E-Pass, C Pass, Leeway, and O Pass. SunPass is a statewide system that is being implemented on all state-operated toll roads. The State of Florida is actively pursing interoperability between SunPass and the state's other toll systems.

- **Advanced Traffic Management Systems (ATMS).** Florida has deployed ITS to combat congestion throughout the State. These initiatives use advanced technologies (e.g.,

closed circuit television cameras, in-pavement detectors, dynamic message signs, and fiber optic communications) to enhance incident detection and response. The system can identify roadway congestion and inform the public about alternative routes.

- **Automated Commercial Vehicle and Driver Inspections.** Florida Motor Carrier Compliance Officers utilize ASPEN-equipped laptop computers to automate roadside inspections.

- **511 Service.** In July 2002, FDOT launched a 511 service to provide travelers in the Orlando, Miami-Dade, Broward, and Palm Beach areas with continuously updated information on traffic incidents, roadway conditions, travel times, and congestion. Transit information will be available shortly. Tampa and Jacksonville likely will be added to the 511 network in the near future.

- **Commercial Vehicle Information Systems and Networks (CVISN).** As a national program administered by the Federal Motor Carrier Safety Administration (FMCSA), CVISN is designed to improve motor carrier safety and to enhance the efficiency of administrative processes for industry and government. CVISN is designed to facilitate electronic linkages for the exchange of motor carrier information among the State, commercial vehicle operators, regional clearinghouses, and national databases. The State of Florida is aggressively working on its CVISN Program, which will be implemented over the next few years.

In addition to the initiatives listed above, Florida is actively involved in a variety of ITS/CVO forums, including the ITS America Commercial Vehicle and Freight Mobility Forum and the Commercial Vehicle Safety Alliance's ITS Committee. Such forums are setting the stage for the future of ITS/CVO and CVISN practices. The cornerstone of the Broward County ITS program is the new traffic management center (TMC). The TMC will serve as the nerve center for ITS projects deployed in Broward County, including the I-95/I-595 Dynamic Message Sign System (DMS), Freeway Video Monitoring, Advanced Traveler Information System (ATIS), ATMS, 511 service, and the Broward County Signal System. All of these technologies affect overall traffic flows, thereby improving freight movements as well. In addition, the ITS Intermodal Plan development, as well as the new Port Everglades security program, will specifically address ITS applications for freight operations.

The Broward County ITS Intermodal Plan must be developed within the context of the other ITS initiatives that are taking place in the County and the Southeast Florida Region. Synergies with other programs will facilitate the development of the plan and may allow expedited deployment in some instances. Coordination also is needed to make the process more efficient, capitalizing on efforts in progress or already completed.

In an effort to identify the ITS initiatives and key transportation mobility, safety, and security issues for freight movements a number of relevant documents were reviewed. Existing and planned ITS improvements were collated from a number of sources and have been organized into the following categories: ATIS; Emergency Management (EM); and Commercial Vehicle Operations (CVO). The existing and planned ITS initiatives in Broward County are illustrated in Table 2.1.

Table 2.1 Summary of the Existing and Planned ITS in Broward County

Existing	Planned
Advanced Traveler Information Systems (ATIS)	
Commuter Services Info. Systems Ride Matching (South FL Commuter Services)	SunGuide Advanced Traveler Information System
District 4 Static and Planned Traveler Info. System (FDOT D4 Public Info Office)	
Turnpike District Static and Planned Information System	
SmartRoute Systems	
Florida DOT Traffic Information Web Page	
Advanced Traffic Management Systems (ATMS)	
Turnpike Traffic Management Centers	I-595/I-95 Dynamic Message Sign System
CSX, NS and FEC Rail Operations Centers (Rail Operator)	Freeway Video Monitoring System
Tri-Rail Commuter Rail System (Tri-Co Commuter Rail Authority)	ATMS
	Arterial Incident Detour Route Signing System
	Oakland Park Congestion Management System (CMS)
	17th Street Causeway CMS
	Sunrise Boulevard CMS
	Atlantic Boulevard CMS
	S.R. 7/U.S. 441 CMS
Emergency Management	
Broward County Fire Rescue Dispatch (Broward County Fire Rescue)	Freeway Incident Management Team
Broward/Palm Beach SunGuide Service Patrol Dispatch (FDOT D4)	SunGuide Road Rangers Service Patrol
FDOT District Emergency Operations Centers	
Florida Highway Patrol Dispatch (FL Highway Patrol)	
Commercial Vehicle Operations (CVO)	
HAZMAT (CHEMTREC)	CVO Parking Facility (FDOT)
Florida Vehicle Fleet Dispatch Systems (FL Vehicle Fleet Operators)	Automated Collision Notification System (Commercial Vehicle Fleet Operators)
Over Dimension Permit System (FDOT Central Maintenance)	Automated Routing and Permitting Software Design and Development (FDOT)
License, Registration, and Fuel Tax System (Florida Department of Highway Safety and Motor Vehicles)	Electronic Payment Option (FDOT)
	Electronic Screening and Weight Stations (FDOT)

2.2 State-of-the-Art in ITS Freight Applications

Traditional ITS projects such as ATMS provide benefits to all motorists, including commercial vehicles. As the use of ITS to solve transportation problems has become more widespread, new and innovative systems have emerged specifically to target freight and goods movement. These ITS strategies should be coordinated with existing and planned ITS projects. Florida has a strong ITS program which should be leveraged as appropriate in the development of freight-specific projects.

Examples of ITS technologies designed to facilitate freight flows and improve CVO have been grouped into the following categories:

- CVISN;
- Electronic Toll Collection (ETC), Electronic Screening (E-Screening), Electronic Commerce (E-commerce);
- Point of Entry Control and Security;
- ATIS;
- Traffic Management;
- Incident Management; and
- Intelligent Vehicle Initiative (IVI).

Table 2.2 provides a brief description for each ITS category and ranks each for its applicability to the southeast Florida region. A high ranking corresponds to a high level of applicability.

Table 2.2 Overview and Ranking of ITS Freight Applications

Category *ITS Freight Application*	**Description**	**Ranking**	**Application Opportunities for Broward County, Florida**
CVISN	**CVISN is a national program administered by the Federal Motor Carrier Safety Administration (FMCSA) designed to improve motor carrier safety and to enhance the efficiency of administrative processes for industry and government.**		
CVISN	CVISN facilitates the exchange of motor carrier information among state, commercial vehicle operators, regional clearinghouses, and national databases.	High	Deployment of CVISN technology in Broward County has been proposed by FDOT District 4 as an operational test to improve security at Port Everglades. This would include technology deployments on I-595 on the approach to Port Everglades for the purpose of identifying high-risk trucks.
	The system allows carriers to apply for and receive their essential operating credentials remotely, and provides regulatory agencies with safety and inspection data.		FDOT's CVISN program will provide motor carriers with the ability to access electronic credentialing throughout the state, including Broward County. This system is not in place yet, but is a component of the state's overall CVISN program.
ETC, E-Screening, and E-commerce	**ETC systems employ transponders that enable the electronic payment of highway, bridge, and tunnel tolls. E-Screening systems are deployed at weigh stations and international border crossings to ensure trucks are in compliance with safety and regulatory requirements. E-commerce allows preapproved carriers to monitor shipment status at ports, airports, etc.**		
SunPass	SunPass is one of several ETC systems currently operating in Florida.	High	ETC is available in much of Florida through SunPass, E-Pass, C Pass, Leeway, and O Pass. Florida is actively pursing interoperability between SunPass and the state's other toll systems. Broward County should ensure that ETC is available and compatible with other systems when possible.
Pre-Pass	Pre-Pass is an E-Screening system that allows participating vehicles with transponders to bypass designated weigh stations and other facilities in 24 states. Precleared vehicles proceed at highway speed, thereby increasing safety and efficiency while allowing law enforcement to focus resources on noncompliant motor carriers. (Florida has 19 sites).	High	E-screening at weigh stations and agriculture inspection facilities is available in Florida through Pre-Pass. Pre-Pass is part of Florida's CVISN architecture. Weigh stations and agriculture inspections facilities equipped with Pre-Pass are located in northern, central, and southwestern parts of the state. Broward County does not have any Pre-Pass/CVISN sites. If possible, Broward County should explore the possibility of developing a weigh station and/or agriculture inspection site that is Pre-Pass compatible. This will be a Florida DOT (weight/safety) or Florida Department of Agriculture and Consumer Services.
North American Preclearance and Safety System (NORPASS)	NORPASS is a similar system to Pre-Pass and is used in five states. NORPASS transponders can be read by the Pre-Pass system, but not vice versa.	Low	As a member of the Pre-Pass program, Florida will not participate in NORPASS.

Table 2.2 Overview and Ranking of ITS Freight Applications (continued)

Category *ITS Freight Application*	Description	Ranking	Application Opportunities for Broward County, Florida
ETC, E-Screening, and E-commerce	**(continued)**		
I-95 Corridor Coalition ETC and E-Screening Interoperability Project	This is a pilot program to develop a single windshield-mounted transponder to pay tolls in the E-ZPass system and to bypass CVISN-compatible weigh stations.	Medium	Broward County should monitor efforts by the I-95 Corridor Coalition and others to develop a single use transponder for both ETC and E-Screening. When the technology is fully tested and ready, Broward County should consider making the new transponders available to shippers and carriers.
Freight Information Real-time System for Transport (FIRST)	FIRST is a relatively new network that integrates real-time port, cargo transfer and carrier information and displays it on a user-friendly web site for the Port of New York and New Jersey (NY and NJ).	Medium	Port Everglades is currently undertaking a major initiative to upgrade security. The use of ITS models such as FIRST, PortNet.com, and Port Pass should be considered viable strategies to improve port access and freight cargo movements into and out of the port facility in Broward County.
PortNet.com	Similar to the FIRST system, PortNet.com integrates real-time relevant information for ports and their customers. This system has been deployed in Singapore since 1999, where use of the system is enforced by the government.	Medium	Port Everglades is currently undertaking a major initiative to upgrade security. The use of ITS models such as FIRST, PortNet.com, and Port Pass should be considered viable strategies to improve port access and freight cargo movements into and out of the port facility in Broward County.
Port Pass	Readers are being installed at entry lanes, truck slots, and exit lanes at the Port of NY and NJ to read E-ZPass transponders on trucks. Port Pass will interface with FIRST to enable the creation of an appointment system for cargo pickup and delivery.	Medium	Port Everglades is currently undertaking a major initiative to upgrade security. The use of ITS models such as FIRST, PortNet.com, and Port Pass should be considered viable strategies to improve port access and freight cargo movements into and out of the port facility in Broward County.
Air Cargo Electronic Supply Chain Manifest (ESCM)	A field test led by the American Transportation Research Institute, ESCM is designed to demonstrate the efficiency and security of an Internet-based electronic manifest system compared with traditional processes and paper-based manifest systems.	Low	Although Fort Lauderdale – Hollywood International Airport experiences limited air cargo movements, they also can benefit from using ITS. The ESCM field operational test should be monitored, and used as the basis for improving security, and air cargo movement at Fort Lauderdale airport.

Table 2.2 Overview and Ranking of ITS Freight Applications (continued)

Category *ITS Freight Application*	Description	Ranking	Application Opportunities for Broward County, Florida
Point of Entry Control and Security	**Systems in this category facilitate the exchange of vital information at international border crossings and ports.**		
Integration of Electronic Commercial Vehicle, Cargo, and Driver Information at the United States/Canada Border	Three integrated ITS systems are being deployed to identify, monitor, and pre-process cargo in intermodal containers that are trucked over the Washington/British Columbia border. Two of the systems use a standard transponder that provides commercial vehicle information; the third (eSeal) uses an electronic container door seal to confirm border clearance and verify there was no tampering with the load.	Low	Port Everglades and the Fort Lauderdale – Hollywood International Airport could adopt portions of the WSDOT eSeal Project. The eSeals were tested as means to track shipping containers both in ports and along roadways. They also were tested as a tool to increase the security of cargo as the seals have a tamper indicator message. Cargo shipments arriving at ports or airports with the eSeal can help inspectors quickly identify containers that have been tampered with, and concentrate on non-participating shippers.
Virginia Port Authority Security Program	The Virginia Port Authority and Hampton Roads shipping terminal installed a security system that checks for bombs on containers as they depart the terminal, an effort to prevent terrorists from using cargo containers as a means for sneaking bombs into the country.	High	In today's security conscientious world, improving security at points of entry is a primary focus. Port Everglades has an extensive security program underway that includes the deployment of "star system" gamma x-ray equipment at port access gates designed to enhance law enforcement efforts to stop the exportation of stolen automobiles and heavy construction equipment from this country. Similar detection equipment that detects explosives should be investigated. Port Everglades can use the Virginia Port Authority and Hampton Roads shipping terminal as an example of a system that, although limited, addresses security while minimizing disruptions to freight movements. Ideally, non-intrusive security systems could be installed that scan containers while they are being loaded/unloaded.

Table 2.2 Overview and Ranking of ITS Freight Applications (continued)

Category *ITS Freight Application*	Description	Ranking	Application Opportunities for Broward County, Florida
Advanced Traveler Information System (ATIS)	**ATIS are designed to provide real-time traffic information, enabling travelers to make optimum route and mode selection decisions. Recently, the ATIS concept has been adapted for freight-specific uses.**		
FleetForward	FleetForward is a field test being performed by the I-95 Corridor Coalition that pairs real-time traffic information (i.e., congestion, incidents, highway construction and maintenance activities) with motor carrier's routing and dispatch decisions. The system focuses on truck relevant data, such as information that helps truckers navigate through an entire metropolitan region.	Medium	Develop a platform similar to FleetForward to provide route-specific information to motor carriers and dispatchers in Broward County. Motor carriers have unique traffic information needs that are not typically met by a traditional ATIS. A modified system could pivot off the ATIS technology and format data to provide information specifically tailored to meet the needs of the motor carrier industry.
Advanced Transportation Management, Information, and Security System (ATMIS)	The Ports of Long Beach and Los Angeles are planning to implement three types of ITS technologies: 1) deliver real-time en-route information and safe evacuation routes during major incidents; 2) a transportation management system that will control ITS field devices, monitor traffic signals and roadway travel conditions; and 3) an ATIS promoting the exchange of data between the public and private sectors.	High	The ATMIS technology utilized by the Ports of Long Beach and Los Angeles could be adapted to meet the needs of Port Everglades. Port Everglades is facing many of the same problems as the Ports of Long Beach and Los Angeles, including maintaining efficient access to the port facility in light of rapidly growing truck traffic as well as increased security concerns. A program similar to ATMIS would help Port Everglades manage such issues more effectively. The new Broward County Traffic Operations Center (TOC) will serve as a central platform for expanding future ITS operations. The TOC will support the SunGuide ATIS that will provide real time information to motorists in Miami-Dade, Broward, and Palm Beach County via phone, fax, radio, TV, and the Internet. In July 2002, FDOT launched the 511 dialing code for traveler information in Orlando, Miami-Dade, Palm Beach, and Broward Counties. The 511 service provides continuously updated information on traffic incidents, roadway conditions, travel times, and congestion. Transit data also will be available shortly. In the future, this system could develop information specifically designed for motor carriers and dispatchers, such as traffic conditions in and around Port Everglades.

Table 2.2 Overview and Ranking of ITS Freight Applications (continued)

Category *ITS Freight Application*	Description	Ranking	Application Opportunities for Broward County, Florida
Advanced Traveler Information System (ATIS)	**(continued)**		
Truck-only Lanes	Truck-only Lanes are lanes designated for the exclusive use by trucks. They can employ ITS devices such as DMS or other lane use signals to regulate and inform motorists when lanes are designated as truck-only, similar to the operation of high-occupancy vehicle (HOV) lanes.	Low	Both I-95 and I-595 have a high volume of truck traffic. Truck only lanes could improve travel times for motor carriers using these corridors, and improve safety. This option does require further study to determine if this could be an appropriate solution for Broward County given public concerns over truck only lanes.
Overheight Vehicle Detection System (OHVDS)	AN OHVDS alerts drivers if their vehicles exceed the clearance limit for an upcoming bridge, overpass, overhead walkway, etc. The system detects the overheight vehicle and warns drivers in enough time for them to take action and avoid damaging their vehicle and the overhead structure.	Low	In areas of Broward County where trucks have repeatedly damaged overhead structures such as highway overpasses, an OHVDS could be installed to warn overheight motor carriers that they are too tall to clear the upcoming overpass or tunnel. Such a system could help reduce further incidents, minimize damage to infrastructure and trucks, and improve travel time for motor carriers and the traveling public.
Truck Speed Warning Systems	Several projects have coupled Weigh-in-Motion (WIM) devices with DMS to provide customized warning messages for trucks approaching dangerous downgrades and/or steep curves. The system can use the weight measurement to calculate the appropriate speed for the vehicle within seconds. Simpler, systems also are available that employ flashing signs and warning messages when a truck is exceeding recommended speeds.	High	As a result of the geography of Broward County, steep downgrades with sharp curves are uncommon. However, at the terminus of Eller Drive into Port Everglades, for example, the geometry of the roadway is problematic for large trucks. A flashing warning system would be an effective way to alert drivers they need reduce speeds. As in most other metropolitan areas, motor carriers traveling at excessive speeds is a problem regardless of the roadway geometry. In areas where this a concern, DMS could be installed in conjunction with a truck speed warning systems to alert motor carriers that they are traveling at excessive speeds. This system can allow other messages (i.e., general traffic conditions) to be displayed, and only display the warning message when a truck is determined to be traveling above the recommended speed limit for that area.

Table 2.2 Overview and Ranking of ITS Freight Applications (continued)

Category *ITS Freight Application*	Description	Ranking	Application Opportunities for Broward County, Florida
Incident Management	**Incident management is a planned and coordinated program to detect, respond to and remove unplanned traffic incidents, restoring capacity as safety and quickly as possible. Successful programs include well-defined plans and regular collaboration among all involved agencies.**		
Incident Management	Incidents involving trucks are particularly complex, as they often require specialized equipment and a timely, well-coordinated response by law enforcement, fire and rescue, emergency medical services, towing services, and HAZMAT cleanup services.	High	As part of the incident management program in Broward County, Chemtrec – a national hazardous material information service – was contracted to provide detailed information on hazardous materials and appropriate response to HAZMAT clean up responders. Each FDOT District, including the Turnpike, has an Emergency Operations Center that is activated for major incidents/ emergencies, which in turn usually impact freight flows. Broward County should continue to improve coordination between the public and private sector through the use of ITS technology to ensure an efficient, and timely response to all traffic incidents. Efforts underway include: • A Freeway Incident Management team of approximately 60 members representing State, County, and local engineering and emergency management, law enforcement, fire department agencies, towing, HAZMAT, and traffic information services is programmed for 2002-2006.
IVI	**Led by the U.S. DOT, the IVI program is designed to reduce crashes by helping drivers avoid hazardous mistakes. IVI aims to accelerate the development and commercialization of vehicle-based driver assistance products that will warn drivers of dangerous situations, recommend actions, and even assume partial control of vehicles to avoid collisions.**		
IVI	Many of the IVI technologies represent advanced systems that are not yet available. Specific commercial vehicle-related IVI operational tests include: a roll-over advisor/education and control system; a hazardous material collision notification system; and a "trucker advisory" system that notifies truck drivers as they approach locations with the potential for danger (past crash history, geometry, downgrade, etc.). Florida is a participant in the "trucker advisory" test being conducted by McKenzie Tank Lines.	Low	Much of the IVI technology is still in testing stages, but Broward County should monitor its progress and try to participate in future pilot programs.

3.0 Needs and Deficiencies Statement

Literature reviews, data collection, and stakeholder outreach yielded a list of critical needs, challenges, and deficiencies in the Broward County transportation system that may be mitigated through the Broward County ITS Intermodal Plan. This list was used to develop a needs and deficiencies statement for Broward County. This section presents a summary of the needs and deficiencies statement. For a more detailed description, readers are referred to the ***Needs and Deficiencies Statement Technical Memorandum,*** completed in December 2002.

3.1 Critical Challenges and Deficiencies

Geographical constraints and fast population growth pose challenges to freight mobility in Southeast Florida. Despite a relatively young transportation infrastructure, the tri-county region is experiencing rapid growth, causing congestion on key roadways. The region's roadway network includes significant capacity on north-south facilities, with I-95 and Florida's Turnpike. However, there is very little opportunity for expansion as future growth can essentially only occur in Palm Beach County and points northward. Growth of this type would likely increase northbound truck traffic in the tri-county region. East-west traffic poses a different problem as freeway capacity is very limited, forcing truck traffic to use arterials. In addition, there are major load centers (e.g., three major seaports, three major international airports, and several rail yards) located throughout the tri-county region that generate truck traffic on the roadway network. Critical challenges and deficiencies, concerning the movement of freight in Broward County, include:

- Significant congestion in key freight corridors;
- Limited access for freight movements;
- Balance of freight operations and security;
- Freight-specific management issues;
- Need for improved regional communications and coordination;
- Infrastructure limitations; and
- Political and institutional barriers to freight mobility.

These challenges and deficiencies are described below. Each challenge or deficiency is accompanied by a potentially applicable ITS strategy.

Significant Congestion in Key Freight Corridors

Challenge. On June 19, 2002, the *Palm Beach Post* reported that the southeast Florida region (Miami-Dade, Broward, and Palm Beach counties) had the second fastest congestion growth rate in the United States. Stakeholders agreed that all major highways in the region are congested and that the lack of east-west freeways is causing an over reliance on east-west arterials. Peak hours are spreading beyond the traditional a.m. and p.m. periods, and these problems are being compounded by the fact that the major freeways attract a wide array of users, including tourists, commuters, and heavy trucks. Expected population growth and increased freight volumes will further strain the transportation system in the future.

In addition, the considerable under use of mass transit by area residents exacerbates congestion on the region's roadways. The development and enhancement of transit operations would provide an opportunity to improve regional mobility. The tri-county region, and Broward in particular, is working diligently to expand and improve the transit system, which will contribute significantly to the region's future level of freight mobility.

Potential ITS Strategy or Application. More reliable truck-oriented travel time information; dedicated truck only lanes and times on key freight highway segments; and optimizing traffic signal timings on key freight arterials.

Limited Access for Freight Movements

Challenge. The region boasts three sea ports, two major rail corridors (South Florida Rail Corridor [SFRC] and FEC), three major airports and four general service airports providing a multimodal network for moving freight. Although access in general is a regional advantage for southeast Florida, several deficiencies were identified.

- **Port Access.** The geometrics as I-595 ends and Eller Drive begins are not amenable to truck operations, as there are several tight turns, low overpasses, and stop lights that hinder freight and other traffic entering Port Everglades. Infrastructure work to correct this problem is at least six years away, and checkpoints installed after September 11, 2001 often cause long queues for trucks and other vehicles, at times resulting in backups onto I-595.

- **Airport Access.** The highway infrastructure provides fairly direct eastbound access from Fort Lauderdale International Airport (FLL) to Port Everglades, but westbound access from Port Everglades to FLL is indirect, requiring vehicles to traverse local and industrial roads. Poor access from air cargo terminals to I-595, I-95, and U.S. 1 also is a concern.

- **Signage.** There are few directional signs directing truck and cruise-related traffic in and out of Port Everglades, which often impedes the smooth flow of traffic in the Port area. Stakeholders cited a similar problem at Fort Lauderdale International Airport.

- **Downtown Deliveries.** Most truck traffic is comprised of local deliveries, and access for trucks making downtown deliveries is complicated by inadequate loading/ unloading zones and other restrictions such as low-hanging trees.

Potential ITS Strategy or Application. Queue detection equipment and flashing warning signs; DMS; and other common ITS devices. ITS also could be applied to improve the limited enforcement capabilities for the region's frequently violated HOV-lane requirements as well as to ease access to truck loading/unloading zones.

Balancing Freight Operations and Security

Challenge. The events of September 11, 2001 had a profound impact on freight operations nationwide. The challenge faced by freight stakeholders in Broward County is to balance security needs with the need for fast, efficient freight movements. For example, new security requirements, while increasing safety and security within the Port Everglades complex, reduce the overall efficiency of port movements and cause bottlenecks along the main port entrance at Eller Drive. Only one truck is allowed dockside to serve a cruise ship at any one time, but large cruise ships require multiple deliveries prior to setting sail. This causes large queues of delivery trucks just as passengers are arriving for cruises. In addition, there is a need to keep cruise ship passengers separated from sensitive parts of the port complex.

Potential ITS Strategy or Application. Technologies for improved security will be a major component of Port Everglades' new security program. These include a new Security Operations Center that will monitor the port with cameras and other security devices. In addition, Port Everglades is collaborating with the BCMPO and FDOT District 4 to coordinate ITS deployments that will benefit both the Port and surrounding roadways. Operational technologies may include DMS, detectors, and other traffic management devices.

Freight-Specific Incident Management Issues

Challenge. The State of Florida ranks third in the United States for the number of fatal truck crashes. Incidents, fatal or otherwise, impede freight operations. Issues include:

- **Inadequate Equipment.** The salvage equipment operated by the Turnpike is not sufficient to move heavy trucks, causing longer incident-related delays and a greater likelihood for secondary incidents.

- **Liability.** Further delaying clean-ups, on-scene commanders are often hesitant to clear truck accidents for fear that they would be liable for any losses incurred during that operation. Unlike in other states (e.g., Minnesota and Washington), on-scene commanders in Florida are not absolved of responsibility for such moves.

- **Incident Response on Rail Corridors.** Incidents on the South Florida Rail Corridor (SFRC) right-of-way can take as long as two to three hours to clear. Tri-Rail is working with various County Sheriff's departments to address this problem.

- **Coordinated Response to HAZMAT and Other Emergency Incidents.** A major issue is the coordination of incident command responsibilities among many different agencies, including county and local police, fire, rescue, and others. Gaps and jurisdictional overlaps in the system can cause confusion concerning which agency is responsible for the response.

- **Potential ITS Strategy or Application.** Though incident management issues are often institutional in nature, they may be mitigated via ITS-based communication strategies, such as the new TMS for Broward County that can coordinate responses to incidents.

Need for Improved Regional Communications and Coordination

Challenge. The lack of adequate communication and coordination may impede freight movements in a number of respects. Issues include:

- **Regional Coordination and Multiple Jurisdictions.** The southeast Florida region is divided among several large MPOs (Miami-Dade, Broward, and Palm Beach) and three FDOT districts (4, 6, and the Turnpike). As neither freight nor passengers acknowledge jurisdictional boundaries during their trips, transportation planning in the region, including ITS deployments, should occur at a regional level. However, ITS and freight priorities vary considerably among the six agencies, making regional planning difficult. Florida is a participant in the CVISN program, which was designed to facilitate the operation of trucks, while improving enforcement efficiencies. This is critical because there should be compatibility between what southeast Florida undertakes as freight ITS projects and the State's ITS-CVO program.

- **Public Versus Private Planning Horizons.** Carriers typically see five years as a long-range planning period, whereas the government is required to generate "short-term" five-year Transportation Improvement Plans (TIP) as well as a 20-year outlook. Although the government's long-range plans directly impact the private sector, it has trouble persuading the private sector to participate in the planning process. By reaching out to the private sector freight community as well as executive-level decision-makers, planners will be better able to understand the needs and concerns of freight carriers in the region as well as determine the ways in which freight movements would benefit from ITS deployments.

Potential ITS Strategy or Application. Specific ITS strategies to address communications and coordination needs, potentially benefiting commercial vehicles and other motorists, include the provision of data needed to make route choices based on real-time information, data sharing among agencies for planning purposes, use of data for educational programs, etc.

Infrastructure Limitations

Challenge. Roadway and railroad transportation infrastructure characteristics impede the efficient flow of freight and goods in the region. Issues include:

- **Few Limited Access Highways.** The low number of limited access highways in Broward County forces trucks to maneuver along signalized roadways for large portions of their trips. High volumes of trucks on east-west roadways cause conflicts with passenger cars and strain the roadway infrastructure.

- **Lack of Truck Service Facilities.** There are a limited number of truck service facilities within Broward County for trucks to consolidate or transfer loads, forcing the use of rest areas, truck stops, other facilities, and even neighborhoods, as de facto staging areas.

- **Rail Capacity.** Rail also has infrastructure-related limitations. The SFRC is used by Tri-Rail, Amtrak and CSX, constraining schedules for both passenger and freight services. An initiative to double-track this corridor will help mitigate the problem. Numerous at-grade rail crossings in the region also are a concern, especially given future growth in the region, which pose a serious safety concern.

Potential ITS Strategy or Application. ITS strategies, such as truck-oriented travel time information and optimized traffic signal timings, are an effective means to improve traffic flow and increase capacity without the high costs and long-time horizons associated with large infrastructure projects.

Political and Institutional Barriers to Freight Mobility

Challenge. Freight-specific transportation planning and investment is limited by the established political and institutional environment in southeast Florida. Local politicians are driven by public demands for safer, more efficient transportation systems that provide a high level of personal mobility. The movement of freight, although critical to sustain life as we know it, interferes with this demand for personal mobility. Issues include:

- **All funding should be spent on transit.** Transportation planning agencies have been directed by local politicians to focus funding and resources on the development of new and enhanced transit service. This limits the funding available for freight mobility projects. However, an improved transit system can benefit freight movements by reducing highway congestion; a fact recognized by the freight industry.

- **Truck operations should be limited.** There is a common desire throughout southeast Florida to restrict operations. This includes lane assignments as well as time of day programs. The motivation behind these recommendations is to improve passenger mobility and safety during peak hours.

- **Public funds should not be spent on freight projects.** Policy-makers and politicians struggle with the belief that investing in the freight transportation infrastructure equates to helping private industry be more profitable. As a result, there is resistance by many to spending public funds on improvement projects that directly benefit carriers.

- **Multiple jurisdictions limit regional approach.** Southeast Florida has several planning agencies, each responsible for its own jurisdiction. This restricts regionalism, which is critical to industry because the region represents one marketplace for them. Currently, the three MPOs in southeast Florida are addressing regionalism as part of their Long-Range Transportation Plan updates. This will provide further opportunities for enhancing freight mobility in the region.

These issues highlight the political environment in southeast Florida. They cannot be addressed with ITS applications. However these issues must be recognized and addressed as they ultimately will impact how successful the ITS Intermodal Plan is.

3.2 Stakeholder Recommendations for Improvement

Stakeholder participation was a critical data collection source, providing first-hand perceptions of strengths and weaknesses in the regional transportation system. Interviews were conducted with the region's ITS and freight stakeholders (public and private) to collect information on the region's current and planned ITS initiatives; and gain insight into the system's needs and deficiencies. The interviews also provided an opportunity for the public and private stakeholders to identify key transportation mobility, safety and security issues for freight movements that can potentially be mitigated through the use of ITS technologies.

In response to the issues, problems, and deficiencies outlined in the previous section, stakeholders were asked to provide specific suggestions – organizational and technological – that would help mitigate freight problems in the Southeast Florida region. The suggestions were used to help guide the potential ITS mitigation strategies developed, subsequently, in Section 4.0 of this report. The ideas provided by the regional stakeholders for improvements have been categorized into five broad classifications:

1. Outreach and Education;

2. Stakeholder Coordination;

3. Policy;

4. Infrastructure; and

5. ITS and Other Operational Strategies.

Outreach and Education

The public and decision-makers are often unacquainted with the efficiency and safety improvements that ITS applications can bestow on a local or regional transportation system. In addition, people may not directly associate the impacts of freight on their own mobility and quality of life. In order for ITS and freight improvement projects to gain political traction and to become a transportation priority, a greater awareness is needed to underline their importance and benefits. Recommendations to spawn this awareness include:

- **Conduct Freight Education and Outreach with the Public**. The traveling public is largely unaware of the handling and performance characteristics of trucks. Providing outreach efforts through driver education programs may contribute to a reduction in the number of crashes between passenger and freight vehicles.

- **Conduct ITS Awareness, Education, and Outreach with Local Decision-makers.** Local decision-makers should be educated to strengthen their understanding of and support for ITS investments. A comparable program also might be valuable to increase the awareness of ITS benefits to end users of the technology (truckers, railroads, the public, etc.).

- **Conduct Outreach for the Port Everglades Security Program.** An important aspect of deploying a new ITS system is user education. Commercial vehicle operators should be trained to facilitate the use of new ITS services at the Port. The successful application of these technologies at the Port would help build greater support for other ITS projects.

- **Provide ITS Training for FDOT Staff.** FDOT has developed 10 training modules designed to train government agencies in ITS-related issues. Other, similar courses are available through the Federal Highway Administration's National Highway Institute and other organizations. FDOT should consider offering such ITS training to all staff, both at the Central and District offices.

Stakeholder Coordination

In order to facilitate the development of policies and foster their application, improved coordination is needed between key stakeholders. On the operational side, agencies and agency divisions that work on the same or complementary systems should have strategies in place to expedite processes and capitalize on potential synergies.

- **Establish a Freight Stakeholders Committee.** The Miami/Dade MPO recently created a freight advisory committee to formalize its freight program and facilitate the identification of projects, strategies, and initiatives that address freight mobility. This type of committee should be in place throughout the tri-county region.

- **Co-locate Local Freeway Operations and Signal Management.** Currently, freeway operations and signal management are handled by two different agencies. FDOT

handles freeway operations and local public works departments handle signal management. Co-location would enhance coordination between these agencies and may result in improved traffic and information flow.

- **Consolidate/Co-locate All Traffic Management Functions at the Broward County TMC.** The new TMC will house FDOT, Broward County Traffic, and Mass Transit personnel as well as a direct tie-in to the Emergency Operations Center. Communication and coordination are key to the success of ITS, and other agencies should be encouraged to have permanent working places in the new TMC, as appropriate.

- **Initiate an Information-Sharing Agreement between the Broward County TMC and Port Everglades.** To maintain efficient flows of both passengers and goods into and out of the Port complex, it is critical that Broward County share its traffic information with the Port. There is interest in improved coordination and an information-sharing agreement.

Policy

Using existing infrastructure and resources, there are many potential improvements that could be made to freight mobility in Southeast Florida. However, these would first require changes in policy in terms of how the transportation system is used and operated, changes to some business practices, and in some instances, the enhancement of public-private partnerships.

- **Implement Dedicated Truck-Only Times on Specific Highway Lanes.** It would be helpful to require trucks to travel in dedicated lanes at designated time periods on major corridors. The Center for Urban Transportation Research (CUTR) recently completed a research project to investigate the feasibility of dedicated truck lanes. This topic is politically challenged, however there are benefits to such an operation that should be considered.

- **Promote "Flextime" for Area Employees.** Employers should offer "flextime" to discourage peak-period commuter travel, thereby relieving some congestion on regional roadways.

- **Treat Signal Systems as a Public Utility.** Counties should consider the operation and maintenance of their signal systems as a public utility, setting performance measures and evaluating their performance. Decision-makers, particularly at the County level, should be educated that the proper use of signal systems can have the same kinds of impacts as capacity improvements.

- **Decentralize Construction and Maintenance Responsibilities to the Local Level.** The deployment of ITS projects could potentially be streamlined if local agencies took over these responsibilities.

- **Investigate Innovative Funding Sources and Public-Private Partnerships for Freight Improvements.** There is a need for more funding to increase capacity and build grade separated rail crossings. A partnership with the trucking and rail industries may be an effective mechanism, where system users help defray operating and maintenance costs by forming a public/private partnership.

- **Improve HAZMAT Permitting Process.** An interface between HAZMAT and licensing databases would improve administrative efficiency and may have beneficial security impacts as well.

- **Institute a Statewide "Quick-Clearance" Agreement.** A "quick-clearance" agreement to absolve on-scene commanders in Florida from cargo liability may improve incident management operations statewide, thereby decreasing delays caused by truck incidents.

Infrastructure

Beyond enhancing the transportation system through ITS, several physical infrastructure improvements would facilitate freight and personal mobility in Broward County by improving connectivity and adding to capacity.

- **Improve Connections to Rail Freight**. Improved connections to rail freight facilities may cause some truck movements to divert to rail, which might have significant impacts on the regional transportation system. The BCMPO should work with railroads to address this possibility.

- **Continue Efforts to Complete Cloverleaf On/off Ramps to U.S. 1**. The completion of a cloverleaf on- and off-ramp connection ("the Loop") to U.S. 1 would improve the mobility of cruise passengers returning to FLL Airport from Port Everglades and improve access to the airport for air cargo shipments.

- **Continue Efforts to Build a People-Mover between FLL and Port Everglades.** FLL has proposed a people-mover to run between the airport and the cruise terminals at Port Everglades. Development of this system would impact congestion on local streets between these facilities.

ITS and Other Operational Strategies

ITS applications enhance the efficiency and safety of the transportation network. Several ITS-focused initiatives, including route selection, the relaying of traffic and roadway information from trucks, and the use of weigh-in-motion technologies, were recommended by stakeholders to improve freight flows in Southeast Florida.

- **Provide Reliable Truck-Oriented Travel Time Information.** Commercial vehicle operators can make informed route choices with more reliable travel time information.

For example, better quality travel time information comparing I-95 to Florida's Turnpike would be valuable for commercial vehicle operators and other motorists. FDOT District 6 would like to share traveler information with the other state districts, thereby improving traveler information for long-distance truck trips.

- **Use Freight Trucks as Traffic Information "Probes."** Freight trucks operating along the region's roadways may be able to provide real-time information describing traffic conditions throughout the region using their existing internal communications systems. This could help districts manage traffic operations and incident response, as well as provide travel information to other motorists.

- **Install Weigh-in-Motion (WIM) for Commercial Vehicles.** WIM would expedite the movement of freight through weigh stations along highways in the region. (The Turnpike does not have any weigh stations and has no plans to install them.)

- **Improve Signage at Port Everglades and FLL**. The current signage at the port was designed to be temporary and is beginning to show its age. Most truck drivers are familiar with the port layout, but one potential concern is that 90 percent of truck drivers speak Spanish only, so information on new signs may need to be displayed in both English and Spanish. Signage is most important for cruise passengers entering the port complex, as they are not typically familiar with the port layout. Similarly, there is a lack of consistent signage directing tourists and cruise passengers both to and from the airport. The FLL currently is working to improve its signage. This effort should be coordinated with the signage at Port Everglades to ensure the use of standards for consistency.

- **Investigate Strategies to Improve Safety at the Terminus of I-595 at Port Everglades.** Until the Eller Drive Improvement project is complete (six years minimum), there will be major safety issues approaching the intersection of Eller Drive and 7th Avenue from I-595. In the interim, it would be useful to install warning lights and/or DMS to warn trucks and other vehicles to slow down and use caution.

- **Install DMS at FLL.** DMS signs were mentioned as an ITS technology that would improve landside airport operations. This would allow the airport to provide messages to arriving vehicles and would be especially helpful during security incidents.

- **Investigate Strategies to Improve Efficiency and Safety of At-grade Railroad Crossings.** At times, congestion and queuing causes vehicles to get backed up onto the tracks, posing a serious safety hazard. ITS devices such CCTV camera monitoring, flashing lights and signs may help prevent such problems. All 72 at-grade crossings along the SFRC will be upgraded with four-quad gates and a median curb as part of the double-tracking effort. Similar improvements would be helpful at the other crossings in the region.

- **Optimize Signal Timings Regionwide.** Adjust signal timings along east-west arterials to improve traffic flow, particularly during peak hours.

- **Provide Real-time Information to Train Operators.** Real-time operational information could be provided to train operators via in-vehicle (in-train) devices or on DMS along the rail corridor.

- **Provide Critical Information to HAZMAT Responders.** Weather information, particularly data on prevailing winds is critical during HAZMAT response. Locations of drainage areas and sewers also are important.

- **Implement Wireless Technologies for Emergency Management and Incident Response.** Real-time information sharing is critical in emergency management and incident response. Wireless technologies will have important impacts on emergency management and dispatch in the future and may improve coordination among responding agencies.

4.0 Development of Alternatives

Under the broad umbrella of Intelligent Transportation Systems, some of the most advanced applications and technologies are being designed to address and facilitate freight movements. Specifically, these systems focus on activities being performed by truck drivers, truck fleet operators, and state regulators; and managing points of entry such as international border crossings, airports, and seaports. This section presents the set of alternatives developed for consideration as part of the ITS Intermodal Plan. It includes a description of the process undertaken to develop the alternatives based on the needs and deficiencies statement. For a more detailed description of the development of the alternatives, readers are referred to the ***Potential ITS Solutions Technical Memorandum,*** completed in May 2003.

4.1 Identification of Potential Mitigation Strategies

Based on the identified needs and deficiencies in Broward County, a set of possible ITS strategies were developed. These strategies were organized around the established needs and deficiencies categories. The following summarizes the identified strategies by the six needs categories:

1. **Significant Congestion in Key Freight Corridors**
   - ATIS
   - Truck-only lanes
   - Signal timing optimization
   - Use freight trucks as probes
   - Improve communications with train operators
2. **Limited Access for Freight Movements**
   - Speed warning system
   - DMS
   - Ramp Metering

3. **Balancing Freight Operations and Security**
   - Port Everglades Security Program
   - Lane Use DMS
   - Expand CVISN to Ports
   - DMS
   - Appointment System
4. **Freight-Specific Incident Management Issues**
   - Enhance incident management program
   - Database of shared resources
   - Institute a "Quick-Clearance" agreement
   - Improve interagency communications
   - Provide real-time train locations to emergency response agencies
   - Provide critical information to HAZMAT responders
   - Support Federal IVI program
5. **Need for Improved Regional Communications and Coordination**
   - Improve communications
   - Integrate ITS freight programs
   - Outreach and education
   - Information sharing
   - Database integration
6. **Infrastructure Limitations**
   - Guidance system for truck service facilities
   - Dynamic curve warning system
   - Improve and reduce at-grade rail crossings
   - Upgrade dispatch capabilities
   - Overheight vehicle detection system

4.2 Initial Screening of ITS Mitigation Strategies

The above strategies were presented to the technical advisory committee as part of a working meeting to begin prioritizing these possible solutions and mitigation measures. The goal of workshop was to review and adjust the presented strategies to ensure consistency with the underlying goals of the project, which include:

- Develop potential ITS projects to address the freight needs and deficiencies in Broward County and the Southeast Florida region;
- Lay the foundation for a coordinated ITS intermodal program for Broward County; and
- Coordinate with the security program at Port Everglades.

As part of the workshop, the strategies were analyzed for their practicability and level of importance. Participants also determined which agency would be the most suitable for leading the implementation of each strategy. Based on these criteria, each strategy was given: 1) a pass or fail grade based on a "fatal flaw" analysis; 2) a priority level based on strategic importance; and 3) a lead organization based on initial assumptions concerning the agencies or other entities that would be most appropriate for implementing the strategy. This process and the criteria are further described below.

- **Fatal Flaw Analysis.** Cambridge Systematics worked with Workshop attendees to perform a pass/fail "fatal flaw" analysis for each strategy. An ITS strategy "passed" the fatal flaw test if the group agreed the option was viable (politically and technically feasible), if the technology currently was available or would be soon, if the strategy was applicable to the region, and if the strategy fit within the scope of this project.
- **Priority Level.** For those ITS strategies that passed the fatal flaw analysis in the first step, the group then determined the strategy's priority level based on strategic importance.
- **Lead Organization.** Workshop participants made suggestions concerning which organization(s) should take the lead on each strategy.

The results of this activity are illustrated in Table 4.1.

Table 4.1 Needs and Deficiencies Mapped to Potential ITS Mitigation Strategies

Need/Deficiency	ITS Strategy for Consideration	Description	Existing Deployments	Geographic Scale	Potential Benefits	Pass/ Fail	Rank	Lead Org.	Comments
1.0 Significant Congestion in Key Freight Corridors									
1.1 Major highways are congested	ATIS	Provide more reliable truck-oriented travel time information so commercial vehicle operators can make informed route choices. Review results of FleetForward, a field test performed by the I-95 Corridor Coalition that pairs real-time traffic information with motor carrier's routing and dispatch decisions. The system focuses on truck relevant data.	511, SunGuide	Local	Travel time Reliability	P	H	Port Everglades BC TED	Current 511 system needs enhancements to improve reliability; Begin with deployments at Port Everglades (i.e., DMS at port exits); Then link to 511; Then expand to other facilities and market to truckers
1.2 Increasing freight volumes; trucks share roadways with passenger cars	Truck-only lanes	Implement truck-only lanes and times on key freight highway segments. Install ITS devices such as DMS or other lane use signals to regulate and inform motorists when lanes are designated as truck-only, similar to the operation of high-occupancy vehicle (HOV) lanes. Decrease conflicts with passenger cars.		Regional	Travel time Safety	F			Technically sound idea but politically infeasible due to public opposition to trucks in general
1.3 Region lacks east-west highways	Signal timing optimization	Optimize signal timings on key freight arterials regionwide, particularly during peak hours (Sample Road, Hollywood Boulevard, Broward Boulevard, University, etc.).	Technology in place, optimization planned	Local, Regional	Travel time	P	H	BC TED	Optimization already in place that includes signal preemption and priority (EMS in place, transit under consideration); Work with truckers to investigate providing truck priority at key locations
1.4 Additional source of real-time traffic data	Use freight trucks as probes	Investigate use of freight trucks to provide first-hand, real-time travel condition information using their existing internal communications. Use data to help manage traffic operations, incident response, and for the provision of travel information to other motorists. Form a public-private partnership.		Local, Regional	Travel time Data	F			Time consuming process to get public-private partnership established; Traffic cameras will provide enough data
1.5 Real-time information for train operators	Improve communications with train operators	Investigate the provision of real-time operational information (e.g., timely speed restriction information) via in-train devices or DMS along the corridor at-grade crossings.	Currently radio-based	Regional	Data	P	?	?	Need to investigate further – contact railroads and Larry Merritt of FDOT

Table 4.1 Needs and Deficiencies Mapped to Potential ITS Mitigation Strategies (continued)

Need/Deficiency	ITS Strategy for Consideration	Description	Existing Deployments	Geographic Scale	Potential Benefits	Pass/ Fail	Rank	Lead Org.	Comments
2.0 Limited Access for Freight Movements									
2.1 Safety concerns at terminus of I-595 at Eller Drive	Radar speed detector, DMS warning system	Detect queues at Eller Drive security gate and warn approaching vehicles "SLOW TRAFFIC AHEAD" and "BE PREPARED TO STOP." Or, deploy a truck speed warning system (WIM and DMS provide customized warning messages for trucks approaching dangerous downgrades and/or steep curves). Simpler systems employ flashing signs and warning messages when a truck exceeds recommended speed.	Geometric redesign planned	Local	Safety	P	H	FDOT D4 Port Everglades	Well-known high-accident area; FDOT for the DMS; Port for the detector; Maybe static signs; New security gate will be set in to allow much more queuing space; investigate pavement reflectors that flash in wet weather
2.2 Deficient signage to/ from Port Everglades	DMS	Install DMS and static guide signs for vehicles entering/ exiting Port Everglades, particularly toward FLL Airport (in English and Spanish). Especially helpful during security incidents. Coordinate with FLL for consistency. Temporary signage needed while permanent program is planned.		Local	Access	P	H	FDOT D4	Coordinate with Rick Mitinger, who is working with FLL on static signs
2.3 Deficient signage to/ from/within FLL Airport	DMS	Install DMS and static guide signs for vehicles entering/ exiting FLL Airport. Especially helpful during security incidents. Coordinate with Port for consistency. Specific signage to air cargo area needs improvement. Temporary signage needed while permanent program is planned.		Local	Access	P	H	Airport FDOT D4	Primarily static signs; Being addressed under current construction project
2.4 Highway design sections are marginal	Ramp metering	Install ramp metering on congested highways in the region.	Ramp metering is planned in Miami-Dade on I-95	Local, Regional	Travel time Safety	P	M	FDOT D4	Waiting to learn from FDOT D6's experience along I-95 in Miami-Dade County

Table 4.1 Needs and Deficiencies Mapped to Potential ITS Mitigation Strategies (continued)

Need/Deficiency	ITS Strategy for Consideration	Description	Existing Deployments	Geographic Scale	Potential Benefits	Pass/ Fail	Rank	Lead Org.	Comments
3.0 Balancing Freight Operations and Security									
3.1 Traffic management within a secure port	Port Everglades Security Program	This extensive program includes the deployment of a Security Operations Center (SOC), fiber optic communications, camera monitoring, security gates, and more.	Planned linkage between Broward County TMC and the Port's SOC	Local	Access Security Travel time	P	H	Port Everglades BC TMC	Coordination is already underway
3.2 Queuing at security gates at Port Everglades	Port Everglades Security Program	Sort passenger cars and trucks in advance of security gates to eliminate conflicts. Use DMS in advance of the security gates to display lane use and other information.		Local	Access Safety	P	M	Port Everglades	Coordinate with Rick Mitinger, FDOT D4, and Eller Drive project
3.3 Improve security at Port Everglades	Expand CVISN to Ports	Log security, credentialing, safety and other information about drivers, trucks, and cargo. Facilitate the exchange of information (e.g., vehicle owner, safety records, driver information, registration, etc.) among port, state, regulatory agencies, commercial vehicle operators, regional clearinghouses, and national databases. Allow carriers to apply for and receive their essential operating credentials remotely. Track HAZMAT and agricultural cargo; share information with regulatory agencies.	Port Everglades Security Program, CVISN	Local, Regional, Statewide, National	Security Access	P	M	FDOT D4 Broward MPO	FDOT D4 and MPO submitted a project proposal to expand CVISN components into southeast FL; Project currently is on hold; Tahira Faquir of FDOT D4 to send web site with five-year plan; Follow-up with Mike Akridge of FDOT Central Office; Mario Aispuro suggests coordinating with an incident management organization
3.4 Deficient signage within Port Everglades	DMS	Install DMS and/or static signs that guide vehicles to their destinations within the Port. Help prevent passenger cars from entering secure areas, reduce passenger car and commercial vehicle conflicts. Provide real-time travel information via DMS for travelers exiting the port.		Local, Regional	Access Travel time Security Safety	P	H	1. BC TED 2. Port Everglades	TEC and the Port have already begun to coordinate with regard to DMS
3.5 Poor pier-side freight access to cruise ships	Appointment system	New security policies only allow pier-side parking for one truck at a time, causing lengthy queues and interfering with passenger arrivals. Implement scheduling system to improve operations and reduce wait times.		Local	Access Security Travel time	P	M	Port Everglades Operations	Could be a joint effort in combination with the provision of traffic information; Scheduling system would require public-private partnership
4.0 Freight-Specific Incident Management Issues									
4.1 High number of truck crashes	Incident management program	Continue to improve the regionwide incident management program that incorporates clearly defined plans and responsibilities, and eliminates gaps in unincorporated rights-of-way. Hold regular coordination meetings with all incident responders. High-tech incident management systems also could be incorporated that allow first responders to send images to secondary responders (HAZMAT, etc.).	South Florida Incident Management Working Group	Local, Regional	Safety Reliability	P	H	FDOT D4	Improved mechanisms of communication are the key opportunity for ITS; Follow-up with Murali Pasumarthi

Table 4.1 Needs and Deficiencies Mapped to Potential ITS Mitigation Strategies (continued)

Need/Deficiency	ITS Strategy for Consideration	Description	Existing Deployments	Geographic Scale	Potential Benefits	Pass/ Fail	Rank	Lead Org.	Comments
4.0 Freight-Specific Incident Management Issues (continued)									
4.2 Insufficient salvage equipment for heavy trucks and trailers	Database of shared resources	Create an inventory of shared equipment that can be accessed by various agencies when needed. Upgrade communications with towing contractors for speedier response times.		Local, Regional	Response times Safety	P	M	FDOT D4 Turnpike	Statewide Traffic Incident Management (TIM) teams (towing industry, DOT, FHP); Should be easily accessible
4.3 On-scene commander liability	Institute a statewide "quick-clearance" agreement	On-scene commanders are hesitant to rapidly clear spilled cargo on the roadway from truck accidents since they are liable for damage or loss. Institute a statewide "quick-clearance" agreement like Minnesota or Washington, where commanders are absolved of liability, allowing for faster clearance times.		Statewide	Response times Safety Travel time	P	M	FDOT Central Office	Follow-up with statewide TIM team; Follow-up with Lap Honag, State Traffic Engineer in FDOT Central Office
4.4 Lengthy delays during rail incidents	Improve interagency communications	Train incidents, particularly fatalities, can take as long as two to three hours to clear. Implement a more efficient incident management program with clearly defined plans and responsibilities. Hold regular coordination meetings with all incident responders. Investigate use of wireless and/or handheld devices for real-time information sharing.	Incident management plan	Regional	Response times Reliability	P	M		Tri-Rail with the assistance of the Palm Beach County Law Enforcement Committee, Amtrak, CSXT, and FEC developed a "Standard Operating Procedure for Investigating Rail Incidents." This SOP was developed for assisting law enforcement investigations into rail accidents, and expediting rail traffic.
4.5 Need for improved coordination between railroads and emergency responders	Provide real-time train locations to emergency response agencies	FEC Railway provides real-time train locations to local fire houses. Expand this program to provide data to all regional fire and rescue agencies. Implement a similar program for the SFRC.	FEC Railway	Local, Regional	Response times	P	M		Tri-Rail is a member of the Local Emergency Planning Committee (LEPC) District XI, and has participated in several Emergency Preparedness Drill Exercises with the LEPC. In addition, as required by 49 CFR, Part 239 Tri-Rail conducts drills and training exercises with first responder and law enforcement agencies along the SFRC. Full blown exercises are required every two years. Additional training i.e., equipment familiarization, swat training, etc., are conducted throughout the fiscal year.
4.6 HAZMAT responders need timely information for response	Provide critical information to HAZMAT responders	Provide critical weather information (particularly data on prevailing winds) to HAZMAT responders at time of incident. Provide drainage area and sewer information at incident site for containment considerations.		Local, Regional	Safety Environmental protection	P	M/L	FDOT D4	Follow-up with Amy Sermons; Requires public-private partnership; Currently use DMS for major leaks/spills, road closures; Could use for security concerns
4.7 Improve commercial vehicle safety	IVI	IVI technologies represent advanced systems that are not yet available, including: a roll-over advisor/education and control system; a hazardous material collision notification system; and a "trucker advisory" system that notifies truck drivers as they approach locations with the potential for danger (past crash history, geometry, downgrade, etc.).	Florida is a participant in the "trucker advisory" test being conducted by McKenzie Tank Lines	National	Safety	P	L	MC MPO National	Ongoing

Table 4.1 Needs and Deficiencies Mapped to Potential ITS Mitigation Strategies (continued)

Need/Deficiency	ITS Strategy for Consideration	Description	Existing Deployments	Geographic Scale	Potential Benefits	Pass/ Fail	Rank	Lead Org.	Comments
5.0 Need for Improved Regional Communications and Coordination									
5.1 Need for improved coordination among freight and ITS stake-holders; Lack of private sector involvement	Improve communications	Establish a freight stakeholders committee. Hold periodic meetings to develop goals, strategies, and share information (perhaps piggyback off another relevant, well-attended working group in the region). Set up a message board and e-mail group to share information and ask questions.	South Florida ATIS Steering Committee	Regional	Planning	P	H	Three MPOs	Informational web site, not a project; New committee in Miami-Dade called FTAC
5.2 Enhance coordination among ITS programs	Integrate ITS freight programs	Enhance coordination among local, regional and state ITS programs. Increase awareness of various ITS programs. Integrate and expand where appropriate.	Statewide ITS Strategy, CVISN	Local, Regional, Statewide	Planning	P	H	Equal effort: MPO, FDOT, and BC TED	Many players and many ideas; ITS course via FDOT D4 ITS group; FHWA ITS Awareness online course
5.3 Lack of awareness about ITS benefits	Outreach and education	Although there are many local, regional and statewide ITS deployments, the general public and some decision-makers lack awareness about the benefits of ITS. Increase in the visibility of ITS deployments and benefits through outreach/education.	511 service	Local, Regional, Statewide	Gain support for Freight and ITS				
5.4 General public lacks knowledge about freight operations	Outreach and education	The general public and some decision-makers lack under-standing of the importance of freight in their daily lives. Use outreach/educational tools to teach the importance of freight, and how to drive safely in the vicinity of commercial vehicles and at-grade crossings.		Local, Regional, Statewide	Safety				
5.5 Need for increased information sharing	Information-sharing and improved communications	Share real-time travel information among all County TMCs (everyone with valuable travel information should participate). Initiate an information-sharing agreement between the BC TMC and Port Everglades.	511 service	Regional, Statewide	Travel time More effective use of resources				
5.6 Lack of freight planning data	Database integration	Integrate existing databases to increase understanding of freight-related issues in the region (accident data, freight vol-ume data, freight trip data, etc.). FDOT Traffic Info CD, FDOT Roadway Characteristics Inventory, Crash Analysis Reporting System (CARS), TMC data, CVO data, and MPO long-range planning data.		Local, Regional, Statewide	Planning Data	P	M	FDOT Central Office – Planning	
5.7 Need for improved communications	Improve communica-tions for all ITS programs	Various technologies need to talk to each other	Individual systems at Airport, Port, TMC, Turnpike, etc.	Local, Regional	More effective use of resources	P	H	All	Overall ITS, not just for Freight; Institutional issues need to be overcome

Table 4.1 Needs and Deficiencies Mapped to Potential ITS Mitigation Strategies (continued)

Need/Deficiency	ITS Strategy for Consideration	Description	Existing Deployments	Geographic Scale	Potential Benefits	Pass/ Fail	Rank	Lead Org.	Comments
6.0 Infrastructure Limitations									
6.1 Lack of truck service facilities	Guidance system for truck service facilities	With the lack of truck service facilities, trucks are forced to use rest areas, trucks stops, or other facilities as de facto staging areas. Many trucks leave the Interstate or Turnpike entirely and park in local neighborhoods. Investigate the provision of timely information to truckers on location of available facilities. Investigate the designation of special space and times for trucks at existing facilities, perhaps using DMS to demarcate.		Local, Regional	Safety	P	L		One is under development at the S.R. 7 and Turnpike interchange, but that is not enough
6.2 Noise pollution on highways	Dynamic curve warning system	Trucks often screech their brakes where the highway moves from north-south to east-west (Palmetto Expressway). Deploy DMS and radar detector to encourage reduced speeds in advance of the curve.		Local	Safety Reduce noise pollution	P	L		Follow up with Miami/Dade
6.3 Numerous at-grade rail crossings	Improve and reduce at-grade rail crossings	Frequent trains cause significant queuing on east-west arterials. Improve at-grade railroad crossing safety via four-quad gates and other devices. Upgrade rail signal system. Improve coordination among agencies to minimize impacts.	SFRC crossing upgrade project; FEC shorter train lengths	Local, Regional	Safety Travel time	P	H	Tri-Rail; FDOT D4 OMD	Segment 5 Project includes upgrade of 70 grade crossings and signal system on SFRC. Follow up with Dan Mazza, Tri-Rail Director of Engineering.
6.4 Multiple railroad operations on a single rail corridor	Double Tracking of SFRC	The SFRC was purchased by FDOT; Tri-Rail, Amtrak, and CSX all operate on the corridor.	Tri-Rail Double-Tracking Program	Regional	Reliability Safety Increase capacity	P	H	Tri-Rail	Segment 5 Project will complete the double tracking of the entire SFRC.
6.5 Structural damage from overheight vehicles?	Overheight Vehicle Detection System (OHVDS)	An OHVDS alerts drivers if their vehicles exceed the clearance limit for an upcoming bridge, overpass, overhead walkway, etc. The system detects the overheight vehicle and warns drivers in enough time for them to take action and avoid damaging their vehicle and the overhead structure.		Local, Regional	Safety	P	L		Martin and Indian River Counties; Follow-up with Tahira Faquir at FDOT D4; Not a frequent problem, but it does happen; Something to look at in the future

An overview of the results is provided below:

- **Fatal Flaw Analysis.** Of the 33 strategies presented, the fatal flaw analysis results were as follows:
  - Twenty-five potential mitigation strategies "Passed" the fatal flaw analysis;
  - Two "Failed"; and
  - Six were tabled, requiring further investigation.
- **Priority Ranking.** Of the 25 strategies that passed the fatal flaw analysis, the priority ranking results were as follows:
  - Twelve "High" priority;
  - Eight "Medium" priority;
  - Four "Low" priority; and
  - One tabled for further investigation.
- **Lead Organizations.** For the 20 strategies that ranked medium priority or higher, the following organizations were identified as lead agencies:
  - Port Everglades;
  - Broward County Traffic Engineering Department/Traffic Management Center;
  - Florida Department of Transportation, District 4;
  - Fort Lauderdale/Hollywood International Airport;
  - Broward County Metropolitan Planning Organization;
  - Florida Department of Transportation, Turnpike District; and
  - Florida Department of Transportation, Central Office.

4.3 Consolidating Screened ITS Strategies into a Set of Defined Alternatives

Alternatives, or sets of strategies, were developed by grouping the identified ITS mitigation strategies into logical, functional clusters. All the ITS mitigation strategies that passed the fatal flaw test and ranked at least a "medium" in priority level, based on input from the technical advisory committee, were included in the alternatives. The analysis generated six alternatives, grouped by transportation mode and/or functionality. The six alternatives consist of:

- Port Everglades Access Improvements;
- Rail-Related Improvements;
- Incident Management Improvements;
- Outreach and Communication Improvements;
- Better Use of Data; and
- Traffic Management Improvements.

Table 4.2 presents the six defined alternatives and provides the objectives and strategies for each.

Table 4.2 ITS Mitigation Alternatives

Alternatives	Objectives	Strategies
Port Everglades Access Improvements	• Improve safety at I-595 terminus • Balance port operations with security requirements • Reduce queuing and delays • Optimize port operations • Provide valuable, reliable traveler information to port users	• Install speed warning system at I-595 terminus • Sort vehicles prior to security gates via Lane Use DMS • Install static guide signs within the port • Install static guide signs to/from port and FLL airport • Enhance port security through CVISN technologies • Implement scheduling system for cruise deliveries • Provide traveler information via DMS at port exits • Establish communications link between port and Broward County TMC
Rail-Related Improvements	• Improve safety at grade crossings • Improve incident management at railroads • Reduce delays for trains, trucks and cars	• Provide real-time train locations to fire and rescue agencies • Improve communications with train operators • Better define incident management plans and responsibilities • Upgrade dispatch capabilities, rail signal system and crossings

Table 4.2 ITS Mitigation Alternatives(continued)

Alternatives	Objectives	Strategies
Incident Management Improvements	• Reduce incident response times • Improve incident clearance times • Reduce delays and secondary incidents	• Continue improving the regional incident management program • Share resources; create inventory of clearance equipment • Upgrade communications with towing contractors • Provide weather and drainage data to HAZMAT responders • Work to institute a statewide "Quick-Clearance" agreement
Outreach and Communication Improvements	• Improve communications across all ITS programs • Enhance coordination among all freight and ITS stakeholders • Increase awareness of ITS benefits • Reduce commercial vehicle and passenger conflicts	• Improve communications among regional ITS programs • Establish a freight stakeholders committee • Create a web site for freight/ITS information sharing • Provide outreach and education about: – ITS benefits – Importance of freight – Driving safely near trucks
Better Use of Data	• Improve ability to effectively use ITS-related data for freight planning activities • Improve ability to effectively use ITS data to better manage the freight transportation system in real time	• Identify and collect additional data • Integrate available databases into centralized system • Use system performance data to improve long-range transportation planning activities • Use current/real-time data to improve regional traffic management system activities
Traffic Management Improvements	• Improve east-west freight movements	• Optimize signal timing for key freight movements on east-west arterials

5.0 Evaluation of Alternatives

Once the sets of alternatives were developed, an evaluation process was defined, based upon identified performance measures, available data, and the default values from the ITS Deployment Analysis System (IDAS). IDAS is an innovative software analysis tool developed by Cambridge Systematics for the Federal Highway Administration. It is designed to help agencies determine the impacts, benefits, and costs of various ITS deployments. As such, it contains a library of data for a variety of ITS deployments, including capital costs, operations and maintenance costs, as well as monetary benefit estimates.

The objectives were to develop evaluation criteria and performance measures for each of the ITS mitigation strategies; evaluate the potential impacts of the alternatives in order to prioritize and identify the preferred alternative; and develop specific project recommendations for the implementation of that alternative. Using IDAS benefit/cost ratios were developed for each strategy for which quantitative data were available. This section describes the performance measures used, the generation of benefit/cost ratios, and finally the development of the preferred alternative.

5.1 Performance Measures and Evaluation Criteria

The first step in evaluating the defined alternatives was to define the performance measures and evaluation criteria to be used. As a starting point, a list of evaluation criteria was created. It included the following:

- Delay Savings;
- Travel Time Reliability;
- Crash Reduction Savings;
- Fuel Consumption and Emissions Savings;
- Security and Strategic Importance;
- Freight Operational Efficiency;
- Compatibility with National, Statewide, and Regional ITS Architectures;
- Costs of Alternatives; and
- Coordination Opportunities with Other Regional Existing or Planned Future ITS Projects.

The second step was to identify the desired and available data for the strategies within each of the six alternatives. The evaluation of ITS alternatives essentially entailed a benefit/

cost analysis. As such, the development of benefit/cost ratios was limited to those alternatives for which data were available. Data were collected to calculate the monetary benefits and preliminary cost estimates for each of the six alternatives. As data were available, the impacts and benefits were estimated using the nationally accepted default values from IDAS. In addition, other sources were used, such as specific vendor estimates, as available.

The goal of the evaluation was to prioritize the ITS alternatives in order to identify and recommend one preferred alternative, which will then be expanded for inclusion in the implementation plan.

5.2 Benefit/Cost Analysis

The first step in conducting the benefit/cost analysis was to identify the key performance measures for each ITS mitigation strategy within each alternative. For some of the strategies, data were unavailable and therefore the dollar amounts could not be provided. In other cases, predominantly for non-ITS strategies, the monetary benefits were difficult to calculate and therefore could not be provided. Special consideration was given to each of these unquantifiable strategies when recommending the preferred alternative for inclusion in the implementation plan.

The next step involved researching system costs for each of the strategies, including both capital costs as well as cost estimates for operations and maintenance. Where available, actual numbers were used, including:

- Roadway segment crash data at the I-595 terminus;
- Truck and auto volumes entering/exiting Port Everglades;
- At-grade train crossing delays; and
- System cost estimates.

To supplement this data, default values for both the annual costs and benefits were estimated using the default values in the IDAS software package. IDAS was especially useful in estimating:

- Crash reduction savings;
- Travel time reliability;
- Delay reduction; and
- System costs (capital and O&M).

All the costs and benefits were annualized based on life-cycle estimates for each component in the ITS system. Table 5.1 provides a summary of the results of the benefit/cost analysis. The assumptions and backup calculations for each of these costs and benefits are provided in Appendix A, along with brief descriptions for each strategy.

Table 5.1 Summary of Benefit/Cost Analysis

Alternatives	Measure	Annual Cost[1]	Annual Benefit[2]	B/C Ratio	Comment
Alternative 1 – Port Everglades Access Improvements					
1. Install speed warning system at I-595 terminus	Crash Reduction	$11,000	$1,425,000	130:1	
2. Sort vehicles prior to security gates via Lane Use DMS	Delay Reduction	$52,000	$232,000	4:1	
3. Install static guide signs within the port	N/A				Non-ITS; assessed separately.
4. Install static guide signs to/from port and FLL airport	N/A				Non-ITS; assessed separately.
5. Enhance port security through CVISN technologies	N/A				Data not available.
6. Implement scheduling system for cruise deliveries	Delay Reduction	$7,000	$34,000	5:1	
7. Provide traveler information via DMS at port exits	Travel Time Savings	$25,000	$205,000	8:1	
Alternative 2 – Rail-Related Improvements					
8. Provide real-time train locations to fire and rescue agencies	Delay Reduction	$22,000	$47,000	2:1	Does not include potential reduction in injuries and fatalities.
9. Improve communications with train operators	N/A				Data not available.
10. Better define incident management plans and responsibilities	N/A				Data not available.
11. Upgrade dispatch capabilities, rail signal system and crossings	Travel Time Savings	$330,000,000	N/A		Tri-rail has not yet calculated time savings due to double-tracking.
Alternative 3 – Incident Management Improvements					
12. Continue improving the regional incident management program	N/A				Data not available.
13. Share resources; create inventory of clearance equipment	Agency Cost Savings	$10,000	$177,000	18:1	
14. Upgrade communications with towing contractors	Reduced Incident Response Times and Travel Time Savings				Data not available.
15. Provide weather and drainage data to HAZMAT responders	Reduced Incident Response Times and Travel Time Savings	$49,000	$133,000	3:1	Data not available for Travel Time Savings calculation.
16. Work to institute a statewide "Quick-Clearance" agreement	N/A				Non-ITS; data not available.

[1] and [2] 1995 U.S. Dollars to be consistent with dollar values in the latest version of IDAS.

Table 5.1 Summary of Benefit/Cost Analysis (continued)

Alternatives	Measure	Annual Cost[1]	Annual Benefit[2]	B/C Ratio	Comment
Alternative 4 – Outreach and Communication Improvements					
17. Improve communications among regional ITS programs	N/A				Data not available.
18. Establish a freight stakeholders committee	N/A				Data not available.
19. Create a web site for freight/ITS information sharing	N/A				Data not available.
20. Provide outreach and education	N/A				Data not available.
Alternative 5 – Better Use of Data					
21. Identify and collect additional data	N/A				Data not available.
22. Integrate available databases into centralized system	Agency Cost Savings	$5,000	$21,000	4:1	
23. Use system performance data to improve long-range transportation planning activities	Agency Cost Savings				Data not available.
24. Use current/real-time data to improve regional traffic management system activities	N/A				Data not available.
Alternative 6 – Traffic Management Improvements					
25. Optimize signal timing for key freight movements on east-west arterials	Travel Time Savings	$16,000	$285,000	18:1	

[1] and [2] 1995 U.S. Dollars to be consistent with dollar values in the latest version of IDAS.

5.3 Identify and Prioritize Strategies for Implementation

Each and every ITS strategy must be evaluated in some way and considered for implementation. Since not all ITS strategies were able to be quantified for reasons described above, their level of importance and feasibility are not as apparent as those strategies with benefit/cost ratios. This made the task of comparing and prioritizing the strategies more difficult. To compensate for this problem, a set of implementation criteria was developed that takes all the strategies into consideration, with or without benefit/cost ratios. The criteria are as follows:

- **High Benefit/Cost Ratio** – Strategies that stand out as having very high returns on investment.

- **High Benefit/Cost Ratio and Low Cost** – Strategies that are relatively inexpensive to implement in terms of cost, and have a benefit/cost ratio of 5:1 or higher.

- **Not So High Benefit/Cost Ratio, but Very Low Cost –** Strategies that are relatively inexpensive to implement in terms of cost, and have a benefit/cost ratio of 2:1 or higher.

- **Strategies that Improve Safety and/or Emergency Issues** – Strategies that focus on safety were considered critical, as they have potential for even greater non-monetary benefits (i.e., reduction of personal injuries and fatalities) than those incorporated in the benefit/cost evaluation were considered critical.

- **Strategies that Improve Security** – As national security issues currently are a high priority for all transportation agencies, strategies that focus on security were considered critical, as they have potential for even greater benefits than those incorporated in the benefit/cost evaluation.

- **Strategies Necessary to Effectively Implement the Above Five Criteria** – Some of the strategies are vital to the success of other new systems being implemented, such as public outreach and education; therefore, these are considered important even without benefit/cost numbers.

The original scope of work proposed to select the best of the six defined alternatives for inclusion in the Implementation Plan. As the evaluation was carried out, it became clear that this was no longer in Broward County's best interest. For example, in many instances, there were individual strategies within an alternative that had strong stand alone benefit/cost ratios. Therefore, selecting one overall dominant alternative, such as Alternative 1 – Port Everglades Access Improvements, would preclude the inclusion of individual strategies from other alternatives, thus limiting the effectiveness of the overall ITS program. To maximize the potential for realized benefits from the most desirable ITS strategies, a new alternative was developed that incorporated a mixture of all the ITS strategies that successfully met the above evaluation criteria. These selected strategies were grouped into Alternative 7 – Improvements Recommended for Implementation. Table 5.2 lists each of the ITS strategies included in the new Alternative 7 as well as their reason for being selected. Note that the numbering corresponds to the complete list of strategies provided in Table 5.1.

Table 5.2 Improvements Recommended for Implementation

Recommended Strategy	Criteria Met	Lead Organization	Next Steps
1. Speed warning system at I-595 terminus	High B:C (130:1) and Safety	FDOT D4, BC TED	Funds allocated; developing RFP
25. Optimize signals for freight movements	High B:C (18:1) and Low Cost	BC TED, FDOT D4	Identify freight movements; adjust signal timings
13. Clearance equipment sharing	High B:C (18:1) and Low Cost	FDOT D4, Turnpike	Form MOU; design and implement system
7. Traveler info via DMS at port exits	High B:C (8:1) and Security	Port Everglades, BC TED	Form MOU; design and implement system
8. Real-time train locations to fire/rescue	Safety/Emergency Issue (2:1)	FEC, CSX, BC Fire/Rescue	Form MOU; design and implement in both rail corridors
6. Appointment system for cruise deliveries	Low Cost and Security (5:1)	Port Everglades, Private Industry	Form MOU; design and implement system
22. Integrate data into central database	Low Cost (4:1)	BC MPO, BC TED, FDOT	Identify data; integrate sources
20. Outreach, communications, and info sharing	Necessary for implementation of others	BC MPO	Establish freight stakeholders committee; promote regional programs; develop out-reach and education programs

Brief descriptions of all the recommended strategies are provided below.

1. Install speed warning system at I-595 terminus

Due to high truck and automobile speeds, sharp curves and downgrades, there are safety concerns at the eastbound terminus of I-595. Although a geometric redesign is in the design phase, construction will not be complete for a minimum of five or six years. A temporary ITS speed warning system has been recommended to mitigate the problem in the interim. The deployment would be a standalone system employing radar speed detection and one DMS.

25. Optimize Signal Timing for Key Freight Movements on East-West Arterials

An arterial traffic signal optimization system is already in place in Broward County and the technology includes preemption and priority capabilities. This strategy involves using the current system to provide priority to typical truck movements at key east-west arterials regionwide, particularly during peak hours. Research and coordination with the trucking industry would be necessary to identify appropriate deployment locations, as well as any impacts on non-truck traffic.

13. Share Resources; Create Inventory of Clearance Equipment

Currently, there is insufficient clearance/salvage equipment in Broward County for crashes that involve heavy vehicles. For example, I-95 has specialized equipment to right

overturned tractor-trailers and Florida's Turnpike does not. As these roadways are parallel, it geographically makes sense to share some of this equipment. In an effort to reduce response times to incidents involving trucks, this strategy would involve creating an inventory of shared clearance equipment that can be accessed by both FDOT District 4 and Florida's Turnpike when needed.

7. Traveler Information via DMS at Port Everglades Exits

Currently, there is no traffic information available for vehicles exiting Port Everglades. This strategy would employ DMS to inform motorists exiting the port of important traffic information, such as major incidents on I-95 and the Turnpike, as well as provide security-related information, to facilitate route selection. The deployment would consist of one roadside DMS at each of the exits from Port Everglades.

8. Provide Real-Time Train Locations to Fire and Rescue Response Vehicles

FEC Railway currently provides real-time freight train locations to local fire houses so their response vehicles can avoid lengthy delays at grade crossings when responding to an emergency. This strategy involves an upgrade/expansion of this program to provide train location data to all the regional fire and rescue agencies in Broward County, as well as an implementation of a similar system for the SFRC. The deployment would consist of emergency management center hardware, software, and communications as well as on-board communications and GPS for the emergency response vehicles.

6. Appointment System for Cruise Ship Deliveries

New security policies only allow pier-side parking along a ship for one truck at a time, causing lengthy truck queues along key access roads within the port. The queuing interferes with passenger arrivals for cruise ships and wastes valuable time. The implementation of an appointment scheduling system would likely improve operations and reduce wait times. Delivery trucks would sign up for a particular time slot rather than having to wait in a long queue, as deliveries currently are allowed one truck at a time on a first-come, first-served basis. The deployment would consist of a web-based appointment system comprised of hardware, software, integration, office space, labor, and communications.

22. Integrate Available Databases into Centralized System

Currently, there is a significant volume of freight data collected, but it is not integrated. This strategy involves integrating existing databases to increase understanding of freight-related issues in the region (accident data, freight volume data, freight trip data, etc.). This would consist of making more effective use of existing standalone databases. To start, the following resources should be integrated as part of this effort:

- FDOT Traffic Info CD;
- FDOT Roadway Characteristics Inventory;
- Crash Analysis Reporting System (CARS);
- TMC data;

- CVO data; and
- MPO long-range planning data.

20. Provide Outreach and Education

Although there are many local, regional and statewide ITS deployments, the general public and some decision-makers lack awareness about the benefits of ITS. This strategy could include the upgrade of current outreach and education programs, as well as the development of new programs that increase the visibility and understanding of ITS deployments and their benefits (including the ITS deployments that are part of this plan).

Similarly, the general public and some decision-makers lack understanding of the importance of freight in their daily lives. This strategy also could include new and improved outreach/educational tools that teach the importance of freight, and how to drive safely in the vicinity of commercial vehicles and when approaching at-grade crossings.

6.0 ITS Implementation Plan

Where the FGMS defined the framework for a regional freight plan and program, this ITS Intermodal Plan project provides the foundation for a coordinated ITS intermodal program for Broward County. These two separate efforts have been undertaken as one project. The overall goal is to have closely coordinated results together in one freight and goods movement report that includes both a section on ITS applications for freight, and a standalone ITS intermodal plan. It also has provided the opportunity for interagency coordination, particularly with ongoing major security changes and plans at Port Everglades.

The first task of this project involved close coordination with the FTAC developed for the FGMS in addition to key ITS stakeholders. It also involved scheduling and attending meetings/presentations to provide outreach to these key stakeholders. One key achievement under Task 1 included working with local ITS stakeholders and Port Everglades to establish the appropriate sites for underground conduit runs within the Port that will allow for state-of-the-art communications for future ITS devices and equipment. This conduit will facilitate future integration of system monitoring and operations between the Port, FDOT and Broward County.

The next task involved the collection of all available data related to freight flows and ITS in order to identify the key transportation mobility, safety, and security issues for freight movements in the region. These issues were identified by conducting personal interviews with public and private stakeholders as well as performing an analysis of related reports, studies, documents, plans and data. The results of this research were compiled in the form of a Needs and Deficiencies Statement for Broward County.

It is important to understand that ITS applications that specifically address freight issues are a relatively new concept. Southeast Florida is breaking new ground by conducting this project, which strives to identify ITS solutions that are designed to explicitly address freight issues in their region. Task 3 involved researching and compiling a comprehensive list of current ITS applications that have potential to improve or facilitate freight operations. It also involved a mapping exercise to match each item identified in the Needs and Deficiencies Statement with a potential ITS mitigation strategy. The results of the mapping exercise were presented to the stakeholders for review and comment. CS facilitated a group exercise with the stakeholders where a pass/fail analysis and priority ranking were conducted, and appropriate lead agencies were identified for each ITS mitigation strategy.

Task 4 involved identifying all the components that comprise each of the ITS mitigation strategies, which at this point have been termed "projects." This task also included an evaluation of the potential impacts of these projects in order to identify which projects will be recommended for implementation. After evaluation criteria and performance measures were selected, a benefit/cost analysis was conducted, primarily using values from the ITS Deployment Analysis System benefit/cost database. Using the results of the benefit/

cost analysis and other considerations, eight ITS mitigation projects were compiled into one grouping, called Alternative 7. Each of the projects within this preferred alternative are included in the Implementation Plan.

In summary, over the course of this project, key freight issues were identified and ITS strategies to mitigate these issues were researched, mapped and evaluated. Task 5 involves the development of a plan for implementing the resultant ITS projects and ensuring their ongoing success through an overall ITS-for-freight program. This chapter includes results of Task 5.

The following Implementation Plan is intended to provide guidance for Broward County MPO and their affiliated regional stakeholders to implement the projects within the preferred alternative and realize their potential benefits. It is essentially a recipe book that will provide directions for making each of the project concepts within Alternative 7 into a reality. The Implementation Plan includes the following elements for each of the projects and programs recommended for the Broward County ITS Intermodal Plan:

- Definition of the Preferred Alternative;
- Recommendations for identifying project and program ownership and stakeholder roles and responsibilities;
- Recommendations for project phasing (i.e., short-term, medium-term, etc.) and program development;
- Cost estimates and potential funding sources;
- Integration, resource and information sharing, and coordination opportunities;
- Recommendations for future planning and performance assessments;
- Operations and maintenance considerations; and
- Recommendations for compliance with the regional ITS architecture.

6.1 Preferred Alternative Definition

The evaluation conducted under Task 4 resulted in the recommendation of eight projects to be included in the preferred alternative. This Alternative 7 is comprised of the following.

- **Install Speed Warning System at I-595 Terminus.** A temporary ITS speed warning system has been recommended to mitigate the safety concerns at the eastbound terminus of I-595. The deployment would be a standalone system employing speed detection and one DMS.

- **Optimize Signal Timing for Key Freight Movements on East-West Arterials.** This strategy involves using the current traffic signal optimization system to provide priority to typical truck movements at key east-west arterials regionwide, particularly during peak hours.

- **Share Resources; Create Inventory of Clearance Equipment.** In an effort to reduce response times to incidents involving trucks, this strategy would involve creating an inventory of shared clearance equipment that can be accessed by both FDOT District 4 and Florida's Turnpike when needed.

- **Traveler Information via DMS at Port Everglades Exits**. This strategy would employ DMS to inform motorists exiting the port of important traffic information, such as major incidents on I-95 and the Turnpike, or security-related information, to facilitate route selection.

- **Provide Real-Time Train Locations to Fire and Rescue Response Vehicles.** FEC Railway currently provides real-time freight train locations to local fire houses so their response vehicles can avoid delays at grade crossings when responding to an emergency. This strategy involves an upgrade/expansion of this program for all the regional fire and rescue agencies in Broward County, as well as an implementation of a similar system for the SFRC.

- **Appointment System for Cruise Ship Deliveries.** The implementation of an appointment scheduling system for cruise ship deliveries would likely improve operations and reduce wait times. Delivery trucks would sign up for a particular time slot rather than having to wait in a long queue.

- **Integrate Available Databases into Centralized System.** This strategy involves integrating existing databases to increase understanding of freight-related issues in the region (accident data, freight volume data, freight trip data, etc.). This would consist of making more effective use of existing standalone databases.

- **Provide Outreach and Education.** This strategy could include the upgrade of current outreach and education programs, as well as the development of new programs that increase the visibility and understanding of ITS deployments and their benefits. It also could include new and improved outreach/educational tools that teach the importance of freight, and how to drive safely in the vicinity of commercial vehicles and at-grade crossings.

6.2 Recommended Project Ownership and Stakeholder Roles and Responsibilities

It is important to note that although the ITS Intermodal Plan has been funded and managed by the Broward County MPO, implantation of the individual projects is not the typical role

played by the MPO. In addition, it is not the role of the MPO to impose the projects on any of the stakeholders. These projects have been identified and approved, at least on a preliminary and conceptual level, by the contributing stakeholders who participated throughout this effort. With this in mind, the fundamental role of the Broward County MPO at the conclusion of this ITS Intermodal Plan project is to continue to build consensus, facilitate interagency coordination, and provide technical support and resources where possible in order to make these ITS projects into a reality.

Moreover, accountability needs to be created to ensure each of these projects gets a fair chance to make it to the implementation stages. The first action item as a result of this plan should be the identification/development of a project team for each of the eight projects. The designation of a team leader for each of these projects is imperative for success. The project leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. Therefore, the project leader will most likely be a representative from the project "owner." By definition, the project owner is the organization with the expertise, resources, and right-of-way ownership required for deployment of the project. As such, this organization, and the project leader will be well positioned to build the project team and successfully manage the project.

Project owners have been nominated by the stakeholders during the mapping exercise meeting conducted under Task 3 using the following criteria:

- What organization(s) need to participate?
- Which organization(s) will likely benefit from the ITS strategy?
- Does the ITS strategy build off another existing project?
- Who should own or operate the system (right-of-way, etc.)?
- Who has the resources?
- If this is a group initiative, who should take the lead?

Sometimes two or more project owners were identified as equally important partners. The resulting list of project owners and key stakeholder participants for each project are presented in Table 6.1. Most likely, the list of key stakeholders will change and grow as each projects matures.

Table 6.1 Recommended Project Owners and Key Stakeholders

Project Name	Owners	Key Stakeholders
Install speed warning system at I-595 terminus.	Florida Department of Transportation (FDOT) District 4, Port Everglades	Broward County Traffic Engineering Department (TED), Broward County MPO
Optimize Signal Timing for Key Freight Movements on East-West Arterials.	Broward County TED	Private trucking industry, FDOT District 4, Broward County MPO
Share Resources; Create Inventory of Clearance Equipment.	FDOT District 4, Florida's Turnpike	Towing contractors, Broward County MPO
Traveler Information via DMS at Port Everglades Exits.	Port Everglades, Broward County TED	I-95 Corridor Coalition (Information Exchange Network), FDOT District 4, Broward County MPO
Provide Real-Time Train Locations to Fire and Rescue Response Vehicles.	Florida East Coast Railway (FEC), Tri-Rail, Fire and Rescue	SFRC, Broward County TED, Broward County MPO
Appointment System for Cruise Ship Deliveries.	Port Everglades and private trucking industry	Broward County MPO
Integrate Available Databases into Centralized System.	FDOT Central Office – Planning	Broward County TED, Broward County MPO
Provide Outreach and Education.	Broward County MPO	All stakeholders

6.3 Recommended Project Phasing and Program Development

Recommended Project Phasing

Projects have been divided into the following categories: immediate, short-term, medium-term, and ongoing. Although the projects that made it into the preferred alternative are all regarded as high priority, not all of the initiatives can be accomplished at the same time. Rather, careful consideration is needed to allow each project to be implemented at the appropriate pace for success. As such, the following phasing categories are recommended. The project prioritizations provided by stakeholders during the mapping exercise under Task 3 and the unique nature/circumstances of each individual project have been carefully considered to determine these phasing recommendations. Explanations for each are provided below.

Immediate

Projects under this category are urgent and high priority. For these projects to achieve the anticipated benefits, they must be developed and deployed as soon as possible. Only one project has been identified for this category, based on the temporary nature of the deployment.

- **Install Speed Warning System at I-595 terminus.** This project is intended to be procured and operated as a temporary solution to a safety problem that will be addressed by a major roadway redesign that will not be in place for at least six years. In the interim, this curve speed warning system has potential to increase roadway safety even before the construction of the new roadway design begins. Because this temporary project has potential for reducing crashes, will be a standalone system, and is not very complex in nature, it is recommended that immediate steps begin now for implementation.

Short Term

Projects under this category have an implementation timeline of zero to two years. Although the project owners and stakeholders should designate a team leader and begin putting together their project teams as soon as possible, these projects will require research (such as a feasibility study), joint partnership agreements, and/or funding sources that will require a significant amount of time to secure. However, these projects represent initiatives that should be started now to coincide with other regional ITS elements.

- **Optimize Signal Timing for Key Freight Movements on East-West Arterials.** A thorough feasibility study is required to identify corridors and turning movements for which signal timing changes could potentially improve freight truck movements on arterials in Broward County. Although this feasibility study can begin right away, this project will need to be coordinated with other deployments in the region. For example, coordination is required with the Broward County ATMS project, which involves the deployment of new communications and signal system components. Phase 1 Project Area of the ATMS project includes Port Everglades and its surrounding roadways. If the feasibility study results in changes to truck turning movements at signals in and around Port Everglades, it is possible to begin improving freight turning movements in this area first.

- **Share Resources; Create Inventory of Clearance Equipment.** The first action item for this project is to arrange a meeting between appropriate representatives of Florida's Turnpike and FDOT District 4 to confirm interest in a partnership agreement of this type. If both parties agree to move forward, then the logistics of this equipment sharing program will need to be discussed and negotiated until both parties feel comfortable with all terms. A partnership agreement or memoranda of understanding will be required. It is recommended to start small and perhaps share one piece of equipment to work out the details. Implementation time will depend on the complexity level of the system (i.e., will new and sophisticated communication devices be needed?)

- **Traveler Information via DMS at Port Everglades Exits**. For this ITS project to be successful, the signs should be deployed either before or concurrently with the new security gates at Port Everglades. Therefore, immediate coordination is necessary (at least in terms of design) with the security initiative at Port Everglades as the new gates are slated for construction over the next year. In addition, coordination is needed with the Broward County ATMS project to ensure that appropriate communications are available with the information sources such as the Broward County Traffic Management Center and the I-95 Information Exchange Network (IEN).

- **Integrate Available Databases into Centralized System.** There are many existing standalone databases in the region that if integrated, would increase understanding of freight-related issues in the region. Some of these resources include: the FDOT Traffic Info CD, FDOT Roadway Characteristics Inventory, CARS, TMC data, CVO data, and MPO long-range planning data. In order to integrate all of these databases, a platform would need to be selected to house all of this information. This effort could prove complex since the aforementioned databases reside in a variety of software formats, requiring potentially complicated conversion processes and ongoing procedures for updating the system.

Medium Term

Projects under this category have an implementation timeline of two to five years. These projects may require some significant research, planning, coordination and/or funding for successful implementation. These projects have a longer timeframe because the represent public/private projects that will require significant outreach activities. In addition, the projects/programs that would impact these projects are still in development.

- **Provide Real-Time Train Locations to Fire and Rescue Response Vehicles.** Currently, local fire departments can track FEC trains to determine which at-grade crossings are clear for responder use and which are blocked by a crossing train. A study should be conducted to learn how this system works to benefit from lessons learned and success stories. Following this study, a new and more robust system can be planned and designed. The system should be coordinated with the double-tracking initiative because at-grade rail crossings are being upgraded as part of this project. In addition to the system design considerations, many organizations should be a part of this effort: all public and private entities operating trains on the tracks, and emergency response agencies such as fire, rescue, and police. The SFRC can either participate in these early stages of this initiative and design their own system in parallel, or keep informed of progress before implementing their own similar system.

- **Appointment System for Cruise Ship Deliveries.** At this time, Port Everglades' immediate focus is rightfully on their new security initiative, which includes new Port identification cards, new infrastructure and procedures. Once these measures are in place, the Port can then focus on implementing a new electronic appointment system for cruise ship delivery times. This system would require outreach efforts to get buy-in from the private delivery companies. Once their interest and participation has been secured and the new gating procedures are fully in place, this system can be designed and implemented.

Ongoing

The projects under this category will be addressed uniquely, as they are more suitable for the overall ongoing ITS Intermodal Program's goals. Only one project has been assigned to this category. This project is not a physical ITS project, but rather an institutional program that should be done on an ongoing basis.

- **Provide Outreach and Education.** For each of the projects mentioned above, outreach and education are important for the participating stakeholders as well as the traveling public. Therefore, there should be an outreach component to all freight and ITS projects, particularly those proposed under this project. If outreach efforts are made for each new ITS or freight project in the region, the benefits of these projects will be communicated and more clearly understood by policy-makers, executive-level decision-makers, and the traveling public. Moreover, general outreach and education about ITS benefits and the importance of freight is key to the future success of the ITS Intermodal Program as a whole. A new outreach and education program should be developed to target policy-makers, executive-level decision-makers, and the traveling public. These higher-level programs could be led by regional, State or Federal organizations, or some combination thereof.

Program Development

In reviewing the phasing recommendations, another important factor to consider is program development. Florida's ITS program development and implementation activities are documented through the following. Potential funding sources for these projects are listed in the following section of this chapter.

- **Florida Transportation Plan.** This plan is Florida's Long-Range Plan and currently covers material through 2020. It is more of a policy document and does not really include a plan of specific projects.

- **10-Year ITS Cost Feasible Plan.** This plan exclusively covers ITS projects in Florida. It is oriented toward interstate projects. For example, it would cover an ITS project on I-595, but not an arterial signal project.

- **Five-Year Work Program.** This plan is Florida's State Transportation Improvement Program (STIP). Unlike the 10-Year ITS Cost Feasible Plan, the Five-Year Work Program can include non-interstate ITS projects.

- **Statewide Freight Mobility Plan.** Currently, a Freight Network and Modal Linkages Study is being conducted for Florida. This study could result in identification of additional funding sources that might be appropriate for the projects listed in this Implementation Plan. The Broward County MPO should monitor the progress of this initiative as an opportunity may arise shortly.

- **Strategic Intermodal System (SIS)**. Another opportunity to watch is the SIS. Under this initiative, certain facilities have been labeled key freight entities, including interstates, the turnpike, ports, airports, and some connectors. The DOT is in the process of developing an initial funding program for operational improvements on these facilities.

6.4 Project Cost Estimates and Potential Funding Sources

The detailed, annualized cost estimates for each project is provided in Appendix A. In this section, additional cost considerations as well as potential funding sources are presented.

Project Cost Estimates

- **Install Speed Warning System at I-595 terminus.** The annual cost estimate of $11,000 includes an annualized capital cost for the system components as well as an annual operations and maintenance (O&M) cost estimate. Should the use of an engineering consulting company be required for the design and procurement of the system (as opposed to in-house), additional funds may be required for these activities. The Broward County MPO has secured some CMAQ funding to pay for this project.

- **Optimize Signal Timing for Key Freight Movements on East-West Arterials.** Average annual costs for LAN communications and signal controllers were used to estimate this system cost. Assuming this strategy would be applied to key turning movements at 10 signalized intersections, the annualized cost is approximately $16,000, inclusive of annualized capital and O&M costs. As the ATMS project involves the upgrade of signal controllers in Broward County, there also is a good possibility that some of the signal timing changes will be possible without purchasing new controllers or communications, and/or without incurring additional maintenance costs. This would significantly decrease the cost of the system. However, a study to determine the appropriate locations to make timing changes also is warranted. Should the use of a consulting company be required for conducting the study (as opposed to performing the necessary analysis in-house), additional funds may be required.

- **Share Resources; Create Inventory of Clearance Equipment.** As both parties currently operate traffic management systems, the additional expense needed would cover the integration required to track and share clearance equipment effectively. Therefore the annualized cost, including annualized capital and O&M costs, is approximately $10,000. Depending on the design and complexity of the system, additional funds could be required for system integration and possibly in-vehicle devices.

- **Traveler Information via DMS at Port Everglades Exits**. Average annual costs for TMC integration, communications, and roadside DMS at each of the three Port Everglades exits were used to estimate the annualized system cost of approximately $25,000. This estimate assumes some communications capabilities can be supplied as part of the current Port Everglades security initiative and/or the Broward County ATMS project. If not, costs could increase.

- **Provide Real-Time Train Locations to Fire and Rescue Response Vehicles.** This strategy involves an upgrade/expansion of the current program on the FEC that provides train location data to all the regional fire and rescue agencies in Broward County, as well as an implementation of a similar system for the SFRC. The deployment would

consist of emergency management center hardware, software, and communications as well as on-board communications and GPS for the emergency response vehicles. Assuming a conservative estimate of about 50 response vehicles would be equipped as part of this initiative, the annualized cost including capital and O&M becomes approximately $22,000. Costs are highly variable depending on the number of emergency vehicles to be equipped. Costs would significantly decrease if the system was designed without the use of on-board equipment.

- **Appointment System for Cruise Ship Deliveries.** The deployment would consist of a web-based appointment system comprised of hardware, software, integration, office space, labor, and communications. Including annualized capital and O&M costs, the average annual cost is approximately $7,000. If cruise ship delivery service companies perceive a high enough time savings value, it is possible they will enter into a public-private partnership with Port Everglades Operations to assist in the implementation the system. This could potentially offset a significant amount of the system cost.

- **Integrate Available Databases into Centralized System.** A cost estimate for this project is difficult to predict without a study to identify the platforms as well as which databases should be integrated first. Not all of the databases can be integrated at once. Rather, it is recommended that the highest priority databases be integrated first, and the rest will follow as resources allow. Should the use of an outside firm be required for conducting the integration (as opposed to performing the necessary integration in-house), additional funds could be required. The schedule and costs also could be impacted by the complexity of the integration efforts required.

- **Provide Outreach and Education.** The cost of this project is extremely variable. A small percentage of the cost for each aforementioned project (i.e., approximately two to five percent depending on the size and scope of the project) should be allocated for outreach, public relations, and education purposes. Any additional effort over and above those included as part of the budget in each project also should be included here. For example, a new outreach and education program developed to target policy-makers, executive-level decision-makers, and the traveling public be lead by regional, State or Federal organizations, or some combination thereof.

General Funding Considerations

TEA-21

In general, one important feature of TEA-21 is the great flexibility permitted in the use of Federal transportation funds. While demands on these funds to pay for needed road and bridge repairs are significant, many Federal programs also can be used for ITS systems. Under TEA-21, there are various funding programs that could be used to finance ITS projects. These programs include the National Highway System Program (NHS), the Surface Transportation Program (STP), Congestion Mitigation and Air Quality Program (CMAQ), the ITS Integration Program, and the Interstate Maintenance (IM) Program. Most ITS projects across the country have been funded through the ITS Integration program, its

predecessors or earmarked funds. It also should be noted that SAFE-TEA, the next generation of TEA-21, is expected to provide specific support for freight and ITS initiatives.

State and Local Funding

The ITS department at FDOT Central Office receives Federal funding to be allocated to the District offices. Currently, this funding source can only be applied to projects on the NHS, such as the interstate highways. As such, only two of the projects in this implementation could potentially be eligible to take advantage of this funding pool: 1) Install speed warning system at I-595 terminus and 2) Share Resources, Create Inventory of Clearance Equipment.

The State ITS office is thinking about allowing non-interstate projects to benefit from this funding source, as the Districts are very interested. Until then, funding for non-interstate ITS projects may come from monies set aside for the Five-Year Work Program and Broward County MPO. However, these funding sources are not assigned exclusively toward ITS or freight projects. As such, projects need to compete for funds with traditional transportation improvement projects, such as infrastructure upgrades.

Additionally and as noted in Section 6.3, the Statewide Freight Mobility Plan and the SIS should be closely monitored by the Broward County MPO and participating stakeholders as new funding opportunities may arise from these efforts in the near future.

Operations and Maintenance Funding

Ongoing funding for O&M of ITS systems has been a major challenge for the transportation industry. Relatively few non-toll transportation agencies have been able to establish a stable source of funding that allows for both day-to-day operation and replacement of equipment as it wears out or becomes obsolete. Federal sources that currently are used for O&M funding include CMAQ, NHS, and STP program funds. STP funds can be used for O&M activities with no time limit, and with an 80 percent Federal share, and 20 percent state local/share. NHS and CMAQ funds also can be used with an 80/20 split between Federal and state/local funds. CMAQ funds can be used after the three-year threshold if the project proves to continue providing air quality benefits.

Public-Private Partnerships

Public-private partnerships also can provide for O&M funding. There are many successful examples of public-private partnerships involving various deployments of ITS. As a general rule in traffic analysis, delay costs more per commercial vehicle than that of a personal vehicle. If the cost of delay is great enough and the potential benefit of the mitigation strategy is perceived as high enough, the private industry may be willing to share costs of implementing, operating and/or maintaining the system. Where possible, opportunities for such partnerships should be thoroughly explored.

6.5 Integration, Resource and Information Sharing, and Coordination Opportunities

Economy-of-scale is achieved when costs per unit are reduced through operational efficiencies. In terms of ITS projects, system integration and resource/information sharing have potential to significantly reduce capital, operations and maintenance costs.

Only the projects that ranked highest using the evaluation criteria in Task 4 are included in this Implementation Plan. It is therefore no surprise that most of these eight projects have high benefit/cost ratios because they have potential to capitalize from integration, resource sharing, and/or information sharing opportunities. Table 6.2 explains these opportunities. All of the projects involve multi-agency coordination at some level, as apparent in Table 6.1.

Table 6.2 Integration, Resource and Information Sharing Opportunities

Project Name	Integration	Resource/Info Sharing
Install speed warning system at I-595 terminus.	N/A	N/A
Optimize Signal Timing for Key Freight Movements on East-West Arterials.	N/A	Builds upon existing signal timing capabilities.
Share Resources; Create Inventory of Clearance Equipment.	Florida's Turnpike TMC and FDOT D4 TMC.	Shares incident clearance equipment.
Traveler Information via DMS at Port Everglades Exits.	Port Everglades and FDOT D4 TMC.	Provides traveler information to vehicles exiting the Port.
Provide Real-Time Train Locations to Fire and Rescue Response Vehicles.	Fire and Rescue, Police, and train operators along FEC and SFRC.	Provides train location data to emergency responders.
Appointment System for Cruise Ship Deliveries.	N/A	N/A
Integrate Available Databases into Centralized System.	Databases 'owned' by various organizations.	Provides new data set to all stakeholders.
Provide Outreach and Education.	N/A	N/A

6.6 Recommendations for Future Planning and Performance Assessments

The Florida Transportation Commission produces an annual report called the Performance and Production Review which includes reporting on several performance measures for major programs within FDOT. This annual review does not contain performance measures for ITS at this time. We know that ITS is a very cost-effective and

beneficial method of addressing the State's safety and capacity needs. However, it is difficult to prove the benefits of the ITS expenditures on the safety and mobility of Florida's transportation system without performance measurement techniques in place. This is especially true when considering the fact that in many cases, ITS projects are competing with traditional infrastructure improvement projects for the same pool of funding. Performance measures that assess operations, safety, capacity, etc., become increasingly important to create a level playing field.

ITS Florida currently is working with the Commission to develop appropriate performance measures to assess how effectively the implementation of ITS technologies are addressing the safety and capacity needs of our transportation system on a statewide and/or regional basis. The study will lead to a report recommending performance measures in three main categories: safety, operations and mobility. This process will not only serve the Commission's needs for performance measures but also lay the groundwork for the assessment of the planning, programming, design, deployment, management, operations and maintenance of Florida's ITS system. It is recommended that Broward County participate by joining the Task Team of state experts on the topic of ITS and performance measures that has been created specifically for this effort.

As the individual components of the ITS Intermodal Plan are developed and deployed, it is recommended that the project teams adopt criteria for the performance of ITS systems, and continue to develop tools to measure those criteria. On an annual basis, each of the above projects should be assessed based on their performance to determine if they are they meeting their objectives. A feedback loop needs to be created that continuously updates projects/programs/deployments. The FTAC provided positive feedback on performance measures such as delay, travel time reliability, crash rates, and fuel consumption and emissions levels. The following are key performance measures to be considered for each of the projects listed below.

- **Install speed warning system at I-595 terminus.**
  - Crash rates
- **Optimize Signal Timing for Key Freight Movements on East-West Arterials.**
  - Throughput at key intersections
- **Traveler Information via DMS at Port Everglades Exits.**
  - Travel time reliability
- **Provide Real-Time Train Locations to Fire and Rescue Response Vehicle**s.
  - Emergency response times
  - Customer satisfaction (fire and rescue agencies)

- **Appointment System for Cruise Ship Deliveries.**
  - Queue length
  - Customer satisfaction (delivery services)
- **Integrate Available Databases into Centralized System.**
  - Customer satisfaction (planning agencies)
- **Provide Outreach and Education.**
  - Customer satisfaction (target audience)

6.7 Operations and Maintenance Considerations

O&M considerations are particularly important during implementation, as the future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding.

Each of the projects in this document should include a clearly defined O&M plan of its own to ensure operational efficiency. This plan should list the system components along with the activities required to successfully operate and maintain them (equipment replacement, preventive maintenance, repair, etc.). Also in this O&M Plan, each of these activities should be paired with the organization responsible for carrying out those duties in order create accountability.

As it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects, securing funding for O&M is essential. Most of funding sources cited in Section 6.4 are more oriented toward capital investments. Consequently, ongoing funding for O&M of ITS systems has been a major challenge for the transportation industry. Potential funding sources for O&M are listed in Section 6.4 under the subheadings Operations and Maintenance Funding and Public Private Partnerships.

6.8 Recommendations for Compliance with the Regional ITS Architecture

The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems. Following these national guidelines, Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All of the ITS projects in this report should be designed in compliance with these ITS standards where possible to ensure compatibility.

"The Department should develop and maintain a statewide ITS architecture and supporting standards. This architecture should utilize the National ITS Architecture and adapt as needed to meet Florida's needs. The scope of a statewide architecture must recognize and accommodate existing regional ITS architectures in Jacksonville, Orlando, the Tampa Bay area, Miami and Ft. Lauderdale as well as corridor architectures such as for I-4, the Florida Turnpike and existing ITS infrastructure (legacy systems). The statewide ITS Architecture should focus on interurban and rural applications, but also should add value to urban areas. ITS development would be preceded by an analysis and mapping of the User Services needed to meet the adopted concept of operations."[1]

6.9 Overall ITS Intermodal Program Considerations

The implementation of ITS projects in this report represent a major challenge for Broward County, as it does for other municipalities around the country. The challenges to implementing ITS are largely institutional, and can be overcome with the use of analytical tools and regular coordination meetings. Southeast Florida has been very successful in the ongoing implementation of ITS projects.

In order to kick-start, establish and sustain an effective ITS-for-freight program, the following action items are recommended:

- Identify project leaders and establish project teams;
- Establish specific goals and a mission for ITS projects;
- Adopt criteria for the performance of ITS systems and develop tools to measure those criteria;
- Establish a regional freight stakeholders committee with public and private participants to identify and assess performance of projects, strategies, and initiatives (such as ITS) that address freight mobility;
- Create a stable funding source for ongoing operations and maintenance; and
- Increase awareness among stakeholders, staff responsible for project implementation, local officials and decision-makers about ITS and its benefits.

[1] "Florida's Intelligent Transportation System Strategic Plan" Final Report. August 23, 1999.

6.10 Incorporation of Other Regional Freight ITS Projects

The projects identified and developed for implementation as part of the ITS Intermodal Plan represent the initiatives that were deemed most likely to succeed with a positive impact on Broward County. However, for this plan to be successful, it is important to have a process for incorporating existing projects, as well as new projects identified and developed in the future. The ITS Intermodal Plan will guide all MPO-led initiatives for freight ITS applications. Therefore, a project must be included in this plan to receive programming and funding.

Existing Projects

Existing projects consist of those initiatives that have already gone through the established approval process. These projects, although developed outside of this plan, are recognized by this plan as official projects. As such, as these projects advance and become a reality, they will reflect on and contribute to the ITS Intermodal Plan. For example, the Broward County MPO, on behalf of FDOT District 4, submitted a project concept application to FHWA for ITS early deployment funding. This was in response to a request for ITS projects that enhance the security of the transportation system. The project concept developed by District 4 consisted of an advanced notification system along the I-75/I-595 corridor approaching Port Everglades to notify FHP and port security personnel of approaching trucks carrying high risk loads. The specific technologies proposed consist of:

- Gantry-mounted CVISN transponder readers with WIM system;
- CCTV system;
- Communication system linking CVISN transponder readers/CCTV system to remote monitoring sites at Port Everglades and Broward FHP Troop;
- Remote site monitoring work station; and
- Image detection/analysis system, including database.

These technologies will be integrated to provide load specific information in real-time for eastbound trucks destined for Port Everglades. To date, projects have not been awarded by FHWA. In fact, FHWA turned over all applications for these awards to the Department of Homeland Security for consideration and action; the current status of this project is unknown. However, if this project becomes funded and advances as an ITS early deployment project, it will become part of the ITS Intermodal Plan.

Future Projects

Future projects represent initiatives that have not been developed to date. As new project concepts are developed, they will need to conform to specific criteria before they are adopted by and included in the ITS Intermodal Plan. The following defines the steps to be undertaken by individual project leaders to be considered for adoption into the Plan:

- Develop project description, including justification for inclusion as a freight ITS project;
- Identify ITS technologies to be included;
- Provide documentation of benefits and costs;
- Define outreach and educational requirements for project deployment;
- Ensure compatibility with existing ITS deployments and Florida's ITS architecture;
- Identify involved stakeholders;
- Identify operations and maintenance requirements;
- Define funding requirements; and
- Define project schedule.

Based upon the specific project material, the MPO will make a decision regarding formal acceptance of the project. Upon approval, the project will become part of the ITS Intermodal Plan.

Other ITS Initiatives

In addition to ensuring incorporation of existing and new projects into the ITS Intermodal Plan, it will be equally important to monitor and coordinate with other ITS initiatives and programs. At the local level, this will include ongoing communication and collaboration with the overall ITS programs being deployed to better manage traffic in the tri-county region. At the state level, adherence to the defined architecture and standards will be critical. In addition, the CVISN program should be monitored as it continues to advance and expand. This can be accomplished through regular participation in the CVISN project meetings. In summary, to ensure the best chance for success, the ITS Intermodal Plan must strive to integrate and coordinate with other ITS projects, as appropriate, to ensure development of an efficient and effective ITS program in southeast Florida.

7.0 Summaries of Selected Projects

The implementation plan defined in Section 6.0 provides a functional overview of the projects included in the recommended alternative. This section provides project-based summaries to facilitate consensus-building with lead agencies. Key information about each project is presented on a one-page, double-sided reference sheet for ease of distribution.

7.1 Speed Warning System on I-595 Terminus

Due to high truck and automobile speeds, sharp curves and downgrades, there are safety concerns at the eastbound terminus of I-595 at Eller Drive. Although geometric redesign currently is in the design phase, construction will not be complete for a minimum of five years. This project involves the deployment of a temporary ITS speed warning system to mitigate the safety concerns in the interim.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – Florida Department of Transportation District 4 and Port Everglades.

Key Stakeholders – Broward County Traffic Engineering Department and Broward County Metropolitan Planning Organization (BC MPO).

Project Phasing

Immediate projects are urgent and high-priority. To achieve the anticipated benefits, they must be developed and deployed as soon as possible.

Immediate – This project is intended to be procured and operated as a temporary solution to a safety problem that will eventually be addressed by infrastructure redesign. Moreover, this system has potential to reduce crashes, will be a standalone system, and is not very complex in nature. To achieve maximum benefits, it is imperative that immediate steps begin now to achieve prompt and successful implementation.

System Components

The system would include a speed detector (e.g., radar) and one DMS. As a standalone system, only local communications and power would be required.

Integration, Resource/Information Sharing, and Coordination Opportunities

Not applicable as this is a standalone, temporary system.

System Cost Estimate

The system cost estimate of $35,000 was obtained from the American Signal Company (AmSig) for their Dynamic Curve Warning System. Assuming a five-year life cycle and $2,000 annual operations and maintenance (O&M) costs, the approximate annual cost of this project is $11,000.

Potential Funding Sources

The BC MPO has secured some Congestion Mitigation and Air Quality (CMAQ) program funding to pay for this project.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – One key performance measurement in this project is the crash rate in the last 1.8-mile segment of I-595 eastbound.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

As this is a standalone, temporary deployment, it is not essential for the speed warning system to be compliant. However, it would be in the County's best interest to design a system whereby at least some components can be used subsequent to this temporary period. In order for these components (e.g., DMS) to be reusable, they must be compliant with local standards, including the accepted ITS architecture.

7.2 Optimize Signal Timing for Key Freight Movements on East-West Arterials

An arterial traffic signal optimization system is already in place in Broward County and the technology includes preemption and priority capabilities. This strategy involves using the current system to provide priority to typical truck movements at key east-west arterials regionwide, particularly during peak hours. Research and coordination with the trucking industry would be necessary to identify appropriate deployment locations, as well as any impacts on non-truck traffic.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – Broward County Traffic Engineering Department.

Key Stakeholders – Private trucking industry, FDOT District 4, and Broward County MPO.

Project Phasing

Short-term projects have an implementation timeline of two years or less. These projects will require research, joint partnership agreements, and/or funding sources that will require a significant amount of time to secure. However, these projects represent initiatives that should be started now to coincide with other regional ITS elements.

Short-Term – This project will require a feasibility study to identify corridors and turning movements for which signal timing changes could potentially improve freight truck movements on arterials in Broward County. Although this feasibility study can begin right away, this project will need to be coordinated with other deployments in the region. For example, coordination is required with the Broward County Advanced Traffic Management System (ATMS) project, which involves the deployment of new communications and signal system components. Phase 1 Project Area of the ATMS project includes Port Everglades and its surrounding roadways. If the feasibility study results in changes to truck turning movements at signals in and around Port Everglades, it is possible to begin improving freight turning movements in this area first.

System Components

Since the feasibility study has not yet been completed, we have assumed that the timing changes would be applied to key freight turning movements at approximately 10 signalized intersections in Broward County. Therefore, 10 signal controllers are included in this system along with the necessary LAN communications.

Integration, Resource/Information Sharing, and Coordination Opportunities

The system modifications required for this project will build upon the existing signal system and the upgrade in progress. Therefore, no other integration is necessary. However there is an opportunity for the public sector to coordinate with the trucking industry to identify problem areas.

System Cost Estimate

The cost estimate was obtained using values from the ITS Deployment Analysis System (IDAS). The approximate annual cost for 10 signal controllers and LAN communications is $16,000, inclusive of capital and O&M costs. As the ATMS project involves the upgrade of signal controllers, it is possible that some or all of the signal timing changes will be possible without purchasing new equipment or communications, and without additional O&M costs. However, if a consultant is required to conduct the feasibility study, additional costs may be required.

Potential Funding Sources

The Federal TEA-21 includes various funding sources that could be used to finance ITS projects. These programs include the National Highway System Program, the Surface Transportation Program, Congestion Mitigation and Air Quality Program, the ITS Integration Program, and the Interstate Maintenance Program. SAFE-TEA is expected to provide specific support for freight and ITS initiatives. Monies set aside for Florida's Five-Year Work Program and the Broward County MPO are other viable options. Potential new opportunities include the Statewide Freight Mobility Plan and the SIS. Where possible, public-private partnerships should be explored to share the costs of implementing, operating and/or maintaining the system.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – One key performance measurement in this project is the change in vehicle throughput at the modified intersections. This would include an analysis of all turning movements for all vehicle types at the selected intersections as well as an evaluation of impacts at nearby intersections.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

7.3 Share Resources; Create Inventory of Clearance Equipment

Currently, there is insufficient clearance/salvage equipment in Broward County for crashes that involve heavy vehicles. For example, I-95 has specialized equipment to right overturned tractor-trailers and Florida's Turnpike does not. As these roadways are parallel, it geographically makes sense to share some of this equipment. In an effort to reduce response times to incidents involving trucks, this strategy would involve creating an inventory of shared clearance equipment that can be accessed by both FDOT District 4 and Florida's Turnpike when needed.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – FDOT District 4 and Florida's Turnpike.

Key Stakeholders – Towing contractors and Broward County MPO.

Project Phasing

Short-term projects have an implementation timeline of two years or less. These projects will require research, joint partnership agreements, and/or funding sources that will require a significant amount of time to secure. However, these projects represent initiatives that should be started now to coincide with other regional ITS elements.

Short-Term – This project should be initiated through a meeting between appropriate representatives of Florida's Turnpike and FDOT District 4 to confirm interest in a partnership agreement of this type. If both parties agree to move forward, then the logistics of this equipment sharing program will need to be discussed and negotiated until both parties feel comfortable with all terms. A partnership agreement or memorandum of understanding will be required. It is recommended to start small and perhaps share one piece of equipment to work out the details. Implementation time will depend on the complexity level of the system (i.e., will new and sophisticated communication devices be needed?)

System Components

As both parties currently operate traffic management systems, the sole system component is software and database development in order to track and share clearance equipment effectively.

Integration, Resource/Information Sharing, and Coordination Opportunities

This project will require Florida's Turnpike TMC and FDOT D4 TMC to develop an integrated system to share information on the availability and location of incident clearance equipment. The system will allow the two agencies to use the same pool of equipment. Full deployment of this system also should include electronic connections with the contracted tow operators.

System Cost Estimate

The cost estimate was obtained using values from the ITS Deployment Analysis System (IDAS). We used the IDAS values for TMC integration as this a conservative estimate for software/database development and integration. The average annual cost for this type of integration is $10,000, inclusive of annualized capital and O&M costs.

Potential Funding Sources

The Federal TEA-21 includes various funding sources that could be used to finance ITS projects. These programs include the National Highway System Program, the Surface Transportation Program, Congestion Mitigation and Air Quality Program, the ITS Integration Program, and the Interstate Maintenance Program. SAFE-TEA is expected to provide specific support for freight and ITS initiatives. Monies set aside for Florida's Five-Year Work Program and the Broward County MPO are other viable options. Potential new opportunities include the Statewide Freight Mobility Plan and the SIS. Where possible, public-private partnerships should be explored to share the costs of implementing, operating and/or maintaining the system.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – One key performance measurement in this project will be the change in response time and overall incident clearance time with and without the system. Incident clearance time is already tracked throughout the region.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

7.4 Traveler Information via DMS at Port Everglades Exits

Currently, there is no traffic information available for vehicles exiting Port Everglades. This strategy would employ DMS to inform motorists exiting the port of important traffic information, such as major incidents on I-95, to facilitate route selection. The DMS also can be used to provide security-related information. The deployment would consist of one DMS at each of the three exits from Port Everglades.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – Port Everglades and Broward County Traffic Engineering Department.

Key Stakeholders – I-95 Corridor Coalition, Florida's Turnpike, FDOT District 4, and Broward County MPO.

Project Phasing

Short-term projects have an implementation timeline of two years or less. These projects will require research, joint partnership agreements, and/or funding sources that will require a significant amount of time to secure. However, these projects represent initiatives that should be started now to coincide with other regional ITS elements.

Short-Term – For this ITS project to be successful, the signs should be deployed either before or concurrently with the new security gates at Port Everglades. Therefore, immediate coordination is necessary (at least in terms of design) with the security initiative at Port Everglades as the new gates are slated for construction over the next year. In addition, coordination is needed with the Broward County ATMS project to ensure that appropriate communications are available with the information sources such as the Broward County Traffic Management Center and the I-95 Information Exchange Network (IEN).

System Components

Since the Broward County TMC is already under construction, the system will require TMC integration, communications, and three DMS panels and towers (one for each gate).

Integration, Resource/Information Sharing, and Coordination Opportunities

This project will require close coordination between Port Everglades and the FDOT D4 TMC. The system will provide traffic conditions from the TMC via DMS installed at the port exits. Integration between the TMC and the Port's SOC, as appropriate, will ensure truck drivers get real-time access to accurate traveler information.

System Cost Estimate

The cost estimate was obtained using values from the ITS Deployment Analysis System (IDAS). Since the Broward County TMC cost already has been incurred, we assumed this

project would incur the additional cost equivalent to approximately 10 percent of the IDAS default value for TMC integration. Adding the costs for all system components, the approximate annual system cost is $52,000, inclusive of capital and O&M costs.

Potential Funding Sources

The Federal TEA-21 includes various funding sources that could be used to finance ITS projects. These programs include the National Highway System Program, the Surface Transportation Program, Congestion Mitigation and Air Quality Program, the ITS Integration Program, and the Interstate Maintenance Program. SAFE-TEA is expected to provide specific support for freight and ITS initiatives. Monies set aside for Florida's Five-Year Work Program and the Broward County MPO are other viable options. Potential new opportunities include the Statewide Freight Mobility Plan and the SIS. Where possible, public-private partnerships should be explored to share the costs of implementing, operating and/or maintaining the system.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – One key performance measurement in this project will be the change in travel time reliability for trucks exiting the port terminals. This will directly impact their ability to predict ETAs more accurately.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

7.5 Provide Real-Time Train Locations to Fire and Rescue Response Vehicles

FEC Railway currently provides real-time freight train locations to local fire houses so their response vehicles can avoid lengthy delays at grade crossings when responding to an emergency. This project involves an upgrade/expansion of this program to provide train location data to all the regional fire and rescue agencies in Broward County, as well as an implementation of a similar system for the SFRC.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – Florida East Coast Railway (FEC), Tri-Rail, and Fire and Rescue.

Key Stakeholders – South Florida Rail Corridor (SFRC), Broward County Traffic Engineering Department, and Broward County MPO.

Project Phasing

Medium-term projects have an implementation timeline of two to five years. These projects have a longer timeframe because they represent public-private projects that will require significant out-reach activities and are tied to other projects/programs that are still in development.

Medium-Term – This project will build off of an existing program. Currently, local fire departments can track FEC trains to determine which at-grade crossings are clear for responder use and which are blocked by a crossing train. A study should be conducted to learn about how this system works, lessons learned and success stories. Following this study, a new and more robust system can be planned and designed. The system should be coordinated with the double-tracking initiative because at-grade rail crossings are being upgraded as part of this project. In addition to the system design considerations, many organizations should be a part of this effort: all public and private entities operating trains on the tracks, and emergency response agencies such as fire, rescue, and police. The SFRC can either participate in these early stages of this initiative and design their own system in parallel, or keep informed of progress before implementing their own similar system.

System Components

The deployment would consist of emergency management center hardware, software, ISP, wireless communications, on-board communications and GPS for each of the emergency response vehicles.

Integration, Resource/Information Sharing, and Coordination Opportunities

This program requires the development of a real-time train location system that provides real-time information to emergency responders. Integration and coordination of the information will be critical to the success of this program.

System Cost Estimate

The cost estimate was obtained using values from the ITS Deployment Analysis System (IDAS). Since we were unable to obtain the total number of emergency response vehicles, we therefore used the conservative assumption of 50 vehicles. Adding all the system components, the approximate annual system cost is $22,000, inclusive of capital and O&M costs.

Potential Funding Sources

The Federal TEA-21 includes various funding sources that could be used to finance ITS projects. These programs include the National Highway System Program, the Surface Transportation Program, Congestion Mitigation and Air Quality Program, the ITS Integration Program, and the Interstate Maintenance Program. SAFE-TEA is expected to provide specific support for freight and ITS initiatives. Monies set aside for Florida's Five-Year Work Program and the Broward County MPO are other viable options. Potential new opportunities include the Statewide Freight Mobility Plan and the SIS. Where possible, public-private partnerships should be explored to share the costs of implementing, operating and/or maintaining the system.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – The key performance measurements in this project will consist of the change in emergency response times and the overall customer satisfaction (emergency response staff) experienced.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

7.6 Appointment System for Cruise Ship Deliveries

New security policies only allow pier-side parking along a ship for one truck, causing lengthy truck queues along key access roads within the port. The queuing interferes with passenger arrivals for cruise ships and wastes valuable time. The implementation of an appointment scheduling system would likely improve operations and reduce wait times. Delivery trucks would sign up for a particular time slot rather than having to wait in a long queue, as deliveries currently are allowed one truck at a time on a first-come, first-served basis.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – Port Everglades and private trucking industry.

Key Stakeholders – Broward County MPO.

Project Phasing

Medium-term projects have an implementation timeline of two to five years. These projects have a longer timeframe because they represent public-private projects that will require significant outreach activities and are tied to other projects/programs that are still in development.

Medium-Term – This project is designed to assist with the new security program under development at Port Everglades. At this time, Port Everglades' immediate focus is rightfully on their new security initiative, which includes new Port identification cards, new infrastructure and procedures. Once these measures are in place, the Port can then focus on implementing a new electronic appointment system for cruise ship delivery time slots. This system would require outreach efforts to get buy-in from the private delivery companies. Once their interest and participation has been secured and the new gating procedures are fully in place, this system can be designed and implemented.

System Components

The deployment would consist of a web-based appointment system comprised of hardware, off-the-shelf scheduling software, integration, and communications.

Integration, Resource/Information Sharing, and Coordination Opportunities

This project relies on the integration of steamship load information which will be made available to the trucking industry. These two private sector participants will rely on this real-time appointment system to manage their pick-ups and deliveries. Port Everglades will need to take a lead role in establishing a public-private partnership to unite industry representatives.

System Cost Estimate

The cost estimate was obtained using values from the ITS Deployment Analysis System (IDAS). Adding office space and labor to the list of system components, the approximate annual system cost is $7,000, inclusive of capital and O&M costs. Additional outreach costs maybe be incurred for Port Everglades to inform their clients about the scheduling system, provide instructions, and encourage its use.

Potential Funding Sources

The Federal TEA-21 includes various funding sources that could be used to finance ITS projects. These programs include the National Highway System Program, the Surface Transportation Program, Congestion Mitigation and Air Quality Program, the ITS Integration Program, and the Interstate Maintenance Program. SAFE-TEA is expected to provide specific support for freight and ITS initiatives. Monies set aside for Florida's Five-Year Work Program and the Broward County MPO are other viable options. Potential new opportunities include the Statewide Freight Mobility Plan and the SIS. Where possible, public-private partnerships should be explored to share the costs of implementing, operating and/or maintaining the system.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – The key performance measurements in this project will be the change in queue length of trucks waiting to make deliveries, the change in total time spent within the port, and customer satisfaction (truck driver and dispatch staff perceptions).

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

7.7 Integrate Available Databases into Centralized System

Currently, there is a significant volume of freight data collected, but it is not integrated. This strategy involves integrating existing databases to increase understanding of freight-related issues in the region (accident data, freight volume data, freight trip data, etc.). Integrating this data would make existing standalone databases more effective. To start, the following resources should be integrated as part of this effort:

- FDOT Traffic Info CD;
- FDOT Roadway Characteristics Inventory;
- Crash Analysis Reporting System (CARS);
- TMC data;
- CVO data; and
- MPO long-range planning data.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – FDOT Central Office – Planning.

Key Stakeholders – Broward County Traffic Engineering Department and Broward County MPO.

Project Phasing

Short-term projects have an implementation timeline of zero to two years. These projects will require research, joint partnership agreements, and/or funding sources that will require a significant amount of time to secure. However, these projects represent initiatives that should be started now to coincide with other regional ITS elements.

Short-Term – There are many existing standalone databases in the region that if integrated, would increase understanding of freight-related issues in the region. In order to integrate these databases, a platform would need to be selected to house all of this information. This effort could prove complex since the aforementioned databases reside in a variety of software formats, requiring potentially complicated conversion processes and ongoing procedures for updating the system.

System Components

This project consists of a functional, integrated database.

Integration, Resource/Information Sharing, and Coordination Opportunities

This project will integrate a variety of databases 'owned' by various organizations to provide new data sets to all stakeholders. As such, resource and information sharing will be critical in establishing an integrated and ongoing program.

System Cost Estimate

The cost estimate was obtained using values from the ITS Deployment Analysis System (IDAS). Using the IDAS value for TMC integration, the approximate annual system cost is $5,000, inclusive of capital and O&M costs. These costs do not reflect the activities that each database owner will need to undertake to provide their data in the same format for incorporation into this system. Therefore, additional costs will be required for the data conversion, whether done in-house or by a consultant.

Potential Funding Sources

The Federal TEA-21 includes various funding sources that could be used to finance ITS projects. These programs include the National Highway System Program, the Surface Transportation Program, Congestion Mitigation and Air Quality Program, the ITS Integration Program, and the Interstate Maintenance Program. SAFE-TEA is expected to provide specific support for freight and ITS initiatives. Monies set aside for Florida's Five-Year Work Program and the Broward County MPO are other viable options. Potential new opportunities include the Statewide Freight Mobility Plan and the SIS. Where possible, public-private partnerships should be explored to share the costs of implementing, operating and/or maintaining the system.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – The key performance measurements in this project will be the change in the level of use of data sources by planning staff, and customer satisfaction (planning staff) with the new database functionality.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

7.8 Provide Outreach and Education

Although there are many local, regional and statewide ITS deployments, the general public and some decision-makers lack awareness about the benefits of ITS. This strategy could include the upgrade of current outreach and education programs, as well as the development of new programs that increase the visibility and understanding of ITS deployments and their benefits (including the ITS deployments that are part of this plan).

Similarly, the general public and some decision-makers lack understanding of the importance of freight in their daily lives. This strategy also could include new and improved outreach/educational tools that teach the importance of freight, and how to drive safely in the vicinity of commercial vehicles and when approaching at-grade rail crossings.

Project Team

The first action item is to develop a project team. The team leader should have the authority to commit resources and deploy the system, and have the time and skill set required to coordinate the team and see the project through to completion. The team leader will likely be a representative from the project owner, which is the organization that has the required resources and right-of-way.

Project Owners – Broward County MPO.

Key Stakeholders – All stakeholders.

Project Phasing

Ongoing projects represent initiatives that are addressed continuously as they support the continuing development of the overall ITS Intermodal Program.

Ongoing – For each of the previously described projects, outreach and education are important for the participating stakeholders as well as the traveling public. There should be an outreach component to all freight and ITS projects, particularly those proposed under this project. If outreach efforts are made for each new ITS or freight project in the region, the benefits of these projects will be communicated and more clearly understood by policy-makers, executive-level decision-makers, and the traveling public. Moreover, general outreach and education about ITS benefits and the importance of freight is key to the future success of the ITS Intermodal Program as a whole. A new outreach and education program should be developed to target policy-makers, executive-level decision-makers, and the traveling public. These higher-level programs could be led by regional, State or Federal organizations, or some combination thereof.

System Components

This project is not a physical ITS project, but rather an institutional program that should be carried out on an ongoing basis.

Integration, Resource/Information Sharing, and Coordination Opportunities

Interagency coordination will drive the ongoing outreach and educational activities that will be part of each specific project. Coordination also is an essential component to ensure the success of an overall outreach and education program.

System Cost Estimate

Outreach costs vary by project, and should be allocated before the deployment of the ITS projects in this report. Outreach costs also are highly variable in terms of developing a new overall outreach and educational program. Only after careful research and stakeholder meetings can an appropriate cost be determined.

Potential Funding Sources

To be determined.

Future Planning and Performance Assessments

In many cases, ITS projects compete with traditional infrastructure improvement projects for funding. Performance measures that assess operations, safety, capacity, etc., are important to create a level playing field. ITS projects should be assessed annually to determine if they are meeting their objectives.

Key Performance Measurement – The key performance measurement in this project will be the customer satisfaction/response of the target audiences for a given project.

Outreach and Education Considerations

Outreach and education are an essential component for success. The goal of conducting outreach is to clearly communicate the benefits of this project to the participating stakeholders, policy-makers, executive-level decision-makers, and the traveling public. Efforts should be coordinated with overall ITS Intermodal Program efforts.

Operations and Management (O&M) Considerations

O&M considerations are particularly important because it is typical for ITS O&M activities to take a higher percentage of capital cost than traditional transportation projects. The future of any ITS system will be ineffective without clearly defined agency responsibility and secured funding for O&M. An O&M Plan needs to be developed for this project that lists all system components along with the activities required to successfully operate and maintain them. In addition, each activity should be paired with the name of the organization responsible for carrying out those duties in order to create accountability.

Regional ITS Architecture Considerations

Florida has developed a statewide ITS architecture as well as a district-specific ITS architecture. All ITS projects need to be designed in compliance with these standards where possible to ensure compatibility.

Appendix A

Backup Calculations

Backup Calculations

The first step in conducting the benefit/cost analysis was to identify the key performance measures for each Intelligent Transportation Systems (ITS) mitigation strategy within each alternative. For some of the strategies, data were unavailable and therefore the dollar amounts could not be provided. In other cases, predominantly for non-ITS strategies, the monetary benefits were difficult to calculate and therefore could not be provided. Special consideration will be given to each of these unquantifiable strategies when recommending the preferred alternative for inclusion in the implementation plan.

The next step involved researching system costs for each of the strategies, including both capital costs as well as cost estimates for operations and maintenance. Where available, actual numbers were used. To supplement this data, default values for both the annual costs and benefits were estimated using the default values in the ITS Deployment Analysis System (IDAS)[1] software package. Again, for strategies where data was not sufficient to estimate costs, special consideration will be given when recommending the preferred alternative for inclusion in the implementation plan.

All the costs and benefits were annualized based on life-cycle estimates for each system component. Table 5.1 in the main section of this document provides a summary of the results of the benefit/cost analysis. The assumptions and backup calculations for each of these costs and benefits are provided in this appendix, along with brief descriptions of each strategy. Note that the values used for estimating dollar amounts are approximate; most are default values from the IDAS benefit/cost database. All estimates are in 1995 U.S. dollars to be consistent with values in the latest version of IDAS.

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[1] IDAS is an ITS sketch-planning analysis tool developed by the Federal Highway Administration that can be used to estimate the impacts, benefits and costs resulting from the deployment of ITS components. IDAS is designed to help state, regional, and local planners screen and prioritize among ITS technologies to identify the most beneficial, cost-effective, and economically feasible alternatives.

IDAS can currently predict relative costs and benefits for more than 60 types of ITS investments. For each ITS component the software is capable of analyzing, IDAS provides default settings of ITS impacts. These default values have been determined through reviews of observed impacts around the world. The set of impacts evaluated by IDAS include changes in user mobility, travel time/speed, travel time reliability, fuel costs, operating costs, accident costs, emissions, and noise. Table 1.1 lists the set of ITS components IDAS is capable of analyzing.

Alternative 1 – Port Everglades Access Improvements

1. Install speed warning system at I-595 terminus

Strategy Definition

Due to high truck and automobile speeds, sharp curves and downgrades, there are safety concerns at the eastbound terminus of I-595. Although a geometric redesign is in the design phase, it will not be complete until many years from now. A temporary ITS speed warning system has been recommended to mitigate the problem in the interim. The deployment would be a standalone system employing radar speed detection and one DMS.

Annual System Cost Calculation

The system cost estimate of $35,000 was obtained from the American Signal Company (AmSig) for their Dynamic Curve Warning System. Assuming a five-year life cycle for this system, and $2,000 annual operations and maintenance costs (O&M), the annual cost becomes **$10,536**.

Annual Monetary Benefit Calculation

The following table outlines the crash data obtained for the 1.8-mile segment at the east-bound terminus of I-595.

Table A.1 Crash Data for I-595 Terminus Segment

Crash Type	1998	1999	2000	Average
Totaled (PDO)	33	36	46	38.33333
Injuries	37	24	42	34.33333
Fatalities	1	1	3	1.666667
Truck Crashes	0	6	4	3.333333
Trucks Injuries	0	2	1	1
Truck Fatalities	0	0	1	0.333333
State Average	*1.441*	*1.371*	*1.371*	
Safety Ratio	**0.259012522**	**0.294689**	**0.376547445**	

A crash reduction rate of 18.5 percent was used. This rate comes from the Colorado I-70 Truck Speed Advisory project. The IDAS benefit/cost database provided the monetary values used for fatalities, injuries, and PDOs. Table A.2 outlines the benefit calculations.

Table A.2 Benefit Calculation for I-595 Terminus Segment

Monetary Values from IDAS	Internal	External	Total	Average (from Table A.1)	All Crashes	Monetary Benefits (18.5% of average annual crashes)
Fatality	$2,317,398	$408,952	$2,726,350	1.666667	$5,452,700	$1,008,750
Injury	$ 50,760	$ 8,958	$ 59,718	34.33333	$2,110,036	$ 390,357
PDO	$ 2,824	$ 498	$ 3,322	38.33333	$ 138,417	$ 25,607
TOTAL						**$1,424,713**

Benefit/Cost Ratio

$1,425,000/$11,000 = **130:1**

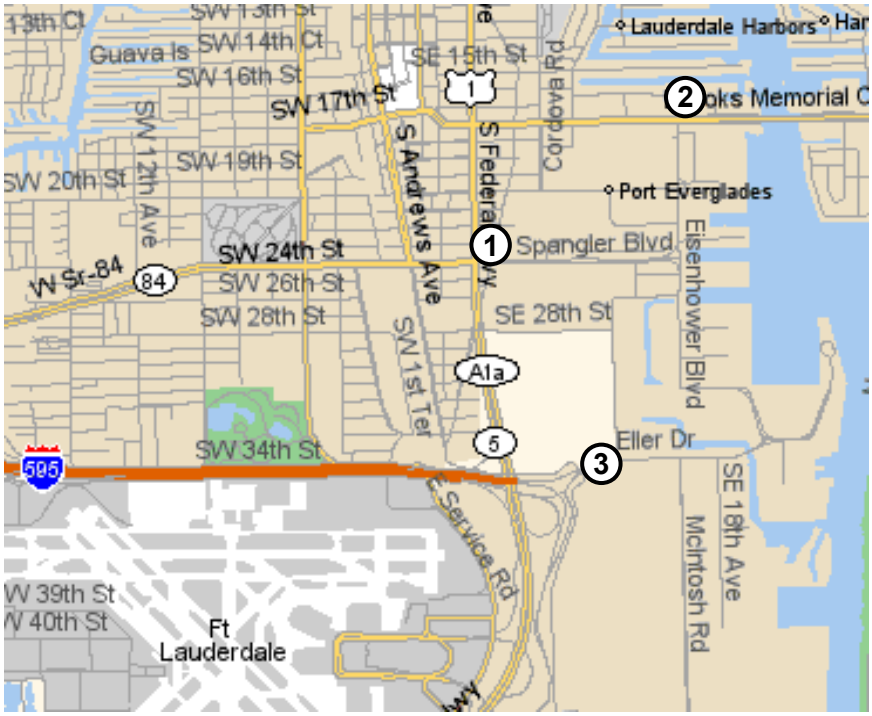
2. Sort Vehicles Prior to Security Gates via DMS

Strategy Definition

Since the implementation of temporary security gates at Port Everglades, some queuing problems have developed. These queuing problems should be addressed as Port Everglades is moving forward with the planning and construction of permanent gates. In addition, many cruise ship passengers enter the port in cars through the same gates that trucks access their freight destinations. To relieve queuing and reduce conflicts between passenger cars and heavy trucks, this strategy involves sorting passenger cars and trucks in advance of the security gates. For example, the DMS would direct all cruise ship passengers to use the right lane. The deployment would include DMS in advance of each of the three gates to display lane use and other important information.

The location of the three security gates are depicted in Figure A.1. Gate 1 is located at Spangler Boulevard, Gate 2 at Eller Drive, and Gate 3 at Eisenhower Boulevard.

Figure A.1 Port Everglades Security Gate Location Map



Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.3, which were obtained using values from IDAS. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

Since the TMC (or Security Operations Center) cost has already been incurred, we assumed this project would cost approximately 10 percent of the IDAS default value for TMC system integration. As such, the annualized cost becomes **$52,250**.

Table A.3 Cost Calculation for Vehicle Sorting Prior to Security Gates

System Cost	Life	Capital Low	Capital High	O&M Low	O&M High	Annual Capital Average	Annual O&M Average	Unit	Total Annual Costs
TMC integration (10% of IDAS default value)	20	$ 9,000	$ 11,000	$ 4,500	$ 6,000	$ 500	$ 5,250	1	$ 5,750
Communications line	20	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 50	$ 1,000	3	$ 3,150
DMS panel	20	$48,000	$120,000	$ 2,000	$ 6,000	$ 4,200	$ 4,000	3	$ 24,600
DMS tower	20	$25,000	$125,000	$ –	$ 5,000	$ 3,750	$ 2,500	3	$ 18,750
TOTAL									**$ 52,250**

Annual Monetary Benefit Calculation

Tables A.4 and A.5 outline the entrance/exit data obtained for each of the three access points at Port Everglades. Table A.4 contains the 2002 p.m. peak volumes for inbound and outbound traffic accessing Port Everglades. Table A.5 shows the approximate process times by vehicle type for inbound traffic.

Table A.4 Volumes, Queues and Average Delays at Port Everglades

Security Gate Location	Number of Vehicles	Average Queue (vehicles)	Average Delay (sec/veh)
Spangler Boulevard			
Inbound	125	1.2	34
Outbound	728	N.A.	N.A.
Eller Drive			
Inbound	236	5.0	76
Outbound	892	N.A.	N.A.
Eisenhower Boulevard			
Inbound	148	1.8	43
Outbound	381	N.A.	N.A.
Subtotal Inbound	509		
Subtotal Outbound	2,001		
Total Volume	**2,510**		
Total Weighted Average Delay			**56.3**

Table A.5 Process Times by Vehicle Type at Port Everglades

Percent Inbound Traffic	Carrying Port ID?	Vehicle Type	Process Time (seconds)	Maximum Number of Vehicles/Hour
14%	Yes	Cars, delivery vehicles, buses	10	360
14%	No	Cars, delivery vehicles, buses	60	60
14%	Cruise Ticket	Cars, buses	10	360
15%	Yes	Loaded cargo trucks	10	360
15%	No	Loaded cargo trucks	60	60
14%	Yes	Empty cargo trucks	10	360
14%	No	Empty cargo trucks	60	60
100%			**Weighted Average**	**231**

A delay reduction rate of 17 percent was used. This rate comes from the IDAS benefit/ cost database. Seventeen percent of the total average delay (56.3 seconds per vehicle, as indicated in Table A.4) results in a delay reduction of 9.6 seconds per vehicle.

In order to convert this value into a monetary unit, IDAS default values for travel time reliability have been used. The IDAS default value for truck travel time reliability is $62.40 per hour and the value for passenger cars is $25.50 per hour. Using a weighted average of 58 percent trucks and 42 percent cars, the monetary benefit is $46.90 per peak hour, or $0.013 per second.

Multiplying the value of travel time reliability ($0.013 per second) by the delay reduction (9.6 seconds per vehicle) results in a savings of $0.125 per vehicle. Applying this value to the total number of inbound vehicles (from Table A.4, 509 vehicles), the result is a savings of $63.63 per peak hour. Assuming total volumes are 10 times the peak hour multiplied by seven days per week and 52 weeks per year, the resultant annual monetary benefit is **$231,613**.

Benefit/Cost Ratio

$232,000/$52,000 = **4:1**

3. Install Static Guide Signs within Port Everglades

This strategy includes the installation of signs within the Port to guide motorists to their appropriate destinations inside the port (in English and Spanish). This would be a low cost project that has the potential to improve the circulation of traffic within the port and decrease the chance for passenger cars to inadvertently end up in secure port areas. As

this item is not an ITS-based strategy, we could not obtain IDAS default values for a benefit/cost analysis. However, it is our understanding that Port Everglades is already working on improving their interior guidance signs.

4. Install Static Guide Signs to/from Port Everglades and FLL Airport

This strategy includes the installation of signs to/from Port Everglades and Fort Lauderdale-Hollywood International Airport (in English and Spanish). Currently, there is not a direct limited access route from Port Everglades to FLL Airport. As such, some vehicles departing the port end up meandering through local residential neighborhoods until they reach the airport. Installing guide signs that direct traffic from the port to the airport would be a relatively low-cost project that has the potential to improve the circulation of traffic and decrease the chance for commercial vehicles to inadvertently end up on neighborhood roadways. As this item is not an ITS-based strategy, we could not obtain IDAS default values for a benefit/cost analysis. However, it is our understanding that FLL Airport, Port Everglades, and Broward County are already working on improving their guidance signs in this area.

5. Enhance Port Security through CVISN Technologies

Commercial Vehicle Information Systems and Networks (CVISN) is a national program administered by the Federal Motor Carrier Safety Administration (FMCSA) designed to improve motor carrier safety and to enhance the efficiency of administrative processes for industry and government. CVISN facilitates the exchange of motor carrier information among state, commercial vehicle operators, regional clearinghouses, and national databases. The system allows carriers to apply for and receive their essential operating credentials remotely, and provides regulatory and enforcement agencies with performance data.

The deployment of CVISN technology in Broward County has been proposed by FDOT District 4 as an operational test to improve security at Port Everglades. This would include technology deployments on I-595 on the approach to Port Everglades for the purpose of identifying high risk trucks. FDOT's CVISN program will provide motor carriers with the ability to access electronic credentialing throughout the state, including Broward County. This system is not in place yet, but is a component of the state's overall CVISN program. As FDOT is already working toward the implementation of this system, we have not included this strategy in our benefit/cost analysis.

6. Appointment System for Cruise Ship Deliveries

Strategy Definition

New security policies only allow pier-side parking for one truck at a time, causing lengthy truck queues that interfere with passenger arrivals for cruise ships and create a potential

security issue. The implementation of an appointment scheduling system would likely improve operations and reduce wait times. Delivery trucks would sign up for a particular time slot rather than having to wait in a long queue, as deliveries are currently allowed one truck at a time on a first-come, first-served basis. The deployment would consist of a web-based appointment system comprised of hardware, software, integration, office space, labor, and communications.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.6, which were obtained using values from the IDAS benefit/cost database. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column. As such, the annualized cost becomes approximately **$6,870**.

Table A.6 Cost Calculation for Vehicle Sorting Prior to Security Gates

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
TMC hardware	10	$ 15	$ 30	$ –	$ –	$ 2	$ –	1	$ 2
TMC software and integration	20	$ 815	$1,720	$ 6	$ 12	$ 63	$ 9	1	$ 72
Office space	100	$ –	$ –	$ 6	$ 9	$ –	$ 8	1	$ 8
Labor	100	$ –	$ –	$ 50	$ 250	$ –	$ 150	1	$ 150
Communications	20	$ 500	$1,000	$4,800	$8,400	$ 38	$6,600	1	$6,638
Total									**$ 6,870**

Annual Monetary Benefit Calculation

Actual queue measurements were unavailable for cruise ship deliveries within Port Everglades. However, Table A.7 shows the weighted average process time for cruise ship-related deliveries at security gates is 17.1 seconds per vehicle. Since this system also

would reduce some delay at the security gates (in addition to reducing the queue inside the port awaiting portside delivery time), we have used a conservative delay reduction rate of 7.5 percent. This rate comes from the IDAS benefit/cost database. Applying 7.5 percent to 17.1 seconds results in a process time cut of 1.3 seconds per vehicle.

Table A.7 Process Times for Delivery Vehicles at Port Everglades

Percent Inbound Traffic	Carrying Port ID?	Vehicle Type	Process Time (seconds)	Maximum Number of Vehicles/Hour
14%	Yes	Cars, delivery vehicles, buses	10	360
14%	No	Cars, delivery vehicles, buses	60	60
			Weighted Average	**17.1**

In order to convert this value into a monetary unit, IDAS default values for travel time reliability have been used. The IDAS default value for truck travel time reliability is $62.40 per hour. Using the process time reduction of 1.3 seconds per vehicle, the monetary benefit becomes $9.36 per peak hour. Assuming total volumes are 10 times the peak hour multiplied by seven days per week and 52 weeks per year, the resultant annual monetary benefit is **$34,070**.

Benefit/Cost Ratio

$34,000/$7,000 = **5:1**

Note that the benefit calculations used for this strategy are quite conservative. Due to the unavailable data, the benefit/cost analysis relates only to the process time savings at the security gates and does not include the expected reduction in delay once inside the port awaiting one's turn for portside delivery. Therefore, this benefit/cost ratio is likely even higher.

7. Traveler Information via DMS at Port Everglades Exits

Strategy Definition

This strategy would employ DMS to inform motorists exiting the port of important traffic information, such as major incidents on I-95 or security-related information. The deployment would consist of one roadside DMS at each of the three exits at Port Everglades.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.8, which were was obtained using values from the IDAS benefit/cost database. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

Similar to the cost calculations for the DMS prior to security gates at the port entrances, we assumed this project would cost approximately 10 percent of the IDAS default value for TMC system integration. As such, the annualized cost becomes approximately **$24,500.**

Table A.8 Cost Calculation for DMS at Port Everglades Exits

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
TMC integration	20	$ 9,000	$11,000	$ 4,500	$ 6,000	$ 500	$ 5,250	1	$ 5,750
Communications	20	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 50	$ 1,000	3	$ 3,150
Roadside DMS	20	$24,000	$24,000	$ 2,000	$ 6,000	$1,200	$ 4,000	3	$ 15,600
TOTAL									**$ 24,500**

Annual Monetary Benefit Calculation

According to Table A.4, the total outbound peak-hour traffic exiting the port is 2,001 vehicles per peak hour. Since the DMS will only provide information during major incidents, we have assumed that 1) the sign will only provide such information about 1.5 percent of the time, and 2) approximately 80 percent of all exiting traffic will react to the information provided. The default value in IDAS for travel time savings is a conservative estimate of three minutes per vehicle, or 0.05 hours. Considering all these values, the travel time savings is 1.2 hours per peak hour.

In order to convert this value into a monetary unit, IDAS default values for travel time reliability have been employed. The IDAS default value for truck travel time reliability is

$62.40 per hour for trucks and $25.50 per hour for cars. According to Table A.5, port traffic is comprised of approximately 42 percent cars and 58 percent trucks. Applying these vehicle type percentages to the IDAS travel time reliability values, a resultant monetary value of $46.90 results.

Using the above results, Travel Time Savings (1.2 hours) at $46.90 per hour results in a total of $56.31 savings per hour. Assuming total volumes are 10 times the peak hour multiplied by seven days per week and 52 weeks per year, the resultant annual monetary benefit is **$204,970**.

Benefit/Cost Ratio

$205,000/$25,000 = **8:1**

Alternative 2 – Rail-Related Improvements

8. Provide Real-Time Train Locations to Fire and Rescue Response Vehicles

Strategy Definition

FEC Railway currently provides real-time freight train locations to local fire houses so their response vehicles can avoid getting stuck at grade crossings when responding to incidents. This strategy involves an upgrade/expansion of this program to provide train location data to all the regional fire and rescue agencies in Broward County, as well as an implementation of a similar system for the SFRC. The deployment would consist of emergency management center hardware, software, and communications as well as on-board communications and GPS for the emergency response vehicles.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.9, which were obtained using values from the IDAS benefit/cost database. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

We were unable to obtain the actual number of emergency response vehicles, and therefore used the conservative assumption of 50 vehicles. As such, the annualized cost becomes approximately **$22,236**.

Table A.9 Cost Calculation for Train Locations to Fire/Rescue

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
EM center hardware	10	$15,000	$ 30,000	$ 300	$1,000	$ 2,250	$ 650	1	$ 2,900
EM center software	10	$70,000	$150,000	$1,000	$4,000	$11,000	$2,500	1	$ 13,500
ISP service	100	$ –	$ –	$ 120	$ 180	$ –	$ 150	1	$ 150
Wireless communications	100	$ –	$ –	$ 180	$ 200	$ –	$ 190	1	$ 190
On-board communications	7	$ 200	$ 400	$ 4	$ 8	$ 43	$ 6	50	$ 2,443
On-board GPS	7	$ 250	$ 500	$ 5	$ 10	$ 54	$ 8	50	$ 3,054
TOTAL									**$ 22,236**

Annual Monetary Benefit Calculation

Tables A.10 and A.11 depict data on delays at FEC railroad crossings from the morning peak period (6:00 a.m. to 9:00 a.m.) and the afternoon peak period (3:00 p.m. to 6:00 p.m.), respectively. Limited data also were obtained for delays at the CSX at-grade crossings, but the quality of the data was not robust enough for use in this analysis. Therefore, only FEC data were considered.

Table A.10 Delays at FEC Rail Crossings in the A.M. Peak Period*

Crossing	Obs. #1	#2	#3	#4	#5	#6	#7	#8	#9	Average (seconds)
48th Street	1,294	N/A.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,294
Sample Road	971	260	2,210	1,439	N/A	N/A	N/A	N/A	N/A	1,220
Copans Road	1,384	353	90	5,318	207	1441	N/A	N/A	N/A	1,466
N.W. 15th Street	1,565	1,142	121	61	162	N/A	N/A	N/A	N/A	610
NW/10th Street	1,586	87	540	78	315	N/A	N/A	N/A	N/A	521
Sunrise Boulevard	253	70	855	328	66	N/A	N/A	N/A	N/A	314
Hammondville Road	346	72	488	70	61	130	N/A	N/A	N/A	195
Atlantic Boulevard.	369	610	142	1,269	97	150	67	155	N.A.	357
Cypress Creek Road	96	180	70	91	97	11	62	10	106	77
N.W. 38th Street	224	83	197	143	26	94	27	75	74	109
Stirling Road	71	198	264	154	N/A	N/A	N/A	N/A	N/A	172
Hollywood Boulevard	47	187	96	N/A	N/A	N/A	N/A	N/A	N/A	110
Pembroke Road	67	185	141	138	N/A	N/A	N/A	N/A	N/A	133
Hallandale Beach Boulevard	75	182	151	146	N/A	N/A	N/A	N/A	N/A	139
County Line Road	78	287	142	129	N/A	N/A	N/A	N/A	N/A	159

* Although data have significant variances, it was the best data available and therefore included in the analysis. These numbers in Tables A.10 and A.11 are the preemption times in seconds, which cause the surrounding signals to activate the red phase.

Table A.11 Delays at FEC Rail Crossings in the P.M. Peak Period*

Crossing	Obs. #1	#2	#3	#4	#5	#6	#7	#8	#9	#10	Average (seconds)
48th Street	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample Road	77	136	83	104	N/A	N/A	N/A	N/A	N/A	N/A	100
Copans Road	78	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78
N.W. 15th Street	120	65	24	34	24	95	95	75	25	105	66.2
NW/10th Street	23	81	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	52
Sunrise Boulevard	141	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	141
Hammondville Road	138	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	138
Atlantic Boulevard	160	138	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	149
Cypress Creek Road	7	140	63	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70
N.W. 38th Street	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	71
Stirling Road	159	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	159
Hollywood Boulevard	146	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	146
Pembroke Road	150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	150
Hallandale Beach Boulevard	143	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	143
County Line Road	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100

* Although data have significant variances, it was the best data available and therefore included in the analysis. These numbers in Tables A.10 and A.11 are the preemption times in seconds, which cause the surrounding signals to activate the red phase.

Averaging the two peak periods together, the resulting average existing delay is 291 seconds. Using a delay reduction rate of 8.85 percent from the IDAS benefit/cost database, the delay reduction achieved would be 26 seconds per emergency vehicle. Assuming 50 emergency vehicles, the overall systemwide reduction in delay becomes 1,300 seconds.

In order to convert this value into a monetary unit, the IDAS default value for time is $16.96 per hour. IDAS also employs a multiplier of 30 for estimating the value of time for emergency vehicles. This brings the monetary value up to $508.80 per hour, or $0.14 per second.

Applying this monetary value of $0.14 per second to the total delay of 1,300 seconds results in a monetary benefit of $182 per use. Assuming an annual usage of five times per week, or 260 per year, the annual monetary benefit is estimated at **$47,313**.

Benefit/Cost Ratio

$47,000/$22,000 = **2:1**

Note that injury and fatality reductions are not considered as part of this calculation. The reduction of just one injury would greatly increase the payoff.

9. Improve Communications with Train Operators

This strategy involves the provision of real-time operational information (e.g., timely speed restriction information) via in-train devices or DMS along the corridor at grade crossings. The deployment would include Information Center integration, software, communications, and on-board devices or trackside DMS.

Although this strategy has potential, it was not evaluated due to a timing issue. Once the double-tracking project is complete and the impacts have been assessed, this strategy should be evaluated and considered for implementation if the need for improved communications with train operators still exists. Therefore, this strategy has been included in the preferred alternative as a placeholder to ensure it is looked into when the appropriate time comes.

For future reference, the following considerations have been provided. Because the same real-time operational information is currently being provided via radio, it is not likely that any significant improvement would result from the implementation of a newer, electronic system – unless the train operators are not effectively receiving and reacting to the radio-based information. Currently, we have not received information about any major issues of this nature from the train operators. Moreover, the benefits would likely be incurred by the train operator.

10. Better Define Rail Incident Management Plans and Responsibilities

Train incidents, particularly fatalities, can take as long as two to three hours to clear. This strategy involves continuing to work toward the implementation of a more efficient incident management program with more clearly defined plans and responsibilities. To accomplish this, regular coordination meetings with all incident management parties are necessary. The use of wireless and/or handheld devices for real-time information sharing also should be considered. An incident management plan is already in place for the rail corridors, and the appropriate parties are currently involved and invested in making improvements to the plan. As these improvements are already being worked on, we have not included this strategy in our benefit/cost analysis.

11. Upgrade Dispatch Capabilities, Rail Signal System and Crossings

The South Florida Rail Corridor (SFRC) is owned by FDOT. Tri-Rail, Amtrak, and CSX all operate on this same corridor. As multiple railroads operate on a single rail corridor, this strategy involves upgrading to a modern dispatch system that would likely improve coordination, safety, and reliability. Tri-Rail is currently leading the initiative to double-track the entire rail corridor, upgrade dispatch capabilities, and improve rail signals and crossings. Construction has already started on this project, which is estimated to cost approximately $330,000,000 for Broward, Palm Beach and Miami-Dade Counties combined. Since work on these improvements is already being implemented in the field, we have not included this strategy in our benefit/cost analysis.

■ Alternative 3 – Incident Management Improvements

12. Continue Improving the Regional Incident Management Program

To help mitigate the high number of truck crashes, it is imperative to continue to improve the regionwide incident management program. This strategy includes building upon the work already being accomplished via the South Florida Incident Management Working Group. The incident management program needs to be continually updated in order to incorporate the most clearly defined plans and responsibilities possible, thereby eliminating gaps in unincorporated rights-of-way. In addition to holding regular coordination meetings with all incident responders, improvements in communications could facilitate speedier clearance times. For example, high-tech incident management systems also could be incorporated that allow first responders to send images to secondary responders (HAZMAT, etc.). Since this strategy has already started and remains a high priority for all involved parties, we have not included this strategy in our benefit/cost analysis.

13. Share Resources; Create Inventory of Clearance Equipment

Strategy Definition

Currently, there is insufficient clearance/salvage equipment for crashes that involve heavy vehicles. For example, I-95 has specialized equipment to right overturned tractor-trailers and Florida's Turnpike does not. In effort to reduce response times to incidents involving trucks, this strategy would involve creating an inventory of shared clearance equipment that can be accessed by both FDOT District 4 and Florida's Turnpike as needed.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.12, which were obtained using values from IDAS. The first column in the table lists the components that

comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

As both parties currently operate traffic management systems, the additional expense needed would cover the integration required to track and share clearance equipment effectively. As such, the annualized cost becomes approximately **$10,250**.

Table A.12 Cost Calculation for Clearance Equipment Sharing

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
TMC integration	20	$ 90,000	$ 110,000	$ 4,500	$ 6,000	$ 5,000	$ 5,250	1	$ 10,250
TOTAL									**$ 10,250**

Annual Monetary Benefit Calculation

The system benefit calculation is detailed in Table A.13. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. In this case, we were unable to obtain both high and low values, so an average value was placed under the "low" columns. The seventh column annualizes the average cost based on the life cycle from column two. The eighth column repeats the average annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

The measurable benefit is essentially just the annual savings of what it would cost to own and operate a second specialized clearance vehicle. We were unable to obtain an actual cost estimate for this type of specialized equipment, the assumptions for a heavy duty wrecker are detailed in Table A.13. As such, a conservative estimate of the annualized benefit becomes approximately **$177,067**.

Table A.13 Benefit Calculation for Clearance Equipment Sharing

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
Heavy-duty wrecker	8	$250,000	$ –	$135,200	$ –	$ 41,867	$ 135,200	1	$ 177,067
TOTAL									**$ 177,067**

Benefit/Cost Ratio

$177,000/$10,000 = **18:1**

14. Upgrade Communications with Towing Contractors

Heavy trucks and other types of vehicles typically require specialized equipment for clearance purposes. This strategy involves upgrading the communications system between responders and the towing contractors to reduce incident response/clearance times. An improved system would likely reduce the number of times that towing contractors erroneously send the wrong equipment to the incident scene. When the wrong equipment is sent to the scene, the response time likely doubles while waiting for the right equipment to arrive. Unfortunately, no data was available on the number of times incorrect equipment was sent to the incident scene. Therefore, a benefit/cost analysis could not be performed for this strategy due to insufficient data.

15. Provide Weather and Drainage Data to HAZMAT Responders

Strategy Definition

Responders to incidents involving hazardous materials (HAZMAT) need timely information for effective and efficient response performance. For safety and environmental protection, this strategy involves the provision of critical weather information (particularly data on prevailing winds) to HAZMAT responders at the time of the HAZMAT incident. It also would include the provision of drainage area and sewer information at incident site for containment considerations. The deployment would include emergency management software, communications, and integration at an emergency management center as well as on-board GPS and wireless communications.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.14, which were obtained using default values from IDAS. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

We increased the IDAS default value for the cost of on-board GPS to cover the added cost of a wind sensor. As a HAZMAT incidents require close coordination among the HAZMAT agency, the emergency response agency and the roadway agency, the costs for center software, communications and integration have been multiplied by three. We also assumed 25 vehicles would need to be equipped with the communications and wind-sensing GPS device. As such, the annualized cost becomes approximately **$49,465**.

Table A.14 Cost Calculation for Weather and Drainage Data to HAZMAT Responders

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
EM center software	20	$ 5,000	$ 10,000	$2,500	$5,000	$ 375	$3,750	3	$12,375
Communications line	20	$ 500	$ 1,000	$ 600	$1,200	$ 38	$ 900	3	$ 2,813
TMC integration	20	$90,000	$110,000	$4,500	$5,500	$5,000	$5,000	3	$30,000
On-board communications	7	$ 200	$ 400	$ 4	$ 8	$ 43	$ 6	25	$ 1,221
On-board GPS with wind sensor	7	$ 500	$ 1,000	$ 5	$ 10	$ 107	$ 8	25	$ 2,866
Wireless communications	100	$ –	$ –	$ 180	$ 200	$ –	$ 190	1	$ 190
TOTAL									**$49,465**

Annual Monetary Benefit Calculation

The monetary value in IDAS for potential savings that apply to this strategy are as follows:

- Response to routine incidents = $1,125 (average of low and high);
- Reducing unjustifiable evacuations = $8,000; and
- Reducing avoidable highway/rail incidents = $4,150.

Adding these three values, the savings per HAZMAT incident becomes $13,275. Assuming a conservative estimate of approximately 10 total annual HAZMAT incidents, the total savings becomes **$132,750** annually.

Benefit/Cost Ratio

$133,000/$49,000 = **3:1**

16. Institute a Statewide "Quick-Clearance" Agreement

On-scene commanders are hesitant to rapidly clear spilled cargo on the roadway from truck accidents in Florida due to the fact that they are liable for damage or loss. This strategy involves working toward instituting a statewide "quick-clearance" agreement similar to Minnesota or Washington, where commanders are absolved of liability, allowing for faster clearance times. This strategy works in tandem with strategy 12 and requires the involvement of the entire State of Florida, particularly the statewide Traffic Incident Management (TIM) team, in order to change the current policy. It is difficult to measure the cost of policy change, and therefore a benefit/cost analysis was not performed for this strategy.

■ Alternative 4 – Outreach and Communications Improvements

The following strategies involve outreach, communications and information sharing improvements. Each of them include components that are critical to the success of any future freight ITS project, and therefore should in some way be considered for inclusion in the Broward County ITS Intermodal Implementation Plan. Consequently, the following four strategies have not been evaluated using benefit/cost analyses. A brief description of each strategy is provided below.

17. Improve Communications Among Regional ITS Programs

This strategy involves enhancing coordination among local, regional, and state ITS programs. It also could involve the integration of ITS and freight programs, where appropriate. Ideally, all agencies with valuable travel information should share real-time travel information.

18. Establish a Freight Stakeholders Committee

This strategy involves the establishment of a freight stakeholders committee that holds periodic meetings to develop goals, strategies, and share relevant information. Perhaps meetings can be 'piggy-backed' off of another relevant, well-attended working group in the region, such as the quarterly South Florida ATIS Committee meetings. A new committee of this sort is being instituted in Miami-Dade County called the Freight Technical Advisory Committee (FTAC).

19. Create a Web Site for Freight/ITS Information Sharing

This strategy is not necessarily a project, but rather something that can be set up by the agencies for the purpose of interagency information sharing. It would involve setting up a message board and e-mail group to share information and ask questions.

20. Provide Outreach and Education

Although there are many local, regional and statewide ITS deployments, the general public and some decision-makers lack awareness about the benefits of ITS. This strategy could include the upgrade of current outreach and education programs, as well as the development of new programs that increase the visibility and understanding of ITS deployments and their benefits.

Similarly, the general public and some decision-makers lack understanding of the importance of freight in their daily lives. This strategy also could include new and improved outreach/educational tools that teach the importance of freight, and how to drive safely in the vicinity of commercial vehicles and at-grade crossings.

■ Alternative 5 – Better Use of Data

21. Identify and Collect Additional Data

This strategy involves researching opportunities to collect useful information for freight and ITS planning purposes. The costs and benefits for this strategy cannot be readily quantified at this time.

22. Integrate Available Databases into Centralized System

Strategy Definition

This strategy involves integrating existing databases to increase understanding of freight-related issues in the region (accident data, freight volume data, freight trip data, etc.). To start, the following resources should be integrated as part of this effort:

- FDOT Traffic Info CD;
- FDOT Roadway Characteristics Inventory;
- Crash Analysis Reporting System (CARS);
- TMC data;
- CVO data; and
- MPO long-range planning data.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.15, which were obtained using values from IDAS for TMC integration. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column. As such, the annualized cost becomes approximately **$5,000**.

Table A.15 Cost Calculation for Database Integration

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
TMC integration	20	$ 90,000	$ 110,000	$ –	$ –	$ 5,000	$ –	1	$ 5,000
TOTAL									**$ 5,000**

Annual Monetary Benefit Calculation

The system benefit calculation is detailed in Table A.16. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations* and *maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

The measurable benefit is essentially a percentage of a sample TMC system cost. Applying the IDAS rate of 13 percent to the total annual system cost of $163,825, the annualized benefit becomes approximately **$21,297**.

Table A.16 Benefit Calculation for Database Integration

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
TMC hardware	5	$ 5,000	$ 10,000	$ 250	$ 1,000	$1,500	$ 625	1	$ 2,125
TMC software	5	$ 18,000	$ 22,000	$ 900	$ 1,000	$4,000	$ 950	1	$ 4,950
TMC integration	20	$ 90,000	$ 110,000	$ 4,500	$ 6,000	$5,000	$ 5,250	1	$ 10,250
TMC labor	100	$ –	$ –	$90,000	$110,000	$ –	$100,000	1	$100,000
Communications	20	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 50	$ 1,000	3	$ 3,150
DMS panel	20	$ 48,000	$120,000	$ 2,000	$ 6,000	$4,200	$ 4,000	3	$ 24,600
DMS tower	20	$ 25,000	$125,000	$ –	$ 5,000	$3,750	$ 2,500	3	$ 18,750
TOTAL									**$163,825**

Benefit/Cost Ratio

$21,000/$5,000 = **4:1**

23. Use System Performance Data to Improve Long-Range Transportation Planning Activities

ITS performance data can be used to improve long-range transportation planning activities. This strategy involves researching useful information for these purposes. The costs and benefits for this strategy cannot be readily quantified at this time.

24. Use Current/Real-Time Data to Improve Regional Traffic Management System Activities

Real-time system data can be used to improve regional traffic management system activities. This strategy involves researching useful information for these purposes. The costs and benefits for this strategy cannot be readily quantified at this time.

■ Alternative 6 – Traffic Management Improvements

25. Optimize Signal Timing for Key Freight Movements on East-West Arterials

Strategy Definition

An arterial traffic signal optimization system is already in place and the technology includes preemption and priority capabilities. This strategy involves using the current system to provide priority to typical truck movements at key east-west arterials regionwide, particularly during peak hours. Research and coordination with the trucking industry would be necessary to identify key locations, as well as impacts on non-truck traffic.

Annual System Cost Calculation

The annual system cost estimate calculations are provided in Table A.17, which were obtained using values from IDAS. The first column in the table lists the components that comprise this strategy. The second column indicates the approximate expected life cycle of each component. The third and fourth columns represent the low and high *capital* cost estimates for each component. Similarly, the fifth and sixth columns represent the low and high annual *operations and maintenance* cost estimates for each component. The seventh column takes an average of the high and low capital cost estimates for each component, and annualizes the cost based on the life cycle from column two. The eighth column takes an average of the high and low annual operations and maintenance cost estimates. Finally, the average annual values in columns seven and eight are summed and multiplied by the number of components listed in column nine ("Unit") to get the total annual costs in the final column.

Assuming this strategy would be applied to key turning movements at approximately 10 signalized intersections, the annualized cost becomes approximately **$15,850**.

Table A.17 Cost Calculation for Signal Timing Optimization

		Capital		O&M		Annual			Total
System Cost	Life	Low	High	Low	High	Capital Average	O&M Average	Unit	Annual Costs
LAN communications	10	$40,000	$70,000	$ 400	$ 800	$5,500	$ 600	1	$ 6,100
Signal controller	10	$ 2,500	$10,000	$ 200	$ 500	$ 625	$ 350	10	$ 9,750
TOTAL									**$15,850**

Annual Monetary Benefit Calculation

The IDAS travel time savings rate is three percent. Assuming an average commercial vehicle travel time of 30 minutes on east-west arterials, the average travel time savings would be approximately 0.9 minutes, or 54 seconds per commercial vehicle.

As peak-hour truck volumes on east-west arterials were unavailable, the following method was used to derive an estimate for this value. As indicated in Table A.4, the total volumes inbound and outbound at Port Everglades during the peak hour is 2,510 vehicles. From Table A.5, trucks comprise about 70 percent of port traffic, making the peak-hour truck volume approximately 1,757 vehicles. Assuming about 20 percent of these trucks traverse the east-west arterials in Broward County, we will assume a peak-hour volume of 351 trucks on the east-west arterials.

In order to convert this value into a monetary unit, the IDAS default value for commercial vehicle travel time savings is $20.80 per hour. Using the volume of 351 trucks with a travel time savings of 54 seconds (0.015 hours) at a rate of $20.80 per hour, the monetary benefit becomes $110 per peak hour. Assuming the total daily volume is 10 times the peak hour, five days per week, 52 weeks per year, the annual monetary benefit is estimated at **$285,056**.

Benefit/Cost Ratio

$285,000/$16,000 = **18:1**

Appendix B

Acronyms

Acronyms

AIIS	Advanced Incident Management System
ATIS	Advanced Traveler Information Systems
ATMIS	Advanced Transportation Management/Information and Security System
ATMS	Advanced Traffic Management Systems
BCTED	Broward County Traffic Engineering Department
BCMPO	Broward County Metropolitan Planning Organization
CARS	Crash Analysis Reporting System
CCTV	Closed Circuit Television
CMAQ	Congestion Mitigation and Air Quality Program
CMS	Congestion Management System
CUTR	Center for Urban Transportation Research
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DMS	Dynamic Message Sign
E-Commerce	Electronic Commerce
E-Screening	Electronic Screening
ETC	Electronic Toll Collection
FDOT	Florida Department of Transportation
FEC	Florida East Coast Railroad
FGMS	Freight and Goods Movement Study
FIRST	Freight Information Real-time System for Transport
FMCSA	Federal Motor Carrier Safety Administration
FTAC	Freight Technical Advisory Committee

Acronyms
(continued)

GPS	Global Positioning System
HAZMAT	Hazardous Material
HOV	High-Occupancy Vehicle lane
IDAS	ITS Deployment Analysis System
IEN	Information Exchange Network
ITS	Intelligent Transportation Systems
IVI	Intelligent Vehicle Initiative
MPO	Metropolitan Planning Organization
NHS	National Highway System
NORPASS	North American Preclearance and Safety System
OHVDS	Overheight Vehicle Detection System
SAFETEA	Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003
SFRC	South Florida Rail Corridor
SIS	Strategic Intermodal System
SOC	Security Operations Center
STIP	State Transportation Improvement Program
STP	State Transportation Plan
TEA-21	Transportation Equity Act of the 21st Century
TIP	Transportation Improvement Program
TMC	Traffic Management Center
TMS	Traffic Management System
TOC	Traffic Operations Center
WIM	Weigh in Motion