Hard Shoulder VS. Contraflow for Hurricane Evacuation

presented by
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Florida DOT analyzed hurricane evacuation strategies on I-75 and I-10 corridors.

The two evacuation strategies are:

1. Shoulder use for Emergency Operations – this allow evacuating vehicles to access the shoulders for through movements (all day)
2. One Way Operations – this is contraflow and allows vehicles to access lanes dedicated to the opposite direction of traffic (during daylight hours)
Illustrations of different evacuation operations.

1. Outside Shoulder Running
2. Inside Shoulder Running
3. Both Shoulder Running
4. Contraflow
Study Objectives

• Determine traffic demand from Shoulder Use for Emergency Operations and One Way Operations hurricane evacuation mitigation strategies for Florida.

• Through travel demand modeling effort develop volumes for inputs into more detailed traffic operation comparisons using microsimulation models.
• Phase 1: estimate evacuation traffic departing the Tampa Bay region (Pinellas, Hillsborough, Manatee, and Pasco Counties) heading north, along I-75 from SR 44 to the Stateline.

• Three scenarios: Inside Shoulder Running, Both Shoulder Running, and Contraflow were tested.

• Contraflow from SR 44 to Stateline with no contraflow egress until US-90.
Phase 2: estimate evacuation traffic departing the North Florida region (Duval, Nassau, Clay, Baker, St. Johns, and Flagler Counties) heading west, along I-10 from SR 23 to I-75, and along I-75 from I-10 to the Stateline.

Two Scenarios: Outside Shoulder Running, and Contraflow were tested.

Contraflow has no egress from SR 23 to I-75.
Two models were used for the travel demand modeling analysis portion of the evacuation study.

• Transportation Interface for Modeling Evacuations (TIME) Model

• Florida Statewide Model
• Traditional Four Step Evacuation Model

• Use Dynamic Traffic Assignment to estimate evacuation traffic on the subarea regional level
• TIME loaded network coverage on Tampa Bay region

• Only evacuation traffic is estimated by TIME - No background traffic

• I-75 evacuation traffic for 2017 was interpolated from TIME 2015 and 2020.
• TIME loaded network coverage on North Florida region

• Same as I-75, only evacuation traffic is estimated by TIME.

• I-10 evacuation traffic for 2017 was interpolated from TIME 2015 and 2020.
• 8,519 Internal Florida TAZs

• Other US TAZs
  • GA/AL – 594
  • All others – 185
• Added ‘special’ evacuation TAZs to the Statewide model to load the total evacuation traffic (estimated from TIME model) at:
  • the I-75 Northbound traffic before SR 44.
  • the I-10 Westbound traffic before SR 23.

• Assigned evacuation traffic to destination TAZs using gravity model.

• Adjusted Statewide model network for Shoulder Use for Emergency Operations and One Way Operations.

• Statewide model trip assignment for background and evacuation traffic.
Shoulder Running Pinch Points

- I-75 Pinch Point Location
  - NW 23rd Avenue – 6’8”

- I-10 Pinch Point Location
  - Forest Road bridge – 8’5”
  - CR 123 – 8’9”

Photo at I-75 & NW 23rd Avenue
• Capacity was lowered at the upstream locations (0.5 miles) of pinch points.
Assign Evacuation Traffic

- Based on previous studies, most of the evacuating population go to friends and relatives, with the next percentage seeking a hotel/motel. A range of 5-10% of the evacuating population might seek public shelter.

- Evacuation traffic was assigned to have three trip purposes in this study:
  - 10% evacuation trips go to Shelters
  - 40% evacuation trips go to Hotel/Motel
  - 50% evacuation trips go to Friend & Family
Shelters

- Shelter locations and capacity along I-75 and I-10 were taken from the TIME model database.
- Evacuation trips were manually assigned to the Shelter TAZs (Only shelters highlighted in red colors were used.) along I-75 and I-10.
I-75 Friend & Family and Hotel Trips

- I-75 Friend & Family and Hotels evacuation trip destinations were estimated separately using gravity models.

- The figure shows the number of I-75 evacuation Friend & Family and Hotel trips to TAZ locations.
• The percentages of I-75 evacuation Friend & Family and Hotel trips to main areas.
• I-10 Friend & Family and Hotels evacuation trip destinations were estimated separately using gravity models
• The figures show the number of I-75 evacuation Friend & Family and Hotel trips to TAZ locations
The percentages of I-10 evacuation Friend & Family and Hotel trips to main areas.
Hourly factors were used to factor daily volumes into hourly volumes. The figure shows yearly average hourly factors from a continuous count station on I-75.
Katrina Hourly Factors

Katrina Hourly Factor

- Saturday, August 27, 2005
The adjusted hourly factors (in orange color) for evacuation were developed from hourly factors from the Katrina evacuation and the continuous data site.
Similar diversion pattern of I-75 evacuation traffic from Shoulder Use for Emergency Operations and One Way Operations

Slightly higher diversion traffic from One Lane Shoulder Running scenario
For I-10, there is higher diversion traffic from One Lane Shoulder Running scenario, compared to Contraflow scenario.
### I-75 Results (Shoulder Running)

#### I-75 Three NB General Lanes and Inside Shoulder Running Lane

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I-75 Results (Shoulder Running)

I-75 Northbound Volume Profile at 5 Highest Volume Segments
I-75 Three NB General Lanes and Inside Shoulder Running Lane

I-75 Northbound Volume Profile at 5 Highest Volume Segments
I-75 Three NB General Lanes and Both Inside and Outside Shoulder Lanes

Capacity for NB GP lanes
Capacity for NB GP lanes with inside shoulder lane
Capacity for NB GP with both inside and outside shoulder lanes
## I-75 Results (Contraflow)

### I-75 SOUTHBOUND Lanes for NB Traffic

|                  | 0:00 | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 |
|-----------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CR 143 to CR 234|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 224 to SR 142|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 26 to SR 48  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 441 to SR 142|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CR 234 to SR 142|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 44 to CR 234 |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 22 to SR 326 |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 27 to SR 326|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CR 34 to SR 20  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 20 to US 23  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 9 to SR 142  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 17 to SR 23  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 14 to SR 23  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 12 to SR 17  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 10 to SR 12  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 8 to SR 10   |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 6 to SR 8    |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |

### I-75 NORTHBOUND (Background and Evacuation)

|                  | 0:00 | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 |
|-----------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CR 44 to SR 200 |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CR 484 to SR 200|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 200 to SR 40 |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 40 to US 27  |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 27 to SR 326 |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 326 to CR 318|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CR 318 to CR 234|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CR 234 to SR 318|      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 90 to I-10   |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I-10 to SR 136  | 456  | 453  | 465  | 444  | 468  | 455  | 428  | 451  |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 136 to US 129| 456  | 453  | 465  | 444  | 468  | 455  | 428  | 451  |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| US 129 to SR 6  | 456  | 453  | 465  | 444  | 468  | 455  | 428  | 451  |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| SR 6 to CR 143  | 456  | 453  | 465  | 444  | 468  | 455  | 428  | 451  |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CR 143 to State Border| 456  | 453  | 465  | 444  | 468  | 455  | 428  | 451  |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |

**Note:** The table provides travel times for various routes and points along I-75, indicating the contraflow lanes for northbound traffic. The times are in minutes and are subject to change based on traffic conditions.

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**I-75 NORTHBOUND:**
- CR 143 to SR 244
- SR 244 to US 129
- US 129 to SR 6
- SR 6 to CR 143
- CR 143 to State Border

**I-75 SOUTHBOUND:**
- CR 44 to SR 484
- CR 484 to CR 200
- SR 200 to SR 40
- SR 40 to US 27
- US 27 to SR 326
- SR 326 to CR 318
- CR 318 to CR 234
- CR 234 to SR 318
- SR 318 to SR 24
- SR 24 to SR 26
- SR 26 to SR 222
- SR 222 to SR 222
- SR 222 to US 441
- US 441 to CR 484
- CR 484 to SR 200
- SR 200 to SR 40
- SR 40 to US 27
- US 27 to SR 326
- SR 326 to CR 318
- SR 318 to SR 24
- CR 234 to SR 142
- SR 142 to US 129
- US 129 to SR 6
- SR 6 to CR 143
- CR 143 to State Border
I-75 Results (Contraflow)

Capacity for NB GP lanes

Capacity for SB Contraflow lanes
IRMA

abcNEWS

HURRICANE IRMA
FORECAST PATH

Thu 8:00AM
160 mph

Fri 8:00AM
155 mph

Sun 8:00AM
145 mph

Tampa
Miami
Bahamas
Cuba
Dominican Republic
Puerto Rico
St. Martin

HURRICANE WARNING

Hurricane Watch

Wed 8:00AM
175 mph
Volume and Speed Before Evacuation

- Count Station Number: 360317
- I-75 Northbound
- 3 Directional Lanes
- Traffic Volume and Speed on Monday, 9/4/2017
Volume and Speed During Evacuation

- Count Station Number: 360317
- I-75 Northbound
- 3 Directional Lanes
- Traffic Volume and Speed on Friday, 9/8/2017
Volume and Speed During Evacuation

• Count Station Number: 360317
• I-75 Northbound
• 3 Directional Lanes
• Traffic Volume and Speed on Saturday, 9/9/2017
Future Possible Improvements

• Deploy traffic counts and Bluetooth data collection devices and collect the data at the same time during the actual hurricane evacuation.

• Improve evacuation model tools:
  – Improve model tools for estimating the evacuation volume at statewide level.
  – Improve O-D estimation for evacuation traffic trips for different hurricane scenarios.
Thanks!

time for questions