

FDOT Mobility Performance Measures Program

Consensus Items

December 6, 2013

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1.0 Introduction

The Florida Department of Transportation has initiated a Mobility Performance Measures (MPM) program. The purpose of the program is to develop and report on multimodal mobility performance measures. The objective of the program is to develop and regularly update measures, analytic and reporting techniques for measures in every mode (freight, auto/truck, transit, pedestrian, bicycle, aviation, rail, seaport) and to ensure they are in accordance with state of the art practices and national guidelines related to mobility performance measurement.

The program can be described through several key components as follows:

- Purpose of a Mobility Performance Measures Program
- Performance measures from a multimodal perspective
- Reporting and sources of data
- Roles of Central Office, Districts and MPOs
- Definitions
- Future direction

The details of these components have been discussed with various groups including FDOT Central and District offices and MPOs throughout the State. This report documents the outreach process and presents the results of the consensus-building process in terms of agreed upon elements of the six key components above.

2.0 Summary of Outreach

The proposed purpose, measures, definitions, mechanisms for reporting, roles and plans for future direction of the MPM program were presented and discussed over the last year with the following groups.

- FDOT Mobility Performance Measures Team - April 9 and 10, 2013 (Orlando), June 17, 2013 (webinar), and October 7, 2013
- MPOAC - January 29, 2013 and October 30, 2013
- Mobility Performance Measures Summits - December, 2012 and January, 2013
- FDOT Travel Time Reliability Coordination Group - March 11, 2013 and September 10, 2013
- FDOT Multimodal Coordination Team - March 12, 2013 and August 8, 2013
- FDOT District 6 Intelligent Transportation Systems and Transportation Systems Management and Operations Offices - May 7, 2013
- FDOT District 4 Planning, Modal Development and Operations - May 8, June 18, August 15, 2013
- Broward County MPO - May 7, June 17, August 14, September 25, 2013
- Florida Section ITE - June 21, 2013
- FDOT District 6 - August 15, 2013
- FDOT District 7 - August 21, September 18, 2013
- Hillsborough MPO - August 21, 2013
- Miami-Dade MPO - October 1, 2013
- FDOT Executive Board - November 21, 2013

3.0 Consensus Items

The following items summarize the MPM program and they consider all comments received and discussed with stakeholders.

3.1 PURPOSE OF A MOBILITY PERFORMANCE MEASURES PROGRAM

The purpose of the MPM program at FDOT is to:

- Develop statewide MPMs for use by transportation and other partners across the State
- Help ensure consistency in understanding and approach by the State and MPOs through a consensus-building process
- Help comply with MAP-21 requirements
- Help in evaluating alternatives and prioritizing projects in planning and programming processes

It is understood that the Transportation Statistics Office within FDOT is responsible for reporting on the MPMs annually for the State through the FDOT *Multimodal Mobility Performance Measures Source Book*. Other offices and MPOs can use the measures and results in their own planning and programming processes. Note that MAP-21 is primarily a highway-oriented bill, and as such, the MPMs are largely oriented to the auto and truck modes. Future iterations will evolve with increased emphasis on other modes such as transit, aviation, rail, and seaports.

3.2 MULTIMODAL MOBILITY PERFORMANCE MEASURES

Multimodal mobility performance measures represent one aspect of FDOT's overall performance measures program. A matrix of MPMs will be reported on regularly. The matrix includes freight and people components, and is divided into four dimensions of mobility: quantity, quality, accessibility, and utilization. Appendix A contains the current measures reported and Appendix B contains future recommended measures.

- Current Measures – The current measures are shown for people (highway (auto/truck), transit, pedestrian, bicycle, aviation, rail and seaports) and freight (auto/truck, aviation, rail, seaports.) The four dimensions stratify the measures and reporting periods (peak hour, peak period, daily and yearly) are indicated for each measure. The matrix indicates which measures FDOT is proposing to be reported for MAP-21 purposes in bold type.

- Future Recommended Measures – Future measures will be developed within the next year or two. Appendix B matrix shows the proposed 2014 measures in italics and bold indicates MAP-21 measures. As work continues, some measures may be added and others deleted.

The measures are provided as recommendations. An agency may wish to revise how the measures are reported, for example: vehicle miles travelled *per capita*.

3.3 REPORTING AND SOURCES OF DATA

Multimodal mobility performance measures are currently reported in the FDOT Transportation Statistics Office's *Multimodal Mobility Performance Measures Source Book*. When FHWA announces the required MAP-21 measures, FDOT will also report on and provide measures to the Districts and MPOs as described below in the MAP-21 section.

Multimodal Mobility Performance Measures Source Book

The primary source of data and analysis is the *Multimodal Mobility Performance Measures Source Book*. The *Source Book* will be published every August. It is anticipated that MPOs and District offices will refer to and use the *Source Book* for their own reporting.

The measures are provided by facility and area types as appropriate. For example, most measures are reported for State Highway System (SHS), SIS Highway Corridors, SIS Highway Connectors, Freeways, Non-Freeways and by State, seven largest counties, other urbanized areas, and non-urbanized areas:

- VMT
- PMT
- percent of travel meeting LOS criteria
- vehicle hours of delay
- average travel speed
- percent of miles severely congested
- percent of travel severely congested
- hours severely congested
- vehicles per lane mile
- combination truck miles traveled
- truck miles traveled
- combination truck hours of delay
- combination truck average travel speed
- percent of travel severely congested (freight)
- vehicles per lane mile (freight)

Auto and freight travel time reliability and variability are provided only on freeways for the state, its seven largest counties, other urbanized areas, non-urbanized areas, and Turnpike.

For more information, please refer to the Transportation Statistics Office’s website at <http://www.dot.state.fl.us/planning/statistics/sourcebook/>.

MAP-21

The Department’s intent is to supply the MPOs with analyses for all required MAP-21 mobility performance measures. Starting in 2014, the Transportation Statistics Office will provide the following to districts to transmit to the MPOs in anticipation of required MAP-21 reporting. If MAP-21 requires different MPMs, the list will be changed and updated.

- Vehicle Miles Traveled (daily and peak hour)
- Combination Truck Miles Traveled (yearly)
- % Travel Meeting LOS Criteria (peak hour, peak period, daily)
- Travel Time Reliability - People (peak hour, peak period, daily)
- Delay (peak period, daily, yearly)
- Travel Time Reliability - Freight (peak period)
- Combination Truck Delay (daily)

It is FDOT’s intent to provide these for the State as a whole, by freeway and non-freeway facility types and for each U.S. Census designated urbanized area and for groups of urbanized areas served by one MPO. (“FHWA smoothed urbanized area” boundaries will be used.) If an MPO provides the shape files for its Planning Boundaries to the Transportation Statistics Office, then the data for the Planning Boundaries will also be provided to the MPO. Note that measures will not be provided by district.

3.4 ROLES OF CENTRAL OFFICE, DISTRICTS AND MPOS

FDOT and MPOs will be responsible for developing/reporting on their own:

- Multimodal mobility performance measures
- Performance targets
- Performance plans

The consensus measures and definitions contained in this document are designed for use by all stakeholders.

The FDOT Central Office will:

1. Coordinate statewide efforts on MPM Program.
 - a. Lead the development and update of the measures and analysis techniques
 - b. Conduct and share research activities and District case studies through the State with all stakeholders

2. **Produce and report on statewide MAP-21 measures** – This will be done in compliance with MAP-21 and will include the development of performance targets and performance plans. The reports and data will be provided to the districts who will share with the MPOs.
3. Produce the annual Transportation Statistics Office’s *Multimodal Mobility Performance Measures Source Book* every August. The measures and reporting periods are shown in the Current MPM Matrix (Appendix A).
4. **Provide additional MPMs** on a case-by-case basis (as requested).
5. **Lead the acquisition** and dissemination of the National Performance Measures Research Data Set (NPMRDS) and other data sources as appropriate.
6. **Lead the development of targets** at the State level and **support MPOs** in their target development.
7. Develop and provide training in 2014.

FDOT District Offices will:

1. **Provide input** to Central Office on the MPM program
2. Coordinate with MPOs and MPO Alliances
 - a. Provide MAP-21 mobility performance measure analyses developed by the Central Office
 - b. Provide technical support
 - c. Provide advice on setting goals and objectives related to measures
3. **Implement FDOT projects/programs** to implement Federal and State goals/objectives and document those activities.
4. **Develop own MPMs** within and across districts as appropriate.

MPOs will:

1. Develop and use their own MPMs as appropriate.
2. Comply with MAP-21.
 - a. Use calculated results provided by FDOT, if desired
 - b. Develop performance targets
 - c. Report to FHWA as required
 - d. Include measures in long range transportation plans (LRTPs) and congestion management plans (CMPs) to evaluate alternatives
 - e. Coordinate with other MPOs as appropriate

3.5 DEFINITIONS

A set of MPM-related definitions is included in Appendix C. It is recommended these FDOT definitions be used as much as possible for statewide consistency. Note that the measures are primarily auto and truck oriented at this point. Future versions will be increasingly multi-modal in their orientation.

3.6 FUTURE DIRECTION

In addition to the roles and responsibilities listed above, FDOT Central Office will take the lead on the following activities in the next two years:

- Refine the MPMs and coordinate with the stakeholder groups through quarterly statewide meetings
- Develop and deliver a Training and Users Guide on multimodal mobility performance measures and performance based planning
- Conduct research related to application of Strategic Highway Research Program (SHRP2)
- Evaluate the impact of safety on the MPMs
- Develop freight origin/destination measures
- Conduct research regarding accessibility measures
- Develop targets and address issues related to timing and other planning documents
- Evaluate the National Performance Measures Research Data Set (NPMRDS) for use in the *Mobility Performance Measures Source Book* and MAP-21 measures
- Research and consider MPMs for measuring multimodal corridors

A. Current Mobility Performance Measures Matrix

Matrix of Multimodal Mobility Performance Measures

	MODE	QUANTITY	QUALITY	ACCESSIBILITY	UTILIZATION
People	Highway	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		% Miles Severely Congested % Travel Severely Congested Hours Severely Congested Vehicles Per Lane Mile
	Aviation	Passengers	Departure Reliability		
	Rail	Passengers			
	Seaport	Passengers			
	Transit	Passenger Miles Traveled Passenger Trips	Average Headway		
	Pedestrian			% Sidewalk Coverage	
	Bicycle			% Bike Lane/Shoulder Coverage	
Freight	Highway	Combination Truck Miles Traveled Truck Miles Traveled	Travel Time Reliability Travel Time Variability Combination Truck Hours of Delay Combination Truck Average Travel Speed		% Miles Severely Congested Vehicles Per Lane Mile
	Aviation	Tonnage			
	Rail	Tonnage			
	Seaport	Tonnage Truck Equivalent Units			

Reporting Periods: = Peak Hour = Peak Period = Daily = Yearly

Bold = Map-21-Related Measure

Refer to *Multimodal Mobility Performance Measures Source Book* for more details -
<http://www.dot.state.fl.us/planning/statistics/sourcebook/>

B. Future Recommended Mobility Performance Measure Matrix

Draft Recommended Matrix of Multimodal Mobility Performance Measures					
	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	<i>% Population Within 30 Min of Job</i>	% Miles Severely Congested % Travel Severely Congested Hours Severely Congested Vehicles Per Lane Mile
	Transit	Passenger Miles Traveled Passenger Trips	Average Headway		
	Pedestrian		<i>Level of service (LOS)</i>	% Sidewalk Coverage	
	Bicycle		<i>Level of service (LOS)</i>	% Bike Lane/Shoulder Coverage	
	Aviation	Passengers	Departure Reliability	<i>Highway adequacy (LOS)</i> <i>% Population within 30 min drive time</i>	<i>Demand to capacity ratios</i>
	Rail	Passengers	Departure Reliability	<i>% Population < X time or distance</i>	
	Seaports	Passengers	Departure Reliability	<i>Highway adequacy (LOS)</i>	
Freight	Auto/Truck	Combination Truck Miles Traveled Truck Miles Traveled <i>Combination truck tonnage</i> <i>Combination truck ton miles traveled</i>	Travel Time Reliability Travel Time Variability Combination Truck Hours of Delay Combination Truck Average Travel Speed <i>Truck LOS</i>		% Miles Severely Congested Vehicles Per Lane Mile <i>Combination truck backhaul tonnage</i>
	Aviation	Tonnage		<i>Highway adequacy (LOS)</i>	
	Rail	Tonnage		<i>Highway adequacy (LOS)</i> <i>Quality rail access</i>	
	Seaports	Tonnage Truck Equivalent Units		<i>Highway adequacy (LOS)</i>	

Reporting Periods: = Peak Hour = Peak Period = Daily = Yearly

Bold = Map-21-Related Measure *Italicized Grey Text* = Future Measure in 2014

c. Definitions

Accessibility (a dimension of mobility) – conceptually the ease in engaging in activities; ability to reach desired destinations, activities, goods, and services – performance measures typically associated with this mobility dimension are:

- Time, distance or cost to reach a destination
- Modal choices/alternatives
- Connectivity
- Number of transfers (transit)

Auto (automobile) – a highway travel mode that includes motor vehicle traffic including motorcycles, passenger cars, and four tire, single units (FHWA Vehicle Category Classification, Classes 1- 3 (See Appendix D)).

Auto/Truck – a combination of the auto and truck modes (FHWA Vehicle Category Classification Classes 1-13).

Average travel speed – The length of the highway segment divided by the average travel time of all vehicles traversing the segment, including all stopped delay times.

Aviation – mode relating to the transportation of people and goods by aircraft.

Benchmark – a common reference point used for comparisons for performance measures practices.

Bicycle – a mode comprised of vehicles with two wheels tandem, propelled by human power.

Bikeway - a bicycle path physically separated from motorized traffic by an open space or barrier, either within the highway right-of-way or within an independent right-of-way.

Bottleneck – a segment of a transportation network that consistently experiences significant operational problems such as oversaturated congestion.

Buffer index – a travel time reliability performance measure defined by the ratio of an actual travel time (typically the 95th percentile travel time) to the average travel time; conceptually represents the extra travel time (or time cushion) travelers must add to their average travel time when planning trips to ensure on-time arrival (note: this measure is not recommended for statewide reporting of travel time reliability or in project prioritization).

Bus – a highway travel mode operated by rubber-tired vehicles that follow fixed routes and schedules along roadways (FHWA Vehicle Category Classification Class 4).

Capacity (for auto/truck modes) – the maximum number of vehicles that reasonably can be expected to traverse a point or a uniform section of roadway during a given time period under prevailing conditions.

Capacity (for other modes) – To be added in future.

Combination truck – a truck consisting of a tractor and trailer (FHWA Vehicle Category Classification Classes 8-13).

Congestion (congested conditions) (for the auto/truck modes) – a condition in which traffic demand causes the level of services (LOS) to be at or below FDOT's LOS standard.

Adjectives describing the severity of congestion are:

- Mild
- Heavy
- Severe

Adjectives describing the types of congestion are:

- Non-recurring
- Recurring

Container – a large, standard sized metal box into which cargo is packed for shipment. (See definition of twenty-foot equivalent unit.)

Context measure – see Indicator.

Corridor (for auto/truck modes) – (1) a set of essentially interrelated, parallel transportation facilities for moving people and goods between two points; (2) a geographic area used for the movement of people and goods; (3) highway, rail line, waterway, bikeway and other exclusive-use facilities that connect major origin/destination markets.

Delay (for auto/truck modes) – (1) additional travel time beyond some norm (e.g., LOS C in urbanized areas, LOS B elsewhere) experienced by a traveler; (2) any additional travel time experienced by a traveler.

Delay (for other modes) – to be added in future.

Demand – the number of persons or vehicles desiring to use a mode or facility.

Demand to capacity ratio – see volume to capacity ratio.

Enplanements – passenger boardings at airports.

Facility (for auto mode) – a length of roadway composed of points and segments.

Free flow speed (for auto/truck modes) – the average speed of vehicles on a given segment, measured under low-volume conditions, when drivers are free to drive at their desired speed and are not constrained by the presence of other vehicles or downstream traffic control devices; typically 5 mph over the posted speed limit.

Free flow time (for auto/truck modes) – the average time spent by vehicles traveling at the free flow speed over a facility length.

Freeway – a multilane, divided highway with at least two lanes for exclusive use of traffic in each direction and full control of ingress and egress.

Freight – any commodity being transported.

Goal – the description of a desired outcome. The purpose toward which an endeavor is directed, integral to organization mission. (e.g., provide safe and secure transportation across modes.)

Heavy congestion (for the auto/truck modes) – a condition in which traffic demand is at a level to cause the LOS to be below FDOT’s LOS standard.

Heavy vehicle (truck and bus modes) – a vehicle meeting FHWA Vehicle Category Classification Classes 4-13.

Highway – a general term for denoting a public way for purposes of vehicular and people travel, including the entire area within the right-of-way.

Highway modes – methods of motorized and non-motorized travel that may utilize a highway, specifically auto, bicycle, bus, pedestrian, and truck.

Indicator (also known as context measure) – a type of mobility performance measure which is used to identify relevant background conditions and trends.

Intermodal – related to the connection between two or more modes of transportation.

Level of service (LOS) – a quantitative stratification of the quality of service to a typical traveler of a service or facility into six letter grade levels, with “A” describing the highest quality and “F” describing the lowest quality.

Mild congestion (for auto/truck modes) – a situation in which traffic demand is in the LOS range of FDOT’s LOS standard.

Mobility – the movement of people and goods.

Mobility performance measure – a metric that quantitatively describes something about one of the four dimensions of mobility (quantity, quality, accessibility, utilization). Measures can be considered as one of two types:

- a mobility metric directly tied to achieving a goal or objective or used in a decision making process; or
- an indicator or context measure which is used to identify relevant background conditions and trends

Mode – a means of moving people or goods.

Motor carrier – a firm engaged in providing commercial motor freight or long distance trucking.

Multimodal - more than one travel mode including potentially the four highway modes (auto/truck, bicycle, bus/transit, and pedestrian), aviation, rail, and seaports.

Non-recurring congestion (for auto/truck modes) - congestion caused by unexpected disruptions or other events, particularly lane blocking incidents.

Objective - A specific, quantifiable statement that clearly relates to a goal; states a desired direction (e.g., reduce the rate of injuries).

On-time arrival - A travel time reliability performance measure defined by a designated travel time (typically for freeways based on a 45 mph speed or 1.33 travel time index); conceptually represents a trip that arrives within a defined travel time.

Paratransit (or demand response) - Forms of transportation service that are more flexible and personalized than conventional fixed route, fixed schedule transit service; typically utilized to accommodate passengers who are older or disabled and unable to use the fixed route service.

Passengers (for aviation, rail, seaports, transit modes) - people in a vehicle making use of a mode.

Peak hour - (1) the hour in which the greatest amount of travel occurs (typically considered 5:00-6:00 p.m. on a weekday); (2) the hour in which the greatest amount of travel occurs for a mode.

Peak period - (1) a multi-hour period in which travel is greatest; and (2) for the auto mode in large urbanized areas the two-hour weekday time period of 5:00-7:00 p.m. at which congestion is typically highest.

Pedestrian - an individual traveling on foot.

Performance based planning - application of performance management principles to transportation system policy and investment decisions.

Performance measure - a metric that quantifies an agency's progress in meeting stated goals and objectives.

Planning time index - a travel time reliability performance measure defined by the ratio of an actual 95th percentile travel time to the free flow travel time. PTI conceptually represents the congested travel time travelers must spend compared to an uncongested travel time to arrive at their destination on time 95% of the time (a value of 3.00 indicates a traveler should allow 60 minutes to make an important trip that takes 20 minutes in uncongested traffic).

Quality (a dimension of mobility) - conceptually how well people or goods are being transported. Performance measures typically associated with this mobility dimension are:

- Average travel speed
 - Travel time reliability
 - Vehicle delay
-

- Level of service

Quality of service – a user based perception of how well a service or facility is operating.

Quantity (a dimension of mobility) - conceptually the number of people or goods being transported. Performance measures typically associated with this mobility dimension are:

- Person trips
- Person miles traveled
- Vehicle miles travel
- Truck miles traveled
- Tonnage

Rail - relating to the transportation of people and goods by train.

Recurring congestion (for auto mode) - the routine presence of congestion on a facility.

Reliability – see travel time reliability.

Seaport - relating to the transportation of people and goods by waterborne vessels.

Severe congestion (for auto mode) – a condition in which traffic demand exceeds the capacity (LOS F).

Single unit truck - a truck without a trailer (FHWA Vehicle Category Classification Classes 5-7).

Stable flow – a flow of traffic on freeways, which is not stop-and-go.

Strategic Intermodal System (SIS) – Florida’s transportation system composed of facilities and services of statewide and interregional significance, including appropriate components of all modes.

System – a combination of facilities or services forming a network or being selected for analysis.

Target – a value of a performance measure representing the level of desired performance reflecting an agency’s goals and objectives.

Throughput – the maximum number of people or vehicles that reasonably can be expected to traverse a point or a uniform transportation facility section during a given time period under prevailing conditions.

Transit – a travel mode in which vehicles (including busses, streetcars, light rail, metro rail, and commuter rail) stop at regular intervals along the roadway or exclusive right-of-way to pick up and drop off passengers.

Travel time – the total time spent getting from one point to another.

Travel time index - a performance measure defined by the ratio of an actual travel time to the free flow travel time; conceptually represents the congested travel time travelers must spend compared to an uncongested travel time.

Travel time reliability - (1) the percent of trips that succeed in accordance with a predetermined performance standard for time or speed; and/or (2) the variability of travel times that occur on a facility or a trip over a period of time - frequently used performance measures are:

- Buffer index
- On-time arrival
- Planning time index
- Travel time index

Travel time variability - see travel time reliability.

Truck - a vehicle engaged primarily in the transport of goods and materials (FHWA Vehicle Category Classification Classes 5-13).

Twenty-foot equivalent unit - the eight-foot by eight-foot by twenty-foot intermodal container used as a basic measure used for container cargo.

Utilization (a dimension of mobility) - conceptually how efficiently the system is being used- performance measures typically associated with this mobility dimension are:

- Volume to capacity ratios
- Percent miles severely congested
- Percent travel severely congested

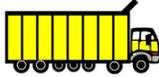
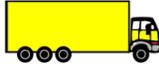
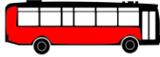
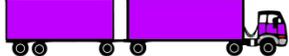
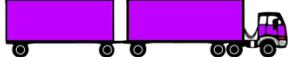
Vehicle - a motorized mode of transportation.

Vehicle miles traveled (for auto/truck modes) - the total number of miles traveled by vehicles using a highway system.

Volume to capacity ratio - the ratio of demand to capacity.

Note: These definitions are primarily related to the auto/truck mode. Additional details will be added in the future to cover more modal definitions.

D. FHWA Vehicle Category Classification

Class 1 Motorcycles		Class 7 Four or more axle, single unit	
Class 2 Passenger cars		Class 8 Four or less axle, single trailer	
			
			
			
Class 3 Four tire, single unit		Class 9 5-Axle tractor semitrailer	
			
			
Class 4 Buses		Class 10 Six or more axle, single trailer	
		Class 11 Five or less axle, multi trailer	
			
Class 5 Two axle, six tire, single unit		Class 12 Six axle, multi-trailer	
			
		Class 13 Seven or more axle, multi-trailer	
Class 6 Three axle, single unit		Class 13 Seven or more axle, multi-trailer	
	