



# TRANSPORTATION SYMPOSIUM

2019

## Operational Impacts of Managed Lane Design

Jennifer Fortunas



**Managed Lanes  
Update**



**Managed Lane  
Networks**



**Operational  
Effects of  
Design**



# MANAGED LANES UPDATE

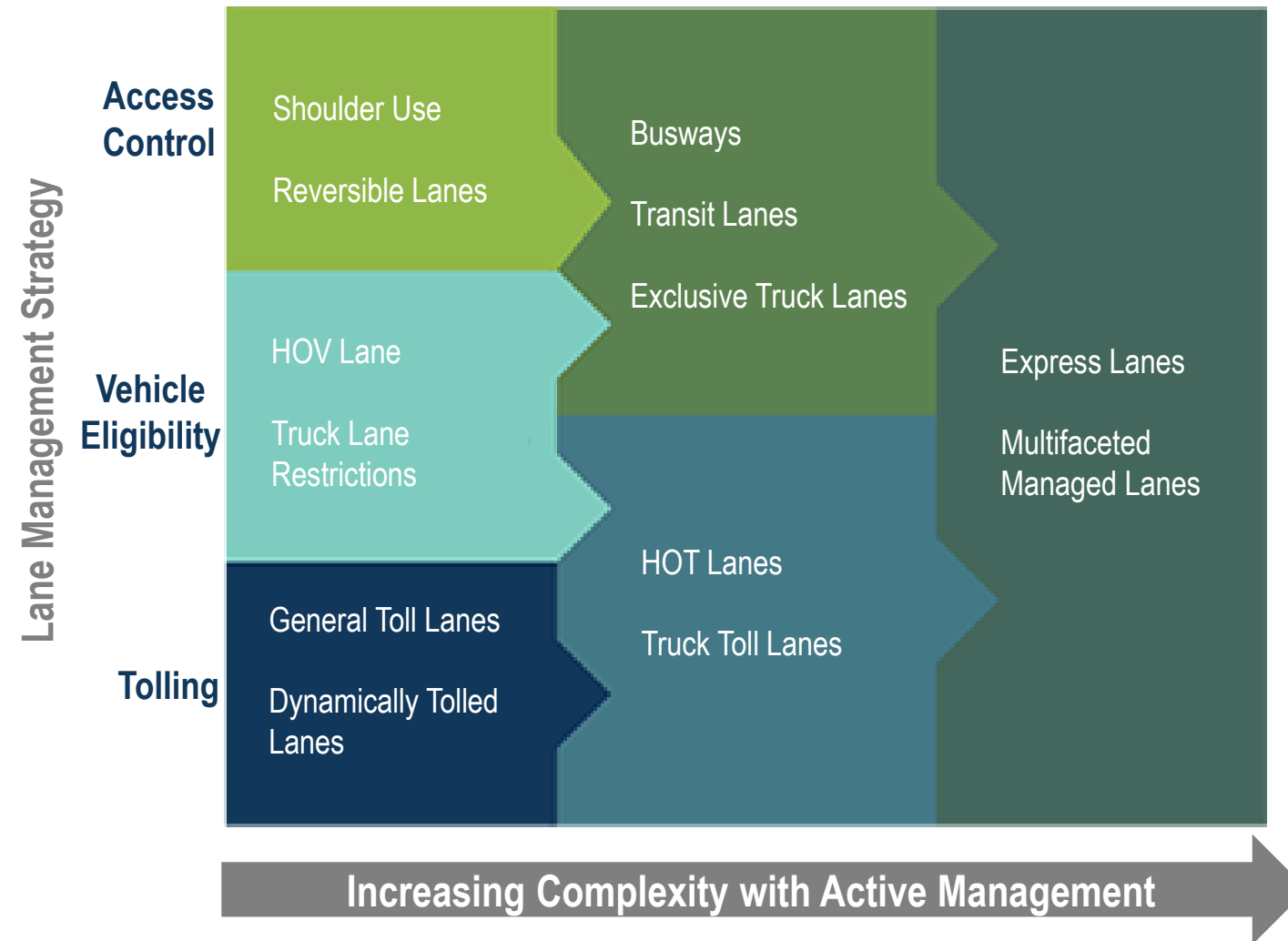
# Managed Lanes

- When evaluating capacity projects for limited access facilities on the SHS, evaluate an alternative that includes **managed lanes**
- Managed Lanes are a TSM&O solution where highway facilities or sets of lanes within an existing highway facility use **management strategies** to provide congestion relief



**Dynamically tolled Express Lanes are  
no longer the only type of Managed  
Lanes allowed**

# Management Strategies



# Managed Lanes Management Strategies





# Choose the Right Solution for the Corridor

What is the congestion profile of the corridor?

What is the expected demand for managed lanes?

What will it cost to manage the system?

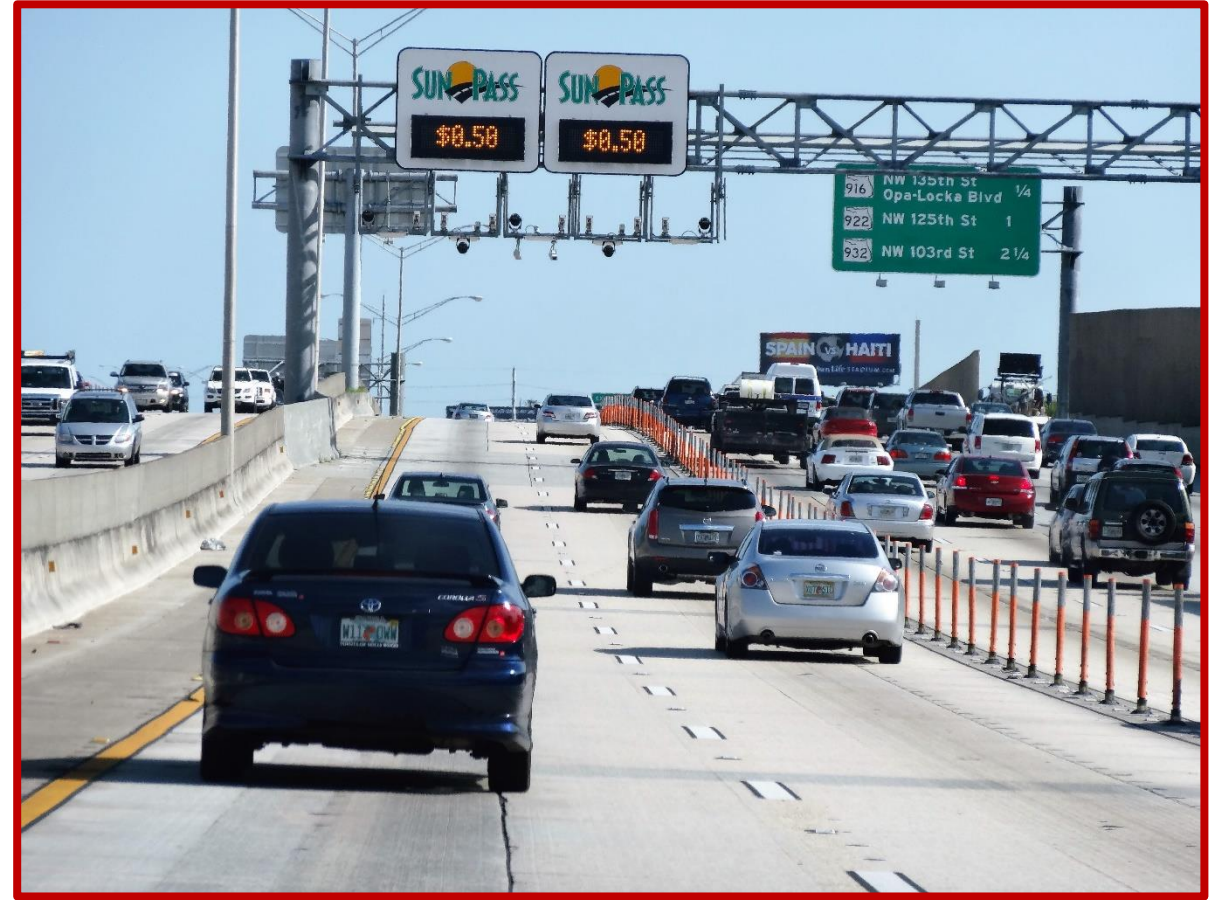
Does the corridor serve transit/freight activity?

**What is the performance objective?**



# Express Lanes

- When tolling is used, the managed lane is an **Express Lane**
- **Tolling Strategies**
  - Static
  - Time of Day (TOD)
  - Dynamic
- Express Lanes are
  - A Type of Managed Lane
  - Tolls May Vary
  - Limited Entrance / Exit Locations
  - Supports Longer Trips





Facility	Project Limits	District	Open to Traffic / Construction End Date	Begin Tolling	Prior to FY 2018	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022			
						17-Jul	17-Oct	18-Jan	18-Apr	18-Jul	18-Oct	19-Jan	19-Apr	19-Jul	19-Oct	20-Jan	20-Apr	20-Jul	20-Oct	21-Jan	21-Apr	21-Jul	21-Oct	22-Jan	22-Apr
						Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Veterans Express	Gunn Highway to Sugarwood Mainline Plaza	FTE	12/9/2017	Summer/Fall 2019			●							T											
Veterans Express	Sugarwood Mainline Plaza to Van Dyke Road	FTE	5/23/2018	Summer/Fall 2019					●					T											
75 Express	I-595 to NW 170th Street (Segments A - E)	D4	3/24/2018	Summer/Fall 2019				● S							◆										
75 Express	NW 170th Street to Palmetto Express	D6	Summer/Fall 2019	Summer/Fall 2019										●	◆										
SR 826 / Palmetto Express	W Flagler Street to NW 154th Street	D6	Summer/Fall 2019	Summer/Fall 2019										●	◆										
295 Express	West Beltway from I-95 to Buckman Bridge	D2	5/18/2019	5/18/2019									● T												
295 Express	East Beltway from JTB Blvd to SR 9B	D2	Fall 2019	TBD											● T										
Beachline Express	I-4 to Turnpike Mainline	FTE	7/9/2019	TBD										●											
Beachline Express	Turnpike Mainline to McCoy Road	FTE	7/9/2019	TBD										●											
HEFT Express	SR 874/Don Shula Expressway to US 1/Caribbean Blvd	FTE	Summer/Fall 2019	TBD										●											
HEFT Express	US 1/Caribbean Blvd to SW 288th Street/Biscayne Drive	FTE	2022/2023	TBD																					●
HEFT Express	SR 874/Don Shula Expressway to SR 836/Dolphin Expressway	FTE	2022/2023	TBD																					●
595 Express	I-75 to Turnpike Mainline	D4	3/36/2014	4/9/2014	● ◆																				
95 Express	Phase 1: SR 112 / SR 836 / I-395 to SR 826 & Turnpike Mainline	D6	NB: 12/2008; SB: 1/2010	NB: 12/2008; SB: 1/2010	● ◆																				
95 Express	Phase 2 Segment 2: SR 825 & Turnpike Mainline to Ives Dairy Road	D4 & D6	NB: 4/2016; SB: 5/2016	Spring/Summer 2019	● ◆																				
95 Express	Phase 2 Segment 3: Ives Dairy Road to Broward Blvd	D4	4/1/2015	Spring/Summer 2019	● S								T												
95 Express	Phase 3A-1: Broward Blvd to Commercial Blvd/SR 870	D4	Summer 2020	TBD													●								
95 Express	Phase 3A-2: Commercial Boulevard/SR 870 to SW 10th Street	D4	Fall 2019	TBD											●										
95 Express	Phase 3B-1: SW 10th Street to Glades Road	D4	Summer 2021	TBD																	●				
Turnpike Mainline	Northern Coin from W Osceola Parkway to SR 528	FTE	Summer 2021	TBD																	●				
I-4 Express	SR 434 to Kirkman Road (Ultimate)	D5	Spring/Summer 2022	TBD																					●
275 Express	Gandy Blvd to North of 4th Street (TBNext Section 2)	D7	Fall 2021	TBD																		●			

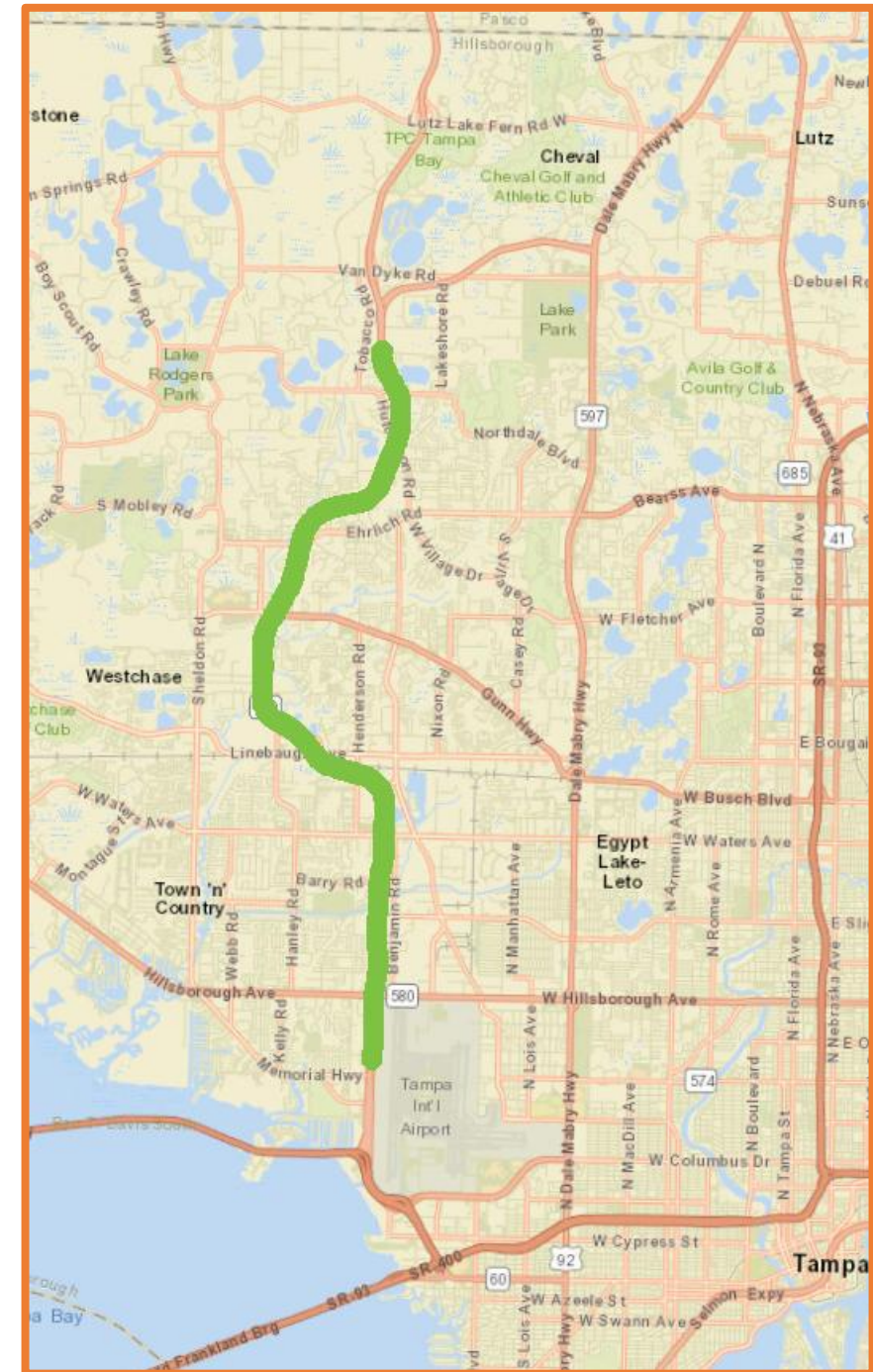
#### LEGEND

- Open to Traffic
- S Begin Static Tolling
- T Begin Time of Day Tolling
- ◆ Begin Dynamic Tolling

# MANAGED LANE NETWORKS

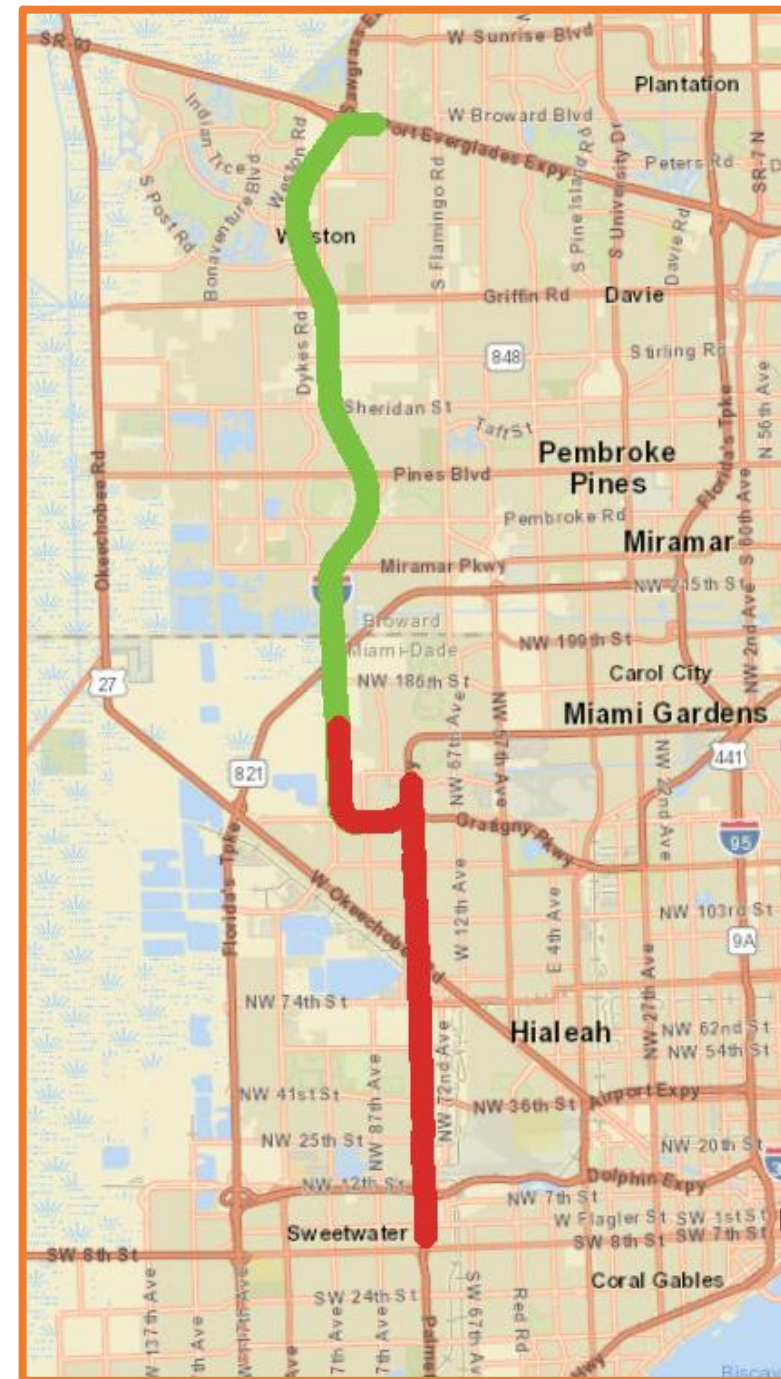
# Veterans Express

- Gunn Highway to Sugarwood Mainline Plaza
- Sugarwood Mainline Plaza to Van Dyke Rd
- Open – General Toll Amount
- Summer/Fall 2019 – TOD Toll



# 75 & Palmetto Express

- **75 Express: Open – Minimum Toll**
  - I-595 to NW 170th Street (Segments A - E)
- **75 & Palmetto Express: Opens Fall 2019**
  - 75 Express: NW 170th Street to Palmetto Express
  - Palmetto Express: W Flagler Street to NW 154th Street
- **Fall 2019 – Dynamic Toll**





# 95 Express

- **Phase 1 & Phase 2 Segment 2: SR 112 / SR 836 / I-395 to Ives Dairy Road**
  - Open – Dynamic Toll
- **Phase 2 Segment 3: Ives Dairy Road to Broward Boulevard**
  - Open – Minimum Toll
  - Summer 2019 – TOD Toll



# 295 Express

- West Beltway: I-95 to Buckman Bridge
  - Opened May 18, 2019 – TOD Toll
- East Beltway: JTB Blvd to SR 9B
  - Opening Fall 2019 – TOD Toll



Florida Department of Transportation

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For Immediate Release  
May 13, 2019

Contact: Tracy Hisler-Pace, (386)758-3714  
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**FDOT Announces New Congestion Relief for I-295 in Jacksonville**  
*Express Lanes scheduled to open on May 18; 'time of day' tolling to be implemented.*

**Jacksonville, Fla.** –The Florida Department of Transportation (FDOT) announced that the much-needed Interstate 295 Express Lanes from Interstate 95 to the Buckman Bridge in Jacksonville are scheduled to open on May 18.





# Managed Lanes Statewide



**In Operation** – 60 miles



**Construction** – 120 miles



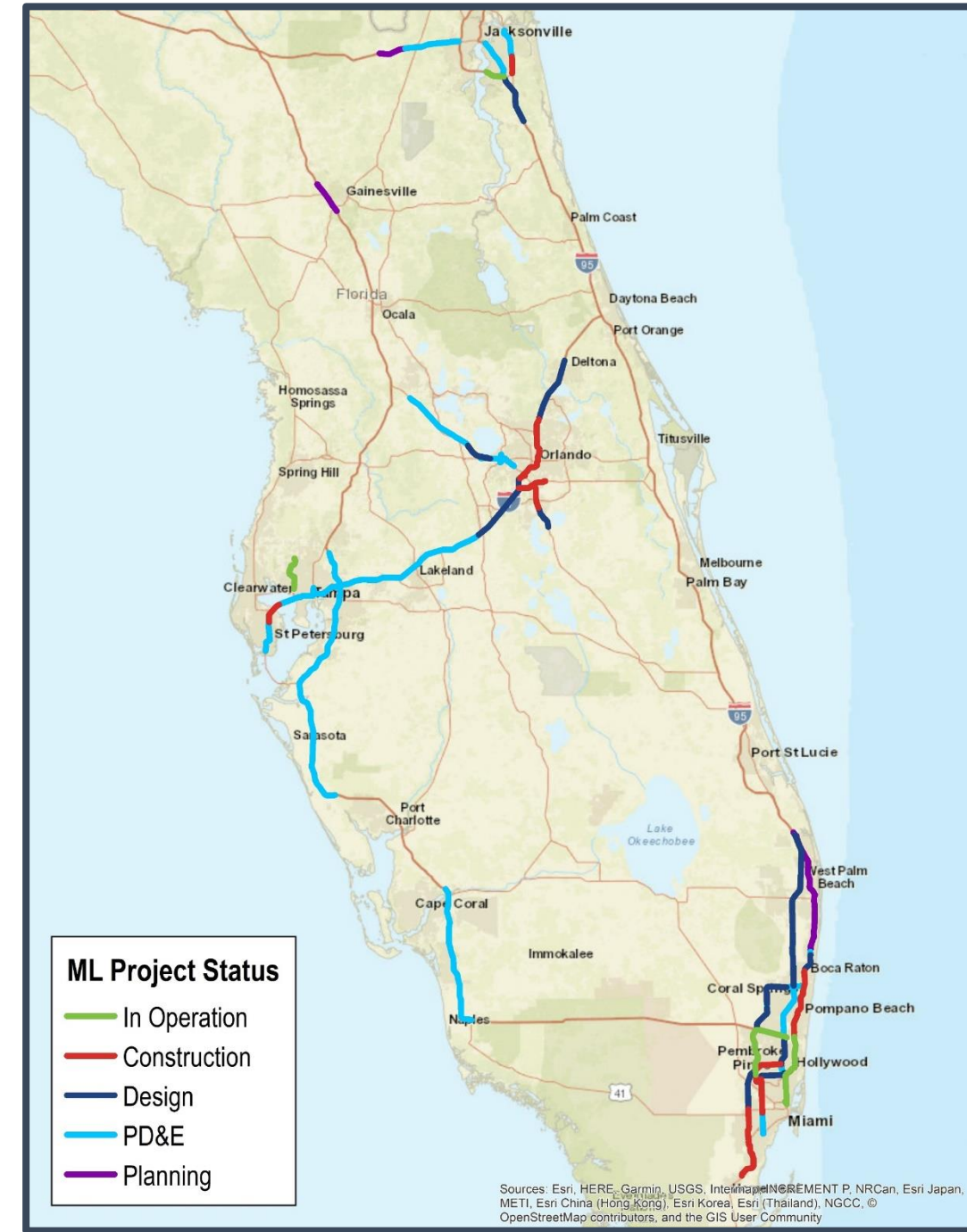
**Design** – 170 miles



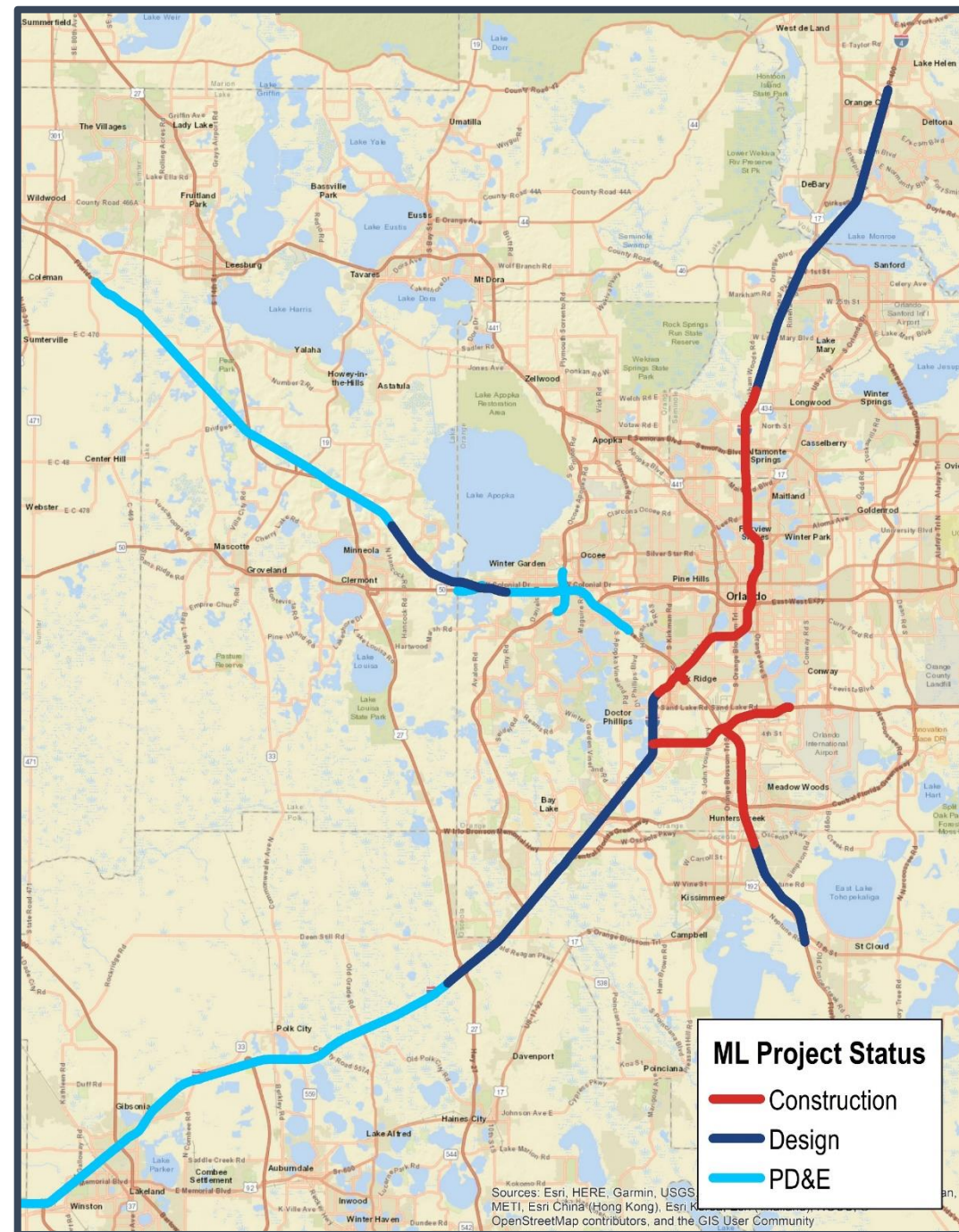
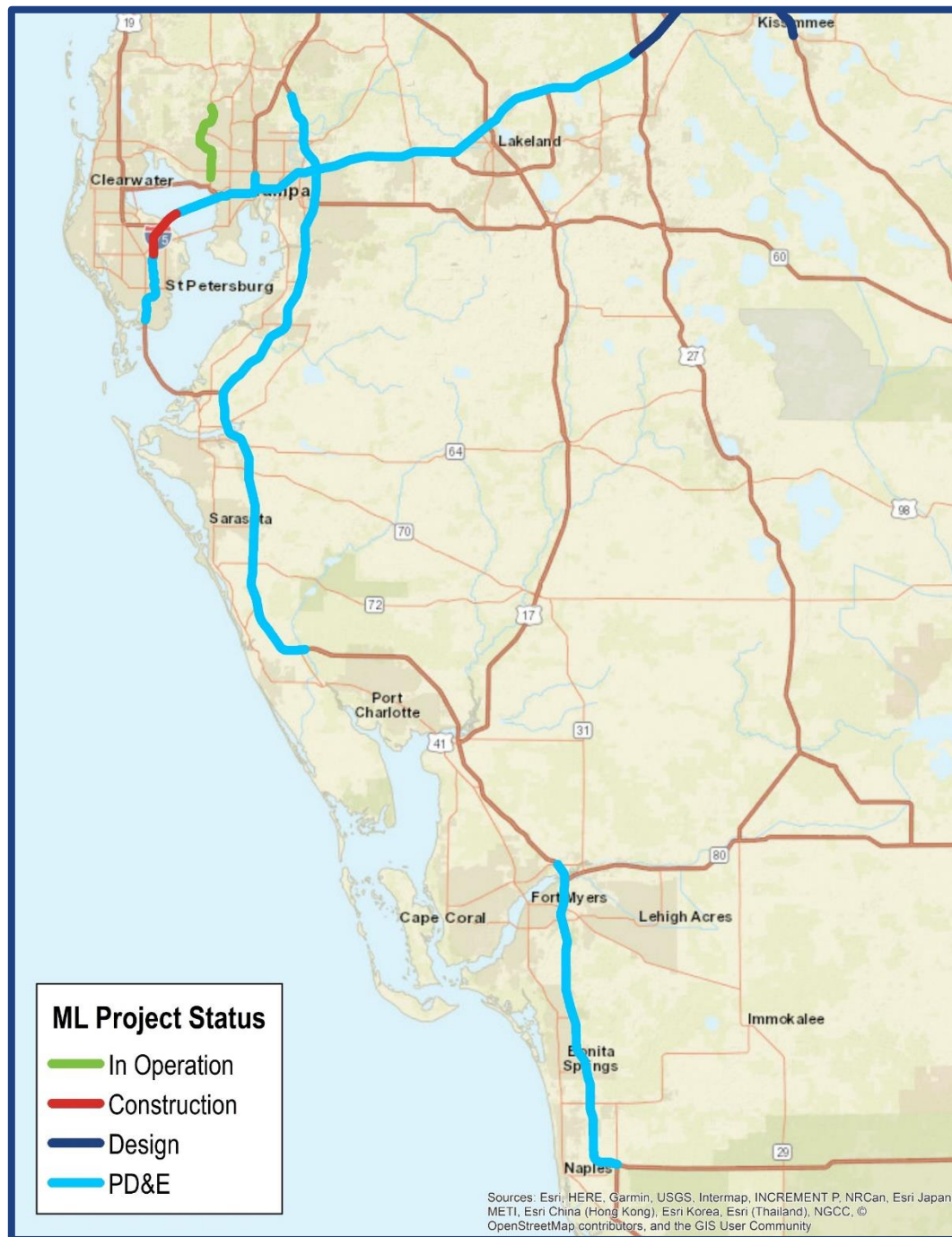
**PD&E** – 340 miles



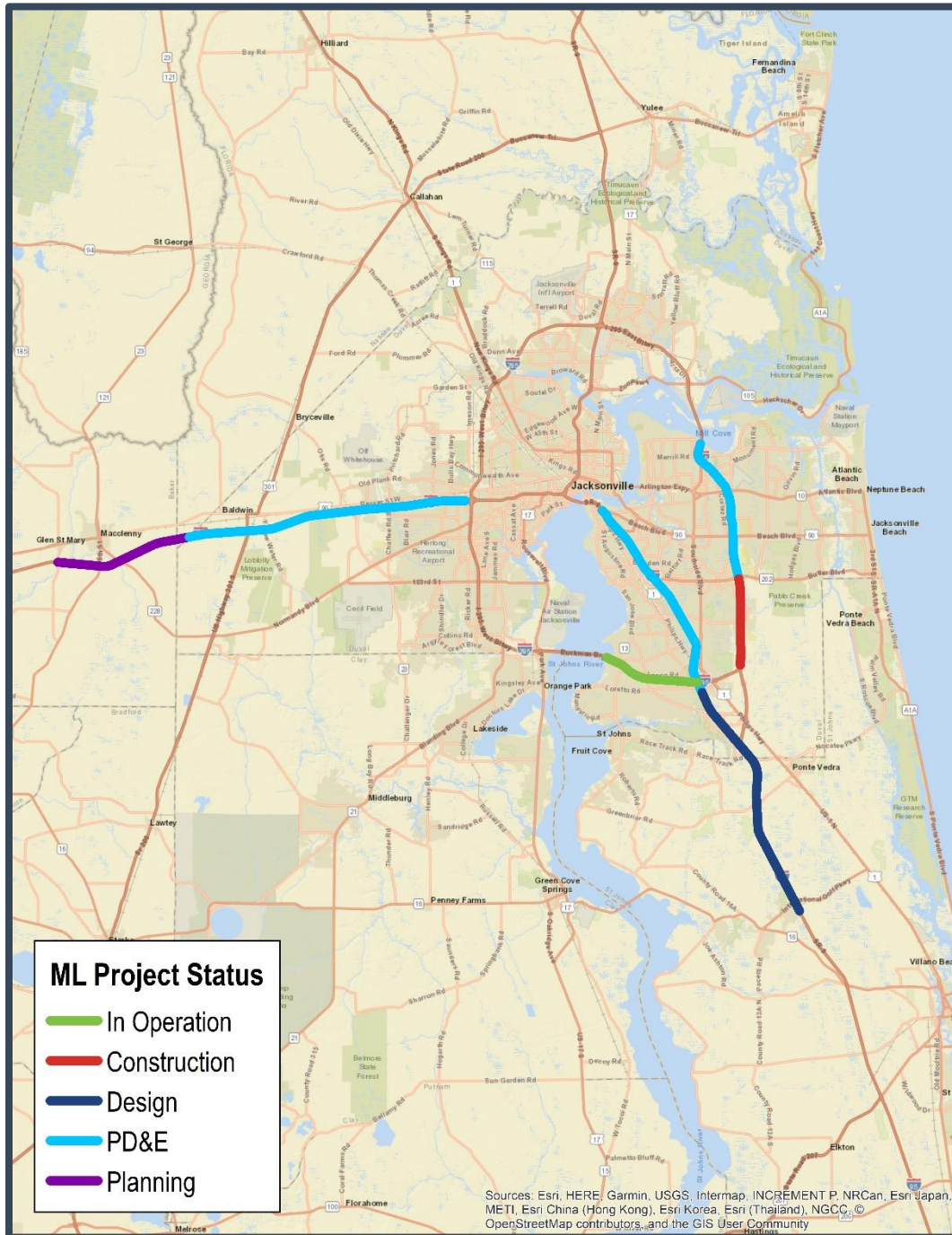
**Planning** – 60 miles











# OPERATIONAL AND SAFETY EFFECTS OF DESIGN DECISIONS

# Managed Lane Goals

- Provide Innovative Travel Alternatives
- Improve Traffic Flow
- Congestion Management





# Benefits of Managed Lanes



Provides Drivers with Travel Choices



Offers a More Predictable Travel Time



Supports Transit Usage



Reduces Fuel Consumption



Decreases Air Pollution

# Features that affect Performance

- Separation Type & Number of Lanes
- Traffic Incident Management
- Access Types
- Lane Width & Lateral Clearance
- Shoulder Width

# Separation Type





# Separation Type





# Separation Type

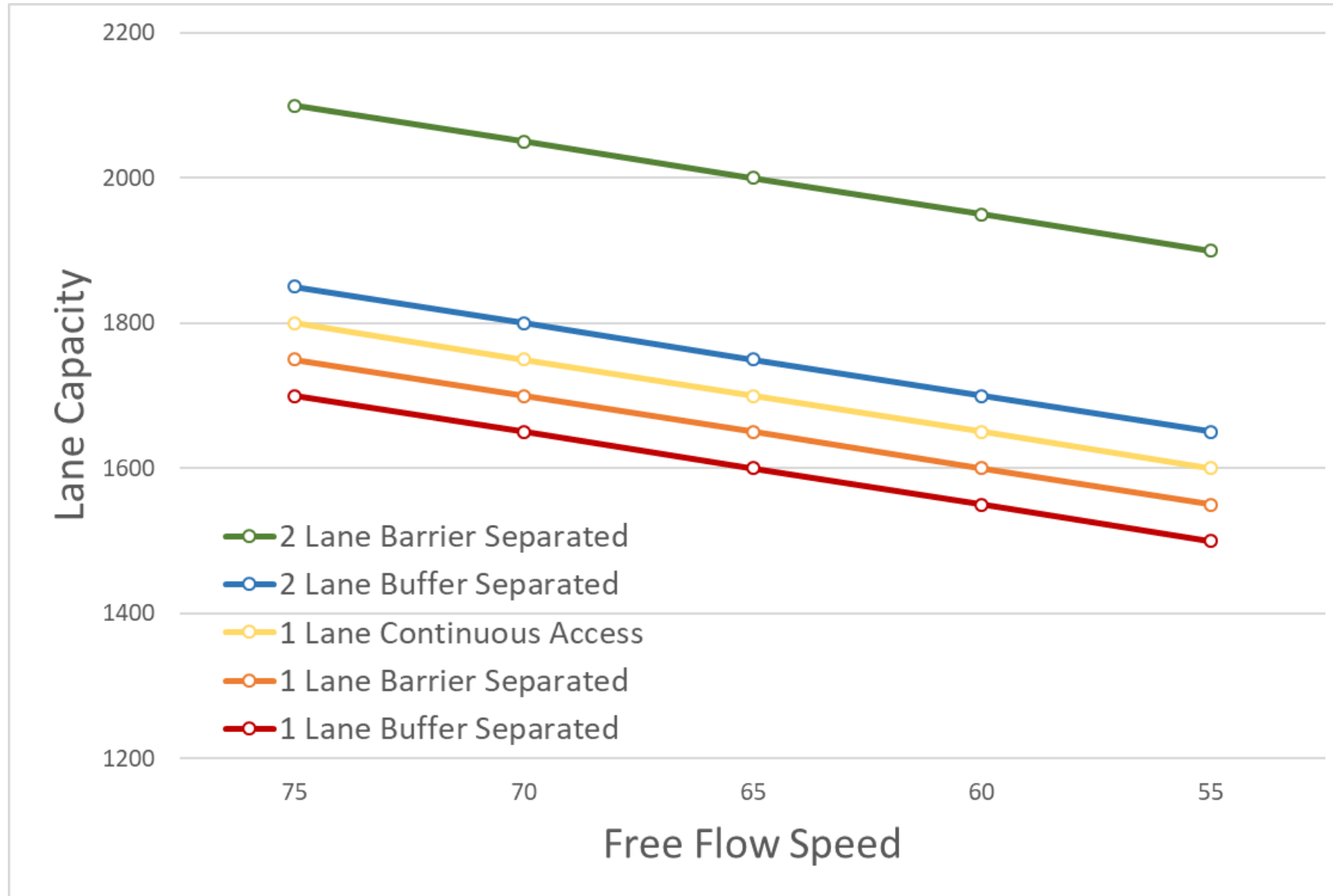




# Separation Type



# Separation Type and Number of Lanes



- 2 Lane Facilities > 1 Lane Facilities

- 2 Lanes

- Barrier > Buffer

- 1 Lane

- Continuous > Barrier > Buffer

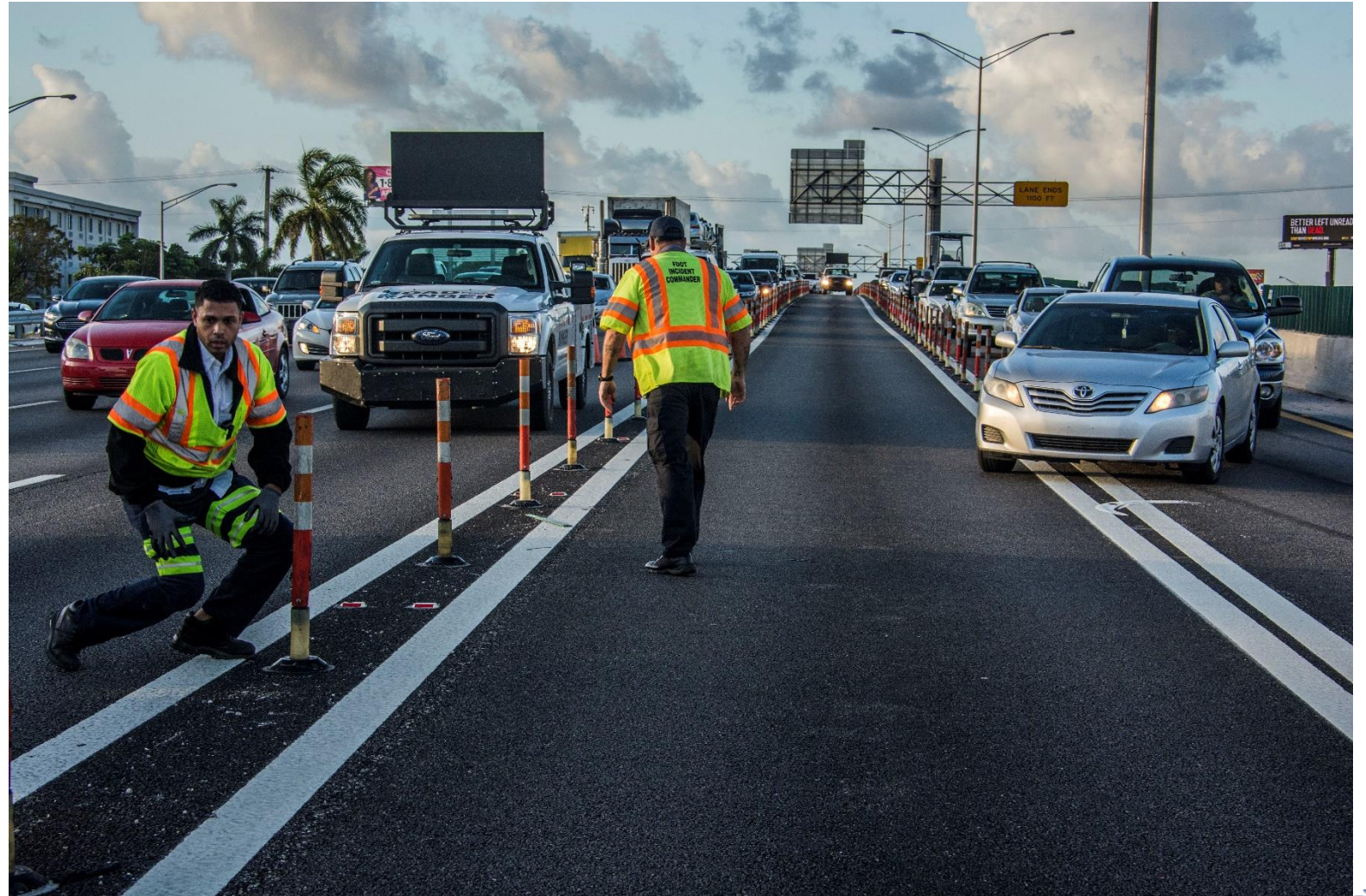
# Separation Type

Type of Separation	Access	Cost/ROW	Retrofit/Expansion Potential	Incident Management	Operations
Buffer Separation with ELM	Possible access violations	↓ construction costs and ROW needs; Potential for ↑ cost for maintenance and enforcement	Facilitates future expansion	Improved access; Limited area for staging during recovery operations	Potential friction between high-speed express lanes and low-speed general use lanes
Wide Buffer Separation	Possible access violations	↑ ROW needs	Facilitates future Expansion	Improved access; Additional staging area for emergency responders	↑ safety and operations
Barrier Separation	Eliminates access violations	Additional costs and ROW needs	Limited retrofit and future expansion	↑ response time due to limited access; Limited area for staging during recovery operations.	↑ safety and operations
Grade Separation	Eliminates access violations	Additional costs and ROW needs	Limited retrofit and future expansion	↑ response time due to limited access; Limited area for staging during recovery operations.	↑ safety and operations



# Traffic Incident Management

Detect  
Respond  
Remove  
Restore



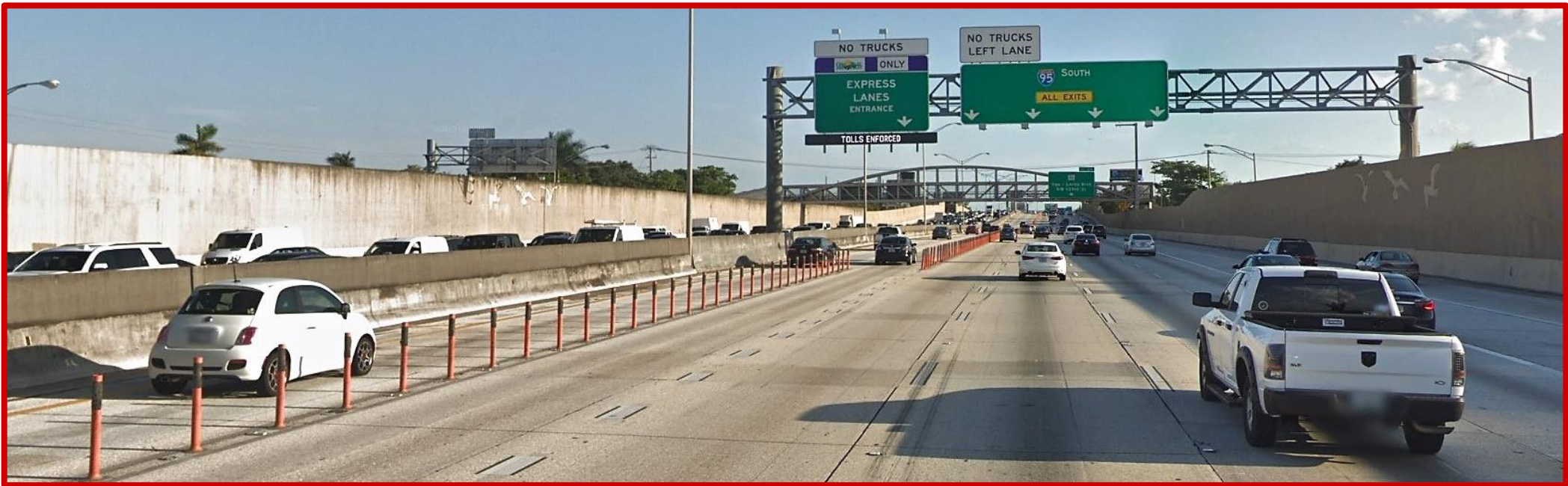
## Access Types

- Slip Ramps
- Weave Lanes
- Weave Zones
- Direct Connect Ramps



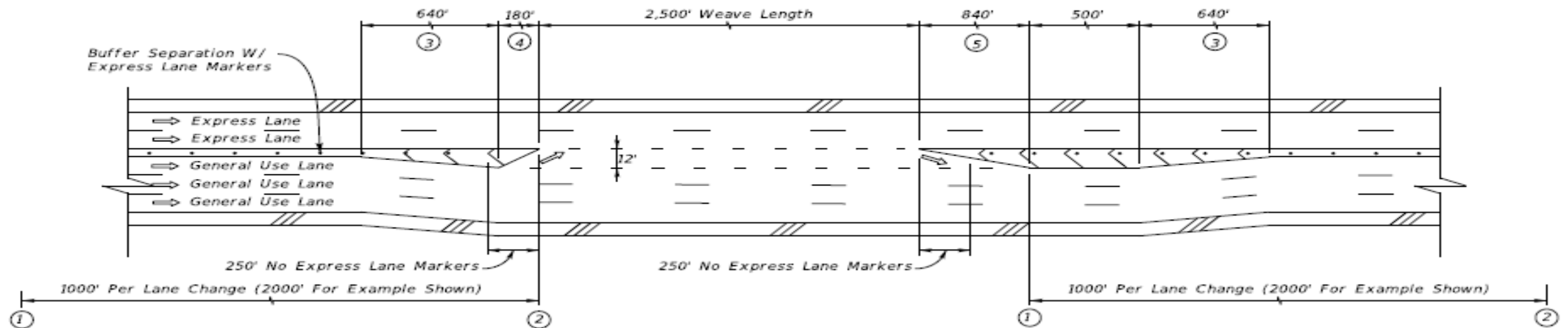
# Slip Ramps

- Separate ingress and egress ramps
- Provide connections using breaks in separation.
- Requires additional roadway width



# Weave Lanes

- Provides a short break in separation at specific locations
- Additional lane to accommodate weaving movements
- Allows simultaneous ingress and egress
- Not desirable for barrier separated facilities



# Weave Zone

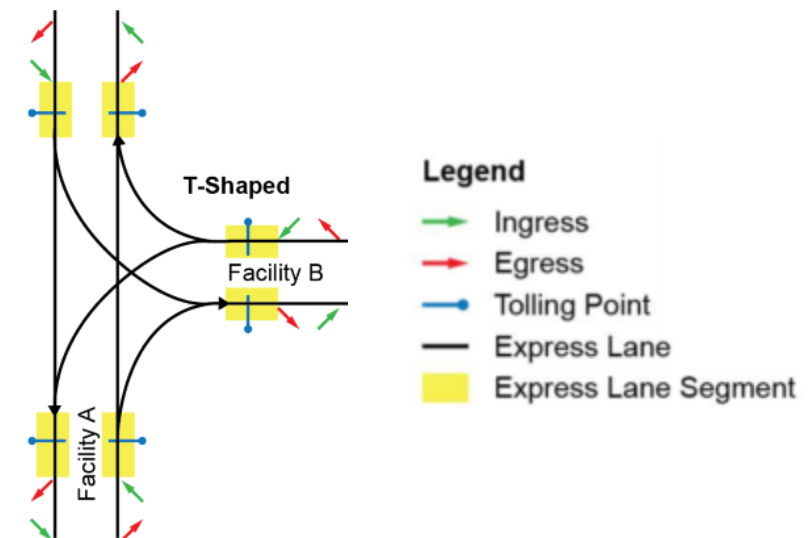
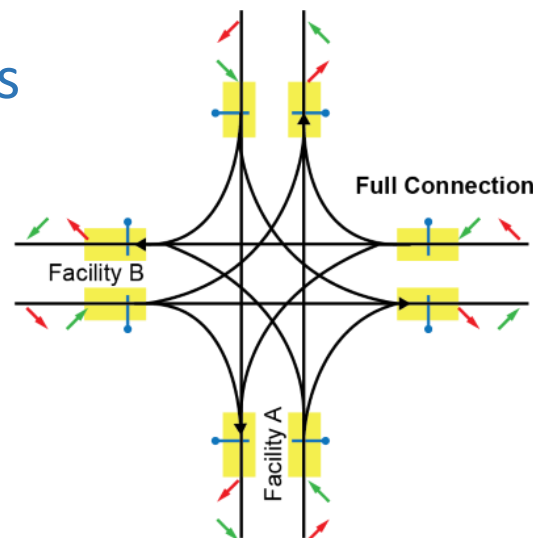
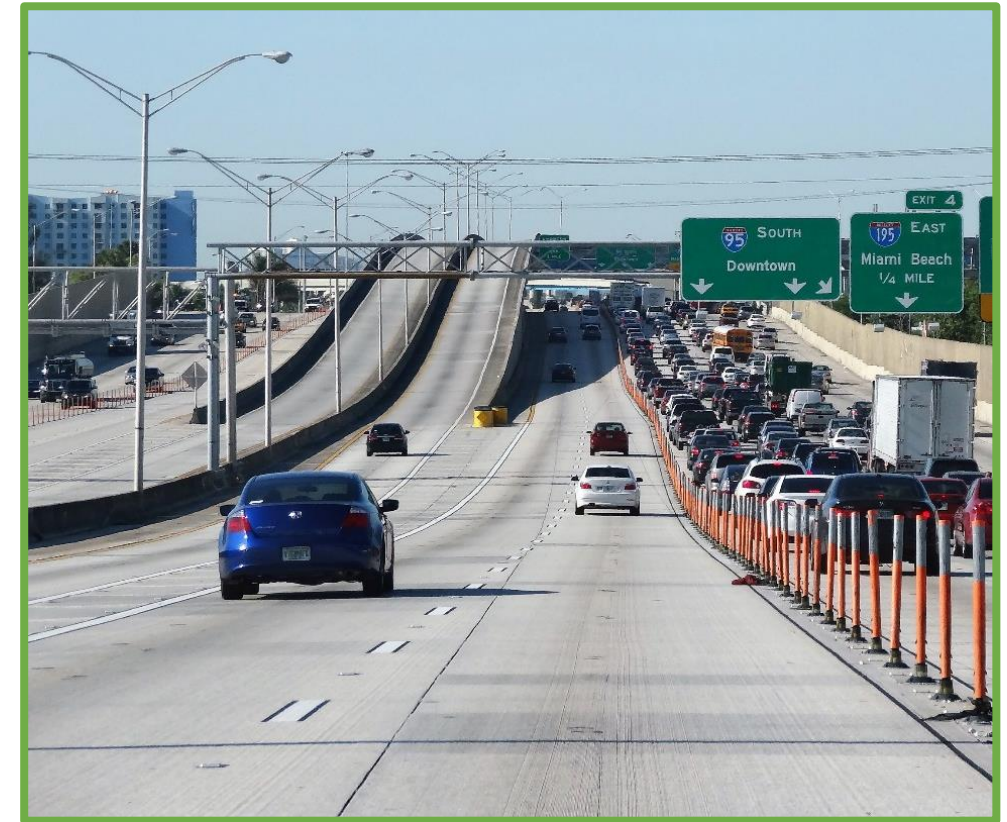
- Provides a short break in separation at specific locations
- Allows simultaneous ingress and egress
- No additional roadway width required
- Not desirable for barrier separated facilities





# Direct Connect Ramps

- Provide dedicated grade separated ramps
- Typically used for system-to-system connections or other high volume connections
  - Major Arterials
  - Park-and-ride facilities
  - Transit facilities
- Typically highest cost



## Legend

- Ingress
- Egress
- Tolling Point
- Express Lane
- Express Lane Segment

# Direct Connect Ramp Considerations

- **Considerations for Ramp Evaluation**
  - Assessment of Directional Design Hourly Volume
    - 400 vehicles per hour → single lane
    - 1,700 vehicles per hour → dual lanes
  - Determination of Benefits
    - ML-ML vs. slip ramp
    - Operation benefits: reduced weaving volumes & improved speeds
  - Consideration of Cost

# Lane Width and Lateral Clearance

Average Lane Width (ft.)	Reduction in Free Flow Speed (mi/hr.)
≥12	0.0
≥11-12	1.9
≥10-11	6.6

Right Side Lateral Clearance (ft.)	Lanes in One Direction			
	2	3	4	≥5
	Reduction in Free Flow Speed (from the 6ft. Base condition)			
≥6	0.0	0.0	0.0	0.0
5	0.6	0.4	0.2	0.1
4	1.2	0.8	0.4	0.2
3	1.8	1.2	0.6	0.3
2	2.4	1.6	0.8	0.4
1	3.0	2.0	1.0	0.5
0	3.6	2.4	1.2	0.6

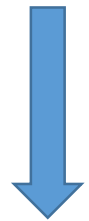


# Shoulder Width

## HSM

Wider Shoulders = Safer

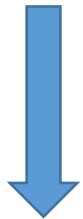
Wider Shoulders reduce the effect of incidents on operations



2 ft. reduction to  
outside (right) shoulder



12%-16% increase in  
fatal/injury crashes

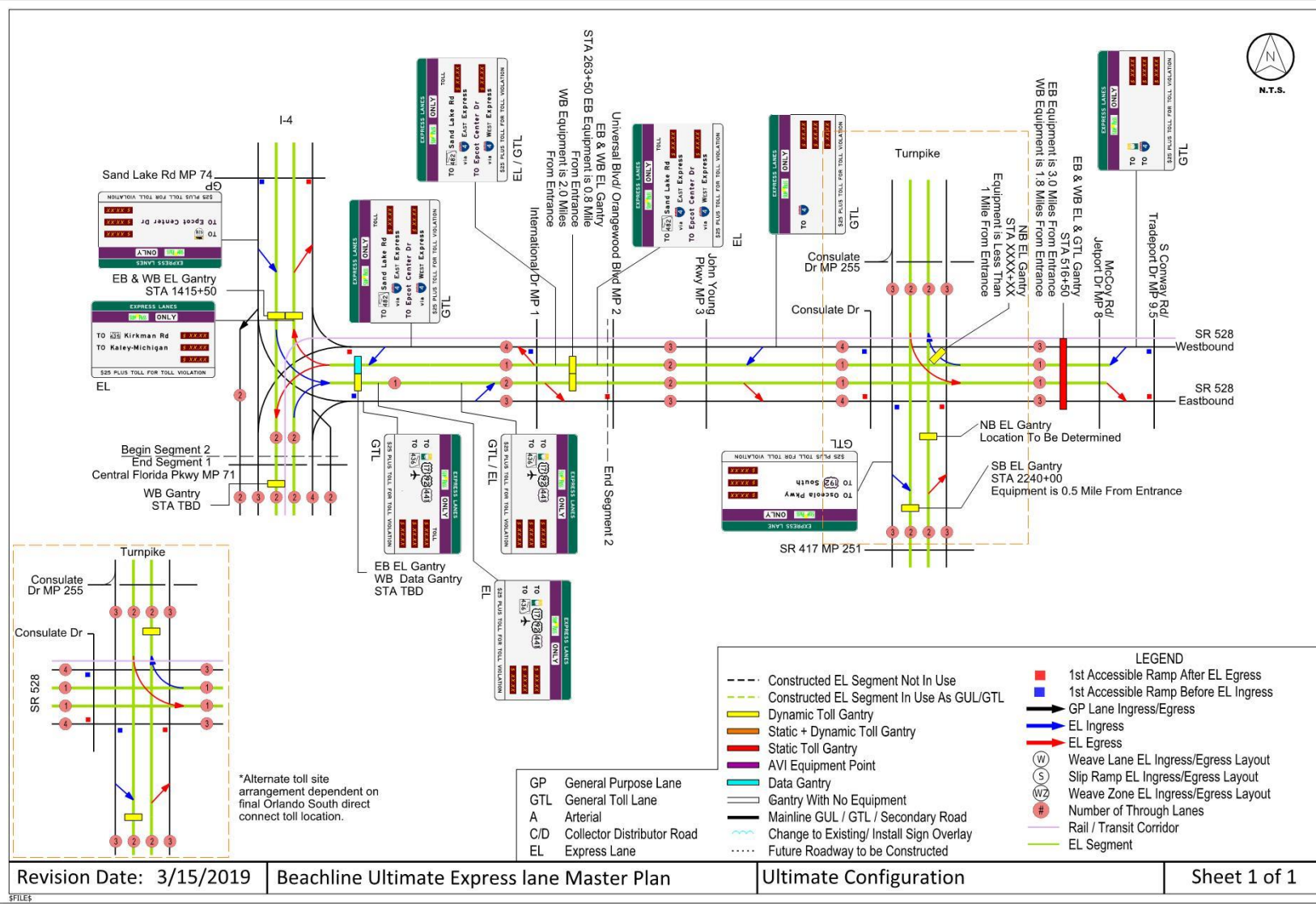


2 ft. reduction to  
inside (left) shoulder



3% increase in  
fatal/injury crashes

# Managed Lane Diagram





EB & WB EL & GTL Gantry  
STA 516+50  
Equipment is 3.0 Miles From Entrance  
WB Equipment is 1.8 Miles From Entrance  
NB EL Gantry  
STA XXXX+XX  
Equipment is Less Than  
1 Mile From Entrance

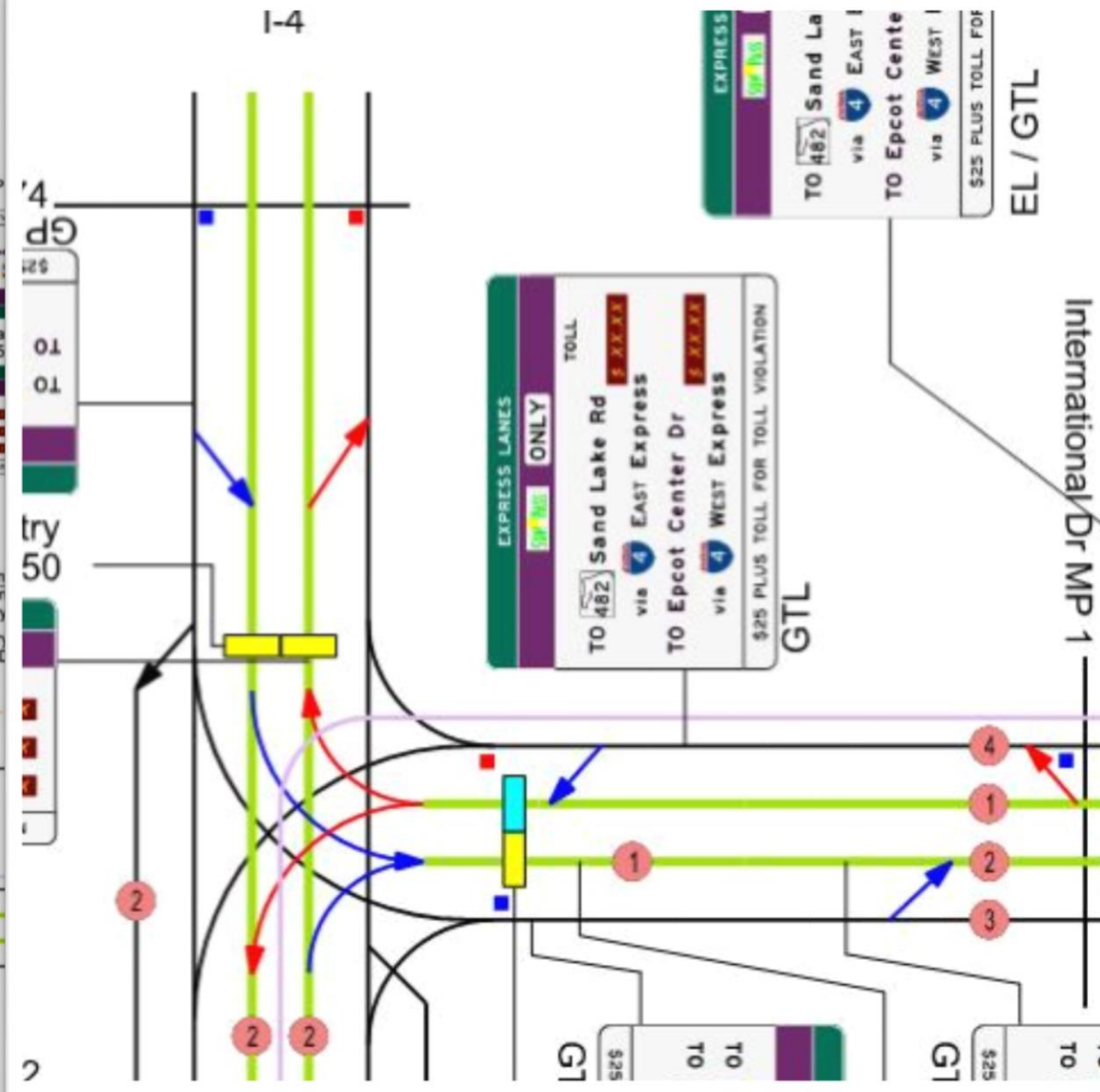
S Conway Rd/  
Tradeport Dr MP 9.5  
SR 528  
Westbound  
SR 528  
Eastbound

McCoy Rd/  
Jetport Dr MP 8  
NB EL Gantry  
Location To Be Determined  
SB EL Gantry  
STA 2240+00  
Equipment is 0.5 Mile From Entrance

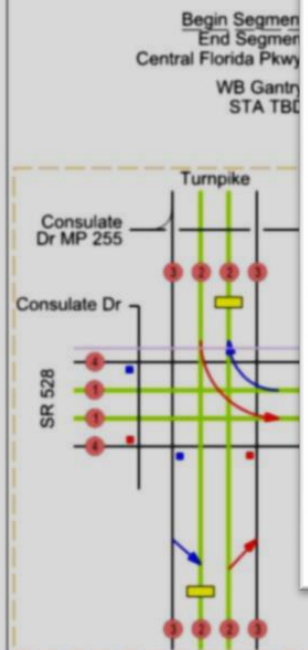
- LEGEND
- 1st Accessible Ramp After EL Egress
  - 1st Accessible Ramp Before EL Ingress
  - GP Lane Ingress/Egress
  - EL Ingress
  - EL Egress
  - Weave Lane EL Ingress/Egress Layout
  - Slip Ramp EL Ingress/Egress Layout
  - Weave Zone EL Ingress/Egress Layout
  - Number of Through Lanes
  - Rail / Transit Corridor
  - EL Segment

EXPRESS  
TO Sand La  
via 4 EAST  
TO Epcot Cente  
via 4 WEST  
EL / GTL  
\$25 PLUS TOLL FOR

EXPRESS LANE ONLY  
TOLL  
TO Sand Lake Rd  
via 4 EAST Express  
TO Epcot Center Dr  
via 4 WEST Express  
GTL  
\$25 PLUS TOLL FOR TOLL VIOLATION



Sand Lake Rd MP  
GP  
\$25  
TO  
TO  
EXPRESS LANE ONLY  
TO Kirkman Rd  
TO Raleigh-Michigan  
\$25 PLUS TOLL FOR TOLL VIOLATION  
EL





# Concept of Operations a.k.a. ConOps

- Defines the environment in which the express lanes will operate
- Derives high-level requirements used to develop the express lanes system
- Provides the criteria to be used for validation of the completed express lanes
- Establishes the roles and responsibilities of incident responders, express lanes operators, and other personnel
- Used when developing additional operational documents such as incident management plans, standard operating procedures/guidelines, and interagency communication guidelines

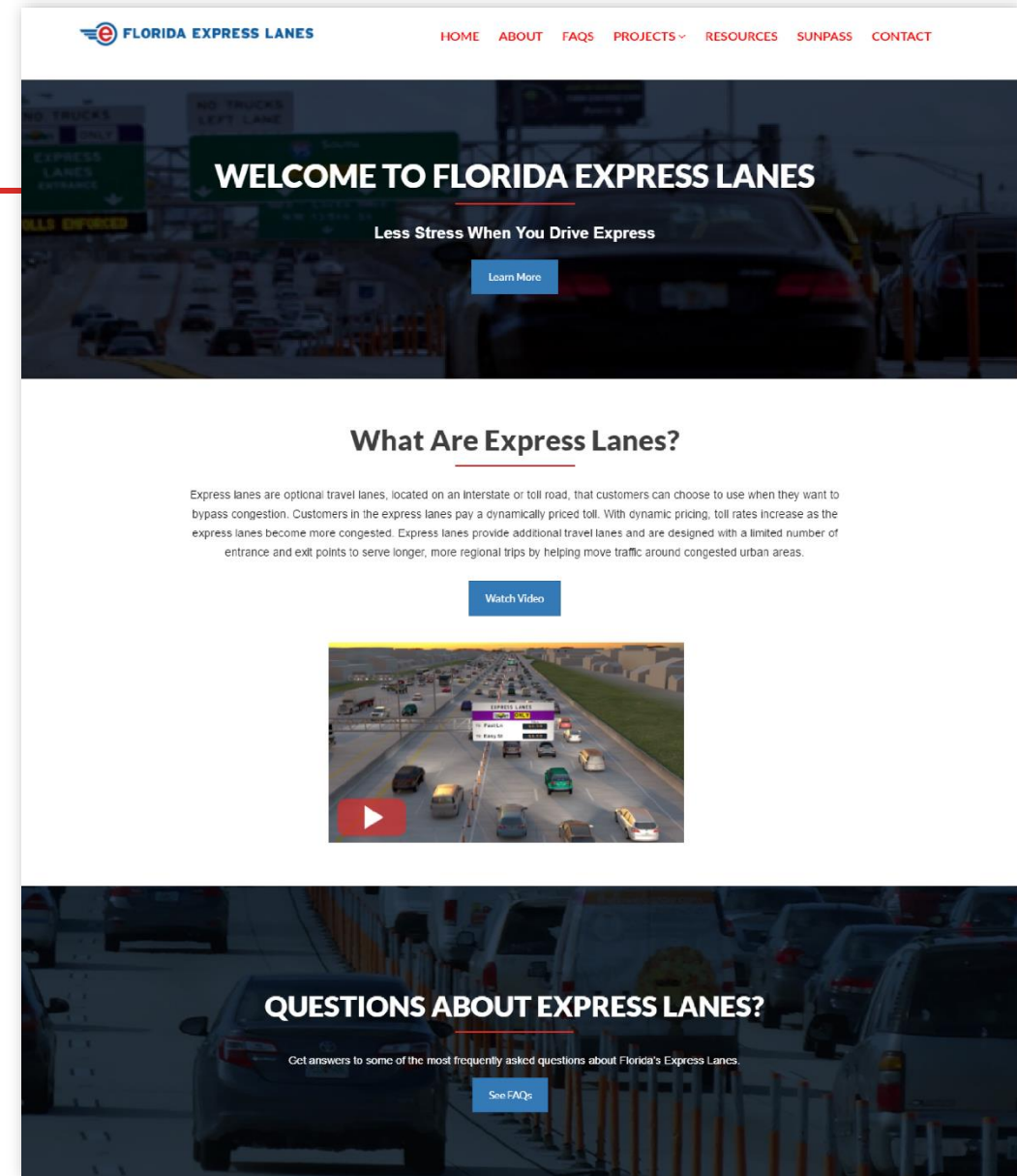
# Summary

- The choice of separation type can affect capacity by 14%!
- Traffic Incident Management Plans improve clearance times and get traffic moving efficiently
- Number and type of access locations affect operational performance
- Lane Width & Lateral Clearance directly impact capacity
- Shoulder width reductions increase crashes and deteriorate performance
- Tools such as Managed Lane Diagrams and Con Ops help coordinate design and operational needs

# WEBSITE

FloridaExpressLanes.com

- Videos and Detailed Maps
- Projects Separated by Region and Updated Regularly
- FAQs and Other Resources
- Performance Reports





# QUESTIONS?

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