CRCOG CAPITOL REGION COUNCIL OF GOVERNMENTS
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To: Transportation Committee

From: Jennifer Carrier, Director of Transportation Planning
Rob Aloise, Principal Transportation Engineer

Date: May 15, 2018

Subject: Transportation Performance Measures and Target Setting

This memorandum provides an update on the Connecticut Department of Transportation's (CTDOT) efforts to comply with federally required Transportation Performance Measures and Target Setting. As a reminder, CTDOT must set 2-year and 4-year targets by May 20, 2018 for ten (10) FHWA performance measures covering 5 general areas, summarized below. After CTDOT establishes targets, CRCOG has 180 days (until November 16, 2018) to either adopt/support each CTDOT target, or set our own.

- Pavement Conditions
- Bridge Conditions
- Performance of the National Highway System (NHS)
- Performance of Freight
- CMAQ Program – On-Road Mobile Source Emissions

Performance targets for highway safety and transit asset management have already been established by our region. Performance targets for congestion reduction do not need to be set until November 2022 and we are awaiting federal guidance and final rule-making for transit safety performance targets.

Background

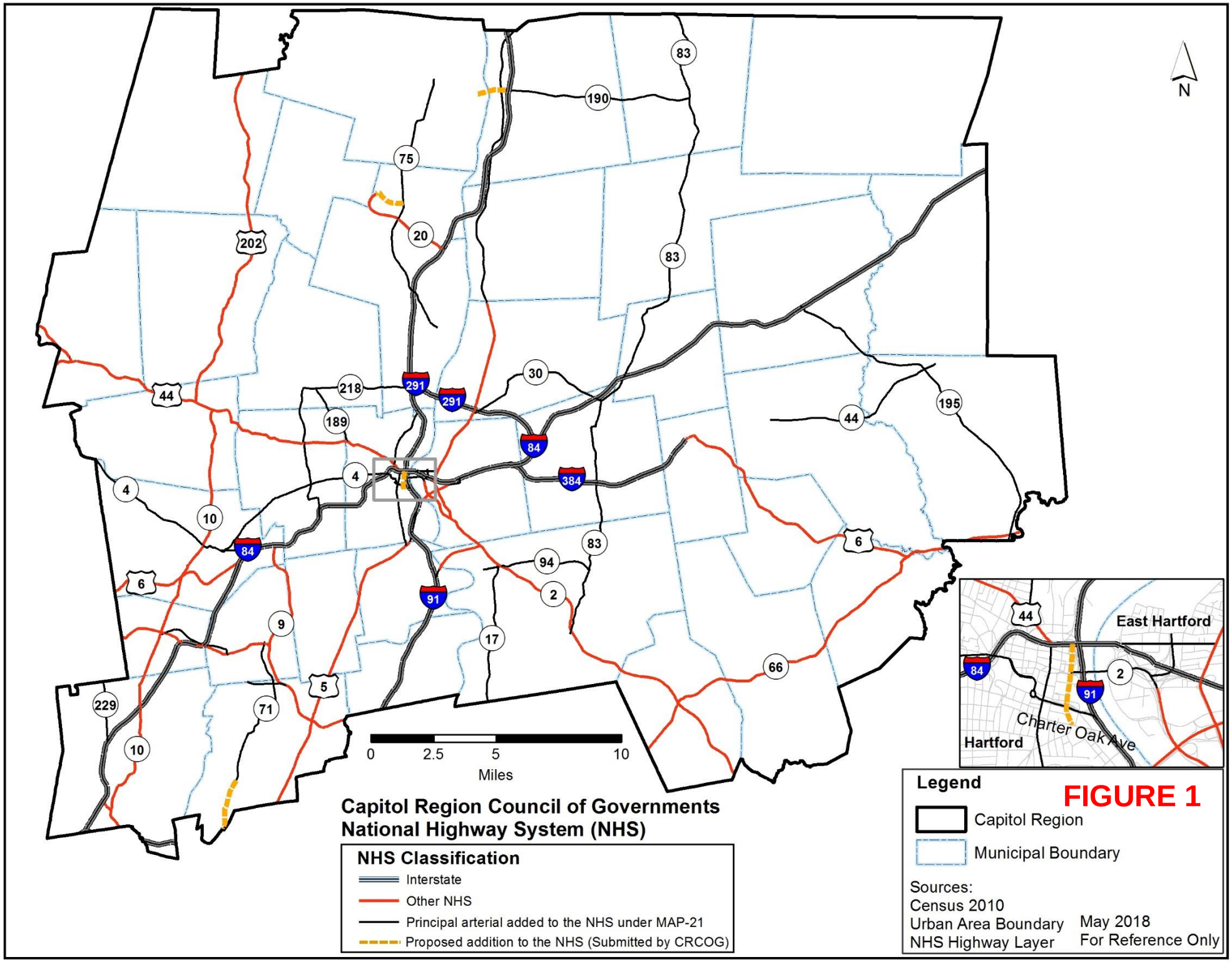
CTDOT met with the regions on May 8th to discuss their methodology for developing specific performance targets. The attached sheets summarize each performance area along with CTDOT's targets. This information should assist us in framing the discussion in our region as we work to understand and establish targets.

One item to specifically note, federal guidance focuses the performance measures on the National Highway System (NHS) which consists of a network of strategic highways, including interstates and other roads that serve major airports, rail or truck terminals, and other strategic transport facilities. The specific NHS roadways within our region are illustrated in Figure 1.

Next Steps

There are a number of complicated components to consider when establishing performance targets however it is an important assignment and opportunity for our region. CRCOG staff recommends the following next steps, in an effort to meet the upcoming November regional deadline and more transparently link transportation funding with performance goals. We would be interested in discussing this in more detail at the May 21st Transportation Committee meeting.

- Establish a performance measures working group to discuss these measures and targets in more detail
- Begin to outline goals and objectives for each performance area, linking them back to the Long Range Transportation Plan (LRTP), which will be updated in the coming months.
- Begin to outline projects in CRCOG's Transportation Improvement Program (TIP) that fit within each performance area, ensuring projects are advanced
- Begin to outline new initiatives and projects that work to address performance
- Regularly coordinate with CTDOT given their management of the NHS within our region (e.g. ensure we receive updates as it relates to pavement and bridge conditions and investments within our region)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Miles
East Hartford
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2
91
Charter Oak Ave
Hartford
Capitol Region Council of Governments
National Highway System (NHS)
NHS Classification
Interstate
Other NHS
Principal arterial added to the NHS under MAP-21
Proposed addition to the NHS (Submitted by CRCOG)
Legend
Capitol Region
Municipal Boundary
Sources:
Census 2010
Urban Area Boundary
NHS Highway Layer
May 2018
For Reference Only

FIGURE 1

Pavement Conditions

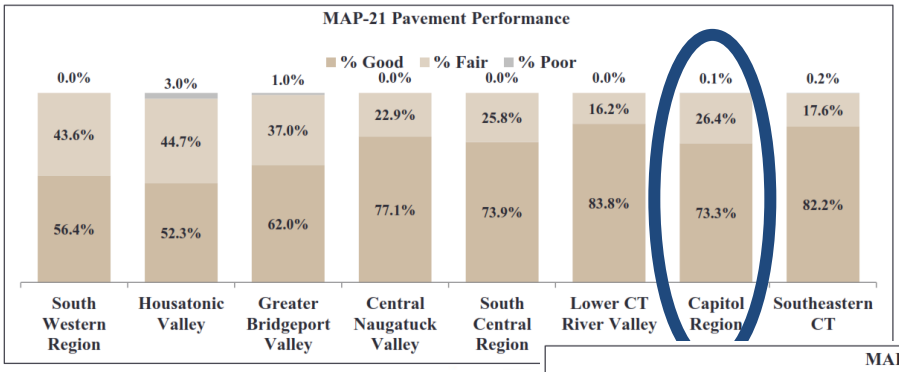
The four performance measures include:

- Percentage of Pavements on the Interstate System in Good condition
- Percentage of Pavements on the Interstate System in Poor condition
- Percentage of Pavements on the non-Interstate NHS in Good condition
- Percentage of Pavements on the non-Interstate NHS in Poor condition

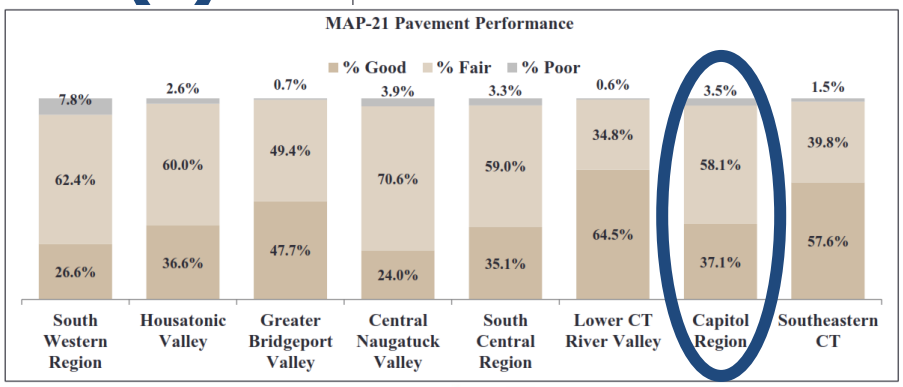
To understand these measures it is important to have the following background:

- CTDOT uses dTIMs, developed by Deighton Associates, as their asset management system. The program encompasses strategic planning components with maintenance, operations and capital investment decision-making aspects.
- CTDOT's Pavement Management System, consists of three major components: a system to regularly collect highway condition data; a computer database (ROADWARE Vision) to process, sort, and store the collected data, and dTIMS to evaluate repair or preservation strategies and suggest cost-effective projects to maintain highway conditions.
- The below graphics represent pavement conditions within our region, compared to other regions.

Percentage of Pavements on the Interstate System in Good/Poor Condition



Percentage of Pavements on the non-Interstate NHS in Good/Poor Condition



CTDOT's pavement condition performance targets are to the right. The current conditions column reflects what CTDOT provided to the Federal Highway Administration (FHWA) last year in their Highway Performance Monitoring System (HPMS) submittal. HPMS is required of all states and is primarily used when assigning federal highway funding to states.

Pavement Condition Measures

- % of Interstate system in "Good" and "Poor" condition
  - MAX % Poor (Interstates): 5%
- % of National Highway System in "Good" and "Poor" condition

Asset (unit of measure)	Current Condition (HPMS submittal 6/2017)		2-year targets (2020)		4-year targets (2022)	
	Good %	Poor %	Good %	Poor %	Good %	Poor %
Interstate Pavement (lane miles)	66.2	2.2	65.5	2.0 Better	64.4	2.6
Non-Interstate NHS Pavement (lane miles)	37.9	8.6	36.0	6.8 Better	31.9	7.6

Bridges

The two performance measures include:

- Percentage of NHS Bridges classified as in Good condition
- Percentage of NHS Bridges classified as in Poor condition

To understand these measures it is important to have the following background:

- CTDOT uses dTIMs, developed by Deighton Associates, as their asset management system. The program encompasses strategic planning components with maintenance, operations and capital investment decision-making aspects.
- CTDOT's Bridge Management System starts with the current status of the bridge, accounts for programmed work and adjusts for predicted decay. Major bridges are analyzed individually by engineers and spreadsheets and all other structures are analyzed by dTIMS. Bridge inputs to dTIM include current bridge condition data, deterioration curves, scheduled projects, treatments and costs, budgets, time spans, inflation and discount rates.
- The below graphics represent bridge conditions within our region, compared to other regions.

Percentage of NHS Bridges classified as in Good/Poor condition

			FAST Act *National Performance Management Measures*	
MPO	NHS-NBI Bridges (Deck Area - ft^2)	Locally Owned NHS-NBI Bridges	% Good (by deck area)	% Poor or % Structurally Deficient (by deck area)
1 - South Western	2,183,450	0	3.3%	19.1%
2 - Housatonic Valley	920,157	2	22.0%	7.4%
3 - Northwest Hills (RPO)	273,510	0	22.7%	10.0%
5 - Central Naugatuck Valley	1,917,348	1	9.7%	34.2%
7 - Greater Bridgeport Valley	3,765,462	0	24.8%	6.3%
8 - South Central Region	4,014,609	4	42.8%	6.0%
10 - Capitol Region	8,567,699	5	13.6%	15.7%
11 - Lower CT River Valley	1,418,300	2	11.0%	16.2%
13 - Southeastern CT	2,832,830	0	7.4%	23.0%
15 - Northeastern CT (RPO)	377,273	0	15.3%	12.6%
TOTAL	26,270,638	14	18.1%	14.9%

CTDOT's bridge performance targets are summarized to the right. The current conditions column reflects what CTDOT provided to the Federal Highway Administration (FHWA) last year in their Highway Performance Monitoring System (HPMS) submittal. HPMS is required of all states and is primarily used when assigning federal highway funding to states.

Bridge Condition Measures

- % of NHS Bridges in "Good" and "Poor" condition
- Max % poor: 10 (MAP-21)

Asset (unit of measure)	Current Condition (NBI submittal 3/2017)		2-year targets (2020)		4-year targets (2022)	
	Good %	Poor %	Good %	Poor %	Good %	Poor %
NHS Bridge (deck area)	18.1	15.0	22.1	7.9	26.9	5.7
			Better	Better	Better	Better

National Highway System (NHS) Performance

The three performance measures include:

- Percent of person-miles traveled on the Interstate System that are reliable
- Percent of person-miles traveled on the non-Interstate NHS that are reliable
- Annual hours of peak-hour excessive delay per capita (CTDOT will establish in 2022; CRCOG not required to set this target until 2022 given our region is less than 1 million population.)

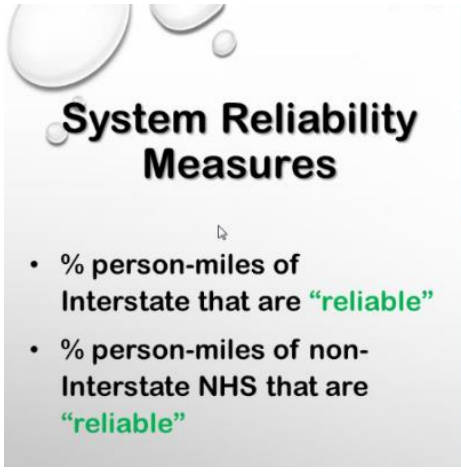
To understand these measures it is important to have the following background:

- Data come from the National Performance Management Research Data Set (NPMRDS), which provides an average travel time in seconds for each segment and 15-minute period
- Reliability is defined as the Level of Travel Time Reliability (LOTTR) and it is a ratio of the longer travel times (defined by 80th percentile) to a normal travel time (defined by the 50th percentile)
- If LOTTR is less than 1.5, it is considered to be reliable
- LOTTR is calculated for each road segment on an annual basis for the AM, Midday, PM, and Weekend time periods, the maximum determines a segment's overall reliability (e.g. AM LOTTR: 1.49, Midday LOTTR: 1.38, PM LOTTR: 1.63, Weekend LOTTR: 1.35, Overall Segment LOTTR = 1.63, and is therefore Unreliable)
- The percentage of reliable person-miles comes from the sum of all "reliable" segments compared to the sum of all segments. Person-miles are a factor of a segment's length, annual traffic volume and occupancy factor (persons per vehicle). CTDOT assumed an occupancy factor of 1.7. (e.g. 1.5 mile segment * 95,000 vehicles *1.7 occupancy factor = 242,250 person-miles for that segment)
- CTDOT used the Mobility Measurement in Urban Transportation (MMUT) pooled fund program based at Texas A&M University to perform data analysis on NPMRDS and prepare the performance targets; CRCOG staff has been using other statistical software (including excel and R software programs) when calculating the same measures
- The below illustrates a general example expanding upon the above:

Segment	AM LOTTR	Midday LOTTR	PM LOTTR	Weekend LOTTR	Overall	Reliability
Segment A	1.49	1.38	**1.63**	1.35	**1.63**	Unreliable
Segment B	1.48	1.35	1.49	1.31	1.49	Reliable

Segment	Length (miles)	Annual Traffic Volume	Occupancy Factor	Person-Miles	Percentage
Segment A (Unreliable)	1.5	95,000	1.7	242,250	50.25%
Segment B (Reliable)	1.7	83,000	1.7	239,870	49.75%
			Total	482,120	100.00%

CTDOT's NHS performance targets for the State of Connecticut are illustrated to the right.



System (unit of measure)	Current Condition	2-year targets (2020)	4-year targets (2022)
	Reliable %	Reliable %	Reliable %
Interstate (person-miles)	78.3	75.2	72.1
		Reliability declines in all cases	
Non-Interstate NHS (person-miles)	83.6	80.0	76.4

Freight Performance

The freight performance measure includes:

- Truck Travel Time Reliability Index (TTTR)

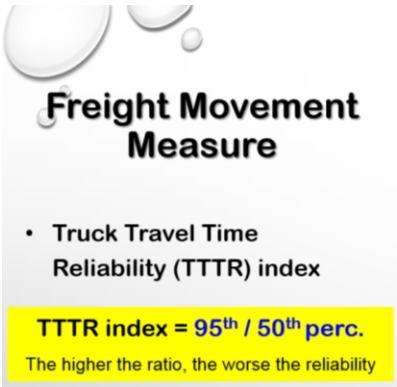
To understand this measures it is important to have the following background:

- Data come from the National Performance Management Research Data Set (NPMRDS), which provides an average travel time in seconds for each segment and 15-minute period
- Reporting is divided into 5 time periods: morning peak (6-10 am); midday (10am – 4 pm) and afternoon peak (4-8 p.m.) Mondays through Fridays; weekends (6 a.m.-8 p.m.); and overnights for all days (8 p.m.-6 a.m.).
- Truck Travel Time Reliability Index (TTTR) is a ratio of the 95th percentile time to the 50th percentile time (also called normal time) for each segment. The TTTR Index is generated by multiplying each segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.
- CTDOT used the Mobility Measurement in Urban Transportation (MMUT) pooled fund program based at Texas A&M University to perform data analysis on NPMRDS and prepare the performance targets; CRCOG staff has been using other statistical software (including excel and R software programs) when calculating the same measures
- The below illustrates a general example expanding upon the above:

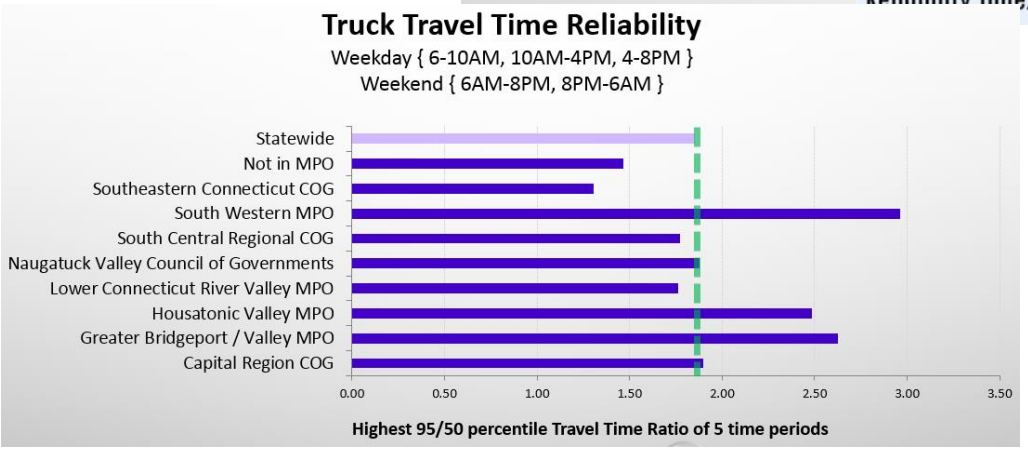
Segment	AM TTTR	Midday TTTR	PM TTTR	Weekend TTTR	Overnight TTTR	Largest TTTR	Segment Length
Segment A	1.8	1.7	1.9	1.4	1.2	1.9	1.5 miles
Segment B	1.9	1.8	2.0	1.5	1.2	2.0	1.3 miles

Segment	Largest TTTR	Segment Length (miles)	Length-Weighted Segment
Segment A	1.9	1.5	2.85
Segment B	2.0	1.3	2.60
	Calculated TTTR	Sum of Segment Lengths	Sum of Length-Weighted Segments
TTTR Index	**1.94**	2.8	5.45

CTDOT's freight performance targets for the State of Connecticut are illustrated to the right and below along with the regional findings. The below graphics represent freight conditions within our region, compared to other regions.



System (unit of measure)	Current Condition	2-year targets (2020)	4-year targets (2022)
	TTTR	TTTR	TTTR
Interstate (Truck Travel Time Reliability Index)	1.75	1.79	1.83
		Reliability gets worse	



Congestion Mitigation and Air Quality (CMAQ) Program – On-Road Mobile Source Emissions

The CMAQ Program – On-Road Mobile Source Emission measure includes:

- Total Emissions Reduction (kg/day)

To understand these measures it is important to have the following background:

- Emissions components for CMAQ funded projects include Volatile Organic Compounds (VOCs), Nitrogen Oxide (NOx), and Particulate Matter (PM2.5)
- Emissions benefits are counted only on the year funds are first obligated (e.g. When CTfastrak opened in 2015, the emissions reduction was only able to be shown in 2015 per federal guidelines when there were also actual benefits in years following).
- CTDOT has relayed that there is variability in yearly obligations under the CMAQ program and mega-projects have significant impacts on the overall emissions reductions.
- Emissions reduction estimates for each CMAQ funded project by pollutant and precursor are identified here: https://fhwaapps.fhwa.dot.gov/cmaq_pub/

CTDOT's air quality performance targets, denoting anticipated future additional reductions to emissions for the State of Connecticut, are illustrated below.

Air Quality Measure

- Total Emissions Reduction
- From projects entered into the CMAQ Public Access system in previous year

Emissions Component	Current Measurements (CMAQ Public Access as of 2017)		2-year targets (2020)	4-year targets (2022)
	2-year cumulative kg/day	4-year cumulative kg/day	2-year cumulative kg/day	4-year cumulative kg/day
VOC	10.820	263.890	19.320	30.140
NOx	34.680	462.490	67.690	102.370
PM2.5	1.040	12.950	1.632	2.674