
NPMRDS for Transportation Planning:
Web-based Analysis and Reporting Tools for
NYSDOT and NYS MPOs


AVAIL
Albany Visualization And Informatics Lab (AVAIL)
Lewis Mumford Center
University at Albany, SUNY

Web-based Open Source Data Science Research Tools

Open Sourcing the research products allows multiple teams to customize the software interface, develop new tools, and build upon legacy research

Web-Based Reliability Tools using NPMRDS

Project Partners:

University Transportation Research Center (UTRC)

NYSDOT

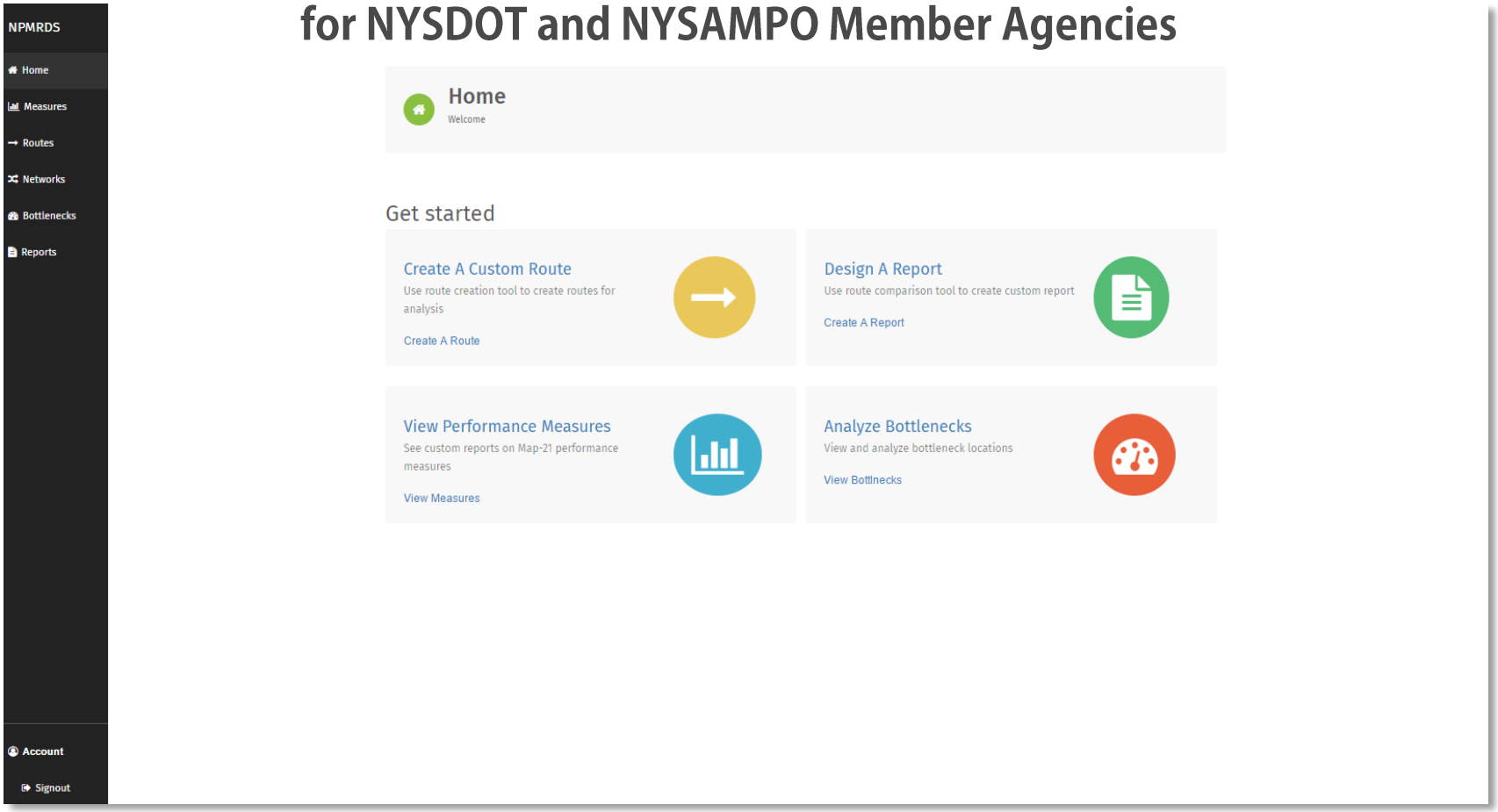
NYSAMPO

AVAIL

Albany Visualization and Informatics Lab

Web-based Traffic Data Analytics Platforms Tailored to your Agency

The NPMRDS Dashboard for NYSDOT and NYSAMPO Member Agencies



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Leveraging NPMRDS for uses beyond FHWA performance measurement requirements

- Corridor Analysis
- Network Analysis
- Bottleneck Identification
- Project Prioritization
- Post-Project Analysis
- Incident Post-mortem Analysis

NPMRDS = National Performance Measurement Research Dataset

- NPMRDS is an aggregated dataset made by the company HERE until Feb 2017, now aggregated by INRIX.
- Provided by FHWA
- Based on passenger probe data obtained from a number of sources, including mobile phones, vehicles, and portable navigation devices, gathered in 5 minute intervals
- Organized spatially by Traffic Messaging Channel (TMC)
- There are 16,263 unique TMCs in NY State
- The subset being examined contains 441,000,000 Data Points

NPMRDS Data Structure
Very Simple // Very Large

Query Results 11:07am, 17 Jun 2015

Row	tmc	date	epoch	travel_time_all	travel_time_passenger	travel_time_truck	weekday
1	120P05874	20141219	232	185	185	0	friday
2	120P05874	20141220	143	201	201	210	saturday
3	120P05874	20141220	188	187	186	210	saturday
4	120P05874	20141220	233	200	196	224	saturday
5	120P05874	20141220	278	221	0	221	saturday
6	120P05874	20141211	135	209	204	213	thursday
7	120P05874	20141211	180	204	204	0	thursday
8	120P05874	20141211	225	272	235	286	thursday
9	120P05874	20141211	270	183	183	0	thursday
10	120P05874	20141212	74	209	209	0	friday
11	120P05874	20141212	119	205	200	221	friday
12	120P05874	20141212	164	210	207	221	friday

First < Prev Rows 1-12 of 100 Next > Last

Source of NPMRDS Probe Speed Data

- GPS
- Phone

Black Box
Processing

Raw Probe Data

HERE - 2014-2016
INRIX - 2017 -

Query Results 11:07am, 17 Jun 2015

Row	tmc	date	epoch	travel_time_all	travel_time_passenger	travel_time_truck	weekday
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First < Prev Rows 1-12 of 100 Next > Last

NPMRDS Data

Data Quality?

Data Quality

Multi-Temporal Resolution: 5 Minute (raw) → Yearly Averages

- To mitigate data quality issues, the AVAIL Tool Suite uses daily, monthly, and yearly averages as well as historic speed distributions
- AVAIL Calculates number of Epochs in a sample and % of total Epochs in a sample

Multi-Temporal Resolution: 5 Minute (raw) → Yearly Averages

- Allows for comparisons at various temporal resolutions for customizable examinations.
  - Compare a day to the yearly average day

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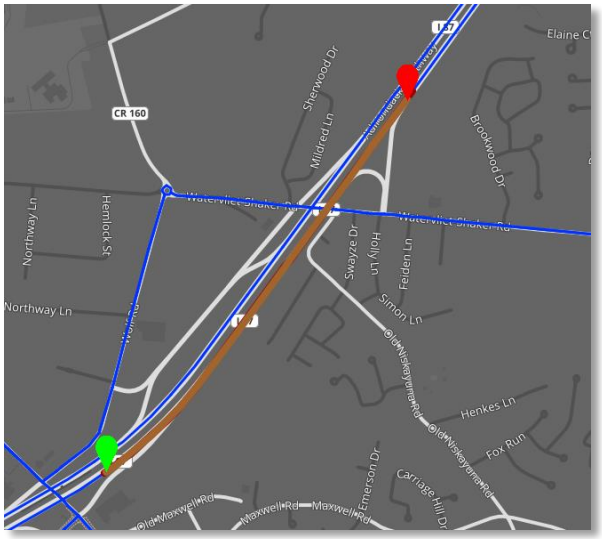
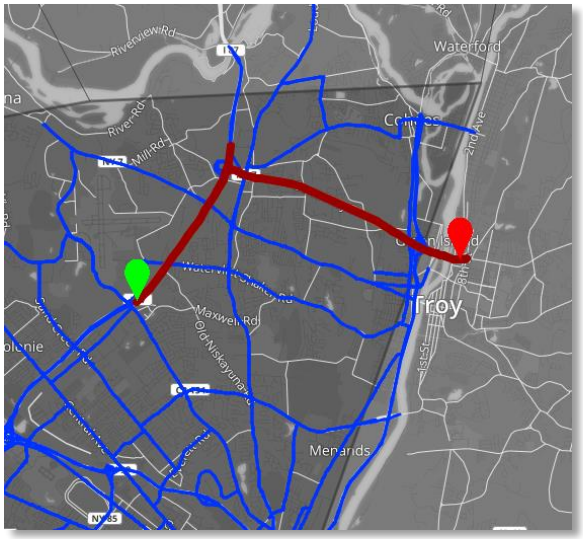
Multi-Geographic Resolution: TMC/Route/Multi-Route Corridor/Network





Creation and editing tools make your geographies fully customizable

AVAIL

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Possible Uses of the Web-based Tool Suite Include:

Project Prioritization, Performance Measurement, Corridor Analysis, Bottleneck Analysis, Post-project / Post-incident Analysis

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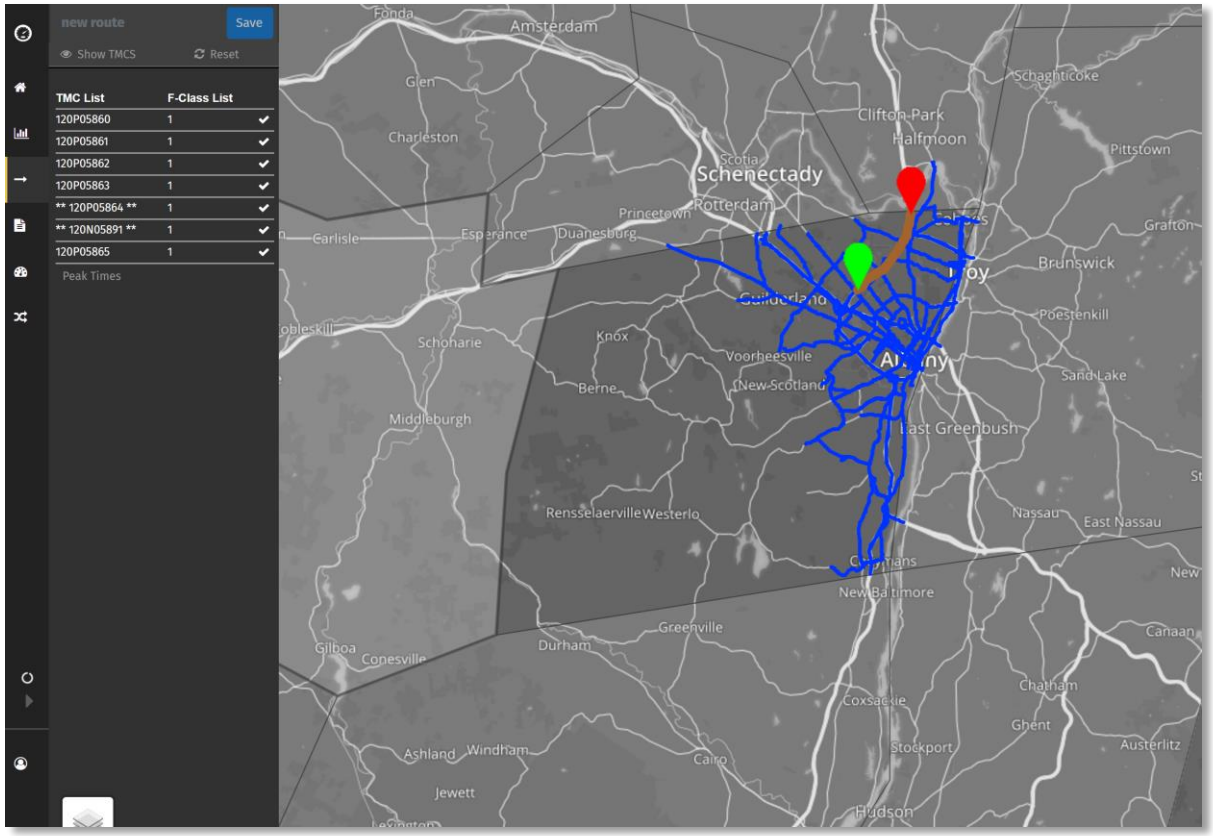
Corridor Analysis Tools
I-87 Northbound to the Twin Bridges



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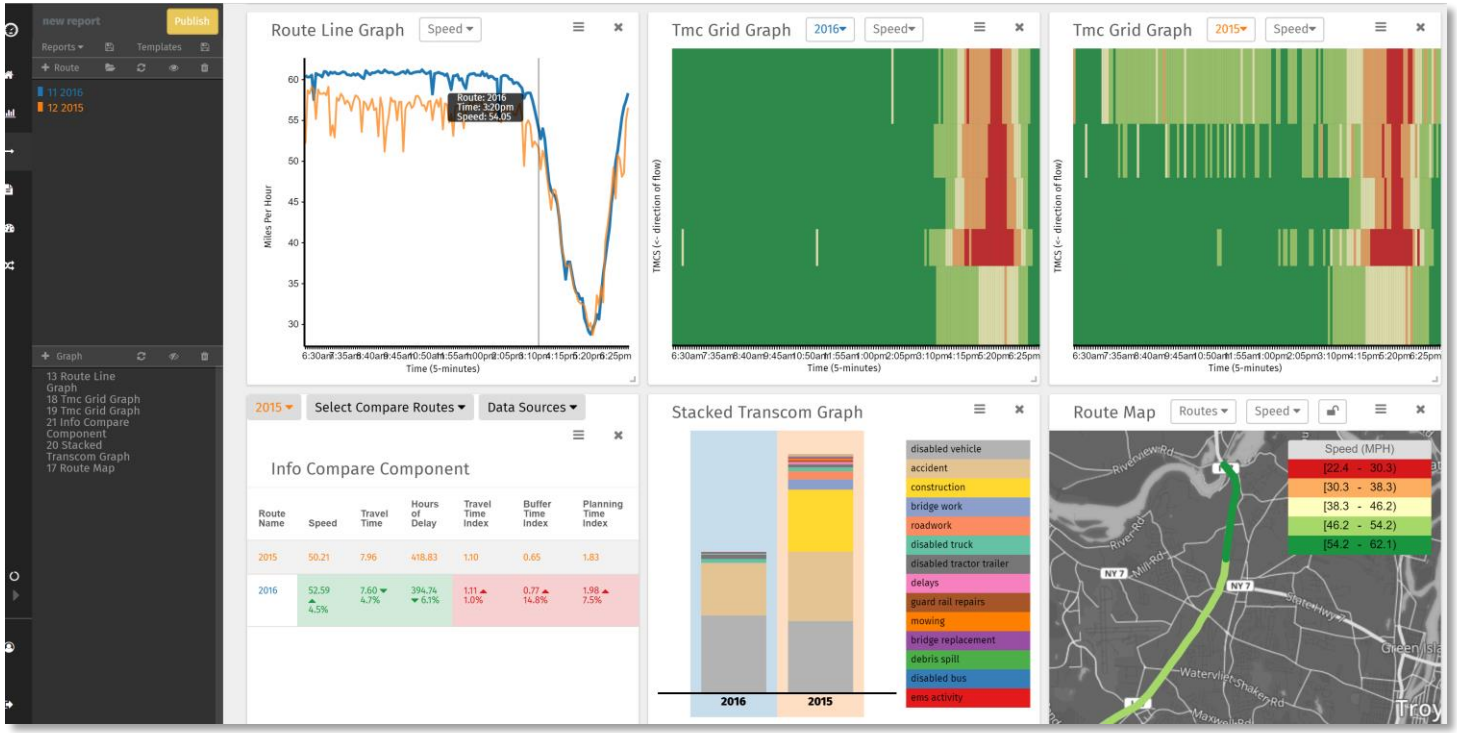

20+ Visualization and Analysis Tools for assessing the traffic patterns of a route or corridor and for comparing the route against itself in various time aggregations as well as against other routes

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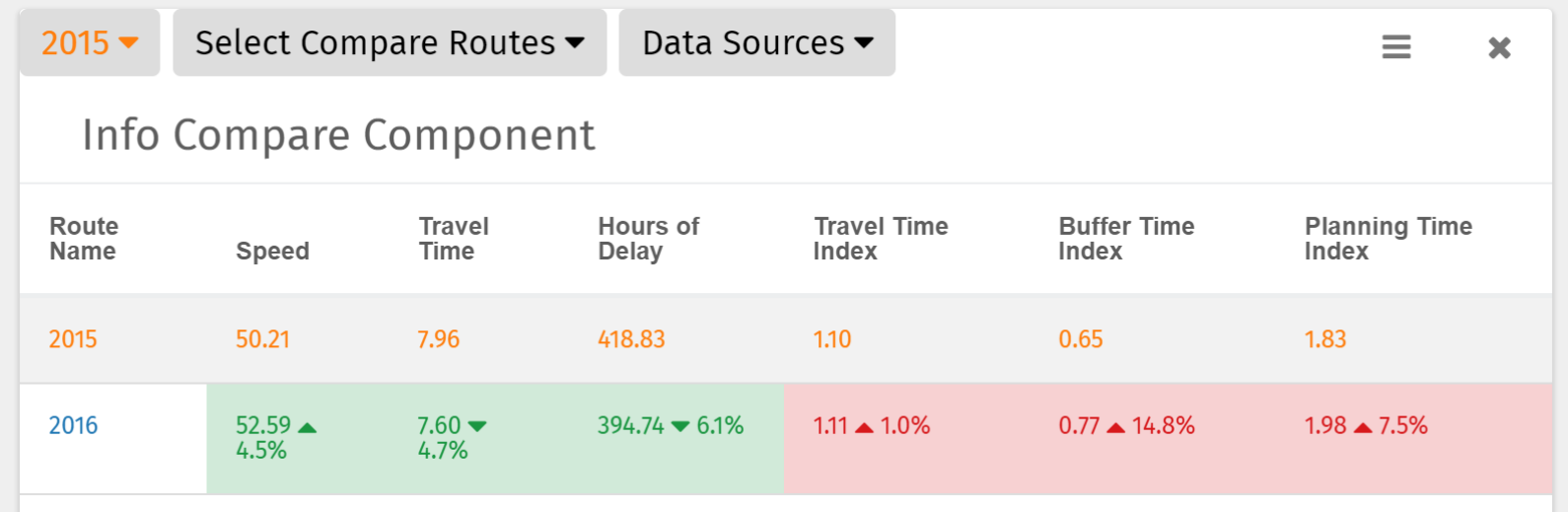
Corridor Study Tools
I-87 Northbound to the Twin Bridges



Route Name	Speed	Travel Time	Hours of Delay	Travel Time Index	Buffer Time Index	Planning Time Index
2015	50.21	7.96	418.83	1.10	0.65	1.83
2016	52.59 ▲ 4.5%	7.60 ▼ 4.7%	394.74 ▼ 6.1%	1.11 ▲ 1.0%	0.77 ▲ 14.8%	1.98 ▲ 7.5%

Compare 2015 and 2016

For Various Metrics Including:
Speed, Travel Time, Hours of Delay, Travel Time Index, Buffer Time Index, Planning Time Index, VMT, Counts, and more.

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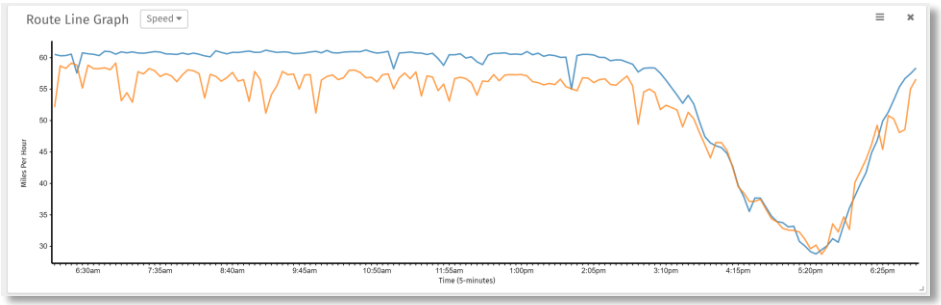
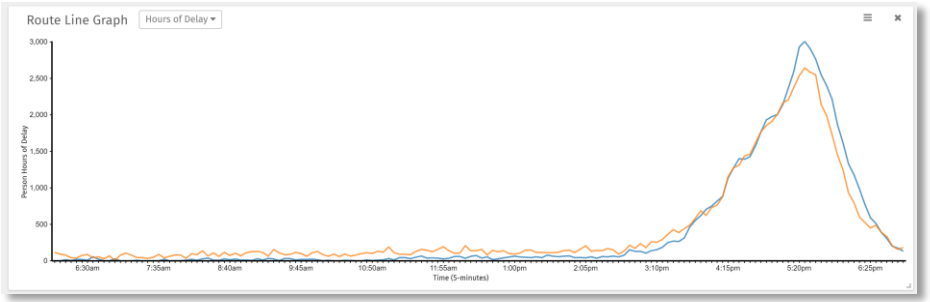
Corridor Study Tools
I-87 Northbound to the Twin Bridges

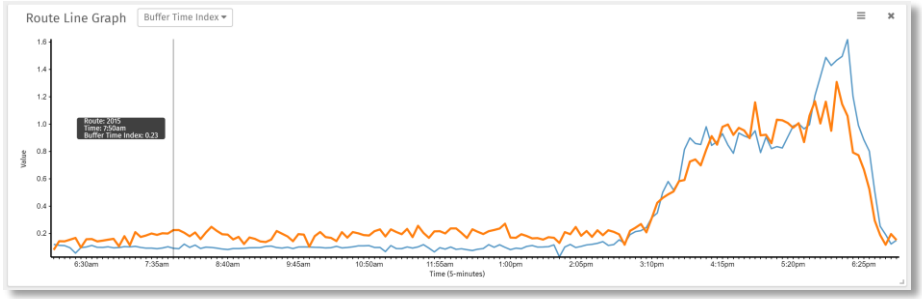
Travel Time



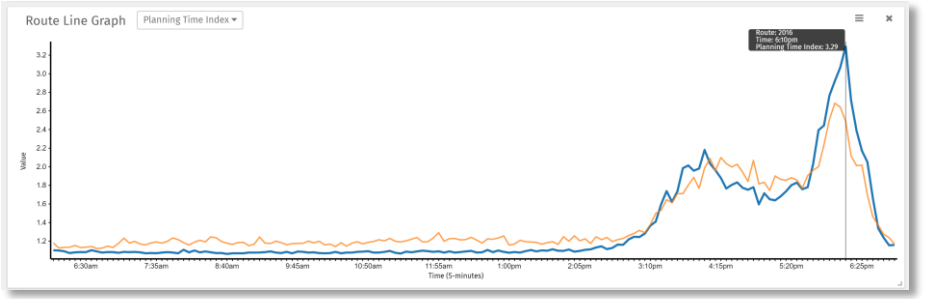
Hours of Delay



Buffer Time Index



Planning Time Index



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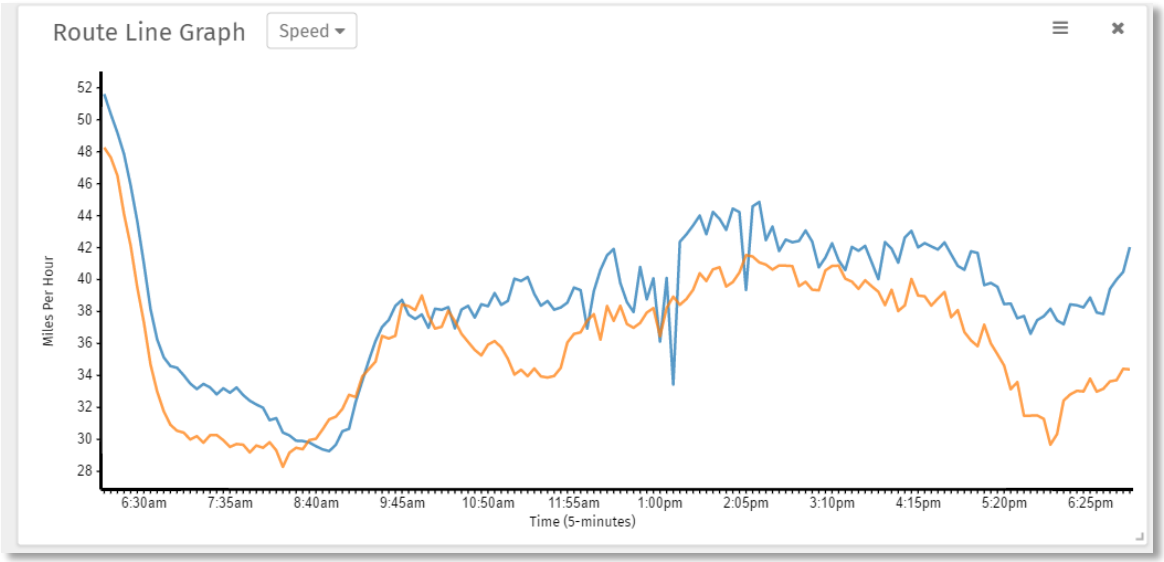
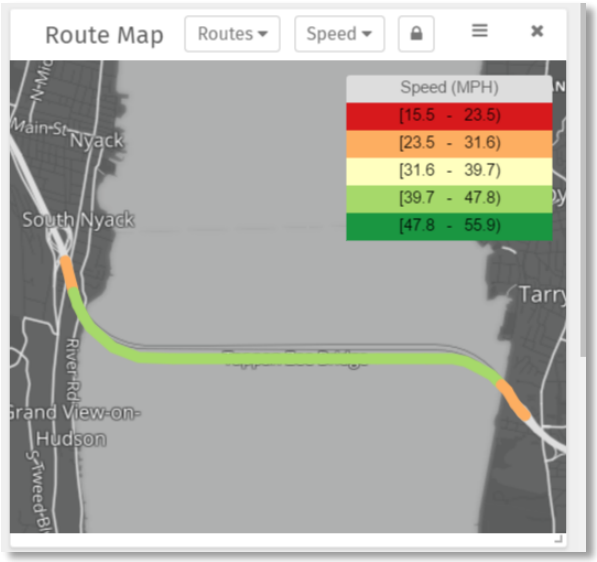
Post Project Analysis Case Study:
The Tappan Zee Bridge Cashless Toll Project





**The graph on the left shows an average day in five minute epochs from 6am to 7pm.
The blue line is for 2016 data. The orange line is for 2015 data.**

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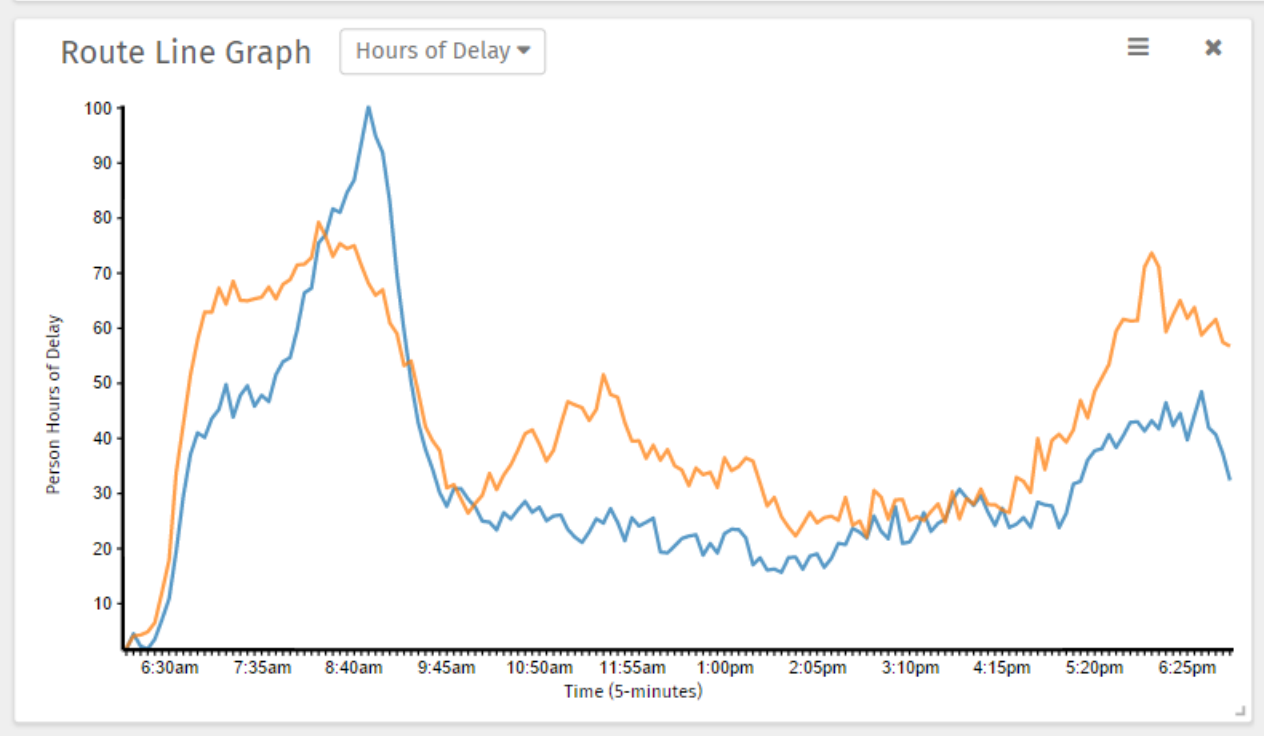
Post Project Analysis Case Study:



The metrics can be changed via the dropdown menu. This graph now shows hours of delay of an average day, by 5-minute epoch. Blue is 2016, Orange is 2015.

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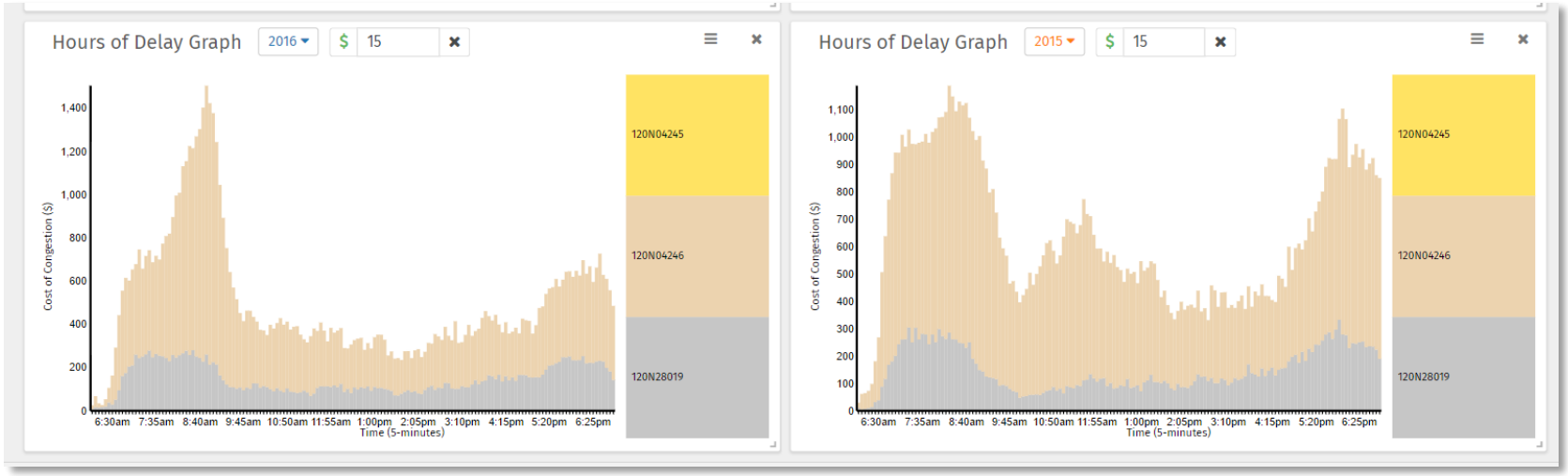
Post Project Analysis Case Study: The Tappan Zee Bridge Cashless Toll Project



Here's another look at hours of delay, where cost of delay can be calculated.

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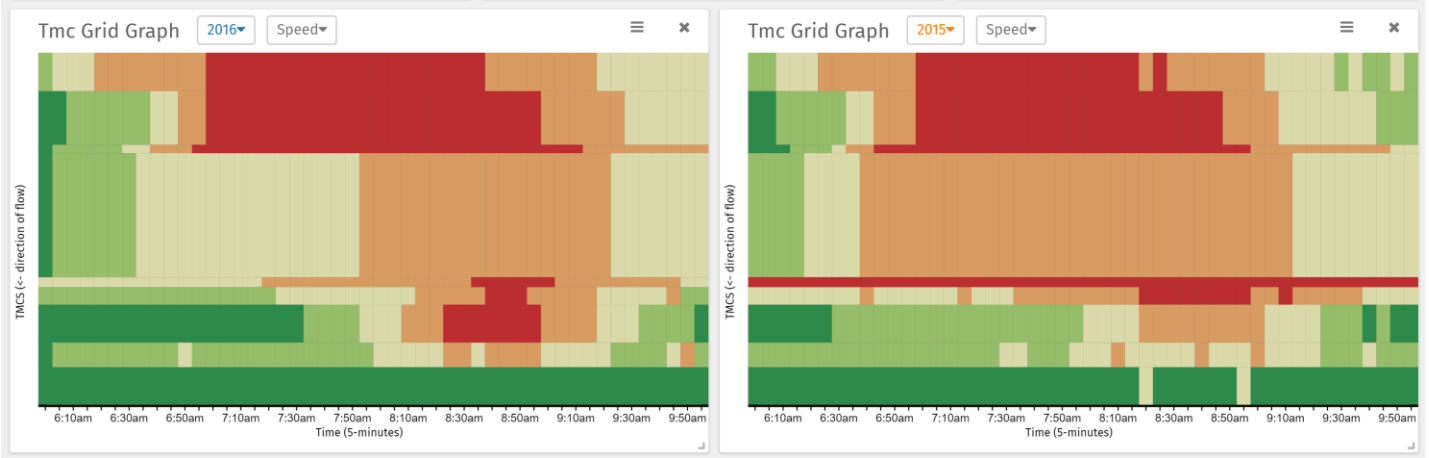
Post Project Analysis Case Study: The Tappan Zee Bridge Cashless Toll Project



2016 2015

The red line on the 2015 graph is the TMC segment where the toll booths were previously located. The graph from 2016 shows significant speed increases at that TMC segment.

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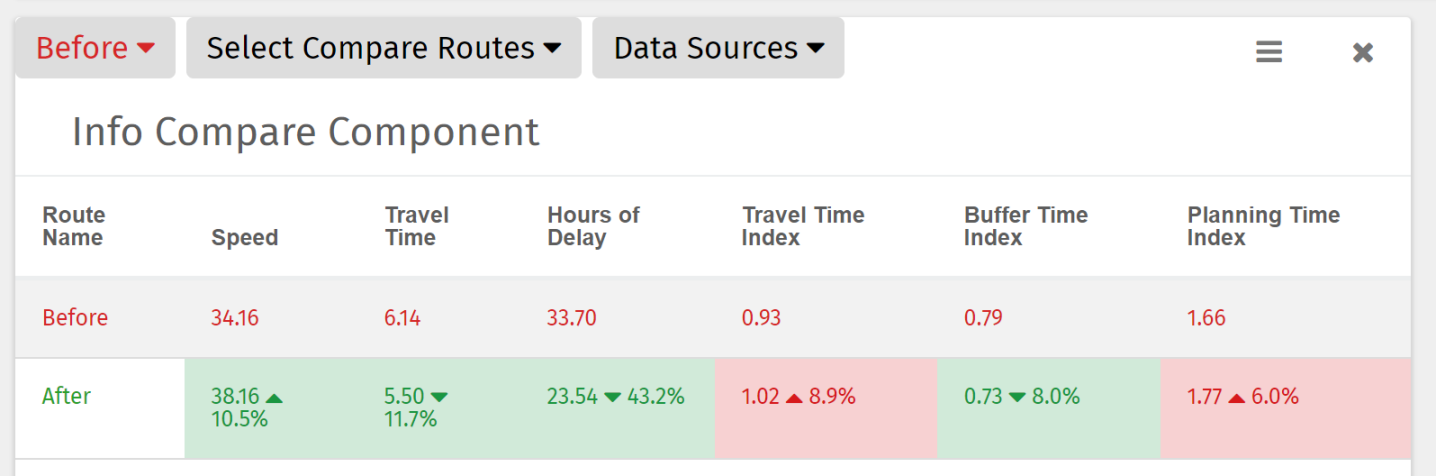
Post Project Analysis Case Study: The Tappan Zee Bridge Cashless Toll Project



Route Name	Speed	Travel Time	Hours of Delay	Travel Time Index	Buffer Time Index	Planning Time Index
Before	34.16	6.14	33.70	0.93	0.79	1.66
After	38.16 ▲ 10.5%	5.50 ▼ 11.7%	23.54 ▼ 43.2%	1.02 ▲ 8.9%	0.73 ▼ 8.0%	1.77 ▲ 6.0%

Comparison Tables can convey a lot of information relatively quickly. Here we see that Speed has increased by 10.5%, Travel Time has decreased by 11.7%, and Hours of Delay has decreased by 43.2%. Planning Time Index and Travel Time Index, however, have both increased, indicating that the bridge is somewhat less reliable.

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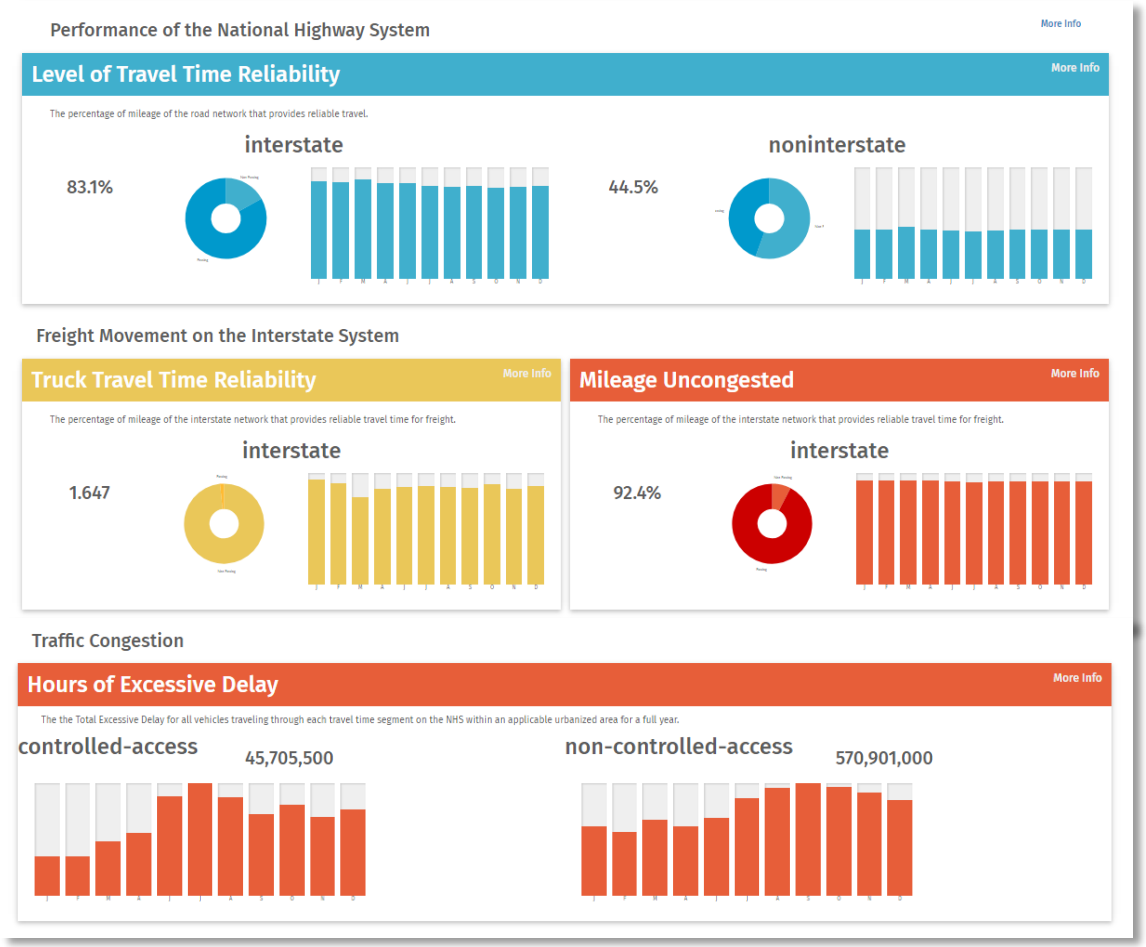
Performance Measurement Tools



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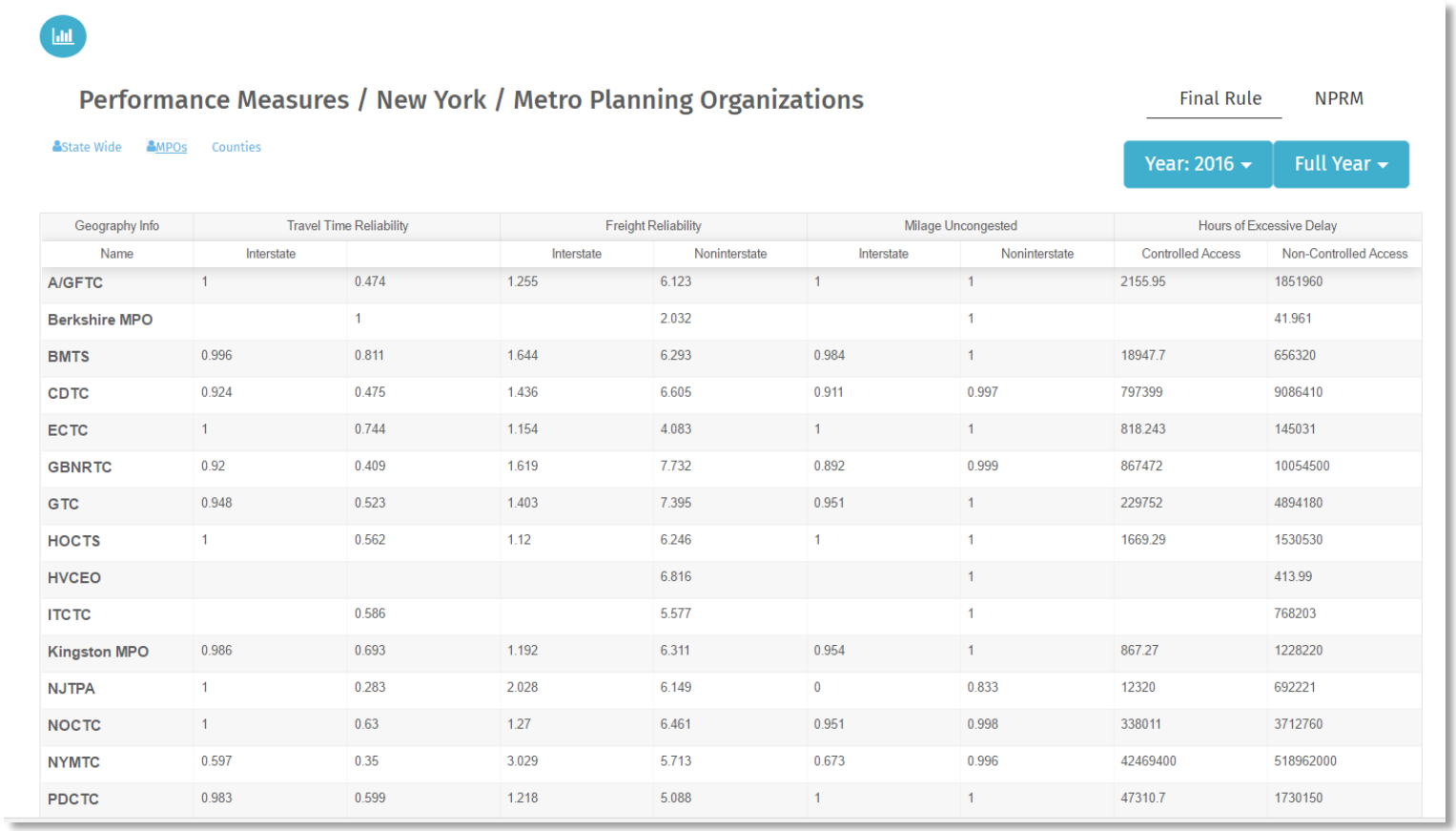
Performance Measurement Tools at Multiple Geographic Resolutions



Performance Measures / New York / Metro Planning Organizations

Final Rule NPRM

State Wide MPOs Counties

Year: 2016 Full Year

Geography Info	Travel Time Reliability		Freight Reliability		Milage Uncongested		Hours of Excessive Delay	
Name	Interstate		Interstate	Noninterstate	Interstate	Noninterstate	Controlled Access	Non-Controlled Access
A/GFTC	1	0.474	1.255	6.123	1	1	2155.95	1851960
Berkshire MPO		1		2.032		1		41.961
BMTS	0.996	0.811	1.644	6.293	0.984	1	18947.7	656320
CDTC	0.924	0.475	1.436	6.605	0.911	0.997	797399	9086410
ECTC	1	0.744	1.154	4.083	1	1	818.243	145031
GBNRTC	0.92	0.409	1.619	7.732	0.892	0.999	867472	10054500
GTC	0.948	0.523	1.403	7.395	0.951	1	229752	4894180
HOCTS	1	0.562	1.12	6.246	1	1	1669.29	1530530
HVCEO				6.816		1		413.99
ITCTC		0.586		5.577		1		768203
Kingston MPO	0.986	0.693	1.192	6.311	0.954	1	867.27	1228220
NJTPA	1	0.283	2.028	6.149	0	0.833	12320	692221
NOCTC	1	0.63	1.27	6.461	0.951	0.998	338011	3712760
NYMTC	0.597	0.35	3.029	5.713	0.673	0.996	42469400	518962000
PDCTC	0.983	0.599	1.218	5.088	1	1	47310.7	1730150

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Performance Measurement Tools at the County Level

Performance Measures / New York / Counties

Final Rule NPRM

State Wide MPOs Counties

Year: 2016 Full Year

Geography Info	Travel Time Reliability		Freight Reliability		Milage Uncongested		Hours of Excessive Delay	
Name	Interstate		Interstate	Noninterstate	Interstate	Noninterstate	Controlled Access	Non-Controlled Access
Franklin		0.529		4.693		1		304529
Fulton		0.757		4.988		1		194824
Hamilton		0.174		10.032		1		41704.1
Lewis		0.488		7.3		1		111030
Orleans		0.504		9.205		1		217208
Schuyler		0.493		5.348		1		160598
St Lawrence		0.642		4.638		1		575722
Tompkins		0.565		4.673		1		767470
Washington		0.704		4.948		1		317457
Wayne		0.687		7.383		1		341664
Wyoming		0.631		5.279		1		27518.3
Yates		1		5.405		1		28200.6
Montgomery	1	0.632	1.107	4.897	1	0.996	216.184	321777
Cayuga	1	0.647	1.107	7.171	1	1	224.765	383921
Chenango	1	0.862	1.134	4.497	1	1	229.3	108452
Greene	1	0.478	1.107	6.572	1	1	313.512	96931.1
Tioga		0.876		8.029		1	338.846	316487

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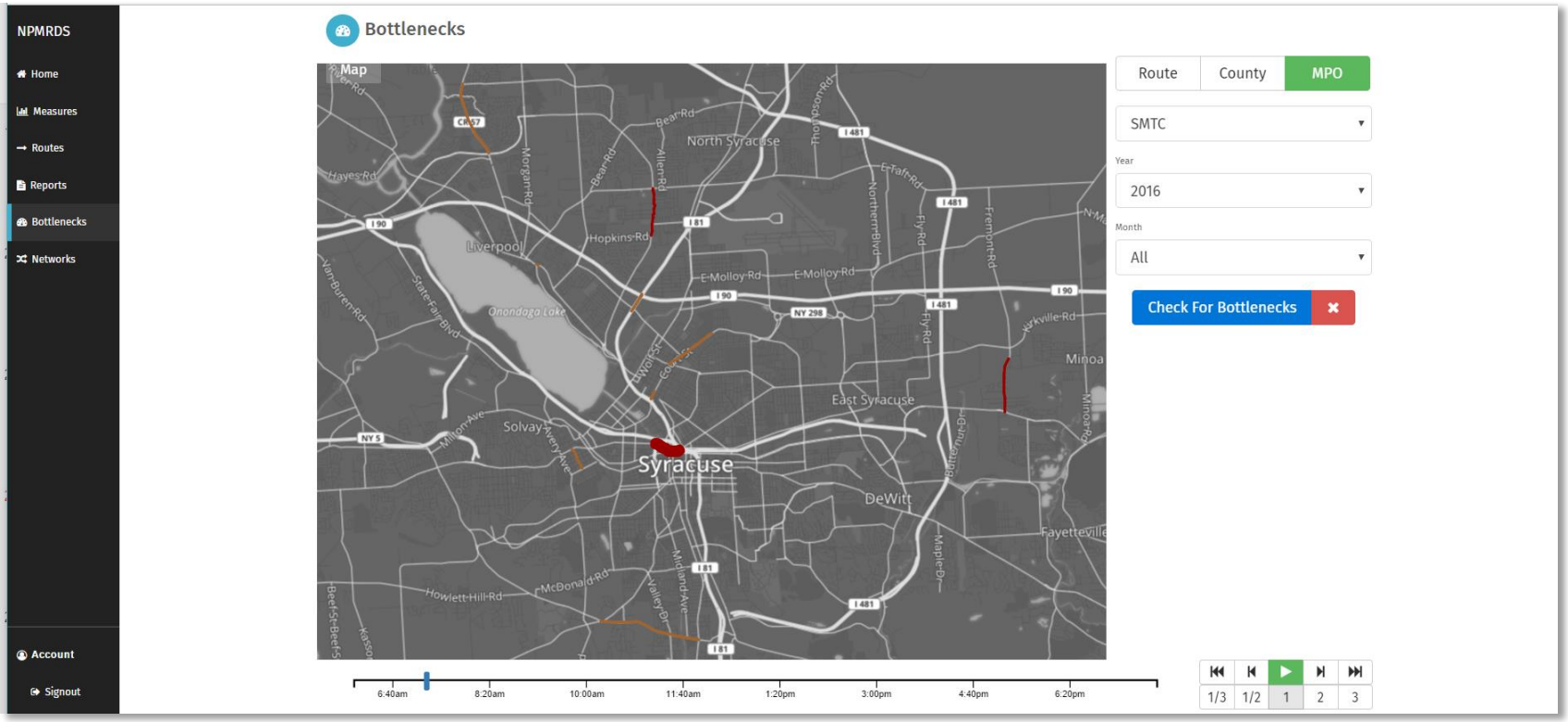
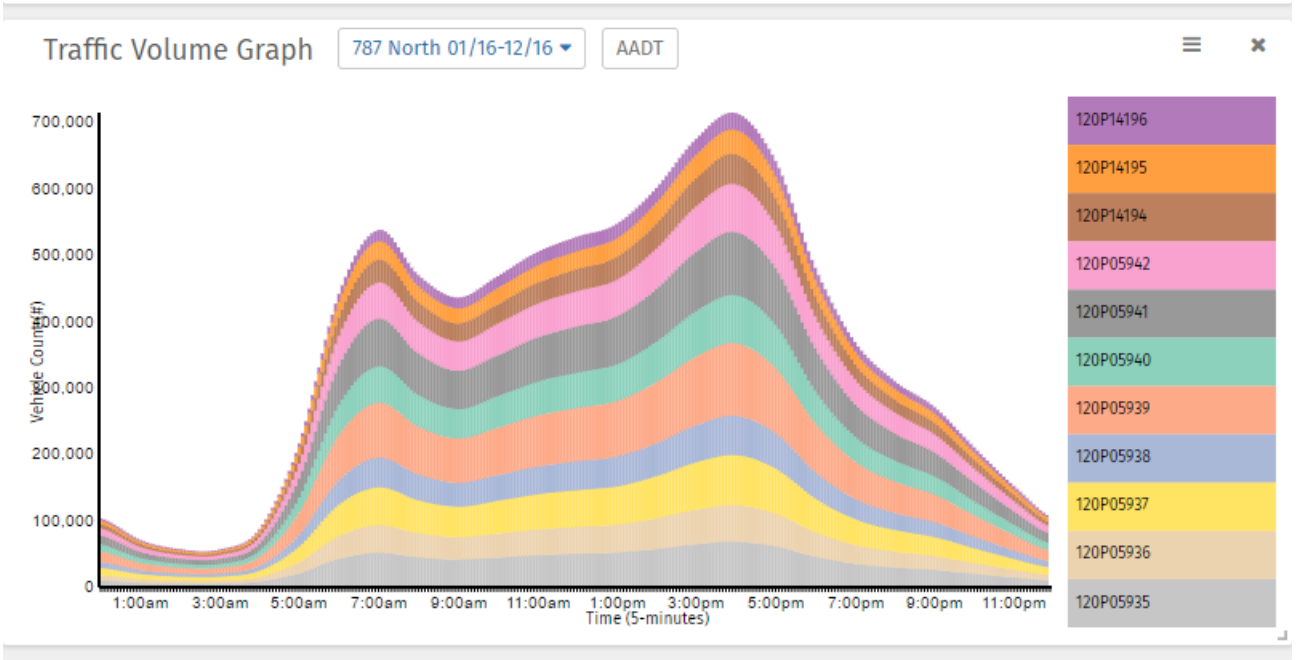
Bottlenecks Analysis



Data Integration

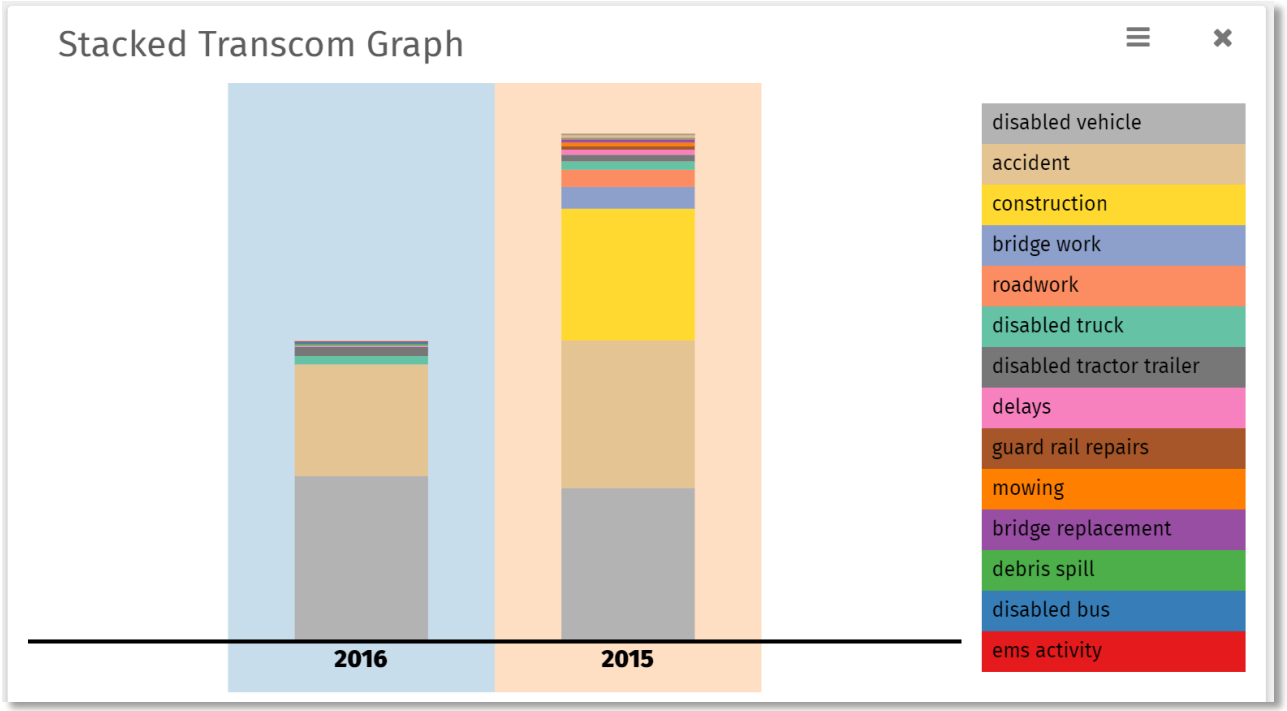
AVAIL has begun to integrate many other geo-spatial transportation datasets through conflation of the NPMRDS shapefile to the LRS and HPMS shapefiles

Data Integration and Additional Data Integration Possibilities



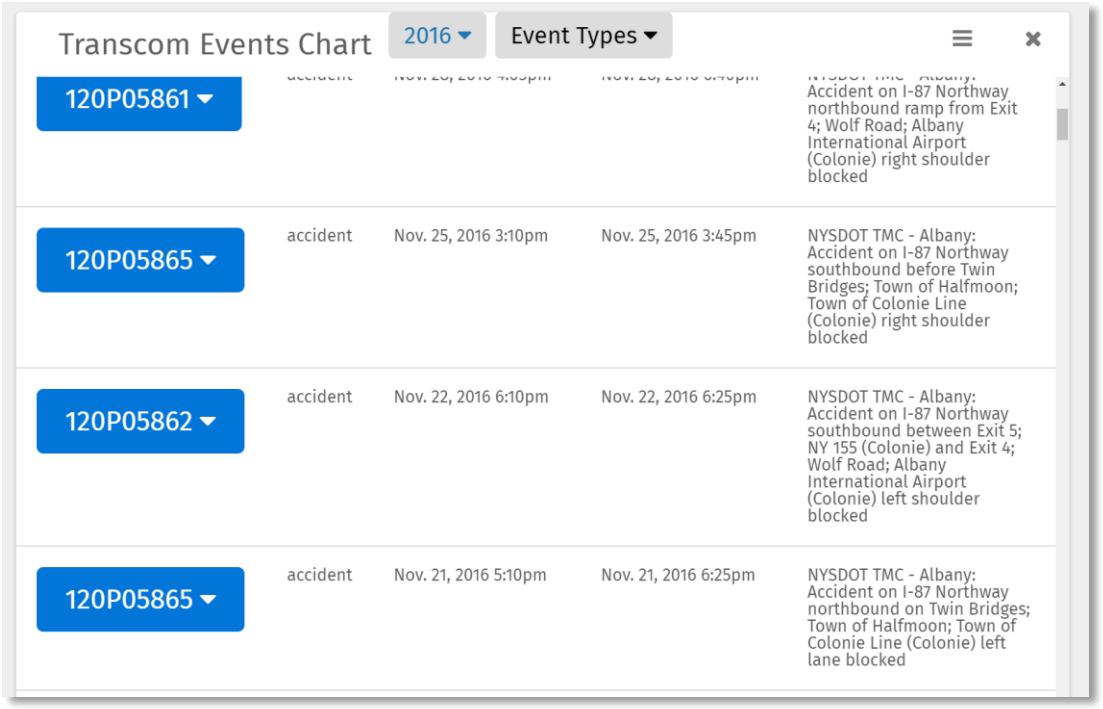
AADT and Continuous Counts

Data Integration



Transcom Incidents

Data Integration

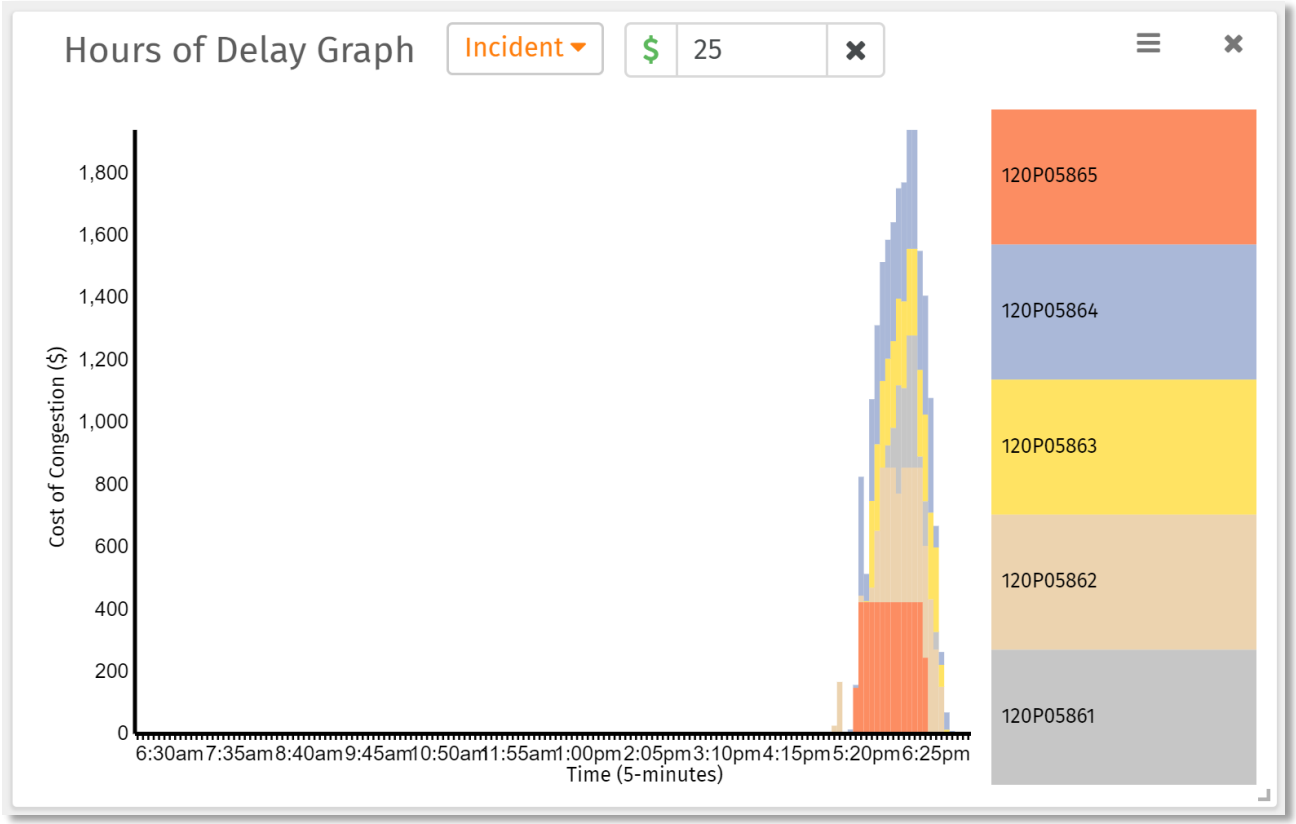


Transcom Incidents

Data Integration

Incident Template showing I-87 Northbound Incident from November 21, 2016

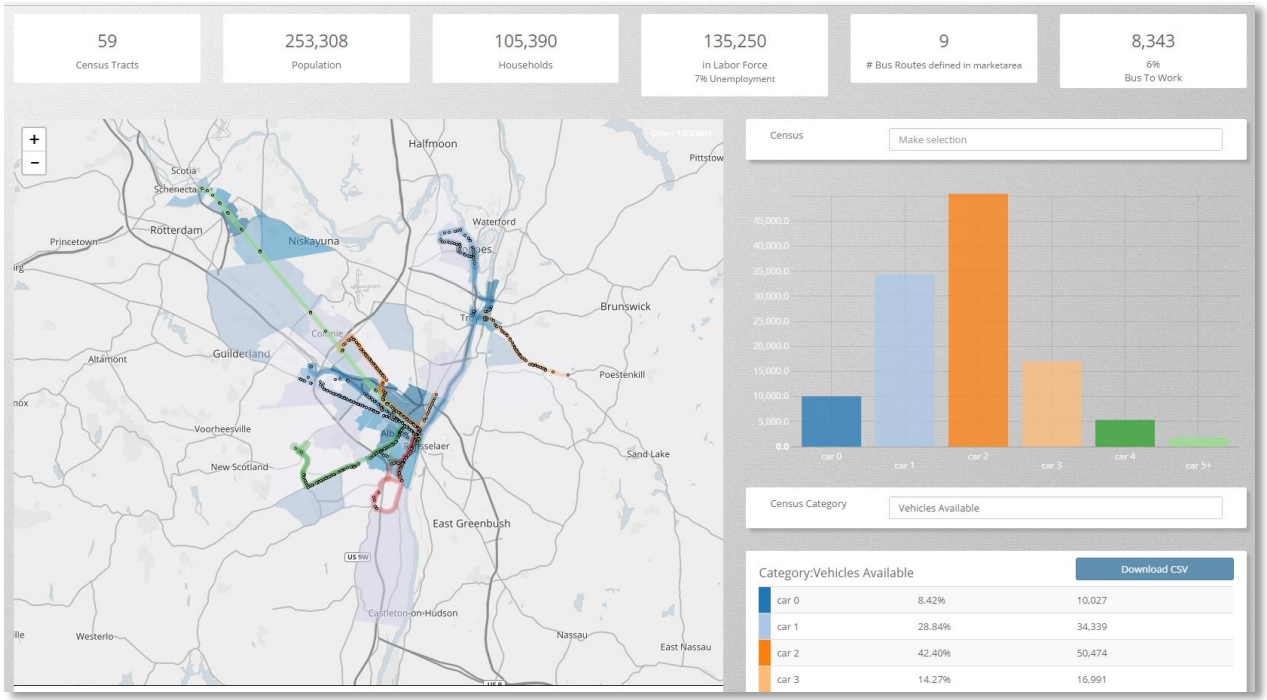
Data Integration



Hours of Delay and Cost of Delay associated with the selected incident

Forward Looking

- Transearch
- Socio-economic-demographic effects of transportation network,
  - Census/Infogroup etc.
- Site-Specific Volume Delay Functions
- Imputed Counts using Probe Data
- Multi-modal GTFS/Rail
- Merging real-time probe data with historic analytics for forecasting
  - Statistical Probability Distributions based on time of day and current counts/speeds,



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