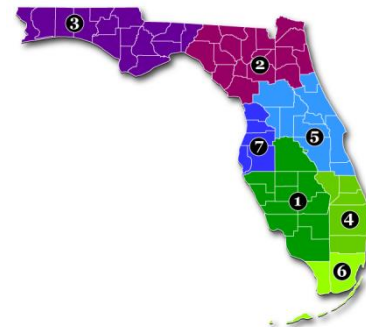# Data for Florida's Mobility Performance Measures

Anita Vandervalk, P.E., P.M.P.

August 18, 2015

Topics

1. Florida's MPM Program

2. Data needs and sources

3. Use of measured data vs modeled

4. Lessons learned

5. Plans for next year

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
Mobility Performance Measures Reporting

http://www.FloridaMPMs.com/SourceBook.htm

Multimodal Mobility Performance Measures Matrix 2015

	MODE	QUANTITY	QUALITY	ACCESSIBILITY	UTILIZATION
People	Auto/Truck	**Vehicle Miles Traveled** ◐ □ ⊙ Person Miles Traveled ◐ □ ⊙	**% Travel Meeting Los Criteria** ◐ ◓ □ % Miles Meeting Los Criteria ◐ ◓ **Travel Time Reliability** ◐ ◓ □ Travel Time Variability ◐ ◓ □ **Vehicle Hours Of Delay** ◐ □ ⊙ Person Hours Of Delay ◐ □ ⊙ Average Travel Speed ◐ ◓	*In Development – To Be Reported In 2015*	**% Miles Severely Congested** ◐ ◓ % Travel Severely Congested ◐ ◓ □ Hours Severely Congested □ ⊙ Vehicles Per Lane Mile ◐
	Transit	Passenger Miles Traveled ⊙ Passenger Trips ⊙	Average Headway ◓		
	Pedestrian		Level Of Service (LOS) ◐	% Sidewalk Coverage ⊙	
	Bicycle		Level Of Service (LOS) ◐	% Bike Lane/Shoulder Coverage ⊙	
	Aviation	Passengers ⊙	Departure Reliability ⊙	Highway Adequacy (LOS) ◐ ◓	Demand To Capacity Ratios ◐
	Rail	Passengers ⊙	Departure Reliability ⊙		
	Seaports	Passengers ⊙		Highway Adequacy (LOS) ◐ ◓	
Freight	Truck	**Combination Truck Miles Traveled** □ Truck Miles Traveled □ Combination Truck Tonnage ⊙ Combination Truck Ton Miles Traveled ⊙ Value of Tonnage ⊙	**Travel Time Reliability** ◓ Travel Time Variability ◓ **Combination Truck Hours Of Delay** □ Combination Truck Average Travel Speed ◐		**% Miles Severely Congested** ◐ ◓ Vehicles Per Lane Mile ◐ Combination Truck Backhaul Tonnage ⊙
	Aviation	Tonnage ⊙		Highway Adequacy (LOS) ◐ ◓	
	Rail	Tonnage ⊙		Highway Adequacy (LOS) ◐ ◓ Active Rail Access ⊙	
	Seaports	Tonnage ⊙ Twenty-Foot Equivalent Units ⊙		Highway Adequacy (LOS) ◐ ◓ Active Rail Access ⊙	

Reporting Periods: ◐ = *Peak Hour*   ◓ = *Peak Period*   □ = *Daily*   ⊙ = *Yearly* | **Bold** = FDOT Map-21-Recommended Measure

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Non Highway Modes

- At the state level, modal data is mostly a culmination of data obtained from individual hubs

- In half the instances the data is required in annual reports to a federal agency

- The challenge = identifying existing data or recurring reports that capture the dimensions of mobility emphasized by FDOT

Highway - Primary Data Needs

	Delay	Travel Time Reliability/Variability
Measure	**Vehicle Hours of Delay**	**% of Travel >45 mph on Freeways (Reliability)** **95th Percentile Travel Time Index (Variability)**
Coverage	**State Highway System**	**Limited Access Facilities**
Inputs	• **Traffic Volume** • **Travel Time/Speed**	**Travel Time/Speed**
Source	• **FDOT Planning Traffic** • **HERE**	**HERE**
Database	• **Traffic** • **Roadway**	**Traffic, Roadway**
Reports	**Source Book** **MAP-21** **Annual Performance Report**	**Source Book** **MAP-21** **Annual Performance Report**

Mobility Data Challenges and Opportunities

- **Primary data needs =** roadway characteristics, traffic volume, speed

- **Transitioning from modeled to measured data**
  - Travel time, speed, and volume data can be collected automatically by roadside or probe devices
  - Past methodology based on theoretical models and assumptions

Data Sources Evaluated

- Possible field measured data sources
  - Video Image Detection
  - Microwave Radar
  - Bluetooth
  - Toll Tag Readers
  - GPS vehicle probe data from private vendors
    - HERE/NPMRDS
    - INRIX
    - TomTom

Data Source Criteria

- Data Coverage – Need State Highway System

- Data completeness – At lease 30% complete

- Data reported by individual TMC at 5 minute intervals throughout the entire calendar year
  - Delivered in tabular and GIS shapefile

- Mean travel time and speed
  - Status flag to indicate normal operations, periods of low traffic flow, inoperable status or unavailable data, etc.

Data Source Criteria, cont.

- Quality indicator that reflects the confidence in the estimate of mean travel time and speed

- Network conflation/data integration
  - Connect field measured speed/travel time data to other data sources

- Separate speed for passenger cars, trucks, and all vehicles

Chosen Option

- Archive of HERE ITS real time data + NPMRDS
  - Minimum additional cost to Department
  - HERE ITS data
  - NPMRDS data for
    - Truck data on NHS
    - Verifying HERE's data processing and imputation algorithms

Major Drawbacks

- Not every road of SHS has corresponding TMC

- TMC network not geographically aligned with FDOT base map

- Higher initial cost

- Different results from modeled data will result in differences when analyzing trends

Data Coverage

- SHS - 12,086 centerline

- HERE ITS
  - 24,874 TMCs
  - 228,430 links
  - Data gaps over time filled by vender
  - No separate truck speed

Missing State roads are mostly in Northern FL, panhandle area

HERE Network and SHS

— HERE Network

— State Roads (STROADNO)
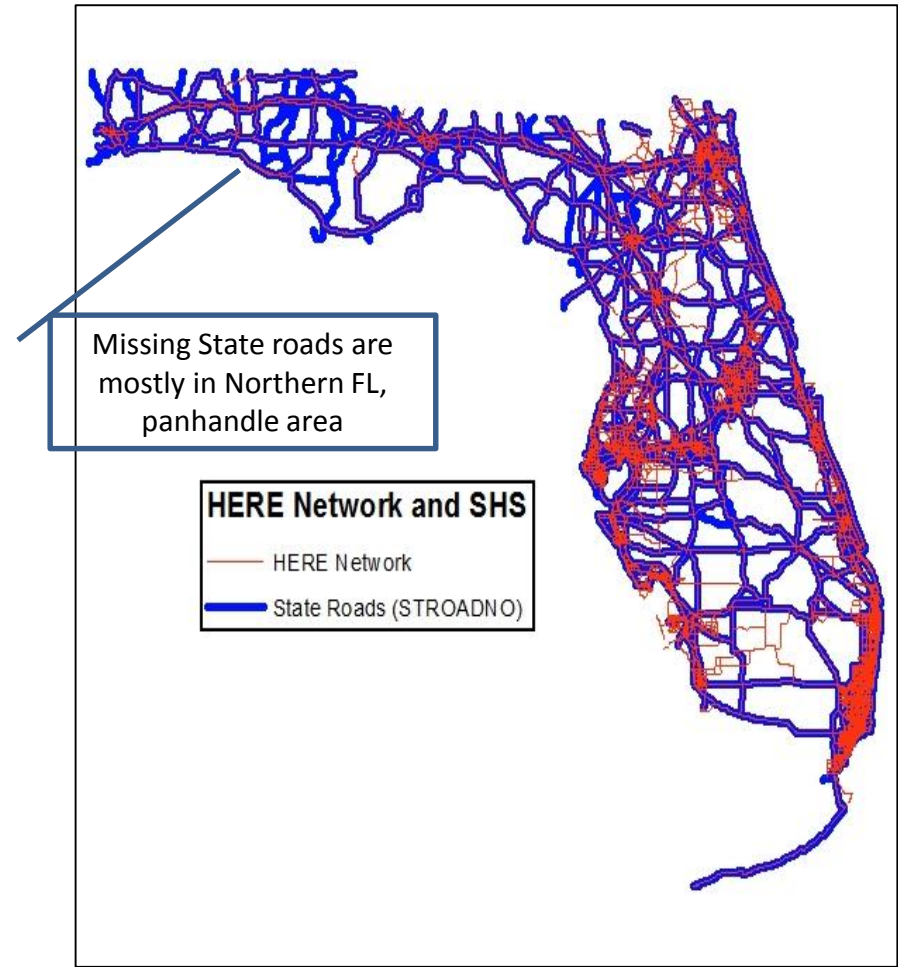
Data Coverage

- NPMRDS
  - NHS - 8147 centerline
  - 11,733 TMCs
  - Raw data
  - Separate truck speed

Coverage Map
— NPMRDS Network
— HERE Network
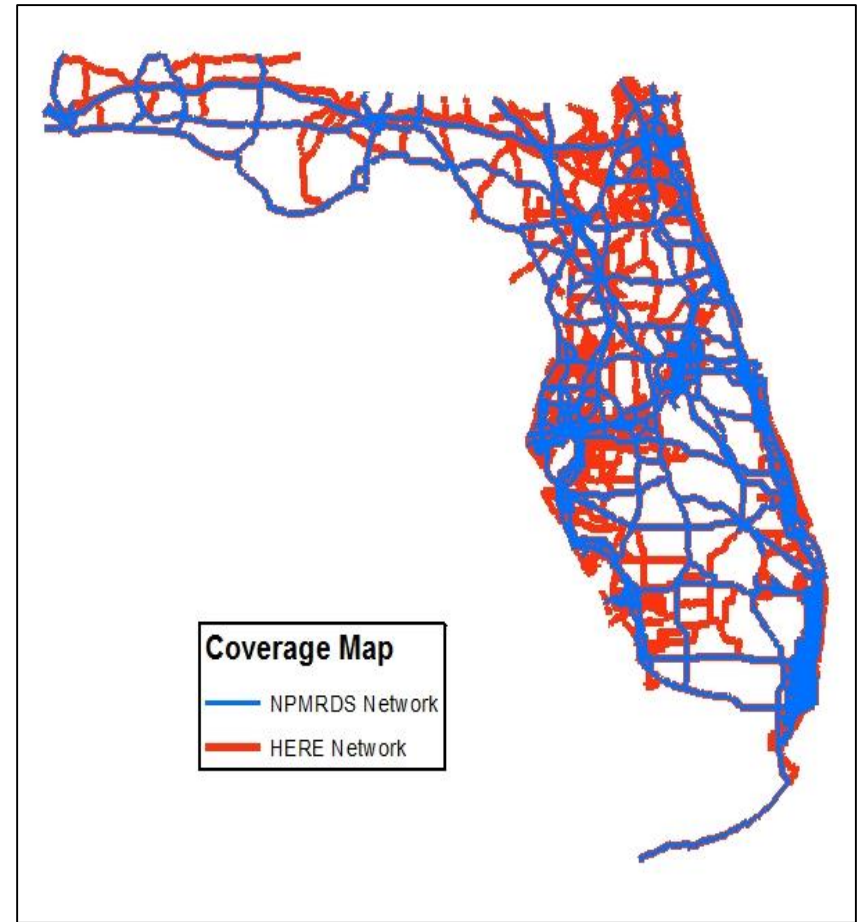
Approach for Missing Data

- Factored-up method: route travel time = sum of travel times from available samples X ratio of route length divided by length of TMCs with data

- Travel times from previous and next timestamps

- Travel times from neighboring TMC links

- Historical averages, free-flow speeds, or speed limits, will also be considered

- For state roads not covered in HERE:
  - Develop speed estimation model/default speeds from measured data of similar facilities by area type, facility type, volume, time of day, etc.

Conflation

☑ Field measured speed data from private vendor

   ☑ 5 minutes average travel time

   ☑ Separate car and truck data

   ☑ Reported on TMC network

☑ GIS map conflation to connect to other FDOT data

   ☑ Roadway characteristics (RCI)

   ☑ Traffic characteristics (TCI)
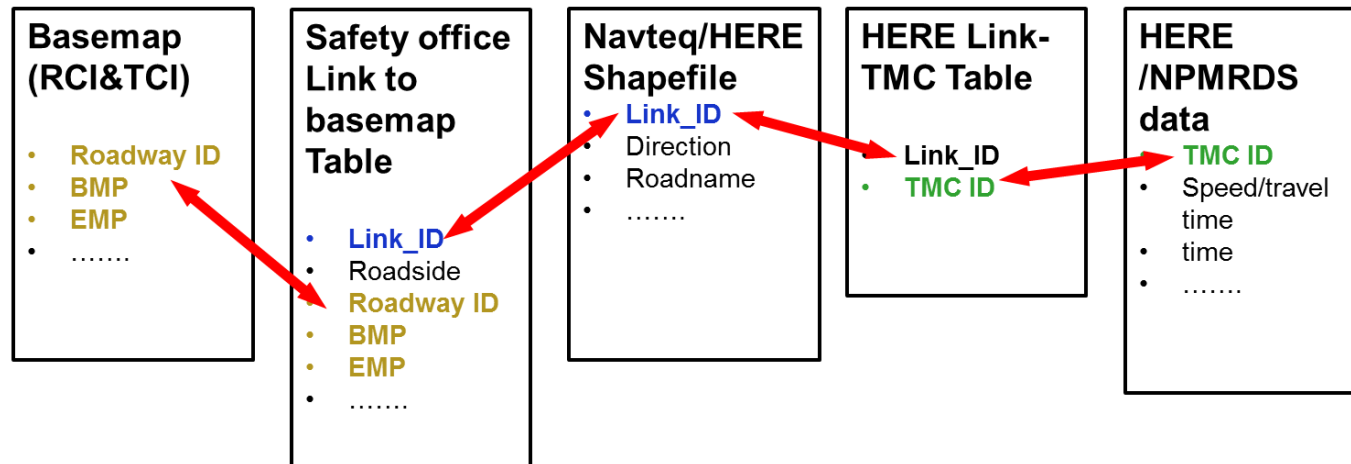
Calculating Travel Time Reliability

1. Aggregate five minute travel speeds to hourly speeds

2. Align speed links with volume links to determine the hourly volume for the corresponding speed

3. Identify the portion of volume able to achieve on-time performance for each link within the state

4. Divide the on-time volume by the total volume to determine the travel time reliability

Data Factors

- Free-flow speeds on freeways are slower than speeds observed in the field

- Average observed arterial speeds are faster than previously calculated speeds

- Speed data is adjusted upwards during typical free flow travel times by a magnitude based on the observed speed

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Lessons Learned

- The speed data is geographically referenced on a network that does not include volume or geometric data

- There are ongoing problems with data sources that cause issues with speed outputs

- Data has unlocked information that was not previously available

- Access to archived data – Go directly to the source

- Stakeholder doubt in results – Consider applying factors

- Be prepared for changing maps and coverage – Plan ahead and set standards

- Details, Details, Details – Know when good enough is good enough

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MPM Source Book

TAMPA TO ORLANDO I-4 CORRIDOR PERFORMANCE
From I-275 to SR 408

New Content

AADT	Vehicle Miles Traveled		Average Speed		Delay			Freight (Daily)		
	Peak Hour/Period	Daily	Peak Hour/Period	Daily	Peak Hour/Period	Daily	Yearly	% Combination Truck	Combination Truck VMT	Combination Truck Delay
111,800 With a max of **152,300**	**1.24**	**8.88**	**57.5**	**66.1**	**2.44**	**7.5**	**2,740**	**5**	**0.53**	**474**
	millions of miles		miles per hour		thousands of hours			percent	million miles	hours

Corridor Performance / Facility Performance

Corridor Length
82.2 miles

Peak Hour/Period
TTR **88%** / TTI$_{95th}$ **2.00**

Daily
TTR **98%** / TTI$_{95th}$ **1.16**

1. I-275 to I-75
- Length 8.3 miles — Peak Hour/Period: TTR 85%, TTI$_{95th}$ 2.51, Average Speed 48.9 MPH
- AADT 134,000 — Daily: TTR 98%, TTI$_{95th}$ 1.08, Average Speed 60.1 MPH

2. I-75 to US 27
- Length 46.2 miles — Peak Hour/Period: TTR 94%, TTI$_{95th}$ 1.38, Average Speed 61.5 MPH
- AADT 92,200 — Daily: TTR 99%, TTI$_{95th}$ 1.08, Average Speed 67.0 MPH

3. US 27 to US 192
- Length 9.4 miles — Peak Hour/Period: TTR 97%, TTI$_{95th}$ 1.14, Average Speed 62.0 MPH
- AADT 103,500 — Daily: TTR 99%, TTI$_{95th}$ 1.09, Average Speed 67.8 MPH

4. US 192 to FLA Turnpike
- Length 12.4 miles — Peak Hour/Period: TTR 71%, TTI$_{95th}$ 2.52, Average Speed 43.9 MPH
- AADT 152,300 — Daily: TTR 96%, TTI$_{95th}$ 1.43, Average Speed 59.1 MPH

5. FLA Turnpike to SR 408
- Length 6.1 miles — Peak Hour/Period: TTR 90%, TTI$_{95th}$ 4.02, Average Speed 48.3 MPH
- AADT 152,000 — Daily: TTR 98%, TTI$_{95th}$ 1.09, Average Speed 63.6 MPH

Congestion Analysis

% of Travel Meeting LOS Criteria
- Peak Hour/Period **58.4%**
- Daily **90.0%**

% of Travel Severely Congested
- Peak Hour **16.8%**
- Daily **5.3%**

Average Speed for Peak Period
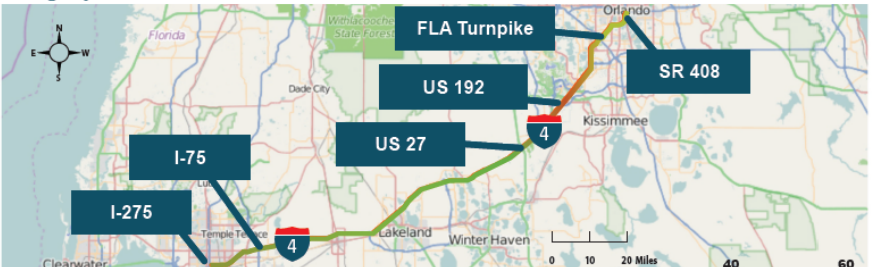
TTR: Travel Time Reliability, percentage of freeway trips traveling at least at the posted speed limit.
TTI$_{95th}$: Travel Time Variability, 95th percentile travel time index 95th percentile travel time divides free flow travel time.

2013 MODAL PERFORMANCE SUMMARY

QUANTITY

TRANSIT ANNUAL PASSENGER TRIPS
Annual number of passenger boardings on the transit vehicles. A trip is counted each time a passenger boards a transit vehicle. Thus, if a passenger has to transfer between buses to reach a destination, the passenger is counted as making two passenger trips.

270 MILLION PASSENGERS

SEAPORT
Annual number of passengers embarking on cruise ships at Florida ports.

14.1 MILLION PASSENGERS

105 MILLION TONS

AVIATION
The total number of revenue passengers boarding aircraft, includes both originating and connecting passengers.

69 MILLION PASSENGERS

RAIL
Tons of freight carried by rail mode originated or terminated in Florida.

52 MILLION TONS

QUALITY

AVIATION RELIABILITY
Departure reliability at Florida airports is defined as "on time" if the flight departs less than 15 minutes after the scheduled time shown in the carriers' Computerized Reservations Systems (CRS).

75%

ACCESSIBILITY

PERCENT BIKE LANE/SHOULDER COVERAGE
The percentage of centerline miles of SHS (nonfreeway) facilities that have bike lanes, paved shoulders, or shared pathways available to bicyclists.

59.6%

PERCENT OF SIDEWALK COVERAGE
The percentage of centerline miles of SHS (nonfreeway) facilities in urban areas (5,000+ population) that have sidewalks and/or shared pathways available to pedestrians.

72.2%

MIAMI TO FT. LAUDERDALE I-95 CORRIDOR PERFORMANCE
From U.S. 1 to I-595

AADT	Million Miles Traveled		Average Speed		Delay			Freight (Daily)		
	Peak Hour/Period	Daily	Peak Hour/Period	Daily	Peak Hour/Period	Daily	Yearly	% Combination Truck	Combination Truck VMT	Combination Truck Delay
211,800	**0.89**	**5.67**	**34.1**	**55.6**	**3.84**	**11.9**	**4,330**	**5**	**0.26**	**749**
With a max of **241,900**	millions of miles		miles per hour		thousands of hours			percent	million miles	hours

Corridor Performance

Corridor Length
23.4 miles

Peak Period
TTR **55%** TTI$_{95th}$ **2.63**
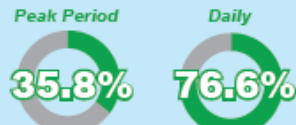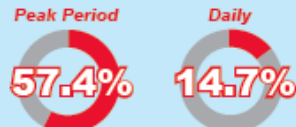
Daily
TTR **92%** TTI$_{95th}$ **1.89**

Congestion Analysis

% of Travel Meeting LOS Criteria
- Peak Period **35.8%**
- Daily **76.6%**

% of Travel Severely Congested
- Peak Period **57.4%**
- Daily **14.7%**

Facility Performance

1. FLA Turnpike to I-595
		TTR	TTI$_{95th}$	Average Speed
Length 10.2 miles	Peak Period:	31%	3.38	25.7 MPH
AADT 241,900	Daily:	88%	2.18	51.9 MPH

2. NW 119th Street to FLA Turnpike
		TTR	TTI$_{95th}$	Average Speed
Length 3.4 miles	Peak Period:	71%	2.73	38.7 MPH
AADT 216,900	Daily:	91%	2.08	55.4 MPH

3. SR 112 to NW 119th Street
		TTR	TTI$_{95th}$	Average Speed
Length 5.0 miles	Peak Period:	98%	1.14	57.9 MPH
AADT 207,800	Daily:	100%	1.10	62.0 MPH

4. SR 836 to SR 112
		TTR	TTI$_{95th}$	Average Speed
Length 1.6 miles	Peak Period:	61%	2.19	40.4 MPH
AADT 220,000	Daily:	92%	1.91	56.8 MPH

5. US 1 to SR 836
|		TTR	TTI$_{95th}$	Average Speed
Length 3.2 miles	Peak Period:	54%	2.01	42.4 MPH
AADT 113,800	Daily:	94%	1.73	59.1 MPH

Average Speed for Peak Period

TTR: Travel Time Reliability, percentage of freeway trips traveling at least at the posted speed limit.
TTI$_{95th}$: Travel Time Variability, 95th percentile travel time index 95th percentile travel time divides free flow travel time.

40 mph — 60 mph

Mobility Performance Measures System

Figure 1. The MPMS Supports FDOT's Performance Management Process
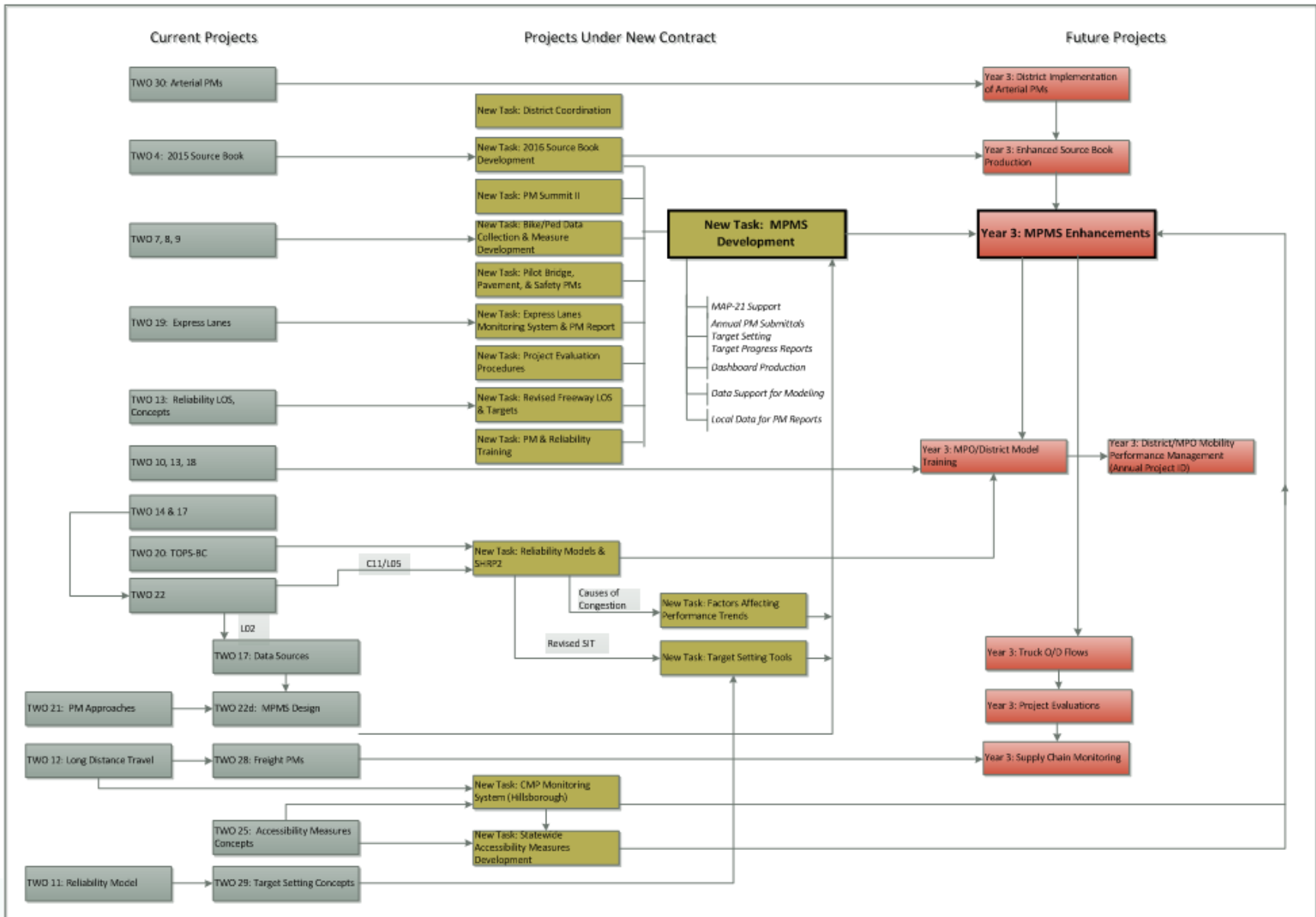
Mobility Performance Monitoring System

- Automated data collection process from various sources in FDOT

- Storage capability to store and maintain large amounts of data

- Processing capabilities that will provide data quality checks, perform needed calculations and provide capabilities to access and manipulate data from the different sources

Mobility Performance Monitoring System

- Query and reporting capabilities that will provide information in formats required by the Source Book and other customized formats

- A maintenance process to maintain the software, hardware and links to data sources

MPM Website

http://www.FloridaMPMs.com/

Mobility Performance Measures Program
Joint Statewide Initiative

| Home | Program Information | MPM Source Book | Meetings, Members, Materials | Work Products | Contact |

Florida's Mobility Performance Measures