

# Contraflow Plan For The Florida Intrastate Highway System

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## **List of Acronyms**

ALDOT	Alabama Department of Transportation
AM	Amplitude Modulated
ATIS	Advanced Traveler Information System
CAD	Computer-Aided Design
CCTV	Closed-circuit Television
CNN™	Cable News Network™
DMS	Dynamic Message Sign
EAS	Emergency Alert System
EMS	Emergency Medical Services
EOC	Emergency Operations Center
ERN	Everglades Radio Network
FDEM	Florida Division of Emergency Management
FDEP	Florida Department of Environmental Protection
FDLE	Florida Department of Law Enforcement
FDOT	Florida Department of Transportation
FHP	Florida Highway Patrol
FHWA	Federal Highway Administration
FIHS	Florida Intrastate Highway System
FM	Frequency Modulated
FNG	Florida National Guard
FTE	Florida's Turnpike Enterprise
GDOT	Georgia Department of Transportation
HAR	Highway Advisory Radio
HERO	Highway Emergency Response Operator
ITS	Intelligent Transportation Systems
MCCO	Motor Carrier Compliance Office
MDX	Miami-Dade Expressway Authority
MHz	Megahertz
MPH	Miles per Hour

## *Contraflow Plan for the Florida Intrastate Highway System*

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<i>MUTCD</i> .....	<i>Manual on Uniform Traffic Control Devices</i>
OCSO.....	Orange County Sheriff’s Office
OOCEA.....	Orlando-Orange County Expressway Authority
PDF.....	Portable Document Format
PIO.....	Public Information Office
PSTA.....	Pinellas Suncoast Transit Authority
SEOC.....	State Emergency Operations Center
SR.....	State Road
TEOO.....	Traffic Engineering and Operations Office
TIM.....	Traffic Incident Management
TiRN™.....	Traveler Information Radio Network™
USF.....	University of South Florida
VMS.....	Variable Message Sign



## **Executive Summary**

The Florida Intrastate Highway System (FIHS) Contraflow Plan Review was initiated in February 2005 as a response to the high level of hurricane activity during the summer of 2004, when a tropical storm and four major hurricanes struck Florida during a seven-week period. Through this review, the Florida Department of Transportation (FDOT) re-examined hurricane response policies and procedures relating to contraflow (or reverse-lane) operations, with the intent of improving travel safety and efficiency during times of natural disaster.

The task of reviewing the state's contraflow operational plans was assigned to the Traffic Engineering and Operations Office (TEOO). The overall project consisted of three primary tasks: Revising the FDOT's contraflow plan entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*; conducting meetings with FDOT District and emergency response agency personnel to solicit their input; and conferring with Georgia and Alabama transportation officials on ways to improve coordination of hurricane evacuation activities.

Produced after Hurricane Floyd's massive evacuation in 1999, the technical memorandum *Analysis of Florida's One-Way Operations for Hurricane Evacuation* was revised in 2002. More recently, FDOT Districts and Florida's Turnpike Enterprise (FTE) have updated their individual contraflow plans, so the Department intends for its contraflow document to be a statewide strategic plan easily distinguished from the Districts' tactical plans. The statewide plan provides general guidelines for contraflow planning and criteria for the utilization of reverse-lane operations on limited-access highways.

While Hurricane Floyd prompted an estimated 2 million people to evacuate Florida five years earlier, that number was easily eclipsed by Hurricane Charley, which compelled 2.7 million to flee prior to that storm's landfall on August 13, 2004. Still, no contraflow operation was instituted in response to Charley or the three subsequent storms, hurricanes Frances, Ivan, and Jeanne. In each case, though, traffic conditions on limited-access corridors were evaluated as evacuations began and during the evacuations. Indeed, the pre-contraflow assessment of conditions is as crucial as the execution of the contraflow plan itself. The criteria for considering a contraflow mirror those for declaring a large-scale evacuation: the hurricane's strength, its direction of travel, the point of anticipated landfall, and what measures are warranted to protect the population threatened.

Once the decision is made to institute a contraflow and participating agencies are notified, the consensus of FDOT staff, the Florida Highway Patrol (FHP), and other responders is that contraflow operations only occur during daylight hours to ensure safety. All FDOT contraflow plans reviewed involved four-lane routes allowing the reversal of two travel lanes. Executing a successful contraflow also requires speedy mobilization of the necessary resources and personnel to prepare the actual route. Designation of proper contraflow starting and ending points is critical to keep traffic moving and to take full advantage of the additional roadway capacity. Any

misdesign or mishandling of the contraflow termination, for example, has great potential to cause a multimile traffic backup, and with it commensurate criticism of the overall operation. Several plans terminate their contraflows at interchanges with other limited-access facilities, where a two-lane exit is employed to move two lanes of contraflow capacity to another roadway. This type of contraflow termination was regarded as preferred.

Effective contraflow planning also provides for emergency vehicle access, incident response procedures for disabled vehicles, and monitoring traffic conditions through a combination of reports from on-scene personnel and information from closed-circuit television (CCTV) cameras and vehicle detection systems along the route.

The coordination essential for contraflow operations to work effectively occurs long before the plan is activated. Besides District personnel from the Maintenance, Traffic Operations, and Safety offices, there is interaction with local government, police, fire, emergency medical services, and other Traffic Incident Management (TIM) team members – plus coordination with Tallahassee – so that the scope of contraflow action is understood and its operational phases planned and carried out effectively. When the time comes to implement a contraflow operation, this supporting framework of agencies and expertise increases the likelihood of success.

One concept proposed that may enhance communication is the establishment of an Evacuation Executive Council. This committee, based in Tallahassee, would be responsible for the planning and oversight of contraflow operations. Composed of members from the various entities involved in emergency management and response efforts, the council would provide a channel for two-way contraflow communications, coordination would be easier, and there would be less uncertainty regarding the information flow between Tallahassee and field operations. The council could also be a resource for contraflow policy, training, and public outreach, and for the periodic review of various reverse-lane plans.

Public outreach is no less important when emergencies occur. In the case of hurricanes, Florida residents and visitors want details on how a contraflow would be carried out in their community and what they should do to prepare. Agencies intend respond with accurate, timely information disseminated using fixed and portable variable message signs (VMS), 511 advanced traveler information services, highway advisory radio (HAR) broadcasts, and other means.

Contraflow is one of several hurricane response actions at the FDOT's disposal, though the Districts agree that the practice is one they hope they never have to use. There are risks inherent in the implementation of a contraflow, and limitations on both available hours for operation and viable termini. The resources and personnel that would be devoted to a contraflow operation may actually be better utilized in some other response action, such as the "shelter in place" strategy advocated by state emergency management.

None of the contraflow plans in this document has ever been used under actual conditions or otherwise initiated in connection with a hurricane evacuation. Though each has been carefully crafted and contingencies accounted for, a plan's true test will come in its implementation. Florida's transportation professionals and emergency responders have mapped their contraflow plans with considerable thought and critical analysis. They are confident that these preparations, together with ample resources and experienced personnel, will be the keys to a safe, effective evacuation.

## **1. Introduction**

In February 2005, the Florida Department of Transportation (FDOT) Traffic Engineering and Operations Office (TEOO) was assigned the task of reviewing the state's contraflow operation plans that were developed for use in hurricane evacuation events. The project began in mid-February and includes the preparation of this draft report. This project consists of the following three primary tasks:

- Review and revise the FDOT's contraflow plan entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*.<sup>1</sup>
- Conduct six (later seven) meetings with FDOT District-level personnel and representatives from other emergency response agencies to discuss individual contraflow route plans and solicit input from participants.
- Discuss methods for improving the coordination of hurricane evacuation activities with transportation officials in Georgia and Alabama.

The Florida Intrastate Highway System (FIHS) Contraflow Plan Review project was initiated in response to the unusually high level of hurricane activity that occurred during the summer of 2004, when a tropical storm and four major hurricanes struck the state in a seven-week period. Another contributing factor was the need to re-examine the FDOT's hurricane response policies and procedures with the intent of improving travel safety and efficiency during times of natural disasters. The technical memorandum entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation* was produced by PBS&J in 2000 after the massive evacuation prior to Hurricane Floyd in 1999. At that time, several FDOT Districts had already produced local contraflow plans – part of the wave of evacuation planning efforts throughout the Southeast in response to Floyd.

The technical memorandum was updated in 2002. More recently, FDOT Districts and Florida's Turnpike Enterprise (FTE) have been updating their individual contraflow plans, so the FDOT intends its contraflow update effort to be regarded as a statewide strategic plan that is easily distinguished from the Districts' tactical plans. In no way is the statewide plan intended to replace District plans. Rather, its purpose is to provide general guidelines for contraflow planning and criteria for the utilization of reverse-lane operations on limited-access highways.

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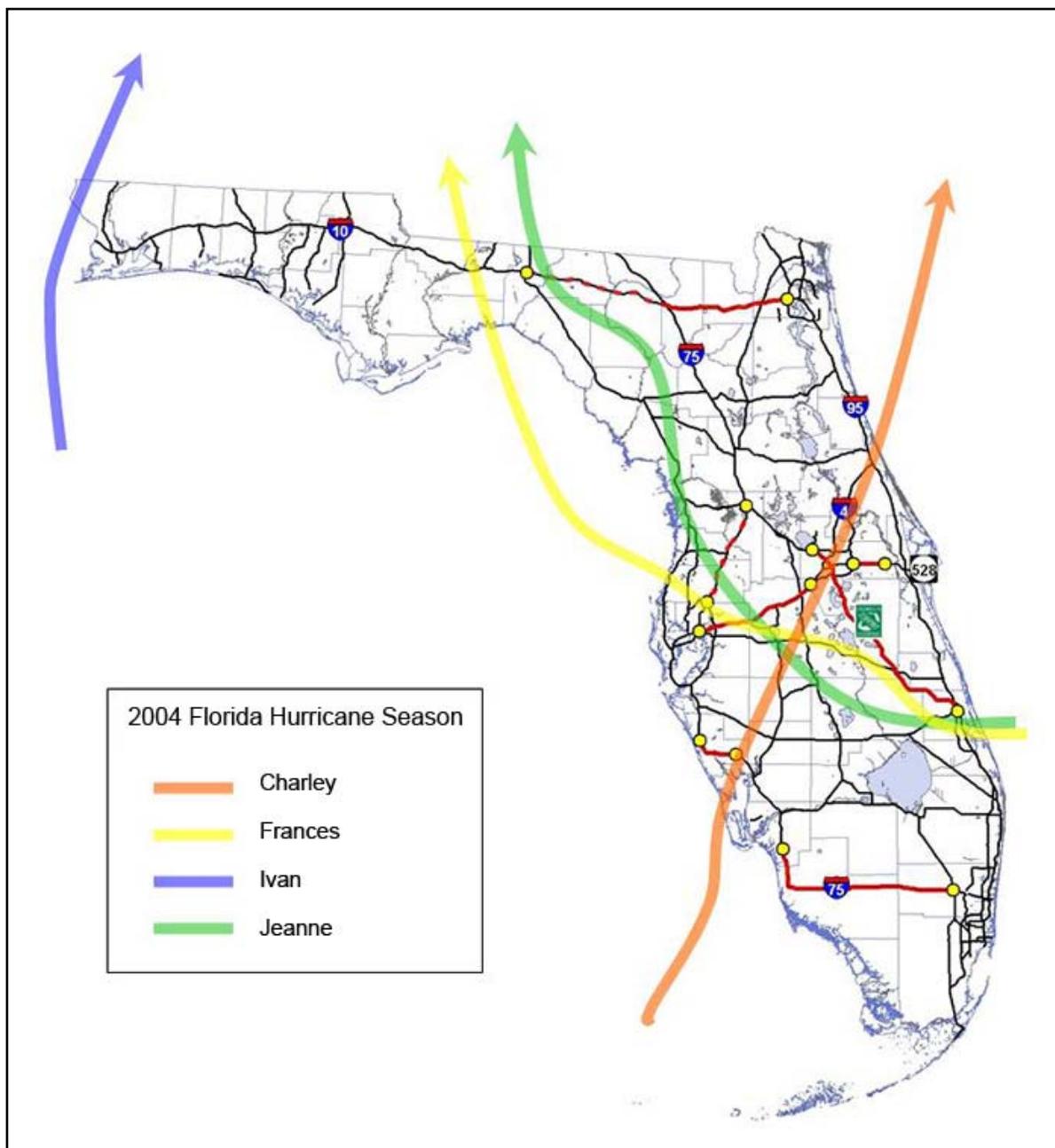
<sup>1</sup> *Technical Memorandum: Analysis of Florida's One-Way Operations for Hurricane Evacuation – Compendium of Route by Route Technical Memoranda* (revised March 2002). This document is included herein as *Appendix B*. The electronic version is available online at [http://www.rsip.lsu.edu/anb10-3/Resources/Analysis\\_of\\_Florida\\_s\\_One-Way\\_Operations\\_for\\_Hurricane\\_Evacuation.pdf](http://www.rsip.lsu.edu/anb10-3/Resources/Analysis_of_Florida_s_One-Way_Operations_for_Hurricane_Evacuation.pdf).

Another important aspect of this project is the effort to benefit from District insights and experiences in hurricane evacuation, given the storm-related activities of the last year. Many communities' emergency response capabilities were put to the ultimate test from hurricanes that struck when residents had hardly recovered from the previous storm. Each of the hurricanes (Charley, Frances, Ivan, and Jeanne) was unique in its characteristics, path, and the demand it placed on emergency operations. (Refer to Figure 1.1 to review the hurricanes' paths.) Evacuation efforts figured prominently in each and no District was unaffected by the resulting traffic impacts.

In preparing the contraflow plan and report, a series of meetings was held around Florida so that Districts could offer their ideas about reverse-lane procedures. As Table 1.1 depicts, these meetings also brought together representatives from the Florida Highway Patrol (FHP), the Florida Department of Law Enforcement (FDLE), county sheriff and municipal police departments, fire and rescue personnel, members of local traffic incident management (TIM) teams and others, each with a different perspective on contraflow issues and a different role to play in evacuation plans. The six District meetings were followed by a seventh meeting in Tallahassee with FDOT Central Office staff and individuals from other state government departments who are involved in emergency response.

The scope of work for this update did not include modeling to evaluate changes in District population growth patterns and evacuation needs. During the course of the meetings held, it became clear that a fundamental change in evacuation philosophy has occurred. This new philosophy, known as "shelter in place," would likely cause a significant reduction in the number of mandatory evacuees.

Figure 1.1 – 2004 Florida Hurricane Season



*Contraflow Plan for the Florida Intrastate Highway System*

**Table 1.1 – Contraflow Meetings Held in Florida**

Location	Date	Districts in Attendance	Other Agencies Represented
Jacksonville	February 22	District 2	FDOT, GDOT, Jacksonville Sheriff's Office, FHP, FDLE, Jacksonville Fire/Rescue Department, St. Johns County, FDOT Motor Carrier Compliance Office (MCCO), the District 2 Road Rangers, Jorgensen Contract Services, SmartRoute Systems/FDOT
Orlando	March 1	District 5 and FTE	FHP, FDOT, Orlando-Orange County Expressway Authority (OOCEA), Orange County Sheriff's Office (OCSO)
Davie	March 2	Districts 4 and 6, and FTE	Miami-Dade Police Department, Miami-Dade Expressway Authority (MDX), Sal's Towing, Broward County Traffic Engineering Department, Miami-Dade Department of Environmental Resource Management, FHP, Davie Fire/Rescue, FDOT MCCO, Miami-Dade Fire Department, HNTB, PB Farradyne, Emerald Towing, GCA, Anchor Towing, Synergy Environmental, South Florida Regional Transportation Authority/Tri-Rail, Sunshine Towing, 511-SmartRoute Systems, Davis Video News, ICA I-75 Management, Superior Towing
Tampa	March 11	Districts 1 and 7, and FTE	Arrow Towing, Hillsborough County Fire Department, University of South Florida (USF), FDOT, FHP, ICA, Hillsborough County Sheriff's Office, PB Farradyne, Manatee County, Pinellas County Fire Department, PBS&J, Tampa Fire Department, Earth Tech, Tampa Police Department, Florida Fire Chiefs Association, AAA South, Bradenton Fire Department, FDLE, Jorgensen Contract Services, Pinellas Suncoast Transit Authority (PSTA), VMS Inc.
Chipley	March 14	District 3	FDLE, FDOT MCCO, FHP
Fort Myers	March 24	District 1	Lee County, Collier County, United Rentals, FDOT, FHP, San Carlos Fire Department, Jorgensen Contract Services, FDLE, Bonita Springs Fire Department, Lee County Sheriff's Office, Lee County Metropolitan Planning Organization, PB Farradyne
Tallahassee	April 1	Districts 2, 3, and 6, and FTE	FDOT, FDLE, FHP, PBS&J

Though personnel from the Georgia Department of Transportation (GDOT) attended the Jacksonville contraflow meeting on February 22, 2005, separate FDOT meetings were held later with transportation officials in Alabama and Georgia to acquaint them with Florida's evacuation planning and explain potential impacts on their highway systems from Florida residents fleeing hurricanes. Contraflow was discussed in detail, including the contraflow policies and procedures employed in these neighboring states and how they have worked. Refer to *Section 4* of this document for that information. Notes from the FDOT District meetings are included in *Appendix A*.

### **1.1 Background**

Until the summer of 2004, the largest evacuation in Florida's history occurred in September 1999 as a result of Hurricane Floyd, a Category 4 hurricane that skirted Florida's Atlantic coast and made landfall in North Carolina. Though Florida residents were able to evacuate without harm, they encountered another ordeal in the form of congested highways and long hours mired in traffic with little or no guidance on where to find hurricane shelters. Travelers heading west from Jacksonville moved along at no more than 5 miles per hour (mph) on I-10. The scene was repeated all along the eastern seaboard as residents of coastal communities jammed interstates attempting to move inland to higher, safer ground.

Beyond the traffic impacts from the evacuation, Hurricane Floyd is illustrative for other reasons. The storm's approach came during a very active hurricane season that brought high water levels in many places the preceding two weeks. While public agencies were generally better able to respond to Floyd than they were to earlier hurricanes, nothing prepared them for the public's quick reaction to the evacuation warnings and the sheer numbers of people intent on getting away from the storm.

What followed was an opportunity for Florida leaders to witness the transportation system's ability to accommodate a large-scale movement of evacuees. Agencies mobilized quickly, and positioned their personnel and equipment accordingly in anticipation of Floyd's arrival. Evacuees from the most vulnerable areas along the coast were able to escape the hazardous conditions, and the evacuation occurred safely and without loss of life. Conversely, local officials and the general public were unaware of the dynamics inherent in such an evacuation. The unprecedented congestion prompted numerous complaints about the state's apparent inability to better manage the traffic. There should have been more information available to evacuees, critics charged, especially from the agencies directing emergency operations.

The traffic volumes and lengthy travel times raised questions about the highway system. Considering the population growth rates along the Atlantic and Gulf coasts, it was not feasible or prudent to build a network of roads able to accommodate the numbers of people evacuating from storms like Floyd. Other strategies were needed to manage evacuating traffic and the resulting congestion during storm events of that magnitude. In the fall of 1999, the Governor's Hurricane Task Force assigned its traffic management team the job of evaluating the feasibility of reversing the travel lanes on limited-access interstate highways. The team members conducted meetings around the state and identified routes that might support one-way evacuations in the event of another major hurricane. The highways they named included portions of I-4, I-10, I-75, Florida's Turnpike, and the Beeline Expressway (State Road [SR] 528). These contraflow routes, as currently planned, are explained more fully in *Section 3* of this document.

The 2004 hurricane season was marked by a series of major hurricanes that hammered the state during August and September, affecting virtually every community and stretching emergency management resources to the limit. The storms made landfall on all three sides of the Florida peninsula and together caused an estimated \$41 billion in property damage throughout the state. While Hurricane Floyd prompted an estimated 2 million people to evacuate Florida five years earlier, that number was easily eclipsed by Hurricane Charley, which compelled 2.7 million to flee prior to the storm's landfall Friday the 13th of August in Charlotte County. According to the Florida Division of Emergency Management (FDEM), evacuation for Hurricane Frances was 1.8 million, Hurricane Ivan was 545,000, and Hurricane Jeanne totaled 4.4 million people.

In each case, traffic conditions on the limited-access corridors prompted an assessment of the evacuation's progress and whether an area's contraflow plan should be initiated. It must be stressed that in none of the cases mentioned above was a contraflow implemented on the designated highways, though local FDOT Districts, FHP personnel, and other responders were prepared to do so if asked.

Conditions that prompt consideration of a contraflow operation parallel the criteria for declaring a large-scale evacuation: strength of the hurricane, its direction of travel, the point of anticipated landfall, and what measures are warranted to protect the population threatened. Enacting a contraflow plan is considered in that context.

While the *usage* of contraflow plans may indicate otherwise, the *need* for them as an emergency management tool has not diminished. If anything, another busy hurricane season could bring the kind of situation that would trigger a large-scale evacuation of a major urban population prior to the arrival of a rapidly advancing Category 4 or stronger hurricane — a scenario that could easily warrant the execution of a one-way plan for the area's designated route. (It should be noted that during the 2004 hurricane season, storms of lesser intensity also prompted large-scale evacuations.) In short, it's not *if* a contraflow operation would be declared under such circumstances, but *when*.

## **1.2 Source Document**

As stated previously, the *Analysis of Florida's One-Way Operations for Hurricane Evacuation* was last revised in March 2002. It contains reverse-lane plans for the original highways noted in the 1999 version of the document, but with notable changes. As a result of the Tampa Bay Regional Hurricane Evacuation Study<sup>2</sup>, a contraflow operation was proposed for the segment of I-75 from I-275 north to Wildwood. In the Panhandle, the I-10 eastbound contraflow route from Pensacola to Tallahassee was dropped due to the need for bidirectional traffic movements along that corridor during evacuation events.

In the process of analyzing the various routes for the 2002 update, the FDOT learned that the review of contraflow plans “must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends.” The individual reports that comprised the analysis helped underscore the benefits and disadvantages of each contraflow plan, along with its operational feasibility. The update recommended that the FDOT establish a review cycle in which two contraflow routes per year would receive formal review by agency participants. They would examine detailed operational features, and any environmental or infrastructure changes that could affect the operation’s feasibility or the timeframes for the contraflow’s startup or shutdown.

Since 2002, there have been numerous changes to the FIHS that necessitate contraflow plan revisions. That work is ongoing at the District level to ensure that the plans reflect actual conditions, and that adequate resources and personnel are available to implement the contraflow plan. At the state level, the FDOT determined that a general guidance document was warranted to present contraflow planning criteria and operating guidelines covering such elements as:

- Ensuring that incident responders have access to evacuation routes
- Advisability of utilizing highway shoulders as traffic lanes
- Identifying a means for improving communication with motorists
- Utilizing contraflow plans on arterial routes
- Re-entry planning after hurricane events
- Manpower needs
- Coordinating evacuations with adjacent states

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<sup>2</sup> For more information and to obtain a copy of the *2001 Tampa Bay Region Hurricane Evacuation Study Update*, visit the Southwest Florida Regional Planning Council’s Web site, available online at <http://www.swfrpc.org/hurr.htm>.

### **1.3 Organization of this Technical Memorandum**

*Section 2, Contraflow Issues and Operations*, explores critical aspects of contraflow implementation. Among these are the criteria on which a contraflow decision must be made, preparation for reverse-lane operations, contraflow setup and shutdown, staffing, and hours of operation. These aspects of contraflow are common to all plans. *Section 2* includes a discussion of public outreach strategies that will acquaint Florida residents and visitors with contraflow plans and how they will be implemented. The section concludes with recommended formats for contraflow plan documents so that all details are communicated clearly.

*Section 3, Specific Plan Information*, is devoted to unique contraflow details and features apparent at the District level, especially issues that will have great bearing on whether a particular plan is instituted and the evacuation's potential for success.

*Section 4* summarizes the information gathered from the meetings and discussions with Alabama and Georgia DOT representatives.

Following the plan summary in *Section 5*, *Appendix A* contains the notes from this project's kick-off meeting and from each of the seven subsequent meetings held with FDOT District personnel and Central Office staff in Tallahassee. *Appendix B* contains a copy of the *Analysis of Florida's One-Way Operations for Hurricane Evacuation* for reference.

## **2. Contraflow Issues and Operations**

Though the scope of work for this statewide contraflow plan update did not call for a detailed review of the operational plan associated with each District's contraflow implementation, operational issues must be taken into account to offer guidance on staging effective reverse-lane procedures. These subjects often arose in discussions during the various District-level meetings and reflect areas of agreement among Florida's transportation professionals as to how contraflow operations should be carried out.

### **2.1 Contraflow Setup and Shutdown**

While the chronological nature of contraflow implementation and operation begins with the physical deployment and setup of the needed resources, the time-critical aspect of contraflow is the actual traffic operation. A consistent comment made at all meetings is that contraflow operations should only occur during the daytime. There was mention in these comments that a past statewide evacuation-planning meeting, held perhaps several years ago, resulted in the determination that actual contraflow operations could only be performed safely during daylight hours. Lack of consistent roadway lighting, and atypical operations on the contraflow side of the roadway, compounded by a lack of typical highway signage (i.e., regulatory, warning, and motorist information/guide signs) were the main contributors to this conclusion.

The amount of daylight varies considerably during the hurricane season, which begins June 1 and ends November 30. In June, sunrise and sunset are approximately 14 hours apart, while in October, sunrise and sunset are only 11 hours apart – a 3-hour difference in available daylight. This seasonal variation in available daylight must be taken into consideration when scheduling a contraflow operation.

In the interest of maximizing the time available for a contraflow operation, there was an implicit understanding throughout the Districts that the actual device deployment (placement of barrels, barricades, signs, vehicles, etc.) for contraflow must occur during predawn hours to ensure that the roadway is adequately prepared for the reverse-lane operation as soon after sunrise as possible. While not a universal concern, one comment made was the need for a pilot to fly the contraflow route after preparation – but before opening it to contraflow traffic – to ensure safety. This would have to be done during daylight to provide visual confirmation of conditions. Later in the day, vehicle entry at the beginning of the contraflow route ceases in time to allow the last cars in line to clear the contraflow termination before sundown.

One significant aspect of contraflow operations that Districts raised, but which appeared to have not been discussed significantly previously, concerned the time, effort, and resources associated with restoring a contraflow roadway to conventional traffic flow. Generally, all Districts wanted to actually retrieve the devices deployed before the onset of tropical storm-force winds and not simply move barrels, cones, and vehicles out of the way. The reasons discussed for this approach include:

- Having the resources in hand for redeployment in support of re-entry after the storm
- Eliminating the potential for devices to be blown by high winds, becoming additional debris
- Minimizing the likelihood of damage to portable variable message signs (VMS)

Successful contraflow scheduling and operation must take into account all of these parameters, along with the minimum 24-hour notice to other participating agency personnel so they can mobilize their resources. Given the requirement for daytime only operation, variation in available daylight, predawn setup, and takedown before nightfall, the resultant contraflow timeframe is one day (or perhaps less, as dictated by the arrival of the hurricane itself). At the end of the contraflow operation, the roadway should be restored to normal flow and opened to all traffic so that evacuation can continue.

## **2.2 Loading Contraflow**

While the terminating point of a contraflow operation, which will be discussed later, is one of considerable focus and concern due to the potential for traffic congestion, the beginning point of a contraflow operation is nearly as significant. The preferred means of contraflow loading is the ability to load the contraflow operation with the same number of lanes that the contraflow roadway will provide—typically two. Less loading capacity creates two different risks: the potential for congestion at the loading point, and the potential public relations issue associated with an apparent poor use of contraflow capacity.

Specific crossover situations are noted in the description table for each evacuation route in *Section 3*.

The only evacuation route actually without an initial or beginning crossover in place is the I-75 Alligator Alley eastbound/southbound route. While there has been discussion about the need for such a crossover in the Fort Myers area, it has not been implemented. A temporary crossover is in place in that area in conjunction with a construction project. A discussion was held at the Fort Myers meeting concerning the possibility of this temporary crossover being permanently used in contraflow operations.

The crossover at the east end of the SR 528/Beeline Expressway contraflow route is only one lane, but this was designed deliberately. A key feature of the SR 528/Beeline Expressway contraflow plan is that it takes traffic evacuating on SR 520 west/northbound and assimilates it on SR 528 westbound. The single-lane crossover provides greater entering capacity at the SR 520 interchange for SR 520 west/northbound traffic.

The contraflow plan for Florida's Turnpike has a two-lane crossover, but there is no explicit means to load additional traffic onto either the contraflow or the normal flow side of the roadway. According to the FTE operational plan, the contraflow lanes are to be used as (and promoted as) express lanes for moving only northbound passenger cars to I-75.

### **2.3 Terminating Contraflow**

The most critical element of a contraflow operation is its termination. Any misdesign or mishandling of the contraflow termination has great potential to cause a multimile traffic backup, and with it commensurate criticism of the overall operation. All contraflow plans reviewed involved the reversing of two lanes of capacity. Successful termination of all these contraflow plans requires provision of two lanes of capacity to ensure minimal congestion. While there would be no real benefit to providing extra capacity, such as a three-lane contraflow exit, excess capacity at the termination would be of benefit. This advantage typically takes the form of eliminating, metering, or constraining merging traffic upstream of the contraflow merge.

Several contraflow plans terminate contraflow operations at an interchange with another limited-access facility (i.e., Florida's Turnpike, I-4, SR 528, I-75/Alligator Alley eastbound) where a two-lane exit is employed to move two lanes of contraflow capacity to another facility. This appears to be the most favorable means of terminating contraflow operations and the most likely means of ensuring success.

The adjusted I-10 plan, terminating at the I-10/I-75 interchange, is currently designed to have only a single-lane transition onto I-75 northbound. The two conventional westbound lanes are designed to taper into a single westbound lane, which would be forced to exit onto I-75 northbound. It is strongly recommended that this plan be revisited to evaluate the potential of developing two (even substandard) lanes on the existing exit ramp from I-10 to I-75, and perhaps a short section of shoulder use on I-75 northbound, coupled with the planned constraining of I-75 northbound traffic to a single lane. This would allow the two streams of I-10 traffic to merge successfully.

A topic of discussion at the District meetings concerned the need to contraflow six-lane facilities. The critical concern with such a concept focuses on the contraflow termination, where three lanes of capacity must be appropriately dealt with. While two-lane exits at major interchanges exist with some frequency, three-lane exits do not. Creative means of using multiple exits (one single-lane exit, one two-lane exit) at a single major interchange may have the appearance of accommodating the capacity, but could well result in significant congestion as motorists attempt to position themselves for the exit that takes them in a preferred direction. This difficulty – or inability – to have adequate terminating capacity severely limits any potential implementation of contraflow operations on six-lane (or greater) facilities.

A related element of contraflow termination includes the positioning and use of uniformed officers along contraflow routes. While the presence of a uniformed officer is perhaps the surest means of ensuring that traffic will “do as it is told” and not attempt to circumvent the planned route, the presence of any individual has the potential to reduce roadway capacity due to the motorists’ tendency to both slow in the presence of a pedestrian and also engage the individual in conversation. This tendency will slow traffic, thereby reducing roadway throughput and aggravating evacuating congestion. Similarly, the presence of flashing lights operating can also serve to slow traffic and can also worsen congestion.

Given these tendencies, the best recommendation for routine positioning of resources at terminations or other contraflow decision points would be for troopers or other agencies’ employees to remain inside their vehicles, with lights off, unless circumstances dictate a more elevated presence.

## **2.4 Contraflow Access for Evacuating Vehicles**

The contraflow plans in place statewide are inconsistent in terms of allowing access for evacuating vehicles. While most plans allow contraflow vehicles to exit at interchanges, some allow re-entry to the contraflow side; others allow it at some interchanges, while others not at all.

There can be a strong interest in limiting access for contraflow vehicles to streamline reverse-lane operations, but limited access can have negative impacts on contraflow operations as well. All evacuating vehicles will have routine travel needs, such as gas, food, and rest stops. The easiest means to provide these services is through access provided at interchanges and existing rest areas or service plazas. Further, allowing evacuating traffic to exit may encourage some motorists to leave the roadway entirely, whether to seek shelter or to find an alternate route, reducing (even if slightly) the corridor’s evacuating traffic flow.

Allowing traffic to re-enter the contraflow side from interchanges is a concern, principally due to the unusual nature of using a roadway system designed for exiting in one direction to function as an entrance from the opposite direction. Varying interchange geometries statewide sometimes accommodate contraflow exit/entry better than others. However, to the greatest extent possible, reentry to the reverse-lane side should be permitted, simply to allow for some balancing of traffic flow as vehicles enter and leave the roadway.

### **2.5 Emergency Vehicle Access**

A critical contraflow issue associated with shoulder usage concerns emergency vehicle access to the subject roadway. For shoulder usage plans, the loss of a shoulder is the loss of both a place for disabled vehicles to move, as well as a loss of paved surface for emergency vehicle use.<sup>3</sup> However, for shoulder use situations, the roadway continues to operate as a two-way road, allowing emergency vehicles to use the opposing travel lanes to approach incidents in a manner similar to normal conditions.

But in the case of contraflow operations, emergency vehicle access is limited from the perspective that one direction of approach is simply eliminated. This results in an additional burden being placed on emergency responders that may have to be met through alternative means, such as:

- **Prepositioning vehicles:** Since one direction of travel is not available for use, emergency vehicles may be compelled to position themselves along the route at certain interchanges to ensure reasonable response time during contraflow operations.
- **Use of alternative routes:** The need to travel in the direction counter to a contraflow, whether in response to an incident or to return to a base facility or prepositioning point, may force emergency responders to use alternate routes not typically considered. If these routes are close and approximately parallel to the contraflow corridor, the impact of this may not be great. Such roads may already be among the emergency responders' candidate routes. However, as the alternate routes become progressively less attractive, emergency responders may be less prone to use them due to their inconvenient locations.

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<sup>3</sup> It should be noted that the Road Rangers, as well as other responders, have expressed reluctance to traveling along the shoulder to reach a disabled vehicle when the travel lanes are backed up. Their concern is a legal one: if a motorist in a travel lane ahead pulls onto the shoulder and a Road Ranger hits them, the Ranger is liable for the accident.

It is recommended that agencies agree on the response procedures for disabled vehicles. A plan developed by the FTE, for example, provides for removal of a vehicle from the roadway or shoulder to ensure that traffic flow is not impeded unnecessarily in an evacuation. Disabled vehicles are to be moved off the roadway (pushed if necessary). The responder will spend a minimum amount of time trying to repair or restart the vehicle. If the repair cannot be done, the vehicle will be left on the roadside and its occupants offered a ride to an exit, a rest area, or service plaza. The shoulder is to remain clear for emergency access. In the event of an incident occurring at an interchange or exit, the vehicle(s) must be moved to prevent blocked lanes, which could otherwise negate any capacity benefits gained from contraflow.

## **2.6 Shoulder Usage**

As an alternate to contraflow operations, the idea of using the existing paved shoulder as a means to create additional evacuating capacity was raised. As discussions at the different Districts progressed, it was apparent that this is a concept that had been previously examined. Generally, there was little support for shoulder usage evacuation plans. The reasons presented most frequently in response to the question “Why?” included:

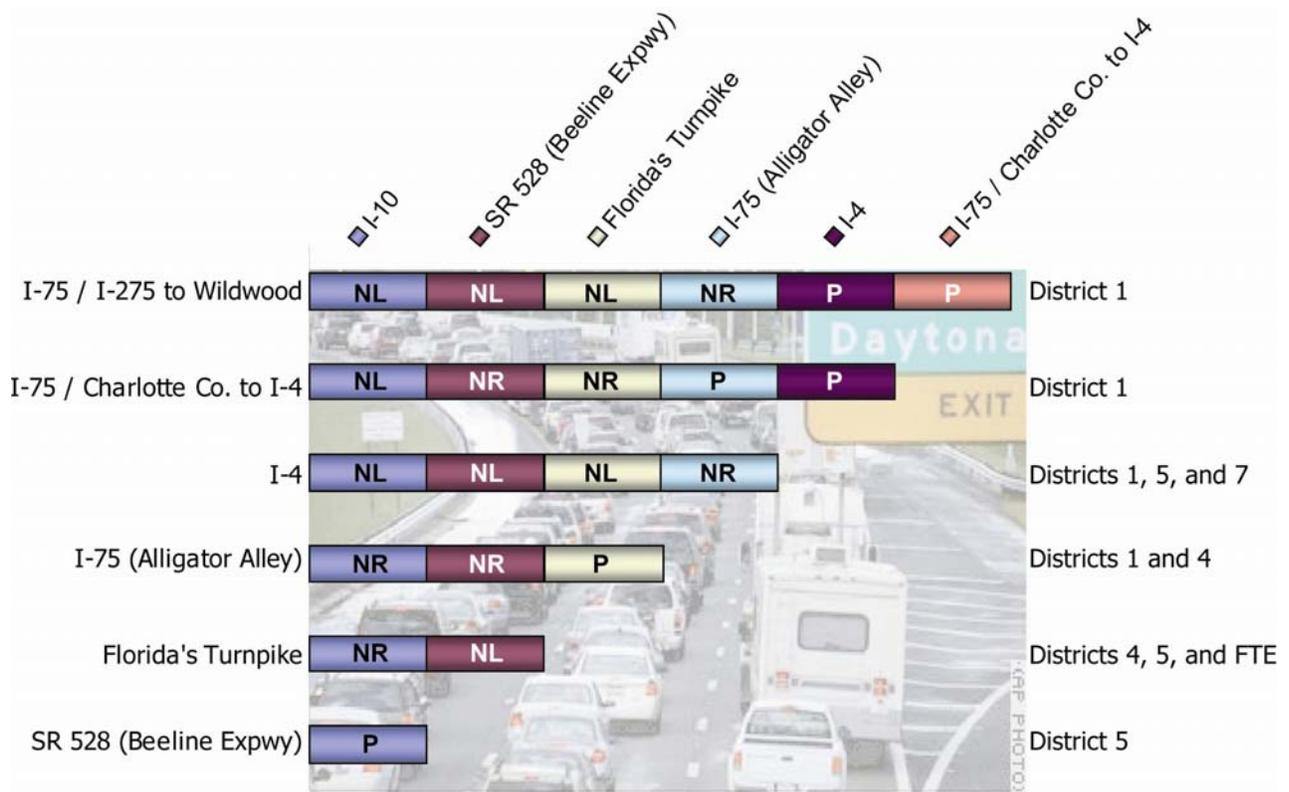
- **Rumble strips grooved into the shoulder:** Most shoulders have rumble strips cut into the pavement as a means of addressing lane departures. The annoyance of the noise and vibration travelers experience on the shoulder makes extended driving on that surface intolerable.
- **Inadequate shoulder width at some bridges:** While many bridges have full-width shoulders, there are significant numbers that do not. Their presence makes shoulder use inconvenient at the least, and potentially unsafe.
- **Inability for emergency responders to access emergency:** The shoulder is an accepted means for emergency response providers to access incidents. If the shoulder is used as a travel lane, this access is eliminated, potentially causing a disabled vehicle to block a lane and increase congestion.
- **Debris on shoulders requiring removal:** Various types of debris frequently accumulate on paved shoulders. Some of this material is of the size and type to puncture tires and cause other damage to vehicles traveling on the shoulder.
- **Proximity of existing motorist aid call boxes:** Call boxes are located very close to the edge of the paved shoulder, unsafely (and uncomfortably) close to traffic traveling on the shoulder.

## **2.7 Concurrent Contraflow Operations**

An issue that requires some investigation concerns the need for concurrent contraflow operations. Most Florida metropolitan areas have more than one contraflow plan that either begins or ends in their vicinity. And separately, hurricane tracks could create a need for multiple contraflow plans to be in operation at the same time. Table 2.1 labels the routes with the greatest likelihood of activating contraflow operations simultaneously with a “P.” Routes labeled “NL” indicate which routes, though reasonably close to each other, are not likely candidates for simultaneous operations. The “NR” label is used for those routes that are far from each other, so much so that their simultaneous operation would not have a significant impact.

For those sets of contraflow plans labeled “P,” additional analysis should be performed to ensure that either resources are present for both routes simultaneously, or that alternate source(s) are investigated and available prior to the need.

**Table 2.1 – Simultaneous Operation of Contraflow Plans in Florida**



**Legend**

- P – Possible
- NL – Not likely, though reasonably close geographically
- NR – Not geographically relevant

## **2.8 Roles of Individual Agencies**

Over the course of a contraflow operation, several different agencies are involved to varying extents. The roles and responsibilities of each agency (or agency type) need to be clearly understood to ensure that each aspect of contraflow operations is addressed – but only once. Plan development is a multiagency effort that includes state and local agencies. The different agencies anticipated to be involved in contraflow operations, and a summary of their roles and responsibilities, is presented below.

### **2.8.1 Florida Department of Transportation**

The FDOT is the agency responsible for the development of the contraflow plan's route, identifying its beginning and ending points, and identifying any additional hard infrastructure needed to make the contraflow route complete, such as paved crossovers. Contraflow plan development should be performed in a coordinated manner between the FDOT and the appropriate FHP troop commander to ensure that, to the greatest extent possible, the plan accurately reflects the FHP's resource needs. At the time of contraflow plan implementation, the FDOT is responsible for furnishing such resources as cones, flares, barricades, and portable VMS, placing them according to the contraflow plan's guidelines. Additionally, FDOT personnel will furnish vehicles and manpower to assist in implementing the contraflow plan. The FDOT is also responsible for infrastructure maintenance before, during, and after a contraflow operation.

### **2.8.2 Florida Highway Patrol**

The FHP is the agency responsible for implementing and operating a contraflow plan. The FHP should be involved in the development of the contraflow plan, and any inclusion of FHP resources in the plan should have FHP approval. The FHP is also the agency responsible for communicating the decision to implement a contraflow operation to the FDOT; local law enforcement; and local fire and emergency response agencies. The FHP may choose (or be required) to develop a contraflow operational plan independent of the FDOT's contraflow plan, but the FHP plan should not deviate from the FDOT-developed plan. The FHP plan should only differ in its method of presentation, as required to meet FHP procedures.

### **2.8.3 Florida National Guard**

While use of Florida National Guard (FNG) resources is mentioned in some contraflow plans, discussion during the District meetings made it clear that FNG resources will not be called on for actual contraflow operations. This decision is based on the lead time required to request FNG resources, which is in excess of 48 hours. This is in conflict with the expected contraflow

decision window of 24 hours before implementation of the contraflow plan. Consequently, it is not reasonable to plan for use of FNG resources; contraflow plans should not show their involvement.

#### ***2.8.4 Local Law Enforcement Agencies***

The resources of local law enforcement agencies are not to be part of contraflow plan operations. This recommendation is deliberate and based on the assumption that law enforcement resources will be fully committed to noncontraflow needs, which may include operational needs on surface roads or other local streets. Any explicit requirement for local law enforcement involvement in a contraflow plan operation should only be stated when availability of such resources has been formally assured by the candidate law enforcement agency.

#### ***2.8.5 Local Fire and Emergency Response Agencies***

Local fire departments and emergency responders will be responsible for their usual readiness and involvement in the same manner as when no contraflow operations are occurring. Emergency medical services (EMS) are coordinated through the State Emergency Operations Center (SEOC). As needed, the Florida Department of Health will provide “backfill” resources to agencies in the affected area using units from other locations around the state. As fire or rescue needs occur, these departments will meet them in the customary and appropriate manner. However, as described in *Subsection 2.5*, it may be incumbent upon fire and rescue providers to pre-position their resources or be prepared to use alternate routing in response to incidents because of contraflow operations.

### **2.9 Communication and Coordination**

A concern raised at many of the District meetings was the need for communication and coordination between Tallahassee and District field operations. The concerns raised were oriented around the issues of “Who is listening?” and “Are we being heard?” As the meetings progressed, it became clear that both parties were being heard by the other – and that communication was both strongly desired, and the information passed up the line to state leaders was being heard and used.

The near-contraflow of the Beeline Expressway in 2004 is perhaps the best example of this. A comment from Tallahassee was, “We did not contraflow the Beeline because the locals did not think it was needed.” A companion comment from local forces was, “We were ready to contraflow, but they never told us to do it,” along with “Traffic was moving fine, so why contraflow?” Ultimately, it appears that an important dialogue did take place, conditions were evaluated, and based on that, the right thing was done in not implementing contraflow operations on the Beeline Expressway.

One concept that may improve communication is the establishment of an Evacuation Executive Council. This committee, based in Tallahassee, should be responsible for the planning and oversight of contraflow operations. The panel should represent the various entities involved in the emergency management and response effort, including the FDOT, FHP, FDEM, Florida Sheriff's Association, and related responders. The members of this committee and their contact information should be published statewide. The council should be the body responsible for receiving reports from local agencies and assessing local conditions prior to a hurricane, then making a contraflow recommendation that would be forwarded to the director of the Florida Division of Emergency Management.

The committee membership may well include professionals who are already part of the state's emergency response personnel and not necessarily additional individuals. In having a formally established committee with a channel for two-way contraflow communications, coordination would be easier and there would be less uncertainty regarding the information flow between Tallahassee and field operations. The Contraflow Executive Council could also be a resource for contraflow policy, training, and public outreach, and for the periodic review of various reverse-lane plans.

## **2.10 Public Outreach Strategies**

There are few times when public information efforts are more crucial than when emergency situations occur. In the case of hurricanes, Florida residents and visitors seek information on two levels:

- Weather conditions due to the storm itself.
- Agency guidance on hurricane preparations and evacuations.

This demand for information has led to more intensive hurricane coverage by the media and more frequent advisories by various sources, though it is a mistake to equate the overall quantity of reports produced and aired with the quality and usefulness of the information provided.

Nonetheless, the dissemination of essential information on roadway conditions and traffic flow is of particular importance during these times of natural disaster. Both prior to and following hurricane events, the public must be able to receive accurate and timely information so that they may evacuate from and return to affected areas safely and quickly. Because most travelers are unfamiliar with contraflow operations and how they function, the FDOT, its Districts, and their agency partners have a much greater task before them in educating the public and increasing awareness of this evacuation procedure.

The public outreach strategy for contraflow operations can be planned around:

- Content
- Timing
- Mode of delivery

Each of these aspects will have an effect on an awareness campaign's success, and each should be utilized for message impact and effectiveness. Guidelines given here are intended to aid the planning process, but are by no means intended to supplant proven procedures or practices for public information campaigns. Throughout these efforts, the FDOT, FHP, and SEOC public information officers should coordinate their activities to ensure consistent message delivery and the broadest coverage possible.

### *2.10.1 Content*

From a practical standpoint, a public awareness campaign for contraflow operations should assume that Florida residents and visitors know little or nothing about the subject, even though they may have had personal experience with evacuating for a hurricane in the past. Another consideration is the fact that a contraflow plan is unique to the community where it is implemented, so local residents may already be familiar with the highways affected by a reverse-lane operation; the contraflow's beginning and ending points; and alternate routes to take if they prefer. This basic knowledge should be enhanced through dissemination of the contraflow plan itself in whatever format is most appropriate. This way, motorists will learn more specific information about how their local interstate will be configured for contraflow operations and the changes they can expect should they take that route to evacuate.

Supplement this plan information with additional details on the hours a contraflow is likely to be operated, when it will be instituted on a given day, and when it will be curtailed. Explain how vehicles will enter and leave the reverse-lane portions of the highway. Provide basic information on the general criteria that the FDOT and other agency representatives rely on to determine whether a contraflow operation is warranted. Also include details on a contraflow's timing as it relates to an approaching hurricane and how the reverse-lane operation is scheduled prior to the onset of tropical storm-force winds, which make driving unsafe.

If a District has initiated any contraflow-related construction, such as installation of median crossovers, or there have been changes to the plan document itself, use such occasions to talk about contraflow operations with members of the press. Arrange for photographers to get pictures or video of the construction being done. Furnish contraflow plan maps to print and broadcast reporters for them to use with their reports.

Should a storm threaten a particular District and raise the potential for a contraflow operation to be declared, message content should emphasize specific details on what motorists can expect and how travel plans should be made. The FDOT advisories could even be coordinated with those from the FHP, since the contraflow operation will be administered by State Troopers. Always conclude the advisory with ways that motorists can obtain additional information, such as telephone hotlines and the 511 advanced traveler information system (ATIS), Web sites, and highway advisory radio (HAR) broadcasts. If the bulletin is to be repeated at regular intervals or updated later, give the time that such a revised announcement will be available.

### *2.10.2 Timing*

This plan recommends the start of contraflow information efforts well before hurricane season starts June 1. With summer still a few months away, a District can issue press releases on hurricane evacuation planning that include explanations of contraflow operations and how they work. Find out if local newspapers or broadcast stations are planning preseason hurricane reports, special sections, or programs. If so, offer to assist with an article or program segment on contraflow planning, and suggest possible interview subjects that reporters can contact on the subject.

Other ways of reaching the public and offering contraflow information include speaking at gatherings of local civic or professional organizations, or homeowners associations. Look for opportunities to have exhibits on hurricane evacuation and highlight the area's contraflow plan. Distribute fliers at shopping malls, public libraries, driver's license offices, and courthouses or city halls.

Once hurricane season begins, public interest in hurricane preparations and evacuation will depend largely on the presence of a particular storm and its potential threat to Florida. With a storm still several days out, there is still time available to distribute local information on evacuation efforts. A press release might delve into how a District will prepare the highway system for prestorm traffic flows, and how signals and other systems will be restored once a hurricane has passed. Contraflow operations can be explained during this time, as well, along with details on where residents and visitors can obtain more information (i.e., Web sites, FDOT publications, local emergency management offices, etc.).

As noted elsewhere in this technical memorandum, the decision-makers responsible for contraflow implementation reach a critical milestone approximately 48 hours before the onset of tropical storm-force winds. It is then that they assess weather conditions and the storm's anticipated landfall, and determine if conditions are right for a contraflow operation to be instituted for a given highway. Once that decision is made, preferably 24 hours or more in advance of tropical storm-force winds, events are set in motion to mobilize a contraflow operation and carry out the plan. This action must include advisories to all local media with the specifics of what is planned, when it is planned, where it will occur, and for how long. Ideally, the press information to be released is prepared in advance, with last-minute details and FDOT contact information added prior to dissemination.

### *2.10.3 Mode of Delivery*

#### *2.10.3.1 News Media*

The news media is the main means of providing travel-related information to the public. In general, this information is given to the media by the District Public Information Office (PIO) and includes information from Traffic Operations staff on current road conditions, road closures, detours, debris removal, and signal repairs. In the days leading up to a hurricane's landfall, newspapers, radio, and television outlets allocate increasingly greater resources and time to covering the storm event, and their interest in the FDOT's traffic and travel advisories rises accordingly. Because most Floridians will be getting most, if not all, of their hurricane-related news from radio, television, newspapers, and the Internet, the PIO is wise to utilize these outlets to the greatest advantage possible.

Make sure news departments know which key District personnel are the contacts for contraflow information and how to reach them. Be familiar with the deadline schedules for the different media outlets. Television stations will want stories produced before air time, (usually the 6 and 11 o'clock newscasts), though they may choose to break away for a live interview during a news program. Radio stations typically follow a schedule of regular hourly newscasts, but often host on-air interviews of agency representatives who can talk about evacuation plans and answer listener questions in a call-in format. A newspaper's deadlines follow the publication's print schedule, so reporters' stories for a morning paper are usually due by late afternoon or early evening. Deadlines for newspaper photography and special graphics, such as maps, diagrams or charts, may be several hours earlier to allow sufficient production time.

Coverage of an approaching storm will intensify as the hurricane nears, so most broadcast outlets will switch to continuous reports, interspersed with tips on hurricane preparation, shelter locations, school closings, and the like. This affords the affected District even more opportunities to relay information on contraflow operations, traffic conditions, and other travel-related subjects. During the 2004 hurricane season, radio stations in District 7 joined local TV stations in broadcasting critical information before, during, and after the storms. That meant that those residents using battery-operated radios were getting the same information as those capable of receiving information from TV broadcasts.

### 2.10.3.2 Web Site Operations

The value of Web site operations lies in the host's ability to directly determine the content of the information distributed and update it at will. With the rapid growth of Internet usage and the popularity of Web sites as news sources, posting contraflow information in this manner is a means of public outreach that should not be overlooked. Members of the public who may hear about an FDOT advisory on the radio or TV are very likely nowadays to seek additional information online, provided they know the Web site name to use.

This was proven to be the case during the summer of 2004. Web site traffic rose noticeably prior to each hurricane as individuals sought the latest information on traffic conditions, evacuation routes, bridge closures, travel times, and emergency management advisories. Certain portions of the state, notably Southeast Florida and the Tampa Bay area, had Web sites to disseminate traveler information for their particular regions, and other parts of Florida are expected to follow with the implementation of similar services. Remember, too, that related sites, such as those of other agencies, counties, or municipal governments, and some media outlets, may accept links to FDOT sites, which would increase the number of Web site visits and provide wider dissemination of the desired information.

Take every opportunity to promote the District's Web site by giving the address with each press release or news conference. Include it on business cards, posters, leaflets or other printed materials that the District may produce for distribution. Disseminate it during HAR broadcasts and on 511 ATIS messages.

### 2.10.3.3 Information en Route

Highway dynamic message sign (DMS) units, both fixed and portable varieties, are valuable for on-scene advisories that are site-specific, enabling the FDOT to deliver evacuation information at the exact location where it is needed and often during times when power outages limit available options. In the case of contraflow operations, examples could include alerting motorists to the beginning or end of a reverse-lane segment of highway; presence of lane changes or closures; and potential delays ahead due to traffic congestion. Dynamic message signs can be

used to promote other information sources, such as HAR and 511 ATIS services. The signs, however, are limited in the number of lines and characters they can display, so lengthy or detailed messages are not possible.

During past weather emergencies, FDOT Districts have supplemented DMS deployment with HAR advisories. This gives the Districts a greater ability to prepare and broadcast detailed messages that explain the alerts and provide more information on the corridors being used. There is no time limit on the message duration, and the broadcasts can be done in Spanish and Creole as well as English. Foreign language HAR broadcast templates need to be prepared well in advance of storm onset to make sure the proper idioms are used.

A similar service to HAR is the Everglades Radio Network (ERN), an educational service that provides information on the history of the Everglades and its ongoing ecosystem restoration effort. The ERN consists of two low-power frequency modulated (FM) radio stations that were constructed by the FDOT, are managed by the Florida Department of Environmental Protection (FDEP), and are operated by Florida Gulf Coast University in Fort Myers. The planned broadcast radius was approximately 5 miles, although the actual broadcast radius reaches about 10 miles. The stations are positioned so that their broadcast area covers all of Alligator Alley on I-75 in Collier County, allowing motorists to tune in WFLP-FM at 98.7 megahertz (MHz) and WFLU-FM at 107.9 MHz to listen to the broadcast. Since the ERN is a licensed facility, each station must be tied into the Emergency Alert System (EAS) and is required to provide emergency information generated by the EAS.

The ERN is set up so that the FDOT can interrupt broadcasts to provide traveler advisories and emergency information, such as hurricane evacuation guidance, to motorists when necessary. The process to get information aired on the stations requires the requestor to contact Florida Gulf Coast University and, typically, the requestor provides a recorded message for the University to play on the air.

The Traveler Information Radio Network™ (TiRN™) is a public-private partnership that provides tourist information in Central Florida. It covers the four counties of Brevard, Orange, Osceola, and Seminole. Information is broadcast from two amplitude modulated (AM) stations, WTIR and WQBQ. The FDOT is given a total of six minutes each hour to provide traffic information on a regular basis, but during emergency events, the FDOT can utilize more time as necessary. Generally, the transportation information broadcast by TiRN is provided by both TiRN personnel and District 5's PIO, which utilizes closed-circuit television (CCTV) cameras, information from the FHP, and information from their incident hotline. During the days prior to a hurricane's expected landfall, TiRN reports information from county emergency operations personnel and carries news from the Cable News Network™ (CNN™).<sup>4</sup> Close coordination is

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<sup>4</sup> CNN is a trademark of Cable News Network, LP, LLLP, a Time Warner Company. All rights reserved. © 2005.

needed between the TiRN, FDOT PIO, and TMCs to ensure that up-to-date, accurate information on current roadway conditions is broadcast in a timely manner.

Another tool is the 511 telephone service, which is available in southeast and central Florida, Central Florida, and the Tampa Bay area. Motorists can dial 511 to obtain information on traffic congestion, road closures, travel times, and separate hotline numbers to call for hurricane shelter locations. The 511 service has the advantage of being very reliable: at no time during any of the 2004 hurricane events were the operating 511 systems in Florida down or unable to function.

System operators, however, are addressing a primary drawback of 511 – the inability to transfer a caller to agencies outside an area’s 511 system. Nonetheless, 511 service is a means of relaying bulletins to travelers for whom the cellular telephone is a constant companion. The service can be advertised on DMS units; billboards; posters at rest areas; and fliers at truck stops and service plazas. It can be used to direct callers to other sources of contraflow information.

In response to the 2004 hurricanes, the Orlando area’s 511 system provided hurricane-related information as a header message under their special alert system feature, which the caller can access if desired. Information regarding shelter locations and space availability was provided by directing callers to a separate evacuee telephone number for the Orlando-Orange County Convention and Visitors Bureau that was mentioned during the header message.

In Tampa, the 511 service provider, Mobility Technologies, provided evacuation information through an alert process programmed into the 511 system. The system had two levels of alert: mandatory and voluntary. The mandatory alerts were provided as a floodgate message and the caller had no choice except to listen or hang up. With voluntary alert messages, it is up to the caller to access the voluntary alert message if desired. Mobility Technologies also had people stationed at the county emergency operations center (EOC) and passed along the emergency alerts originating there to the 511 system.

### ***2.11 Frequently Asked Questions Regarding Contraflow Operations***

As a companion to the preceding section on public outreach, common contraflow questions and responses are included below. They can be incorporated into materials that are distributed to the media, or used in other ways to inform Florida residents and visitors about contraflow plans and their application in emergency situations.

**Why don't contraflow operations occur at night?**

Principally, it is due to safety concerns. When a road is operated as a contraflow, vehicles are traveling on it in the opposite direction from how it was designed and constructed. All the signage designed to help guide motorists is oriented away from contraflow motorists. Additionally, the raised pavement markings are not designed to be used by contraflow vehicles. Consequently, the road has little to offer the contraflow motorist in terms of safety, and this is worsened at night.

**Why do all contraflow routes end at major interchanges?**

The principal intent of contraflow operations is to move as many evacuating people away from the threatened area as quickly as possible. At the end of the contraflow operation, the contraflow traffic must be handled appropriately to minimize any backups. The most efficient means to do this is at a major freeway-to-freeway interchange, where there is adequate capacity to move the contraflow traffic safely and quickly to another high-capacity roadway.

Contraflow planners are urged not to end these operations at diamond interchanges, which typically have single-lane entrances and exits, and frequently have a right-angle intersection with the crossing roadway. Both these limitations severely restrict the capacity of the diamond interchange to move traffic.

Lastly, contraflow terminations are positioned so that motorists are left with alternatives either to seek shelter or to continue their travels.

**Why are contraflow routes only those with two lanes in each direction?**

As with the practice of ending contraflow routes at major interchanges, having enough exiting capacity at the end of the contraflow route is critical. If roads with more than two lanes in each direction are operated as contraflows, then more than two lanes of capacity would be needed at the end of the contraflow route. While it is reasonable to have two lanes of exiting capacity at a major freeway-to-freeway interchange, having greater than that as exiting capacity does not frequently occur.

**Why do contraflow operations need to stop before nightfall?**

While some aspects of this question were answered in the response on daytime operations, there is another relevant aspect to contraflow operations to consider. All resources (i.e., barricades, cones, portable VMS units) placed along the route are to be retrieved prior to the onset of tropical storm-force winds. This is done deliberately to:

- Minimize the potential for damage to these resources during the storm
- Have the resources available in hand to support reentry
- Minimize the risk that resources may be blown onto the roadway during the progress of a storm

**What tools can be used to assess traffic conditions before deciding to implement contraflow operations?**

Perhaps the principal traffic management reason to implement contraflow operations is when volumes of vehicles, presumably evacuating vehicles, increase to the point that travel speeds drop significantly – what is typically called traffic congestion. Besides firsthand reports from personnel along the route, there are technological tools that can be used to help assess traffic conditions.

- Traffic count stations – Florida already has an extensive statewide network of permanent traffic count stations. These stations periodically send traffic count information to a central computer. While that transmission typically occurs daily or possibly even less frequently, it can be adjusted to occur much more frequently during special circumstances, such as hurricane evacuations. Care must be taken in interpreting data from these sites, in that a low volume reading may indicate that traffic volumes are quite low – or that congestion is so severe that very few cars are passing the count station. Some form of positive confirmation is needed to ensure actual traffic conditions.
- CCTV cameras – Florida has an increasing number of CCTV cameras installed on highways, with these deployments typically radiating from metropolitan areas. These cameras can be valuable in assessing traffic flow conditions, even if the quality of the video displayed is limited. The height of the CCTV camera installation (typically 40 feet or greater) also makes it an even better tool than a person standing on a bridge over a road, since the viewing range is so much greater.

**Why aren't FNG troops used in contraflow operations?**

To activate its personnel, the FNG requires a minimum of 48 hours advance notice. In light of the need to make the evacuation/contraflow operation decision with approximately 24 hours'

notice, it is not realistic to consider the FNG as a reasonable resource for use in staffing contraflow operations.

**Why isn't there a contraflow route for I-75 north of Tampa?**

Though there has been considerable discussion about a contraflow route for I-75 from Tampa northward to the Wildwood interchange, such a plan has not been developed and is not envisioned. This is due mainly to the lack of capacity at Wildwood, which would be the likely end of such a contraflow route. Another reason Wildwood is not feasible for a contraflow termination is that it is the end point for Florida's Turnpike, which would intensify the traffic congestion there at the merge with I-75.

**Why aren't there contraflow routes for the western part of I-10 or for I-95?**

A critical goal of any evacuation is to ensure that those evacuating are taken to a safer locale. The principal cause of fatalities from hurricanes is not wind, but storm surge, so evacuees must be moved away from coastal areas most threatened by storm surges. When coupled with the uncertainty of a hurricane's projected path and point of landfall, I-10 in the Panhandle and I-95, which both roughly parallel the Florida coast, cannot be counted on reliably to take evacuees out of harm's way, so they do not have contraflow routes designed for them.

**What are the benefits of contraflow operations?**

The principal benefit of contraflow operations is the ability to use the maximum amount of major roadway capacity possible for evacuating people from a threatened area.

**What are the risks (i.e., negatives, liabilities) associated with contraflow operations?**

There are numerous negatives, including:

- The risk that overwhelming congestion will occur at the end of the contraflow route, and that evacuating people may, at worst, still be on the highway in their vehicles when the storm hits.
- Safety aspects of traffic flowing in the reverse direction on a segment of highway. Such highway features as signage, guardrails, and interchanges are intended for use by vehicles headed in a particular direction. Reversing that flow is inherently hazardous, especially to any errant vehicles present. There are additional safety implications in asking evacuees who are already stressed and fatigued to drive on the wrong side of the road.

- The labor and equipment necessary to deploy barricades and signs, and then to physically staff critical points along the route, is significant. A contraflow operation consumes these resources and precludes their use elsewhere for the duration of the weather emergency. Additionally, the setup and takedown time required further taxes these resources. While cost is certainly waived as a consideration when lives are in peril, other alternatives (even cheaper ones) may work at least as well or better than a contraflow, and result in greater protection of the public.
- The risk of damage or loss of resources. The operating procedures developed for contraflow operations call for equipment to be removed before the onset of tropical storm-force winds, but there is a significant chance that resources may be inadvertently left in the field, where the risk of damage is greater due to the storm. These same resources may be needed for marking return routes after a hurricane, but replacing lost equipment then is likely to be difficult.

## **2.12 Contraflow Plan Documentation**

The individual contraflow plans differed significantly among each other in several different aspects. While some of these variations are simply a matter of different plan preparation or document formatting decisions, other differences are due to different design and operational philosophies or assumptions. Nonetheless, certain needs became apparent based on the review of all plans, including the:

- Need to total quantities for the entire plan
- Need to total quantities per sheet
- Need for a broadly understood plan appearance
- Need to clarify relationships between plan sheets when depicting maps
- Need for consistent symbology
- Need for consistent portable VMS message provision
- Need for “universal” plan availability

### **2.12.1 Total Quantities for the Entire Plan**

Most of the plans had no planwide summary of quantities for such essentials as barricades, signs, personnel, and vehicles. Such a summary is the key to assessing resource needs quickly, both at an individual plan level and at a statewide level. A standardized summary of quantities is needed for every plan, and these figures must be totaled for non-FDOT resources as well, including FHP vehicles and troopers. Vehicular needs and personnel needs should be totaled separately to ensure clarity.

### ***2.12.2 Total Quantities per Sheet***

Plan format frequently provided a single interchange on a single plan sheet. This is a good documentation strategy that both simplifies plan development and provides some assurance that, if the plan set is broken up and each sheet distributed separately, then the entire plan need for a single interchange is illustrated on a single sheet. However, many plans had no summary of materials or resources per sheet, which would be a helpful aid to the plan implementers. Quantities need to be totaled for non-FDOT resources as well, including FHP vehicles and troopers. Vehicular needs and personnel needs should be totaled separately to ensure clarity.

### ***2.12.3 Broadly Understood Plan Appearance***

Recognizing that the contraflow plans may be distributed at a broad level, including individuals (both within and external to the FDOT) that have little experience reading plans, a plan appearance that can be widely understood is necessary. The plan appearance and format used for the I-10 contraflow plan in District 2 meets this need. These plans are not necessarily to scale, and exaggerate the roadway width, especially for exit ramps and crossroads. This exaggeration helps to clarify the location of specific devices and vehicles, especially for the inexperienced plan reader. Adoption of such a format, with quantity information added, is recommended.

Similarly, a consistent cover sheet format and plan set name will also help ensure understandability. The cover sheet should contain:

- Route name
- Plan limits
- A statement that the plan is for hurricane evacuation only
- A statement that the plan is to be used in conjunction with operational plans developed and maintained by the FHP

### ***2.12.4 Clarification of Sheet Relationship***

In contrast to typical FDOT roadway-oriented plans, the typical plan sheet for contraflow operations ignores the segments between interchanges and only provides sheets for interchanges. While this is an entirely appropriate means of plan development, some text on each plan sheet should convey that there is a “gap” between successive sheets, simply to provide reassurance that an implementer in fact has all of the plan sheets that exist.

### **2.12.5 Consistent Symbology**

Symbology for portable VMS units, as well as for the various types of vehicles, should be standardized statewide. This standardization would not only ease the transition of looking at one plan versus another, but would also create an “apples-to-apples” view for comparison of vehicle and personnel needs. The VMS symbology used needs to provide a positive sign orientation message to the implementer.

A total of eight vehicle and personnel types was shown across the different plans:

- Florida Highway Patrol with Vehicle (symbol labeled as FHP)
- Florida Highway Trooper (symbol labeled as FHP)
- Law Enforcement Vehicle (symbol labeled as FHP)
- National Guard or Law Enforcement (symbol labeled as NG)
- Law Enforcement (symbol labeled as LE)
- FDOT Personnel with Vehicle (symbol labeled as DOT)
- Department of Transportation (symbol labeled as DOT)
- Work Vehicle with Flashing Beacon (symbol labeled as DOT)

To create consistency across the contraflow plans, standardize three vehicle/personnel symbol types:

- Florida Highway Patrol with Vehicle (symbol labeled as FHP) – This symbol would represent a single marked FHP unit with lights and a single trooper.
- Law Enforcement with Vehicle (symbol labeled as LE) – Further information is provided below.
- FDOT Personnel with Vehicle (symbol labeled as DOT) – This symbol would represent a single FDOT vehicle, which could range from a sedan to a pickup truck to a larger vehicle, with (at least) a single yellow strobe and a single FDOT employee.

Refer to *Subsection 2.8* for further discussion on the roles and responsibilities of different agencies in contraflow plan operations.

### **2.12.6 Consistent Portable Variable Message Sign Messages**

To the greatest extent possible, consistent portable VMS messages need to be employed. Recognizing the unique characteristics of each evacuation route, the opportunities for consistency may be limited. The FDOT's *Approved Messages for Portable CMSs*<sup>5</sup> is a model starting point for the development of approved hurricane evacuation CMS messages, which should be developed for use statewide. Further, the *Approved Messages for Portable CMS* document uses a consistent format for the display of two-phase messages, an issue inconsistently handled throughout District contraflow plans.

Recent revisions to the Federal Highway Administration's (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*<sup>6</sup> have dramatically increased the scope and depth of *Part 6, Temporary Traffic Control*. The 2003 *MUTCD* has brief "standard" information concerning the use of portable CMSs:

*Portable Changeable Message signs shall be TTC devices with the flexibility to display a variety of messages. Each message shall consist of either one or two phases. A phase shall consist of up to three lines of eight characters per line.<sup>7</sup> Each character module shall use at least a five wide and seven high pixel matrix.*

While this does not provide explicit message guidance, it does standardize the capacity of a portable VMS (i.e., three lines, eight characters per line, up to two phases), which then provides a logical limit for the messages displayed.

### **2.12.7 Universal Plan Availability**

A comment made at the meetings concerned the need for broad availability of all the contraflow plans. After some discussion, the best means of providing that plan information was determined to be:

- Posting plans on the FDOT's Web site
- Distributing all plans in portable document format (PDF) file type

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<sup>5</sup> *Approved Motorist Safety Messages for Portable Changeable Message Signs on the State Highway System* (revised April 2004). Available online at <http://www.dot.state.fl.us/trafficoperations/default.htm>.

<sup>6</sup> Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways – 2003 Edition* (including Revision 1 dated November 2004). Available online at <http://mutcd.fhwa.dot.gov/>.

<sup>7</sup> *MUTCD § 6F.55, Portable Changeable Message Signs.*

Given that many of the plans' users may not be technically oriented, much less have access to a computer with computer-aided design (CAD) software, these two accessibility guidelines are appropriate "least common denominators" for plan distribution.

### **3. Specific Plan Information**

The combinations of plans and situations are very unique for each FDOT District. For example, while District 2 only has a single plan on I-10, it has the greatest need for interaction with the GDOT on I-95 and I-75. At another point on the scale, District 5 has three separate plans that all converge on Orlando, though the likelihood of all three plans being in operation simultaneously is very low. This section will explore, at a District level, the specific issues unique to each District that can influence the use and potential success of hurricane evacuation plans.

The information presented in this section is that received from each District for the plans under their jurisdiction, and reflect plan status as of the date this report was prepared. Updates are underway for several of these plans, so the information in this section is subject to change as these updates are completed.

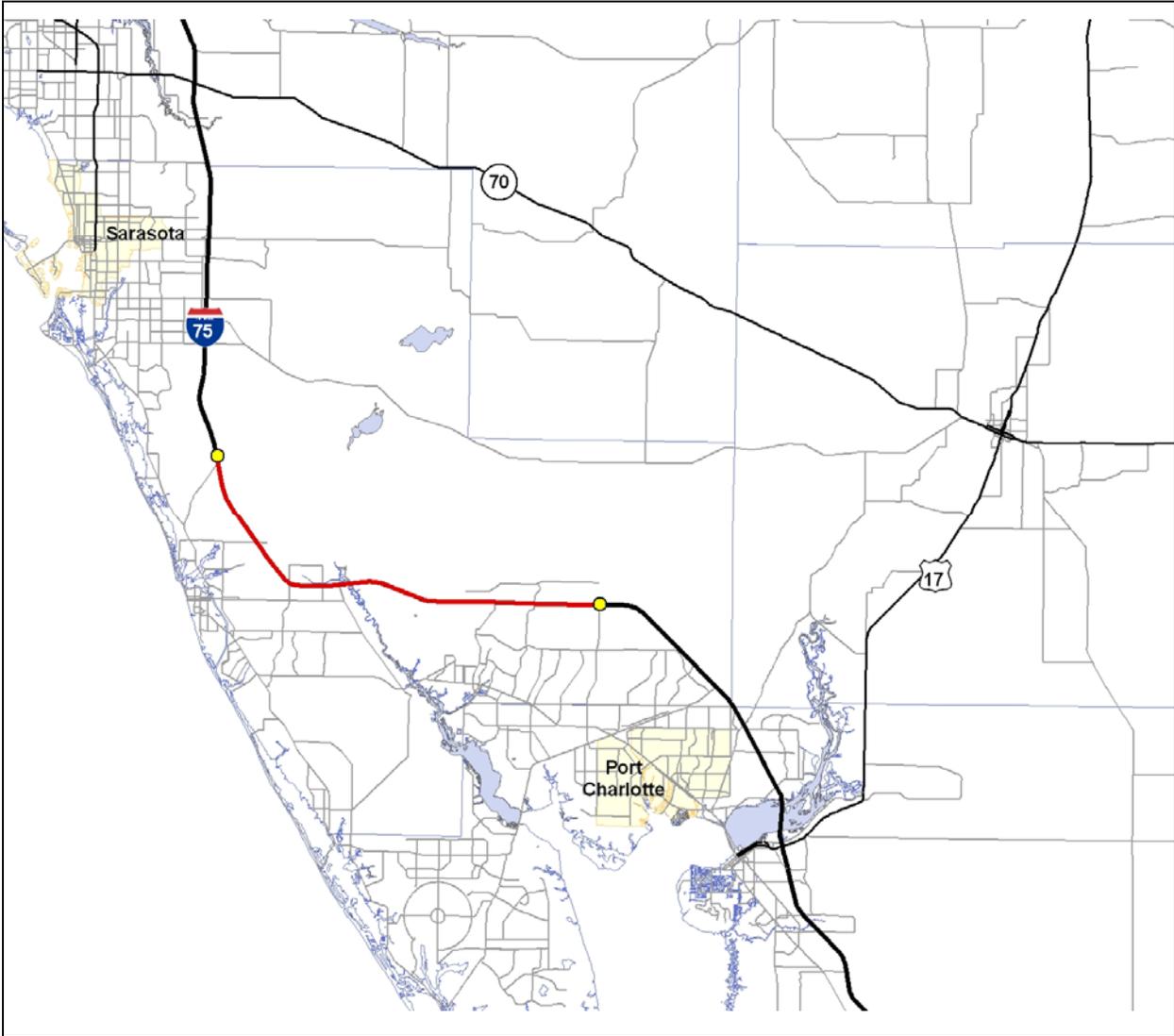
#### **3.1 Sarasota County's I-75 Shoulder Use Plan**

Sarasota County's shoulder use plan extends along 21 miles of I-75 northbound and is the only plan of its type in Florida. After the traffic reaches SR 681, the four-lane interstate becomes six lanes, so the traffic proceeding on the shoulder simply switches over to the newly added third travel lane.

**Table 3.1 – Details of Sarasota County’s Shoulder Use Plan**

Plan Name	I-75 (SR 93) Northbound Shoulder Plan – Sarasota County
Districts Involved	District 1
Southern Limit	Toledo Blade Boulevard (Exit 179)
Northern Limit	SR 681 (Exit 200)
Type of Plan	Shoulder Use Only
Length of Plan	21 miles
Lanes of Additional Capacity	1
Interchanges Included	6
Justification for Plan	Provide additional northbound evacuating capacity south of the addition of a third northbound lane on I-75.
Portable VMS Required	16
FHP Vehicles / Troopers Required	10
FDOT Vehicles / Staff Required	0
Other Law Enforcement Vehicles / Staff Required	11
Unique Features	This is the only shoulder use plan in the entire state. The northern end of the plan, at the SR 681 interchange, is the southern end of an additional (third) through lane.
Limitations	A consistent adequate shoulder width on bridges is not present, which severely limits emergency response access due to the lack of a northbound shoulder.

Figure 3.1 – I-75 Shoulder Use Plan in Sarasota County



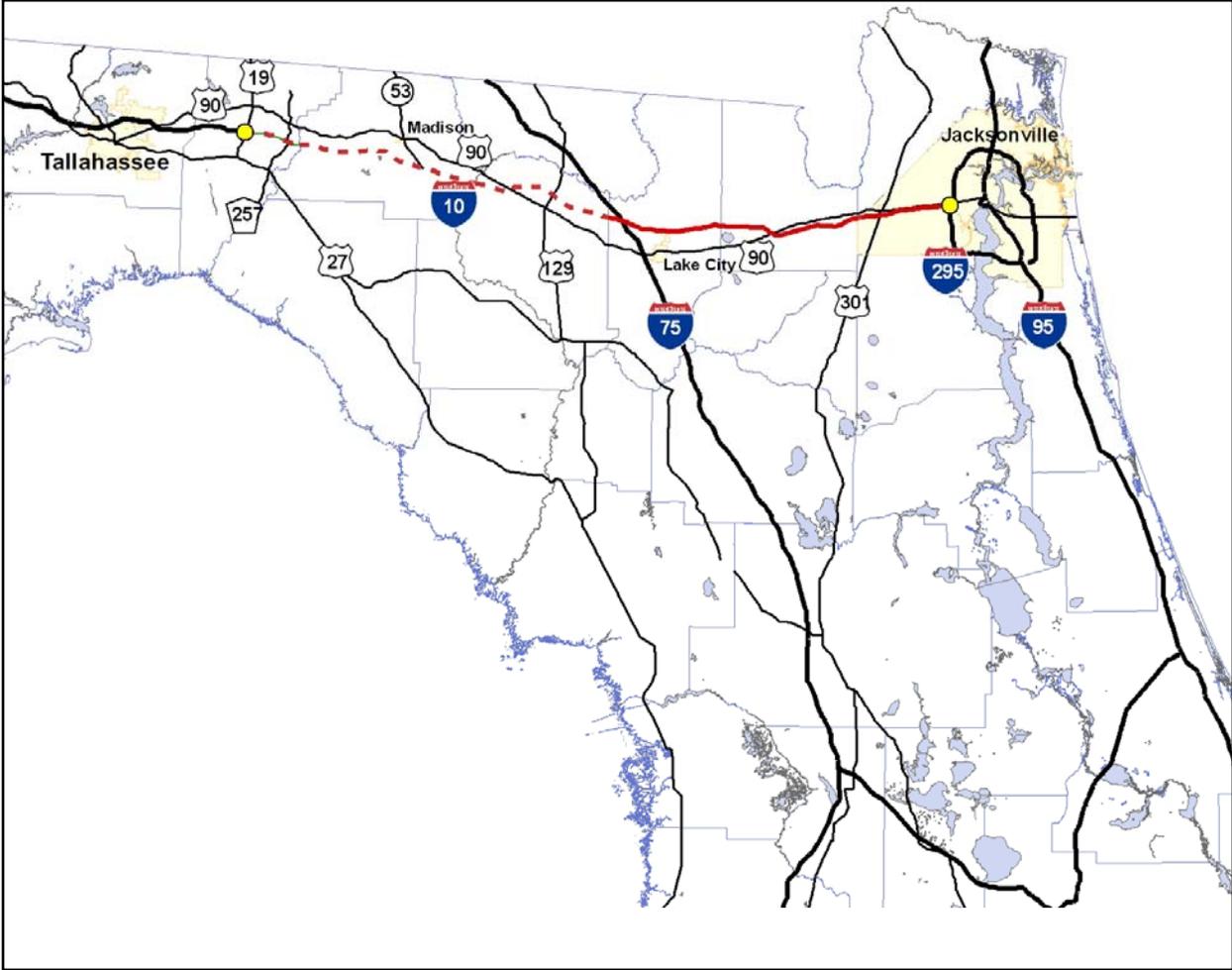
### **3.2 Jacksonville's I-10 Contraflow Plan**

The contraflow plan in Jacksonville takes traffic west on I-10 to the interchange with I-75 in Columbia County. Before this plan was revised, it was the state's longest contraflow – totaling 131 miles from the I-295 interchange on I-10 to U.S. 19 in Jefferson County.

**Table 3.2 – Details of Jacksonville's I-10 Contraflow Plan**

Plan Name	[Interstate 10] Evacuation Routes 1. Duval County, 2. Baker County, 3. Columbia County, 4. Suwannee County, 5. Madison County, 6. Jefferson County
Districts Involved	District 2
Eastern Limit	I-295 Interchange
Western Limit	I-75 Interchange (as revised)
Type of Plan	Westbound Contraflow Route
Length of Plan	62 miles
Lanes of Additional Capacity	2
Interchanges Included	13
Justification for Plan	Provide two additional lanes of westbound capacity for evacuating the Jacksonville metropolitan area.
Portable VMS Required	16
FHP Vehicles / Troopers Required	32
FDOT Vehicles / Staff Required	17
Other Law Enforcement Vehicles / Staff Required	0
Unique Features	None
Limitations	The current plan requires typical westbound lanes to taper to a single lane before a forced exit onto I-75 northbound. I-75 northbound will have the right through lane coned off upstream of the ramp merge.

Figure 3.2 – I-10 Contraflow Plan in Jacksonville



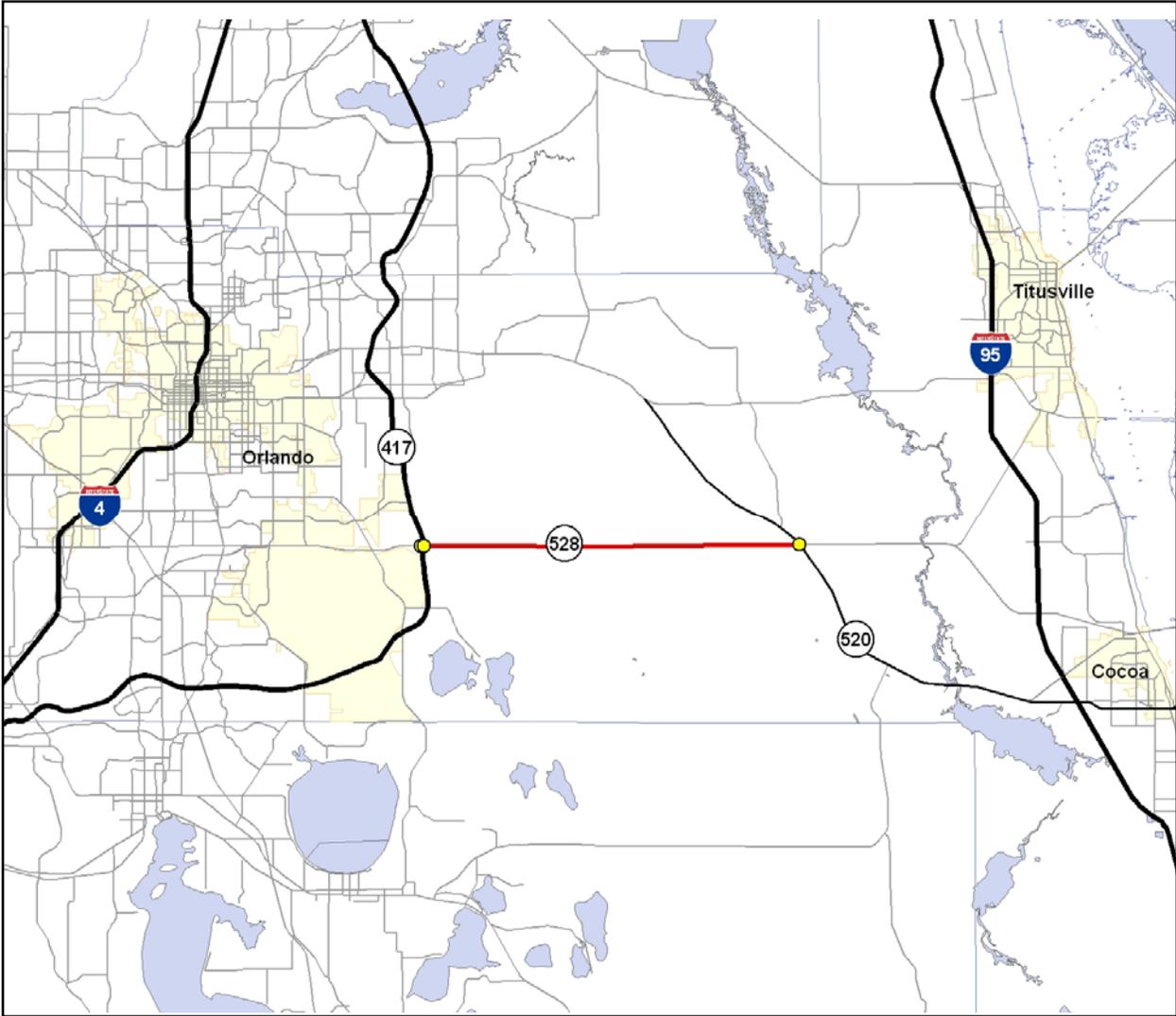
### **3.3 Space Coast’s SR 528 / Beeline Expressway Contraflow Plan**

When the first segment opened in 1967, the Beeline Expressway was utilized as a limited-access toll road connecting Brevard County’s Space Coast with Orlando. It has since become the main westerly evacuation route for Brevard County residents, who can take this contraflow route all the way to SR 417.

**Table 3.3 – Details of Space Coast’s SR 528 / Beeline Expressway Contraflow Plan**

Plan Name	SR 528 Contraflow Plans Orange County Section No. 75002000
Districts Involved	District 5
Eastern Limit	SR 520 Interchange
Western Limit	SR 417 Interchange
Type of Plan	Westbound Contraflow Route
Length of Plan	11 miles
Lanes of Additional Capacity	2
Interchanges Included	4
Justification for Plan	Provide two additional lanes of westbound capacity for vehicles evacuating the Merritt Island, Cocoa, and Cape Canaveral areas.
Portable VMS Required	11
FHP Vehicles / Troopers Required	21
FDOT Vehicles / Staff Required	21
Other Law Enforcement Vehicles / Staff Required	29
Unique Features	The plan was designed to use SR 520 northbound as a main traffic input at the SR 520/SR 528 interchange.
Limitations	While very short, the two interchanges present between each end of the contraflow operation do not have access.

Figure 3.3 – SR 528 / Beeline Expressway Contraflow Plan for the Space Coast



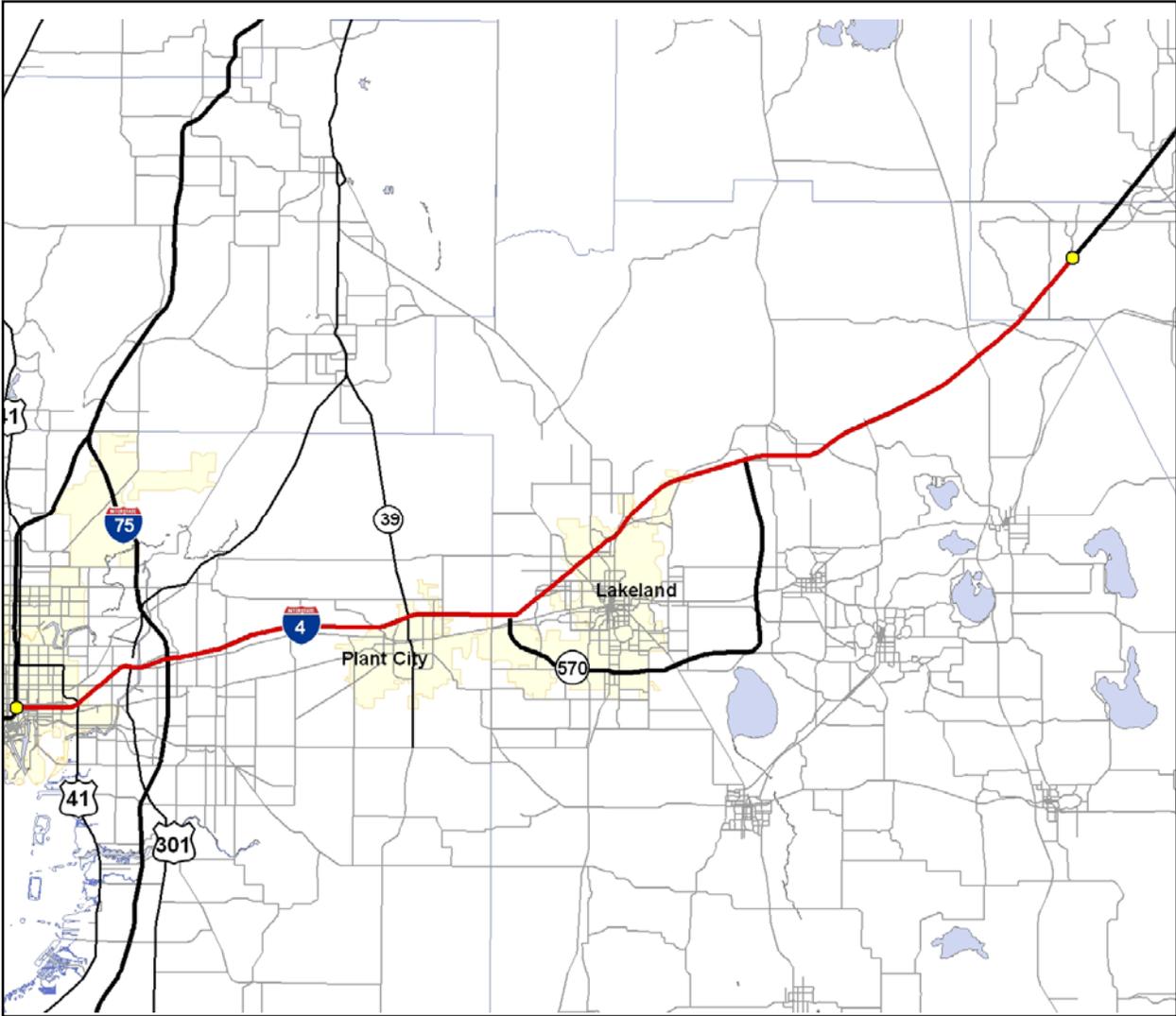
### **3.4 Tampa Bay's I-4 Contraflow Plan**

The I-4 contraflow plan originates east of Tampa and provides a means of evacuation to Orlando. A cooperative effort involving three FDOT Districts, the I-4 plan is noteworthy in that it requires the most extensive use of equipment, vehicles, and personnel of any plan in the state.

**Table 3.4 – Details of Tampa Bay's I-4 Contraflow Plan**

Plan Name	Contraflow Implementation Plan – Interstate 4 Tampa to Orlando (63 miles) 2004
Districts Involved	Districts 1, 5, and 7
Western Limit	I-275 Interchange
Eastern Limit	SR 417 Interchange
Type of Plan	Eastbound Contraflow Route
Length of Plan	63 miles
Lanes of Additional Capacity	2
Interchanges Included	35
Justification for Plan	Provide two additional lanes of eastbound capacity for evacuating the Tampa Bay area.
Portable VMS Required	31
FHP Vehicles / Troopers Required	141
FDOT Vehicles / Staff Required	4
Other Law Enforcement Vehicles / Staff Required	148
Unique Features	The route begins at the I-275 interchange in downtown Tampa. I-4 is being widened to a total of six lanes.
Limitations	I-4 is under construction as part of a major widening project.

Table 3.4 – I-4 Contraflow Plan for Tampa Bay



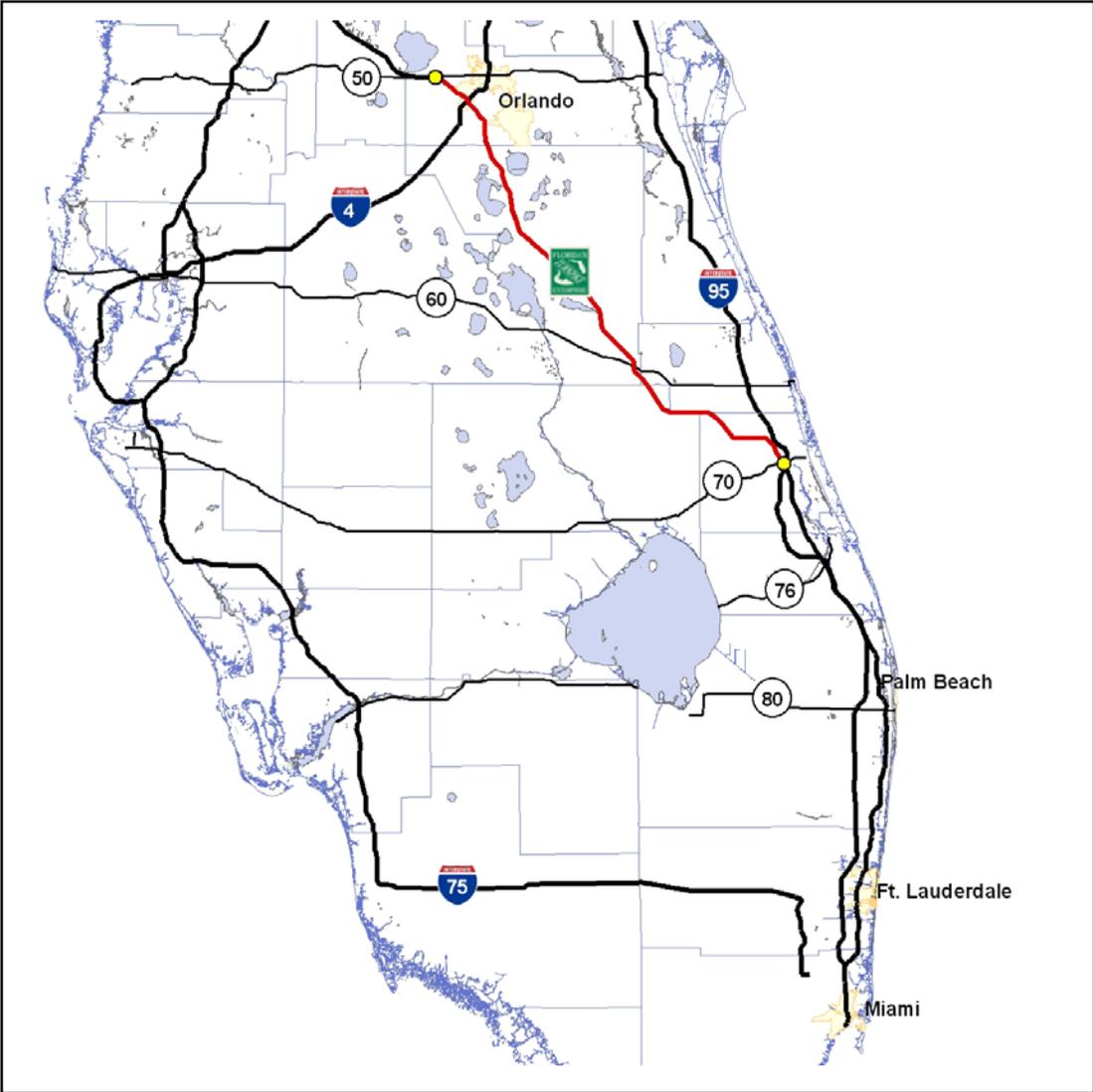
### **3.5 Florida’s Turnpike Contraflow Plan for Southeast Florida**

Florida’s Turnpike provides a prime northbound evacuation route for the major urban areas of South Florida. Unlike I-95, which parallels the coast, Florida’s Turnpike begins a northwesterly track after it passes Fort Pierce, which helps move threatened populations further inland in advance of a hurricane.

**Table 3.5 – Details of the Contraflow Plan for Florida’s Turnpike**

Plan Name	Florida’s Turnpike Enterprise Emergency Hurricane Evacuation Contraflow Plan Fort Pierce to Ocoee
Districts Involved	Districts 4 and 5, and FTE
Southern Limit	SR 70 / Fort Pierce Interchange
Northern Limit	SR 50 / Ocoee Interchange
Type of Plan	Northbound Contraflow Route
Length of Plan	114 miles
Lanes of Additional Capacity	2
Interchanges Included	11
Justification for Plan	Provide two additional lanes of northbound capacity for evacuating southeastern Florida.
Portable VMS Required	18
FHP Vehicles / Troopers Required	28
FDOT Vehicles / Staff Required	5
Other Law Enforcement Vehicles / Staff Required	0
Unique Features	The plan provides a two-lane crossover north of Fort Pierce. Service plazas are the only opportunities for contraflow traffic to stop or shift to the normal flow side.
Limitations	Florida’s Turnpike northbound reduces from three lanes to two significantly before the contraflow plan’s beginning.

Figure 3.5 – Southeast Florida’s Contraflow Plan for Florida’s Turnpike



### **3.6 Southeast / Southwest Florida's Contraflow Plan for I-75 / Alligator Alley**

Alligator Alley along I-75 crosses a remote area of the Florida Everglades between Broward and Collier counties. It provides additional eastbound lanes for evacuating residents of Southwest Florida and can be a westbound evacuation corridor for those from Southeast Florida. The route, however, offers no food, fuel, or repair facilities along the way. Access for emergency responders is also a concern. The two tables presented here describe the separate eastbound and westbound plans.

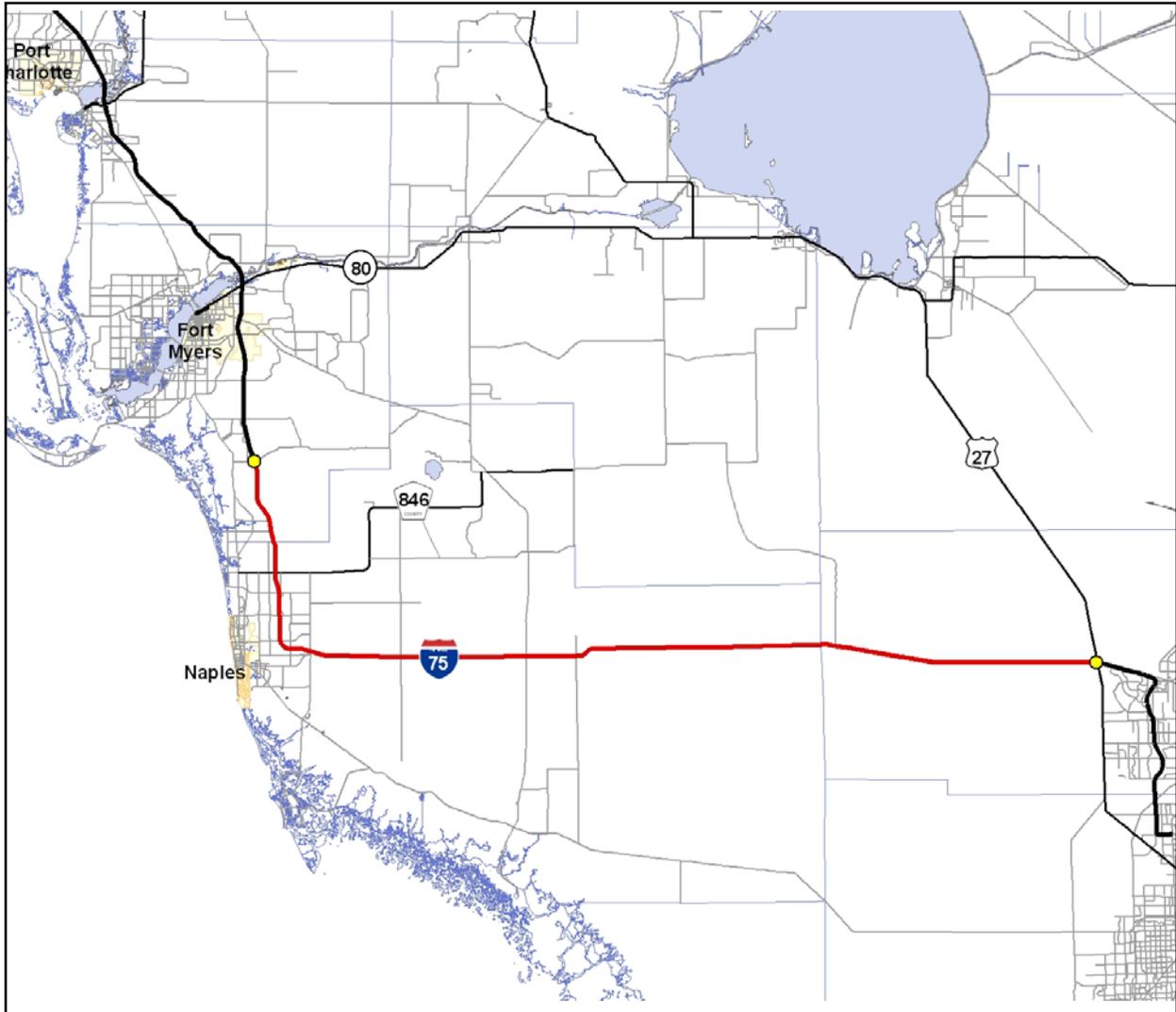
**Table 3.6 – Details of the I-75 / Alligator Alley Eastbound Contraflow Plan**

Plan Name	Interstate 75 (SR 93) Eastbound Contraflow Plan from SR 951, Collier County to U.S. 27, Broward County
Districts Involved	Districts 1 and 4
Western Limit	SR 951 Interchange
Eastern Limit	U.S. 27 Interchange
Type of Plan	Eastbound Contraflow Route
Length of Plan	78 miles
Lanes of Additional Capacity	2
Interchanges Included	5
Justification for Plan	Provide two additional lanes of eastbound capacity for evacuating Southwest Florida.
Portable VMS Required	16
FHP Vehicles / Troopers Required	31
FDOT Vehicles / Staff Required	0
Other Law Enforcement Vehicles / Staff Required	4
Unique Features	The plan's beginning does not have crossovers in place. Due to the lack of exits/access, this is a very low-resource plan to implement.
Limitations	The lack of exits limits the availability of motorist services and opportunities for emergency service providers to access I-75.

**Table 3.7 – Details of the I-75 / Alligator Alley Westbound Contraflow Plan**

Plan Name	Interstate 75 (SR 93) Westbound Contraflow Plan from US 27 in Broward County to Alico Road in Collier County
Districts Involved	Districts 4 and 1
Eastern Limit	US 27 Interchange
Western Limit	Alico Road Interchange
Type of Plan	Westbound Contraflow Route
Length of Plan	107 miles
Lanes of Additional Capacity	2
Interchanges Included	10
Justification for Plan	Provide two additional lanes of westbound capacity for evacuating Southeast Florida.
Portable VMS Required	62
FHP Vehicles / Troopers Required	63
FDOT Vehicles / Staff Required	16
Other Law Enforcement Vehicles / Staff Required	30
Unique Features	The ending is not at a high-capacity interchange and is subject to significant backup.
Limitations	The lack of exits throughout the Alligator Alley segment limits the availability of motorist services and opportunities for emergency service providers to access I-75.

**Figure 3.6 – I-75 / Alligator Alley Contraflow Plan**



## **4. Neighboring States**

As part of this project's activities, interaction with Alabama and Georgia was included to:

- Furnish information to those states concerning Florida's contraflow operational activities.
- Request and receive information from those states concerning their relevant contraflow activities.
- Discuss their recent experiences with hurricane evacuation and contraflow operations.

The following subsections detail this information for each state.

### **4.1 Alabama**

Florida's primary contraflow interaction with Alabama would be along I-10, as it is the only limited-access facility that traverses both states. However, neither state operates I-10 as a contraflow route in the Gulf Coast or Panhandle for any purpose, including hurricane evacuation. Neither Alabama nor Florida regards I-10 as a suitable evacuation route due to its east-west orientation, which does not serve to move evacuating traffic definitively away from a threatened coastline.

Alabama has a contraflow plan in place for I-65 from a beginning point northeast of Mobile (at Milepost 31) to the metropolitan Montgomery area (Milepost 167). The location of I-65, which generally runs northeasterly from Mobile to Montgomery, makes it potentially attractive for evacuees coming from the Pensacola and western Florida Panhandle region. Alabama Department of Transportation (ALDOT) officials said that they regard the I-65 contraflow plan as being in place to serve Baldwin County, or the eastern half of Alabama's Gulf coastline, Pensacola, and the west part of the Florida Panhandle.

Alabama's contraflow procedure is very similar to Florida's in that reverse-lane operations are only conducted in the daytime. All exit ramps, whether normal or contraflow, are open throughout the length of the contraflow route. Only the normal flow entrance ramps are open, however. While the Alabama contraflow plan has open access over the length of the operation, ALDOT officials anticipate that the principal route for evacuating Pensacola will be U.S. Highway 29, with traffic then shifting to Alabama SR 113 and on to 113's interchange at I-65. The other principal coastal evacuation route is Alabama SR 59, which is west of U.S. 29 and will serve to evacuate coastal Alabama traffic. Staff in the ALDOT were recently directed to assess the feasibility of one-way (i.e., contraflow) operations on SR 113. It was their conclusion that SR 113 is not suitable for one-way operations, as is the case with many surface roads.

Alabama did implement contraflow operations on I-65 in September 2004 in advance of Hurricane Ivan. The state's experiences serve to validate many of Florida's contraflow operational approaches. Notes of the meeting with ALDOT staff in Montgomery are included in *Appendix A*, but significant observations are presented here.

During contraflow operations, the traffic flow on I-65 was between 10 and 20 mph below typical travel speeds, even though contraflow operations were not congested or near capacity. Experience gained by the ALDOT in both contraflow setup and removal indicate that those operations took approximately twice the time originally anticipated.

Staff in the ALDOT acknowledged the usefulness of the Web-based traffic count information that Florida publishes, and mentioned that they consulted that information frequently to assess traffic conditions.

### **4.2 Georgia**

Florida's primary contraflow interaction with Georgia would be along I-75 and I-95. While Florida does not have contraflow operations planned for I-95 at all, and for I-75 only in the extreme southern section of the state, Georgia does have contraflow operational plans in place for both routes in a response to a current, but temporary, capacity limitation.

Both I-75 and I-95 are to be widened to at least six lanes for their entire length through Georgia. However, these widening efforts are not yet complete, so Georgia's contraflow operational plans were developed to provide contraflow operations along both I-75 and I-95, where four lanes currently exist.

Georgia's I-75 contraflow plan extends north from Milepost 28 near Valdosta to the Dooly County line, approximately located at Milepost 106, near Cordele. Its I-95 contraflow plan is in the Brunswick/Glynn County area. During 2004, Georgia experienced a significant backup on I-75, and was close to implementing contraflow operations on the interstate in response. Florida's changes to northbound traffic routing caused the backup to shorten, and contraflow operations were not implemented.

Given the purpose and location of the I-75 and I-95 contraflow operations, use of exits and entrance ramps is not as significant or relevant to Florida. However, three exits and two rest areas will be available for contraflow traffic to exit I-75:

- Exit 29/Georgia State Route 122
- Exit 62/Georgia State Route 520
- Exit 101/Georgia State Route 30
- Cook County Rest Area at Milepost 47
- Turner County Rest Area at southbound Milepost 73 and northbound Milepost 85

On I-95, contraflow traffic will not be able to exit; however, contraflow operations begin north of an exit that has good refueling capability. Portable VMS will be used to advise motorists of this information.

The GDOT plans to deploy its Highway Emergency Response Operator (HERO) incident responders to contraflow operational areas, depending on availability. This deployment is in keeping with HERO use during the Hurricane Floyd contraflow operations.

Georgia last implemented contraflow operations on I-16 in 1999 in advance of Hurricane Floyd. The state's experiences with this effort resulted in their installation of manual gates along I-16 to reduce manpower needs for contraflow operations. Notes of the telephone conference with GDOT staff are included in *Appendix A*.

Staff in the GDOT, especially those from Georgia's District 5, which is the coastal district based in Jesup, Georgia, acknowledged that they rely on the Web-based traffic count information that Florida publishes, and that they consulted that information frequently to assess traffic conditions.

## **5. Summary**

Contraflow operations should be one of many hurricane response actions at the disposal of the FDOT, though the Districts agree that the practice is one they hope they never use. There are risks inherent in the implementation of contraflow operations, and limitations on both available hours for operation and viable termini. The resources and personnel that would be devoted to a contraflow operation may actually be better utilized in some other response action, or even in support of the “shelter in place” strategy being advocated by state emergency management.

Contraflow plans referenced in this document are just that – plans. None has ever been used under actual conditions or otherwise initiated in connection with a hurricane evacuation. Though each has been carefully crafted and contingencies accounted for, the true test will come in the implementation.

There are variables that cannot be predicted accurately or with great certainty. No two hurricanes will pose the same type of threat or necessitate the same response at the local level. Even with the precision in forecasting today, adequate reaction time to changes is often a luxury. There is no telling how the public will respond to evacuation orders, or whether the intrastate highway system will be able to handle the resulting traffic volumes. Florida’s transportation professionals and emergency responders, to their credit, have mapped their contraflow plans with considerable thought and critical analysis. They have realized that the precontraflow assessment of conditions is as crucial as the execution of the contraflow plan itself. Indeed, the decision *not* to institute contraflow operations is a valid outcome of such assessment, depending on the hurricane’s force, speed, direction, anticipated landfall, the population threatened, and the type of evacuation necessary to move that number of people out of harm’s way.

Just as modern weather forecasting keeps tabs on the hurricane’s progress, intelligent transportation system (ITS) deployments on Florida’s limited-access corridors are indispensable in monitoring traffic flow and supplementing the first-hand observations of personnel in the field. As ITS is deployed in more places around Florida, this valuable tool will be able to assist more communities in evaluating whether conditions warrant a contraflow response through increased CCTV deployment and use. Later, ITS will play a role in the evacuation’s success by alerting drivers to road conditions and communicating hurricane-related information through HAR and VMS use.

Coordination necessary for contraflow operations to work effectively occurs well before the plan is activated. Besides District personnel from the Maintenance, Traffic Operations, and Safety offices, there must be involvement of local government representatives, police, fire, EMS, and other TIM team members so that the scope of contraflow action is understood and its operational phases carried out properly. The contraflow plans in this document are products of, and intended specifically for, their respective communities, and the responsibility remains with these stakeholders to participate fully in evacuation planning and procedures – even in training and practice drills, as some Districts have done. When the time comes to implement a contraflow operation, this supporting framework of agencies and expertise will increase the likelihood of success.

With the big picture in mind, the final focus must be on the details. As past efforts elsewhere have illustrated, large-scale evacuations using contraflow procedures depend on setup, proper timing of the operations, choosing the right starting and termination points, and the availability of emergency responders who have access to disabled vehicles and other incidents. Sufficient numbers of vehicles, staff, and equipment are essential. Consistent, predictable, logical plans must be readily available statewide. The contraflow traffic function must be supported with motorist information supplied using DMS units, 511 ATIS services, HAR broadcasts, and other means. Coordination with neighboring states, most notably Alabama and Georgia, is important, especially if the magnitude of evacuation will affect their highway systems.

Contraflow is a play in Florida's hurricane response playbook. If the time comes to call the play, and the team is practiced and prepared, the result will be a safe, effective evacuation of the people a hurricane threatens.



**Appendix A**

**Meeting Notes and Supporting Documents  
Used to Prepare the Contraflow Plan**



## *Contraflow Plan for the Florida Intrastate Highway System*

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This appendix contains meeting notes from the following meetings:

- One-Way Operations for Hurricane Evacuations Meeting ..... A-2  
Tallahassee, Florida – February 11, 2005
- District 2 Meeting on One-Way Plan for Hurricane Evacuations ..... A-4  
Jacksonville, Florida – February 22, 2005
- District 5 Meeting on One-Way Plan for Hurricane Evacuations ..... A-8  
Orlando, Florida – March 1, 2005
- Joint Broward / Miami-Dade Traffic Incident Management Team Meeting ..... A-14  
Davie, Florida – March 2, 2005
- District 7 Meeting on One-Way Plan for Hurricane Evacuations ..... A-17  
Tampa, Florida – March 11, 2005
- District 3 Meeting on One-Way Plan for Hurricane Evacuations ..... A-21  
Chipley, Florida – March 14, 2005
- District 1 Meeting on One-Way Plan for Hurricane Evacuations ..... A-24  
Fort Myers, Florida – March 24, 2005
- Tallahassee Meeting on One-Way Plan for Hurricane Evacuations ..... A-28  
Tallahassee, Florida – April 1, 2005
- ALDOT Meeting on One-Way Plan for Hurricane Evacuations ..... A-32  
Montgomery, Alabama – April 4, 2005
- GDOT Meeting on One-Way Plan for Hurricane Evacuations ..... A-35  
Atlanta, Georgia – April 14, 2005 (via Teleconference)

# **ONE-WAY OPERATIONS FOR HURRICANE EVACUATIONS**

**February 11, 2005**

**Tallahassee**

**2:30 PM**

## **Purpose:**

Discuss the New Task for the Contraflow Plans Update

## **Attendees:**

Mike Akridge, FDOT Traffic Engineering and Operations Office (TEOO)

Ken Carr, FDOT Motor Carrier Compliance Office (MCCO)

Paul Clark, FDOT State Safety Office (MS 53)

Bob Collins, PBS&J

Dale Cook, FDOT Central Office Maintenance

Frank Day, FDOT Emergency Management

John Harris, FDOT State Maintenance Office (MS 52)

John Hibbard, PBS&J

Lap Hoang, FDOT Traffic Engineering and Operations Office (TEOO)

Patrick Odom, Florida Division of Emergency Management (FDEM)

Leroy Smith, Florida Highway Patrol (FHP)

Paul Watson, PBS&J TEOO ITS Section (MS 90)

Steve Williams, Florida Department of Law Enforcement (FDLE)

## **Item #1 (Akridge) – Welcome and Introductions**

A discussion of the purpose of this meeting was held and introductions were provided around the table.

**Item #2 (Hibbard) – Hurricane Response Evaluation**

Hibbard presented a brief overview of the past efforts and the documents previously published (*Analysis of Florida's One-Way Operations for Hurricane Evacuation*). It was discussed that this present effort is best classified as a 'strategic' plan to distinguish it from the 'tactical' plans previously developed (and, in some cases, under revision) by the Districts. The current effort by the Central Office will not take the place of the Districts' plans, but will provide guidelines for standardizing the plan presentations and offer suggestions for issues that each tactical plan can address.

Hibbard also presented a draft agenda and agency invitee list for the six proposed meetings that should be held to ensure District and local agency input.

These issues were suggested as potential discussion topics and for inclusion in each plan, as appropriate:

- Incident responders' access to evacuation routes
- Equipment pre-positioning
- Use of shoulders as traffic lanes
- Improved motorist communication
- Contraflow on arterial routes
- Re-entry planning
- Manpower needs
- Coordination with adjacent states

It was also suggested that representatives from the agencies identified below might be invited to an additional meeting to be held in Tallahassee following the District meetings:

- A representative from Dr. Smith's office at the Florida Department of Health (FDOH)
- A Florida Department of Environmental Protection (FDEP) consultant knowledgeable in fuel supply and fueling issues
- A representative from the Governor's Office

Paul Clark and Leroy Smith asked to be invited to each of the six District meetings.

**Item #3 (Akridge) – Adjournment**

The meeting was adjourned at 4:15 p.m.

## **DISTRICT 2 MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Tuesday, February 22, 2005  
FDOT Urban Office Training Center, Jacksonville**

**9:00 A.M.**

### **Purpose:**

Meeting of District 2 Traffic Incident Management (TIM) Team members to discuss the statewide contraflow plan for hurricane evacuations and issues to consider in the forthcoming update of the plan.

### **Attendees:**

James L. Brown, Georgia DOT	Ed Ward, FDOT D2	Paul Clark, FDOT CO
Chad H. Hartley, Georgia DOT	Marguerite Barr, JFRD/FRCC	Steve Mullen, Jax SO
Alvin Lightsey, Georgia DOT	Russell Gautreaux, FDOT	Jerry Ausher, FDOT
Rick Carpenter, FHP	Richard Bame, FDOT	Roger Bolman, FDOT
Donna Danson, FDOT D2	Julius Rinosa, FDOT	John W. Scott, JFRD
John Hibbard, FDOT ITS [PBS&J]	Derrick Odom, SmartRoute/FDOT	Tim Culhane, FHP
Dave Hodges, FDOT ITS [PBS&J]	Alex H. Slaughter, FDOT	Luella Thomas, FDOT
Ray Green, Jorgensen Cont. Services	Steve Donaway, FDLE	Keith Gaston, FHP
Dave Fachko, FDOT MCCO	Mitch Stamitoles, FDOT	Leroy Smith, FHP
Bill Dobscoma, Jax SO	Richard Reid, St. Johns County	Tim Spaulding, FHP
Marise Marshall, Road Rangers	James Hannigan, FDOT	

John Hibbard began the meeting by explaining the origin and purpose of the state's contraflow plan, how it is applied to the interstate system, and the reason for the current series of District meetings to gather information for updating the document. The document, similar to a strategic plan, is entitled *Technical Memorandum Analysis of Florida's One-Way Operations for Hurricane Evacuation*. John polled the group in attendance and only a few responded that they knew of the document. The technical memo was produced in 2000 after the massive evacuation in advance of Hurricane Floyd [1999]. The document was updated in 2002.

John explained that the FDOT Central Office does not want to dictate the contraflow plans; the detailed contraflow plans will still be developed by the Districts. For the overall plan, the Districts are to provide ideas and input on the best policies and guidelines to follow. Each District will supplement the statewide guidance document with its own contraflow plan for use on local interstates. It was noted that District 2's original plan has since been updated.

Although each individual contraflow plan must be unique, there are elements that should be common to all of them. One is having sufficient personnel to institute a contraflow operation, and whether assigning staff members to that function is actually their highest and best use in light of other local hurricane preparation needs.

The topic of road shoulder use was discussed in detail. That idea was researched after Hurricane Floyd, especially to determine whether interstate bridges were wide enough and whether motorist aid call box proximity to the edge of the shoulder would preclude traffic using the shoulder during evacuations. The idea was eventually dropped. At the very least, the shoulder needs to stay open for FHP troopers, ambulances, Road Rangers, and others to respond when incidents occur.

Representatives from the FHP explained the procedures they follow to implement the contraflow plan. Contraflow operation is not done at night. It is to be initiated early in the morning after MOT is finished and a pilot flies the entire route to check everything. The contraflow operation is then concluded as daylight ends. The contraflow operation is suspended entirely 6 to 8 hours prior to the onset of tropical storm-force winds. Representatives from Georgia DOT said they followed the same practice with vehicle and aerial inspections of the route before contraflow begins, although they do not terminate contraflow operations before the onset of tropical storm-force winds. FDOT's contraflow operations are stopped at the point of origin several hours before nightfall to allow time for the last cars to work their way to the termination point.

Regional evacuation plans, where different geographic areas are assigned evacuation time windows, are the norm now and they work, relying heavily on alternative county and state roads. FHP Maj. Rick Carpenter said that was the best answer, especially since there needs to be so much involvement from cities and counties to make the practice effective. Conversely, contraflow plans are not going to be the magic answer to evacuation because support from local agencies is often lacking. In the case of SR 528 in Central Florida, local officials were opposed to implementing a contraflow operation, so despite an inclination toward its implementation, that did not occur.

During the summer of 2004, the hurricane evacuations were aided greatly by local motorists using alternative routes (e.g., US 301 instead of I-75). These routes were disseminated by the media with the aid of District Public Information Offices.

Everyone agreed that use of the media is vital as a public awareness tool. People need to be told in advance what's going to happen if they get in a contraflow lane westbound on I-10, for example. They need to know what to expect. The goal of contraflow must be to get people out of harm's way, especially those along the coast. Beyond that, there's no objective for relocating motorists to a particular destination. It was noted that District 2's revised contraflow plan that involves I-10 only goes as far west as I-75, whereas it originally continued to US 19. The anticipated operation of the revised I-10 contraflow termination at I-75 was discussed from the perspective of adequate capacity at the contraflow termination. Even with five named storms in 2004, however, that I-10 contraflow was never activated.

"Shelter in place" is the predominant philosophy for hurricane response now. The critical evacuation need is getting coastal residents moved inland to escape the anticipated storm surge, and it's important that the highway system function for people that have to use it.

It was also noted that people who do evacuate tend to leave earlier nowadays. One exception in the case of Hurricane Charlie was the rural counties in Southwest Florida. Many residents there didn't seem to get the word that they needed to leave, too. The FHP does daily conference calls with local agencies during such events to disseminate plans and advisories to make sure everyone is up to date on the hurricane alerts.

Another concern is planning for relief workers and response vehicles that are headed toward the hurricane zone. They try to get in close in order to begin staging recovery operations as soon as the storm passes. These efforts include the transport of potable water, ice, and food to the affected communities.

There was discussion of whether to recover FDOT equipment that is used for MOT along the evacuation corridor(s). This includes cones, barriers, portable signs, and barrels that are essential for motorist safety, but that could become hazards in high winds if left along the highway. It is FDOT's plan to recover contraflow materials before the onset of tropical storm winds. When the storm passes, these same items are needed to mark return routes and detours.

District 2 works closely with GDOT officials. Chad Hartley, GDOT's District Maintenance Engineer in Jesup, said they find Florida's network of CCTV cameras on interstates a valuable tool for gauging the approaching traffic flow into Georgia during evacuations and would welcome expansion of that capability.

GDOT has instituted contraflow operations on I-16 west of Savannah, and leaves the contraflow lanes open for the duration of the storm. The Department installed gates on eastbound ramps to prevent vehicles from entering contraflow lanes from the wrong direction. The cost of these and other improvements were covered by federal funds, Hartley said. Another practice GDOT follows is to assign evacuation routes to people depending on the geographic area in which they live. GDOT also has a recently developed contraflow plan prepared for a segment of I-95 in the Brunswick/Glynn County area. However, this plan is only intended for use until that segment of I-95 is widened to three lanes in each direction. After completion of that widening, the plan will be discontinued. Louisiana instituted it on I-10 westbound in advance of Hurricane Ivan. The first day, the start of contraflow operations was delayed until noon. In fact, there was already a huge traffic volume before agencies had the contraflow operation in place to handle it. The contraflow termination point in Baton Rouge was not well planned, either. John Hibbard said Louisiana's experience may influence officials there against implementing it again.

The meeting concluded at about 11:20 a.m.

## **DISTRICT 5 MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Tuesday, March 1, 2005  
FDOT District 5 Office, Orlando**

**9:00 A.M.**

### **Purpose:**

Meeting of District 5 Traffic Incident Management (TIM) Team members to discuss the statewide contraflow plan for hurricane evacuations and identify issues to consider in the forthcoming update of the plan.

### **Attendees:**

Cyrus Brown, FHP	John Hibbard, FDOT ITS [PBS&J]	Leroy Smith, FHP
Pat O'Neill, FHP Brevard	Dave Hodges, FDOT ITS [PBS&J]	Tracy Turner, FHP
Larry M. Costanzo, FHP	Robert S. Duncan, FHP Orlando	Jim Lee, FHP Turnpike
Jerry Sudimick, Turnpike	Douglas Prager, Turnpike	Mike Heffinger, FDOT
Polly Papke, FHP Orlando	Linda Perkins, FHP Lakeland	Tim Fekany, OCSO
Carlos F. Vazquez, FHP Tampa	Assaad Saliba, FDOT	Jim Wood, FDOT
Michael Washburn, Turnpike	Mark Wiseman, FDOT D5	Mike Danos, FDOT
Jennifer Heller, FDOT D5	Leslie A. Griffin, OOCEA	Tim Cannon, OCSO
George Keyser, FDOT Brevard *	Douglas Martin, FDOT Brevard *	Alan Hyman, FDOT

John Hibbard began the meeting by explaining the origin and purpose of the state's contraflow plan, how it is applied to the interstate system, and the reason for the current series of District meetings to gather information for updating the document. The document, similar to a strategic plan, is entitled *Technical Memorandum – Analysis of Florida's One-Way Operations for Hurricane Evacuation*. John polled the group in attendance and about two-thirds responded that they knew of the document. The technical memo was produced in 2000 after the massive evacuation in advance of Hurricane Floyd [1999]. The document was updated in 2002.

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\* Mr. Martin and Mr. Keyser joined the meeting via conference call.

John explained that the FDOT Central Office does not want to dictate the contraflow plans; the detailed contraflow plans will still be developed by the Districts. For the overall plan, the Districts are to provide ideas and input on the best policies and guidelines to follow. Each District will supplement the statewide contraflow guidance document with its own contraflow plan for use on local interstates.

Although each individual contraflow plan must be unique, there are elements that should be common to all of them. One is having sufficient personnel to institute a contraflow operation. A slide in the presentation compared the various Districts' contraflow plans, the mileage involved, number of interchanges, vehicles and people required, and portable VMS units to be deployed. Jennifer Heller noted that D5's plan for I-4 – which calls for the most vehicles and people of all the plans – overstated the staff and vehicle numbers to make certain there was sufficient personnel to handle any unforeseen events.

There was discussion of whether members of the Florida National Guard would be available to assist with contraflow operations. Some National Guard troops had been trained in Lakeland by the FHP to assist with evacuations. Those individuals, however, have probably been replaced by other troops since then, so retraining would be in order, and would be an ongoing need due to overseas troop rotations.

Maj. Leroy Smith of the FHP said there is little chance the National Guard could be used because the Guard needs at least 48 hours advance notice in order to mobilize its personnel, and it would be difficult to guarantee them that much lead time in advance of an order to contraflow. Maj. Smith said that FHP operates on 24 hours advance notice to implement contraflow, by comparison. Local agency representatives (police, sheriff's deputies) are the primary personnel for staffing the regional evacuation plans, with FHP and other state law enforcement personnel assuming responsibility for the interstates. The Florida Department of Law Enforcement (FDLE) is the state's mutual aid coordinator.

On the subject of equipment, Maj. Smith recommended that the FDOT and FHP coordinate the placement of cones, barricades, portable signs, and other resources, as well as their removal prior to the onset of tropical storm-force winds.

Lt. Pat O'Neill of the FHP in Brevard County said his greatest concern is the state mutual aid plan. He had written the evacuation plan for Brevard, and still had questions about what each agency is going to contribute in the way of staff to carry out such plans. Lt. O'Neill said there needs to be a defined list of people and defined list of equipment, both developed based on the known available resources. Without this essential information, the evacuation plans are "pie in the sky." He noted that he had seen some lists that showed the same variable message sign (VMS) utilized at three different locations.

Prepositioning assets for contraflow is vital. It was noted that District 5 has procured the necessary equipment for contraflow operations (e.g., cones) and the area maintenance yards are serving as the staging areas for this inventory. Once the plan and equipment details are ironed out, execution of the contraflow is easy. In fact, D5 can respond to a contraflow order and place the necessary equipment along the D5 section of I-4 in 50 minutes. (Mike Heffinger explained later that he has everything in the yard shrink wrapped on pallets and labeled. Those pallets are loaded and ready to be trucked to the designated locations along the contraflow routes. Crews are already established for each location. The equipment includes brand new cones, barricades, and VMS units. For his people to haul out the supplies from the FDOT yard, get to their stations on the highway, get into place and ready to begin the contraflow deployment is 48 minutes. D5 has rehearsed this multiple times for both I-4 and the Beeline.) Similarly, the Turnpike has had three rehearsals on the setup for contraflow. D5 can have all the contraflow materials on SR 528 in place in about 48 minutes. On each corridor, the goal is to mobilize quickly. It was presumed that it would take a similar amount of time to remove the materials, if not slightly less.

A recommendation from Larry Costanzo of the FHP was to utilize multiple vehicles for deploying the cones, barricades, and signs. District 1's deployment rehearsal (using one truck) showed that one truck is not enough. District 5 indicated that they will do whatever is necessary for faster placement of equipment. Districts should also seek advance approval for the staff overtime pay that contraflow operations are sure to require.

Contraflow planners must evaluate their route's impact on other highways. Orange County, for example, has asked that the state not have a contraflow operating on SR 528 and the Turnpike at the same time. Also discussed is what a community (in this case, Orlando) is going to do with the massive influx of traffic at the termination of the contraflow. For similar reasons, the I-75 contraflow northbound terminating in Wildwood is not desirable and therefore will not be done because the town would be overwhelmed with evacuees and lacks sufficient lodging or shelters to handle the influx. Mark Wiseman of District 5 indicated that it's important for local officials to attend the evacuation planning meetings to make their concerns known.

Crossovers in the medians are the primary means of beginning and ending a contraflow operation. D5 said I-4 has dual-lane crossovers that feed into two and from three regular travel lanes. SR 528 has single-lane crossovers. The Turnpike has two lanes in and two out. It was the consensus of the group that a crossover at a contraflow termination not "throttle down" the traffic, i.e., create a situation where three lanes of traffic must transition to two, or two lanes down to one, because it is likely that the crossover's presence, in conjunction with contraflow operation, will already restrict traffic flow somewhat. There must be an effective means of dissipating the traffic at the end of the contraflow.

The topic of road shoulder use was covered next. John Hibbard explained that the shoulder idea was researched after Hurricane Floyd, but using it as a travel lane would affect the ability of FHP, Road Rangers, fire/rescue, and others to respond when incidents occur. I-75 reportedly can support limited shoulder use, and it was noted that SR 528 could function the same if a bridge along that corridor were modified. In general, however, road shoulders aren't really suitable for use as regular travel lanes due to rumble strips, interference by bridges lacking full shoulders, inadequate cross section, and the presence of disabled vehicles.

Another concern was directing evacuating traffic through construction zones, which have their own barrier and marking requirements. In addition to deploying the resources associated with the contraflow operation, additional construction-area signage (or, perhaps, reversing construction-area signage) would be required, with additional manpower requirements to accomplish that.

The next topic addressed was what criteria would justify the activation of a contraflow plan, especially in light of the fact that four hurricanes struck the Peninsula in 2004 and no contraflow was ordered. It was noted that the public is often heard asking why aren't opposing (often vacant) lanes of a route opened to evacuating traffic?

At present, the activation of a contraflow is triggered by a Category 4 or 5 hurricane that is approaching at high speed and posing a serious impact to an urban (populated) area. The key factor is lives in peril, not just the category of the storm. It was noted that these criteria must be weighed against the fact that regional evacuation plans seem to work well and are proving effective at moving threatened populations out of harm's way in advance of tropical storm-force winds. While no plan is 100 percent foolproof, evacuation plans work better now than they used to. Jennifer Heller noted that interagency coordination has improved since Hurricane Floyd.

Lt. O'Neill said he believes the need to move large numbers of people on short notice is an important criteria. In the case of Florida Power & Light's St. Lucie II nuclear power plant on Hutchinson Island near Fort Pierce, a disaster there could necessitate the prompt evacuation of up to 300,000 people from an area likely to be threatened by any radiation hazard. Lt. O'Neill said this would have to be done with little or no notice.

Traffic volume should be factored into the contraflow decision. CCTV cameras located along corridors provide a good indicator of how traffic is moving. The Orlando-Orange County Expressway Authority (OOCEA) said they have closed-circuit TV cameras on SR 528 at the main toll plaza, but that they have plans to extend camera coverage east to SR 520 by year's end. At present, the Authority can view traffic approaching the plaza, but not conditions along the whole corridor. D5 maintenance staff had access to traffic video and used it as part of their observation process prior to deciding whether to implement contraflow operations on SR 528. Everyone felt that the local agencies' ability to verify traffic volumes, either by video or by firsthand observation, was important in deciding whether traffic conditions would warrant the use of a contraflow operation. The Governor's Office, in fact, needs that same real-time input to make a "go/no go" decision on enacting contraflow.

District 5 and the Expressway Authority believe that as long as traffic is moving, contraflow is not warranted. Another consideration is emergency response: if all lanes are headed the same direction, how will Road Rangers, troopers, and fire/rescue get “upstream” to reach an incident? Contraflow can work, but it brings with it many other consequences.

The Turnpike staff wrote their original plan for contraflow in 1994, but figured that the plan would not be activated. The plan covered the corridor from Lantana to Wildwood, and it had a huge requirement for staff and resources in order to work. Since that time, the plan has been changed to have contraflow provide “express” lanes that would take northbound evacuees past Yeehaw Junction (SR 60), and I-4, depositing them at SR 50/SR 429.

One question posed was whether the widening of interstates and expressways would alleviate the need for contraflow. As example, I-4 is currently being widened to three lanes in each direction. Upon completion of that widening, would a contraflow plan be required? John Hibbard mentioned the Georgia DOT’s plan to complete the widening of I-95 to three lanes each direction from Florida to South Carolina, thereby expanding traffic capacity in emergencies. He also described Georgia’s plan to contraflow I-95 in the remaining two-lane section, but only until the widening is completed. In areas where construction is not completed, however, the FHP recommended leaving things as is. Don’t pick those areas for contraflow until all road construction has been finished.

For other contraflow candidates, such as SR 528, the advice is “Be ready.” While the FHP in Brevard did not get the order from the Governor to contraflow prior to Hurricane Frances, the FDOT still must be ready with materials, crews, and vehicles. Everyone agreed that contraflow activation should not be a “top down” decision. Rather, it should come from the “bottom up,” from agency people who are on the scene, who can see the need, and who can verify actual conditions.

Be sure to predeploy resources. Plan on taking the contraflow down before dark, at least 4 hours before the onset of tropical storm-force winds. As has been discussed at previous meetings, a contraflow is only to be operated during daylight hours. In the case of the Turnpike, the planners there say it will take 4 hours to curtail contraflow at the end of the day, so they expect to stop it around 3 p.m. so the last vehicles have time to clear the reversed lanes before dark. (Note – times assume the longer daylight hours during the summer.)

It was discussed that FDOT crews will remain on site during contraflow operations to ensure their presence for the contraflow takedown. Otherwise, those personnel may have difficulty getting back out to their posts due to the oncoming traffic.

If your county is likely to be a contraflow destination, are you able to accommodate the influx of evacuees, or should your roads be a conduit to move traffic on past? This question was discussed in light of 2004, when Orlando was itself a target for three storms. Orlando/Orange County evacuation planning had been predicated on the assumption that the Orlando/Orange County area would be a destination for evacuees, and that was not the case in 2004.

Lastly, public outreach is vitally important. The motoring public needs to know what to expect in a contraflow, how it will work, and what will happen at the termination point. Public awareness must be a concerted effort of all agencies involved.

The meeting adjourned at 11 a.m.

## **JOINT BROWARD/MIAMI-DADE TRAFFIC INCIDENT MANAGEMENT TEAM MEETING**

**Wednesday, March 2, 2005**

**FHP Troop L Headquarters, Davie**

**1:30 P.M.**

### **Purpose:**

Regular meeting of the District 4 and 6 Traffic Incident Management (TIM) Team members. Part of the agenda was devoted to discussion of the statewide contraflow plan for hurricane evacuations and the issues to consider in the forthcoming update of the plan.

### **Attendees:**

Angel Reanos, FDOT D6	John Hibbard, FDOT ITS [PBS&J]	Girish Kumar, HNTB
John Sparks, PB Faradyne	Dave Hodges, FDOT ITS [PBS&J]	Guy Francese, FDOT D4
Dennis Burke, FDOT D6	Sean Loscalzo, Superior Towing	Jose Darsin, VMS/MDX
Jim Jennings, Emerald Towing	George Maffei, Sal's Towing	Kimberly Llambles, MDPD
Aurelio Carmenates, MDX	Paul Davis, Davis Video News	John Farina, MD-DERM
Christina Florez, GCA	Daphne Georgiadis, FDOT D4	Ken Vorce, GCA
Colleen Dalton, Turnpike	Javier Rolon, ICA-I75 Mgmt.	Paul Wai, Turnpike
Douglas Prager, Turnpike	Albert Chaviano, MDFD	Bernard Washington, FHP
Rick Steffan, FDOT MCCO	Bob Madge, Davie Fire/Rescue	Mak Khodr, BCTED
John Easterling, Turnpike	Jim Ferranti, Davie Fire/Rescue	Jim Brierton, FHP
Catherine Werner, Turnpike	Bob Murphy, PB Farradyne	Gregg Letts, DTC/MDX
Ron Sperry, MD Fire/Rescue	Donna Newry, MD Fire/Rescue	Derrick Charleston, FHP
Miguel Iglesias, FDOT D6	Andrea Reitor, SFRTA/Tri-Rail	Raul Corbo, Anchor
Towing Mike Millard, 511-SRS	Maggie Ramos, Sunshine Towing	Jason Ibarra, Synergy Env.
	Charlie Robbins, DMJM&Harris	

Ken Vorce began the contraflow discussion by updating the TIM Team members on current plans. He said D4 has a plan to reverse lanes on I-75's Alligator Alley. This would be done from US 27 on the east end to the Corkscrew Road interchange to the west in D1. The D4 plan, produced in 2000, is coordinated with FHP. In June 2004 there was a District 4-sponsored I-75

reverse lane workshop to review the plan and consider updating it, including the deployment of intelligent transportation system (ITS) devices along the route to support contraflow activities.

In particular, the workshop addressed the geographic limits of contraflow operations, coordination with other state and local agencies, use of public information offices, the command and control structure for contraflow, implementation criteria to follow, and potential traffic impacts.

Other contraflow provisions include operations only during daylight hours and making certain ahead of time that sufficient staff and resources are available. The FHP needs at least 24 hours notice before a contraflow plan is activated. Florida National Guard involvement is not a part of ongoing contraflow planning due to their need for at least 48 hours notice prior to deployment. The agencies must also monitor evacuation travel to gauge traffic levels. Ken said the Districts should produce an operations manual for contraflow, and that system requirements must be identified. He also recommended that the manual contain such specifics as the wording for alerts that would be posted on variable message signs (VMS) along the contraflow route.

John Hibbard continued the discussion. He presented a series of slides that explained the origin and purpose of the state's contraflow plan, how it is applied to the interstate system, and the reason for the current series of District meetings to gather information for updating the document. The document, similar to a strategic plan, is entitled *Technical Memorandum – Analysis of Florida's One-Way Operations for Hurricane Evacuation*. John polled the group and several attendees responded that they knew of the document. The technical memo was produced in 2000 after the massive evacuation in advance of Hurricane Floyd (1999). The document was updated in 2002.

John explained that the FDOT Central Office does not want to dictate the contraflow plans; the detailed contraflow plans will still be developed by the Districts. For the overall plan, the Districts are to provide ideas and input on the best policies and guidelines to follow. Each District will supplement the statewide contraflow guidance document with its own contraflow plan for use on local interstates.

Although each individual contraflow plan must be unique, there are elements that should be common to all of them. One is having sufficient personnel and other resources to institute a contraflow operation. John showed a slide that compares the various Districts' contraflow plans, the mileage involved, number of interchanges, vehicles and people required, and portable VMS units to be deployed.

It was noted that South Florida's geography dictates the direction of evacuations – essentially either north or west. While evacuations generally depend on the path of the approaching storm, South Florida residents tend to want to head north. I-75 and the Turnpike can also be a significant southbound route for individuals traveling to escape a hurricane headed for Central Florida, as was the case with Frances and Jeanne in 2004. A factor that complicates evacuations

is often evacuees don't know where they are going. Charlie Robbins asked whether there needs to be more local hurricane shelters, and if the establishment of additional shelters might be a more beneficial option to pursue cost-wise than activating a contraflow plan.

While I-75 westbound is an established evacuation route, there were questions raised about Alligator Alley being a satisfactory contraflow route due to the highway's remoteness, lack of exits, too few gas stations, and the potential for stranded motorists.

Angel Reanos said his understanding was that contraflow should be a remedy of last resort, utilized after all other responses have been applied in an evacuation. He also mentioned that evacuations are generally not mandatory for most people (except those along the beach).

On a regional basis, evacuations need to be timed in such a way that they avoid conflicts with each other. Brevard County's evacuation in advance of Hurricane Frances had the effect of backing up the Turnpike northbound in the Orlando area. Additionally, reference was made to the Turnpike being used to evacuate traffic southbound from Central Florida during at least one of the 2004 storms. Another problem is the traffic volume that contraflow operations likely will generate, leading to bottlenecks at the termination point, even if that point is a well-designed, high-capacity crossover. There's a greater risk of backed-up traffic, and in urban areas this gridlock would counteract efforts to evacuate people successfully. Another concern was traffic needing to move in the opposite direction, such as boat owners traveling to the coast to secure their vessels and people driving south to evacuate elderly family members and take them back north.

The discussion prompted a question from the audience as to whether contraflow is worth considering. Is it ever going to be used? Representatives from the Turnpike said they had geared up for contraflow prior to Hurricane Ivan, but had never activated the plan, though they had all assets for it in place. One team member asked why FDOT is spending this time, money and energy on developing something that we likely won't ever use.

Public awareness issues came up, too. One concern was whether the Districts and the local agencies may be "leaving out the people themselves" in the effort to plan evacuations. The media receives the various advisories from agencies, but the media outlets tend to act as filters on the information. They analyze the alerts, interpret how seriousness the situation is, and even offer their own advice about what people ought to do. For these reasons, the TIM team members seemed to think the media may be the "weak link" in the public information effort. One solution might be to make better use of the District PIOs, and to find a way to better educate the media and the public about hurricane response.

For increasing public awareness, one idea is for the Districts to produce a contraflow information sheet that can be distributed to the various media outlets to explain the use of reverse lanes, why it is done, and how the process will work.

The presentation and discussion ended around 3 p.m.

## **DISTRICT 7 MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Friday, March 11, 2005**

**FDOT District 7 Headquarters, Tampa**

**9:00 A.M.**

### **Purpose:**

Meeting of District 7 Traffic and Emergency Operations personnel, representatives from District 1, FHP, local responders, and other agencies to discuss the statewide contraflow plan for hurricane evacuations and issues to consider in the forthcoming update of the plan.

### **Attendees:**

Don Cashdollar, FDOT D1	John Hibbard, FDOT ITS [PBS&J]	David Elmore, Arrow Towing
David Tilki, FDOT/Turnpike	Dave Hodges, FDOT ITS [PBS&J]	Lance Grace, FDOT D1
Debbie Hunt, FDOT D1	James Olsen, Hillsborough FD	Michael Tako, PBS&J
Debra Kennaugh, FDOT D7	Gary Thompson, FDOT D7	Sam Messick, FDOT D7
Carlos Vazquez, FHP	Jacqueline Freeman, FHP	Leroy Smith, FHP
Jim Moulton Jr., FDOT D7	Tom Knight, FHP	John F. Baumann, FHP
David Buser, ICA	Chuck Lovell, FDOT D1	John Beebe, Pinellas FD
Jennifer Perry, FDOT D1	Larry Hagen, USF	Jim Byers, PSTA
Alex Diaz, Hillsborough SO	Mark Clark, Hillsborough SO	Red Childs, Manatee County
Buddy Cloud, PB Farradyne	Lance Connors, Hillsborough SO	Denny Pedrick
Tom McMullian, VMS, Inc.	Patrick Medina, Manatee County	Marian Scorza, FDOT
T. Sterling, Jorgensen Cont.	Brian Alexander, Hillsborough SO	Gary Ewir, FDOT
Mark Perez, Jorgensen Cont.	John Chaffin, Hillsborough SO	Gary Granata, PBS&J
John Imming, AAA South	Paul Alessandri, Hillsborough SO	John McShaffrey, Earth Tech
David Ezell, Bradenton FD	Mark Souders, Florida Fire Chiefs	Art Hushen, Tampa PD
Nanci Bender, FDLE		

## *Contraflow Plan for the Florida Intrastate Highway System*

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John Hibbard began the meeting by explaining the origin and purpose of the state's contraflow plan, how it is applied to the interstate system, and reasons for the current series of District meetings on updating the plan. The document is actually a "technical memorandum" entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*. John polled the group in attendance and many responded that they were familiar with the document. The technical memo was produced in 2000 after the massive evacuation in advance of Hurricane Floyd [1999]. The document was updated in 2002.

John explained that the FDOT Central Office does not want to dictate the contraflow plans. Rather, Tallahassee is relying on the Districts to provide the ideas and input on the best policies and guidelines to include in the overall plan. Each District will supplement that statewide contraflow guidance document with its own contraflow plan for use on local interstates.

Although each individual contraflow plan is unique, there are certain elements common to all of them. One is having sufficient personnel and other resources to institute a contraflow operation. John showed a slide that compares the various Districts' contraflow plans, the mileage involved, number of interchanges, vehicles and people required, and portable VMS units to be deployed.

The discussion began with comments on the use of a northbound I-75 contraflow from I-275 to Wildwood. The FHP doesn't believe this is needed because evacuating traffic moved along that corridor satisfactorily the last two years. There is much local agency support for that highway during evacuations. Maj. Leroy Smith of the FHP said a contraflow merge at I-75's junction with the Turnpike would be difficult.

While the technical memorandum on one-way operations mentions the I-75 contraflow north to Wildwood, John noted that he didn't have or know of a detailed plan. Based on comments from the attendees, the plan doesn't actually exist. Mark Souders of the Bradenton Fire Department responded that a contraflow plan for that segment of highway may still be needed.

As for I-4, the contraflow eastbound for that corridor begins at Tampa Street and continues to SR417/World Drive near Orlando. The crossover can be multi-lane if need be.

The next topic was use of the highway shoulder during evacuations. The FHP voiced opposition to use of shoulders, especially on bridges. A lane needs to be available for emergency responders to use to reach accidents. It was noted that the I-4 plan doesn't involve the use of the shoulder for travel lanes. However, there is a shoulder use plan in Sarasota County for I-75 northbound over a 21-mile stretch from Toledo Blade Boulevard up to SR 681. The four-lane interstate during that portion becomes six lanes at SR 681 and the vehicles on the shoulder move to the new travel lane. While the plan isn't actually a contraflow, attendees from FDOT District 1 said it does help the evacuation effort. Despite the concerns raised by the FHP and others, the limited length of the Sarasota County plan and its termination at the lane addition at SR 681 makes its development and potential use understandable.

Completion of the I-4 widening (widening from 4 to 6 lanes) will be a factor in determining whether to activate contraflow there. The consensus of the group was that widening should lessen or eliminate the need for reversed lanes. Nonetheless, District 1 representatives said they are about to spend a lot of money updating the contraflow evacuation plan they developed. Some wondered whether such time and effort should be devoted to a plan that may never be used.

The discussion turned to the traffic impacts of contraflow. For example, contraflow of a six-lane interstate would create a tremendous termination challenge. Capt. Carlos Vazquez of the FHP asked whether there ought to be a study of these impacts by FDOT traffic engineers. Included in this discussion was that the contraflow plans for which there was the greatest confidence were those where the contraflow operation terminated at an interchange with adequate roadway capacity, so that one of the evacuating traffic flows is simply diverted onto the intersecting roads.

It was noted that the I-4 contraflow plan calls for a significant amount of resources in terms of personnel, vehicles, and equipment. While some assistance from the Florida National Guard may have been part of this plan's development, discussion confirmed that the National Guard requires in excess of 48 hours notice, which is not always possible to meet. This is complicated by the fact that local agencies often don't know enough about the approaching hurricane's expected path to accurately predict an evacuation time.

The critical resource for evacuations is people. Staff must be trained in basic traffic control procedures. In some areas, trained citizen volunteers function until professional (likely law enforcement) backup arrives from other areas. Last summer's hurricane evacuation went well because of the lead time. That is not expected to be the case in other emergencies, such as a terrorist threat. An evacuation would have to take place on short notice, and local law enforcement would have to be committed to that incident response first. It was noted that the FDLE's Domestic Security Task Force has a plan that provides backup and additional support to local responders in such situations. The reaction time, however, shrinks from days to mere hours.

Maj. Smith of the FHP explained that Florida's mutual aid plan is activated under the provisions of Chapter 23, Florida Statutes. He added that contraflow plans are designed for use in hurricanes.

A fire/rescue department representative said local resources are always tapped first, and this approach is the one being promoted by federal emergency management officials. Local volunteers who have been trained provide first aid and first response. It was noted that Hurricanes Frances and Jeanne last summer prompted a southbound and westbound evacuation of residents from the Atlantic coast, which had the effect of overwhelming communities and their shelter facilities in southwestern Florida. Maj. Smith explained another development: successive hurricanes after Charley prompted greater traffic flow. Frances convinced an

## *Contraflow Plan for the Florida Intrastate Highway System*

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estimated 2.8 million to evacuate South Florida, compared to the previous record of 2.2 million in advance of Hurricane Floyd in 1999.

In light of the current construction on I-4, the impact of highway construction on contraflow plans was discussed. Contraflow implementation through I-4's construction zone would require additional setup and configuration. The contractor there is responsible for barricade movement, but there were doubts about how well that would work. A District representative confirmed that they do have a plan for contraflow on I-4 even while it is under construction. There was an additional concern that contraflow personnel would not be able to reach their posts for evacuation work. Discussion of the need to implement contraflow upon completion of the I-4 widening turned to a discussion of the need to contraflow roads wider than 4 lanes. In light of the anticipated revision of the I-4 contraflow plan, a question was posed about whether contraflow plans should be prepared for six-lane roads at all.

Final comments included mention that District 1's resource numbers for contraflow don't include FDOT staff, only the law enforcement and fire/rescue personnel. Activation of a contraflow plan is contingent upon local traffic, and knowledge of traffic conditions is essential for FHP. There were cases last summer where contraflow was not declared at the last minute (SR 528) because reports from the field indicated that traffic was moving fine.

The term "contraflow" may be replaced by another. Maj. Smith said the acronym is "HELP" for Highway Evacuation Lane Plan.

The meeting adjourned at about 10:35 a.m.

## **DISTRICT 3 MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Monday, March 14, 2005  
FDOT District 3 Headquarters, Chipley**

**9:00 A.M.**

### **Purpose:**

Meeting of District 3 Traffic and Emergency Operations personnel, FHP, FDLE, and other agency representatives to discuss the statewide contraflow plan for hurricane evacuations and issues to consider in the forthcoming update of the plan.

### **Attendees:**

Kenny Morris, FDOT MCCO	John Hibbard, FDOT ITS [PBS&J]	Dawne McKee, FDOT
Keith Westphal, FDOT MCCO	Dave Hodges, FDOT ITS [PBS&J]	Leroy Smith, FHP
Gabriella Molina-Corbin, FDOT	Donnie Branch, FDLE	Timothy Ashley, FHP
William Calhoun, FHP	Jerry L. Maddux, FHP	Charley Locke, FDOT
June Coates, FDOT	Brian Satterfield, FDOT	Alan T. Bush, FDOT
Alaxon Pitts, FDOT	Tommy Cook, FDOT	Larry Kelley, FDOT
Eric Spencer-Auber, FDOT	Jimmy Rodgers, FDOT	Tracy Strickland, FDOT
Larry J. Kelley, FDOT	George Hodge, FDOT	Jeff Loflin, FDOT
	Gene Syfrett, FDOT	

John Hibbard began the meeting by explaining the origin and purpose of the state's contraflow plan, how it is applied to the interstate system, and the reason for the current series of District meetings on updating the plan. The document is actually a "technical memorandum" entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*. John polled the group in attendance and only a few responded that they'd had an opportunity to read the document. The technical memo was produced in 2000 after the massive evacuation in advance of Hurricane Floyd [1999]. The document was updated in 2002.

John explained that the FDOT Central Office does not want to dictate the contraflow plans. Rather, it is up to the Districts to provide the ideas and input on the best policies and guidelines to include in the overall plan. Each District will supplement that statewide contraflow guidance document with its own contraflow plan for use on local interstates.

Although each individual contraflow plan must be unique, there are elements that should be common to all of them. One is having sufficient personnel and other resources to institute a contraflow operation. John showed a slide that compares the various Districts' contraflow plans, the mileage involved, number of interchanges, vehicles and people required, and portable VMS units to be deployed. He explained that District 2's original plan, which sent contraflow traffic as far west on I-10 as Jefferson County in District 3, has been amended to terminate at I-75. This eliminates District 3's involvement in that evacuation plan.

John said District 2's revised plan illustrates an important principle of contraflow planning: terminate the reverse lane operation where you have capacity, where you have a roadway of adequate size/capacity to put people on. Previously, District 2's plan ended at US 19. Although a four-lane divided highway, US 19 did not have the capacity that I-75 does, and the interchange at I-10 and US 19 has only single-lane ramps. A question was posed from the group about the potential for traffic backup from I-10 westbound as the two contraflow lanes are forced to exit on the one-lane exit ramp to I-75 northbound. Most everyone agreed that I-75 could stand to have two-lane entrance and exit ramps at the I-10 interchange. John responded by stating that it's one issue to contend that the I-75/I-10 interchange should have two-lane ramps for day-to-day operation – and that could be validated through traffic engineering analysis. However, for hurricane evacuation/contraflow operations, the issue is not so much how many lanes a certain ramp is but instead if it could be operated with two lanes of evacuating traffic.

Shoulder use was discussed. Besides the presence of rumble strips, the highway shoulder is not a recommended travel lane for evacuations because it is not sufficient to support vehicles. There is also interference from motorist aid call boxes. Maj. Leroy Smith of the FHP said emergency responders need the shoulder to reach accidents. Driving on the grass shoulder is not an option because the grass shoulder can be very unstable, especially if it's raining.

During last summer's Hurricane Ivan, FDOT coordinated the I-10 detour with Alabama DOT. Florida's Road Rangers worked on portions of the detour that ran through southern Alabama. The working relationship between the two departments seems to be good.

Ivan's evacuees generally went north, northeast and east to escape the hurricane. District 3 adjusted the signal timing at intersections to help move the cars along the various routes. The discussion of evacuating people in the Panhandle raised the question of using I-10. Can people really be evacuated west or east on the interstate? A Gulf hurricane headed ashore is very unpredictable, as Ivan proved. John asked whether an evacuation east or west would put people in harm's way, considering the hurricane's potential to change direction. Rather than dictate such a route, it may be better to let people pick their own path.

Maj. Smith said it was up to local officials to decide whether to contraflow I-10 eastbound prior to Ivan. They declined to activate the plan in light of the need for bidirectional traffic movement

on the interstate. In particular, the local emergency management personnel in Panama City did not favor contraflow on I-10.

North-south corridors were discussed. It was noted that US 231 is four lanes from the coast to the Alabama state line. Most other north-south highways in the District are not. US 231 was a key part of the area's regional evacuation plan. FHP said the evacuating traffic moved along well.

In 1995, the Bay County Sheriff's Office took control of US 231 prior to Hurricane Opal and enacted a northbound contraflow for a limited distance.

Walton County was considering implementing a northbound contraflow of SR 331 and came close to activating it, but District staff discouraged them. Walton County ultimately didn't implement the plan. Also, the FHP at the local level wasn't aware of the plan. There is a concern about the large numbers of people now living along the coast in Walton, Okaloosa, and Escambia counties. The residents of the barrier islands are the primary evacuees, but northbound roads from areas like Destin are only two lanes, making evacuation difficult. The Panhandle now has an estimated 1 million residents and at least one-third of them live right along the coast.

District 3 staff said there are plans to four-lane SR 79 and SR 77 from the coast to I-10. The widening of SR 87 up to I-10 is now under construction. The first priority is the ability to get traffic up to the interstate.

As for the storms of 2004, Hurricane Charley frightened many Floridians, so evacuation for Frances was greater in the numbers of people who fled. In subsequent storms, people had exhausted their finances, couldn't leave, and opted to go with the "shelter in place" strategy – which is the state's official policy. Mobile home owners and people living in substandard housing are encouraged to use local hurricane shelters.

Another lesson from 2004 was that past experience often dictates what people actually do before a hurricane. If you evacuate your family, run out of gas on the highway, and become stranded, you probably won't want to flee the next time. It was noted that Ivan probably had the opposite effect: Ivan scared barrier island residents and they will be sure to evacuate next time.

After Ivan, it was noted that the commercial carriers had their own detours as alternatives to I-10. The FHP and the MCCO indicated that they gave "blue light" escorts for trucks in order to get supplies and materials delivered to the areas needing road and signal repairs. Separate detours were set up for passenger vehicles to use.

The meeting ended around 10:45 a.m.

## **DISTRICT 1 MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Thursday, March 24, 2005  
FHP Headquarters, Fort Myers**

**1:30 P.M.**

### **Purpose:**

Meeting of District 1 Traffic and Operations personnel, FHP, FDLE, local law enforcement, and other agency representatives to discuss the statewide contraflow plan for hurricane evacuations and issues to consider in the forthcoming update of the plan.

### **Attendees:**

Gary Grossman, FDOT	John Hibbard, FDOT ITS [PBS&J]	Mark Clark, FDOT
Rich Lisenbee, Lee County	Dave Hodges, FDOT ITS [PBS&J]	Leroy Smith, FHP
Mike Padgett, Lee County	Al Lewis, Bonita Springs FD	Debbie Hunt, FDOT
Richard Fimbel, United Rentals	William Stamey, United Rentals	Andrew Rose, FDLE
Eddie Johnson, Jr., FHP	Roger Philibert, United Rentals	Billy Rippy, FHP
Tom Garcia, FMOC	Mark Perez, Jorgensen Cont. Services	Chris Hof, FMOC
Phil Blanc, San Carlos FD	Linda King, Lee Count SO	Gary Ewin, FDOT
Mike Stone, Collier County	Brian Raimondo, Lee County MPO	Joe Montoya, FMOC
	John Sparks, PB Farradyne	

John Hibbard began the meeting by explaining the origin and purpose of the state's contraflow plan, how it is applied to the interstate system, and the reason for the current series of District meetings on updating the plan. The document is actually a "technical memorandum" entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*. John polled the group in attendance and several responded that they'd had an opportunity to read the document. The technical memo was produced in 2000 after the massive evacuation in advance of Hurricane Floyd [1999]. The document was updated in 2002.

John explained that the FDOT Central Office does not want to dictate the contraflow plans. Rather, it is up to the Districts to provide the ideas and input on the best policies and guidelines to include in the overall plan. Each District will supplement that statewide contraflow guidance document with its own contraflow plan for use on local interstates.

Although each individual contraflow plan must be unique, there are elements that should be common to all of them. One is having sufficient personnel and other resources to institute a contraflow operation. John showed a slide that compares the various Districts' contraflow plans, the mileage involved, number of interchanges, vehicles and people required, and portable VMS units to be deployed.

He explained that the eastbound I-4 plan, which originates in District 7 and crosses District 1, starts in Tampa and ends just short of Orlando in District 5. A contraflow plan for I-75 northbound from Tampa to Wildwood is mentioned in the technical memo, but the plan for it doesn't actually exist. One criteria discussed in the technical memo was how long local agencies should contraflow a certain section of highway to move a give number of evacuees. Operational constraints will also serve to influence how well a contraflow plan functions.

On I-75, the D1 attendees said the contraflow plan never terminated at Alico Road in Lee County (as described in the technical memo). It actually ends one exit sooner at Corkscrew Road. That made more sense because there is more sheltering (e.g., Germain Arena nearby) available at that interchange. At the east end of I-75's Alligator Alley, the terminus is U.S. 27. On the west end, it was mentioned that no crossover exists on I-75 at Exit 101 (Collier Blvd, CR 951). Until the FDOT adds that crossover, the contraflow plan won't work as envisioned.

It was also noted that at the western termination at Corkscrew Road, traffic leaving the contraflow lanes doesn't use a crossover. Instead, the vehicles leave via the southbound on-ramp, where they can proceed to a hurricane shelter or get back on I-75's regular northbound lanes.

Capt. Eddie Johnson of the FHP in Fort Myers said his concern was that westbound evacuees from Broward have no facilities or infrastructure for an effective contraflow on I-75. There are no resources (food, fuel, rest areas, etc.) for 120 miles and personnel are in short supply. Maj. Leroy Smith responded that under Chapter 23 of the Florida Statutes, the state's mutual aid plan provides help when the Governor issues an executive order in such instances. The plan makes sure that extra Troopers and support personnel from other areas of Florida are sent to assist with emergency operations.

Maj. Smith spoke briefly about Alligator Alley. He said the contraflow plan staffing figures given in the presentation for that corridor (31 people) probably only show Broward's staff. Even though there are only two exits on that portion of I-75 (beginning and end), he said there is still a need for deploying lots of personnel along the route for incident response.

The I-4 plan involves three FDOT Districts (7, 1, and 5) as it moves traffic east. John Hibbard asked whether that causes coordination problems. None were mentioned. Another coordination topic was the use of different asset management contractors along stretches of interstate. These situations reflect the kind of questions that need to be addressed in contraflow planning, especially since coordination is so important among all the various agencies and contractors involved.

Shoulder use was discussed. Capt. Johnson said he believes a shoulder plan can work, though he wishes it could be done other places. He was not in favor of the Sarasota County shoulder use plan on I-75 northbound, which extends 21 miles from Toledo Blade Boulevard up to SR 681. The four-lane interstate during that portion becomes six lanes at SR 681 and the vehicles on the shoulder move to the new travel lane. Capt. Johnson said he didn't see what that plan really accomplishes, and it has all the drawbacks of shoulder use, such as rumble strips on the shoulders, restricted shoulder width at some bridges, and the resultant loss of an emergency lane for disabled vehicles.

Also discussed was the impact that intelligent transportation systems (ITS) can have on gauging evacuation conditions. Where traffic counters and CCTV cameras are available, FDOT and FHP staff can discern traffic conditions without having to be out on the highway. Collier County had good results using highway advisory radio (HAR) and other ITS devices to communicate with motorists. Messages broadcast on the HAR covered where to find food, gas, and lodging, and were broadcast in English, Spanish, and Creole.

Maj. Smith asked if FDOT can do a study of whether a road widening to six lanes on interstates alleviates the need for contraflow operations. He said that ought to be done to help indicate whether widening really is an alternative to reversing travel lanes on a highway.

Hurricane Charley, the first of the 2004 major storms to strike Florida, posed some particular challenges, said Linda King of the Lee County Sheriff's Office. A fast-moving hurricane, Charley hit quickly. This cut into the amount of lead time that local agencies had to plan, and it definitely reduced reaction time. In addition, Charley was not expected to come ashore where it did – Punta Gorda. Maj. Smith responded by giving a timetable for contraflow planning and execution. At 48 hours before the onset of tropical storm-force winds, planners are reviewing the contraflow criteria and deciding whether it is needed in light of the hurricane forecast and traffic conditions in the affect area. At 24 hours out, they make a decision on whether to proceed with the contraflow, and if so, have it running 17-18 hours before tropical storm-force winds ensue. The contraflow is then curtailed at least 4 hours before those winds occur.

Capt. Johnson said what's missing is everybody else – local Sheriff's personnel, police, county road departments, municipal responders. Their involvement is needed for handling the huge influx of cars on local roads. He said local coordination is difficult at best. Just closing a portion of the interstate is an ordeal. Evacuees often don't know exactly where they are going, so they need help navigating local highways to reach their destinations.

This prompted a discussion of how best to relay information to the traveling public. All District hurricane evacuation plans include the use of fixed signage, portable VMS units, and permanently mounted VMS, though their ability to provide information is limited by the number of lines and characters available on the signs. It was noted that through use of HAR and the 511 advanced traveler information system where available, the local agency can broadcast as long as necessary to get the message delivered, even changing the language if need be.

However, a larger public outreach should occur long before the storm arrives. Attendees at the meeting seemed to favor an ongoing campaign to educate the public, involve the media, and encourage local agencies to collaborate on promoting hurricane preparedness. This should be a year-round effort, and it should also be directed at tourists.

Maj. Smith said he favored broad distribution of the various contraflow plans, which he recommended be reproduced in an electronic format so they can be e-mailed for more widespread use and so communities and local responders can become more familiar with them. Similarly, Capt. Johnson noted that the content of the plans is due to change to reflect new highway exits, road conditions, staffing, and the like.

On a state level, Maj. Smith said he advocates the establishment of an executive oversight body for the contraflow project. He noted that the idea had been discussed previously, but the initiative seems to have dissipated. Nonetheless, this executive function could help with setting contraflow protocols and practices. He sees the committee or board composed of representatives from FHP, FDLE, FDOT, FDCA, Florida Sheriff's Association, and others.

Mark Perez of Jorgensen Contract Services asked whether the local Traffic Incident Management (TIM) Team would be the best local body to coordinate contraflow functions. He felt this was the best means for getting more local agencies involved in the task, and that the TIM team already exists is beneficial as well

Jose Montoya of FDOT said local agencies need a "dry run" as a way to rehearse their mobilization for contraflow, even the preparation for and placement of staff, signs, barricades, and vehicles along the intended route. Also important are regional evacuation plans, which county Sheriffs developed and which identify the intersections needing to be managed by local law enforcement.

John Sparks of PB Farradyne said communities need to do everything they can so they don't have to institute a contraflow plan. There needs to be more use of ITS and its traffic management techniques, deployment of Road Rangers, and other tools for handling evacuations effectively.

In his concluding remarks, John Hibbard said some data in the *Analysis of Florida's One-Way Operations for Hurricane Evacuation* is old, so an update is definitely needed to reflect current conditions. He noted, however, that a contraflow operation is not so much a traffic volume response as it is more of an operational "spigot" to turn on and off to handle conditions.

The meeting adjourned at about 3 p.m.

## **TALLAHASSEE MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Friday, April 1, 2005  
ITS Section – Rhyne Building  
Tallahassee**

**10:00 A.M.**

### **Purpose:**

Meeting of FDOT Central Office personnel, FDLE and FHP representatives, and District office staff to discuss the input received from the various District contraflow meetings and the issues to be addressed in the forthcoming update of the plan.

### **Attendees:**

Jim Madden, FDLE	John Hibbard, FDOT ITS [PBS&J]	Paul Clark, FDOT
Steve Williams, FDLE	Dave Hodges, FDOT ITS [PBS&J]	Leroy Smith, FHP
Doug Prager, Turnpike	Bob Collins, PBS&J	John Harris, FDOT
Dale Cook, FDOT	Lap Hoang, FDOT	Ed Ward, FDOT D2 *
Paul Thomas, FDOT D3 *	Tommy Cook, FDOT D3 *	Frank Harper, PBS&J *
Jeannie Cann, FDOT D6 *		

John Hibbard began the meeting by offering a summary of the six contraflow meetings held at the various FDOT Districts between February 22 and March 24. He explained that because the contraflow plan will rely so heavily on local input and support, the District meetings were valuable for gaining insights and comments from individuals in the locales where the planned reverse lane operations would be implemented. Without that two-way communication flow between Tallahassee and local communities, contraflow plans and their execution will not be as effective as they otherwise could be.

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\* These participants joined the meeting via conference call.

The meetings spanned a wide range of subjects. John said there were discussions of whether to use the road shoulder for evacuations, how to coordinate evacuations with Georgia and Alabama DOT personnel, and what kind of insights were gained from the experiences of 2004 when four major hurricanes hit Florida in a seven-week period. Preparedness will be a cornerstone of contraflow plans, and this covers such essentials as media involvement before the storm arrives, promotion of regional evacuation plans, and FDOT rehearsals for contraflow deployment. To their credit, District representatives endeavored to develop an honest assessment of the resources they will need to implement a contraflow operation, and several have tested their mobilization procedures with practice drills.

In the statewide contraflow plan, John recommended there be a requirement for consistency among the District plans, especially in the way they total and present plan resources, equipment needed, and personnel to be deployed. FDOT would need to arrive at a consensus on how contraflow plans are supposed to look. That would benefit the users, particularly local government officials and various agency representatives.

Lap Hoang observed that the District meetings were beneficial for hearing local concerns that the contraflow plan was not always appropriate for every evacuation need. Lap said it sounds like the constraints on when and how to implement a contraflow operation have raised the threshold for utilizing the procedure, and the Department must be sure to articulate those restrictions to policymakers.

Maj. Leroy Smith of the FHP told the group that there's still a need for contraflow coordination at the state level. Maj. Smith is an advocate of having a Contraflow Executive Council composed of agency representatives, local officials, members of the Florida Sheriff's Association, and others who would develop contraflow protocols and practices, and advise the director of the state Division of Emergency Management and the Governor on whether to initiate a contraflow. The council could also be active in training, public outreach efforts, and in reporting on contraflow planning activities. Contraflow plans would be updated annually to reflect changes in highway corridors and traffic conditions, then be distributed in electronic format to the various users.

Steve Williams of FDLE responded that the state is supposed to be reviewing evacuation plans on a regular basis anyway. Paul Clark of FDOT said he has been pushing for the Division of Emergency Management to have a review committee for this, but so far it hasn't happened.

Lap asked whether anybody had done an analysis of the traffic capacity gained from instituting a contraflow operation. Has there been a study developed? Doug Prager said PBS&J did a study on the Turnpike, but the Orlando area was not included in it. Before Hurricane Charley arrived in 2004, Doug said the evacuation moved people out of harm's way. But because of the storm's track through Central Florida, suddenly the evacuees found themselves back in the hurricane's path, gridlocked in traffic. The area's transportation officials want to avoid that horror in the future, he said. Paul added that he worries contraflow may only bring on undesired traffic impacts sooner. Another aspect of evacuation planning has to do with a community's capacity to provide hurricane shelters, he noted, and that should not be overlooked.

Highway traffic capacity is typically figured at 2,000 vehicles per hour per lane, and that's what everyone is accustomed to, Lap told the group. John Hibbard responded that a highway can't be expected to maintain that volume at a reverse-lane crossover or at a contraflow termination point. Lap said this detailed traffic/capacity analysis needs to be done – to pin down the capacity question and volume information so planners can determine the dimensions of the “box” that marks the limits of contraflow's application. And policymakers need this input because they otherwise may overestimate a contraflow route's capability to move evacuees. In fact, the contraflow box is actually getting smaller as the criteria become more sharply defined and contraflow's benefits and drawbacks are better understood.

Doug said The Turnpike Enterprise is updating its contraflow plan now to reflect new exits on the highway and other changes. He asked when the FDOT contraflow document would be released, and John responded that it would be out in draft form by the end of April. It's important that the statewide overview provides highlights of the various District contraflow plans for policymakers and the Governor. John said that may take the form of an executive summary or a review at-a-glance to communicate what's being done.

Lap asked how the Florida contraflow effort is being coordinated with Georgia and Alabama. John replied that Georgia DOT representatives attended the District 2 contraflow meeting in Jacksonville, and that he has an April 5 meeting in Montgomery with Alabama officials to acquaint them with Florida's project. John explained briefly that I-16 west of Savannah was made a contraflow route prior to Hurricane Floyd in 1999. Elsewhere, Georgia is widening I-95 in Glynn County from four to six lanes, and the remaining four-lane segments of I-75 are being widened to six lanes to enhance the highways' value as evacuation routes.

Paul asked about the I-10 bridge in Escambia County that was damaged from Hurricane Ivan. What if there's an evacuation involving I-10 eastbound from Louisiana, Mississippi or Alabama with the reduced eastbound capacity? He recommended that there be alternate routes identified for such evacuations and that those arrangements be made now to ensure that Florida is prepared for that potential situation.

Lap offered the observation that the job of traffic engineers should be to study traffic volumes and prepare guidance on the advisability of contraflow for a given route. He advocated an approach over the long term that would produce specifications for crossovers, highway markings, ramp gates, and other facilities. Along evacuation corridors, there should be placement of more CCTV cameras that can be accessed by traffic managers statewide. Another aid would be the development of contraflow planning guidelines to distribute to the Districts.

The meeting adjourned at about 11:30 a.m.

## **ALABAMA DOT MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Tuesday, April 4, 2005  
ALDOT Headquarters  
Montgomery, AL**

**10:00 A.M.**

### **Purpose:**

Meeting of Alabama Department of Transportation (ALDOT) maintenance management personnel involved in Alabama's hurricane evacuation planning and operations efforts.

### **Attendees:**

John E. Lorentson, P.E., State Maintenance Engineer  
George H. Conner, P.E., Assistant State Maintenance Engineer/Bridges  
Stacey Glass, P.E., Assistant State Maintenance Engineer/Management & Training  
Tim Taylor, P.E., Assistant State Maintenance Engineer/Traffic Operations  
John Hibbard, FDOT ITS [PBS&J]  
Harry G. Rice, P.E., PBS&J

John Hibbard began the meeting by explaining the origin and purpose of Florida's contraflow plan, how it is applied to the interstate system, and the efforts associated with updating the plan, including meeting with representatives from Alabama and Georgia to discuss coordination needed between the states. The document that PBS&J is updating is actually a "technical memorandum" entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*.

John explained that the FDOT Central Office utilizes the technical memorandum, but that the document's level of detail is not great. Each District will supplement that statewide contraflow guidance document with its own contraflow plan for use on local interstates.

John said the Florida plan most likely to affect Alabama is the I-10 contraflow plan beginning at Jacksonville and heading west. He explained that while the plan was originally to have its west end near Tallahassee, a recent revision now has the plan ending at the I-75 interchange. There are no freeway-based contraflow or reverse flow plans on any other sections of I-10, and Florida

does not plan to develop any other I-10 contraflow plans due principally to the fact that I-10 roughly parallels the Florida Gulf Coast in the Panhandle, and this orientation is not appropriate for coastal evacuation.

Alabama staff stated that they have no plans for using I-10 as an evacuation route for the same reasons Florida described. Additionally, I-10 is carried under Mobile Bay in a tunnel, whose use is not to be emphasized during a potential high-water scenario. Mobile's existing ITS system only provides coverage on I-10, and is focused on tunnel operations. They described their only existing hurricane evacuation route – I-65 – which runs from Mobile to Montgomery and then northward. The contraflow plan begins at Milepost 31, the State Route (SR) 225 exit in the vicinity of Bay Minette, and terminates at Milepost 167 in Montgomery.

There is a two-lane paved crossover with a 45-mph design speed before the SR 225 exit, but north of the long bridge at Mifflin Lake. The contraflow operation currently ends at South Boulevard in Montgomery. South of the South Boulevard exit, a third lane is added to northbound I-65. A single-lane crossover is used to transition one of the contraflow lanes back to the normal northbound lanes; the other contraflow lane is forced to exit at South Boulevard and then make a left turn onto South Boulevard. Southbound I-65 traffic must exit at South Boulevard. Based on their 2004 experience, ALDOT will change this plan to force southbound I-65 traffic to exit at Fairview (one exit north of South Boulevard). Upon completion of roadway improvements now under construction, the north end of contraflow operations will be changed to the US 31 interchange, as US 31 will be a 4-lane facility upon completion.

Recently, ALDOT was asked to assess the feasibility of implementing a one-way operation on SR 113, which runs from its intersection with US 29 northward to I-65. US 29 is a principal 4-lane surface route from Pensacola. ALDOT's assessment of SR 113 was that it was not suitable for one-way operation.

ALDOT staff stated that their purpose in implementing the I-65 contraflow plan was to handle traffic evacuating from Baldwin County and the western Florida Panhandle (west of US 331). Baldwin County and Mobile County are the two Alabama counties that have Gulf of Mexico coastline. SR 59 and SR 113 are the primary routes expected to carry traffic out of this area. At their interchanges with I-65, traffic evacuating on SR 59 and SR 113 will enter I-65 on its regular northbound side.

Throughout the I-65 contraflow route, all normal northbound entrances and exits remain open. On the contraflow side of I-65, traffic is permitted to exit at all interchanges, but may not re-enter on the contraflow side.

ALDOT staffs 30 locations along the I-65 contraflow route, using approximately 200 individuals. The plan also calls for 60 Alabama State Troopers.

Additionally, ALDOT staff provided valuable information concerning their experience in implementing and contraflow operating I-65 during the Hurricane Ivan evacuation in 2004. The following is the synopsis of this information.

The decision was made on Monday, September 13, to pre-position resources by the evening of Tuesday, September 14, for a contraflow operation beginning Wednesday morning, September 15. The individuals that were part of this pre-positioning were instructed to be within 1-2 hours of their deployment stations.

One part of their information gathering in this was their use of Florida's web-based traffic count information.

On Tuesday, ALDOT observed a peak traffic volume on I-65 of 2,900 vehicles per hour (vph), with brief slowing. ALDOT's pre-positioning efforts resulted in their being ready to implement the contraflow operation by 6:20 a.m. Wednesday. However, due to unanticipated delays in clearing the contraflow lanes, the operation was not implemented until 8:30 a.m. The contraflow operation ended at 2 p.m., at which time the volume on the contraflow side was 90 vph. The peak contraflow traffic volume was 1,380 vph.

From approximately noon on Wednesday onward, gusty winds interfered with the temporary traffic control in use. ALDOT's experience in restoring I-65 to normal flow was that it took 3 hours to remove all the equipment that had been placed, followed by one hour to "sweep" the route prior to re-opening. During the contraflow operation, traffic flowed at approximately 10-20 miles per hour below typical speeds.

Based on their experience, where the decision to implement contraflow operation was not based on engineering input, a change was warranted. ALDOT decided to switch their implementation scheme from a response-based plan (where the decision to implement contraflow operations was in response to a certain set of traffic flow conditions) to a schedule-based plan (where contraflow operations are scheduled to occur at a certain time, regardless of traffic conditions). Their experience also showed that it took approximately twice as long both to set up and to clear the contraflow operation as was anticipated.

ALDOT staff noted that they were unable to get the hour-by-hour web-based traffic count data on Monday, September 13 (only the daily summaries were available), but after contacting FDOT staff, the traffic count data available on the web was changed to provide hourly updates.

ITS deployments in Birmingham and Tuscaloosa, as well as portable changeable message signs (CMS) located at the state line on I-85 and I-20, were all programmed to say "I-65 closed at Montgomery." Two HAR implementations were also used to provide motorist information.

The meeting adjourned at about 11:30 a.m.

## **GEORGIA DOT MEETING ON ONE-WAY PLAN FOR HURRICANE EVACUATIONS**

**Thursday, April 14, 2005**

**GDOT TMC (via phone)**

**Atlanta, GA**

**2:00 P.M.**

### **Purpose:**

Telephone conference with Georgia Department of Transportation (GDOT) maintenance management personnel involved in Georgia's hurricane evacuation planning and operations efforts.

### **Attendees:**

David Crim, Georgia State Maintenance Engineer  
Eric Pence, Assistant State Maintenance Engineer  
John Hibbard, FDOT ITS [PBS&J]

John Hibbard began the meeting by explaining the origin and purpose of Florida's contraflow plan, how it is applied to the interstate system, and the efforts associated with updating the plan, including meeting with representatives from Alabama and Georgia to discuss coordination needed between the states. The document that PBS&J is updating is actually a "technical memorandum" entitled *Analysis of Florida's One-Way Operations for Hurricane Evacuation*.

Mr. Crim's stated that Florida's effort to six-lane I-75 was implemented quicker than Georgia's similar effort, and Florida has six lanes on I-75 from Wildwood northward.

Consequently, when traffic is leaving Florida in advance of a storm (whether formally evacuated or not) northbound traffic volumes increase as you move further north in Florida. But when those volumes reach Milepost 28 in Georgia (in the Valdosta area) where I-75 becomes four lanes northbound, there is likely congestion.

Last year, in association with hurricanes threatening Florida, there was a 22-mile northbound backup from Milepost 22. Mr. Crim stated that GDOT believes strongly that Georgia needs to be ready to contraflow I-75 to eliminate the backup experienced last year.

Mr. Crim went on further to describe the distance and purpose of the I-75 contraflow operation. The purpose is to provide additional capacity in the remaining four-lane section, which is a gap in the six-lane highway of approximately 80 miles from the Valdosta vicinity to the Dooly County line.

In 2004, GDOT was prepared to implement a contraflow on this section of I-75, but Florida's shifting of traffic to US 19 and other surface routes removed enough vehicles from I-75 to eliminate the need for the contraflow on the interstate. Crossovers were paved to facilitate this operation, and they remain in place today.

GDOT is nearing the completion of an I-75 widening project from Georgia Route 133 northward to the Lowndes County line. Upon its completion, the bottleneck point will become Milepost 40, and may well force the relocation of the contraflow crossover.

In Georgia, the Governor is the ultimate decision-maker for contraflow operation, and he had been briefed on the potential need for a contraflow operation on I-75.

I-95 contraflow operations exist for the same reasons as I-75, to provide additional capacity for the remaining four-lane sections of I-95, which is in the Brunswick/Glynn County vicinity. The existing I-95 crossovers are being upgraded from 30-mph to 45-mph design speeds. This upgrade also includes slight changes in locations.

Both I-75 and I-95 are to be widened to six lanes (at least) for their entire length in Georgia. Projects are programmed for the remaining four-lane portions of both interstates. For I-95, the remaining 35 miles that are currently four lanes will be under construction within two years. Upon completion of the six-laning efforts, Georgia anticipates that no contraflow plans will be needed. Due to the Governor's "Fast Forward Program", the I-75 and I-95 widening projects are being accelerated by one year.

Mr. Crim stated that GDOT would like to put up the barrier gates (as currently in place on I-16 between Dublin and Savannah) on ramps for all southern I-75 and I-95 interchanges – just for additional preparedness. Mr. Crim also said that the Georgia State Patrol (GSP) personnel, along with GDOT, was stretched very thin, accentuating the case for installation of the barrier gates. Due to the scarcity of resources, additional responsibility falls to local law enforcement.

Mr. Crim acknowledged that Georgia might be called upon to continue contraflow operations for greater than a single shift and potentially up to several days.

Mr. Crim also mentioned the upcoming meeting with FDOT District staff scheduled for late April 2005. He said that there have been meetings held between southern Georgia and northern Florida DOT Districts that have occurred periodically for more than 10 years. This meeting will be held in Jacksonville, and is hosted by FDOT District 2.

Mr. Crim also stated that he would like a copy of the FDOT report when it is complete.



**Appendix B**

***Analysis of Florida's One-Way Operations  
for Hurricane Evacuation:  
Compendium of Route by Route Technical  
Memoranda***





# **Analysis of Florida's One-Way Operations for Hurricane Evacuation**

## **Compendium of Route By Route Technical Memoranda**

Prepared By



1901 Commonwealth Lane  
Tallahassee, Florida 32303

Prepared For



Florida Department of Transportation  
605 Suwannee Street  
Tallahassee, Florida 32399-0450

March 2002

# **ANALYSIS OF FLORIDA'S ONE-WAY OPERATIONS FOR HURRICANE EVACUATION**

## **Compendium of Route-by-Route Technical Memoranda**

The largest evacuation in Florida's history occurred as the result of Hurricane Floyd in September 1999. Although all of Florida's evacuees were able to evacuate without harm, many spent long hours on congested highways with inadequate guidance on where to go to seek shelter. Long evacuation travel times raised questions as to the need and feasibility of reverse laning limited access facilities to reduce these times. To address these issues, Governor Jeb Bush appointed a Governor's Hurricane Evacuation Task Force, which was chaired by Walter Revell of H. J. Ross Associates, Inc.

The Task Force assigned a traffic management team the responsibility of conducting meetings around the state and identifying routes that might warrant one-way evacuation operations during a major hurricane threat. Seven routes were identified as follows:

- I-10 westbound - Jacksonville to Tallahassee
- I-10 eastbound - Pensacola to Tallahassee
- I-4 eastbound - Tampa to Orange County line
- I-75 northbound - Charlotte County to I-275
- Florida's Turnpike northbound - Ft. Pierce to Orlando
- State Road 528 westbound - SR 520 to SR 417
- I-75 Alligator Alley east and westbound - coast to coast

I-75 from I-275 to Wildwood was added as a result of the recently completed Tampa Bay Regional Hurricane Evacuation Study. I-10 eastbound from Pensacola to Tallahassee has been dropped due to need for bi-directional evacuation movements on I-10 in the Panhandle.

Throughout the process of analyzing each contraflow route in 2000-2001, FDOT and its consultant have learned that the review of contraflow plans must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends. Reports produced for each analyzed contraflow route have been developed at a planning level of analysis, which has helped to identify the benefits/disbenefits and general operational feasibility of each section. It has been suggested by some of the FDOT district staff that a more detailed engineering and design level of analysis be performed on each route as monies and schedule permit. In that regard, it is strongly recommended that a detailed review cycle be established where two contraflow routes per year are reviewed in detail by agency participants. The review would cover detailed operational features and a consideration of environmental/infrastructure changes that may have affected the feasibility of the operation or the timeframes for startup and shutdown.

The tragic events of September 11, 2001 have shifted resources and preparedness focus to preparing for possible terrorist strikes. Future analyses regarding the contraflow sections should address other emergency situations, which may necessitate contraflow implementation besides that of a hurricane threat.

This compendium is divided by the technical memoranda produced for each contraflow section. The technical memoranda are reproduced in exactly the same format as reviewed and approved by the FDOT, FHP and DCA. Since some contraflow routes were analyzed concurrently, there are five reports included in this compendium:

1. I – 10 Jacksonville (I-295) to Tallahassee/Monticello (US19)
2. State Road 528 (Beeline) from SR520 to SR 417
3. Florida Turnpike from SR70 to Milepost 253 North of Osceola Parkway
4. Interstate 75/Alligator Alley from Alico Road to US27
5. Interstate 75 from Charlotte County to Interstate 4, Interstate 4, and Interstate 75 from Interstate 275 to Wildwood



# **Analysis of Florida's One-Way Operations for Hurricane Evacuation**

## **I-10 Jacksonville (I-295) to Tallahassee/Monticello (US 19)**



Prepared By



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**June 2000**  
with Winter 2002 Introductory Update  
090853.21-0102

# **TECHNICAL MEMORANDUM**

## **Analysis of Florida's One-Way Operations For Hurricane Evacuation**

### **I-10 Jacksonville (I-295) to Tallahassee/Monticello (US 19)**

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June 2000 (Final)  
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# **ANALYSIS OF FLORIDA'S ONE-WAY OPERATIONS FOR HURRICANE EVACUATION**

## **I-10 Jacksonville (I-295) to Tallahassee/Monticello (US 19)**

### **INTRODUCTION**

The largest evacuation in Florida's history occurred as the result of Hurricane Floyd in September 1999. Although all of Florida's evacuees were able to evacuate without harm, many spent long hours on congested highways with inadequate guidance on where to go to seek shelter. Long evacuation travel times raised questions as to the need and feasibility of reverse laning limited access facilities to reduce these times. To address these issues, Governor Jeb Bush appointed a Governor's Hurricane Evacuation Task Force, which was chaired by Walter Revell of H. J. Ross Associates, Inc.

The Task Force assigned a traffic management team the responsibility of conducting meetings around the state and identifying routes that might warrant one-way evacuation operations during a major hurricane threat. Seven routes were identified as follows:

- I-10 westbound - Jacksonville to Tallahassee
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- State Road 528 westbound - SR 520 to SR 417
- I-75 Alligator Alley east and westbound - coast to coast

I-75 from I-275 to Wildwood was added as a result of the recently completed Tampa Bay Regional Hurricane Evacuation Study. I-10 eastbound from Pensacola to Tallahassee has been dropped due to need for bi-directional evacuation movements on I-10 in the Panhandle.

## Winter 2002 Status

*Throughout the process of analyzing each contraflow route in 2000-2001, FDOT and its consultant have learned that the review of contraflow plans must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends. Reports produced for each analyzed contraflow route have been developed at a planning level of analysis, which has helped to identify the benefits/disbenefits and general operational feasibility of each section. It has been suggested by some of the FDOT district staff that a more detailed engineering and design level of analysis be performed on each route as monies and schedule permit. In that regard, it is strongly recommended that a detailed review cycle be established where two contraflow routes per year are reviewed in detail by agency participants. The review would cover detailed operational features and a consideration of environmental/infrastructure changes that may have affected the feasibility of the operation or the timeframes for startup and shutdown.*

*The tragic events of September 11, 2001 have shifted resources and preparedness focus to preparing for possible terrorist strikes. Future analyses regarding the contraflow sections should address other emergency situations, which may necessitate contraflow implementation besides that of a hurricane threat.*

This initial analysis models and examines the Interstate 10 westbound segment from Jacksonville at I-295 to Tallahassee/Monticello at US 19. To accomplish this analysis, PBS&J has been retained by FDOT (through FDOT's Florida Intrastate Highway System contract with RS&H) to assist FDOT, DCA and FDLE in analyzing the route operation. Four "slices" of analysis are provided and described below.

**ENTER/EXIT ANALYSIS**

Using the State of Florida's Reverse Lane Implementation Plan for Interstate 10 (Jacksonville to Tallahassee-March 2000 draft and June 2000 final), PBS&J examined how traffic will enter and exit the planned one-way operation. To understand what percent of evacuation traffic is entering the operations from I-10 westbound (just east of I-295), I-295 southbound (just north of I-10) and I-295 northbound (just south of I-10), PBS&J reviewed detailed evacuation traffic modeling that the firm had just completed for the Northeast Florida Regional Planning Council's Regional Hurricane Evacuation Study. The NEFRPC Study, coupled with recent post Floyd behavioral and traffic studies, also helped PBS&J ascertain traffic departure and ingress volumes at US 301 and I-75, which are important to consider.

In the absolute worst case Category 4-5 hurricane scenario, approximately 50,000 vehicles will attempt to use I-10 westbound through the beginning section of the operation. Origins of that traffic will be as follows:

**Worst Case Category 4-5 Hurricane Entering Vehicles**

<b>Feeder Route</b>	<b>Total Evacuation Traffic Volume entering I-10 One Way Operation</b>	<b>Percent of Total</b>
I-10 westbound east of I-295	30,000 vehicles	60%
I-295 northbound south of I-10	15,000 vehicles	30%
I-295 southbound north of I-10	5,000 vehicles	10%

Almost all of the 30,000 vehicles from I-10 westbound will be Duval County evacuees. About three quarters of the I-295 northbound feeder traffic will come from other northeast Florida coastal counties with the remaining quarter from Duval County. The I-295 southbound traffic is mostly Nassau and Duval County traffic with a small percentage of Camden County, Georgia traffic.

At US 301, approximately 10 percent of the westbound I-10 traffic will exit to go to destinations such as Gainesville. However, vehicles will be added back to the traffic stream as Baker County evacuees enter the operation. At I-75 (and at US 129 for vehicles in the contraflow lanes), roughly 20 to 30 percent of the evacuees will want to go northbound as they seek refuge along the Georgia I-75 corridor up to Atlanta. If southeast Florida and the Treasure Coast regions of Florida are evacuating in addition to east central and northeast Florida, I-10 will pick up as much westbound traffic (from vehicles coming northbound on I-75 up to I-10) as it is losing (from westbound vehicles on I-10 turning northbound on I-75).

Current plans call for the normal I-10 westbound traffic east of I-295 to crossover to the (reversed) eastbound I-10 lanes. The I-295 northbound and southbound traffic will enter the I-10 westbound lanes as they normally would. This should work reasonably well and will solve the horrendous traffic conflicts that occurred at this interchange during the Floyd evacuation. This entering scheme and configuration of four westbound travel lanes will yield an evacuation travel flow of up to 5,000 vehicles per hour.

The operation is now planned to end at US 19 with the two contraflow lanes taken down to one lane exiting on the normal eastbound on-ramp. Geometric and topographic features will not allow for two off-lanes. For this operation to work without creating a significant bottleneck, several operational elements must be in place:

- Traffic control personnel will need to be stationed at the US 19/US 27 intersections and at the roundabout in Monticello at the courthouse to direct evacuees and keep them moving
- Public information that is clear and understandable, which directs I-10 contraflow traffic that

desires to go northbound on I-75 to exit at US 129. (Current plans do not allow contraflow traffic to exit at I-75.) Traffic must be bled off at US 129 or it will put tremendous pressure on the ending operation at US 19.

- Public information well before and at US 19 which clearly shows contraflow traffic where they can go if they head south on US 19 to US 27 or where they can go if they go north on US 19 to US 90, Monticello, Thomasville, etc. Evacuees must keep moving at the exit ramp/US 19 location or the bottleneck will be aggravated.

For future seasons, FDOT, FHP, FDLE, FLNG, and DCA might consider a few other alternatives for ending the operation, particularly when just east central and northeast Florida are evacuating:

- Completely end the operation at I-75 by sending two westbound lanes northbound.
- Partially end the operation at I-75 by continuing a third westbound evacuation lane on the westbound shoulder.
- Completely end the operation at I-75 by sending one westbound lane northbound on I-75 and the other westbound lane southbound on I-75.

## **REGIONAL BOTTLENECK IMPACTS**

The strongest positive impact that this one-way operation presents is that it solves the worst bottleneck in the region for any major storm threat where the public responds in large numbers. Local emergency management officials and traffic control/law enforcement personnel will still have to deal with severe congestion moving westbound on Atlantic Blvd., Beach Blvd, and J. Turner Butler Blvd., and congestion due to I-95 northbound through movements. However, proactive evacuation traffic management will be greatly enhanced by this operation and appreciated by the public.

## VEHICULAR THROUGHPUT ANALYSIS

PBS&J modeled the route to determine the number of additional vehicles and people that can get through the one-way segment. This was accomplished by calculating clearance times required to process the worst-case evacuation travel demand on I-10 westbound for a Category 3 and Category 4-5 hurricane scenario with and without the one-way operation. In addition, worst individual household commute times through the route were estimated with and without the one-way operation. For scenarios where the one-way operation is in place, it was assumed that the reverse laning would be operational for no more than 12 hours. Scenarios were also differentiated for light and heavy background traffic conditions. In an urban area such as Jacksonville, the level of non-evacuating traffic also present on the road at the start of an evacuation can be quite variable depending on time of day and depending on whether people have to commute from work to home to begin their evacuation.

As can be seen in the attached tables (regarding clearance times and worst household commute times), the one-way operation on I-10 westbound could save up to seven hours of overall evacuation clearance time and up to six hours of individual household commute time. This is significant on two accounts. First, it allows the northeast Florida area the "luxury" of waiting until a hurricane warning is issued before ordering mass evacuation. Secondly, individual evacuees should see noticeable reductions in commute times. **However, if evacuees load the roadways as quickly as they did for Floyd (rapid response) the system will still be overwhelmed and some households will experience lengthy trips.** The figures presented in each table are based on modeling that seems to accurately reflect conditions that existed during the Floyd evacuation - this "validation" of the modeling should give us confidence in the other numbers presented. Translating the increased vehicular movement (an additional 2,000 vehicles per hour) to people, an additional 5,000 people per hour are able to evacuate the northeast Florida area due to the one-way operation. Looking over the length of an entire evacuation for a worst case Category 4-5 hurricane, this means some 35,000 people will be able to make their evacuation movement that otherwise might not have been able to.

**EVACUATION CLEARANCE TIMES (IN HOURS)**  
**I-10 Jacksonville (I-295) to Tallahassee/Monticello (US 19)**  
**Analysis of Florida's One Way Operations For Hurricane Evacuation**

	<u>Normal Lane Usage</u>		<u>W/One Way Operation</u>	
	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>
<u>Category 3 Hurricane</u>				
Rapid Response/Loading	18.6 hours	19.7 hours	12.3 hours	13.1 hours
Medium Response/Loading	18.5 hours	20.4 hours	13.1 hours	14.6 hours
Long Response/Loading	18.8 hours	21.4 hours	13.3 hours	15.2 hours

	<u>Normal Lane Usage</u>		<u>W/One Way Operation</u>	
	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>
<u>Category 4-5 Hurricane</u>				
Rapid Response/Loading	21.4 hours	22.5 hours	13.9 hours	14.8 hours
Medium Response/Loading	21.3 hours	23.1 hours	14.8 hours	16.4 hours
Long Response/Loading	21.6 hours	24.1 hours	15.1 hours	17.0 hours

**Please Note:** Times were developed using evacuation travel demand data developed in the recent 1998 Hurricane Evacuation Study published by the NEFRPC. Since one-way operations are not anticipated for a Category 1-2 hurricane response, times are shown only for the Category 3-5 hurricane response scenarios. Rapid response/loading means evacuees try to enter the evacuation road network over a 5 to 6 hour period of time (as occurred with Floyd). Medium response/loading means evacuees try to enter over an 8 to 9 hour

period and Long response/loading means evacuees try to enter over an 11 to 12 hour period.

**WORST HOUSEHOLD COMMUTE TIMES (IN HOURS)  
I-10 Jacksonville (I-295) to Tallahassee/Monticello (US 19)  
Analysis of Florida's One Way Operations For Hurricane Evacuation**

	<u>Normal Lane Usage</u>		<u>W/One Way Operation</u>	
	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>
<u>Category 3 Hurricane</u>				
Rapid Response/Loading	11.1 Hours	12.2 Hours	7.4 Hours	8.5 Hours
Medium Response/Loading	8.2 Hours	10.1 Hours	3.0 Hours	4.3 Hours
Long Response/Loading	5.8 Hours	8.3 Hours	3.0 Hours	3.0 Hours

	<u>Normal Lane Usage</u>		<u>W/One Way Operation</u>	
	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>
<u>Category 4-5 Hurricane</u>				
Rapid Response/Loading	13.8 Hours	14.9 Hours	10.0 Hours	11 Hours
Medium Response/Loading	10.9 Hours	12.8 Hours	4.5 Hours	6.0 Hours
Long Response/Loading	8.4 Hours	10.9 Hours	3.0 Hours	3.8 Hours

**Please Note:** Times were developed using evacuation travel demand data developed in the recent 1998 Hurricane Evacuation Study published by the NEFRPC. Since one-way operations are not anticipated for a Category 1-2 hurricane response, times are shown only for the Category 3-5 hurricane response scenarios. Rapid response/loading means evacuees try to enter the evacuation road network over a 5 to 6 hour period of time (as occurred with Floyd). Medium response/loading means evacuees try to enter over an 8 to 9 hour period and Long response/loading means evacuees try to enter over an 11 to 12 hour

period.

## **EVACUEE NOTIFICATION/EVACUATION SHUT-DOWN TIME FRAMES**

As Jacksonville and the northeast Florida area are an origin for significant numbers of evacuees and a potential destination for significant numbers of South Georgia and downstate Florida evacuees, it will be important to implement evacuation shut down procedures so that evacuees aren't stranded on I-95 and I-10 as a storm arrives. This could be a particularly dangerous situation if sustained tropical storm winds or hurricane winds begin to affect the roadway and evacuees are still on the facility. Late in an evacuation, it will be important to make a coordinated decision about when to tell evacuees to stop entering I-95 and I-10.

Since the region and state's population will respond differently for various storm events, the time at which evacuees should be advised to stop entering I-95, I-10 and I-295 should be based on actual traffic conditions and not modeled predictions such as clearance times calculated in the regional and statewide studies (which indicate when an evacuation should begin). There are FDOT permanent traffic count stations located along the facilities which should be used for travel speed monitoring (sites 0157, 0132, and 0833). Traffic conditions can be further monitored through Civil Air Patrol support and/or highway patrolmen stationed on the ground at strategic locations. Hourly snapshots of traffic volumes and average travel speeds at these locations, coupled with storm information regarding radius of tropical storm winds and forward speed, will be critical to making prudent shutdown decisions. As average travel speeds are monitored hour to hour and the information fed back to the state and county EOC's, data must be interpreted and the public notified of evacuation shut down.

The best indicator of evacuation traffic congestion and progression is average travel speed. Identifying the most congested sites in the appropriate direction, PBS&J would propose that the state and counties notify the public to stop entering I-95, I-295 and I-10 in the hourly times frames shown. This should greatly help prevent people from being stuck on the roadway system as hazardous conditions arrive.

**EVACUEE NOTIFICATION TIME FRAMES**

**From The Northeast Florida Hurricane Evacuation Study - 1998**

(Expressed in Hours Before Expected Sustained Tropical Storm Winds to Discourage New Evacuees From Entering Regional Interstate Facilities)

Average Travel Speed of Evacuation Traffic at congestion Monitoring Sites	I-10 Westbound (site 0833)	I-95 Northbound (site 0132) in Nassau County
5 mph	10 Hours	14 Hours
15 mph	3½ Hours	4½ Hours
25 mph	2 Hours	3 Hours
35 mph	1½ Hours	2 Hours
45 mph	1 Hour	1½ Hours
55 mph	1 Hour	1¼ Hours
65 mph	1 Hour	1 Hour

**Please Note:** These notification time frames should not be confused with the time required to shut down the one-way operation. Trial exercises during May 2000 showed that it would take a minimum of three hours for the FHP and FDOT to shut down the operation.

# **Analysis of Florida's One-Way Operations for Hurricane Evacuation**

**State Road 528 (Beeline)  
from SR 520 to SR 417**

Prepared By



1901 Commonwealth Lane  
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Prepared For



Florida Department of Transportation  
605 Suwannee Street  
Tallahassee, Florida 32399-0450

**January 2001**  
with Winter 2002 Introductory Update  
090853.21-0102

# **TECHNICAL MEMORANDUM**

## **Analysis of Florida's One-Way Operations For Hurricane Evacuation**

**State Road 528 (Beeline) from SR 520 to SR 417**

Prepared by

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January 2001  
W/Winter 2002 Introductory Update

090853.21-0102

# **ANALYSIS OF FLORIDA'S ONE-WAY OPERATIONS FOR HURRICANE EVACUATION**

## **State Road 528 (Beeline) from SR 520 to SR 417**

### **INTRODUCTION**

The largest evacuation in Florida's history occurred as the result of Hurricane Floyd in September 1999. Although all of Florida's evacuees were able to evacuate without harm, many spent long hours on congested highways with inadequate guidance on where to go to seek shelter. Long evacuation travel times raised questions as to the need and feasibility of reverse laning limited access facilities to reduce these times. To address these issues, Governor Jeb Bush appointed a Governor's Hurricane Evacuation Task Force, which was chaired by Walter Revell of H. J. Ross Associates, Inc.

The Task Force assigned a traffic management team the responsibility of conducting meetings around the state and identifying routes that might warrant one-way evacuation operations during a major hurricane threat. Seven routes were identified as follows:

- I-10 westbound - Jacksonville to Tallahassee
- I-10 eastbound - Pensacola to Tallahassee
- I-4 eastbound - Tampa to Orange County line
- I-75 northbound - Charlotte County to I-275
- Florida's Turnpike northbound - Ft. Pierce to Orlando
- State Road 528 westbound - SR 520 to SR 417
- I-75 Alligator Alley east and westbound - coast to coast

I-75 from I-275 to Wildwood was added as a result of the recently completed Tampa Bay Regional Hurricane Evacuation Study. I-10 eastbound from Pensacola to Tallahassee has been dropped due to need for bi-directional evacuation movements on I-10 in the Panhandle.

## **Winter 2002 Status**

*Throughout the process of analyzing each contraflow route in 2000-2001, FDOT and its consultant have learned that the review of contraflow plans must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends. Reports produced for each analyzed contraflow route have been developed at a planning level of analysis, which has helped to identify the benefits/disbenefits and general operational feasibility of each section. It has been suggested by some of the FDOT district staff that a more detailed engineering and design level of analysis be performed on each route as monies and schedule permit. In that regard, it is strongly recommended that a detailed review cycle be established where two contraflow routes per year are reviewed in detail by agency participants. The review would cover detailed operational features and a consideration of environmental/infrastructure changes that may have affected the feasibility of the operation or the timeframes for startup and shutdown.*

*The tragic events of September 11, 2001 have shifted resources and preparedness focus to preparing for possible terrorist strikes. Future analyses regarding the contraflow sections should address other emergency situations, which may necessitate contraflow implementation besides that of a hurricane threat.*

This initial analysis models and examines the SR 528 (Beeline) segment from SR 520 to SR 417. To accomplish this analysis, PBS&J has been retained by FDOT (through FDOT's Florida Intrastate Highway System contract with RS&H) to assist FDOT, DCA and FDLE in analyzing the route operation. Four "slices" of analysis are provided and described below.

### **ENTER/EXIT ANALYSIS**

Using the State of Florida's Contra Flow Implementation Plan for SR 528 (Summer 2000 draft), PBS&J examined how traffic will enter and exit the planned one-way operation. To understand what percent of evacuation traffic is entering the operations from SR 520 northbound (west of I-95), SR 528 westbound (from I-95 to SR 407) and SR 407 southbound (from I-95 to SR 528), PBS&J reviewed detailed evacuation traffic modeling that the firm had just completed for the East Central Florida Regional Planning Council's Regional Hurricane Evacuation Study. The ECFRPC Study, coupled with recent post Floyd behavioral and traffic studies, also helped PBS&J ascertain traffic departure volumes at the terminus of the operation.

In the absolute worst case Category 4-5 hurricane scenario, approximately 47,000 vehicles will attempt to use SR 528 westbound through the beginning section of the operation. Origins of that traffic will be as follows:

#### **Worst Case Category 4-5 Hurricane Entering Vehicles**

<b>Feeder Route</b>	<b>Total Evacuation Traffic Volume entering SR 528 Contra Flow Operation</b>	<b>Percent of Total</b>
SR 520 northbound west of I-95	3,800 vehicles	9%
SR 528 westbound from I-95 to SR 407 interchange	37,000 vehicles	78%
SR 407 southbound from I-95 to SR 528 (Beeline)	6,300 vehicles	13%
SR 520 southbound at SR 528 (Beeline)	Negligible	0%

Most of the vehicles using the SR 528 contraflow operation will be Brevard County evacuees. With no major highways connecting with the operation throughout the planned segment of SR 528, it is not anticipated that significant numbers of vehicles will be added or lost.

Current plans call for the two normal westbound lanes on SR 528 to be split just to the west of SR 520 with the left hand lane crossed over to one of the normal eastbound lanes where it will join the SR 520 traffic that is entering the contraflow operation.

Florida Highway Patrol is currently addressing strategies to strongly encourage evacuees traveling westbound on SR 520 (from Merritt Island, Cocoa, and Rockledge) who intend to go westbound, to stay on SR 520 until they enter the Beeline. The modeling accomplished for the ECFRPC recognized that many of these evacuees would try to go north on I-95 then west on SR 528. The aggressive use of variable message signs (VMS) coupled with the implementation of east/west arterial and I-95 traffic management in Brevard County will be critical to successful evacuations. This strategy would put an additional 7,000 to 8,000 evacuating vehicles on SR 520 and would create better balance on the beginning of the operation. It would also help with the severe bottleneck expected on I-95 northbound just below SR 528.

The operation is now planned to end at SR 417 with the two normal westbound SR 528 lanes taken to the northbound SR 417 ramp and the contraflow SR 528 lanes taken to the normal SR 528 westbound lanes. This should work although clear public information needs to be available so that evacuees directed to SR 417 are not confused or lost.

## **REGIONAL BOTTLENECK IMPACTS**

The SR 528 (Beeline) contraflow operation does not solve the worst bottlenecks in the region which control overall clearance time, but does help with a couple of the major secondary bottlenecks listed in the ECFRPC reports. Several east-west arterials, as well as I-95 northbound in Brevard County, are slightly higher on the list of critical bottlenecks. The SR 520 and SR 50 intersection/bottleneck

could be greatly relieved by this operation. Officials will need to look at how to handle the I-95 bottleneck between SR520 and SR 528 to get maximum benefit out of the contraflow operation on the Beeline.

## **VEHICULAR THROUGHPUT ANALYSIS**

PBS&J modeled the route to determine the number of additional vehicles and people that can get through the one-way segment. This was accomplished by calculating clearance times required to process the worst case evacuation travel demand on SR 528 westbound for Category 4-5 hurricane scenario with and without the one-way operation. In addition, worst individual household commute times through the route were estimated with and without the one-way operation. For scenarios where the one-way operation is in place, it was assumed that the reverse laning would be operational for no more than 12 hours. Scenarios were also differentiated for light and heavy background traffic conditions. In an urban area such as Brevard County, the level of non evacuating traffic also present on the road at the start of an evacuation can be quite variable depending on time of day and depending on whether people have to commute from work to home to begin their evacuation.

As can be seen in the attached tables (regarding clearance times and worst household commute times), the one-way operation on SR 528 westbound could save up to six hours of corridor evacuation clearance time and up to six hours of corridor individual household commute time. Translating the increased vehicular movement (an additional 2,000 vehicles per hour) to people, an additional 5,000 people per hour are able to evacuate through the Beeline due to the one-way operation. Looking over the length of an entire evacuation for a worst case Category 4-5 hurricane, this means some people will be able to make their evacuation movement that otherwise might not have been able to.

It should be noted that if this reserve lane concept is used for other types of events (e.g. space shuttle launches), traffic volumes and time frames could be quite different than what has been reported within this report for hurricane situations.

**CORRIDOR EVACUATION CLEARANCE TIMES (IN HOURS)**

**State Road 528 (Beeline) from SR 520 to SR 417**

**Analysis of Florida's One Way Operations For Hurricane Evacuation**

	<u>Normal Lane Usage</u>		<u>W/One Way Operation</u>	
	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>
<u>Category 3-5 Hurricane</u>				
Rapid Response/Loading	17.2 hours	18.1 hours	10.4 hours	11.1 hours
Medium Response/Loading	17.1 hours	18.6 hours	11.2 hours	12.5 hours
Long Response/Loading	17.3 hours	19.4 hours	11.4 hours	13.0 hours

**Please Note:** Times were developed using evacuation travel demand data developed in the recent 1999 Hurricane Evacuation Study published by the ECFRPC. Since one-way operations are not anticipated for a Category 1-2 hurricane response, times are shown only for the Category 3-5 hurricane response scenarios. Rapid response/loading means evacuees try to enter the evacuation road network over a 5 to 6 hour period of time (as occurred with Floyd). Medium response/loading means evacuees try to enter over an 8 to 9 hour period and Long response/loading means evacuees try to enter over an 11 to 12 hour period.

**CORRIDOR WORST HOUSEHOLD COMMUTE TIMES (IN HOURS)**

**State Road 528 (Beeline) from SR 520 to SR 417**

**Analysis of Florida's One Way Operations For Hurricane Evacuation**

	<u>Normal Lane Usage</u>		<u>W/One Way Operation</u>	
	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>	<u>Light Background Traffic</u>	<u>Heavy Background Traffic</u>
<u>Category 3-5 Hurricane</u>				
Rapid Response/Loading	12.4 Hours	13.4 Hours	9.0 Hours	9.8 Hours
Medium Response/Loading	9.7 Hours	11.2 Hours	3.8 Hours	5.0 Hours
Long Response/Loading	7.1 Hours	9.2 Hours	1.2 Hours	2.8 Hours

**Please Note:** Times were developed using evacuation travel demand data developed in the recent 1999 Hurricane Evacuation Study published by the ECFRPC, since one way operations are not anticipated for a Category 1-2 hurricane response, times are shown only for the Category 3-5 hurricane response scenarios. Rapid response/loading means evacuees try to enter the evacuation road network over a 5 to 6 hour period of time (as occurred with Floyd). Medium response/loading means evacuees try to enter over an 8 to 9 hour period and Long response/loading means evacuees try to enter over an 11 to 12 hour period.

## **EVACUEE NOTIFICATION/EVACUATION SHUT-DOWN TIME FRAMES**

As Orlando and the east central Florida area are an origin for significant numbers of evacuees and a potential destination for significant numbers of downstate Florida evacuees, it will be important to implement evacuation shut down procedures so that evacuees are not stranded on I-95 and I-4 as a storm arrives. This could be a particularly dangerous situation if sustained tropical storm winds or hurricane winds begin to affect the roadway and evacuees are still on the facility. Late in an evacuation, it will be important to make a coordinated decision about when to tell evacuees to stop entering I-95, I-4 and the Beeline.

Since the region and state's population will respond differently for various storm events, the time at which evacuees should be advised to stop entering I-95, I-4 and the Beeline should be based on actual traffic conditions and not modeled predictions such as clearance times calculated in the regional and statewide studies (which indicate when an evacuation should begin). There are FDOT permanent traffic count stations located along the facilities, which should be used for travel speed monitoring (sites 9906 and 0292). Traffic conditions can be further monitored through Civil Air Patrol support and/or highway patrolmen stationed on the ground at strategic locations. Traffic can also be monitored using CCTV cameras within the Volusia County and Metro-Orlando area. Hourly snapshots of traffic volumes and average travel speeds at these locations, coupled with storm information regarding the radius of tropical storm winds and forward speed, will be critical to making prudent shutdown decisions. As average travel speeds are monitored hour to hour and the information fed back to the state and county Emergency Management Operation Centers (EOCs), data must be interpreted and the public notified of evacuation shut down.

The best indicator of evacuation traffic congestion and progression is average travel speed. Identifying the most congested sites in the appropriate direction, PBS&J would propose that the state and counties notify the public to stop entering I-95, I-4 and the Beeline in the hourly time frames shown. This should greatly

help prevent people from being stuck on the roadway system as hazardous conditions arrive.

**EVACUATION CLOSURE/EVACUEE NOTIFICATION TIME FRAMES**

**From the East Central Florida Hurricane Evacuation Study - 1999**

(Expressed in Hours Before Expected Sustained Tropical Storm Winds to Discourage New Evacuees From Entering Regional Interstate Facilities)

Average Travel Speed of Evacuation Traffic at Congestion Monitoring Sites	I-4 Westbound (site 9906) near Deltona	I-95 Northbound (site 0292) in Flagler County
5 mph	6 Hours	12 Hours
15 mph	2 Hours	4 Hours
25 mph	13 Hours	22 Hours
35 mph	1 Hour	2 Hours
45 mph	1 Hour	12 Hours
55 mph	1 Hour	1 Hour
65 mph	1 Hour	1 Hour

**Please Note:** These notification time frames should not be confused with the time required to shut down the one-way operation. Trial exercises during November 2000 will show how long it will take the FHP and FDOT to shut down the operation.

**Please Note:** Times were developed using evacuation travel demand data developed in the recent 1999 Hurricane Evacuation Study published by the ECFRPC Since one way operations are not anticipated for a Category 1-2 hurricane response, times are shown only for the Category 3-5 hurricane response

scenarios. Rapid response/loading means evacuees try to enter the evacuation road network over a 5 to 6 hour period of time (as occurred with Floyd). Medium response/loading means evacuees try to enter over an 8 to 9 hour period and Long response/loading means evacuees try to enter over an 11 to 12 hour period.

# **Analysis of Florida's One-Way Operations for Hurricane Evacuation**

**Florida Turnpike from SR 70  
to Milepost 253 North of  
Osceola Parkway**

Prepared By



1901 Commonwealth Lane  
Tallahassee, Florida 32303

Prepared For



Florida Department of Transportation  
605 Suwannee Street  
Tallahassee, Florida 32399-0450

**February 2001**  
with Winter 2002 Introductory Update  
090853.21-0102

# **TECHNICAL MEMORANDUM**

## **Analysis of Florida's One-Way Operations For Hurricane Evacuation**

**Florida Turnpike from SR70 to Milepost 253 north of Osceola Parkway**

Prepared by

**PBS&J  
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February 2001  
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# **ANALYSIS OF FLORIDA'S ONE-WAY OPERATIONS FOR HURRICANE EVACUATION**

## **Florida Turnpike from SR70 to Milepost 253 north of Osceola Parkway**

### **INTRODUCTION**

The largest evacuation in Florida's history occurred as the result of Hurricane Floyd in September 1999. Although all of Florida's evacuees were able to evacuate without harm, many spent long hours on congested highways with inadequate guidance on where to go to seek shelter. Long evacuation travel times raised questions as to the need and feasibility of reverse laning limited access facilities to reduce these times. To address these issues, Governor Jeb Bush appointed a Governor's Hurricane Evacuation Task Force, which was chaired by Walter Revell of H. J. Ross Associates, Inc.

The Task Force assigned a traffic management team the responsibility of conducting meetings around the state and identifying routes that might warrant one-way evacuation operations during a major hurricane threat. Seven routes were identified as follows:

- I-10 westbound – Jacksonville to Tallahassee
- I-10 eastbound – Pensacola to Tallahassee
- I-4 eastbound – Tampa to Orange County line
- I-75 northbound – Charlotte County to I-275
- Florida's Turnpike northbound – Ft. Pierce to Orlando
- State Road 528 westbound – SR 520 to SR 417
- I-75 Alligator Alley east and westbound – coast to coast

I-75 from I-275 to Wildwood was added as a result of the recently completed Tampa Bay Regional Hurricane Evacuation Study. I-10 eastbound from Pensacola to Tallahassee has been dropped due to need for bi-directional evacuation movements on I-10 in the Panhandle.

### **Winter 2002 Status**

*Throughout the process of analyzing each contraflow route in 2000-2001, FDOT and its consultant have learned that the review of contraflow plans must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends. Reports produced for each analyzed contraflow route have been developed at a planning level of analysis, which has helped to identify the benefits/disbenefits and general operational feasibility of each section. It has been suggested by some of the FDOT district staff that a more detailed engineering and design level of analysis be performed on each route as monies and schedule permit. In that regard, it is strongly recommended that a detailed review cycle be established where two contraflow routes per year are reviewed in detail by agency participants. The review would cover detailed operational features and a consideration of environmental/infrastructure changes that may have affected the feasibility of the operation or the timeframes for startup and shutdown.*

*The tragic events of September 11, 2001 have shifted resources and preparedness focus to preparing for possible terrorist strikes. Future analyses regarding the contraflow sections should address other emergency situations, which may necessitate contraflow implementation besides that of a hurricane threat.*

This initial analysis models and examines the Florida Turnpike segment from SR70 near Ft. Pierce to milepost 253 north of Osceola Parkway. To accomplish this analysis, PBS&J has been retained by FDOT (through FDOT's Florida Intrastate Highway System contract with RS&H) to assist FDOT, DCA and FDLE in analyzing the route operation. Four "slices" of analysis are provided and described below.

### **ENTER/EXIT ANALYSIS**

Using the State of Florida's Contraflow Implementation Plan for the Florida Turnpike (Summer 2000 draft), PBS&J examined how traffic will enter and exit the planned one-way operation. To understand what percent of evacuation traffic is entering the operations from each county south of and along the corridor, PBS&J reviewed detailed evacuation traffic modeling that the firm has compiled during the Florida Statewide Recon Study and Phase 3 Transportation Analysis. In addition, a Palm Beach County Supplemental Analysis coupled with recent post Floyd behavioral and traffic studies also helped PBS&J ascertain traffic departure volumes at the terminus of the operation.

In the absolute worst case Category 4-5 hurricane scenario, approximately 171,000 vehicles will attempt to use the Florida Turnpike northbound through the beginning section of the operation. Origins of that traffic will be as follows:

**Worst Case Category 4-5 Hurricane Entering Vehicles**

Feeder Route/County	Total Evacuation Traffic Volume Attempting to Enter Turnpike One Way Operation	Percent of Total
<b>South Florida</b>		
Monroe	10,000 vehicles	6%
Dade	72,000 vehicles	42%
Broward	28,000 vehicles	16%
<b>Treasure Coast</b>		
Palm Beach	22,000 vehicles	13%
Martin	11,000 vehicles	7%
SR70/St. Lucie	7,000 vehicles	4%
SR60/Indian River	6,000 vehicles	3%
<b>I-95 attracted traffic at SR70</b>		
	15,000 vehicles	9%
<b>Totals</b>	171,000 vehicles	100%

If just south Florida is evacuating and not Treasure Coast, the number of entering vehicles drops to 110,000 evacuating vehicles. However, a major category 4 or 5 hurricane will almost always cause more than one region of the state to respond.

The start up of the contraflow section at SR70 appears to be workable with Turnpike traffic coming northbound south of SR70 split with one lane taken to the contraflow side and the other kept on the normal northbound side of the Turnpike. St. Lucie County evacuees and any I-95 traffic attracted to the contraflow operation will need to be integrated into the operation.

Compared to the volumes already on the Turnpike, the vehicles are more modest in number and should be able to be accommodated with the current design.

The current ending of the contraflow operation is less than optimal with four lanes of traffic taken down to two lanes at milepost 253. The Turnpike district recognizes the potential bottleneck and is working on an addendum to the plan to extend the contraflow to the Leesburg south/US27 (MP285) interchange as the termination point of the contraflow. The extension of the contraflow would only be implemented if there were a need to alleviate traffic tie-ups at the northern crossover. The Turnpike district is discussing their efforts with the local counties so that contraflow plans are in harmony with local sheltering plans. The tremendous evacuee demand for private and public sheltering will not be easy to service even under the best of circumstances. Hotel/motel availability information will be critical to the public as they make directional travel decisions at the ending point. As hotels fill up late in the evacuation, evacuees exiting the Turnpike will need public shelter information.

## **REGIONAL BOTTLENECK IMPACTS**

Approximately 65 percent of the vehicles using the contraflow operation will come from Monroe, Dade and Broward Counties. These vehicles will encounter a serious bottleneck near Glades Road in Palm Beach County where the Turnpike transitions from three northbound lanes to two northbound lanes. This transition spot is the worst bottleneck for south Florida evacuations and the current planned operation does nothing to solve this bottleneck. When Palm Beach and Martin County traffic are added to the two northbound lane section of the Turnpike, approximately 85 percent of the total potential entering volume must traverse this area before it ever arrives at the contraflow section.

The Turnpike district of FDOT recognizes this dilemma and is working feverishly to widen the Turnpike in Palm Beach County. Presently, the Turnpike is being widened between Glades Road and Atlantic Avenue at Lantana. A PD&E study has been initiated for the next section which would widen the Turnpike from Atlantic Avenue to Lake Worth. Concept reports are being accomplished to continue the widening to the Martin County line. A final Turnpike

improvement, which is under a design build contract, is the Immanuel Bridge in Martin County. Widening improvements will make it much safer for evacuation either with or without a contra-flow operation.

Ideally, as the Turnpike widening moves north, the beginning of the contraflow section needs to move south so that the South Florida evacuation traffic can be moved northward through a minimum of three northbound lanes.

## **VEHICULAR THROUGHPUT ANALYSIS**

PBS&J modeled the route to determine the number of additional vehicles and people that can get through the one-way segment assuming there is enough time for the vehicles to arrive at the operation. This was accomplished by calculating clearance times required to process the worst-case evacuation travel demand on the Turnpike for a Category 4-5 hurricane scenario with and without the one-way operation. In addition, worst individual household commute times through the route were estimated with and without the one-way operation. For scenarios where the one-way operation is in place, it was assumed that the reverse laning would be operational for no more than 12 to 24 hours. Scenarios were also differentiated for South Florida only and South Florida and Treasure coast concurrent evacuations.

As can be seen in the attached tables (regarding clearance times and worst household commute times), the one way operation on the Turnpike could save 15 to 20 hours of corridor evacuation clearance time and 20 to 25 hours of corridor individual household commute time. Translating the increased vehicular movement (an additional 2,000 vehicles per hour) to people, an additional 5,000 people per hour are able to evacuate through the Turnpike due to the one-way operation. Looking over the length of an entire evacuation for a worst case Category 4-5 hurricane, this means some people will be able to make their evacuation movement that otherwise might not have been able to. Since the operation does not solve the Turnpike bottleneck in Palm Beach County, the greatest benefit will be for St. Lucie and Indian River evacuees who may not have been able to even enter the Turnpike without the contraflow operation.

**TURNPIKE CORRIDOR EVACUATION CLEARANCE TIMES (IN HOURS)**

**Florida Turnpike from SR70 to MP253 north of Osceola Pkwy  
Analysis of Florida’s One Way Operations for Hurricane Evacuation**

Category 4-5 Hurricane	Normal Lane Usage		W/ One Way Operations	
	S. Florida	S. Florida and	S. Florida	S. Florida and
	Evac Only	Treasure Coast	Evac Only	Treasure Coast
Rapid Response/Loading	43 ½ hours	66 ¼ hours	26 ½ hours	40 hours
Medium Response/Loading	43 ½ hours	66 hours	28 ½ hours	42 ½ hours
Long Response/Loading	44 ½ hours	67 hours	29 hours	43 ½ hours

Please note: Times were developed using evacuation travel demand data compiled in the Recon Study and Phase 3 Transportation Analysis – Florida Statewide study report which was based upon hurricane evacuation study data available for southeast and Treasure Coast regions of Florida.

**CORRIDOR WORST HOUSEHOLD COMMUTE TIMES (IN HOURS)**

**Florida Turnpike from SR70 to MP253 north of Osceola Pkwy  
Analysis of Florida’s One Way Operations for Hurricane Evacuation**

Category 4-5 Hurricane	Normal Lane Usage		W/ One Way Operations	
	S. Florida	S. Florida and	S. Florida	S. Florida and
	Evac Only	Treasure Coast	Evac Only	Treasure Coast
Rapid Response/Loading	37 hours	59 hours	19 hours	35 hours
Medium Response/Loading	34 hours	56 hours	17 hours	33 hours
Long Response/Loading	32 hours	54 hours	16 hours	31 hours

Please note: Times were developed using evacuation travel demand data compiled in the Recon Study and Phase 3 Transportation Analysis – Florida Statewide study report which was based upon hurricane evacuation study data available for southeast and Treasure Coast regions of Florida.

## **EVACUEE NOTIFICATION/EVACUATION SHUT-DOWN TIME FRAMES**

As Orlando is a potential destination for significant numbers of downstate Florida evacuees, it will be important to implement evacuation shut down procedures so that evacuees are not stranded on the Turnpike and I-95 as a storm arrives. This could be a particularly dangerous situation if sustained tropical storm winds or hurricane winds begin to affect the roadway and evacuees are still on the facility. Late in an evacuation, it will be important to make a coordinated decision about when to tell evacuees to stop entering the Turnpike and I-95.

Since the region and state's population will respond differently for various storm events, the time at which evacuees should be advised to stop entering the Turnpike and I-95 should be based on actual traffic conditions and not modeled predictions such as clearance times calculated in the regional and statewide studies (which indicate when an evacuation should begin). There are FDOT permanent traffic count stations located along the facilities, which should be used for travel speed monitoring (sites 970410, 970413, 930198, 979931 and 940260). Traffic conditions can be further monitored through Civil Air Patrol support and/or highway patrolmen stationed on the ground at strategic locations. Traffic can also be monitored using CCTV cameras within Palm Beach and Metro-Orlando areas. Hourly snapshots of traffic volumes and average travel speeds at these locations, coupled with storm information regarding the radius of tropical storm winds and forward speed, will be critical to making prudent shutdown decisions. As average travel speeds are monitored hour to hour and the information fed back to the state and county Emergency Management Operation Centers (EOCs), data must be interpreted and public notified of evacuation shut down.

The best indicator of evacuation traffic congestion and progression is average travel speed. Identifying the most congested sites in the appropriate direction, PBS&J would propose that the state and counties notify the public to stop entering the Turnpike and I-95 in the hourly time frames shown. This should greatly help prevent people from being stuck on the roadway system as hazardous conditions arrive.

**EVACUATION CLOSURE/EVACUEE NOTIFICATION TIMEFRAMES**  
**From Palm Beach County Supplemental Emergency Transportation Planning Analysis –**  
**1996**

**(Expressed in Hours Before Expected Sustained Tropical Storm Winds to  
Discourage New Evacuees From Entering the Florida Turnpike and I-95)**

Average Travel of Evacuation Traffic at Most Congested Sites	Florida Turnpike Sites				I-95 Sites	
	Broward	Palm Beach	Ft. Pierce	Wildwood	Palm Beach	St. Pierce
5 mph	20 hrs	17 hours	10 hours	1 hour	17 hours	10 hours
15 mph	7	5 ½	3 ½	1	5 ½	3 ½
25 mph	4	3 ½	2		3 ½	2
35 mph	3	2 ½	1 ½		2 ½	1 ½
45 mph	2 ¼	2	1 ¼		2	1 ¼
55 mph	2	1 ½	1		1 ½	1
65 mph	1 ½	1 ¼	1		1 ¼	1

Please note: These notification timeframes should not be confused with the time required to shut down the one-way operation. Trial exercises in Spring 2001 will show how long it will take the FHP and FDOT to shut down the operation.



# **Analysis of Florida's One-Way Operations for Hurricane Evacuation**



**Interstate 75 / Alligator Alley  
from Alico Road to US 27**

Prepared By



1901 Commonwealth Lane  
Tallahassee, Florida 32303

Prepared For



Florida Department of Transportation  
605 Suwannee Street  
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**February 2001**  
with Winter 2002 Introductory Update  
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# **TECHNICAL MEMORANDUM**

## **Analysis of Florida's One-Way Operations For Hurricane Evacuation**

**Interstate 75/Alligator Alley from Alico Road to U.S. 27**

Prepared by

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# **ANALYSIS OF FLORIDA'S ONE-WAY OPERATIONS FOR HURRICANE EVACUATION**

## **Interstate 75/Alligator Alley from Alico Road to U.S. 27**

### **INTRODUCTION**

The largest evacuation in Florida's history occurred as the result of Hurricane Floyd in September 1999. Although all of Florida's evacuees were able to evacuate without harm, many spent long hours on congested highways with inadequate guidance on where to go to seek shelter. Long evacuation travel times raised questions as to the need and feasibility of reverse-laning limited access facilities to reduce these times. To address these issues, Governor Jeb Bush appointed a Governor's Hurricane Evacuation Task Force, which was chaired by Walter Revell of H. J. Ross Associates, Inc.

The Task Force assigned a traffic management team the responsibility of conducting meetings around the state and identifying routes that might warrant one-way evacuation operations during a major hurricane threat. Seven routes were identified as follows:

I-10 Westbound – Jacksonville to Tallahassee

I-10 Eastbound – Pensacola to Tallahassee

I-4 Eastbound – Tampa to Orange County Line

I-75 Northbound – Charlotte County to I-275

Florida's Turnpike Northbound – Fort Pierce to Orlando

State Road 528 Westbound – State Road 520 to State Road 417

I-75 Alligator Alley East and West bound – Coast to Coast

I-75 from I-275 to Wildwood was added as a result of the recently completed Tampa Bay Regional Hurricane Evacuation Study. I-10 eastbound from Pensacola to Tallahassee has been dropped due to need for bi-directional evacuation movements on I-10 in the Panhandle.

## **Winter 2002 Status**

*Throughout the process of analyzing each contraflow route in 2000-2001, FDOT and its consultant have learned that the review of contraflow plans must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends. Reports produced for each analyzed contraflow route have been developed at a planning level of analysis, which has helped to identify the benefits/disbenefits and general operational feasibility of each section. It has been suggested by some of the FDOT district staff that a more detailed engineering and design level of analysis be performed on each route as monies and schedule permit. In that regard, it is strongly recommended that a detailed review cycle be established where two contraflow routes per year are reviewed in detail by agency participants. The review would cover detailed operational features and a consideration of environmental/infrastructure changes that may have affected the feasibility of the operation or the timeframes for startup and shutdown.*

*The tragic events of September 11, 2001 have shifted resources and preparedness focus to preparing for possible terrorist strikes. Future analyses regarding the contraflow sections should address other emergency situations, which may necessitate contraflow implementation besides that of a hurricane threat.*

This analysis models and examines the I-75/Alligator Alley segment from Alico Road near Ft. Myers to US 27 in Broward County. To accomplish this analysis, PBS&J has been retained by FDOT (through FDOT's Florida Intrastate Highway System contract with RS&H) to assist FDOT, DCA and FDLE in analyzing the route operation.

It is important to note that in August 1998 the Florida Department of Community Affairs, Division of Emergency Management contracted with PBS&J, Inc. to assess the general feasibility of various evacuation and transportation management strategies regarding Alligator Alley. The analysis Scope of Work focused on southeast Florida evacuations with a predominantly westbound evacuation movement through Alligator Alley and southwest Florida evacuations with a predominantly eastbound evacuation movement. A normal directional lane usage, a three-lane operation, and a one-way operation were addressed. The following tasks were accomplished in the analysis:

- Identified the overall need for the evacuation strategies regarding Alligator Alley.
- Assessed the positive and negative impacts to hurricane evacuation clearance times.
- Assessed the positive and negative impacts to traffic capacity.
- Identified major operational problems that might be encountered with initiating, managing and terminating each strategy.
- Developed evacuation shut down time requirements.

The current analysis draws heavily from the Technical Memorandum that was produced for that study. The current effort produced four slices of analysis, which are provided and described below.

## **ENTER/EXIT ANALYSIS**

Using the State of Florida's northbound and southbound Contra-flow Implementation Plans for I-75/Alligator Alley (Summer 2000 draft), PBS&J examined how traffic will enter and exit the planned

one-way operation. To understand what percent of evacuation traffic is entering the operations from each county, PBS&J reviewed detailed evacuation traffic modeling that the firm compiled during the Florida Statewide Recon Study and Phase 3 Transportation Analysis and 1998 Alligator Alley effort. Those counties, which were considered potential counties contributing evacuation traffic to Alligator Alley, are Lee and Collier Counties in southwest Florida and Monroe, Dade and Broward Counties in southeast Florida.

Table 1 shows the category 4-5 hurricane total out-of-county evacuating vehicles for Lee, Collier, Monroe, Dade and Broward Counties for each of five possible storm tracks. The numbers were developed in regional studies conducted by The Southwest Florida Regional Planning Council and by PBS&J for various public clients. It is important to note that the numbers are maximum unconstrained out-of-county traffic figures regardless of exit routes used by each county. Since some portion of these out-of-county vehicles might be diverted to Alligator Alley through aggressive traffic management, these are important numbers to begin with.

**Table 1**  
**CATEGORY 4-5 HURRICANE**  
**OUT-OF-COUNTY EVACUATING VEHICLES BY RELEVANT TRACK**  
**Maximum Unconstrained Out-of-County Evacuating Traffic Regardless of Exit Route for:**

<b>South Florida County</b>	<b>SE Florida Landfall SW Florida Exit</b>	<b>SE Florida Landfall Tampa Bay Exit</b>	<b>East Coast Parallel</b>	<b>SW Florida Landfall E. Central Coast Florida Exit</b>	<b>West Coast Parallel</b>
Southwest Florida Lee Collier	84,000 Vehicles 46,600 Vehicles	21,700 Vehicles 18,900 Vehicles	- 18,900 Vehicles	152,000 Vehicles 75,500 Vehicles	84,000 Vehicles 75,500 Vehicles
Southeast Florida Monroe Dade Broward	31,000 Vehicles 207,000 Vehicles 80,000 Vehicles	31,000 Vehicles 207,000 Vehicles 80,000 Vehicles	31,000 Vehicles 207,000 Vehicles 80,000 Vehicles	- - -	31,000 Vehicles - -

Source: Recon Study and Phase 3 Transportation Analysis, Florida Statewide Hurricane Evacuation/Shelter Plan, 1996, Regional HES Studies

Previous evacuations and hurricane study work suggest that without active traffic management and aggressive public information, Alligator Alley will be underutilized as an evacuation route. In developing percentages of exiting traffic by county that might be diverted to Alligator Alley, PBS&J had to “guesstimate” the maximum percentage for Lee, Collier, Monroe, Dade and Broward counties for possible storm tracks. Two levels of diversion were assumed for each county as follows:

	<b>Limited Diversion</b>	<b>Maximum Diversion</b>
Lee County	20%	40%
Collier County	35%	70%
Monroe County	15%	30%
Dade County	15%	25%
Broward County	15%	25%

Maximum diversion assumes the most aggressive level of traffic management where, perhaps halfway through an evacuation, traffic is forced to use Alligator Alley. Limited diversion would assume the public is strongly advised to consider Alligator Alley as an alternative escape route.

Using the diversion percentages and applying them to out-of-county vehicles shown in Table 1, numbers of evacuating vehicles on the Alligator Alley were generated for contraflow operations in each direction. Table 2 provides the northbound/westbound vehicles for a major storm affecting southeast Florida. Approximately 10 percent of the traffic would come from Monroe County, 25 percent from Broward County, and the remaining 65 percent from Dade County.

**Table 2**  
**Worst Case Category 4-5 Hurricane Northbound/Westbound**  
**I-75/Alligator Alley Evacuation Traffic**

<u>Feeder County</u>	<u>With No Diversion</u>	<u>Limited Diversion</u>	<u>Maximum Diversion</u>
Monroe	1,550 vehicles	4,650 vehicles	9,300 vehicles
Dade	6,350 vehicles	31,750 vehicles	52,450 vehicles
Broward	<u>4,000</u> vehicles	<u>12,000</u> vehicles	<u>20,000</u> vehicles
<b>Total</b>	<b>11,900 vehicles</b>	<b>48,400 vehicles</b>	<b>81,750 vehicles</b>

Table 3 provides the potential southbound/eastbound vehicles for a major storm threatening southwest Florida. Approximately 45 percent of the traffic would come from Collier County and 55 percent from Lee County.

**Table 3**  
**Worst Case Category 4-5 Hurricane Southbound/Eastbound**  
**I-75/Alligator Alley Evacuation Traffic**

<u>Feeder County</u>	<u>With No Diversion</u>	<u>Limited Diversion</u>	<u>Maximum Diversion</u>
Lee	Negligible	30,400 vehicles	60,800 vehicles
Collier	Negligible	<u>26,400</u> vehicles	<u>52,800</u> vehicles
<b>Total</b>	<b>Negligible</b>	<b>56,800 vehicles</b>	<b>113,600 vehicles</b>

Given these traffic volumes and the schematics developed by FDOT for each directional contraflow operation, PBS&J reviewed enter and exit characteristics of each operation. The

southbound/eastbound operation begins at CR 951 in Collier County and ends at US 27 in Broward County. I-75 southbound traffic from Lee County will be maintained in the normal southbound roadway. Collier County evacuees can use the normal southbound lanes or the contraflow lanes depending on actual congestion and conditions. The ending at US 27 should work as I-75 picks up an additional eastbound lane at US 27.

The northbound/westbound operation is more problematic. It is planned to begin at US 27 in Broward County and end at Alico Road in Lee County. It is not clear from the current drawings how Monroe, Dade and Broward Counties will enter the operation officials will want to achieve a balance of traffic on each side of the road. The ending at Alico Road takes four-lanes of traffic down to two lanes of traffic, which will create a major bottleneck. (Fortunately, this analysis justifies a southbound/eastbound contraflow operation, but recommends a normal operation or normal operation with shoulder usage in the northbound/westbound direction.)

## **REGIONAL BOTTLENECK IMPACTS**

The proactive use of I-75/Alligator Alley as a major evacuation route has many benefits in providing relief to major regional and statewide evacuation bottlenecks. The primary benefit of the northbound/westbound operation is relieving the incredible evacuation traffic numbers and bottlenecks on I-95 and the Florida Turnpike. An even greater benefit is derived from the southbound/eastbound operation, which takes pressure off the worst potential hurricane evacuation bottleneck in the whole state (I-75/I-275 interchange just north of Tampa).

While a limited diversion of northbound I-95 and Florida Turnpike traffic to Alligator Alley will help regional bottlenecks, PBS&J would not recommend an aggressive or maximum diversion, as west coast bottlenecks would worsen to the point of negating east coast benefits. Also, limited public shelter spaces in southwest Florida with an exiting category 4-5 hurricane would make it difficult to deal with a lot of southeast Florida evacuees.

**What makes the enhanced evacuation capacity option so appealing is the diversion of evacuation traffic to Alligator Alley, which would otherwise be grossly underutilized. The diversion as previously stated takes traffic away from grossly over-utilized routes. For the upcoming 2001 hurricane season, contraflow plans may need to stay in place. However, a more prudent, less resource intensive option, would be developing the outside shoulder as a third evacuation lane in each direction. This would involve some minor widening and altering of rumble strips. The use of the normal direction outside shoulder will accommodate the identified traffic and will be easier to manage. If the Turnpike or I-75/I-4 contraflow operation is in progress, state resources will be at a premium. Alligator Alley, with a contra flow operation, may overwhelm already committed state resources.**

#### **VEHICULAR THROUGHPUT ANALYSIS**

Table 4 shows the clearance time benefits statewide of using Alligator Alley as a major evacuation route for various storm tracks. Seven to 12 hours of time is saved due to an enhanced use in the northbound/westbound direction. For a southbound/eastbound enhanced use, 29 to 38 hours of clearance time is saved. With an outside shoulder being used as an evacuation lane, vehicles throughput is increased from 3,000 to 4,200 vehicles per hour. With a contra flow operation, vehicle throughput is increased from 3,000 to 5,000 vehicles per hour. Contraflow should not be used unless southwest Florida is taken by surprise by a rapidly forming/rapidly moving, intense hurricane system in the Gulf of Mexico.

**Table 4**  
**IMPACT TO STATEWIDE HURRICANE EVACUATION**  
**CLEARANCE TIMES**

<u>Statewide Category 4/5 Hurricane Storm Track</u>	<u>Potential Savings in Hours of Evacuation Clearance Time</u>	<u>Recommended Level of Diversion/Use of Alligator Alley</u>
SE Florida Landfall SW Florida Exit	7 Hour Reduction	Limited diversion/normal lane use or shoulder addition
SE Florida Landfall Tampa Bay Exit	7 Hour Reduction	Limited diversion/normal lane use or shoulder addition
East Coast Parallel	12 Hour Reduction	Maximum diversion/normal lane use or shoulder addition
SW Florida Landfall E. Central Florida Exit	38 Hour Reduction	Maximum diversion/use eastbound shoulder as third eastbound lane or contraflow
West Coast Parallel	29 Hour Reduction	Maximum diversion/normal lane use or shoulder addition

**EVACUEE NOTIFICATION/EVACUATION SHUT-DOWN TRAFFIC**

As Alligator Alley becomes accepted by the public as a legitimate evacuation route, it will be important to implement evacuation shut-down procedures so that evacuees are not stranded on a 60-mile long section of low-lying roadway with few facilities and virtually no sheltering capability. This could be a particularly dangerous situation if sustained tropical storm winds or hurricane winds begin

to affect the roadway and evacuees are still on the facility. Late in an evacuation, it will be important to make a coordinated decision about when to tell Collier, Lee, Monroe, Dade and Broward evacuees to stop entering Alligator Alley.

Since south Florida's population will respond differently for various storm events, the time at which evacuees should be advised to stop entering Alligator Alley should be based on actual traffic conditions and not modeled predictions such as clearance times calculated in the regional and statewide studies (which indicate when an evacuation should begin). Unfortunately, there are not FDOT permanent traffic count stations located along the facility which could be used for travel speed monitoring. This is because the communications infrastructure is not out there along the remote sections of Alligator Alley to support the newest count station technology. Therefore, traffic conditions will need to be monitored through Civil Air Patrol support and/or highway patrolmen stationed on the ground at strategic locations.

At a minimum, PBS&J recommends that Alligator Alley at State Road 29 and in the vicinity of the Indian reservations be monitored during a hurricane evacuation. Hourly snapshots of traffic volumes and average travel speeds at these locations coupled with storm information regarding radius of tropical storm winds and forward speed will be critical to making prudent shut-down decisions. As average travel speeds are monitored hour-to-hour and the information is fed back to the state and county EOCs, data must be interpreted and the public notified of evacuation shutdown.

The best indicator of evacuation traffic congestion and progression is average travel speed. Identifying the most congested sites in the appropriate direction and using Table 5, PBS&J would propose that the state and relevant counties notify the public to stop entering Alligator Alley in the hourly timeframes shown. This should greatly help prevent people from being stuck on the roadway system as hazardous conditions arrive.

**Table 5**  
**EVACUATION CLOSURE/EVACUEE NOTIFICATION TIMEFRAMES**  
 (Expressed in Hours Before Expected Sustained Tropical Storm Winds  
 Discourage New Evacuees from Entering Alligator Alley)

Average Travel Speed of Evacuation Traffic at Congestion Monitoring Sites	Congestion Monitoring Sites			
	Alligator Alley at SR 29		Alligator Alley at Indian Reservations	
	Eastbound	Westbound	Eastbound	Westbound
5 mph	12 Hours	4 ½ Hours	7 Hours	11 Hours
15 mph	4 Hours	1 ½ Hours	2 ½ Hours	3 ½ hours
25 mph	2 ½ Hours	1 Hour	1 ½ Hours	2 Hours
35 mph	1 ¾ Hours	1 Hour	1 Hour	1 ½ Hours
45 mph	1 ½ Hours	1 Hour	1 Hour	1 ¼ hours
55 mph	1 Hour	1 Hour	1 Hour	1 Hour
65 mph	1 Hour	1 Hour	1 Hour	1 Hour



# **Analysis of Florida's One-Way Operations for Hurricane Evacuation**

Interstate 75 from Charlotte County  
to Interstate 4, Interstate 4,  
and Interstate 75 from  
Interstate 275 to Wildwood

Prepared By



1901 Commonwealth Lane  
Tallahassee, Florida 32303

Prepared For



Florida Department of Transportation  
605 Suwannee Street  
Tallahassee, Florida 32399-0450

**May 2001**

with Winter 2002 Introductory Update

090853.21-0102

# **TECHNICAL MEMORANDUM**

## **Analysis of Florida's One-Way Operations For Hurricane Evacuation**

**Interstate 75 from Charlotte County to Interstate 4,  
Interstate 4, and Interstate 75 from Interstate 275 to Wildwood**

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# **ANALYSIS OF FLORIDA'S ONE-WAY OPERATIONS FOR HURRICANE EVACUATION**

## **Interstate 75 from Charlotte County to Interstate 4, Interstate 4, and Interstate 75 from Interstate 275 to Wildwood**

### **INTRODUCTION**

The largest evacuation in Florida's history occurred as the result of Hurricane Floyd in September 1999. Although all of Florida's evacuees were able to evacuate without harm, many spent long hours on congested highways with inadequate guidance on where to go to seek shelter. Long evacuation travel times raised questions as to the need and feasibility of reverse laning limited access facilities to reduce these times. To address these issues, Governor Jeb Bush appointed a Governors Hurricane Evacuation Task Force, which was chaired by Walter Revell of H. J. Ross Associates, Inc.

The Task Force assigned a traffic management team the responsibility of conducting meetings around the state and identifying routes that might warrant one-way evacuation operations during a major hurricane threat. Seven routes were identified as follows:

- I-10 Westbound - Jacksonville to Tallahassee
- I-10 Eastbound - Pensacola to Tallahassee
- I-4 Eastbound - Tampa to Orange County line
- I-75 Northbound - Charlotte County to I-275
- Florida's Turnpike Northbound - Ft. Pierce to Orlando
- State Road 528 Westbound - State Road 520 to State Road 417
- I-75 Alligator Alley East and Westbound - Coast to Coast

I-75 from I-275 to Wildwood was added as a result of the recently completed Tampa Bay Regional Hurricane Evacuation Study. I-10 eastbound from Pensacola to Tallahassee has been dropped due to need for bi-directional evacuation movements on I-10 in the Panhandle.

## **Winter 2002 Status**

*Throughout the process of analyzing each contraflow route in 2000-2001, FDOT and its consultant have learned that the review of contraflow plans must be an iterative and continuing process that recognizes changing geometrics, law enforcement priorities, resource availability, and evolving evacuation travel behavioral trends. Reports produced for each analyzed contraflow route have been developed at a planning level of analysis, which has helped to identify the benefits/disbenefits and general operational feasibility of each section. It has been suggested by some of the FDOT district staff that a more detailed engineering and design level of analysis be performed on each route as monies and schedule permit. In that regard, it is strongly recommended that a detailed review cycle be established where two contraflow routes per year are reviewed in detail by agency participants. The review would cover detailed operational features and a consideration of environmental/infrastructure changes that may have affected the feasibility of the operation or the timeframes for startup and shutdown.*

*The tragic events of September 11, 2001 have shifted resources and preparedness focus to preparing for possible terrorist strikes. Future analyses regarding the contraflow sections should address other emergency situations, which may necessitate contraflow implementation besides that of a hurricane threat.*

This analysis examines three of the eight areas. The Southwest Florida area along with Tampa Bay comprises the most difficult hurricane evacuation area in the entire United States. A major hurricane threatening this area would precipitate an evacuation that would greatly burden Interstate 75 and Interstate 4. This analysis examines the role that various contra flow and shoulder plans might play separately and in conjunction with one another. Although a separate report has addressed Alligator Alley, it is also included as an analysis feature of this report.

To accomplish this analysis, PBS&J has been retained by the FDOT (through FDOT's Florida Intrastate highway System contract with RS&H) to assist FDOT, DCA, and FDLE in analyzing the route operation. Four "slices" of analysis are provided and described below.

### **ENTER/EXIT ANALYSIS**

Using the State of Florida's recently updated ContraFlow Implementation Plan for Interstate 4, and the state's Interstate 75 Northbound shoulder use plans for Sarasota and Hillsborough Counties, PBS&J examined how traffic will enter and exit the planned operations. It should be noted that no contra flow plan exists for the Interstate 75 from Interstate 275 to Wildwood section as of yet. FDOT and FHP officials will make a decision to move forward with these detailed plans after reviewing findings of this analysis

To understand what percent of evacuation traffic is entering the operations from each county south of and along the corridor, PBS&J reviewed detailed evacuation traffic modeling that the firm compiled during the Florida Statewide Recon Study and Phase 3 Transportation Analysis and the recently completed Tampa Bay Hurricane Evacuation Study.

The following table shows the county-by-county worst-case category 4-5 hurricane contribution of out of county evacuation vehicles to the regional road system. **The vehicle numbers are unconstrained maximums, as most storm scenarios will not permit enough time for this level of out-of-county evacuation to be accommodated.**

<b>Worse Case Category 4-5 Hurricane/ High Tourist Occupancy Unconstrained Out Of County Evacuating Vehicles By Area</b>		
<b>County</b>	<b>Evacuating Vehicles Attempting to Exit the County</b>	<b>Percent of Total</b>
<b>Southwest Florida</b>		
Collier	75,500 vehicles	10%
Lee	152,000 vehicles	21%
Charlotte	65,200 vehicles	9%
Sarasota	86,100 vehicles	12%
<b>Subtotal</b>	<b>378,800 vehicles</b>	<b>52%</b>
<b>Tampa Bay</b>		
Manatee	39,500 vehicles	5%
Hillsborough	82,700 vehicles	11%
Pinellas	149,900 vehicles	20%
Pasco	89,300 vehicles	12%
<b>Subtotal</b>	<b>361,400 vehicles</b>	<b>48%</b>
<b>Total</b>	<b>740,200 vehicles</b>	<b>100%</b>

Interestingly, Southwest Florida and Tampa Bay would contribute roughly equal amounts of out-of-county vehicles. Although Tampa Bay has more total population than Southwest Florida, Southwest Florida is more surge vulnerable thus generating a similar potential volume of out of county traffic

What is critical to understand and try to forecast is what portion of each county's traffic will be on roadway segments leading out of the respective regions for various traffic control/contraflow alternatives. In that regard, PBS&J set up a series of spreadsheets, assigning various percentages of each county's traffic to the available routes. For each traffic control/contraflow alternative, percentages of out of county traffic were assigned to:

- |                     |                        |
|---------------------|------------------------|
| Alligator Alley     | SR-72                  |
| I-75 south of I-4   | SR-64                  |
| I-4                 | SR-60                  |
| I-75 north of I-275 | US-301                 |
| SR-80               | US-41/Suncoast Parkway |
| US-17               | US-19                  |

This was accomplished for each of the following traffic control/contraflow alternatives:

Normal lane usage	Alligator Alley contraflow only with maximum Lee/Collier diversion
I-75 north of I-275 contraflow only	
I-4 contraflow only	I-75 north of I-275 contraflow with Alligator Alley contraflow
I-75 northbound shoulder to I-4 only	
Alligator Alley contraflow only with limited Lee/Collier diversion	I-4 contraflow with Alligator Alley contraflow

The following tables show the assigned maximum unconstrained vehicle volumes by each of the key analysis segments for a Southwest Florida-only evacuation, a Tampa Bay only-evacuation, and a combined Southwest Florida/Tampa Bay evacuation.

<b>MAXIMUM UNCONSTRAINED EVACUATION VEHICLES BY ROUTE SOUTHWEST FLORIDA ONLY EVACUATION</b>				
	<b>Evacuation Vehicles by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	6,815 vehicles	341,770 vehicles	155,400 vehicles	186,360 vehicles
<b>I-75 north of I-275 contraflow only</b>	6,815	341,770	155,400	186,360
<b>I-4 contraflow only</b>	6,815	341,770	167,640	174,130
<b>I-75 northbound shoulder only</b>	6,815	341,770	155,400	186,360
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	56,825	291,760	128,880	162,875
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	113,660	234,903	106,920	128,015
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	113,660	234,930	106,920	128,015
<b>I-4 contraflow with Alligator Alley contraflow</b>	113,660	234,930	109,290	125,640

<b>MAXIMUM UNCONSTRAINED EVACUATION VEHICLES BY ROUTE TAMPA BAY ONLY EVACUATION</b>				
	<b>Evacuation Vehicles by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	0	41,845	101,860	178,540
<b>I-75 north of I-275 contraflow only</b>	0	41,845	97,210	183,190
<b>I-4 contraflow only</b>	0	41,845	108,840	171,560
<b>I-75 northbound shoulder only</b>	0	41,845	101,860	178,540
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	N/A	N/A	N/A	N/A
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	N/A	N/A	N/A	N/A
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	N/A	N/A	N/A	N/A
<b>I-4 contraflow with Alligator Alley contraflow</b>	N/A	N/A	N/A	N/A

<b>MAXIMUM UNCONSTRAINED EVACUATION VEHICLES BY ROUTE SOUTHWEST FLORIDA AND TAMPA BAY EVACUATING</b>				
	<b>Evacuation Vehicles by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	6,815	383,610	257,270	364,900
<b>I-75 north of I-275 contraflow only</b>	6,815	383,610	252,620	369,550
<b>I-4 contraflow only</b>	6,815	383,610	276,480	345,690
<b>I-75 northbound shoulder only</b>	6,815	383,610	257,270	364,900
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	56,825	333,600	230,745	341,415
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	113,660	276,780	208,780	306,550
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	113,660	276,780	204,130	311,205
<b>I-4 contraflow with Alligator Alley contraflow</b>	113,660	276,680	218,130	297,200

In addition to reviewing potential traffic volumes using each operation, plans were reviewed for starting and ending the shoulder and contraflow operations. Both the I-75 shoulder and I-4 contraflow plan seem to be well thought out. The I-75 shoulder plan has already been tested and appears quite doable. The I-4 plan although well designed, would require control of some 30 interchanges and would be very resource intensive. As in previous contraflow analyses, the need for clear communication to the public at the beginning and endings of each operation cannot be overstated.

## **REGIONAL BOTTLENECK IMPACTS**

The I-75 contraflow from I-275 to Wildwood would help “solve” the worst potential evacuation bottleneck in Florida for an evacuation involving Tampa Bay and southwest Florida. The I-4 contraflow plans biggest contribution is in “solving” the horrendous potential bottleneck at the I-4/I-275 interchange in downtown Tampa. The I-75 shoulder plan, although useful to a southwest Florida only evacuation, actually could bring evacuees more quickly into an already over-congested I-4 area if Tampa Bay is also evacuating. The greatest relief to regional bottlenecks would be a combination of an I-75 from I-275 to Wildwood contraflow, an Alligator Alley contraflow and a short I-4 contraflow operation from the I-275 interchange to I-75 east of Tampa. However, even with these enhancements, congestion will be severe and there may not be enough time to accommodate every person who wants to leave the region in a worst-case situation. Also, the state may not have the resources to handle an effort of this magnitude.

## **VEHICULAR THROUGHPUT ANALYSIS**

PBS&J modeled the routes to determine the number of additional vehicles and people that can get through the contraflow segments assuming there is enough time for the vehicles to arrive at the operation. This was accomplished by calculating hours of travel demand/clearance times required to process the worst case evacuation travel demand on each segment for a category 4-5 hurricane scenario with and without the contraflow alternatives. Scenarios were differentiated for Southwest Florida only, Tampa Bay only, and southwest Florida and Tampa Bay concurrent evacuations.

Calculations assumed that the I-75 shoulder plan would increase vehicle throughput from 6,000 vehicles per hour to 7,000 vehicles per hour. The I-75 north of I-295 and I-4 contraflow operations will increase vehicle throughput from 3,000 vehicles per hour to 5,000 vehicles per hour. I-4 will actually carry even more vehicles on those sections that have recently been six laned. This type of analysis must look at the most constrictive sections, which, in the case of I-4, are the four-lane segments near Lakeland. The widening improvements to I-4 are progressing well and will greatly reduce the need for contraflowing I-4 during hurricane evacuations.

The following tables provide the maximum unconstrained hours of travel demand by route for each traffic control/contraflow alternative. Separate tables are provided for the southwest Florida, Tampa Bay and concurrent regional evacuations.

<b>MAXIMUM UNCONSTRAINED HOURS OF TRAVEL DEMAND BY ROUTE SOUTHWEST FLORIDA ONLY EVACUATION</b>				
	<b>Hours of Evacuation Travel Demand by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	2 hours	57 hours	52 hours	62 hours
<b>I-75 north of I-275 contraflow only</b>	2	57	52	37
<b>I-4 contraflow only</b>	2	57	34	58
<b>I-75 northbound shoulder only</b>	12	49	52	62
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	11	49	43	54
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	23	39	36	43
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	23	39	36	26
<b>I-4 contraflow with Alligator Alley contraflow</b>	23	39	22	42

<b>MAXIMUM UNCONSTRAINED HOURS OF TRAVEL DEMAND BY ROUTE TAMPA BAY ONLY EVACUATION</b>				
	<b>Hours of Evacuation Travel Demand by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	0	7	34	60
<b>I-75 north of I-275 contraflow only</b>	0	7	32	37
<b>I-4 contraflow only</b>	0	7	22	57
<b>I-75 northbound shoulder only</b>	0	6	34	60
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	N/A	N/A	N/A	N/A
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	N/A	N/A	N/A	N/A
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	N/A	N/A	N/A	N/A
<b>I-4 contraflow with Alligator Alley contraflow</b>	N/A	N/A	N/A	N/A

<b>MAXIMUM UNCONSTRAINED HOURS OF TRAVEL DEMAND BY ROUTE SOUTHWEST FLORIDA AND TAMPA BAY EVACUATING</b>				
	<b>Hours of Evacuation Travel Demand by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	2	64	86	122
<b>I-75 north of I-275 contraflow only</b>	2	64	84	74
<b>I-4 contraflow only</b>	2	64	55	115
<b>I-75 northbound shoulder only</b>	2	55	86	122
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	11	56	77	114
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	23	46	70	102
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	23	46	68	62
<b>I-4 contraflow with Alligator Alley contraflow</b>	23	46	44	99

Since most of the times would require evacuations to begin before the National Hurricane Center could tell the region it is under threat, the times only serve as a relative measure of one scenario versus another. In that light, tables are also provided indicating the percentage savings in times by route segment for each contraflow alternative. In light of the calculations, the prioritization of measures from highest to lowest should be as follows:

- 1) I-75 from I-275 to Wildwood contraflow
- 2) Alligator Alley contraflow with maximum diversion of Lee and Collier Counties
- 3) I-4 partial contraflow from I-275 to I-75
- 4) I-4 full contraflow (not needed after multilane construction is complete)
- 5) I-75 shoulder plan

<b>PERCENT SAVINGS IN CLEARANCE TIME BY ROUTE SEGMENT BY TRAFFIC CONTROL/CONTRAFLOW ALTERNATIVE SOUTHWEST FLORIDA ONLY EVACUATION</b>				
	<b>Hours of Evacuation Travel Demand by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	Baseline	Baseline	Baseline	Baseline
<b>I-75 north of I-275 contraflow only</b>	0%	0%	0%	40%
<b>I-4 contraflow only</b>	0%	0%	35%	6%
<b>I-75 northbound shoulder only</b>	0%	14%	0%	0%
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	—	14%	17%	13%
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	—	32%	31%	31%
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	—	32%	31%	58%
<b>I-4 contraflow with Alligator Alley contraflow</b>	—	32%	58%	32%

**PERCENT SAVINGS IN CLEARANCE TIME BY ROUTE SEGMENT BY TRAFFIC CONTROL/CONTRAFLOW ALTERNATIVE  
TAMPA BAY ONLY EVACUATION**

<b>Traffic Control/ Contraflow Alternative</b>	<b>Hours of Evacuation Travel Demand by Route</b>			
	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	Baseline	Baseline	Baseline	Baseline
<b>I-75 north of I-275 contraflow only</b>	0%	0%	6%	38%
<b>I-4 contraflow only</b>	0%	0%	35%	5%
<b>I-75 northbound shoulder only</b>	0%	14%	0%	0%
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	—	—	—	—
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	—	—	—	—
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	—	—	—	—
<b>I-4 contraflow with Alligator Alley contraflow</b>	—	—	—	—

<b>PERCENT SAVINGS IN CLEARANCE TIME BY ROUTE SEGMENT BY TRAFFIC CONTROL/CONTRAFLOW ALTERNATIVE SOUTHWEST FLORIDA AND TAMPA BAY EVACUATION</b>				
	<b>Hours of Evacuation Travel Demand by Route</b>			
<b>Traffic Control/ Contraflow Alternative</b>	<b>Alligator Alley</b>	<b>I-75 south of I-4</b>	<b>I-4</b>	<b>I-75 north of I-275</b>
<b>Normal Lane Usage</b>	Baseline	Baseline	Baseline	Baseline
<b>I-75 north of I-275 contraflow only</b>	0%	0%	2%	39%
<b>I-4 contraflow only</b>	0%	0%	36%	6%
<b>I-75 northbound shoulder only</b>	0%	14%	0%	0%
<b>Alligator Alley contraflow only with limited Lee/Collier diversion</b>	—	12%	10%	7%
<b>Alligator Alley contraflow only with maximum Lee/Collier diversion</b>	—	28%	19%	16%
<b>I-75 north of I-275 contraflow with Alligator Alley contraflow</b>	—	28%	21%	49%
<b>I-4 contraflow with Alligator Alley contraflow</b>	—	28%	49%	19%

## **EVACUEE NOTIFICATION/EVACUATION SHUT-DOWN TIMEFRAMES**

As Tampa Bay is an origin for significant numbers of evacuee and a potential destination for significant numbers of Southwest Florida evacuees, it will be important to implement evacuation shut down procedures so that evacuees aren't stranded on I-75 and I-4 as a storm arrives. This could be a particularly dangerous situation if sustained tropical storm winds or hurricane winds begin to affect the roadway and evacuees are still on the facility. Late in an evacuation, it will be important to make a coordinated decision about when to tell evacuees to stop entering I-75, I-4 and I-275.

Since the region and state's population will respond differently for various storm events, the time at which evacuees should be advised to stop entering I-75, I-4 and I-275 should be based on actual traffic conditions and not modeled predictions such as clearance time calculated in the regional and statewide studies (which indicate when an evacuation should begin). There are FDOT permanent traffic count stations located along the facilities which should be used for travel speed monitoring (sites 140190, 100106 and 100110). Traffic conditions can be further monitored through Civil Air Patrol support and/or highway patrolmen stationed on the ground at strategic locations. Traffic can also be monitored using CCTV cameras that are available within the area. Hourly snapshots of traffic volumes and average travel speeds at these locations, coupled with storm information regarding the radius of tropical storm winds and forward speed, will be critical to making prudent shut-down decisions. As average travel speeds are monitored hour to hour and the information fed back to the state and county Emergency Management Operation Centers (EOCs), data must be interpreted and the public notified of evacuation shut down.

The best indicator of evacuation traffic congestion and progression is average travel speed. Identifying the most congested sites in the appropriate direction and using the following table, PBS&J would propose that the state and counties notify public to stop entering I-75, I-4, and I-275 in the hourly time frames shown. This should greatly help prevent people from being stuck on the roadway system as hazardous conditions arrive.

**EVACUATION CLOSURE/EVACUEE NOTIFICATION TIMEFRAMES  
TAMPA BAY FLORIDA HURRICANE EVACUATION STUDY UPDATE-  
1999**

(Expressed in hours before expected Sustained Tropical Storm Winds to Discourage New Evacuees From Entering Regional Interstate Facilities)

<b>Average Travel Speed of Evacuation Traffic at Congestion Monitoring Sites</b>	<b>Shut Down Timeframes</b>
5 mph	8 hours
15 mph	3 hours
25 mph	2 hours
35 mph	1 ½ hours
45 mph	1 hour
55 mph	1 hour
65 mph	1 hour

**Assumed monitoring sites:**

FDOT Station 140190 (I-75 at SR54 in Pasco County)

FDOT Station 100110 (I-275 west of I-4 interchange)

FDOT Station 100106 (I-4 east of I-275)