FHWA Freight Fluidity:
Measuring Supply Chain Performance
- National and State/Regional Programs

State/Regional Pilot Workshop
Chicago - CMAP
June 17, 2019

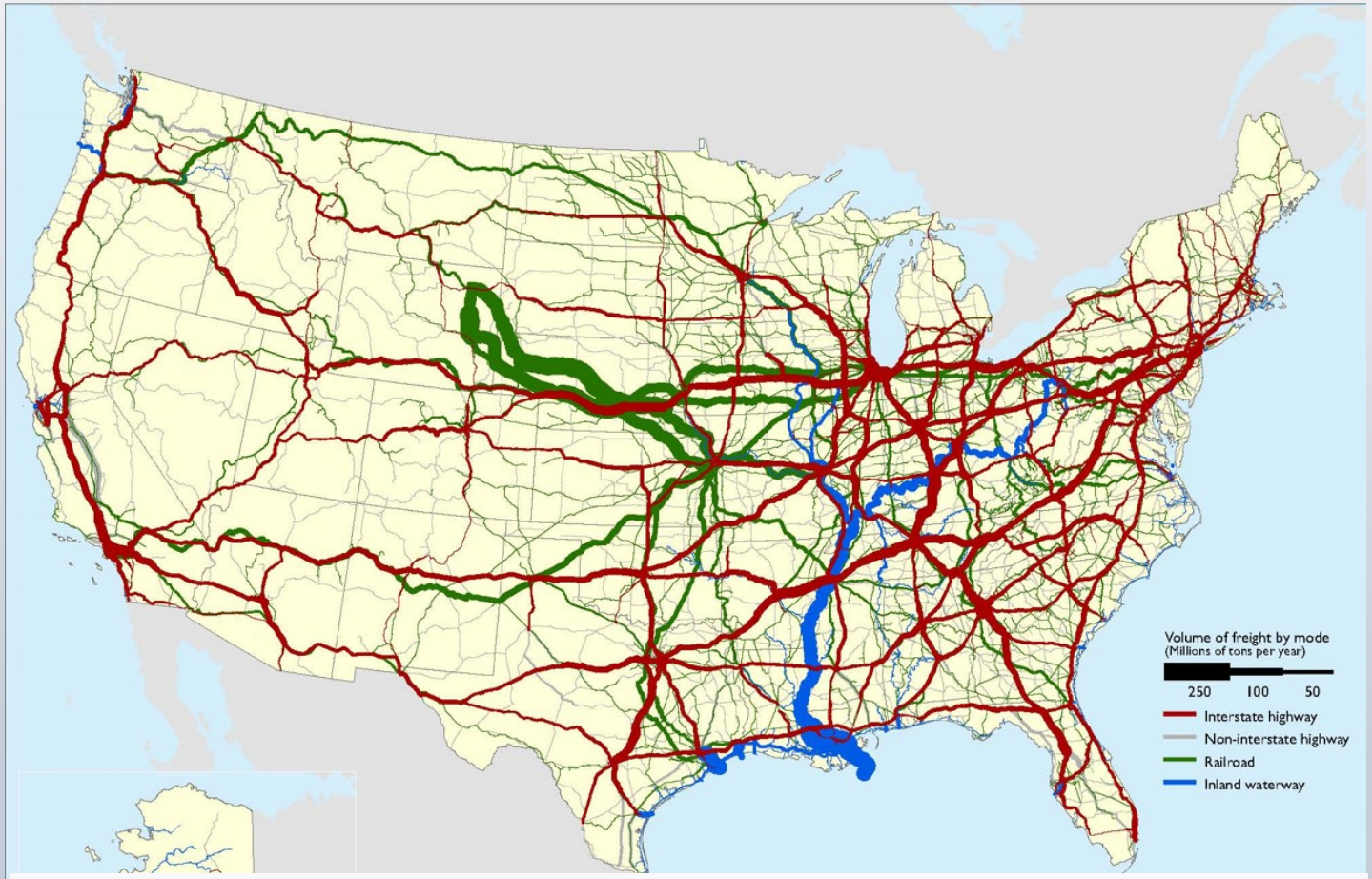
Agenda

11:00 - 11:20 AM	Agenda, Welcome, Introductions and Workshop Objectives: *Marygrace Parker, I-95 Corridor Coalition (Freight Fluidity Team)* *Chicago/CMAP – Thomas Murtha, CMAP* *FHWA - Chandra Bondzie, Office of Freight Management*
11:20 - 12:00 PM	Freight Fluidity Program National and State/Regional Overview *- Joe Bryan, WSP USA*
12:00 - 12:30 PM	Working Lunch
12:30 - 1:45 PM	How You Can Use The Tool – Interactive Presentation/Discussion - *Alan Meyers, WSP USA*
1:45 - 2:15 PM	Informing Supply Chains with FHWA NPMRDS Data - *Bill Eisele, TTI*
2:15 - 2:45 PM	Discussion/Key Insights from Participants - *Marygrace Parker*
2:45 – 3:00 PM	Wrap Up/Next Steps – *Chandra Bondzie, Marygrace Parker*

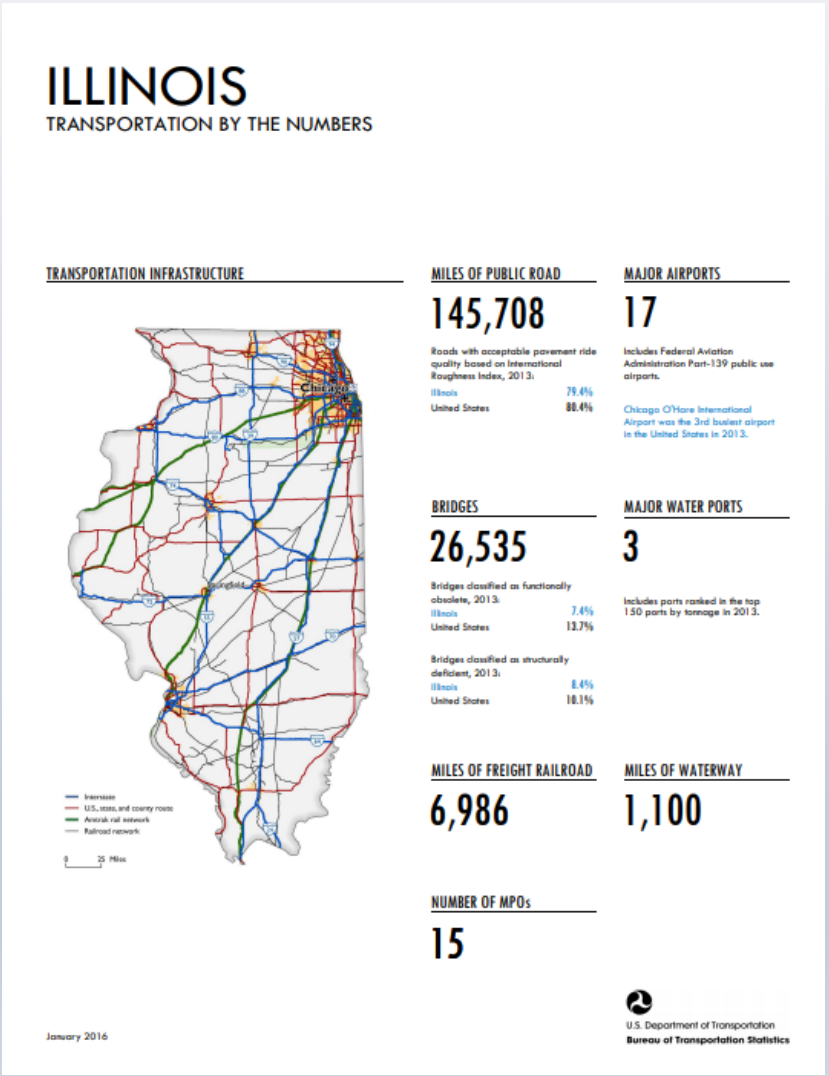
Welcome to CMAP and the State/Regional Freight Fluidity Pilot Workshop

Thomas Murtha
Senior Planner
Chicago Metropolitan Agency for Planning

Chicago Regional Pilot: Why This Workshop Here



A quarter of all freight in the nation originates, terminates, or passes through metropolitan Chicago.



ILLINOIS

TRANSPORTATION BY THE NUMBERS

TRANSPORTATION INFRASTRUCTURE

MILES OF PUBLIC ROAD
145,708
Roads with acceptable pavement ride quality based on International Roughness Index, 2013:
Illinois 79.4%
United States 80.4%

MAJOR AIRPORTS
17
Includes Federal Aviation Administration Part-139 public use airports.
Chicago O'Hare International Airport was the 3rd busiest airport in the United States in 2013.

BRIDGES
26,535
Bridges classified as functionally obsolete, 2013:
Illinois 7.4%
United States 12.7%
Bridges classified as structurally deficient, 2013:
Illinois 8.4%
United States 10.1%

MAJOR WATER PORTS
3
Includes ports ranked in the top 150 ports by tonnage in 2013.

MILES OF FREIGHT RAILROAD
6,986

MILES OF WATERWAY
1,100

NUMBER OF MPOs
15

January 2016

U.S. Department of Transportation
Bureau of Transportation Statistics

Introductions

- Name
- Agency
- Role in Freight

FHWA Freight Fluidity Program

Chandra Bondzie
FHWA – Office of Freight Management
Freight Fluidity Project Manager

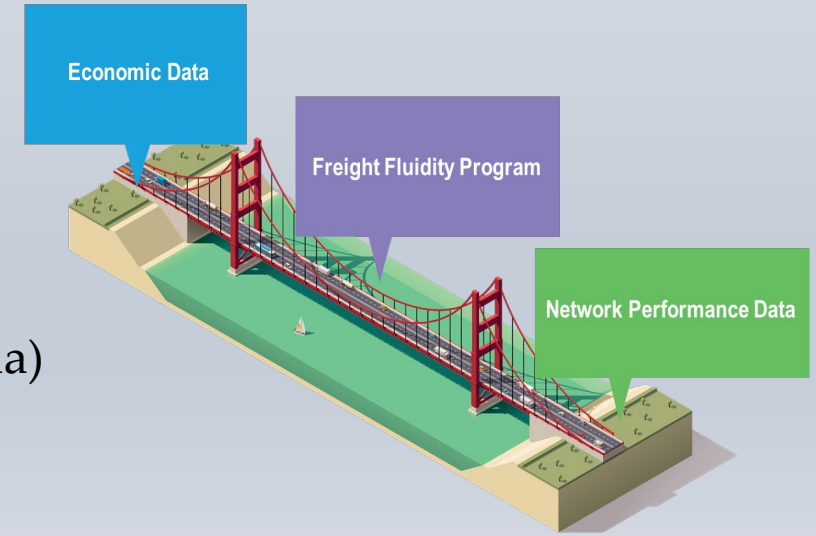
FHWA Freight Fluidity Program

Why?

- Respond to needs for State and regional freight planning as they
  - As they develop multimodal performance measures and freight policy to support statewide and regional freight planning and investment and comply with MAP21 and FAST ACT requirements
    - As the look to
- Bring a multimodal perspective to freight performance measurement
- Improve information on the performance of supply chains to benefit freight stakeholders
- Stimulate new private sector services and tools to plan and optimize freight trips

How?

- Establish national monitoring of freight fluidity
- Add to the "portfolio" of FHWA analysis tools (FAF, HEPGIS…)
- Build on work of previous FHWA work to measure supply chains
- Build on example work of other fluidity efforts (e.g. Transport Canada)



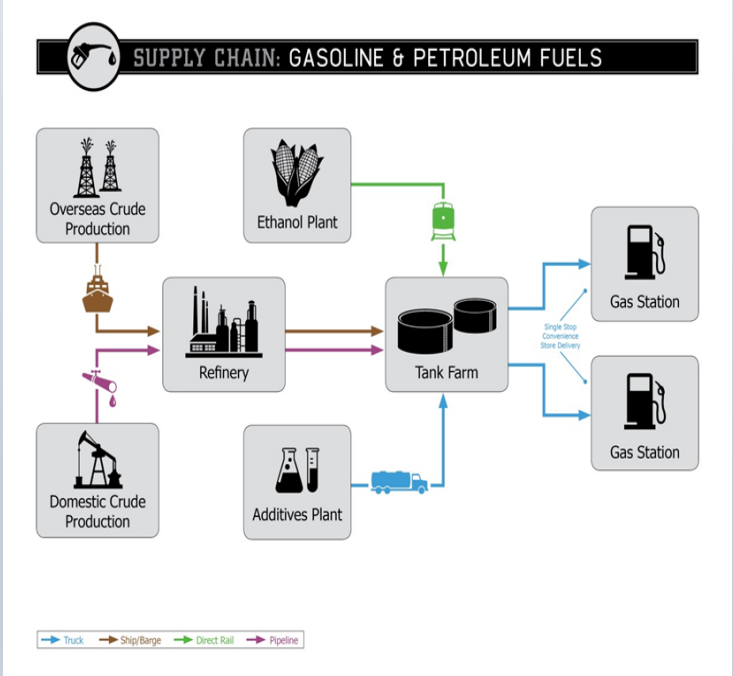
National Freight Fluidity Monitoring Program

Project Objective:

- Improve the measurement of freight transportation performance using a supply chain perspective
- Move supply chain performance monitoring from theory into real-world applications

Approach - Two Tracks:

1) National supply chain performance monitoring
   - Select a "market basket" of supply chains
   - Establish data sharing and procurement agreements
   - Collect and track three supply chain measures
     - Time, travel time reliability, cost
     - Producing quarterly reports for monitoring
- 2) State /Regional Pilots
   - Testing feasibility of applying national monitoring measures locally
   - Two pilots: metropolitan Chicago and metropolitan New York/New Jersey



FHWA Freight Fluidity Supply Chain Monitoring: National Program

Issues	Approaches
What we are measuring?	Travel time, travel time reliability, transportation cost Domestic movements – truck, rail, air, water Supply-chains (end-to-end across modes) and component segments
How much are we measuring?	Representative sample of critical US supply chains "Dow Jones Index" of key infrastructure, based on actual industries
How are index supply chains being chosen?	Selected for coverage of primary economic sectors and high-growth sectors Use of all modes, coverage of US regions Short and long-haul moves, domestic/cross-border/global supply chains
How is data being collected?	Target industries identified and recruited Industries tell us their primary supply chain (commodity/mode/O-D) patterns • **No exchange of confidential information** Project team assembles data to tabulate metrics for supply chain patterns • **Real data, not models** • Supply chain level, not regional/area level (like FAF or Transearch) • Public and private sources have been identified
What are the outputs?	Initial "National Fluidity *Monitoring* Dashboard" with continuous quarterly updates

Freight Fluidity - Supply Chain Selection Criteria

- Data-driven analysis of national "market basket" candidates, identifying industry sectors and candidate firms
- Criteria:

Contribution to national GDP and projected growth among freight-dependent industries

Geographic coverage of US: regions, urban centers, rural areas, gateways, corridors, direction of travel

Contribution to regional GDP and projected growth among freight-dependent industries

Industry importance to resilience of other supply chains and of population

Industry importance in US trade

Modal and travel distance diversity

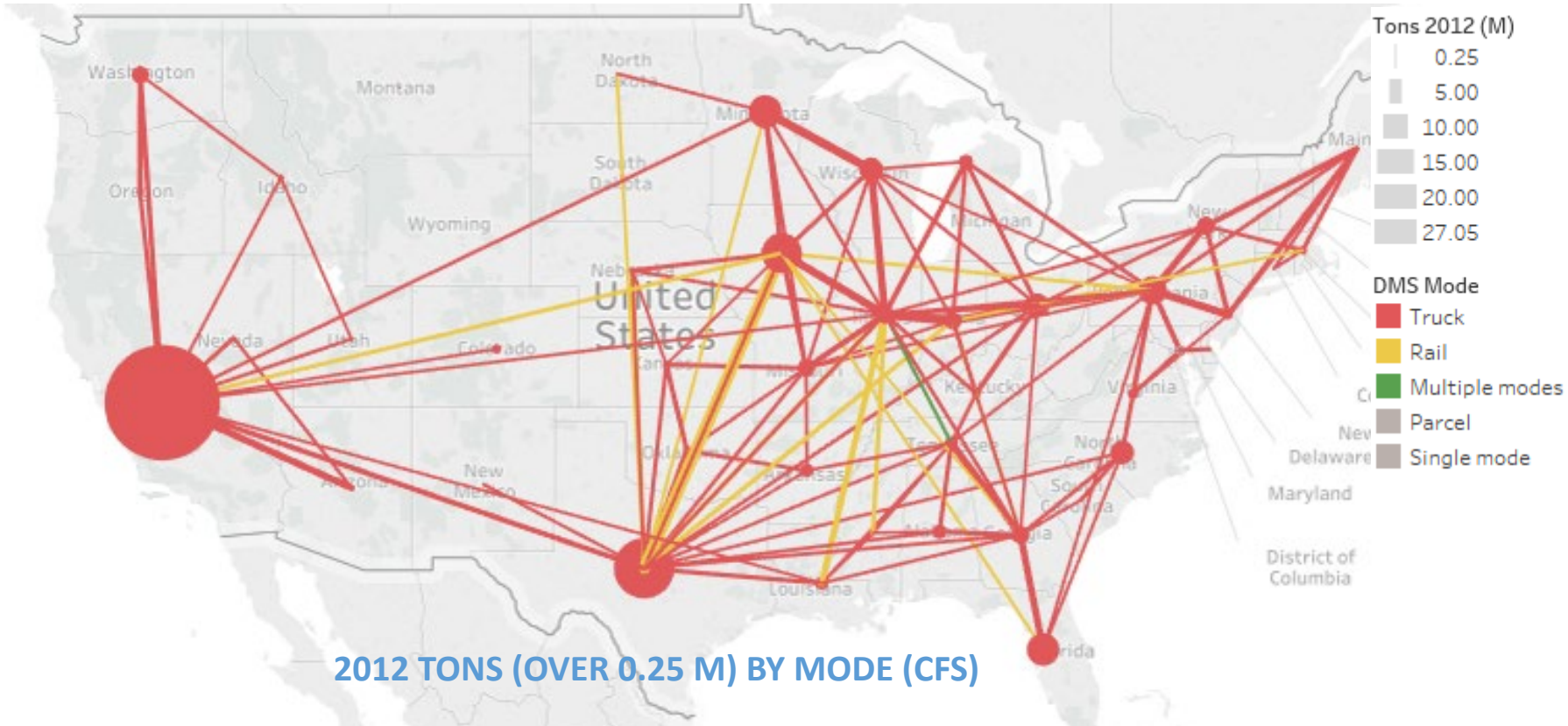
FHWA Freight Fluidity Project – Industry Sectors

#	Industry Sector	Candidate Companies
1	Oilseed & Grain Farming and Production	ADM, Perdue, Cargill, ConAgra
2	Oil & Gas Extraction	Conoco Philips, EOG, Andarko, Pioneer, BP, Shell
3	Coal, Metal Ores, and Nonmetallic Minerals	Peabody, Arch, Cloud Peak, Powder River Basin LLC, Alliance
4	Food Products Manufacturing	Anheuser-Busch, Coca-Cola, Perdue, General Mills, Tyson
5	Dairy Products Manufacturing	Nestle, Kraft, Land O'Lakes, Cabot
6	Paper Manufacturing	Georgia Pacific, Weyerhauser, Int'l Paper
7	Petroleum and Coal Products Manufacturing	Exxon Mobil, Chevron, BP, Atlantic Richfield
8	Organic Chemicals Manufacturing	Mosaic, Monsanto, CF Industries, DuPont, BP
9	Resins and Synthetics Manufacturing	Dow, Lyondell, BASF
10	Pharmaceuticals Manufacturing	Eli Lilly, Merck, Johnson & Johnson
11	Plastics & Rubber Manufacturing	Goodyear, Dart Container, Newell (Rubbermaid)
12	Nonmetallic Minerals Manufacturing	Vulcan, Martin Marietta, Holcim, Cemex, Lafarge, Corning
13	Steel & Fabricated Metals Manufacturing	Arcelor, Nucor, Valmont
14	Construction/Industrial Machinery Manufacturing	Caterpillar, John Deere, Volvo
15	Computers/Electronic Products Manufacturing	Intel, Samsung, Qualcomm, Panasonic, GlobalFoundries, Cisco
16	Motor Vehicles & Parts Manufacturing	GM, Ford, Fiat/Chrysler, Toyota, Honda
17	Aircraft/Other Transportation Manufacturing	Boeing, Northrup Grum… Lockheed Ma…
18	Medical Instruments Manufacturing	Sie…
	…l Service & Wholesale	

- Sectors included: Retail, technology, e-commerce, energy, chemicals, transportation equipment and machinery, etc.
- Major, recognizable companies targeted and recruited

Industry Sector Example: Food Products Manufacturing

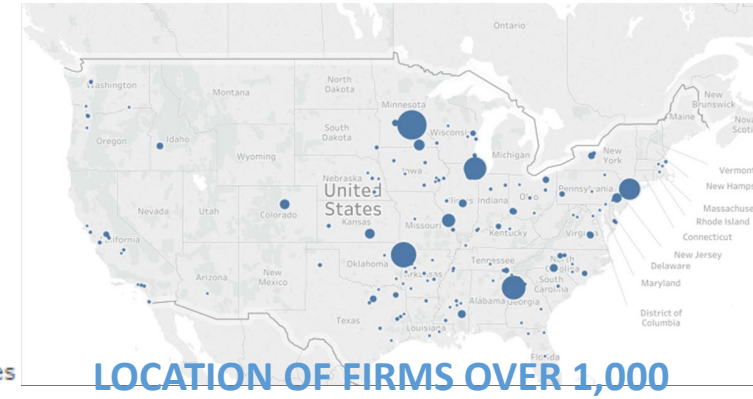
- Definition: NAICS 311-2
- Typical Commodities: fresh, frozen, or processed meats, poultry, fish, fruits, vegetables; milled grains/oilseeds; sugars; baked goods; beverages
- Representative Supply Chains: Anheuser-Busch, Coca-Cola, Perdue, General Mills



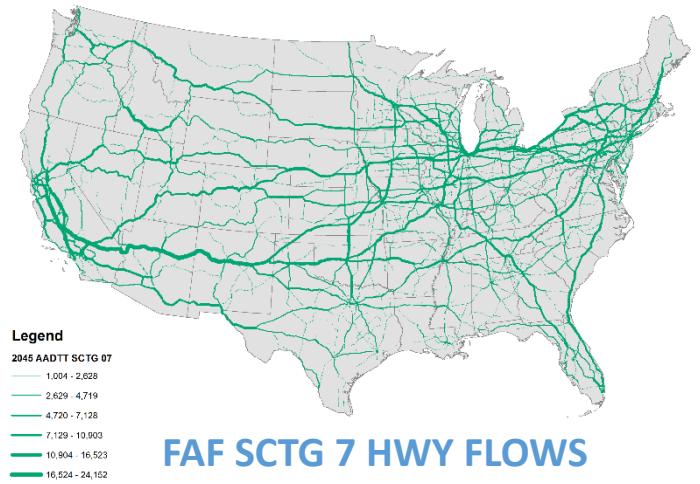
2012 TONS (OVER 0.25 M) BY MODE (CFS)

NAICS GDP	Trade Share (CFS Value)	D Modes (CFS Ton-Miles)	Tons and Avg Dist (CFS)
$493 B	4% E, 96% D or I	68% T, 20% R, 12% O	706 M tons, 440 miles

EMPLOYMENT BY NAICS (CBP)



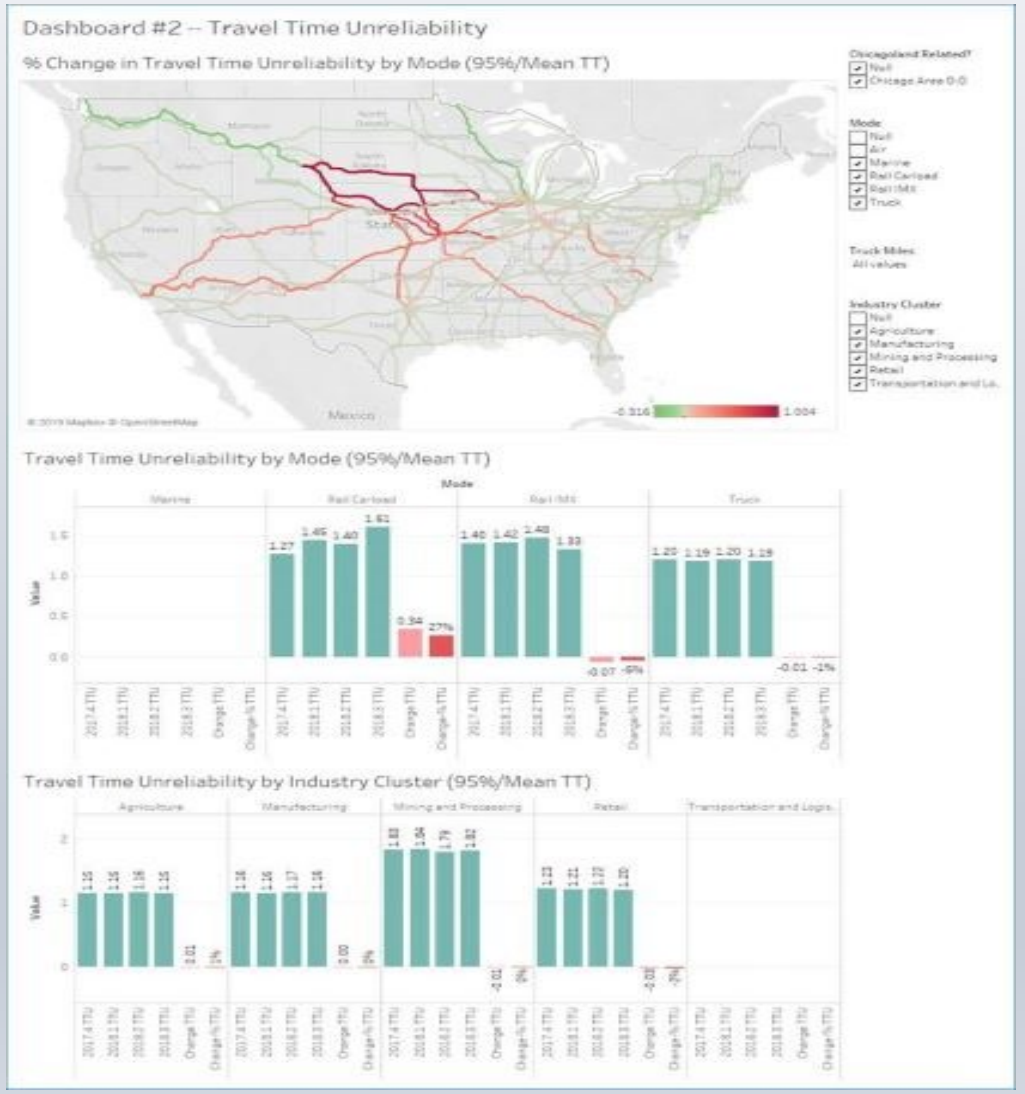
LOCATION OF FIRMS OVER 1,000 EMPLOYEES BY NAICS (INFO USA)



FAF SCTG 7 HWY FLOWS

FHWA Freight Fluidity Tool - Dashboard

- Dashboard concept
  - Database listing each supply chain and component, structured to allow performance metrics to be appended over time
  - Dashboard visualization platform
  - Integration with FHWA HEP-GIS" and other existing display systems
- Contains travel time, travel time reliability and cost data
  - Cost data: "truck trip" not just fuel/time savings
  - Cost data sources (Chainalytics, waybill, carload…)



FHWA Freight Fluidity - Next Steps

- Collect/document feedback from this workshop today
  - And from workshop in NY/NJ Metro region (August 15, 2019)
- Finalize/complete tool content
  - AIS Water Data, feedback from workshops
- Develop and Provide Guidance Documents
- FHWA HOFM makes Freight Fluidity Quarterly Monitoring Data/tool available as resource
  - Complements other FHWA data tools for freight and system performance analysis

Overview of the Freight Fluidity Monitoring Program and Tool

Joe Bryan
Vice President and Manager of Freight and Logistics
WSP USA

FHWA Freight Fluidity Tool – Overview

Goal: a database and visualization/mapping tool to track the cost (price of service), reliability, and travel time for multimodal freight movement, across selected representative national supply chains, on a quarterly basis

Primary Data Sources	Information Obtained	Metrics Developed by Team
27 US companies reflecting major freight-dependent industry sectors	Descriptions of representative supply chains – goods, modes, O/D pairs – not confidential	Flow sequence of key trips Database rows describing trips Slots for performance metrics
NPMRDS	Highway link speeds	Truck metrics for O/D trips: median & mean speed, 95% travel time, Travel Time Index, Planning Time Index
Chainalytics	Commercial data on truck and rail IMX shipment prices	Truck & IMX metrics for O/D trips: cost per move, cost per mile
TransCore	Commercial data on rail travel times, IMX and carload	Rail metrics for O/D trips: median & mean speed, 95% travel time, Planning Time Index
STB Waybill / FRA	Confidential rail costs	[in progress]
US Army Corps of Engineers	Waterborne shipping costs and navigation system time/delay	[in progress]

Freight Fluidity Tool – Accessing Information

From Companies:

- Identify key supply chains (e.g., parts inbound, finished products outbound, parts for repair and maintenance, etc.)
- For each chain:
  - Is it a single end to end move, or are there different links (e.g. individual trips) in the chain?
  - What is the specific role of each link? (inbound raw materials, outbound goods to warehouses, delivery to customers, etc.)?
  - What is the commodity or commodities being moved?
  - What is the mode or modes you are using for each link?
  - What are origins and destinations for each link? (city-state pairs for each trip)
- NEVER ask about business sensitive information – volumes, customer names, carrier names, performance

From Vendors:

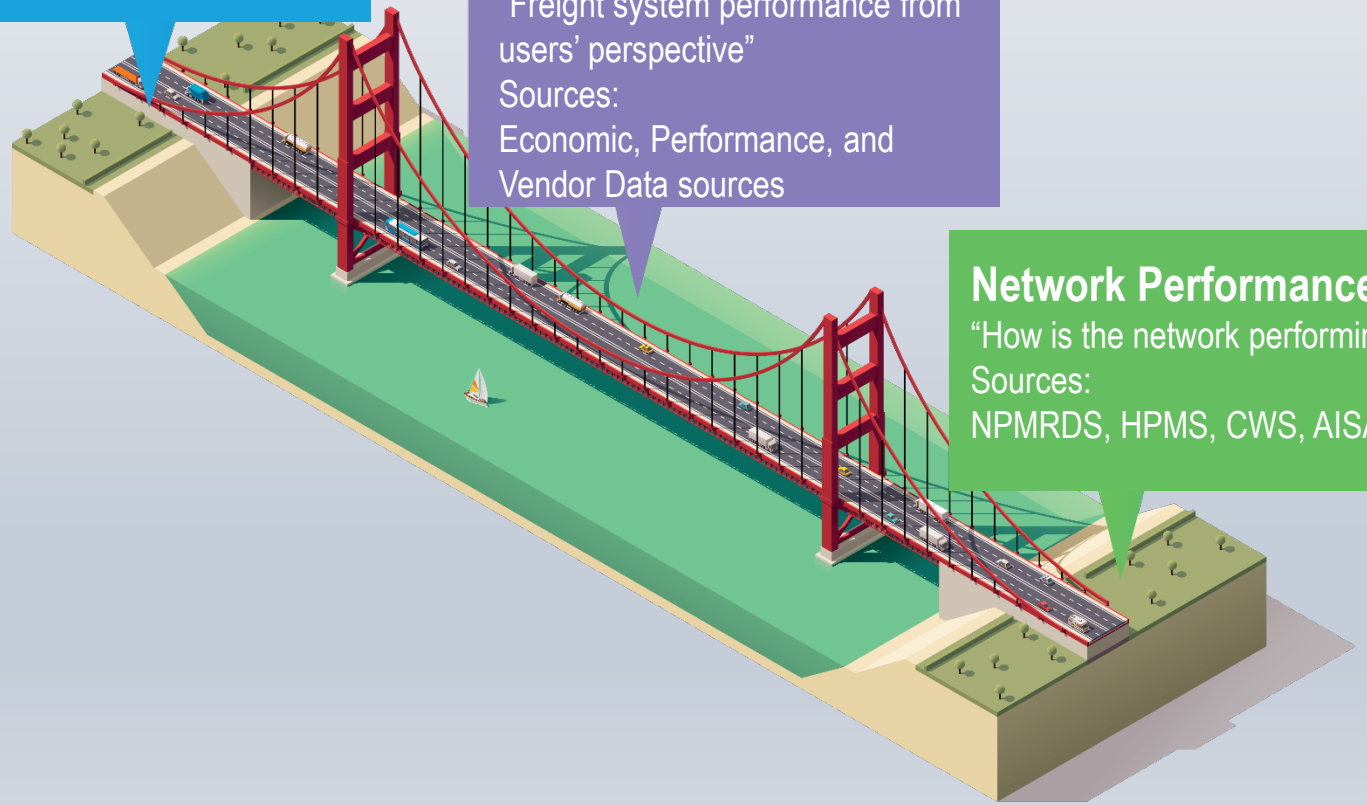
- Circumstances vary by vendor and business purpose
- Chainalytics example:
  - New data source
  - Purpose; benchmarking consortium, not data sales, *but:*
  - Data-driven performance improvement by public agencies benefits their members
  - Relatively small data sample will not compromise members
  - Purchase price defers consortium costs
- Developed model vendor agreement with negotiated price based on data volume, time periods and number of extract requests

Freight Fluidity – A Tool in the FHWA Toolbox

Economic Data
"What and how much freight is moving, and where?"
Sources:
FAF, BEA, CWS

Freight Fluidity Program
"Freight system performance from users' perspective"
Sources:
Economic, Performance, and Vendor Data sources

Network Performance Data
"How is the network performing?"
Sources:
NPMRDS, HPMS, CWS, AISAP



FHWA Freight Fluidity Tool – Software Platforms

- Two integrated platforms, both from existing suite of FHWA freight measurements tools:
  - Tableau database management, analysis and visualization platform
  - FHWA/HOFM GIS data visualization tools, fed from Tableau
- The software platforms meet key criteria:
  - Ability to hold and process large data sets in time series, easily accept updates, and be versatile in use.
  - Accessibility of data to internal and external users, via export into common formats such as spreadsheet software, and directly on the platform without purchase of special tools.
  - Ability to restrict access to certain types or levels of data for certain groups of users.
  - Varied and high quality graphical and cartographical display must be provided, and the displays must be interactive with the data.
  - Stability as a dependable, tested tool.

The New Perspective of Freight Fluidity

- Distinguishing Features:
  - ☑ Focus: Supply chain performance
  - ☑ Key Performance Indicators: Speed, Reliability, Cost
  - ☑ End-to-End: Multimodal, multijurisdictional, flow sequences chained across stages

Current System Performance Capture (Typical)	Freight Fluidity Performance Capture
Travel Time	Travel Time (Industry/Supply Chain)
Travel Time Reliability	Travel Time Reliability (Industry/Supply Chain)
Cost of Wasted Time and Fuel	Transportation Cost (Market Price, Industry/Supply Chain)
Highway Only	Multimodal: Highway, Rail (IMX & Carload), Water

The Value of Freight Fluidity

Monitors Key Performance Indicators (KPIs) comparable to how freight system users monitor themselves

- Keeps public agencies abreast of developments affecting industry
- Anticipates concerns of Freight Advisory Committees and other users

Monitors KPIs that affect industrial competitiveness, supporting economic development and timely response to freight transportation issues

- Performance trends by industry sector
- Operational and investment actions

The Value of Freight Fluidity (continued)

Provides working tool that complements and combines with others in the public agency toolbox

- Fills a gap: supply chain logistics structures and connected links
- Triggers diagnostics from the rest of the toolbox

National platform supplies foundation for state and local agencies to build upon

- Additional sectors and companies
- Additional locations

National Trends in Supply Chain Travel Time

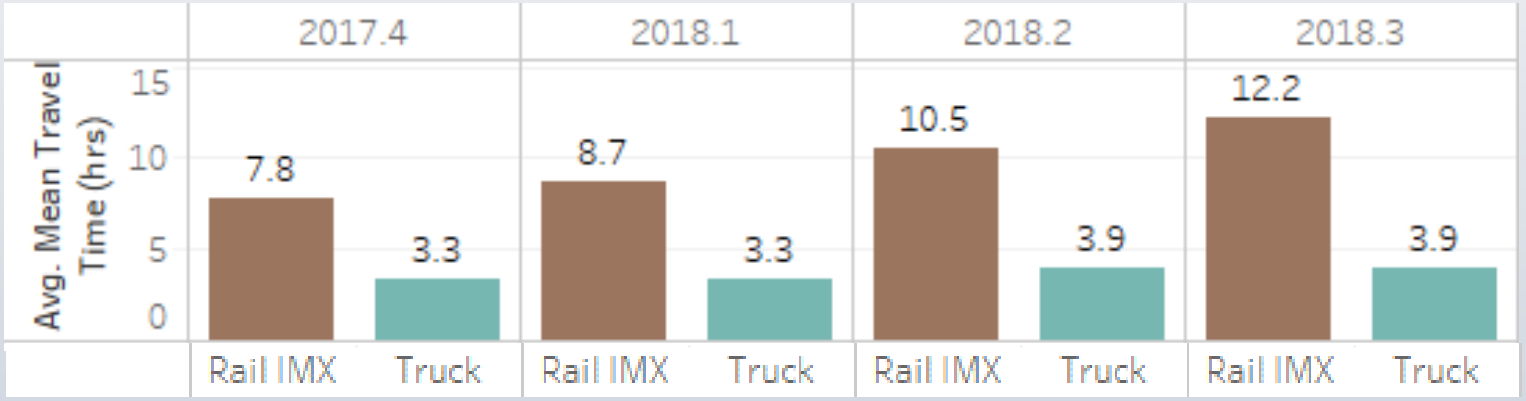
Major US Supply Chains End-to-End:

- Multimodal
- Multijurisdictional
- Flow sequences across stages
- 4Q 2017-3Q 2018

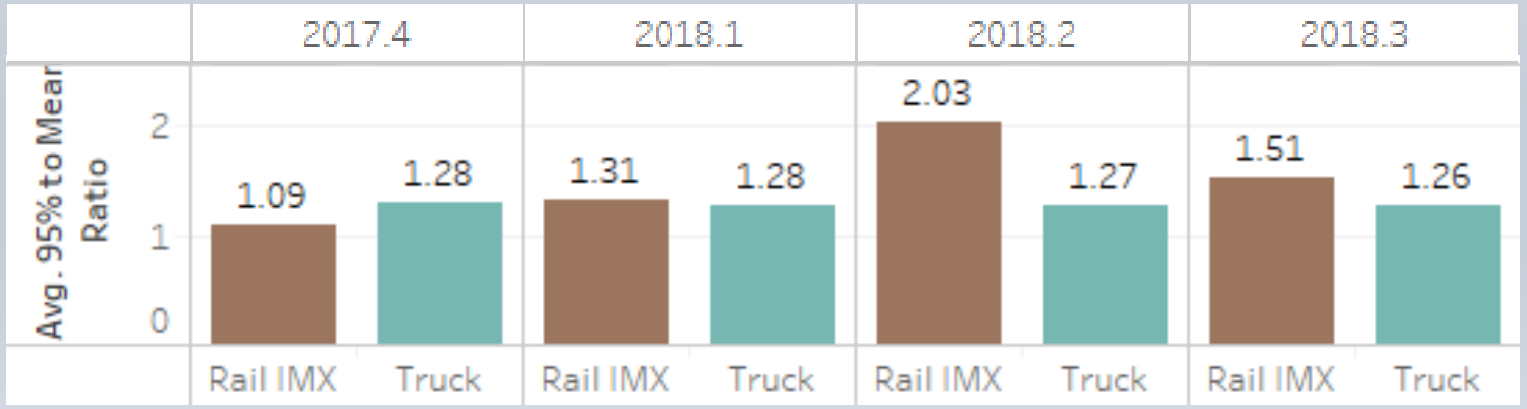
➡ 102 lanes begin and/or end in IL

Questions Answered by Freight Fluidity

What is travel time by mode and how is that changing over time?

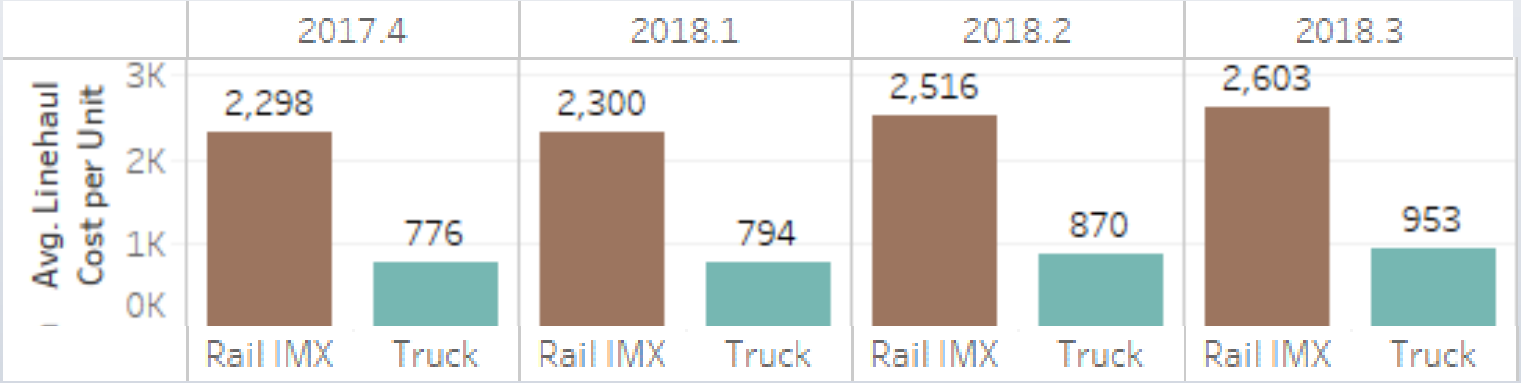


What is reliability by mode and how is that changing over time?



Questions Answered by Freight Fluidity

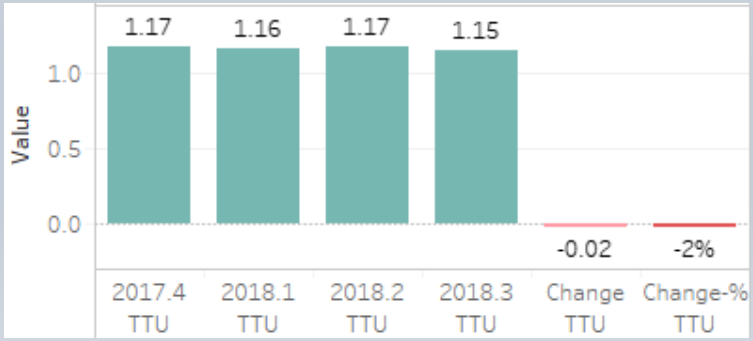
What are the costs by mode and how are they changing over time?

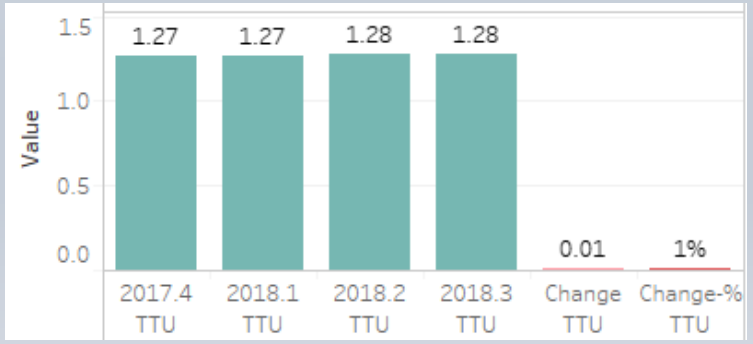


How do regional performance trends compare to national trends? Are we gaining or losing competitively?

Truck Travel Time Unreliability:

National





Truck Travel Time Unreliability:

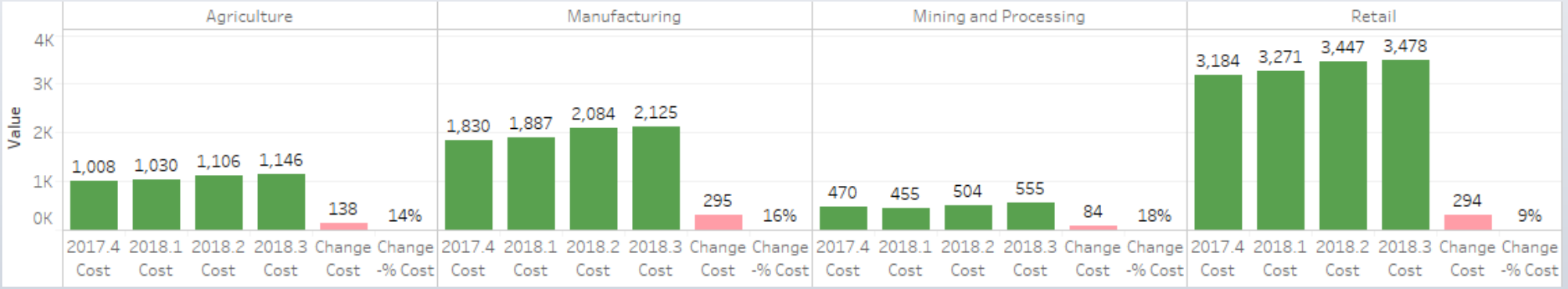
Regional

Questions Answered by Freight Fluidity

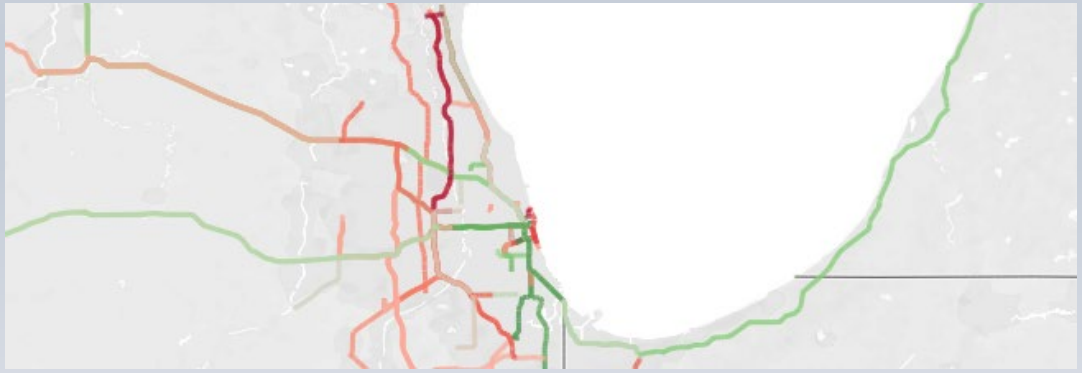
What is the relative performance by industry and how is it changing over time? Are we taking care of key sectors?

Cost by Industry Cluster:

Truck & Rail



What is the relative performance by network segment and how is it changing over time? Are we taking care of key districts?



Percent Change in Truck Travel Time Unreliability

Application of Fluidity in Agency Toolbox

Situation: Supply chain reliability is falling in Northeastern Illinois. Why?

- Fluidity monitoring triggers the question
- Operational diagnostics available from agency:

• Weather	• Construction locations
• Continuous traffic counts	• Bottleneck locations & performance
• Crash trends by location	• Public events … etc.

How is this affecting construction costs around Chicago?

- Fluidity monitoring provides topline answer
- Probe data tools (e.g. ATRI, INRIX, StreetLight, etc.) add breadth and detail:
  - *Is the distance trucks can travel from ready-mix terminals in 90 minutes at 95% reliability declining?*

Freight Sectors in the Fluidity Platform

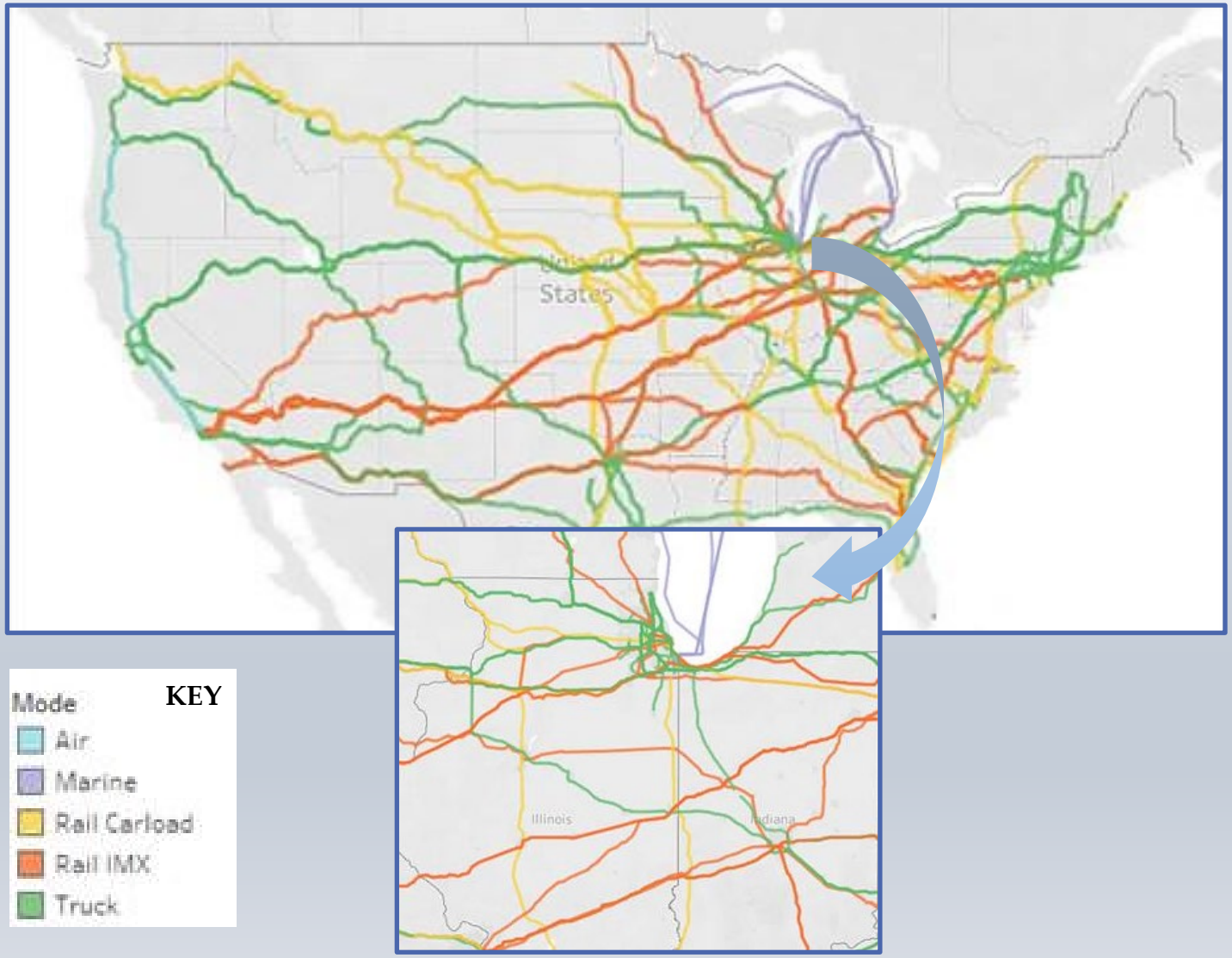
Discrete O-D Moves

Industry Sector	Grand Total	Chicago Area O-D
Agriculture: Animal Products	11	
Agriculture: Dairy Products	9	
Manufacturing: Agricultural and Consumer Machinery	34	13
Manufacturing: Aircraft and Aerospace	5	
Manufacturing: Automotive	6	
Manufacturing: Beverages	5	
Manufacturing: Construction Machinery	23	6
Manufacturing: Consumer and OEM Electronics	17	
Manufacturing: Food Products	6	
Manufacturing: Organic Chemicals (Plastics et al)	9	
Manufacturing: Paper Products	12	
Manufacturing: Pharmaceutical, Medical, and Consumer Products	56	6
Manufacturing: Recreational/Commercial Transport Equipment	22	6
Manufacturing: Speciality OEM Electronic Components	12	
Mining and Processing: Cement and Rock	31	15
Mining and Processing: Coal	9	1
Mining and Processing: Fertilizers	12	1
Retail: Apparel Store	7	
Retail: Department Store	14	
Retail: Home Improvement	12	10
Retail: Major National	4	
Retail: Personal Care Products	27	7
Retail/Wholesale/Distribution: Grocery, Food, Beverage	23	19
Transportation and Logistics	3	
Grand Total	369	84

- 27 companies in 24 sectors provided flow sequences for 369 freight movement lanes by origin-destination zip code, commodity, mode, and logistics purpose
  - 12 = Manufacturing
  - 6 = Retail
  - 3 = Mining
  - 2 = Agriculture
  - 1 = Transportation
- Scalable
  - Of 12 companies active around Chicago, 8 were added or expanded from national platform, with additional O-D moves covering more dealers, retail outlets, etc.
  - Result: 84 Chicago area lanes
  - Similar addition/expansion underway for New York
- Initially, four quarters of data for each data record
  - Data can be updated/maintained at moderate cost

Multimodal Routes in the Fluidity Platform

27 National & Chicago Regional Supply Chains



- Each record in the database has an assigned path
- GIS for each path will be included in the Tool – truck and non-truck
- Allows data attributes to be displayed at a path level in the Tool, in addition to table/chart summaries
- Links to FHWA/HOFM GIS tools for integration with other USDOT products
- More supply chains and lanes can be added to this foundation

Questions/Discussion

- (these will be prompts and noted on a whiteboard for later discussion/follow up)
- *Do these "value proposition" points on why Fluidity/this tool can be of value hold true to you?*
  - *Are there others you are looking for? Believe these can add to?*
- *Looking at the questions Fluidity can answer and the Applications in Agency Toolbox*
  - *Do these sound correct, are there others?*
    - *Recommend they think about these as they look at how the tool is actually used in the next session*

Working Lunch

How You Use the Freight Fluidity Tool
Tool Demonstration/Interactive Discussion

Alan Meyers
Freight and Logistics Principal
WSP USA

Freight Fluidity Tool Demonstration

1. Excel Spreadsheet
   a) Structure, data fields, data sources
   b) Q and A, discussion
2. Tableau, National Level
   a) Overview, dashboards, detail tabs
   b) Q and A, discussion
3. Tableau, Chicago Focus
   a) Dashboards, detail tabs
   b) “Chained trip” analysis
   c) Q and A, discussion
4. Expandability and Maintenance
   a) General ideas for improved capabilities
   b) Updating the spreadsheet and Tableau
   c) Adding finer-grained geography
   d) Q and A, discussion

Informing Supply Chains with FHWA NPMRDS Data

Bill Eisele
Mobility Practice Leader and Senior Research Engineer
Texas A&M Transportation Institute

Overview

- What is NPMRDS and how do I get the data?
- How did we put these data on the supply chains?
  - An example supply chain application
- Data cautions (and opportunities)

National Performance Management Research Data Set

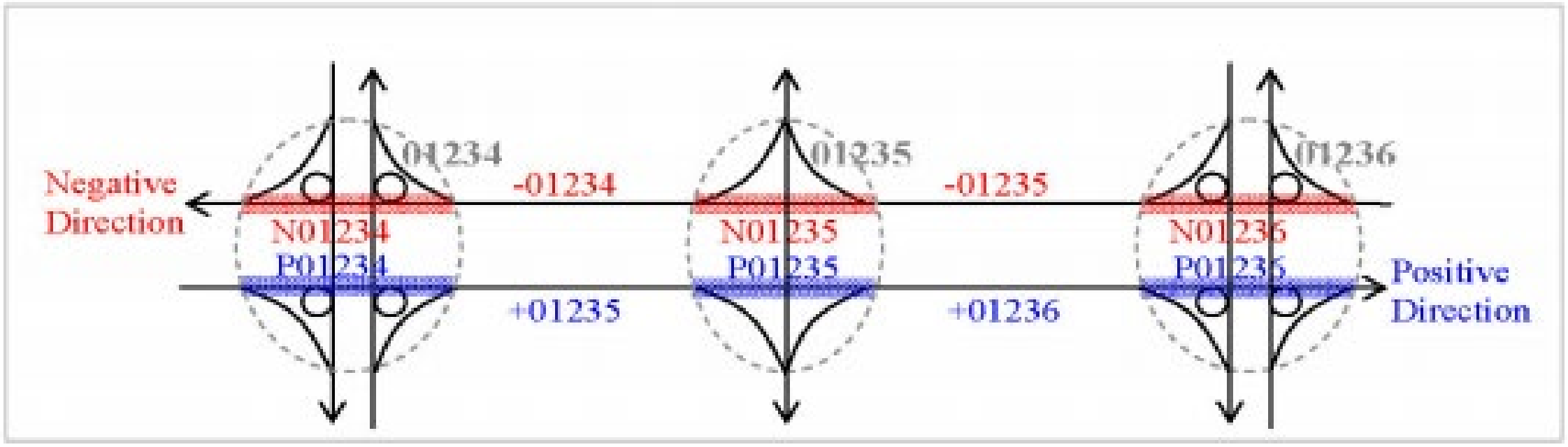
- FHWA acquired the first NPMRDS back in July 2013; and second version in April 2017
- Observed travel times from vehicle-based probes on Traffic Message Channels (TMC)
- Average travel times every 5 minutes on the National Highway System (when available) delivered every month
- Passenger, Freight, and "All Traffic" average travel times

Link to more NPMRDS information: https://ops.fhwa.dot.gov/perf_measurement/index.htm

National Performance Management Research Data Set

- Free to use for State DOTs, MPOs and their contractors for performance management activities
- Includes selected Highway Performing Monitoring System (HPMS) attributes conflated from state HPMS submissions

Depiction of TMCs



Link to more NPMRDS information: https://ops.fhwa.dot.gov/perf_measurement/index.htm

National Performance Management Research Data Set

- Information available in NPMRDS for each road segment (TMC)

Travel Time Items
tmc_code
measurement_tstamp
speed
average_speed *(historical)*
reference_speed
travel_time_seconds
data_density

Items of Note

Sample travel time output from NPMRDS

Metadata Item	Metadata Item(con't)
tmc	f_system
road	urban_code
direction	faciltype
intersection	structype
state	thrulanes
county	route_numb
zip	route_sign
start_latitude	route_qual
start_longitude	altrtename
end_latitude	aadt
end_longitude	aadt_singl
miles	aadt_combi
road_order	nhs
timezone_name	nhs_pct
type	strhnt_typ
country	strhnt_pct
tmclinear	truck
frc	isprimary
border_set	active_start_date
	active_end_date

Sample TMC metadata from NPMRDS

How to Get the NPMRDS Data

1. Sign the data sharing agreement
   - https://npmrds.ritis.org/dsa

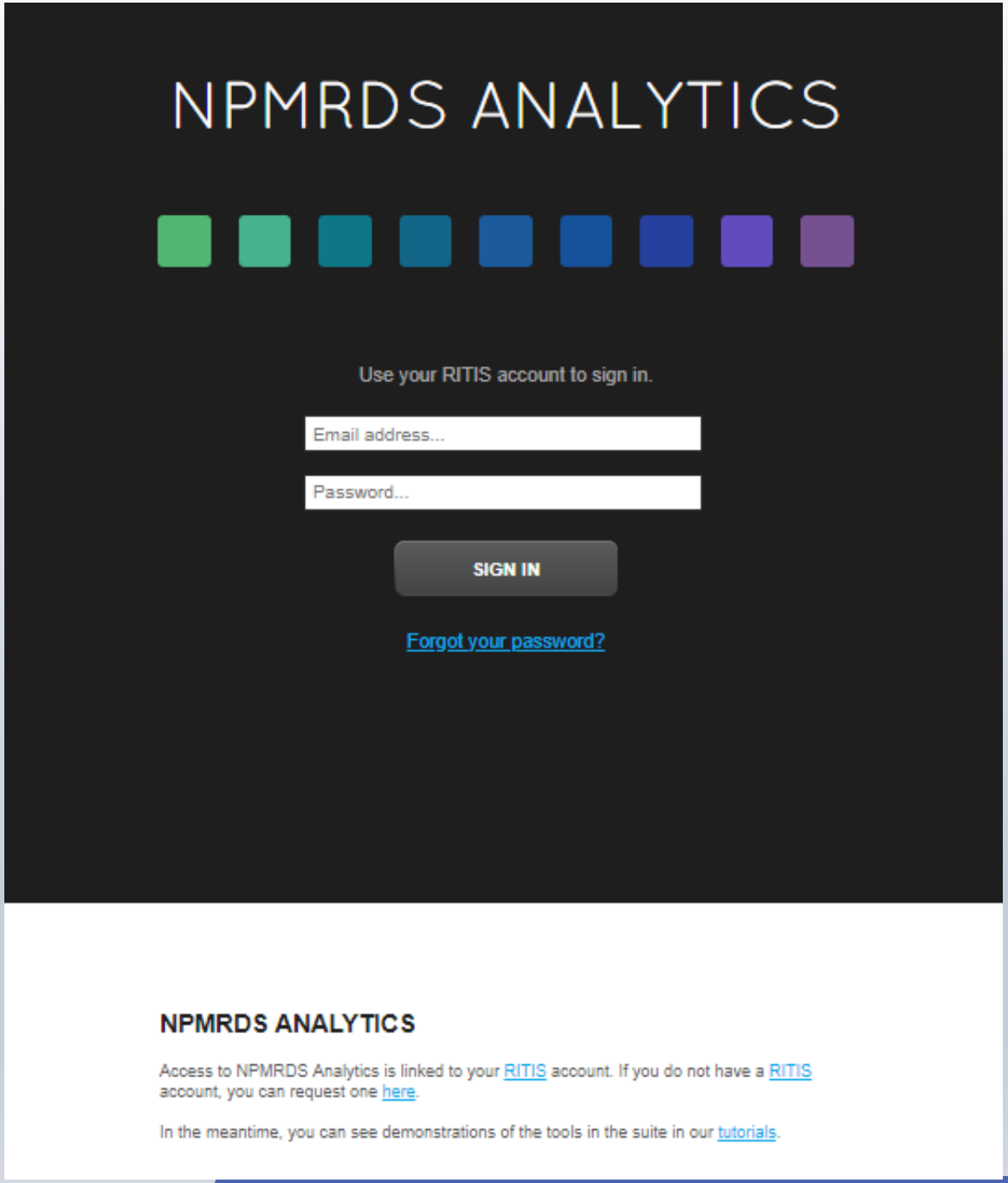
2. Create a RITIS Account
   - https://www.ritis.org/register/

3. Access the data
   - https://npmrds.ritis.org

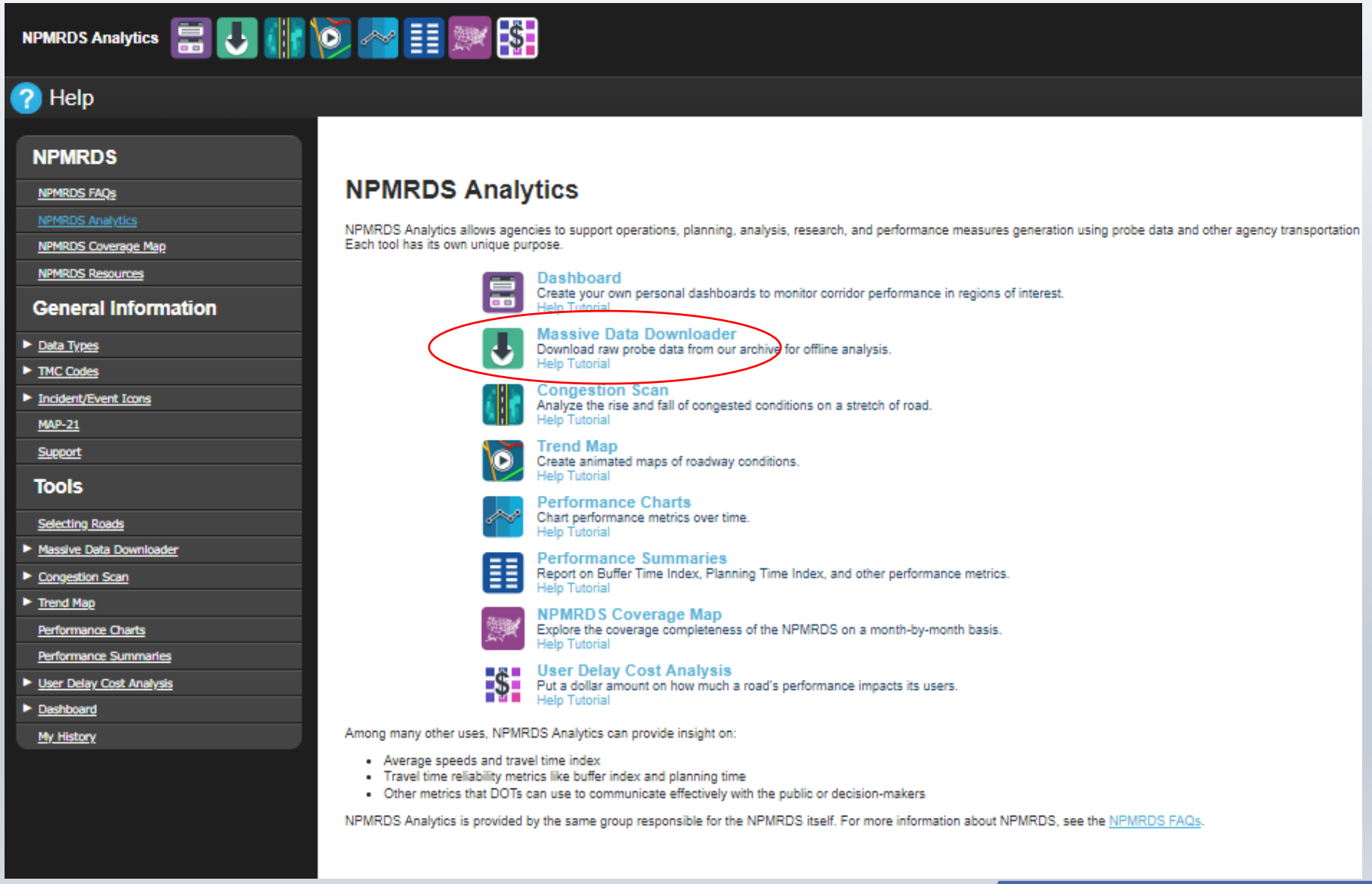
- A quick start guide can be found here: https://npmrds.ritis.org/static/help/docs/NPMRDSquickstart.pdf
- Tutorials can be found here: https://npmrds.ritis.org/analytics/tutorials/
- For additional questions, e-mail/contact: npmrds@ritis.org

NPMRDS

- How to extract data from the NPMRDS interface (available after you have registered)
  - https://npmrds.ritis.org/analytics/

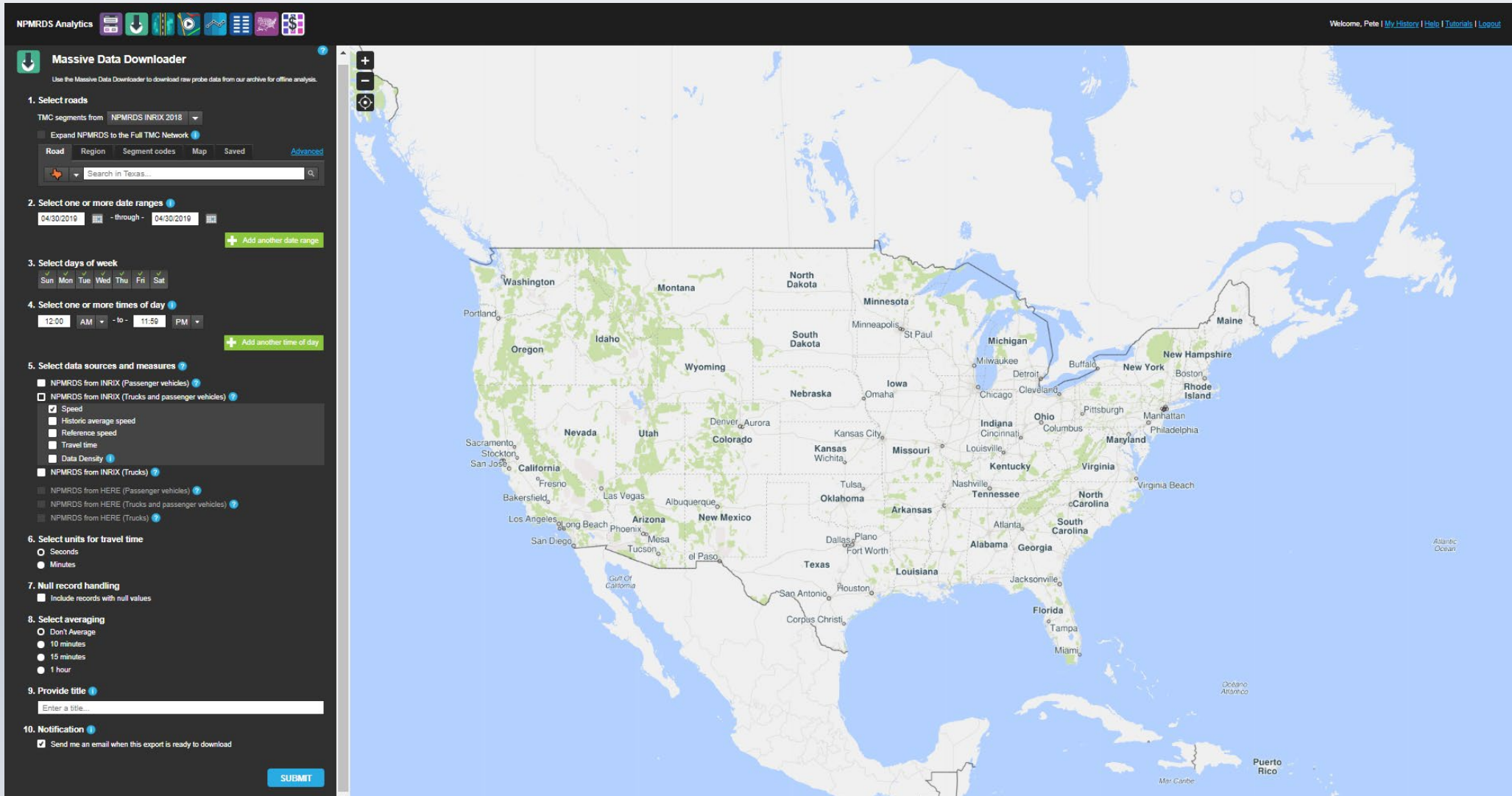


NPMRDS Massive Data Downloader



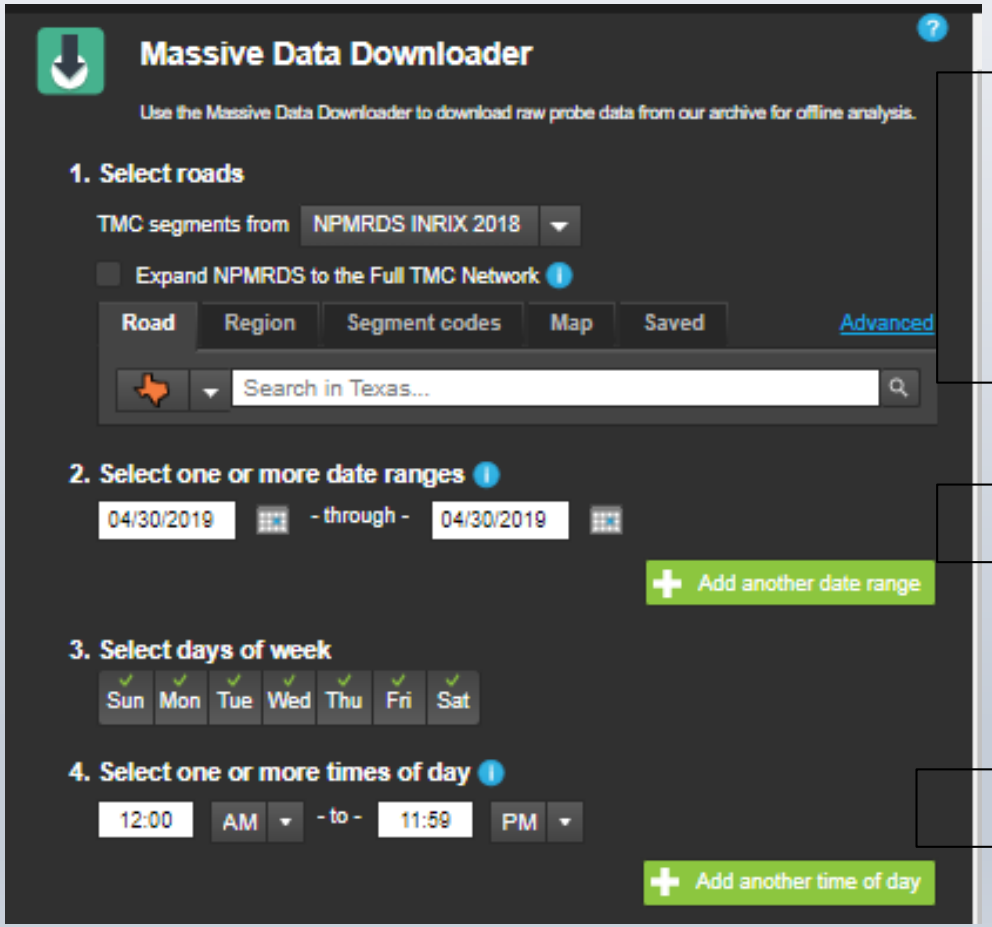
NPMRDS Massive Data Downloader

- Massive Data Downloader uses the interface along the left side of the screen to interact with the data



NPMRDS Massive Data Downloader

- The Interface



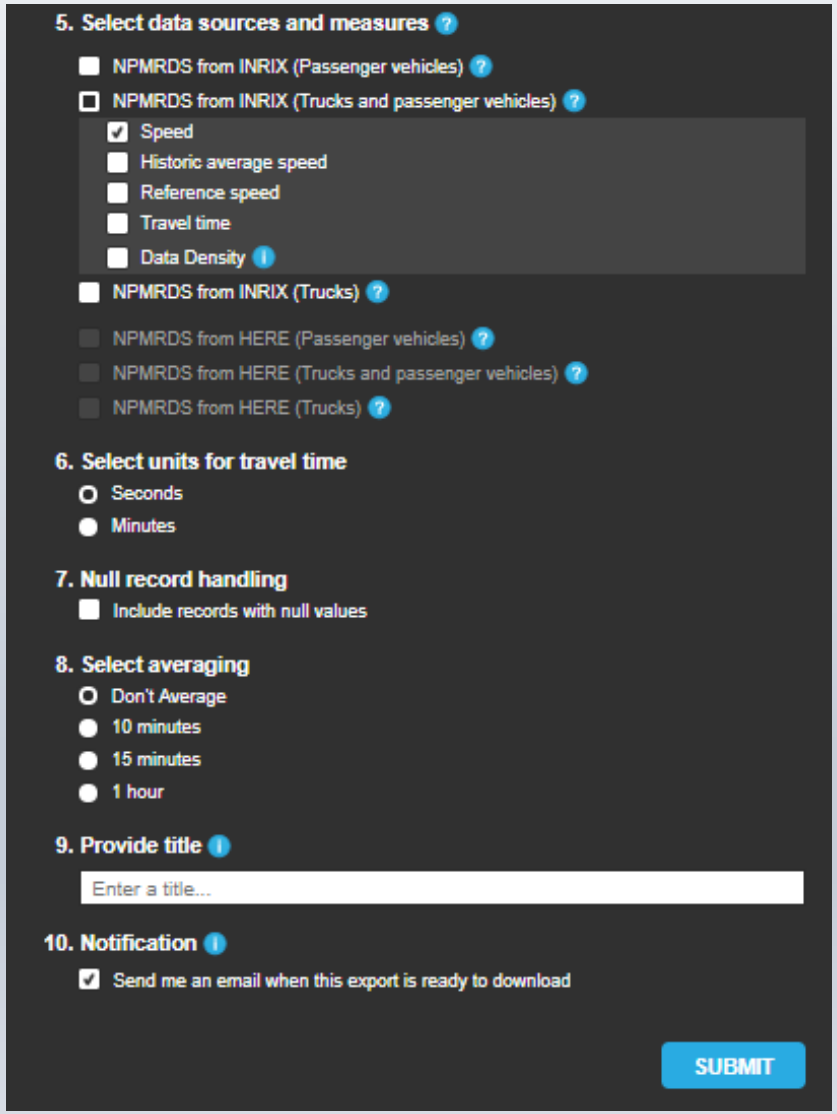
Four options for selecting roads and a way to save your query
-Road by name
-Region (State, county, zip, direction functional class)
-Individual TMC code
-Interactive map

Ability to select date range or multiple date ranges

Ability to select days of the week and specific times if necessary

NPMRDS Massive Data Downloader

- The Interface



Options for selecting speed and travel time data
-Passenger vehicles
-Trucks and passenger vehicles
-Trucks

Travel time can be presented in seconds or minutes

Time intervals can be selected from the following
-5 minute (Don't average)
-10 minute
-15 minute
-60 minute (one hour)

Email notification when submission is complete

Example Supply Chain Application

With temperatures rising this summer, officials want to make sure there isn't a repeat of 1995. As a simple example, a question may be asked about the performance of a supply line of medical hydration fluids between a manufacturing plant and a medical center in the region.

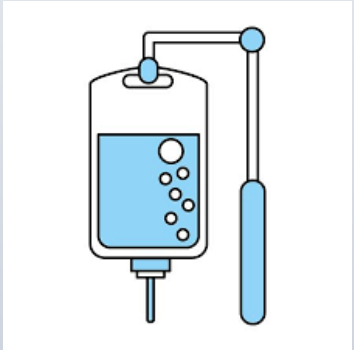
JUL 12, 1995 - JUL 20, 1995

Great Chicago Heat Wave 1995

USA

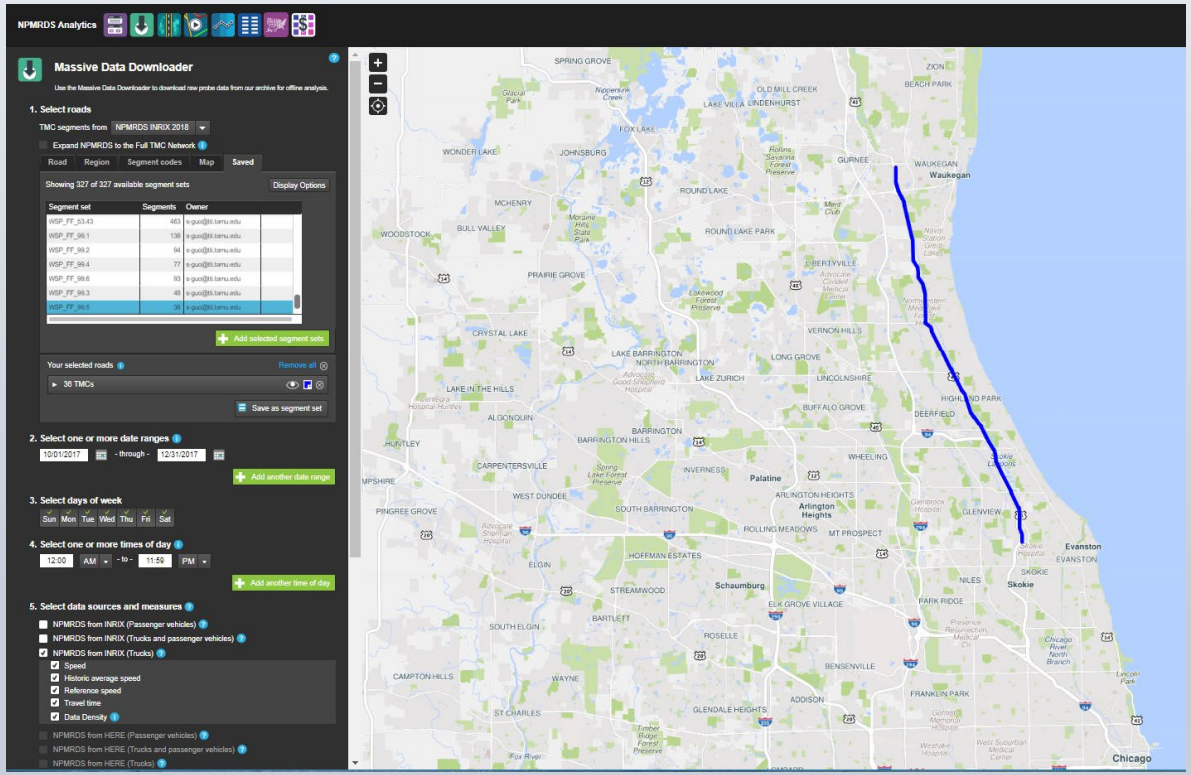
The great heat wave of 1995 was a short but intense event that caused 830 deaths nationally, 525 of which occurred in the urban center of Chicago.

The event is consistent with larger climate trends. One of the clearest findings of climate science is that global warming amplifies the intensity, duration and frequency of extreme heat events.



Example Supply Chain Application

- Applying NPMRDS to a specific example of medical products
- Collect observed travel times on NHS roadway network from the NPMRDS interface



Flow 99.5 Waukegan, IL 60085 to Evanston, IL 60201

Road Segment | Time | Speed | Reference Speed | Travel Time

	A	B	C	D	E
1	tmc_code	measurement_tstamp	speed	reference_speed	travel_time_seconds
2	107N04226	10/01/2017 0:15	60	68	25.38
3	107N04226	10/01/2017 1:00	55	68	27.68
4	107N04226	10/01/2017 1:15	55	68	27.68
5	107N04226	10/01/2017 1:30	55	68	27.68
6	107N04226	10/01/2017 1:45	35	68	43.5
7	107N04226	10/01/2017 2:15	54.5	68	27.94
8	107N04226	10/01/2017 2:45	60.93	68	24.99
9	107N04226	10/01/2017 3:30	59	68	25.81
10	107N04226	10/01/2017 5:30	62	68	24.56
11	107N04226	10/01/2017 6:30	62	68	24.56
12	107N04226	10/01/2017 7:00	58	68	26.25
13	107N04226	10/01/2017 7:15	60	68	25.38
14	107N04226	10/01/2017 8:30	59	68	25.81
15	107N04226	10/01/2017 8:45	60	68	25.38
16	107N04226	10/01/2017 9:30	65	68	23.43
17	107N04226	10/01/2017 9:45	55	68	27.68
18	107N04226	10/01/2017 10:15	57	68	26.71
19	107N04226	10/01/2017 10:30	63	68	24.17
20	107N04226	10/01/2017 11:00	55	68	27.68
21	107N04226	10/01/2017 11:45	66	68	23.07
22	107N04226	10/01/2017 12:00	54	68	28.2

Sample travel time output from NPMRDS

Example Supply Chain Application

Procedures to Calculate Statistics and Measures

1. Line up road segments (TMCs) from origin to destination zip codes using NPMRDS roadway inventory
2. Using this virtual routing, calculate travel times for a trip starting every 15 minutes throughout a quarter ("traces")

Example Supply Chain Application

- Procedures to Calculate Statistics and Measures (cont.)

  3. Record the time it takes to travel the route (O-D) for each starting time and day in the quarter then calculate the following statistics and measures

  - <u>Statistics:</u>
    - 50th percentile travel time (median),
    - Average travel time,
    - Free-flow travel time (15th percentile travel time),
    - 95th percentile travel time,
    - 99th percentile travel time
    - Average speed (distance/average travel time)
  - <u>Measures:</u>
    - TTI (50th percentile travel time / Free-flow travel time)
    - PTI (95th percentile travel time/ Free-flow travel time)
    - Average Delay (50th percentile travel time – Free-flow travel time)

Example Supply Chain Application

Results for Flow 99.5 Waukegan, IL 60085 to Evanston, IL 60201

		Statistics				Measures			
Year-Qtr	Flow Route	Free Flow Travel Time (hrs)	50% Travel Time (hrs)	95% Travel Time (hrs)	99% Travel Time (hrs)	Average Speed (mph)	Travel Time Index (50%/FF)	Planning Time Index (95%/FF)	Avg Delay (hrs) (50% TT-FF TT)
2017Q4	99.5	0.286	0.439	0.624	0.777	54	1.53	2.18	0.153
2018Q1	99.5	0.289	0.436	0.588	0.733	55	1.51	2.04	0.147
2018Q2	99.5	0.297	0.442	0.633	0.739	53	1.49	2.13	0.144
2018Q3	99.5	0.304	0.44	0.628	0.753	53	1.45	2.06	0.136

(Performed same process for all 52 Chicago regional flows)

For the medical hydration fluids of this supply chain (example), this method/tool:
1. Provides baseline data…
2. Can/will provide trend data…
3. Is good for planning purposes…

Example Supply Chain Application

- Produced shapefiles for integration with Tableau and into the tool
  - Shapefiles can be downloaded from NPMRDS and filtered to the desired TMCs for a route

1. Download shapefile from NPMRDS

NPMRDS Shapefiles

NPMRDS INRIX Shapefiles

For use with NPMRDS INRIX data

Statewide Shapefiles

State	Conflation year		
	2017 (January 1, 2017 - December 31, 2017)	2018 (January 1, 2018 - December 31, 2018)	2019 (January 1, 2019 - present)
Alabama	Download (3.8MB)	Download (3.6MB)	Coming in Summer 2019
Alaska	Download (1.8MB)	Download (1.7MB)	Coming in Summer 2019
Arizona	Download (2.3MB)	Download (2.2MB)	Coming in Summer 2019
Arkansas	Download (2.4MB)	Download (2.4MB)	Coming in Summer 2019
California	Download (18.2MB)	Download (17.2MB)	Coming in Summer 2019
Colorado	Download (3.7MB)	Download (3.7MB)	Coming in Summer 2019
Connecticut	Download (2.8MB)	Download (2.3MB)	Coming in Summer 2019
Delaware	Download (518.8KB)	Download (517.4KB)	Coming in Summer 2019
District of Columbia	Download (363.2KB)	Download (307.8KB)	Coming in Summer 2019
Florida	Download (9.3MB)	Download (8.3MB)	Coming in Summer 2019
Georgia	Download (7.6MB)	Download (6.9MB)	Coming in Summer 2019
Hawaii	Download (568.1KB)	Download (642.7KB)	Coming in Summer 2019
Idaho	Download (1.4MB)	Download (1.3MB)	Coming in Summer 2019
Illinois	Download (6.8MB)	Download (6.5MB)	Coming in Summer 2019
Indiana	Download (3.8MB)	Download (3.1MB)	Coming in Summer 2019

https://npmrds.ritis.org/analytics/shapefiles

2. In GIS: Find your route

Route TMC info

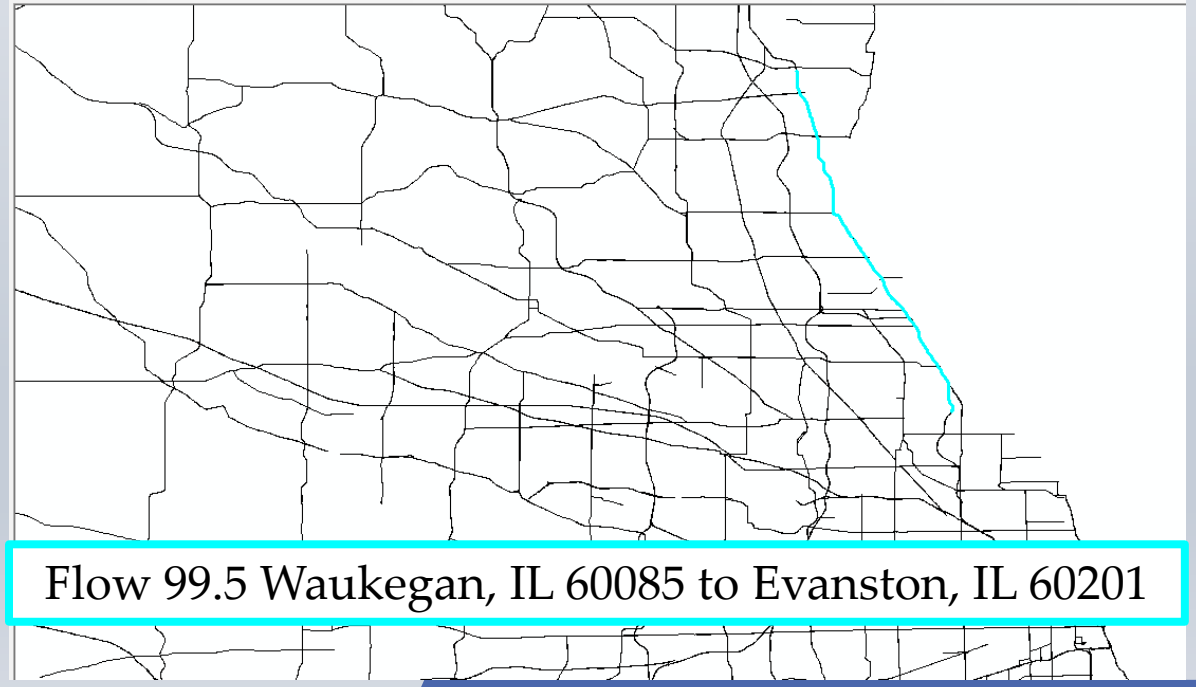
Table

Illinois

FID	Shape	Tmc	TmcType	RoadNumber	RoadName	IsPrimary	FirstName	TmcLinear	Country	State	County
10	Polyline	107-04507	P1	41	Skokie Hwy	1	IL-120/IL-43	65	United States	Illinois	Lake
259	Polyline	107N04224	P1	41	US-41 S	1	I-94	74	United States	Illinois	Cook
334	Polyline	107-04483	P1	94	I-94 E	1	Willow Rd/Exit 33	66	United States	Illinois	Cook

(36 out of 14466 Selected)

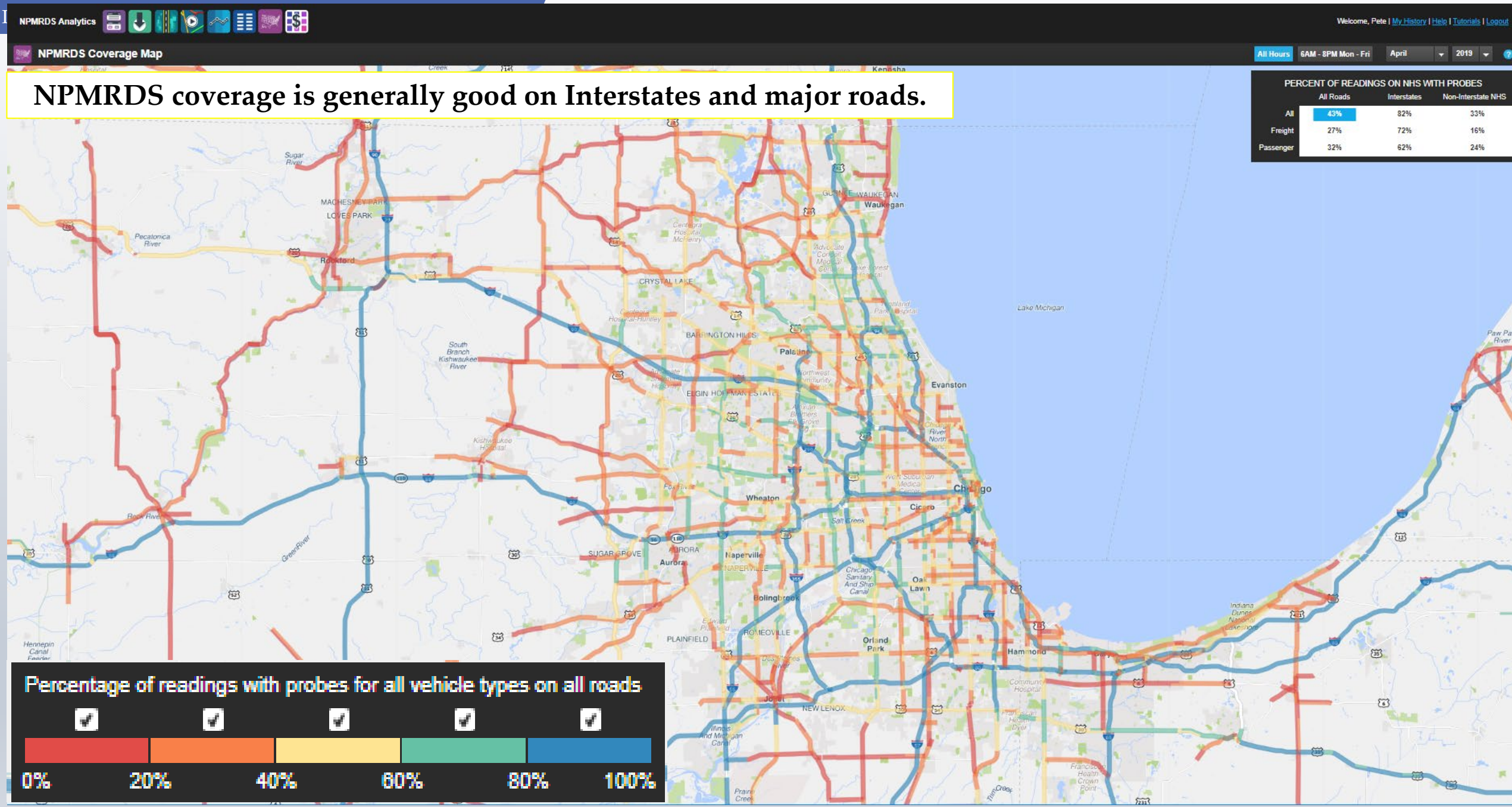
Illinois



Flow 99.5 Waukegan, IL 60085 to Evanston, IL 60201

NPMRDS Considerations/Cautions

- NPMRDS is discontinuous (a non-navigable network).
- NHS only and contains observed travel time / speed readings (no estimates)
  - To fill in beyond NHS - compatible data coverage can be purchased from other data providers (e.g., ATRI, INRIX, HERE, StreetLight, etc.)
- Freight coverage is generally lower than passenger vehicles (because that's reality)
- Coverage is lower when there is less traffic (obviously) like overnights and weekends.
- HPMS meta data are typically lagging by two years (e.g., 2018 NPMRDS data contains 2016 HPMS data).


NPMRDS Analytics
Welcome, Pete | My History | Help | Tutorials | Logout
NPMRDS Coverage Map
All Hours
6AM - 8PM Mon - Fri
April
2019
NPMRDS coverage is generally good on Interstates and major roads.
PERCENT OF READINGS ON NHS WITH PROBES
All Roads
Interstates
Non-Interstate NHS
All 43% 82% 33%
Freight 27% 72% 16%
Passenger 32% 62% 24%
Percentage of readings with probes for all vehicle types on all roads
0%
20%
40%
60%
80%
100%

Example NPMRDS Uses/Activities

- FHWA Urban Congestion Quarterly/Annual Reports
  - https://ops.fhwa.dot.gov/perf_measurement/ucr/
- FHWA Freight Mobility Measures (and Tableau visualization)
  - National freight roadway bottlenecks (and ports, borders, airports, intermodal areas)
- FHWA Pooled Fund (Mobility Measurement in Urban Transportation)
  - Spatial and temporal coverage
  - Performance measure calculations & sensitivity analyses, etc.
- NPMRDS Technical Assistance Webinars
  - https://ops.fhwa.dot.gov/perf_measurement/index.htm

Discussion (and Contact Information)

- Questions on the data?
- …..the uses?
- …..the opportunity?
- Other?

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Discussion/Key Insights

Workshop Participants
Marygrace Parker (Facilitator)

Next Steps

- Collect/document feedback from this workshop
  - And from workshop in NY/NJ Metro region (August 15, 2019)
- Finalize/complete tool content
  - AIS Water Data, feedback from workshops
- Develop and Provide Guidance Documents
- FHWA HOFM makes Freight Fluidity Quarterly Monitoring Data/tool available as resource
  - Complements other FHWA data tools for freight and system performance analysis