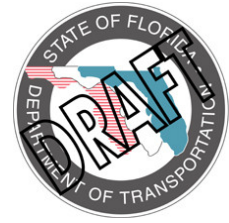


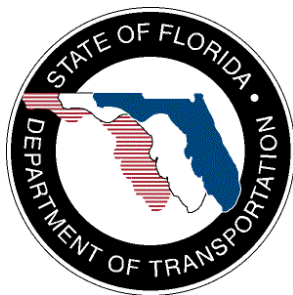
Technical Memorandum



Florida Department of Transportation Evacuation Plan and Contraflow Evaluation Project — Traffic Incident Management

Assessment of Contraflow Plan Risks and Recommended Mitigation Strategies for Interstate 75 Alligator Alley North and South

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List of Acronyms

<i>CEMP</i>	<i>Comprehensive Emergency Management Plan</i>
DMS	Dynamic Message Sign
FDEM	Florida Division of Emergency Management
FDOC	Florida Department of Corrections
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FHP	Florida Highway Patrol
HAR	Highway Advisory Radio
I-75	Interstate 75
ITS	Intelligent Transportation Systems
MHz	Megahertz
MOT	Maintenance of Traffic
RTMC	Regional Transportation Management Center
RV	Recreational Vehicle
SHS	(FDOT) State Highway System
SR	State Road
TMC	Transportation Management Center
U.S.	United States
VMS	Variable Message Sign



1. Introduction

A primary responsibility of the Florida Department of Transportation (FDOT) in natural or man-made emergency situations is to assist with planning and carrying out evacuations using the state's highways. These operations can potentially involve the relocation of millions of Florida residents and visitors from a threatened area, and getting them to shelter in a safe, timely manner. Since 2000, the FDOT has taken a comprehensive approach to evaluating contraflow options and has developed formal plans that call for reversing lanes on certain limited-access highways to maximize their ability to move traffic during hurricane evacuations. These reverse-lane or "contraflow" operations, while potentially beneficial to motorists, involve certain risks over and above a standard emergency evacuation that utilizes highway lanes in the normal fashion.

It is important for the FDOT to identify and address contraflow risks, both as a management function that will aid in the administration of these reverse-lane operations, and as a tool to improve this program and make it a viable alternative when such circumstances as severe weather and traffic conditions dictate that it should be employed. The analysis of a single identified contraflow corridor provides opportunities for identifying issues that may be extrapolated to be valid for any contraflow corridor in the state. Consequently, the purpose of this document is to examine the various risks associated with the contraflow of Interstate 75 (I-75) between Naples and Fort Lauderdale, also known as Alligator Alley. Also presented are several risk mitigation strategies that can be implemented now, and others that will be beneficial over the long term.



2. Contraflow Risks

2.1 Existing Contraflow Plans and Documentation Risk Review

Interstate 75's Alligator Alley is unique among Florida's five contraflow highways in that it has two sets of contraflow plans – one for southbound evacuees traveling from Naples to Fort Lauderdale, and one in the opposite direction for northbound evacuees traveling from Fort Lauderdale to Fort Myers. The contraflow plan actually implemented depends on the evacuation direction. If a northbound contraflow is used, then District 4 is the leading FDOT entity whose plans are used for the evacuation. Conversely, during a southbound contraflow operation, District 1 would be the lead FDOT entity and its plans would be used. Both District plans extend into the other District but are run by the lead District. Both plan sets have similar issues, so the following notes are intended to cover both plans; risks that are specific to a particular District or direction of contraflow will be described separately.

Logistical Issues — The I-75 Alligator Alley plans call for an advance notice of at least 72 hours prior to storm landfall for activation of the contraflow plans, and contraflow operations must be terminated at least 24 hours prior to the onset of tropical storm-force winds to allow time for responders to remove their equipment and seek shelter. This time frame, while sufficient for ensuring proper setup of equipment and notification of personnel, runs the risk of being so lengthy that the hurricane changes its course and a different contraflow route becomes necessary. Another possibility could be that the hurricane changes in intensity and evacuation orders are revised, rendering contraflow unnecessary.

Condition Reporting — The plans indicate that condition reporting will be performed by emergency responders, such as the Florida Highway Patrol (FHP), but does not take into account the potential for these staffing resources to be moved to other locations in an incident situation. The plan also indicates that the FHP will use its aircraft for aerial surveys of traffic conditions, but this doesn't take into consideration the possible need for nighttime reporting if the contraflow route cannot be cleared during daylight hours.

Resource and Equipment Availability — The contraflow plans rely heavily on such temporary highway devices as portable variable message signs (VMS), traffic cones, and barricades. If agencies do not already own these items, it may be difficult to procure this equipment prior to a storm event. The plans also call for stationing FHP and fire rescue vehicles at key locations, so these vehicles need to be available.



Availability of Law Enforcement and Other Personnel — The contraflow plans depend on operational support from the FHP, motorist assistance patrols such as the Road Ranger Service Patrols, FDOT staff, and other responders. Personnel resources of this type may be very limited, given the many needs that arise during an evacuation. The plans do not necessarily address the need to have multiple shifts of personnel ready and available to relieve previously positioned responders.

Dependence on Contract Personnel — Such contract personnel as the Road Rangers, wrecker service operators, and asset management contractors, while required to be available, may have other responsibilities during a contraflow operation, putting their guaranteed availability in question.

Incident and Emergency Response along the Corridor — The I-75 Alligator Alley contraflow routes face limitations in the nature and number of exits and entrances available to the traveling public. The highway traverses a remote area and is bordered on both sides by swamp and drainage canals. Even when the route is not operating as a contraflow roadway, incident and emergency response is difficult because of the limited access. Another concern has been the danger of errant vehicles running into the canals and responders being unable to locate those that are submerged. For this reason, District 1 has installed a safety barrier cable system that triggers a flashing light at the scene and transmits an alarm to the regional transportation management center (RTMC) to indicate that a vehicle has hit the barrier at a specific location within the Collier County portion of Alligator Alley.

Reinsertion of Response Personnel to Maintain Presence — Given the limitations of the I-75 Alligator Alley route for entrances and exits during normal operation, there is a greater problem during contraflow implementation when some of these routes are closed or reentry is limited. Also, given the lack of easily accessible parallel routes from the available exits — Snake Road, State Road (SR) 29, and United States (U.S.) Highway 27 — the time for reinsertion of response personnel presents a serious issue for the contraflow plans because these personnel will be out of service for some time as they circle back to an insertion point.

Public Education and Information — Because a contraflow operation will place limits on access to I-75, as well as to some ramps at interchanges, the public may not anticipate these aspects of the plan.

Training Needs — The FDOT does not practice full contraflow plan implementation at this time, only tabletop exercises.

Responder Knowledge and Plan Experience — Not all potential responders may be familiar with the plans, especially with the reliance on contract staff that may, in turn, also be contracting staff.

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Multiple Plans in Place Simultaneously — The I-75 Alligator Alley contraflow plans have not been analyzed to consider the impacts on resources should it become necessary to implement more than just one contraflow plan, such as the I-75 Alligator Alley plans and the plan for Florida’s Turnpike (SR 91).

Other Risks — The Alligator Alley plans do not clearly delineate vehicle restrictions, such as keeping heavy vehicles on the regular side of the roadway. Also, I-75 has toll plazas on either end of Alligator Alley, so one plaza is affected in each contraflow plan. Toll plazas present potential speed and width issues as vehicles go through these facilities. For example, for a southbound evacuation, vehicles will go through the western toll plaza (in Collier County) in the wrong direction.

In Broward County, the southbound evacuation ends with a lane imbalance as traffic is brought back to the normal roadway configuration just east of U.S. Highway 27, which could result in congestion.

Alligator Alley does not have any nighttime lighting except at interchanges, rest areas, recreation areas, and toll plazas. This makes nighttime operations potentially very dangerous.

There are several other areas of potential concern with the contraflow plan along I-75 Alligator Alley in the northbound direction as noted below:

- The entry point for east-to-west flow is of concern due to the lack of loading capacity.
- The major I-75, Sawgrass Expressway, and I-595 interchange areas are all one-lane ramps and will cause backups for the contraflow route.
- The westbound approach between the above noted interchange and U.S. Highway 27 has two lanes loading the regular flow side and one loading the contraflow side, which may cause confusion for the public.
- Trucks should only be allowed in the regular flow side of the contraflow.
- The northbound ramp to U.S. Highway 27 stays open, which will allow traffic to exit the highway rather than forcing traffic to the end of the route.
- The Snake Road exit allows both contraflow and regular flow traffic to exit in both a northbound and southbound contraflow implementation scenario. However, during a northbound implementation all reentering traffic is forced into the contraflow side and during a southbound implementation all traffic is forced into the regular flow side. This leads to a potential imbalanced loading scenario.
- Since all traffic is able to exit at Snake Road, there is the potential for severe backup at the gas station there, with vehicles queuing on the interstate.



- The start and end of both plans will be a potential issue due to the lack of capacity for the potential traffic.

2.2 Florida Department of Transportation and Partner Agency Staff Interview Risk Review

Logistical Issues — There are concerns that the time planned for staging, setup, et cetera, may not be available; a contraflow may be called for more quickly than agencies have anticipated. Another concern is that if the 72-hour window given for the contraflow activation to occur — including equipment and personnel staging — is not available, the actual contraflow operation may end up occurring at night and the plans are not designed for this. This would be of major concern along Alligator Alley because there is limited condition reporting available with no intelligent transportation system (ITS), in place and none expected until late 2007 or early 2008. The plans rely on aircraft for condition reporting, which would not be feasible at night. There is also concern that there is not enough involvement from other agencies outside the FDOT in the contraflow plans, especially the Florida Division of Emergency Management (FDEM) and the Florida Department of Health (FDOH).

Condition Reporting — Currently, there is no traffic condition monitoring capability (i.e., deployed ITS) on Alligator Alley; this will not change until early 2008.

Resource and Equipment Availability — Portable VMS units will be brought in from outside the area; this will take time. Alligator Alley VMS deployment is the responsibility of an asset management contractor, and there are some concerns that the contractor will not have enough VMS units available for use during a contraflow operation. An asset management company is under contract to the FDOT to perform all necessary and routine roadway maintenance, make minor repairs, and do any other work necessary to keep the roadway at the required standard level as specified in their contract. In recent years, this work has come to include providing equipment and personnel for a contraflow implementation if the roadway in their contract has an associated contraflow plan.

Availability of Law Enforcement and Other Personnel — There may not be enough troopers from the local FHP district to staff the contraflow plan. The local sheriff's office will handle evacuees at major intersections, and troopers will handle freeway interchanges; however, a contraflow operation may require out-of-area troopers to staff all these locations for each shift. Therefore, time is needed to put these out-of-area troopers in place before initiation of a contraflow operation. Also, out-of-area personnel may not have participated in the tabletop exercises for the contraflow plans and this may affect the implementation. Other concerns noted about availability were that personnel may have to take care of personal needs and be unable to perform the required services.

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Dependence on Contract Personnel — It is not clear whether a contract is in place for wrecker services or Road Rangers that would follow the same rotation and reinsertion process as the FHP uses to manage incidents or remain on standby status. Asset management contractors use subcontractors to complete much of the work and these personnel may not be prepared to assist in a contraflow operation.

Incident and Emergency Response along the Corridor — Stranded motorists (and possibly their pets) whose vehicles are inoperable need to be transported to some location so they can find shelter. It was noted that while the FDOT is responsible in large part for resolving contraflow operational problems, other agencies must also be involved, especially in emergency response. For instance, it was noted that the FDOH is supposed to have an ambulance plan for the contraflow route. Also, it was noted that it should not be the FDOT's responsibility to handle stranded motorists except to remove them from the contraflow route; finding them shelter must be the responsibility of the local resources at the end of the routes. This responsibility for removing stranded motorists from the contraflow route has been addressed in a chapter added to *The State of Florida Comprehensive Emergency Management Plan (CEMP)*, but this has not been widely publicized within the agency.¹ Another incident and emergency response concern relates specifically to the I-75 Alligator Alley plans. The highway shoulders and median are soft and usually saturated. If motorists attempt to get around a disabled vehicle or incident, they may become involved in a secondary incident or become disabled themselves.

Reinsertion of Response Personnel to Maintain Presence — The FHP will stage roaming troopers at SR 951 and SR 29 for incident management. These locations allow the troopers to enter the contraflow, handle an incident, and then return via another route so they can then be reinserted into the contraflow. While the above areas allow reinsertion of the emergency vehicles, the time it will take to reroute the vehicles is a concern.

Public Education and Information — A concern was noted that the public needs to be better educated on the ability of a contraflow to reduce evacuation traffic. Motorists need to understand that a contraflow is not a panacea that will remove all evacuation traffic. There is also a concern over the public perception that by implementing a contraflow route, evacuating traffic will be able to travel at the posted speed limit for that route.

Communications — During an evacuation, communications may be limited because cellular networks become overloaded. It was noted, however, that the problems with the cellular system that occurred during the last several hurricane seasons often occurred during or after the storm, so it is less likely to affect communications during a contraflow operation. The possible exception to this are the Alligator Alley plans because the area is not fully covered with cellular service.

¹ Florida Division of Emergency Management, *The State of Florida Comprehensive Emergency Management Plan 2004* (February 2004). Available online at <http://floridadisaster.org/documents/CEMP/floridaCEMP.htm>.

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Training Needs — Tabletop exercises provide an overview of the contraflow plan only.

Responder Knowledge and Plan Experience — This concern was brought up in several other areas, including the statement that out-of-area troopers are planned for use during implementation of a contraflow operation along Alligator Alley in the southbound direction, but these troopers are not the ones practicing the tabletop exercises. There is also concern that since the asset management contractors use subcontractors, these personnel groups may not be familiar with the plan.

Multiple Plans in Place Simultaneously — This was of major concern in the District 4 meetings, given that it has been indicated to them that if the I-75 Alligator Alley plan needs to be implemented, other areas — such as Okeechobee would also need to be evacuated. It may require contraflow operations to be implemented along such highways as I-75 northbound and Florida's Turnpike. If this were to occur, then already limited resources would be strained further.

Construction and Work Zone Impacts — During a state of emergency, construction or work zones are shut down in the affected areas. The need for equipment to supply a contraflow implementation may also require that equipment to be removed from construction or work zones not in the declared emergency area, and this would affect the zones' maintenance of traffic (MOT).

Other Risks — The current contraflow plan has termini at two interchanges, but it is unclear whether this is the best scenario. There is some discussion as to changing plan termini.

There are unofficial driveways for Miccosukee access that are to be blocked, according to the contraflow plans. This is to ensure there are no incorrect entries into the contraflow; but there is concern that motorists will attempt to drive around the barriers.

Rest area facilities may be overwhelmed because they have limited capacity.

There is consideration being given to the use of the recreation areas along Alligator Alley to stage tankers for emergency vehicle and responder refueling. This may cause problems with the public trying to access the tankers.



2.3 2006 Contraflow Workshop Risk Review

A contraflow workshop was held on February 14-15, 2006, in Orlando. Attendees included state transportation and law enforcement representatives along the eastern seaboard from Virginia to Florida, and on the Gulf coast from Alabama to Texas. Participants spoke about their states' contraflow plans, and those who had actually implemented contraflow operations spoke about lessons learned for the benefit of other workshop attendees. Below is a summary of risks to contraflow operations success commonly identified through the course of the participants' presentations.

Political Issues — Political issues are perceived as those having greatest impact and variability with respect to contraflow operations (and perhaps the least control by transportation, support, and law enforcement entities). Because approval for implementation is given by the Governor (with input provided by various emergency management and transportation entities), the initiation of a contraflow operation is seen in some ways as a politically motivated decision. There are clearly defined parameters — contraflow is limited to major (Category 4+) storms, the plan is only used during daylight hours, use is not intended to be long term, the plan is not used for reentry during storm recovery, et cetera. Still, there are fears that factors other than the engineering, technical, operational, or law enforcement aspects of a contraflow could cause undue pressures on state executive leadership and a contraflow might be initiated without meeting the specific conditions outlined in the contraflow plans. Early plan initiation is regarded as having negative safety impacts by increasing the risk of evacuees' high-speed driving and limited law enforcement abilities when forces are engaged elsewhere. Some states that have used contraflows in the past hold the perception that plan initiation may have been politically motivated rather than initiated based on plan criteria.

Political issues may also affect how many contraflow plans are run at one time, and there are fears that not staging the plans methodically could have unintended operational and staffing consequences, particularly at plan termini where vehicles resume normal operations and evacuees seek shelter. There are both intrastate and interstate coordination concerns regarding multiple plan implementations.

Communications (Public) — Previous storms now have a big impact on public behavior and official responses insomuch as the defined “Katrina effect,” or fear of being caught in the hurricane's high winds and storm surge, influences other evacuations. This was the case during Hurricane Rita. This phenomenon causes much higher numbers of actual evacuees than might previously have been anticipated; for example, in Texas' evacuation for Hurricane Rita, 1.2 million evacuees in 445,000 vehicles were expected, but 2.8 million in 1.7 million vehicles actually fled. Besides greatly increasing the time needed to ultimately clear the roadways, response resources were strained because so many more stranded vehicles, crashes, incidents, and medical emergencies occurred from the sheer numbers of evacuees.

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Public communication with the objectives of education and outreach before the storm; during an evacuation; and leading up to and through a contraflow implementation will have a tremendous impact on the public's ability to process information and make useful decisions. Without clear, concise, and understandable information, the public could have great difficulty dealing with the unfamiliar roadway conditions as motorists drive on the formerly wrong side of the roadway. The mix of residents and visitors; the language difficulties, and the lack of understanding or familiarity with the unique conditions associated with a contraflow operation can create real problems in running the operation smoothly.

Communications (Intra- and Interagency) — Communication among the many agency responders is a critical need during the planning and implementation of a contraflow. Without clear, concise communications and agreed-upon roles, protocols, and procedures, there are concerns that successful plan implementation will be jeopardized. Informing the various responding agencies about field conditions accurately and as close to real time as possible is critical as well, since these conditions are intended to be the main factor in calling for contraflow. In areas with limited monitoring ability (i.e., no roadside cameras or detection units) or where law enforcement and transportation management center (TMC) personnel are not collocated, there are concerns that a contraflow could be initiated without the requisite traffic conditions being present. This issue is broadened in areas where inter-District or interstate contraflow corridors exist because more responders and agencies need to be included in the communication process to allow for orderly evacuations.

Time Issues — Contraflow plans have predetermined times defined for setup, clearance, and the initiation of reversed flow for responder and motorist safety. Depending on what time a contraflow is planned to start, these time frames may be shorter than desirable. One of the most critical steps is having the FHP drive the reversed lanes on the contraflow route to verify that all equipment and personnel are in place and that all “normal flow” direction vehicles have cleared the roadway.

Another critical time is when emergency responders such as the FHP, Road Rangers, tow trucks, and FDOT personnel need to be pulled off the roadway for their own safety as wind speeds increase. If a contraflow is still in place, motorists will be left on the roadway at their peril from imminent storm conditions during a contraflow implementation with no emergency services. If a contraflow is halted prior to the time that emergency responders seek shelter for their own safety, there is still a chance that motorists will remain stranded, albeit on a normal-flow roadway.

Field Equipment and Resource Issues — Current plans have extensive manpower requirements in terms of law enforcement and other personnel. There are concerns that the number of responders needed to implement a contraflow per the plan may be unavailable to fully staff locations where and when they are needed. For example, if a contraflow exceeds one shift, relief personnel are needed that may not be accounted for. This concern is also valid if the termini of the contraflow corridors change (i.e., the route is lengthened) because additional manpower (and equipment) will be needed.

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Responders and evacuees need access to fuel, water, food, restrooms, first aid, and other items or supplies for their safety and comfort so that no one is stranded during the emergency.

There are concerns regarding ingress and egress points; with more points of access come more points of conflict, and possible delays associated with merging and diverging traffic movements. Since evacuees are likely to be in a mix of vehicles, there are also problems with allowing trucks, recreational vehicles (RVs), and cars pulling trailers on the reversed side of the roadway.

With the loss of the “normal” roadway direction, how incidents will be handled, how emergency vehicles will reach those in need of assistance, and how responder vehicles will be reinserted into the traffic stream (or sent back to an upstream location) are not clear. To minimize traffic impacts and keep the maximum lanes open for traffic flow, incidents must be managed quickly. Incidents are expected to happen, but given the emergency situation and the reversed lanes, decisions need to be made with respect to inoperable vehicles and their occupants: what happens to the vehicle, where are the occupants transported, what kinds of vehicles are needed for this transport, and what sheltering options are available? Road Rangers and other personnel may not be equipped to transport the public and, even if they do, where are they to go if shelters are not in close proximity?

Accurate, reliable, and timely traffic information is needed during the normal evacuation as well as prior to a contraflow both for managing the roadway and giving key decision makers the best information possible as agencies discuss and prepare for a contraflow implementation. Inconsistent instrumentation for ITS exists along Florida’s contraflow routes, with some areas completely lacking monitoring capability, hampering the ability to obtain current traffic conditions. Because ITS instrumentation may not occur for several seasons, agencies may need to look at temporary, innovative means to obtain traffic information and conditions with visual verification.

Preparation before hurricane season starts is critical so that dedicated traffic control equipment and permanent field equipment (i.e., flip-down signs, et cetera.) can be placed or replaced, and staff with location-specific checklists can go through the plans; otherwise, during emergency situations, errors may occur. Because a mix of fixed, static, and portable electronic signs are likely to be used, everyone involved needs to understand the operation.

Training Needs — Contraflow responders must understand all aspects of the plan to allow for safe, successful implementation. A contraflow is a unique, unusual, and somewhat unknown means to move large numbers of evacuees, and it is critical for emergency responders to have control of this situation because it requires driving behaviors that are counterintuitive.

Construction and Work Zone Impacts — Every year, construction projects on the Florida State Highway System (SHS) and their associated work zones change. New bottlenecks and lane restrictions could affect the success of contraflow plans along a route.

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Other Risks — Planning efforts prior to hurricane season are seen as critical for identifying contraflow issues for executive leadership, so concerns exist that this time period may not be used effectively for planning, modeling, education, decision making, and other needs. For example, known areas of congestion or bottlenecks should be identified, reviewed, and addressed to minimize congestion and operational problems during evacuations and contraflow operations. Leadership should also have a clear understanding of the times anticipated for normal and contraflow evacuations so that they may evaluate the benefits of initiating the plan and answering questions.



3. Mitigation Strategies in the Near and Long Term

3.1 Existing Contraflow Plans and Documentation Strategies

In preparing this report, the project team examined the FDOT contraflow plan documentation with the respective District personnel and their internal staff. This process helped identify particular mitigation strategies that should be implemented to lessen the impact of the contraflow risks outlined previously. This section divides these strategies into those that would be best implemented in the near term and others that should be pursued as long-term objectives.

3.1.1 Near-term Strategies

Condition Reporting — Because of the reliance in the plans for condition reporting on planned emergency personnel and aerial surveillance, a supplemental plan for the potential of nighttime operation needs to be developed.

Resource and Equipment Availability — Because of the heavy reliance on temporary devices such as portable VMS and cones, the Districts can either stockpile the devices themselves or require that their contractors do so. The contractors must be required contractually to make the devices available within prescribed time frames. There may be a premium imposed to do so; however, a contraflow cannot be implemented without these devices, so their availability is critical.

Availability of Law Enforcement and other Personnel — The contraflow plans rely heavily on the FHP, Road Rangers, FDOT staff, and others. With personnel resources stretched, schedules and assignments need to be drawn up prior to any storm event so that all know where, when, and for how long they will be deployed – and when relief will be provided.

Dependence on Contract Personnel — Contract personnel need to be available on a guaranteed basis, and this needs to be reinforced contractually.

Incident and Emergency Response along the Corridor — A collaborative plan between all parties involved in implementing the contraflow plans, including those responsible for the route and the termini, needs to be developed to ensure that adequate emergency response can be achieved in both the near- and long-term. (This may be a two-stage plan with law enforcement, emergency response, and transportation partners starting the effort, and others, such as the FDOH, involved in the longer term.)



Reinsertion of Response Personnel to Maintain Presence — Given the Alligator Alley contraflow route’s physical constraints due to the lack of exits and entrances, a means of rerouting deployed response personnel and a plan with a sufficient number of stand-by response personnel needs to be established and tested. Over the longer term, this should include identification of additional contracts for the extra personnel; a timing plan for release of these personnel into the flow of traffic; and a means of communication to relay when incidents occur and new personnel need to be sent to replace the original personnel.

Public Education and Information — With a contraflow being such an unusual event during the already stressful time of evacuation, additional public information and education efforts must be made to provide as much advance information as possible. Plan details need to be provided over different media, such as radio, television, and newspapers, well in advance of any storm or possible evacuation. Frequent updates and traffic conditions need to be provided during any evacuation to keep the information current.

Training Needs — The I-75 Alligator Alley contraflow plans rely on tabletop exercises to provide training for the responders. An actual “to-the-roadside” implementation of the contraflow routes, where all equipment and personnel are staged without actually being placed on the roadway, should be conducted routinely to identify any areas of concern with the plans and to ensure that responding personnel are properly trained in the full implementation of the contraflow plans.

Responder Knowledge and Plan Experience — Routine practices of full implementation of the contraflow plan on an annual to triennial basis, as well as annual tabletop reviews of the plans, should be required to ensure responders are familiar with them.

Construction and Work Zone Impacts — The I-75 Alligator Alley plans require the removal of portable VMS signs from construction/work zones in order to supply the needed equipment for a contraflow route. This removal may extend to areas beyond those in the declared emergency state. A stockpile of equipment should be purchased by the FDOT or other participating agencies to avoid the need to remove equipment from construction/work zones.

Other Risks — Trucks and other heavy vehicles should be limited to the normal traffic side of the roadway so that they do not interfere with reverse-flow traffic. The *SunPass*® lanes at the eastern plaza should be used because they have the best alignment and greatest width to accommodate trucks.² For a southbound evacuation, trucks should be limited to the normal lanes at the western plaza to avoid the toll lanes, and cars can use the *SunPass* lanes.

² SunPass is a registered trademark of the Florida Department of Transportation.



With the lane imbalance for a southbound evacuation at the contraflow terminus at U.S. Highway 27 in Broward County, consideration may be given to forcing contraflow traffic to exit onto U.S. Highway 27 and allowing only normal flow traffic to continue southbound. Traffic on U.S. Highway 27 could be forced south to access Griffin Road to continue heading east, for example. Unless this lane imbalance is addressed, the contraflow terminus will be congested as four lanes are reduced to two.

3.1.2 Long-term Strategies

Political Issues — Since the driving force behind a contraflow implementation will most likely be driven by political rather than engineering decisions, it is important that the requirements for the implementation of the plans be expressly understood by the person(s) responsible for declaring a contraflow. At a minimum, this information should include the absolute minimum time for the gathering and placing of personnel and equipment to safely operate the contraflow routes; the traffic volumes that can be expected to be moved using the contraflow routes; a realistic understanding of the flow speed for the route that can be expected; the time that it will take to clear the contraflow route as the plans now exist; and the potential issues that cannot be resolved without major reconstruction of the contraflow route.

Resource and Equipment Availability — Florida Department of Transportation Districts need to work with the FHP and fire rescue to ensure that vehicles are available for insertion at key locations.

Communications — The current communication plans rely on cellular service for communications between different agencies and upon the existing 800-megahertz (MHz) radio system for the FHP. Due to the remoteness of the I-75 Alligator Alley route, the cellular service is not always reliable. To ensure that communication remains available throughout the implementation of the I-75 Alligator Alley contraflow plan, a system that does not rely on cellular service should be developed. The FDOT is encouraged to continue pursuing authorization to utilize the existing law enforcement 800-MHz system. It is also recommended that this effort be expanded beyond just Road Ranger Service Patrols to include all FDOT contractors involved in the implementation of contraflow. This could reduce or even eliminate the need to rely on cellular services for those personnel involved in contraflow.

Multiple Plans in Place Simultaneously — There has been no consideration to date of the effects of multiple plan implementation. It is recommended that an analysis of the impacts on traffic flow, resources, and implementation timelines for multiple contraflow plans be done to identify any additional needs for such implementations. As a result the plans should be redesigned to accommodate the findings.



3.2 Florida Department of Transportation and Partner Agency Staff Interview Strategies

For this portion of the study, the project team interviewed the FDOT District personnel and those from partner agencies in conjunction with the review of contraflow plan documentation. The interviews produced additional areas of concern that are addressed in the mitigation strategies presented in this section.

3.2.1 Near-term Strategies

Management Issues — It was noted that an executive-level committee was supposed to have been established with multiagency involvement when the original plans were developed, but this committee has never been formed to the knowledge of the FDOT. It was suggested that this committee should be formed and better statewide leadership provided.

Condition Reporting — Currently, traffic conditions are reported by field personnel. The Fort Myers TMC is expected to open in December 2007 with field devices along Alligator Alley. The FHP will also make use of aircraft surveillance.

Resource and Equipment Availability — The asset management contractor needs to ensure that sufficient time is left for field equipment to be delivered because field devices may come from outside the evacuation area. One possible solution to the dependence on VMSs that is being implemented by District 4 is to place flip-down signs instead of portable VMSs and to reevaluate the placement of the permanent dynamic message signs (DMSs) to assist with contraflow needs. The placement of drop-down gates that are being deployed by the FDOT will help reduce personnel resource needs along the contraflow routes.

Availability of Law Enforcement and Other Personnel — Because there may not be enough local troopers, out-of-area troopers can be brought in to support the contraflow plan. However, these troopers need to be identified prior to any evacuation (which ones are assigned may vary depending on the storm's anticipated landfall), and they need to be brought into the area early with other resources.

Dependence on Contract Personnel — Any necessary contracts for Road Rangers and wreckers to guarantee the availability to manage incidents during a contraflow operation need to be executed prior to any evacuation.

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Incident and Emergency Response along the Corridor — Because there is a possibility that some evacuee vehicles will become inoperable, the *Florida CEMP* has been amended to state that local Districts need to find ways to deal with these stranded motorists and to get them to safe shelter. Details are left to be resolved locally and may include agreements with other state agencies, such as the Florida Department of Corrections (FDOC) and the Florida Lottery, for providing transportation.

Reinsertion of Response Personnel to Maintain Presence — The FHP will stage roaming troopers at SR 951 and SR 29 for incident management. These locations will allow troopers to enter the contraflow, handle an incident, and then return via another route where they can then be reinserted into the contraflow. While the above areas do allow reinsertion of emergency vehicles, there is a time that these vehicles will be out of service, so their insertion or reinsertion must be carefully timed and accounted for.

Public Education and Information — To assist in educating the public, the FDOT ITS and Incident Management sections have established a public Web site at www.OneWayFlorida.org. This will allow the public to view the contraflow routes and get information on how, when, and why they are implemented.

Also, the FDOT has purchased both CB Wizard Alert Systems and portable highway advisory radio (HAR) systems to assist in the dissemination of information to the public during a contraflow route implementation.

Responder Knowledge and Plan Experience — Because out-of-area personnel will probably be used during contraflow implementation, their involvement in preparation and training, particularly during tabletop exercises, is crucial.

Construction and Work Zone Impacts — During a state of emergency, construction and work zones in those areas are shut down. Equipment needed for contraflow implementation may require that the equipment be removed from construction or work zones not in the declared emergency area. To alleviate this, it was suggested that the FDOT stockpile equipment as it does for other emergency needs, such as replacement of damaged or lost signal heads at intersections.

Other Risks — Changes during an actual contraflow implementation that are driven by field conditions may be made by the FHP Incident Commander.

The unofficial Miccosukee access points need to be discussed with the Tribe to ensure they will be closed during plan implementation.

Portable toilets and other temporary facilities need to be removed from the declared emergency area prior to an evacuation to ensure adequate capacity at rest areas along the route.



3.2.2 Long-term Strategies

Logistical Issues — Because contraflow initiation may not go exactly as planned, agencies need to anticipate that contraflow will be called for with less-than-ideal times for staging and setup, and the agencies need to prepare early. Modeling and simulation efforts may provide some useful information with respect to times needed for setup and verification of roadway clearance before lanes are opened to reverse flow traffic.

Resource and Equipment Availability — A possible solution posed for the lack of portable VMS devices would be to have the FDOT purchase the VMS units needed for contraflow routes and remove them from construction MOT lists. This would allow the FDOT to supply the VMS devices to construction sites when they are needed and pull them for contraflow as required.

Availability of Law Enforcement and Other Personnel — In 2007, there will be 12 additional local troopers available to provide support. During conversation with the FHP in Broward County, it was noted that for any county where contraflow is committed to and expected to be performed, then it is necessary for the FHP, if called upon, to ensure that the troops in those areas are fully staffed.

Communications — Road Rangers are looking at switching to a statewide radio frequency for better, more reliable communications.

Training Needs — Step-by-step implementation plan timelines need to be included in tabletop exercises.

Multiple Plans in Place Simultaneously — Because multiple contraflow plans could be implemented simultaneously, sufficient resources (i.e., equipment and personnel) need to be planned for and properly placed prior to plan initiation.

Other Risks — Crossover operations need to be reviewed in modeling efforts; current and future termination points should also be reviewed since queues are expected to form. Proposed contraflow termini changes should be evaluated locally and then sent to the FDOT Central Office for dissemination to other involved agencies for review, comment, and incorporation.

3.3 2006 Contraflow Workshop Strategies

The following strategies were the result of the contraflow workshop held in February 2006, where participants from other states provided information regarding their contraflow plans and what they had learned through the implementation of these evacuation procedures. These strategies are expected to maximize Florida's contraflow success by mitigating risks that the conference participants noted in their presentations.



3.3.1 Near-term Strategies

Communications (Public) — Timely, reliable, and accurate information regarding evacuations, sheltering, traffic conditions, et cetera, is needed for dissemination to the public. To support safe and effective evacuations, workshop participants felt strongly that local instead of regional or statewide evacuations should be encouraged, an activity done in partnership with local emergency entities. Only those who are in evacuation zones should evacuate; others should shelter in place. Using public radio address systems and other media outlets to disseminate public information, as well as prepared press releases, flyers, communications plans, and advance educational materials, were seen as critical to educate and inform evacuees.

Communications (Intra- and Interagency) — Because many agencies need to work together during an evacuation or a contraflow, the most accurate field conditions for information dissemination are needed. Agencies need to communicate clearly and frequently before, during, and after an evacuation. There may even be intra- and interstate communications needed. This is both a near-term and a long-term objective.

Time Issues — Contraflow plans have predetermined times for planning, preparation, and activation. Workshop participants said they strive to prevent these times from being changed for the sake of expediency so that there is sufficient time to set up, clear reversed lanes, and perform other plan activities. Contraflow personnel prefer as much advance notice as possible for implementation, as well as a clearly designated end for the contraflow operation before the onset of tropical storm-force winds.

Training Needs — For maximum familiarity and the opportunity to address unforeseen conditions, tabletop and field exercises are needed annually with the participation of all contraflow responder agencies.

Construction and Work Zone Impacts — From one year to the next, roadway conditions change due to construction and other issues. Bottlenecks and detours need to be identified every year so they can be dealt with and addressed prior to contraflow.

Field Equipment and Resource Issues — First aid, water, food, fuel, and restroom stations along the contraflow route need to be established for field personnel and evacuees because access to resources will be restricted. Responders needed to have defined shifts with known times of relief.

To allow for smoother flow, some vehicle restrictions will be necessary for the contraflow lanes (e.g., no trucks, RVs, or trailers). Limited ingress and egress from the contraflow side exits is also necessary to minimize bottlenecks and other conflicts.



Because one side of traffic will have little to no guide or information signs, general service information may be placed on the back of guide signs for the contraflow direction to show access to food, fuel, restrooms, and other facilities. The backs of signs can also provide information on access to exits, other guidance, and rest areas. Unique signing and pavement markings for the evacuation routes were also seen as potentially helpful.

3.3.2 Long-term Strategies

Political Issues — Because the decision to initiate contraflow is ultimately made by a political body, workshop participants were nearly universal in their recommendation that decisions be made as early as possible to allow field and traffic conditions to dictate plan initiation. A schedule-based rather than response-based plan was seen as most effective and workable. There was a strong desire to have agreement not to implement contraflow before traffic conditions warranted to avoid such risks as high-speed driving and limited enforcement capability.

Workshop participants recognized that contraflow might need to be run during less-than-ideal or planned conditions, given changing circumstances; however, they also expressed the need for agreement and acceptance regarding the designated end of contraflow before the onset of tropical storm-force winds.

Interstate coordination to manage evacuees and phase efforts is needed between state executive offices because some plans cross state lines. Contraflow loading procedures can be made more successful through better coordination between states and regions where phased evacuations better use resources.

Field Equipment and Resource Issues — Workshop participants recognized how manpower intensive contraflow operations are, and suggested using equipment and automation to reduce staffing requirements. For example, gates to restrict movements could be used instead of personnel and vehicles; and field monitoring equipment, such as cameras and other automation using ITS equipment rather than staff, could report accurate field conditions to the TMC. Aerial surveillance was also recommended where possible. (These are long-term concepts, though some are being accomplished in the near term.)

For incident response, service patrol vehicles need to continue to find reinsertion points in the one-way traffic stream. The service patrols can handle minor incidents and repairs so that law enforcement is available for other tasks along the route. This is a near-term strategy for the I-75 Alligator Alley route, and a long-term strategy for the state's other contraflow routes.

Other Risks — Corridor clearance times, developed from modeling and firsthand knowledge of normal and contraflow conditions, need to be identified for executive leadership. This should be done before the onset of a hurricane so management has a clear understanding of contraflow impacts and may compare shortened evacuation times with the loss of a normal-direction corridor.



4. Conclusion

This document identifies risks to contraflow success and strategies to overcome these risks, based upon the considerable time and effort the FDOT and its partner agencies have expended over the last few years in preparing viable contraflow plans and through such activities as:

- Annual review and refinement of existing contraflow plans
- Annual tabletop exercises with involved partners
- National contraflow workshop participation to solicit best practices from other states' contraflow experiences
- Addressing areas where new contraflow plans may be warranted
- Deploying various devices to help make implementation of contraflow easier and less personnel intensive, such as drop-down gates on ramps and exit numbers applied to the pavement at interchanges.

While all this effort has improved the ability of the state to implement contraflow, there are still non-engineering related areas that the FDOT can focus on for improvement. Most of these areas can be classified as logistical issues and include:

- Improving the timing relationship between the activation of a contraflow, i.e. “pulling the trigger,” and the storm path so that there is less likelihood of implementing an ineffective or unneeded contraflow
- Improving the communications on an ongoing, day-to-day basis between all the agencies who respond during an evacuation and contraflow implementation

The risks and mitigation strategies derived from the focus areas have been broken into near-term and long-term categories. Some strategies can be implemented immediately; others will require commitment of resources, money, or time; they may even require agreements between agencies. Nonetheless, the strategies provide a foundation for discussion between the FDOT Central Office and District operational staff involved in evacuations. The FDOT may then determine which strategies to pursue concurrently with other agencies, as appropriate, to minimize as many risks as possible for the time when a major hurricane or other emergency threatens a significant portion of Florida's population and contraflow is implemented on the state's highways.