

CMAP's Experience with NPMRDS Data

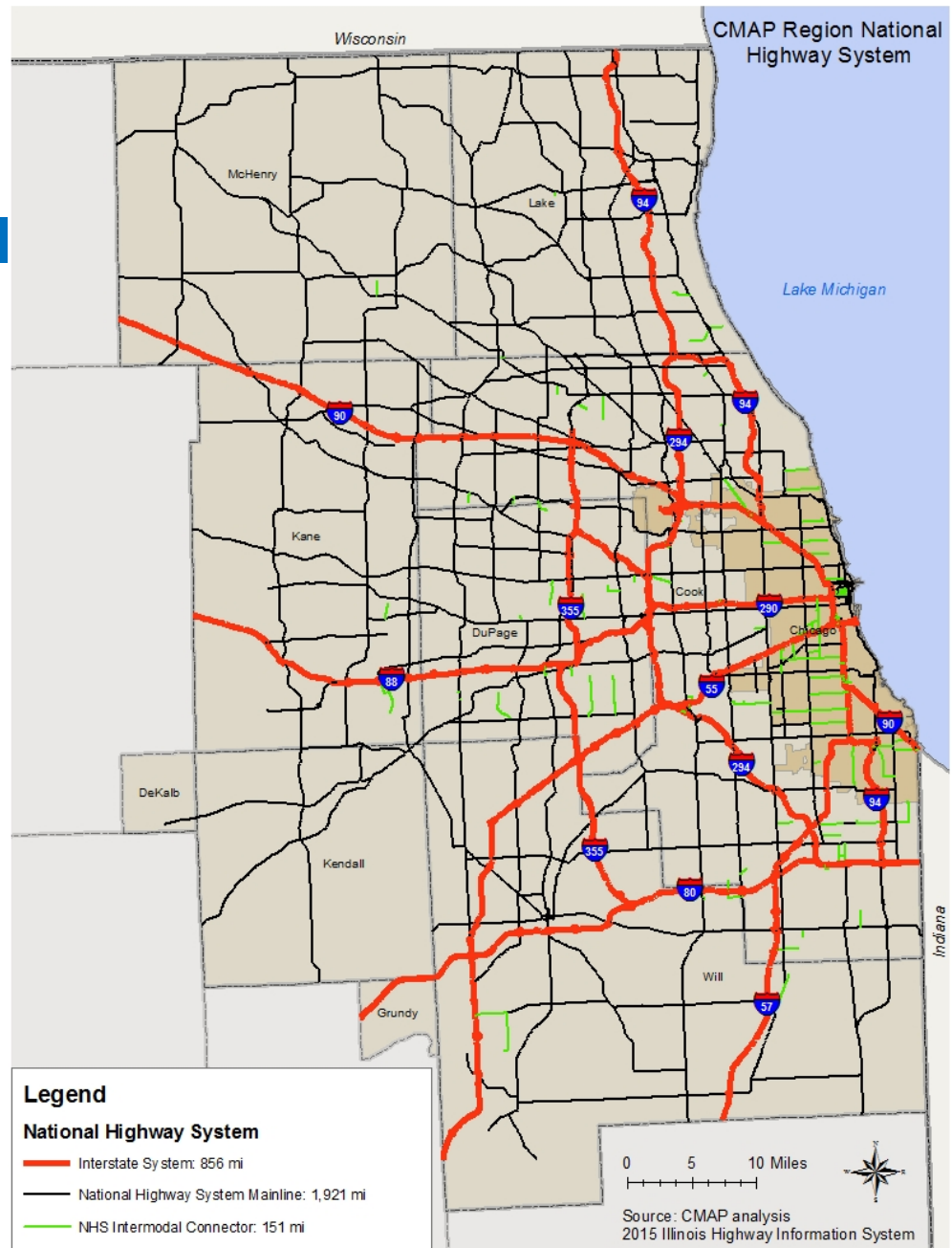
NATMEC 2016

NATMEC: Today's Agenda

- Background
- What we're doing with NPMRDS data
 - ▣ Previous projects
 - ▣ Current projects
 - ▣ Planned projects
- Lessons Learned

NATMEC: Background: CMAP Info

- MPO for northeastern Illinois
- ON TO 2050
- 7 Counties
- Population -
 - ▣ Region: 8.46 million
 - ▣ City of Chicago: 2.7 million
- NHS miles
 - ▣ 2,928
- Trips
 - ▣ 15.9 m trips
 - ▣ 1.76 m transit trips
 - ▣ 175.6 m daily VMT
 - ▣ 17.6 m daily truck VMT



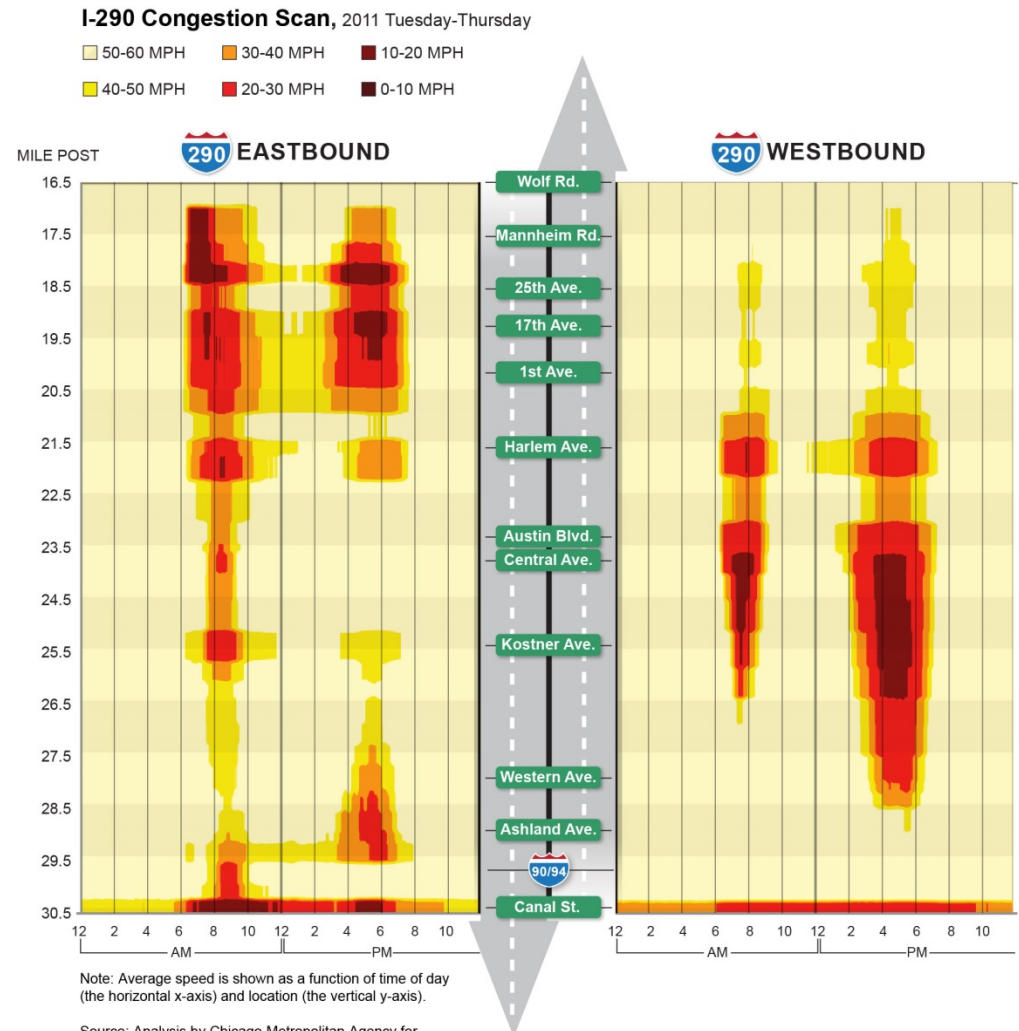
NATMEC: Background

Previous work:

- Expressway traffic scans and other performance metrics

I-290 Westbound

| Measure | 2009 | 2010 | 2011 |
|-----------------|------|------|------|
| AM TTI | 1.67 | 1.82 | 1.72 |
| PM TTI | 2.31 | 2.43 | 2.75 |
| AM PTI | 2.72 | 3.58 | 2.75 |
| PM PTI | 3.81 | 4.66 | 3.83 |
| Congested Hours | 8.04 | 9.83 | 7.48 |



NATMEC: Today's Agenda

- Background
- What we're doing with NPMRDS data
 - ▣ **Previous projects**
 - ▣ Current projects
 - ▣ Planned projects
- Lessons Learned

NATMEC: Previous Project: Transportation Visualization

- Displayed an animation of highway speeds by time of day using the NPMRDS
- Part of a bigger visualization mini-website developed last year.
- We processed NPMRDS; vendor visualized data.
- Visualization is at <http://www.cmap.illinois.gov/mobility/explore#/topic/roads/congestion>.
- Vendor technical information is at <https://www.cleverfranke.com/work/cmap>

NATMEC: Previous Project: Transportation Visualization



Image: CMAP

NPMRDS: Previous Project: Performance Measurement

- Travel Time Index:

$$\frac{\textit{Average Congested Travel Time}}{\textit{Free – Flow Travel Time}}$$

NEW: Peak periods for measuring congested travel time: 7am – 9am and 4pm – 6 pm, Mon. – Fri.

- Planning Time Index:

$$\frac{\textit{95th Percentile Travel Time}}{\textit{Free – Flow Travel Time}}$$

NEW: Free flow speed is the maximum of eight time periods calculated for each link. Used medians.

- 80th Percentile Time Index:

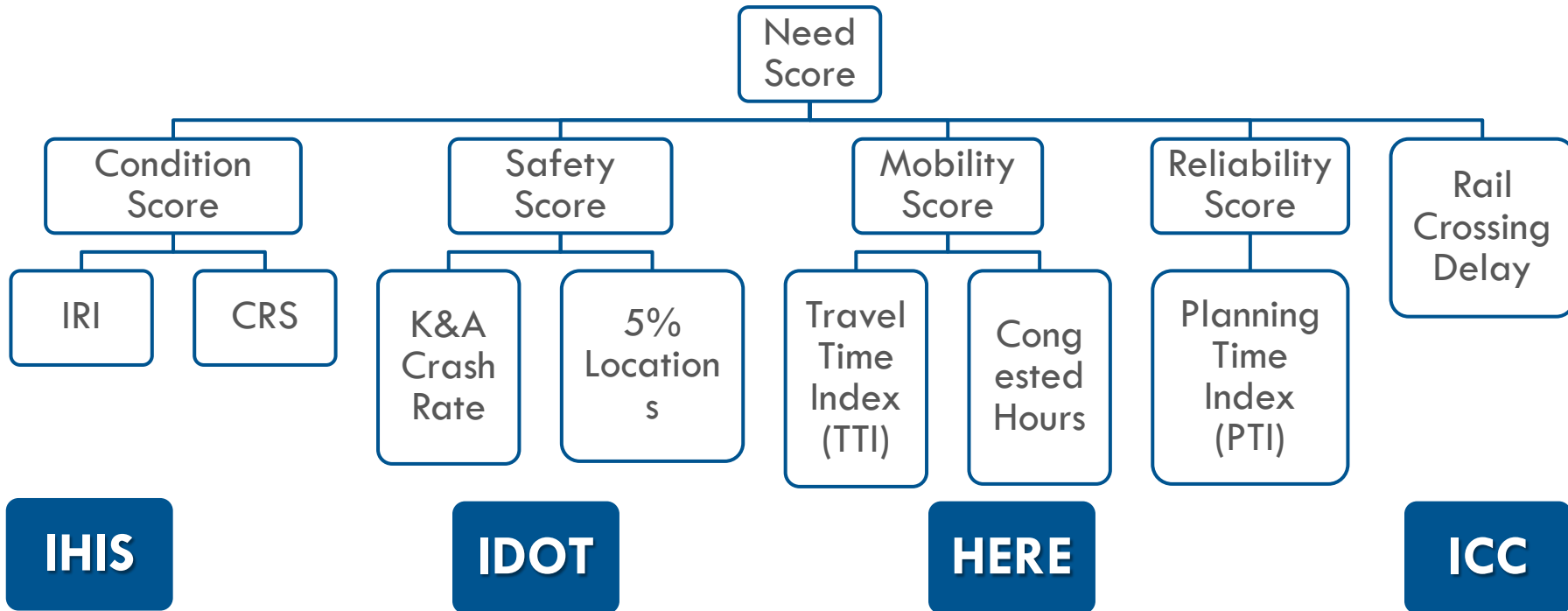
$$\frac{\textit{80th Percentile Travel Time}}{\textit{Free – Flow Travel Time}}$$

NEW: 80th Percentile Time Index – studies have found this measure to be more sensitive to operational changes than the 95th percentile TTI.

- Congested Hours: Average Number of Hours per Weekday where Travel Time > (congestion factor X Free Flow Travel Time).

For link-level analyses, above processes are suitable. For regional-scale performance tracking, data must be weighted by VMT

NATMEC: Previous Work: Highway Need Score



NATMEC: Previous Work: Highway Need Score

- Base scores indexed 0 – 100
 - ▣ Max = 95th percentile value
- Sub scores calculated from the weighted base scores
 - ▣ Condition Score = .8 (CRS Score) + .2 (IRI Score)
 - ▣ Safety Score = Crash Score, with 5% locations always = 100
 - ▣ Mobility Score = .5 (TTI Score) * .5 (Congested Hours Score)
 - ▣ Reliability Score = PTI Score
- Overall Need Score = Sum of sub scores
 - ▣ Grade crossing delay bonus
 - ▣ Sub scores not currently weighted

NATMEC: Current Project:

Performance Measures: Quarterly Congestion Report

Chicago Region Expressway Performance, 2014-2016

| Quarter | | | | | Congested | | | |
|---------|--------|--------|--------|--------|-----------|--------|--------|--|
| | AM TTI | PM TTI | AM PTI | PM PTI | Hours | AM OTI | PM OTI | |
| Q1 2014 | 1.44 | 1.46 | 3.45 | 3.21 | 5:09 | 2.04 | 2.05 | |
| Q2 2014 | 1.40 | 1.46 | 2.84 | 2.99 | 3:54 | 1.91 | 2.00 | |
| Q3 2014 | 1.29 | 1.53 | 2.43 | 3.31 | 4:36 | 1.69 | 2.15 | |
| Q4 2014 | 1.44 | 1.49 | 2.77 | 3.23 | 4:31 | 1.93 | 2.05 | |
| Q1 2015 | 1.31 | 1.43 | 2.69 | 3.18 | 4:43 | 1.77 | 1.98 | |
| Q2 2015 | 1.35 | 1.49 | 2.62 | 3.06 | 4:20 | 1.79 | 2.04 | |
| Q3 2015 | 1.25 | 1.56 | 2.30 | 3.25 | 4:44 | 1.63 | 2.17 | |
| Q4 2015 | 1.44 | 1.58 | 2.68 | 3.26 | 4:56 | 1.90 | 2.18 | |
| Q1 2016 | 1.29 | 1.42 | 2.45 | 2.79 | 4:39 | 1.68 | 1.89 | |

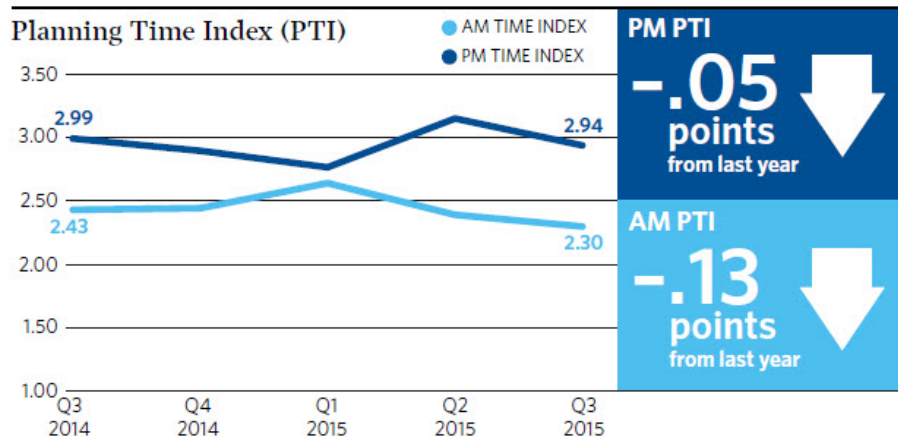
NATMEC: Today's Agenda

- Background
- What we're doing with NPMRDS data
 - ▣ Previous projects
 - ▣ **Current projects**
 - ▣ Planned projects
- Lessons Learned

NATMEC:

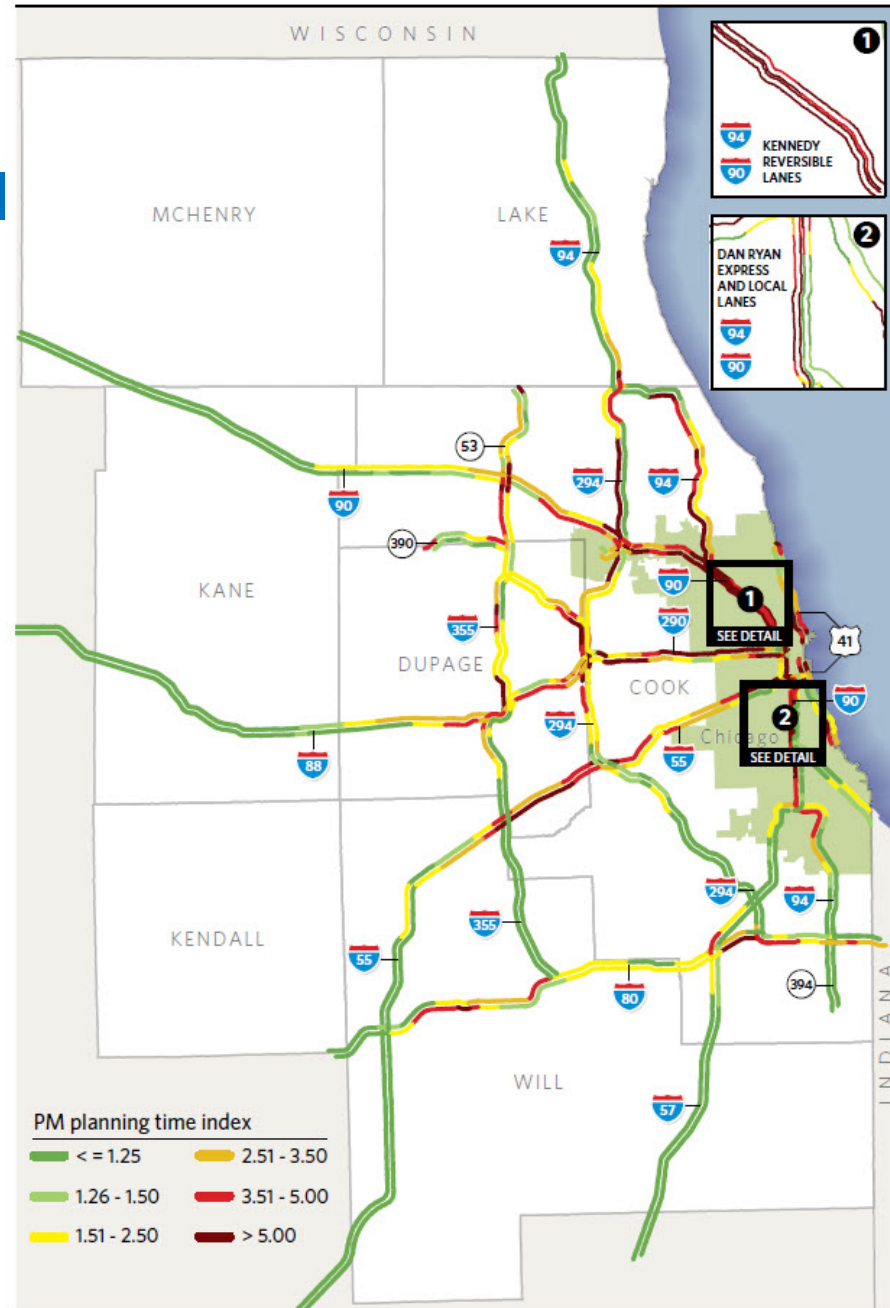
Current Project: QCR

- Track congestion quarterly
- Regional and link (TMC) level
- TTI/PTI and Congested Hours
- Ongoing



PM Planning Time Index (PTI) 2015 Quarter 3 (July - Sept.)

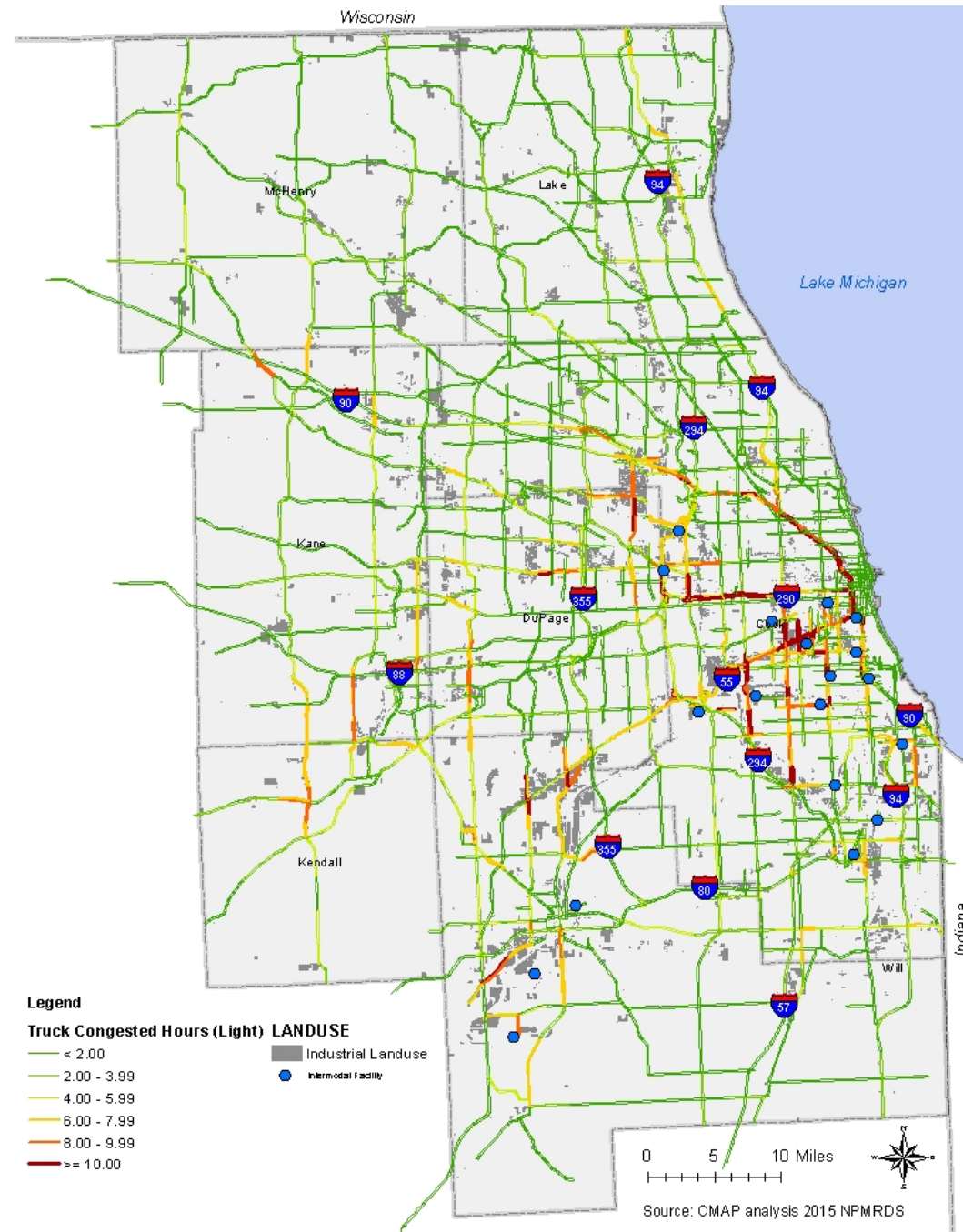
Source:



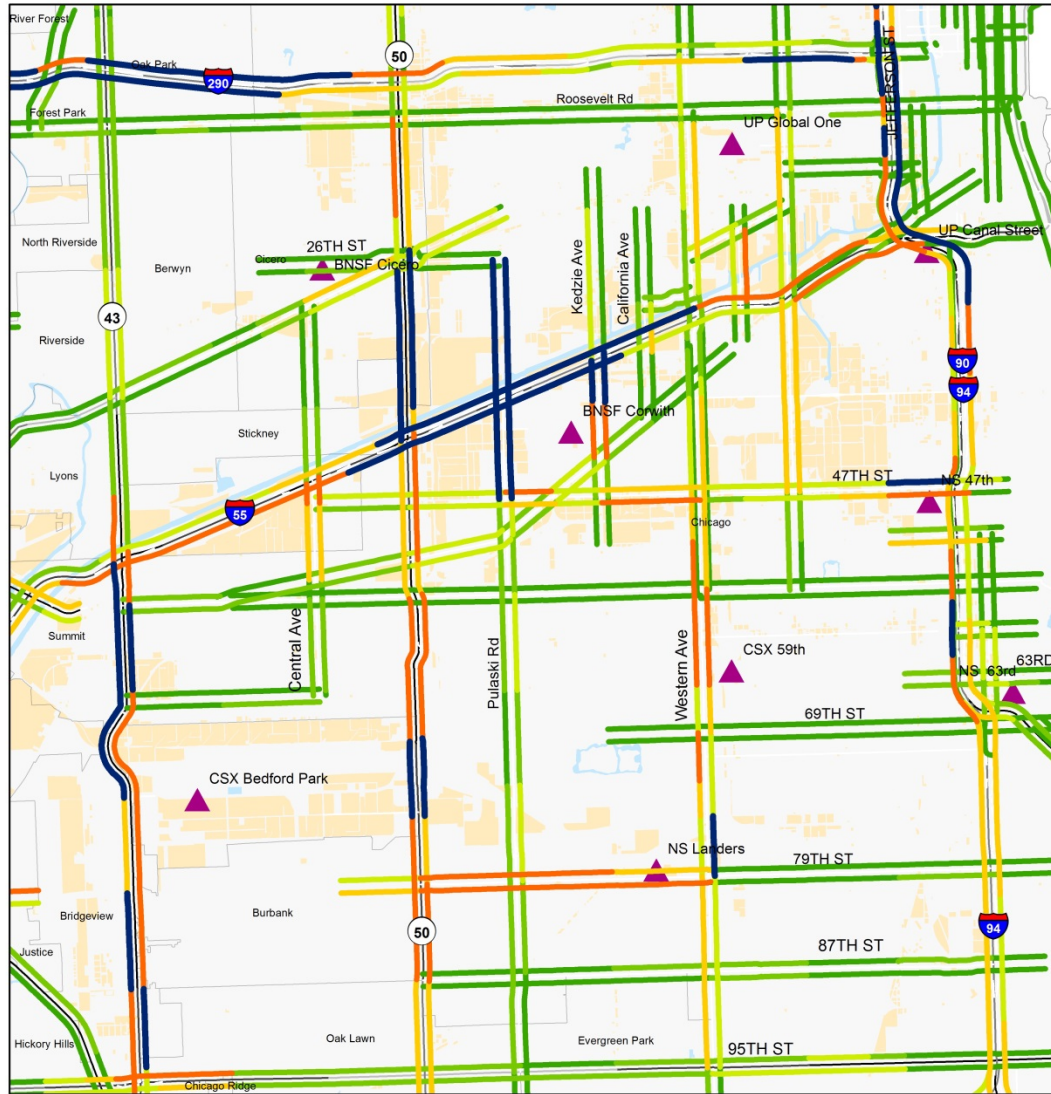
Light Congested Hours Trucks 2015

NATMEC: Current Project: Truck Congestion

- Chicago region freight hub
- Strategically target funds
- Critical Urban Freight Corridors



Truck Light Congested Hours

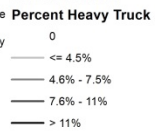


Legend

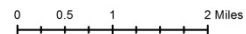
Truck Hours Congested (Light) LANDUSE



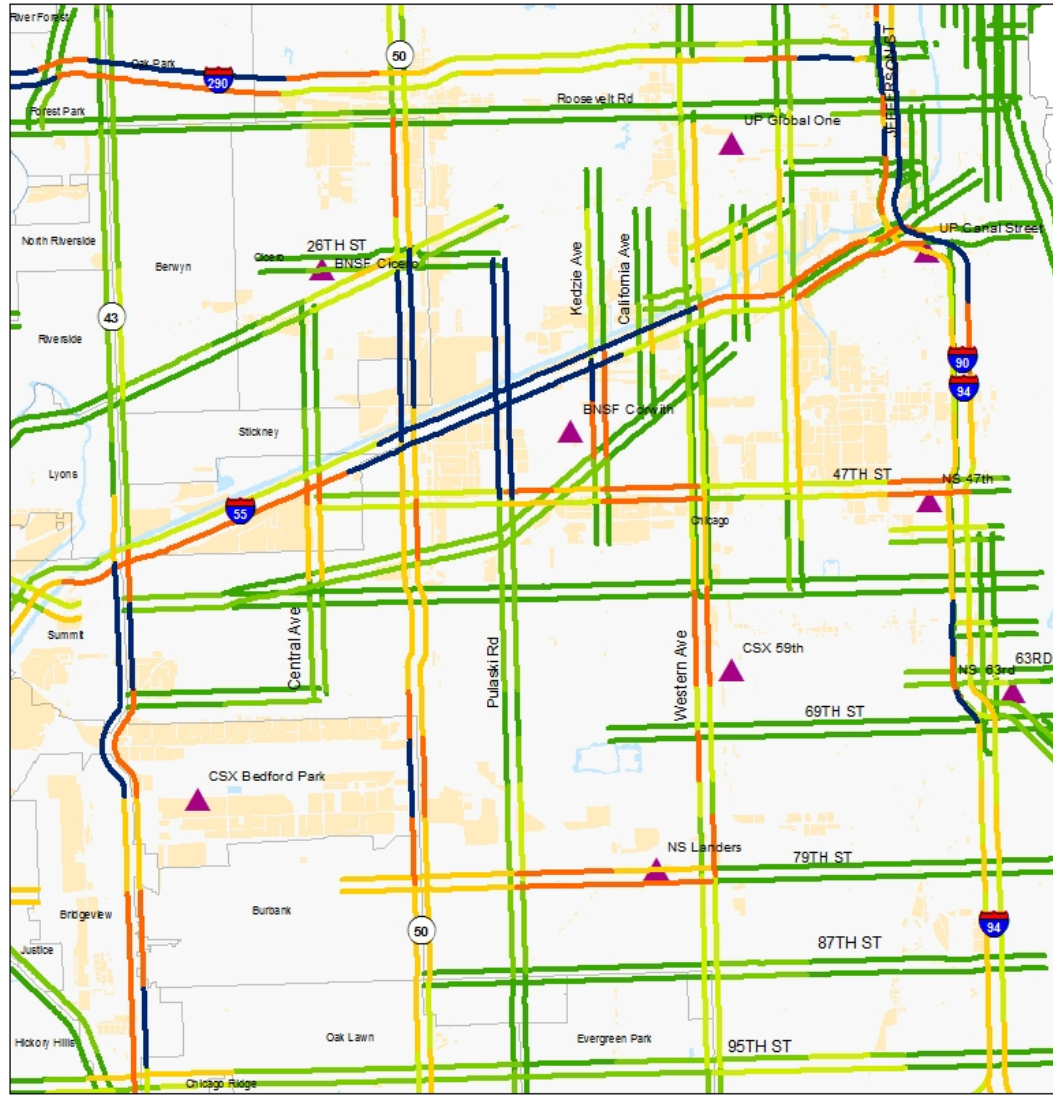
IRIS 2014 AADT Percent Heavy Truck



Light congestion is the average number of hours per weekday in which the speed on the link is at least 10% below free-flow speed.



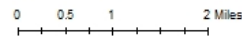
Truck Light Congested Hours 2014



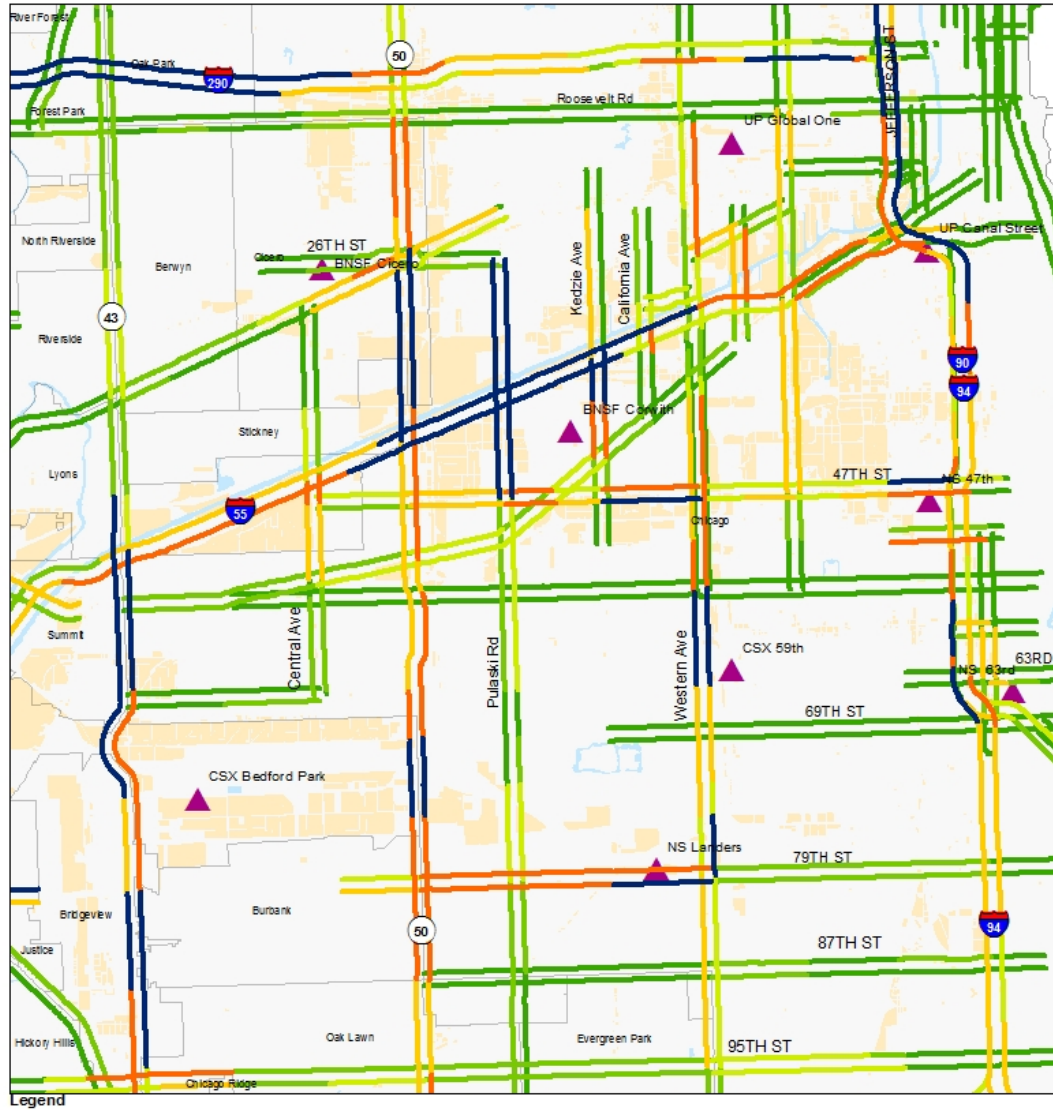
Legend

- Truck Hours Congested (Light)**
- < 2
 - 2.00 - 3.99
 - 4.00 - 5.99
 - 6.00 - 7.99
 - 8.00 - 9.99
 - => 10
- LANDUSE**
- Industrial Landuse
 - ▲ Intermodal Facility

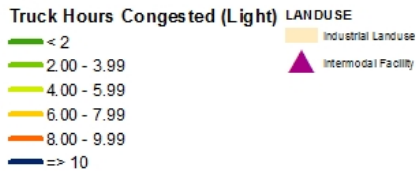
Light congestion is the average number of hours per weekday in which the speed on the link is at least 10% below free-flow speed.



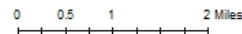
Truck Light Congested Hours 2015

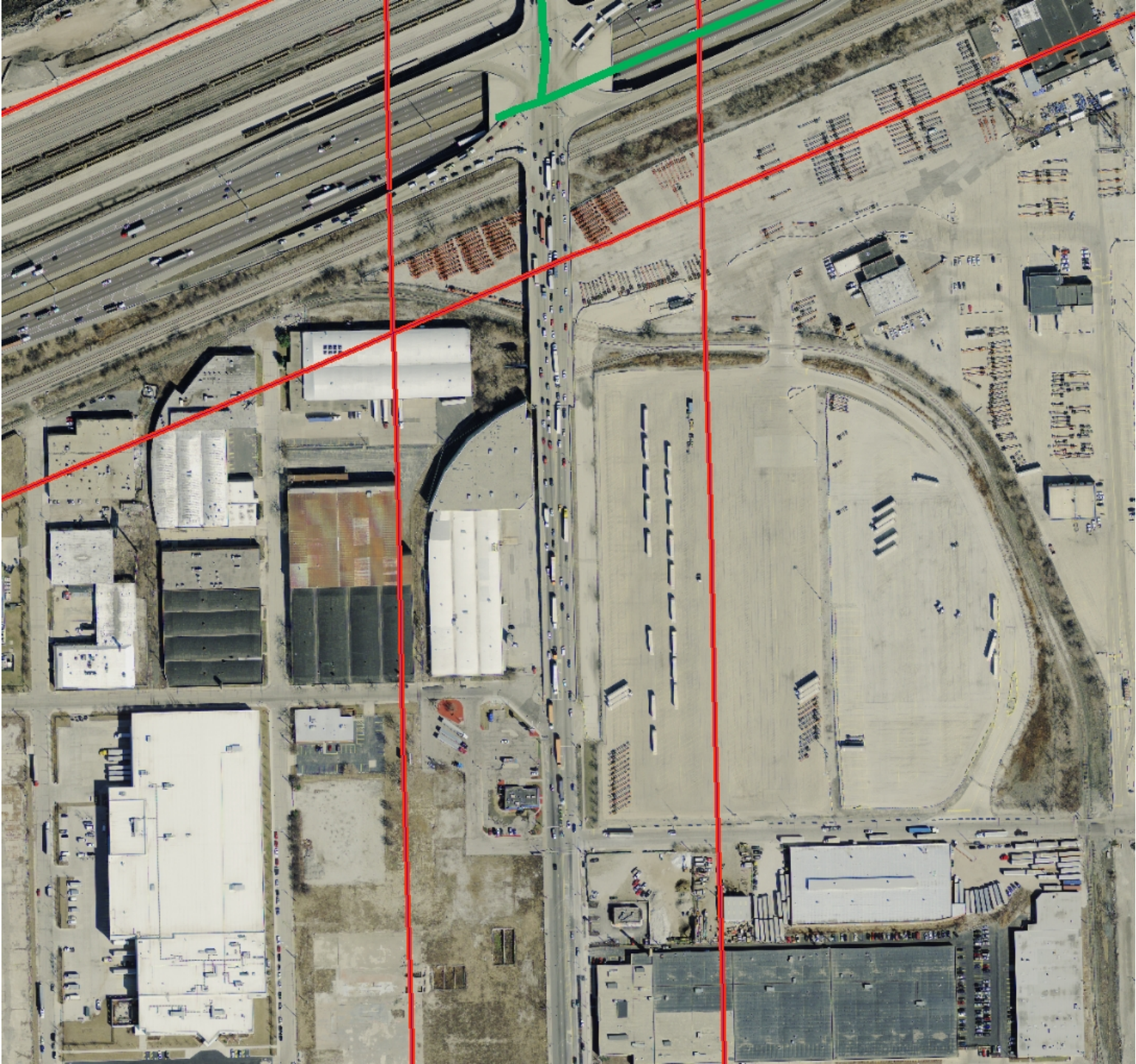


Legend

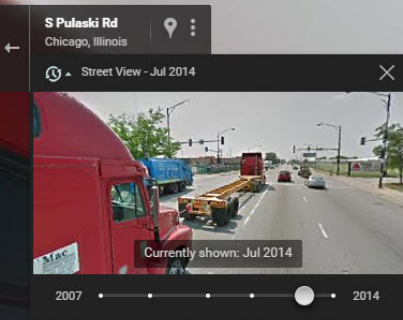


Light congestion is the average number of hours per weekday in which the speed on the link is at least 10% below free-flow speed.





NATMEC: Current Project: Truck Congestion



NATMEC: Current Project: Truck Congestion



NATMEC: Current Project: Truck Congestion

| Order | loc_desc | Constr | Constr_type | RR_crossing | geom | vert | curve | stop_lights | hrly_cnt | lane_drop | weaving | FivePct_Intersection | FivePct_Segment |
|-------|---|--------|--|-------------|------|------|-------|-------------|----------|-----------|---------|----------------------|-----------------|
| 1 | I-94 WB into circle interchange, continuous tmc segments | 1 | Interchange reconstruction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | Harlem Ave NB from W 62nd St to Archer Ave | 0 | | 1 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 |
| 3 | I-90/94 Kennedy EB from Diversey to Hubbards Cave | 0 | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 4 | I-290 from North Ave Entr to I-294 | 0 | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 5 | I-90/94 Kennedy EB from Adams St to Harrison St | 1 | Interchange reconstruction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | I-55 SB from Western to West of Cicero Ave | 1 | Intermittent resurfacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 7 | I-290 EB from Ogden Ave to Morgan St | 1 | Interchange reconstruction | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 8 | I-90/94 Dan Ryan WB from river to Canalport Ave | 1 | Interchange reconstruction | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 9 | Cicero SB from Pershing Rd to I-55 | 0 | | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 10 | Ramp I-290 EB to I-294 SB | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | I-90/94 Dan Ryan WB from 31st to river | 0 | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 12 | Pulaski Rd SB from I-55 to 47th St. | 0 | | 0 | 0 | 0 | 0 | 7 | 1 | 0 | 0 | 0 | 0 |
| 13 | Harlem Ave. SB from I-55 to Archer Ave. | 0 | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 14 | I-90/94 Kennedy EB from Berteau Ave to George St. | 0 | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 15 | Pulaski Rd. NB from 47th St. to I-55 | 0 | | 0 | 1 | 1 | 0 | 7 | 1 | 0 | 0 | 0 | 0 |
| 16 | I-90/94 Kennedy WB from Washington St. to Chicago Ave. | 0 | | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 17 | I-55 NB from Central Ave. to Sacramento Ave. | 1 | Intermittent resurfacing | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 18 | I-290 EB from Addison Creek to Central Ave. | 1 | Drainage/Storm sewer repair (spot) | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| 19 | I-290 WB from Laramie Ave. to Circle Ave (just west of Harlem Ave.) | 0 | | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 20 | Cicero Ave. SB from 115th St. to I-294 | 0 | | 0 | 1 | 1 | 1 | 3 | 1 | 0 | 0 | 1 | 0 |
| 21 | Cicero Ave. NB from Pershing Rd. to 31st St. | 0 | | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 1 |
| 22 | Harlem Ave. SB from Archer Ave. to 63rd St. | 1 | | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 |
| 23 | I-90/94 Kennedy EB from I-90/I-94 merge to Berteau | 0 | | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 24 | I-290 WB from Forest Park Blue Line Station to 4th Ave. | 0 | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 25 | US 47 NB from IL 126 (Schoolhouse Rd) to US 34 (Veterans Pkwy) | 1 | Milling, resurface, and widening | 1 | 1 | 1 | 1 | 5 | 1 | 0 | 0 | 0 | 0 |
| 26 | Cicero Ave. NB from I-294 to 115th St. | 0 | | 0 | 0 | 0 | 0 | 4 | 1 | 1 | 0 | 1 | 0 |
| 27 | Pulaski Rd. SB from 26th St. to I-55 | 0 | | 1 | 1 | 1 | 0 | 6 | 1 | 0 | 0 | 0 | 1 |
| 28 | Harlem Ave. SB from 63rd St. to 71st St. | 0 | | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 0 | 0 |
| 29 | Cicero Ave. NB from 31st St. to 25th St. | 0 | | 0 | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 |
| 30 | Cicero Ave. SB from 28th St. to 31st St. | 0 | | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 |
| 31 | I-90/94 Dan Ryan WB from Maxwell St. to 16th St. | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 32 | I-90/94 Dan Ryan WB from Circle Interchange to Taylor St. | 1 | Interchange reconstruction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 33 | IL 59 SB from Ferry Rd. to I-88 | 1 | Interchange reconstruction | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 34 | Harlem Ave. NB from US 20/95th St. to 87th St. | 0 | | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 1 | 0 |
| 35 | Kedzie Ave. NB from Pershing Rd. to I-55 | 0 | | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 0 |
| 36 | Cicero Ave. SB from 67th St. to 73rd St. | 0 | | 0 | 1 | 1 | 0 | 4 | 1 | 0 | 0 | 0 | 0 |
| 37 | Cicero Ave. SB from 26th St. to Pershing Rd. | 0 | | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 1 |
| 38 | I-90/94 Kennedy WB from Augusta Blvd. to Webster Ave. | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 39 | I-90/94 Dan Ryan WB from 57th St. to 61st St. | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40 | Chicago St. NB from Doris Ave. to I-80 | 0 | | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 41 | US 6 WB from Empress Rd. to I-55 | 1 | Roadway improvement/Resurfacing Intermittent | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |

NATMEC: Current Project: Truck Congestion

Identify probable causes for truck congestion

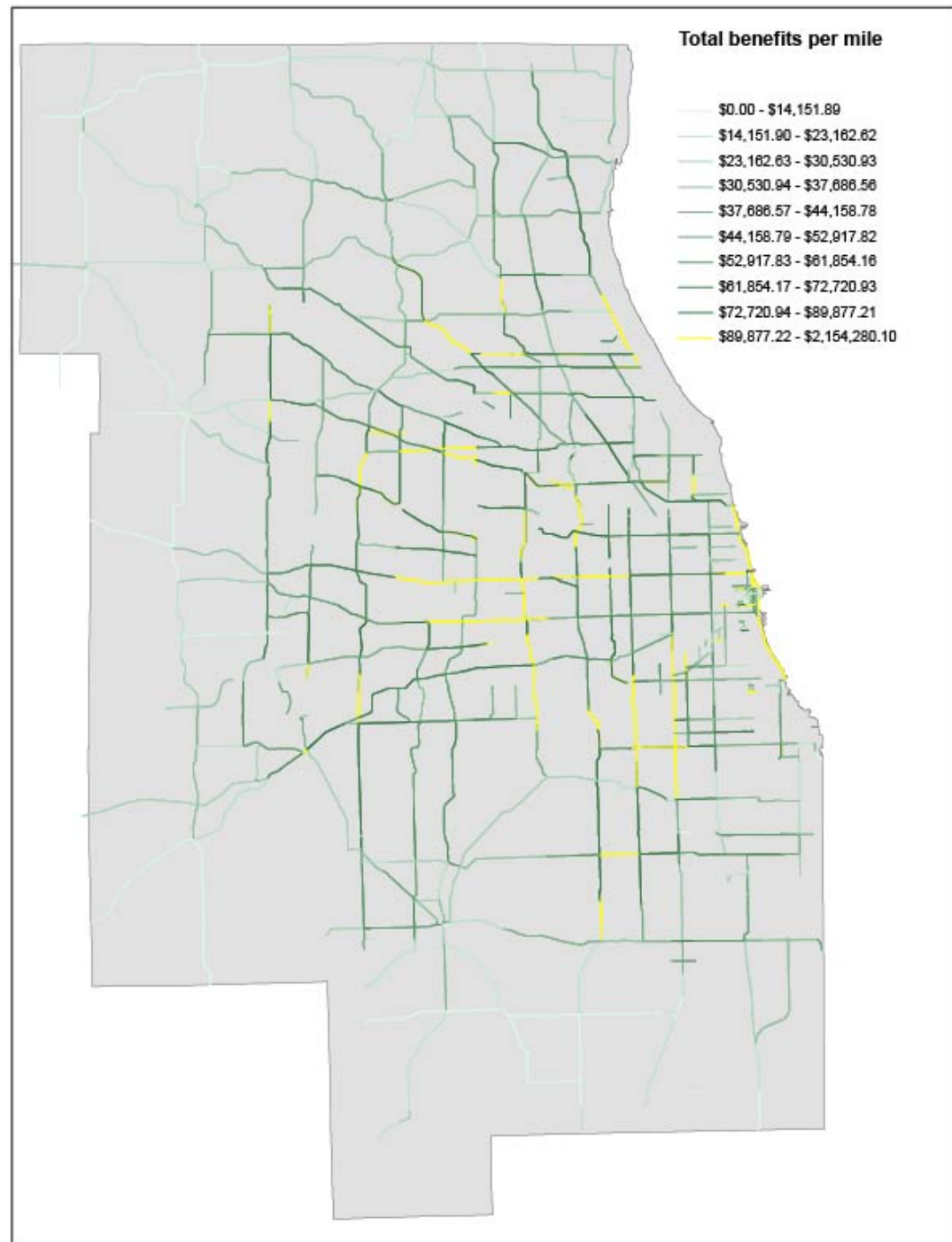
- Network deficiencies:
 - ▣ Lane drop and pinch points
 - ▣ Lane imbalances
 - ▣ Lane use restrictions
 - ▣ Geometric issues
 - ▣ Interchanges (e.g., weaving movements)
 - ▣ Signal operations
 - ▣ Intersection and mainline capacity
 - ▣ Rail crossing
 - ▣ Construction

NATMEC:

Current Project:

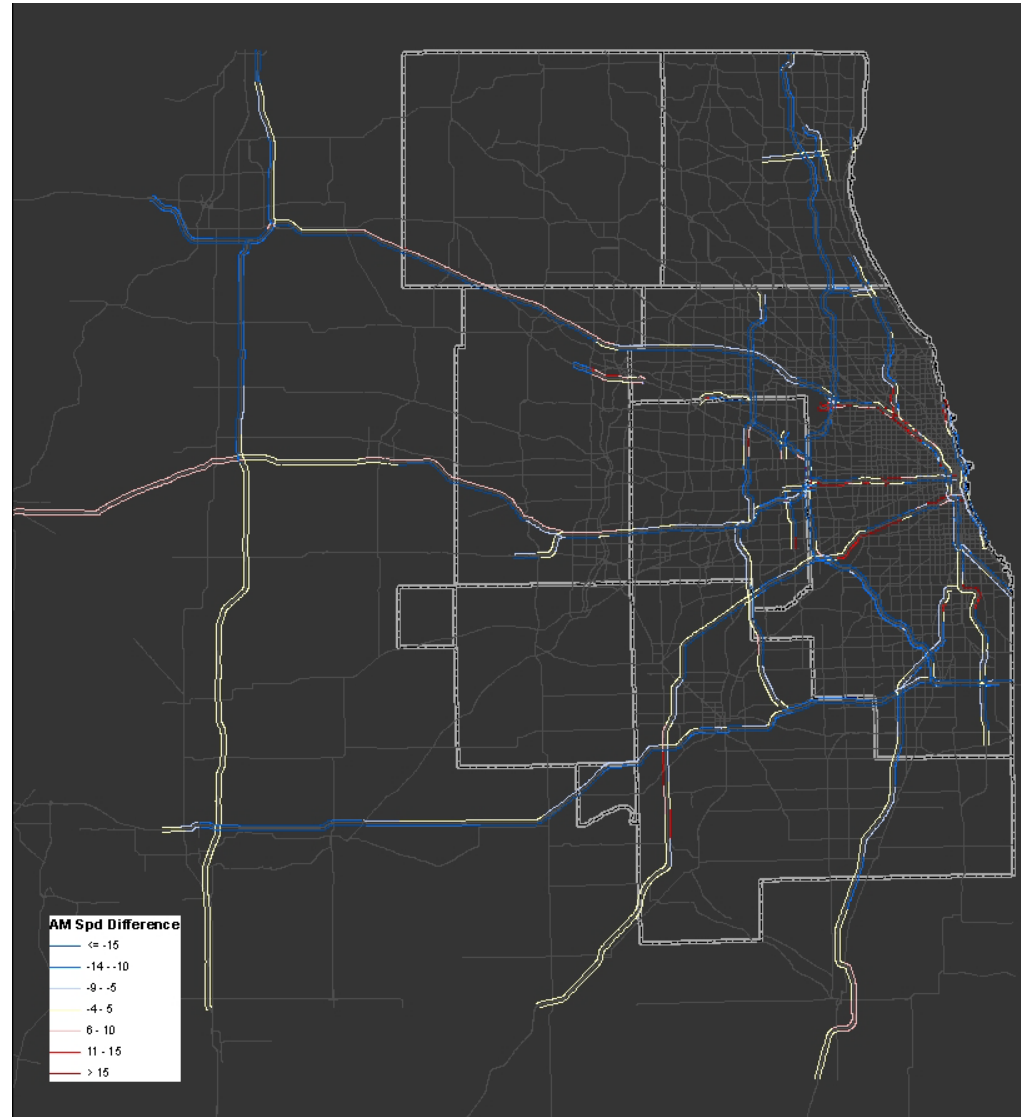
TOPS BC

- Using NPMRDS speed data as input to the Tool for Operations Benefit/Cost model (TOPS BC) to develop priority corridors
- Strategy: Signal Coordination: Central Control
- Draft results



NATMEC: Current Project: Regional travel demand model

- The map shows speed difference (model speed – tmc speed) for all expressway links
- Blue indicates lower model speeds

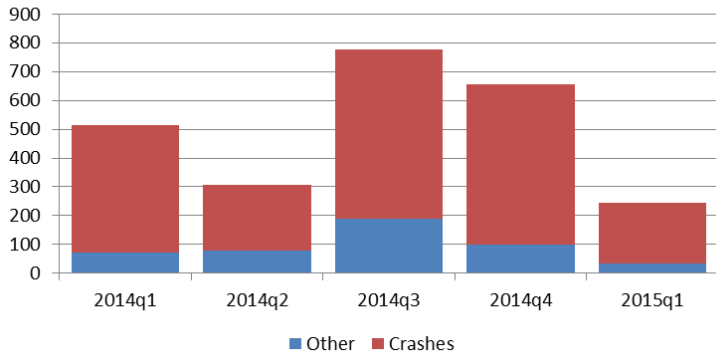


NATMEC: Today's Agenda

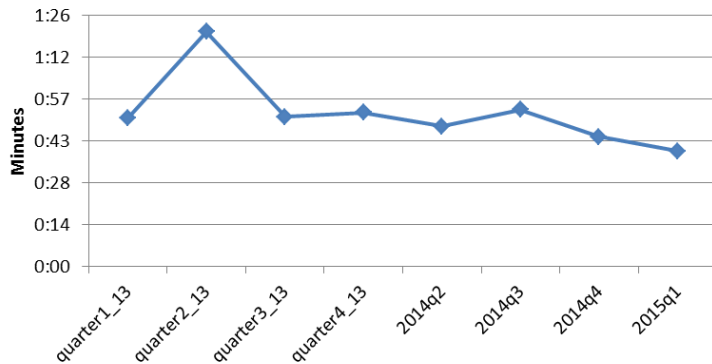
- Background
- What we're doing with NPMRDS data
 - ▣ Previous projects
 - ▣ Current projects
 - ▣ **Planned projects**
- Lessons Learned

NATMEC: Future Project: Expand QCR

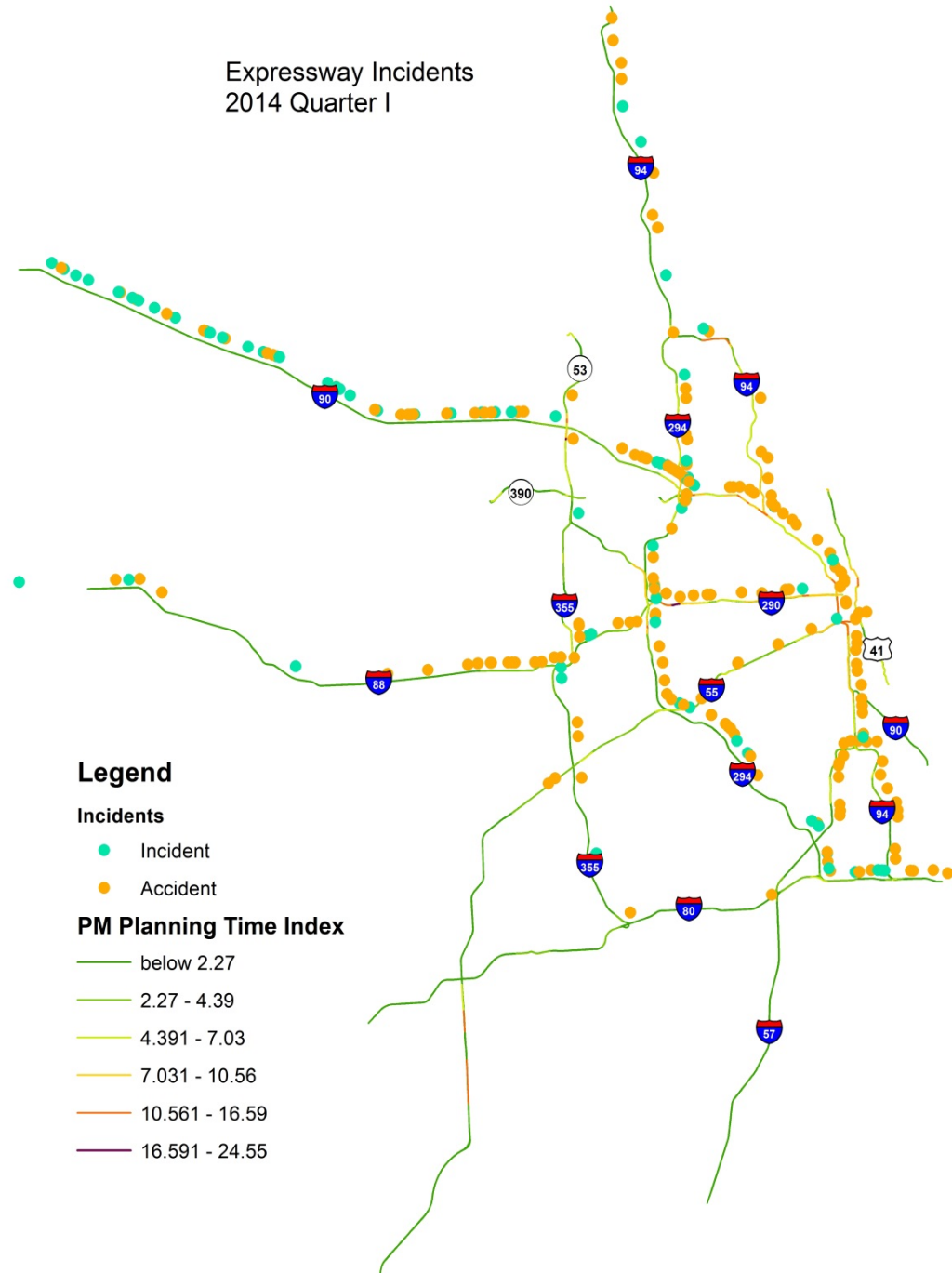
Total Incidents



Average Incident Clearance Time



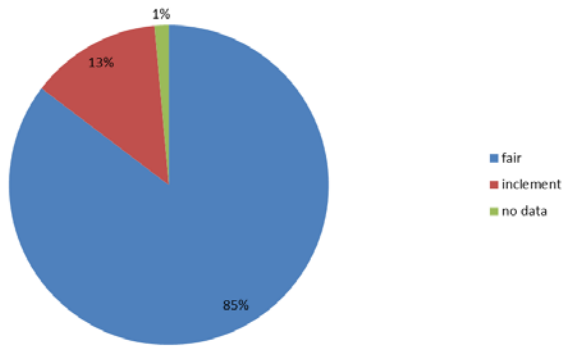
Expressway Incidents 2014 Quarter I



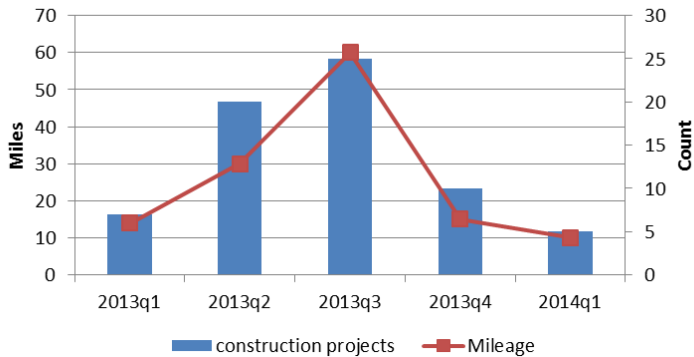
NATMEC: Future Project: Expand QCR

Expressway Construction 2014 Quarter I

Percent of Hours Weather
Quarter 1 2015



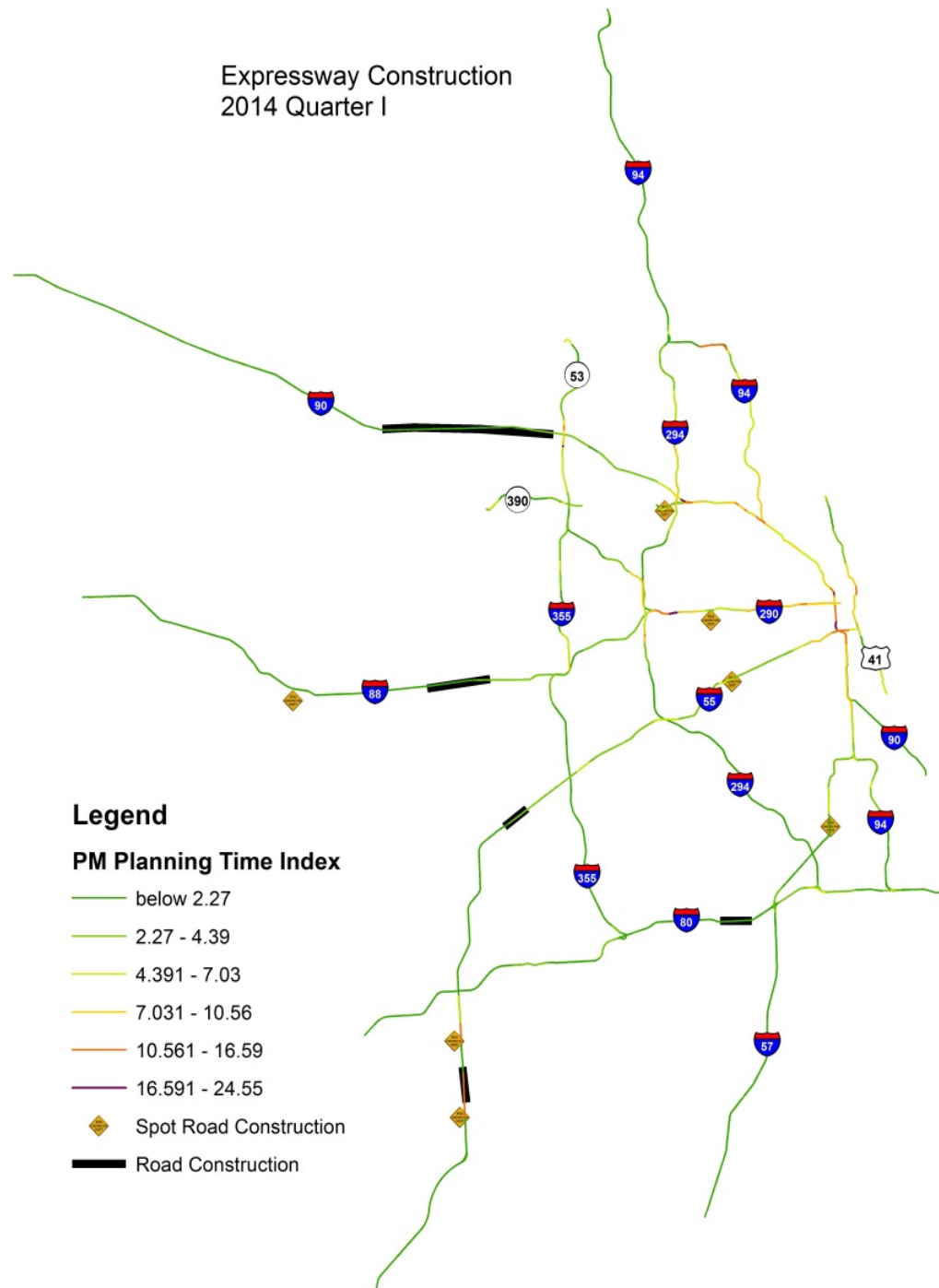
Construction Projects



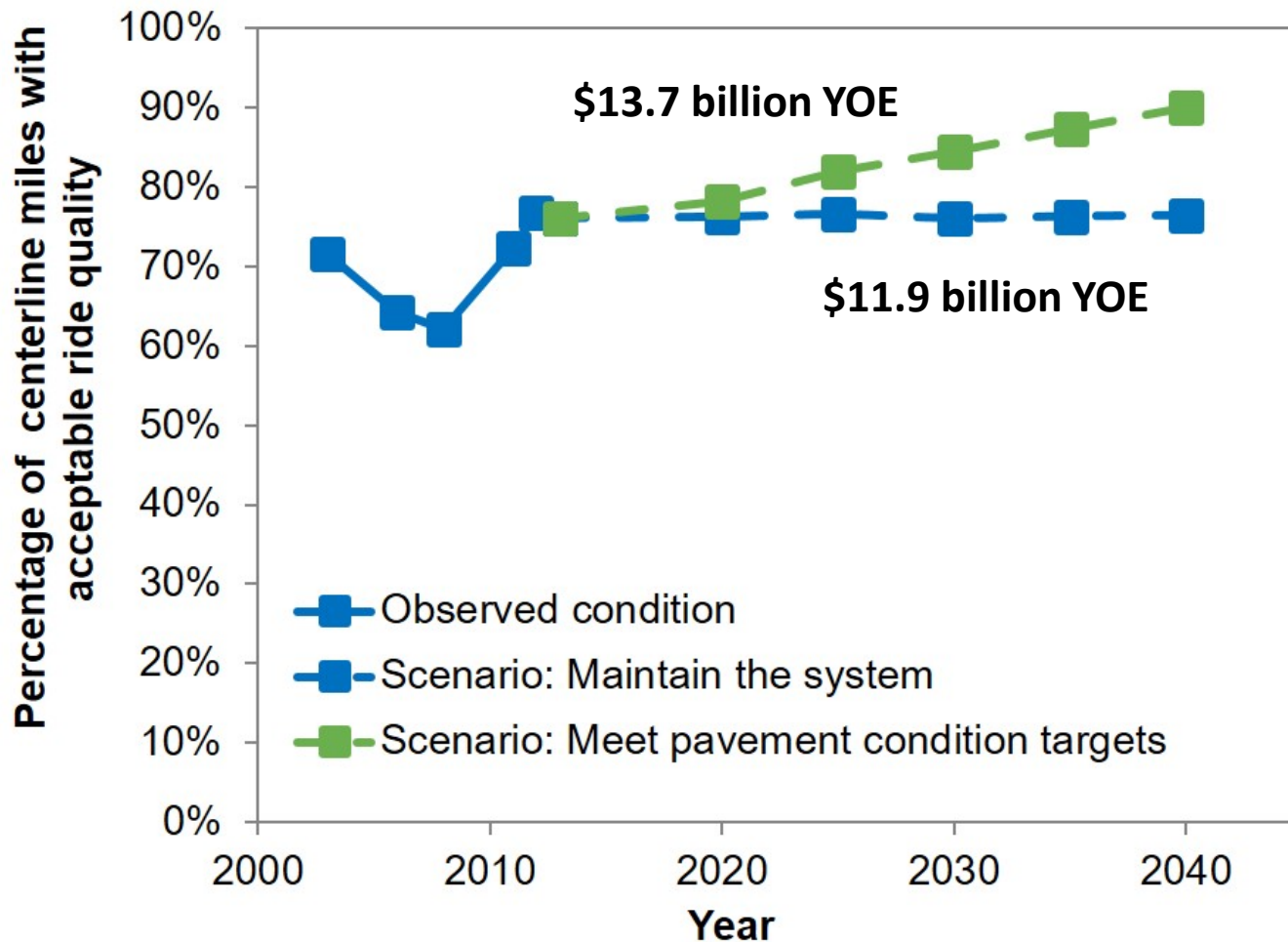
Legend

PM Planning Time Index

- below 2.27
- 2.27 - 4.39
- 4.391 - 7.03
- 7.031 - 10.56
- 10.561 - 16.59
- 16.591 - 24.55
- ◆ Spot Road Construction
- ▬ Road Construction



NATMEC: Future Project: HERS-ST speed validation



NATMEC: Today's Agenda

- Background
- What we're doing with NPMRDS data
 - ▣ Previous projects
 - ▣ Current projects
 - ▣ Planned projects
- **Lessons Learned**

NATMEC: Lessons Learned

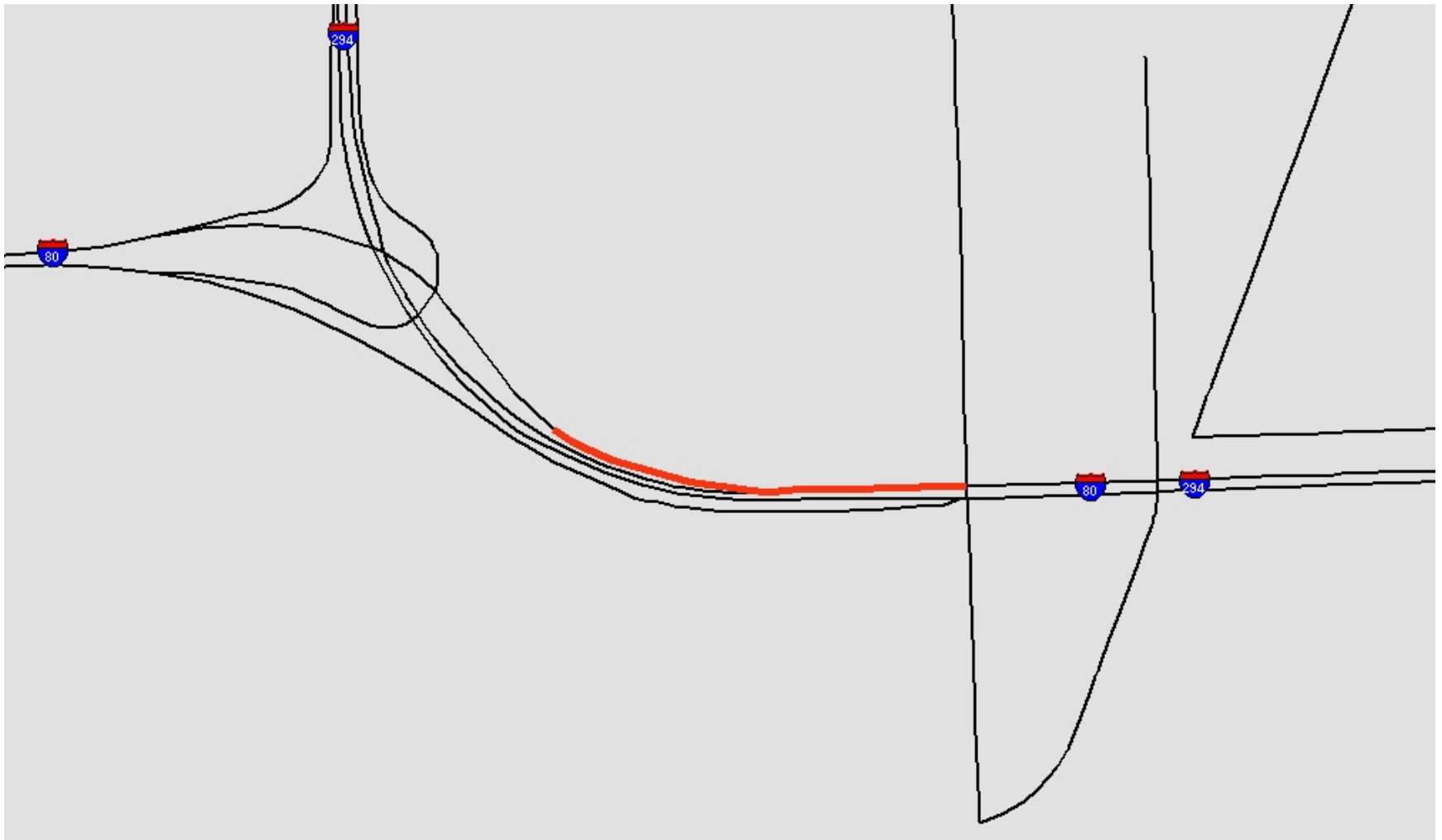
- ▣ Big data
 - Storage
 - Query efficiency
 - Available tools
- ▣ Geography
 - Lengths
 - Missing links
 - MultiLine Strings
- ▣ Conflation
 - State Highway Information System
 - Master Highway Network
- ▣ Communication
 - Partners
 - Document process/GIT hub

ON TO 2050

Thank you

Todd Schmidt
312-386-8711
tschmidt@CMAP.Illinois.gov

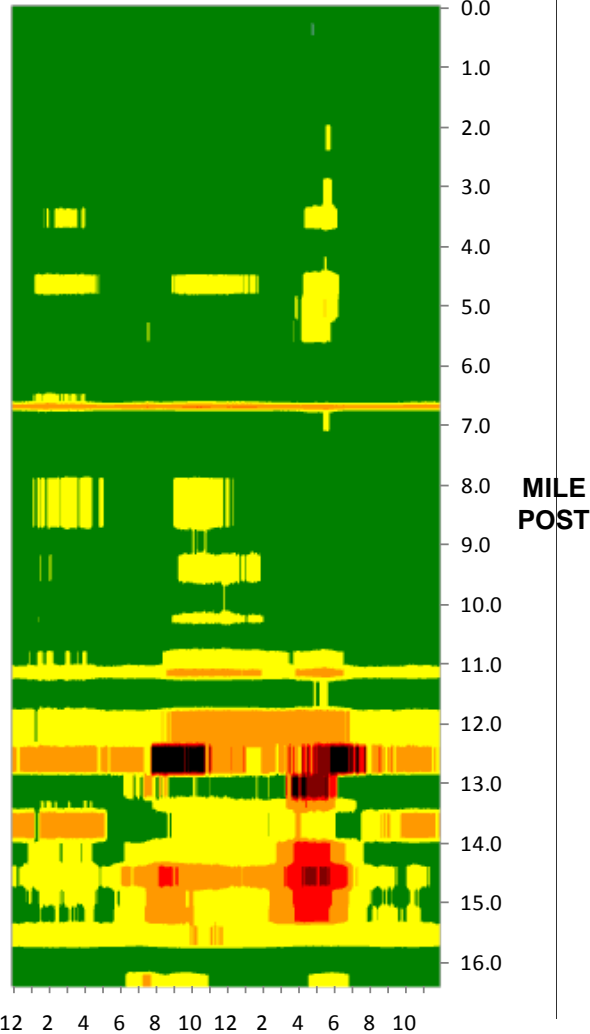
NATMEC: Lessons Learned



I-290 CONGESTION SCAN

2009 Tuesday - Thursday

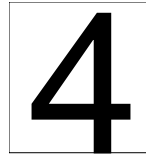
EAST BOUND



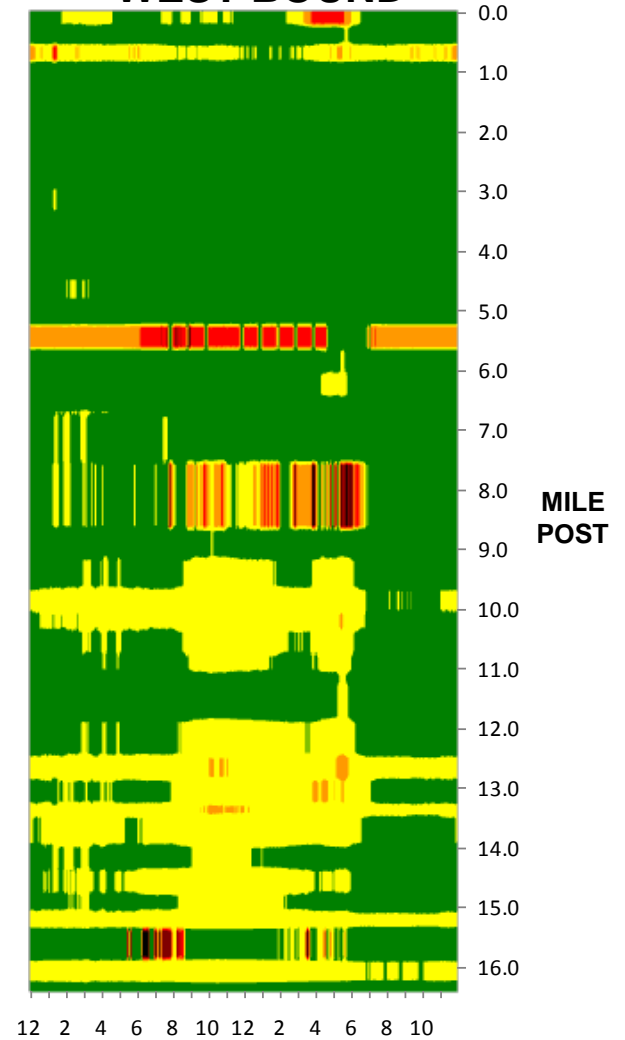
MILE
POST

12 2 4 6 8 10 12 2 4 6 8 10

AM PM
TIME OF DAY



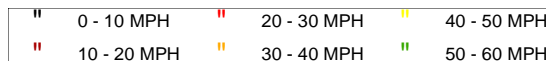
WEST BOUND



MILE
POST

12 2 4 6 8 10 12 2 4 6 8 10

AM PM
TIME OF DAY



The Chicago region traffic scans were created by averaging five minute average speed data obtained from loop detector and mobile technology data collected by Traffic.com. The traffic scans display average speed on a freeway corridor as a function of time of day (the x-axis) and location (the y-axis) along a freeway corridor. A location map of the corridor is along each scan for reference purposes.