# Florida Department of Transportation

### Road Capacity and Shoulder Enhancements February 27, 2012

## Brian Wolshon, Ph.D., P.E., PTOE

- Professor of Civil Engineering Louisiana State University
- Founded and chair the Transportation Research Board of the National Academies' Task Force on Emergency Evacuation
- Founded and serve as the Director of the USDOT sponsored Center for Evacuation and Transportation Resiliency at LSU
- Conduct research for numerous federal and state agencies and national Laboratories, including the National Science Foundation, United States Department of Transportation (USDOT), United States Department of Homeland Security (DHS), Sandia National Laboratories, etc.

### Maximum Sustainable Evacuation Traffic Flow Rates

- The anticipated highest vehicle flow rates that can be practically sustained over an extended period of time during an evacuation event
- Although Maximum Sustainable Evacuation Traffic Flow Rates are similar to the "capacity" of the road segment, they are quite different
- They vary by segment and will also vary based on specific conditions that exist at the time of the event

## Why Are They Recommended?

- Research shows that flow rates recorded during evacuations were lower than those expected from Highway Capacity Manual calculation methods
- Evacuation traffic flows consistently peak at rates below HCM "capacity," then flow further decreases to a level that is sustained for 6 to 8 hours or more
- Based on this, the use of HCM-based capacity values will yield unrealistically high rates of flow in simulation modeling

## Why Are They Recommended?

- These flow rates are also consistent with the highest flow rates recorded during recent evacuations of the Keys and the other peak traffic periods
- These flow rates may further be decreased by other inevitable congestion within the network as well as operations at night and under adverse weather conditions
- Use of higher than these sustainable flow rates will also likely result in clearance times that are not realistically achievable

## **Temporal Evacuation Demand**

- Traffic counter data is consistent with findings of behavioral research that suggests that the vast majority of evacuees tend to travel during daylight hours, regardless of when an evacuation order is issued
- Typically, traffic volumes increase steadily from 6:00am to a peak in the early to mid afternoon
- After a drop to a sustainable rate of flow, high travel demand continues into the mid- to late-evening, when volumes drop significantly around 10:00pm to 11:00pm and remains low during the overnight hours

### Joaquin Vargas, P.E.

- BSCE and MSCE (Transportation/Traffic Engineering)
- 25 Years Practicing Traffic Engineering in South Florida, Including the Florida Keys
- Conducted Hundreds of Traffic Studies in the Florida Keys
- Expert in Hurricane Evacuation Analysis
- Developed 2001 Florida Keys Hurricane, (including the development of the hurricane model), Co-Authored the Development of the MSEFR, Developed Evacuation Plan for US 1 in Florida City for Florida's Turnpike One-Way Hurricane Plan
- Introduced the Speed-Based Methodology For Traffic Analysis in the Florida Keys Has been the traffic standard for the past two decades in Monroe County

11. C.	Milemarkers			Year 2,010	Suggested Maximum Sustainable
Area	From	То	Location/Description	Configuration	Evacuation Flow Rate per your per Lane
Lower Keys	2.0	4.0	Key West to Stock Island	4L	900
Lower Keys	4.0	9.0	Stock Island to Big Coppitt Key	4LD	900
Lower Keys	9.0	17.0	Big Coppitt Key to Sugarloaf Key	2L	1,100
Lower Keys	17.0	22.0	Sugarloaf Key to Cudjoe Key	2L	1,100
Lower Keys	22.0	24.0	Cudjoe Key to Summerland Key Cove Airport	2L	1,100
ower Kove	24.0	25.0	Summerland Key Cove Airport to Summerland Key	31	1 100
Lower Keys	25.0	30.0	Summerland Key to Big Pine Key	21	1,100
Lower Kove	30.0	34.0	Big Pine Key to West Summerland Keys	21	1,100
Lower Keys	34.0	35.2	West Summerland Keys to Spanish Harbor Keys	2L	1,100
Lower Keys	35.2	36.5	Spanish Harbor Keys to Bahia Honda Bridge	4LD	1,100
Lower Keys	36.5	37.5	Bahia Honda Bridge to Bahia Honda Key	2L	1,100
Middle Keys	37.5	47.0	Bahia Honda Key to Hog Key	2L	1,200
Middle Keys	47.0	48.0	Hog Key to Boot Key	2L	1,100
Middle Keys	48.0	50.2	Boot Key to Marathon	4L	900
Middle Keys	50.2	50.8	Marathon to Marathon Shores	5L	900
Middle Keys	50.8	54.0	Marathon Shores to Key Colonial Beach	4LD	900
Middle Keys	54.0	54.5	Key Colonial Beach to Deer Key	4LD	900
Middle Keys	54.5	58.0	Deer Key to Grassy Key	2L	1,100
Upper Keys	58.0	74.0	Grassy Key to Matecumbe Harbor	2L	1,100
Upper Keys	74.0	80.0	Matecumbe Harbor to Teatable Key	2L	1,100
Upper Keys	80.0	83.5	Teatable Key to Islamorada	3L	1,100
Upper Keys	83.5	85.6	Islamorada to Windley Key	2L	1,100
Upper Keys	85.6	90.0	Windley Key to Plantation Key	2L	1,100
Upper Keys	90.0	100.0	Tavernier Key to Newport Key	4LD	900
Upper Keys	100.0	105.0	Newport Key to Sexton Cove	4LD	900
Upper Keys	105.0	106.3	Sexton Cove to Rattlesnake Key	4LD	900
Upper Keys	106.3	126.5	Rattlesnake Key to Card Sound Rd	2L/4L	1,200
South Dade	126.5	HEFT	Card Sound Rd to HEFT	4LD	900
Upper Keys	106.3	Int CR 905 / CR 905 A	Lake Surprise to Crocodile Lake	2L	1,100
Upper Keys	Ocean Reef	Int CR 905 / CR 905 A	Tanglefish Key to Crocodile Lake	2L	1,100
Unner Kevs	Int CR 905 /	US 1	Crocodile Lake to South Miami-Dade	21	1 100

### LEGEND

2L Two-lane facility

- 2L/4L Two lanes with short four-lane sections for passing purposes
  - 3L Three-lane facility (center lane is a two-way left-turn lane)
  - 4L Four-lane undivided facility
- 4LD Four-lane divided facility
- 5L Five-lane facility (center lane is a two-way left-turn lane)

### **Results of Maximum Sustainable Evacuation Traffic Flow Rates**

900 to 1,200 vehicles per hour per lane

### **Recommended Flow Rates**



## **History of Roadway Improvements**

- 2001 Florida Keys Hurricane Evacuation Study (Joint Effort – Steering Committee)
  - Monroe County Commission and Monroe County Staff
  - Florida Division of Emergency Management
  - Florida Department of Transportation
  - Florida International University
  - US Army Corps of Engineers
  - Two Consulting Firms (Miller Consulting, Inc. & Vanasse-Hangen-Brustlin)
- 2001 Roadway Network Not Capable of Safely Evacuating the Florida Keys
- Requires Additional Hurricane Evacuation Capacity

### **History of Roadway Improvements**



### **Completed and Funded Projects**



## Five (5) Year Work Program



2013-2017 TENTATIVE FIVE YEAR WORK PROGRAM (Monroe County)

### Resolutions

### Monroe County BOCC Passed Resolution 475-2008 supporting a northbound shoulder width no greater than 4 feet from MM 93 to MM106

A RESOLUTION OF THE MONROE COUNTY BOARD OF COUNTY COMMISSIONERS REQUESTING THE FLORIDA DEPARTMENT OF TRANSPORTATION REVISE THE FIVE YEAR WORK PROGRAM AS IT PERTAINS TO MILLING AND RESURFACING OF US HIGHWAY 1 FROM MILE MARKER 93 TO 106 REDUCING THE PROPOSED NORTH BOUND SHOULDER TOTAL WIDTH TO NO MORE THAN FOUR 4 FEET OR MATCHING THATOF THE SOUTHBOUND PROPOSAL

- City Commission of Key West Passed Resolution 08-13 Supporting FDOT's Improvements from MM 93 to MM 106 for 10 foot shoulders
- The Department is Awaiting Results of Working Group Regarding Shoulder Improvements in the Upper Keys

### Seat-belts save lives, WEAR THEM!