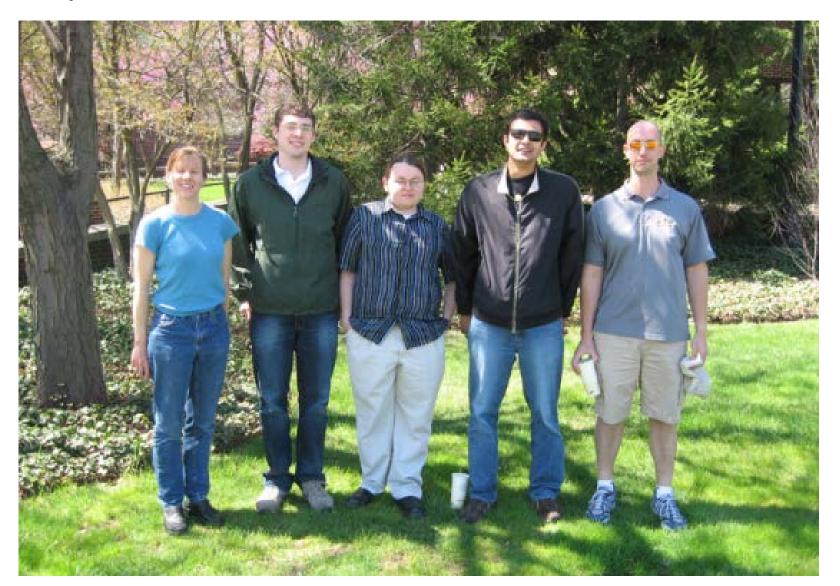
Northbound I-65 Bridge Closure...



April 2007 Team





Topics

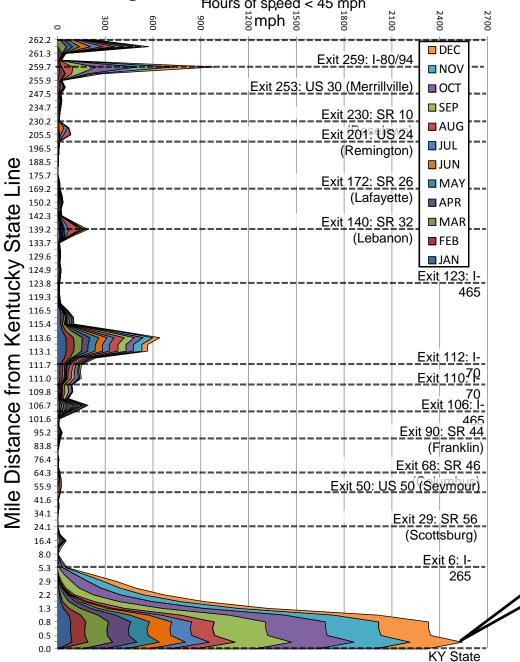
- 1. Probe Data
- 2. Evolving Perspective on
 - Probe Data Dashboards (spatial) and
 - Purdue Traffic ticker (temporal) with some Iowa Examples
- 3. Traffic Ticker Applied to I-65 Detour

Probe Vehicle Data History Crowd Sourced Data (Independent of Graduate Student Travel)

RDIJE

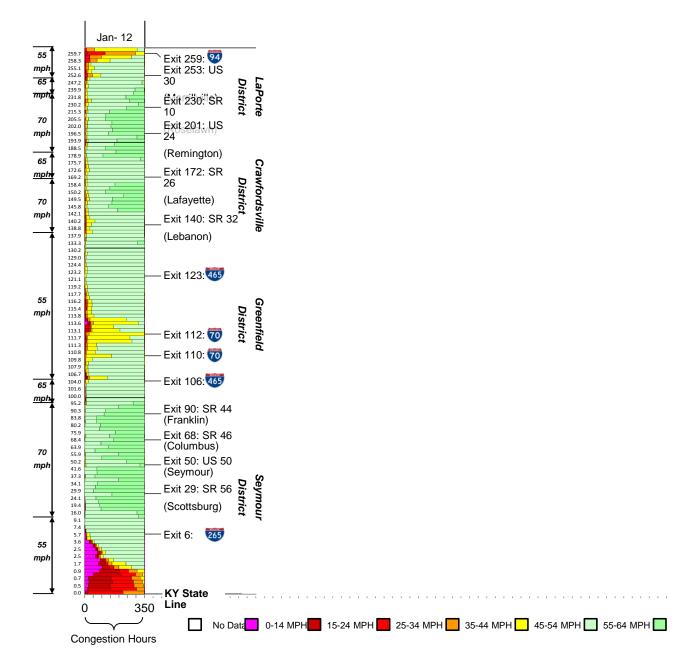


Mobility Report Performance Measures





Mobility Report Performance Measures

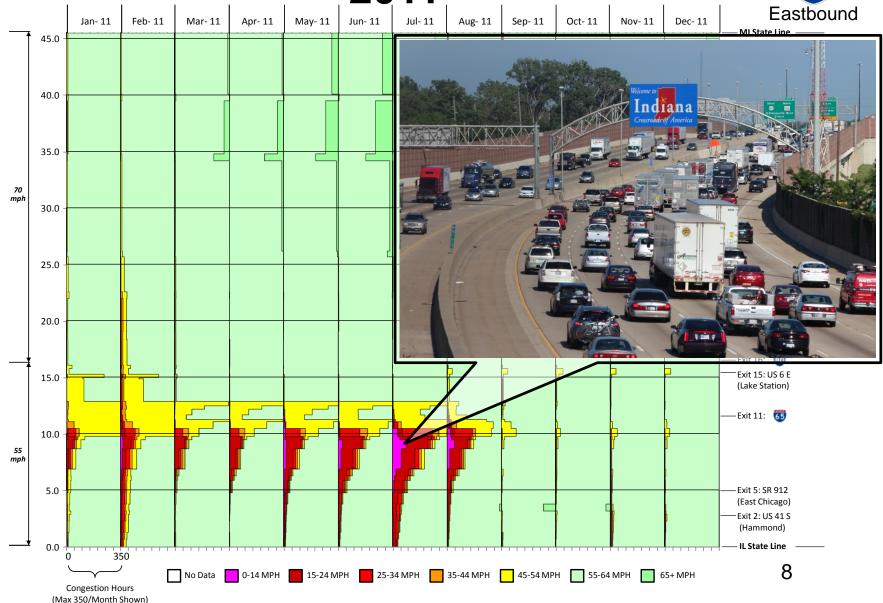


(Max 350/Month Shown)

7

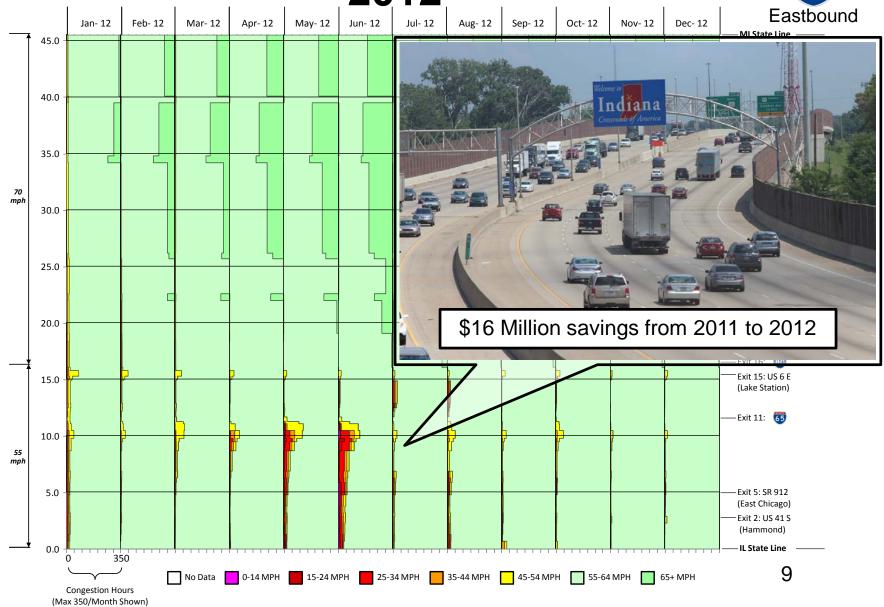
65+ MPH

Mobility Report Performance Measures 2012 Performance Measures: Speed Profile Diagrams 2011



INTERSTATE

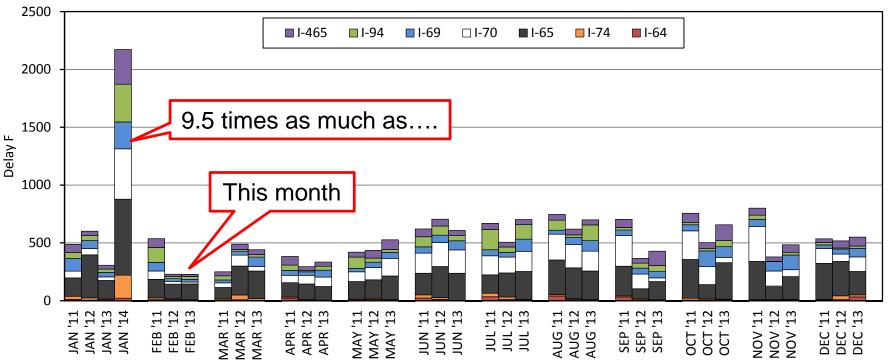
Mobility Report Performance Measures 2012 Performance Measures: Speed Profile Diagrams 2012



NTERSTATE

Indiana Delay₄₅ **Summary** 2011, 2012, 2013, Jan 2014

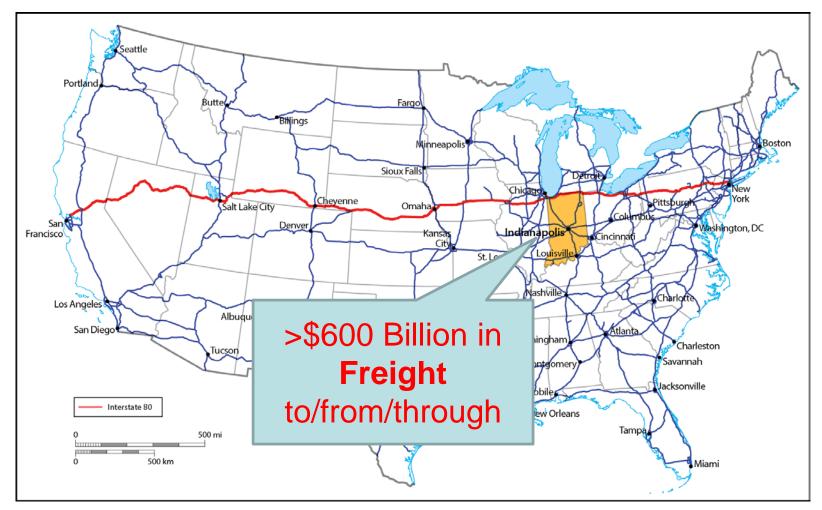




National Performance Measures

Where are the Problems Nationally?

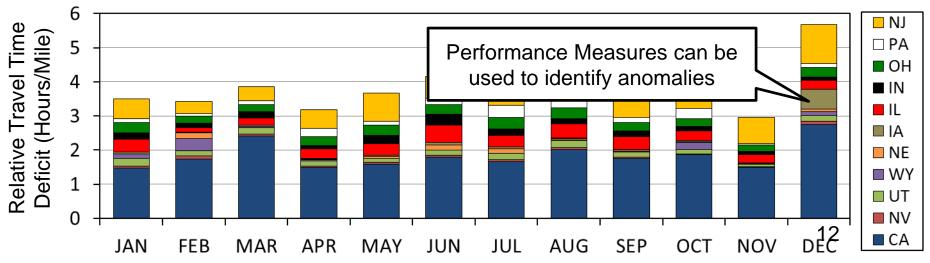




National Performance Measures

Where are the Problems Nationally?





National Performance Measures

Iowa December 2012

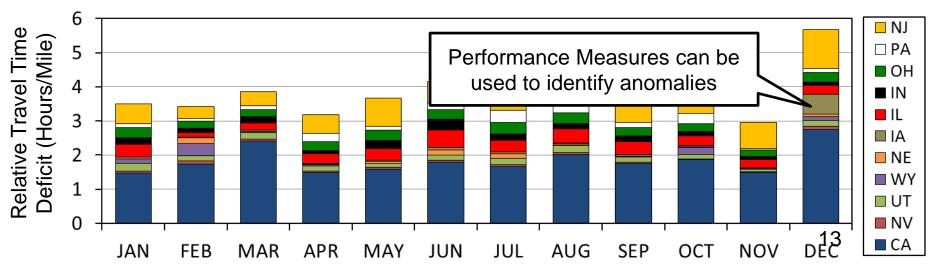


High winds and blowing snow created hazardous travel conditions. Winds have an especially strong impact on lightweight and high-profile vehicles as well as those towing

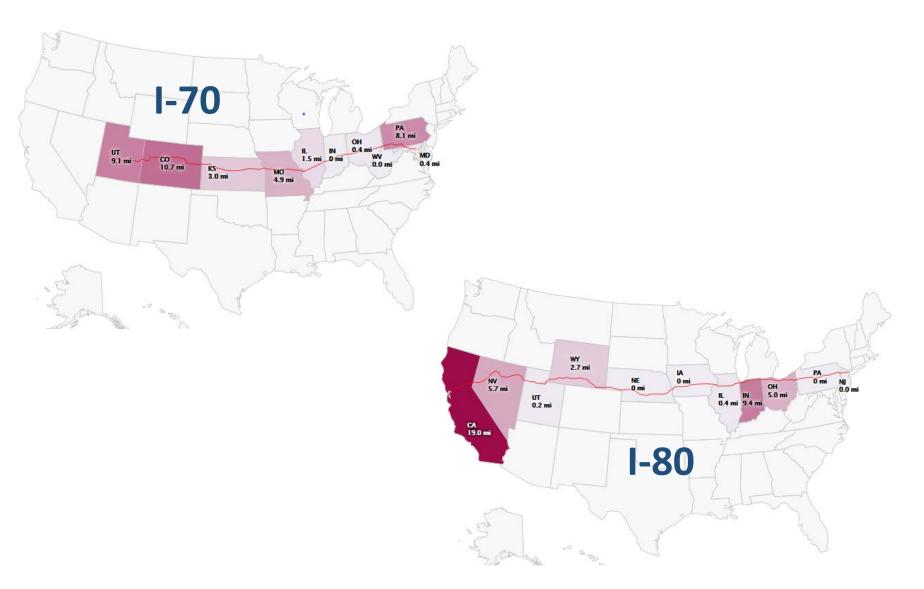


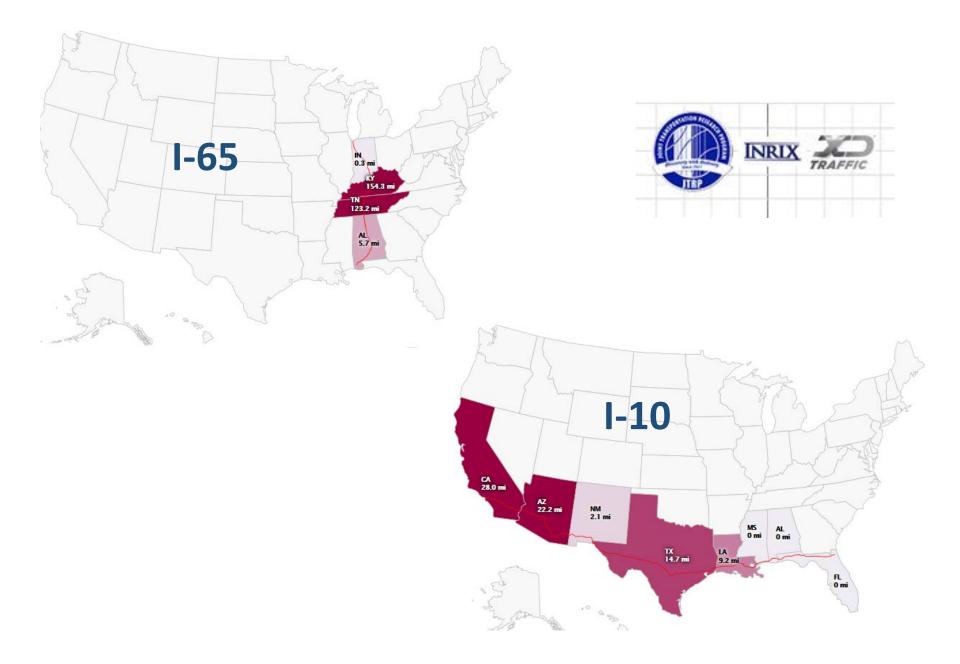


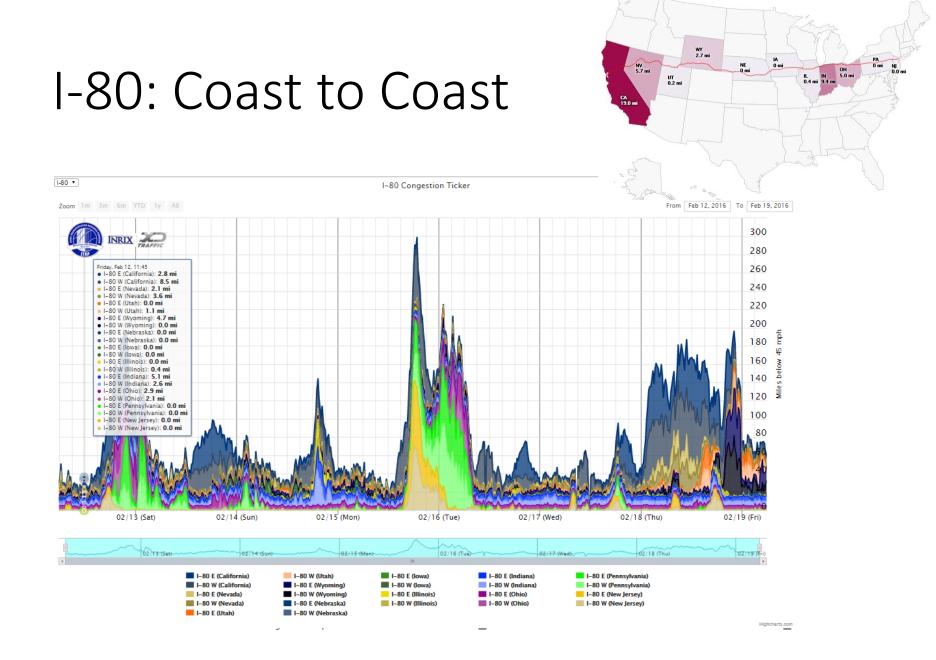




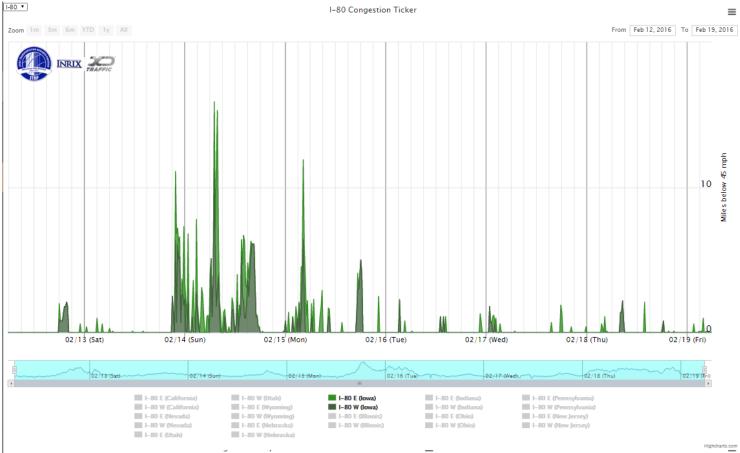
National Traffic Ticker



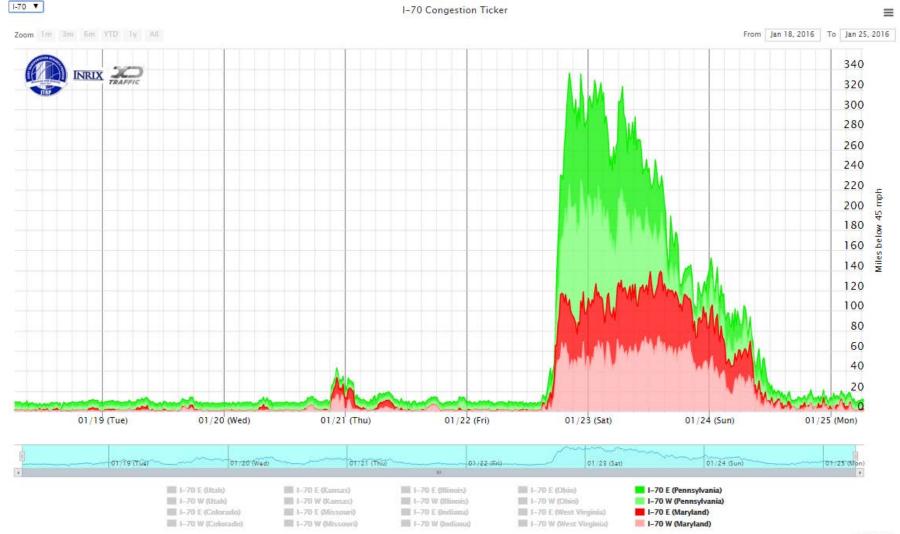




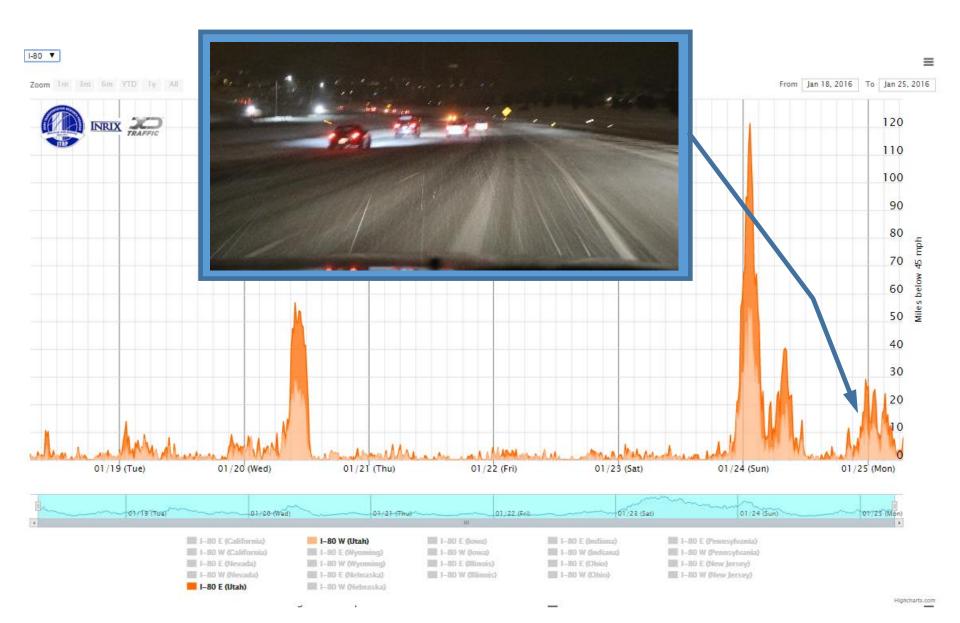
I-80: Iowa This week



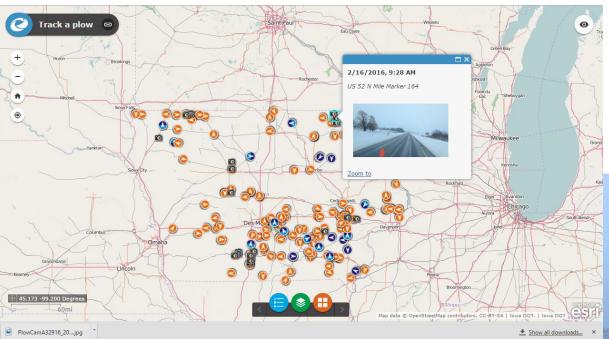
I-70 East Coast Blizzard Impact/Recovery

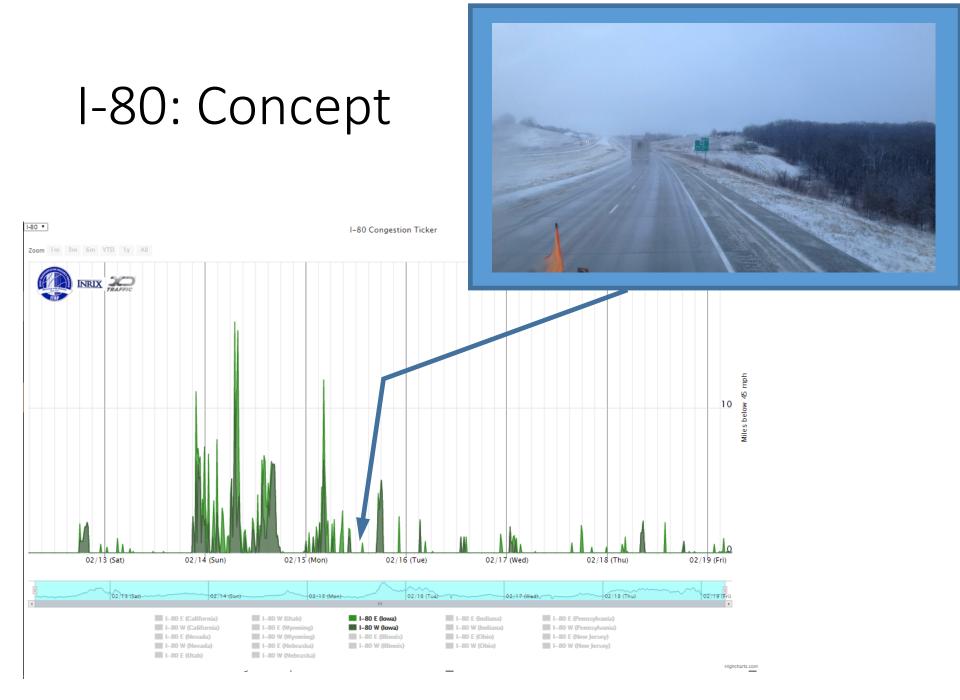


I-80: Sunday January 24, 2016

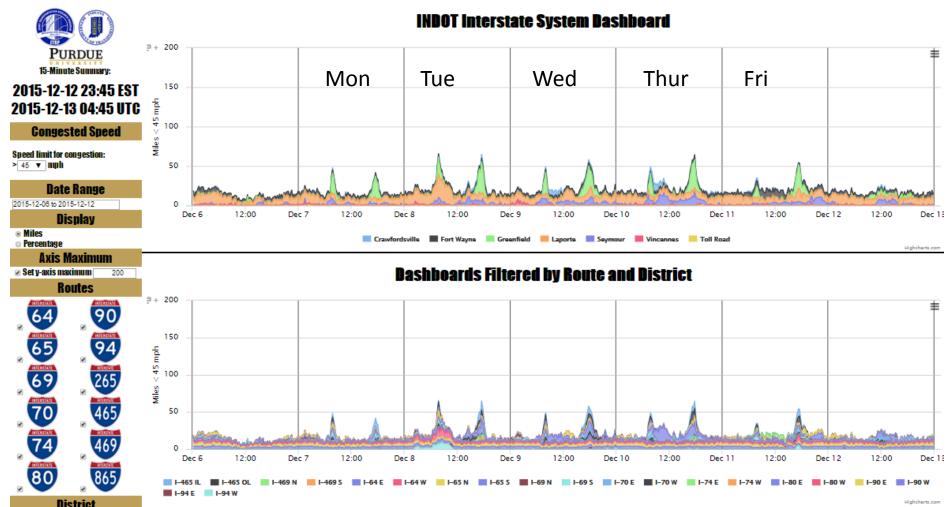


What an opportunity in Iowa for Integrating Iowa Plow cameras with Purdue Traffic Ticker

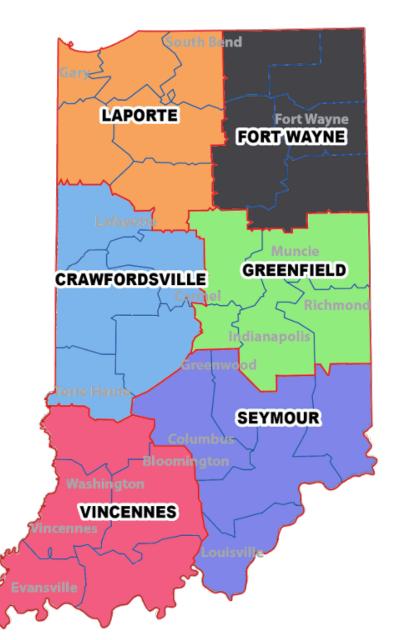




Indiana Freeway Dashboards aka "Traffic Ticker"







Pre-Thanksgiving Winter Weather

69

70

265

465

12:00

Nov 17

12:00

Nov 18

12:00

Nov 19

12:00

Nov 20

12:00

Nov 21

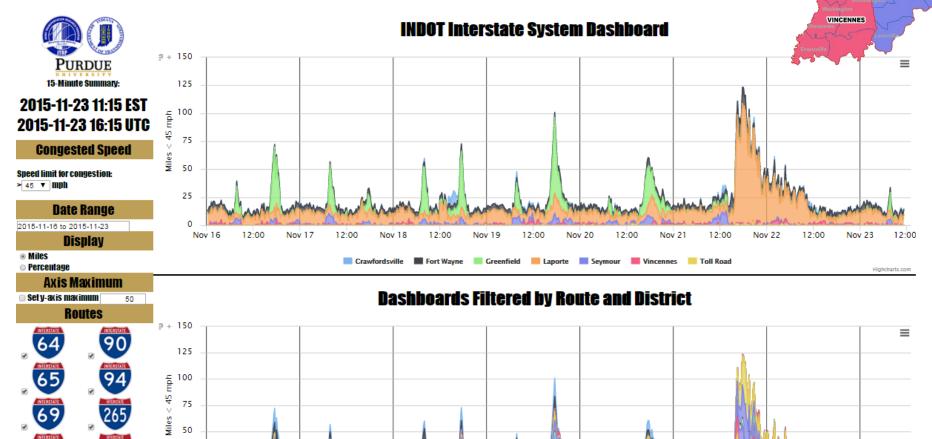
12:00

Nov 22

12:00

Nov 23

12:00



LAPORTE

CRAWFORDSVILLE

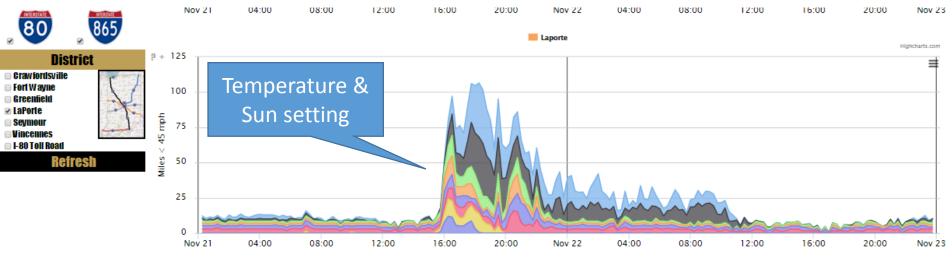
Fort Wayn FORT WAYNE

GREENFIELD

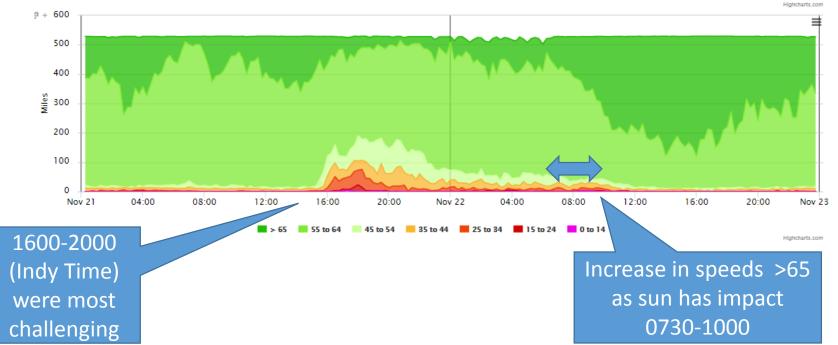
SEYMOUR

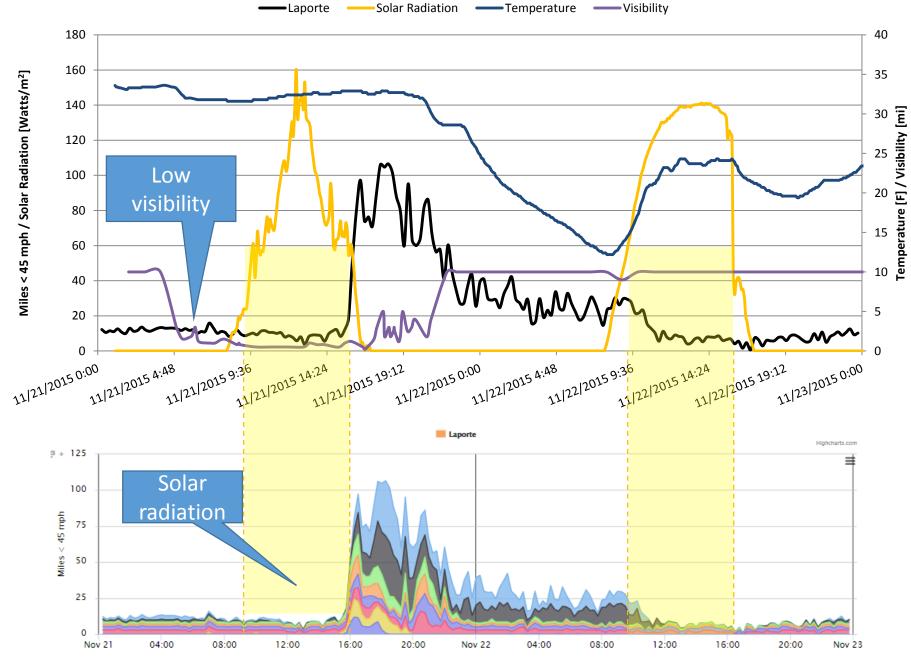
Winter Weather and Traffic Ticker (LaPorte)

Thanksgiving Week Snowstorm

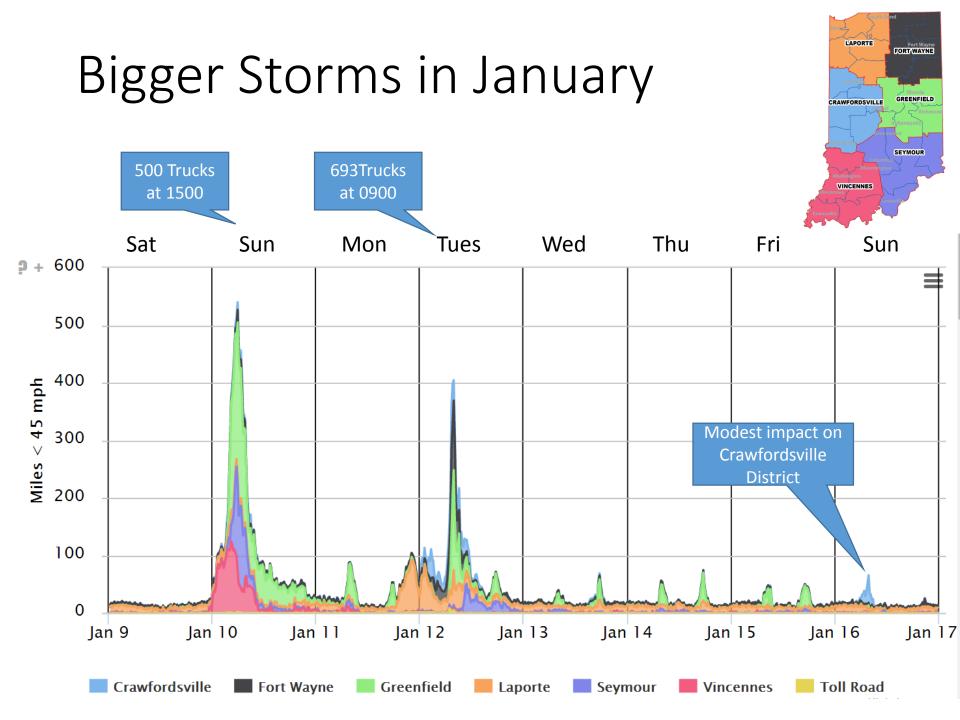


💻 I–65 N 🔳 I–65 S 🔲 I–80 E 📕 I–80 W 📃 I–90 E 📕 I–90 W 📒 I–94 E 🔳 I–94 W



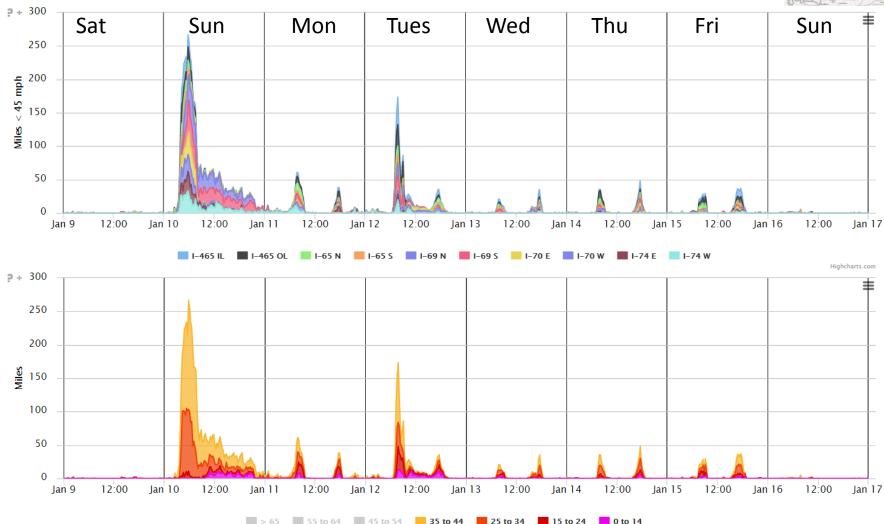


🔲 I–65 N 🔳 I–65 S 📖 I–80 E 📒 I–80 W 🔲 I–90 E 📕 I–90 W 📒 I–94 E 🔲 I–94 W

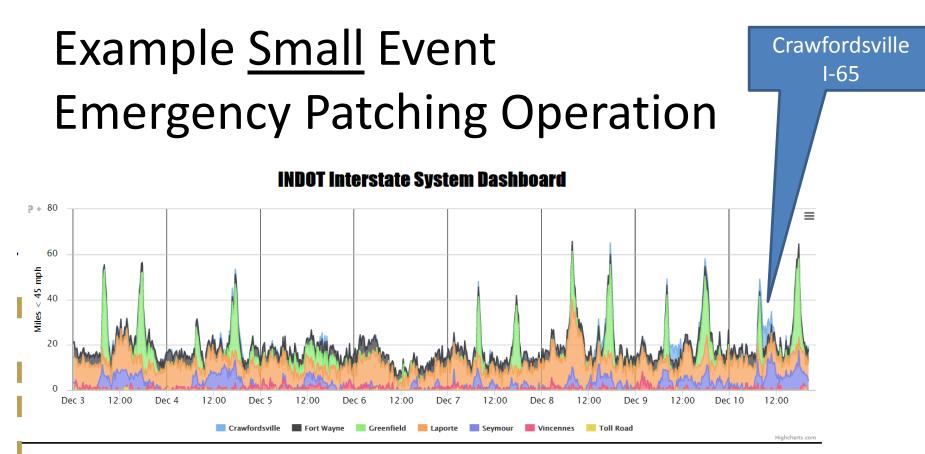


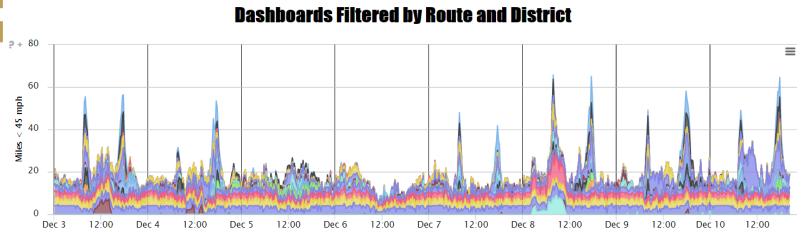
Greenfield Sun (260mi), Tues(160mi)

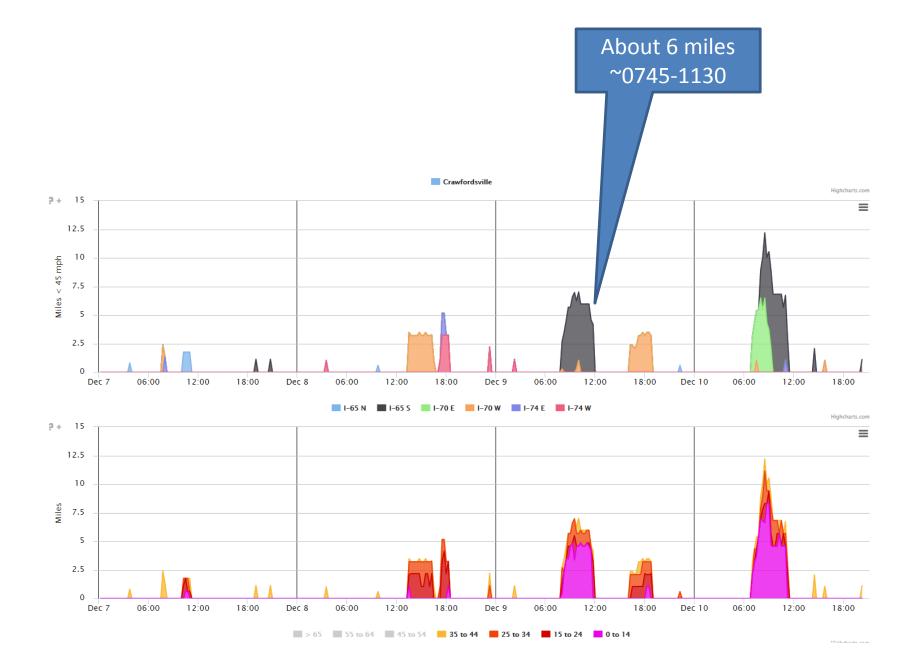




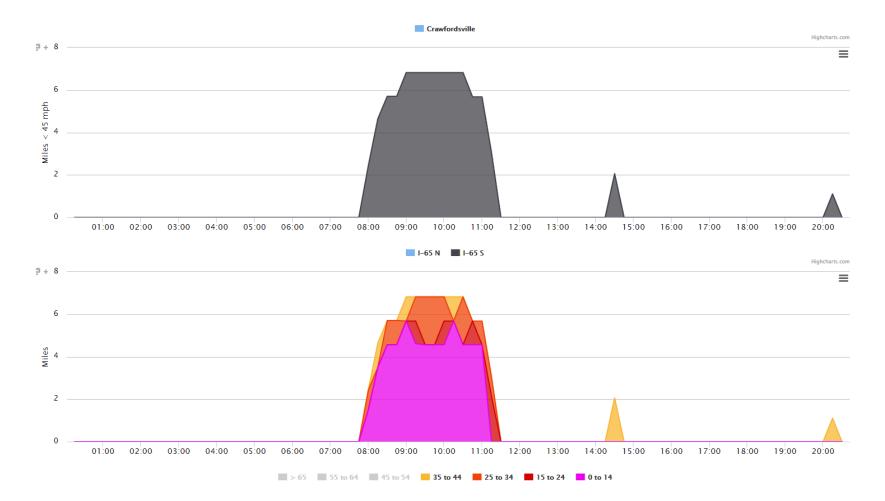
Greenfield



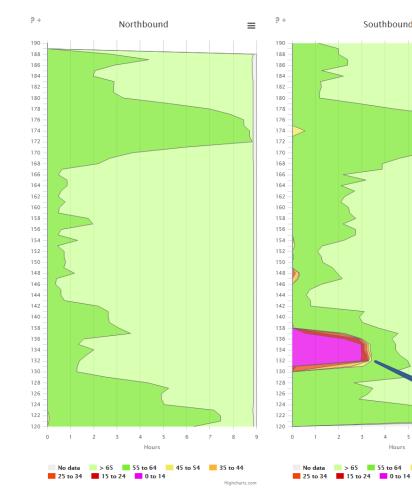




I-65 Speed Profile Times Dec 10, 2015



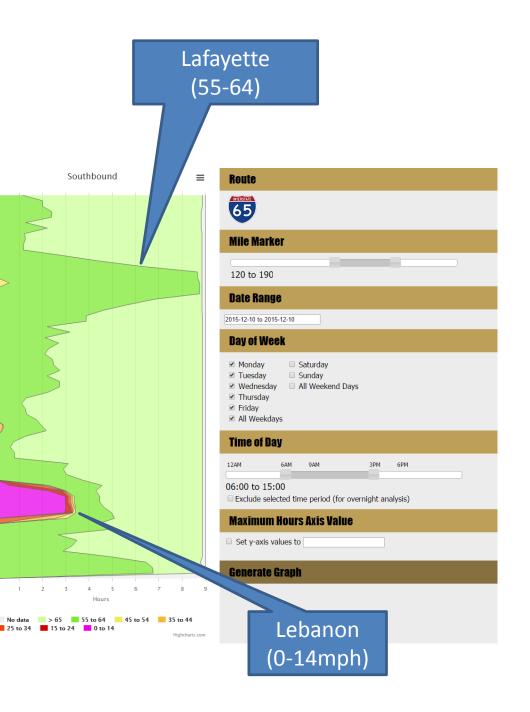
Speed Profile Dec 10, 2015



Southbound

3 4 5

Hours



Topics

- 1. Probe Data
- 2. Evolving Perspective on
 - -Probe Data Dashboards (spatial) and
 - Purdue Traffic ticker (temporal)
 with some Iowa Examples
- **3. Traffic Ticker Applied to I-65 Detour**



Using Real-Time Probe Vehicle Data to Manage Unplanned Detour Routes

BY MARGARET MCNAMARA, HOWELL LI, STEPHEN REMIAS, LUCY RICHARDSON, EDWARD COX, DEBORAH HORTON, AND DARCY M. BULLOCK

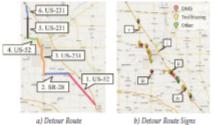
he unexpected closure of an interstate is a massive undertaking involving a variety of stakeholders. Such was the case in August 2015, when pier settlement of the Wildcat Creek Bridge on I-65 N in Indiana, USA required an unplanned closure of a 37-mile stretch of the interstate for approximately 31 days. The detour route had little existing intelligent transportation systems (ITS) infrastructure to assist engineers with managing operations. To fill this information need, real-time crowdsourced probe vehicle data were used to create real-time dashboards hosted on a website for use by Indiana Department of Transportation (INDOT) engineers and public safety officials to monitor mobility and queueing on the 62-mile detour route. This paper describes how the real-time dashboards were used to proactively identify congestion problems, as well as measure the impact of mitigation measures.

Route Diversion

The southbound bridge was too narrow to support bidirectional traffic, so the northbound traffic was diverted onto US-52 at mile marker 141 (Lebanon, IN) and returned to 1-65 just north of Lafayetic at Exit 193 (Figure 1a). This stretch of interstate usually carries an average annual daily traffic of 24,000 vehicles, including about 9,500 trucks, and it is an important connector between Indianapolis, IN and Chicago, IL, USA.

Figure 1 shows the area of the closure and detour, with callout t of Figure 1b marking the location of the closed bridge. The detour consisted of US-52, SR-28, and US-231, shown in Figure 1a. INDOT deployed fifteen dynamic message signs (DMS) that were used to direct drivers, advising them of turns and potential queues. Additionally, there were 40 traffildaring signs marking the direction of the detour and 19 other signs, including warning signs for traffic lights and work zones. Figure 1b, callouts it, iti, and 1v, mark temporary signals that were installed, and callout v marks a four-way stop that was converted to a two-way stop, which are discussed later in the article.

32 December 2015 Ito Journal



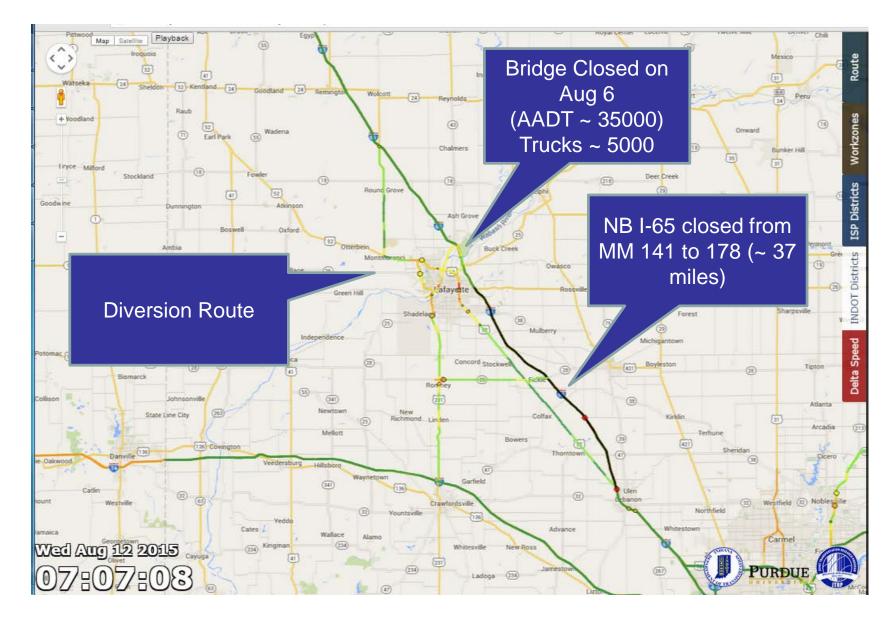
U) DEIDER ROBE S

Figure 1. Maps of Detour Route

Immediately after the closure, DMS near Indianapolis (and later in adjacent states) were used to advise drivers of the closure and encourage Chicago-bound traffic to take I-74 to I-57 in Illinots.

http://tinyurl.com/indetour

Interstate Diversion



Northbound I-65 Bridge Closure... The Problem



Ash Grov

Buck Creek

Northbound I-65 Bridge Closure... Repairs In Progress



35000 vehicles?

Making Real Time Decisions and Separating Fact from Fiction



'SHE CAME TO WIN' Purdue-bound blind pole vaulter medals at state meet Sports, 1D **JCONLINE.COM** JOURNAL & COURIER SUNDAY, MAY 17, 2015 A GANNETT COMPANY | LAFAYETTE - WEST LAFAYETTE MORE THAN IN COUPONS ERSTATE 65 **INSIDE TODAY!** WHAT THEY'RE DOING Crews will widen I-65 from two lanes in each direction to three lanes in each direction. There will be nightly lane closures between 9 p.m. and 6 a.m. **OVERSIZE LOAD** PROVIDED BY KYLE MAR Lanes eventually will be reduced in size to 11-foot lanes with 2-foot shoulders. Lafayette police and Tippecanoe County Sheriff's deputies staged in the area of a Wider or heavier loads will be restricthome on South Third Street in Lafavette ed during construction. Sheriff Barry Richard confirmed that the fugitive jail escapee, Marcus Alan Bramlett CAUTION! had been holed up inside the house The speed limit in the work zone will Fugitive decrease from 70 mph to 45 mph during SPEED active construction. Typically, the 3-mile stretch between Indiana 25 and Indiana LIMIT STAGE 1 26 takes less than three minutes to drive at 70 mph. Here's about how long it will 45 JUNE 2015-2016 surrenders Affects I-65 from exits 172 to 175 take you at reduced speeds: 4 minutes (45 mph) 6 minutes (30 mph) Suspect apprehended without 12 minutes (15 mph) And it could get worse. INDOT said a 3-mile backup du incident after crime spree ing one-lane restrictions is not uncommon By Hannah Smith Kiefer A dangerous fugitive holed up inside a Lafavette house surrendered to police late Saturday night after a chaotic 24-GETTING AROUND IT hour crime spree that started when the suspect overpowered a sheriff's Going north? Take exit 168 onto Indiana 38. turn right onto Sagamore Parkway, turn left on South Street, 2 years of work to clog deputy transporting him from the hospital and stole her squad car and rislightly right onto Columbia Street, continue onto State Lafavette's major artery fle Shortly after 11 p.m Street, turn right on Indiana By Hannah Smith Kiefer 43 and then get back onto I-65 at exit 178. Going south? Marcus Alan the suspect. Marcus Alan Bramlett, 25, peacefully exited the back door of a Bramlett Take the reverse hat could be worse for small brown wood-frame house in the drivers than Interstate NOISE BARRIERS 1000 block of South Third Street in La-fayette. Police had been negotiating 65 in the winter? The first wall will be east of I-65, just north of Indiana 26 and the Visit Lafayete-West Lafayette Try I-65 in the sum-mer, fall and spring with him by telephone for hours to per-suade him to surrender. center, extending about 2,500 feet north. The for the next two to three years. Big changes — and big construction "This concludes a horrible situation second wall will be opposite the location of the first barrier. The third wall will be north of the declared Tippecanoe County Sheriff headaches - are coming to a stretch of second wall and the last wall will be north of that, extending to Eisenhower Road. the interstate that passes through La-fayette. It all starts in a few weeks and See FUGITIVE, Page 6A will continue into fall 2017. Drivers should brace themselves for lane re-USA TODAY strictions, ramp closures, narrower lanes, reduced speeds and longer travel times. ISIL leader killed Wondering just what will be happen-ing, and how bad it will get? Read on ... U.S. troops carried out a raid inside eastern Syria. USA TODAY, 1B (26) What changes are coming? Crews will widen I-65 from two lanes INDEX Opinion 10A in each direction to three lanes in each direction. To do this, workers will place Classified 1E Style 1C Sports 1D Crossword 90 the two new lanes in the current median space and add a concrete barrier to re-Obituaries 10C place the median. With this plan, the shoulder of the road won't have to be widened, although it will be reinforced STAGE 2 JCONLINE.COM 2016-2017 during the first few weeks of the project so lanes can be temporarily shifted. he second stage of the project will begin once FACEBOOK.COM/JOURNALANDCOURIER the first stage is com-pleted. It will affect I-65 See NIGHTMARE, Page 4A from exits 172 to 168. \$2.00 RETAIL 40901 04802 The immediate care you can trust for life's minor injuries, illnesses and accidents. Franciscan LAFAYETTE · Open Daily Noon - 10 pm WEST LAFAYETTE · Open Daily 8 am - 8 pm **EXPRESS**CARE 1501 Hartford St. (St. Elizabeth Central Campus) 915 Sagamore Pkwy West (Across from WL Police Dept.) FranciscanExpressCare.org

How Bad? Ineffective, Absurd... Using Metrics to change the narrative.

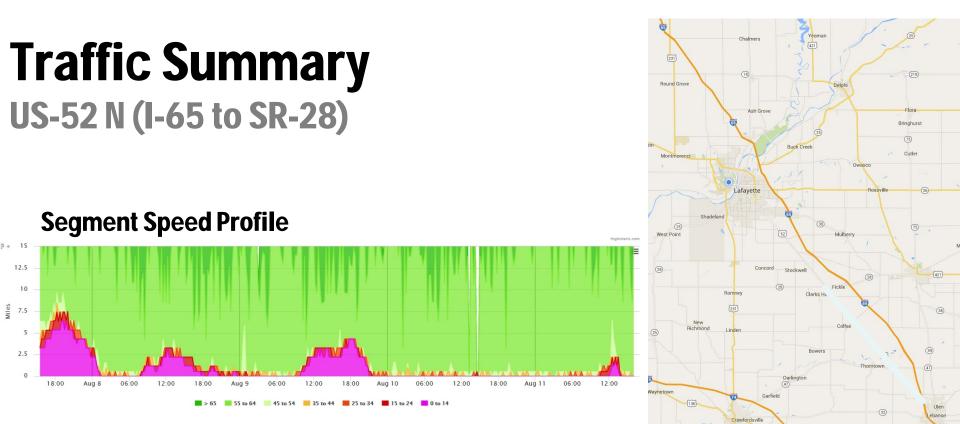


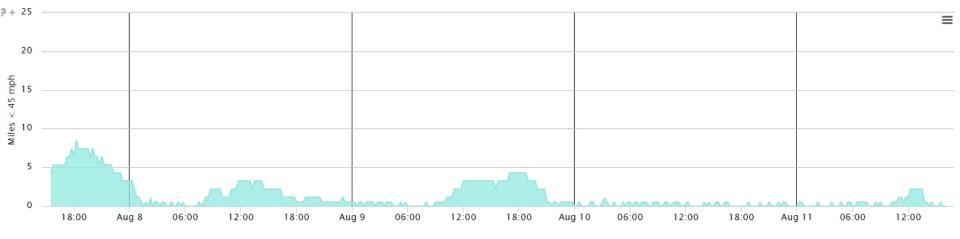
- Reporter drove official detour right after the closure, wrote article for local newspaper
- Took 4 hours to drive ~60 miles
- Said "Moral of the story is that the INDOT detour route is essentially ineffective."
- "Plan for it to take an absurd amount of time."



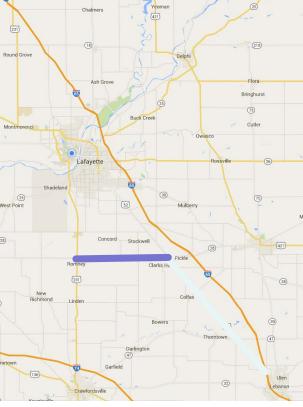








Traffic Summary SR-28 (US-52 to SR-231)



Cumulative Traffic Ticker

18:00

> 65

Aug 9

55 to 64

06:00

45 to 54

12:00

35 to 44

18:00

25 to 34

Aug 10

15 to 24

06:00

0 to 14

12:00

18:00

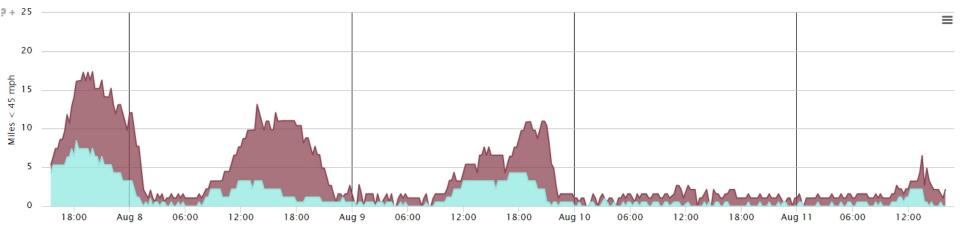
Aug 11

12:00

18:00

Aug 8

06:00

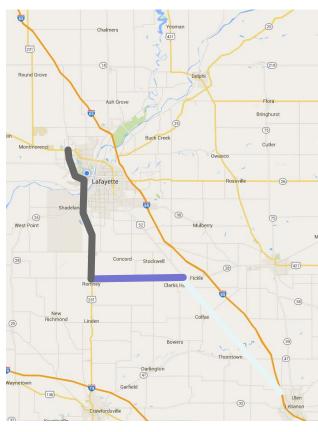


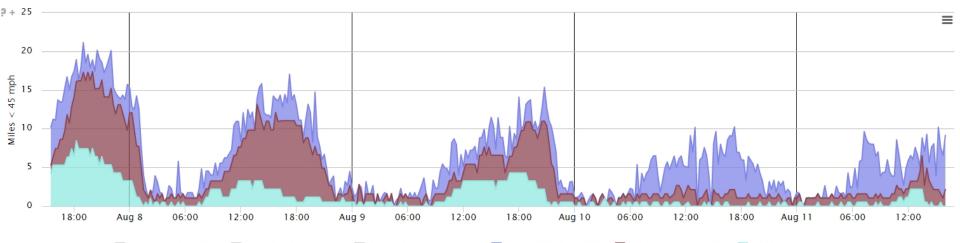
12:00

06:00

Traffic Summary US-231 (SR-28 to US-52)

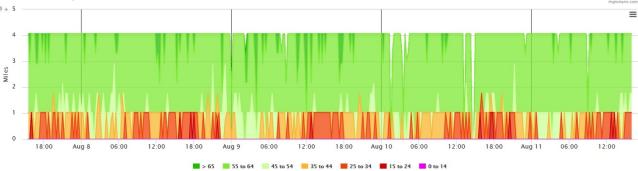
Segment Speed Profile 9 + 10 7.5 Miles 2 2.5 06:00 12:00 18:00 Aug 8 06:00 12:00 18:00 Aug 9 06.00 12:00 18:00 Aug 10 06:00 12:00 18:00 Aug 11 > 65 55 to 64 45 to 54 35 to 44 25 to 34 0 to 14



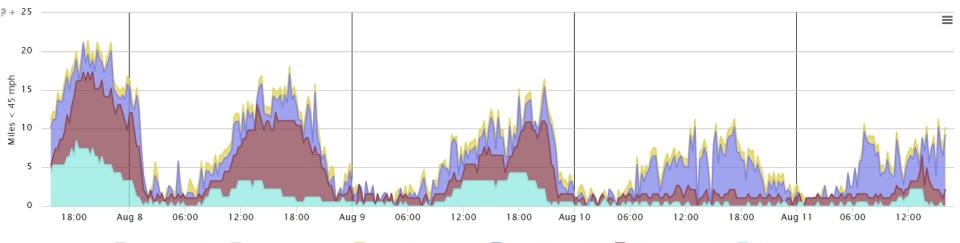


Traffic Summary US-52 N (US-231 to US-231)

Segment Speed Profile

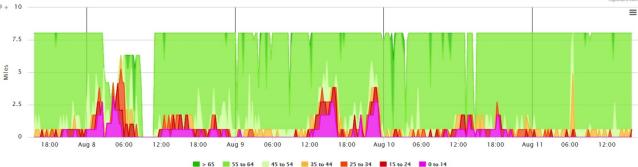




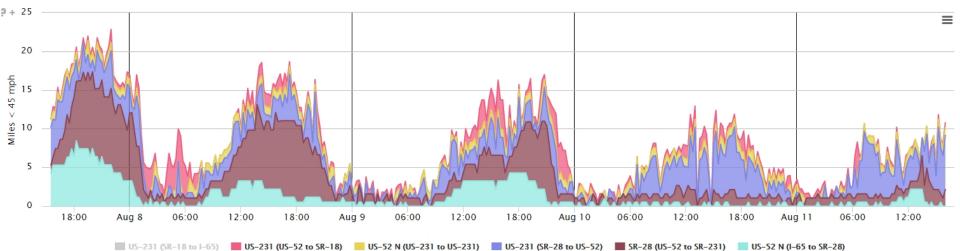


Traffic Summary US-231 N (US-52 to SR-18)

Segment Speed Profile

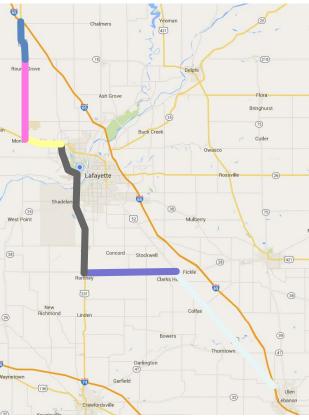




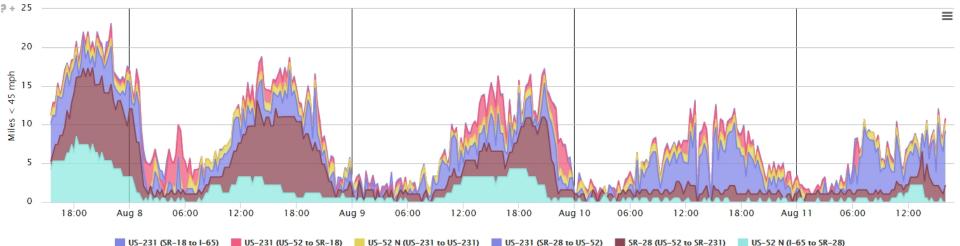


Traffic Summary US-231 N (SR-18 to I-65)

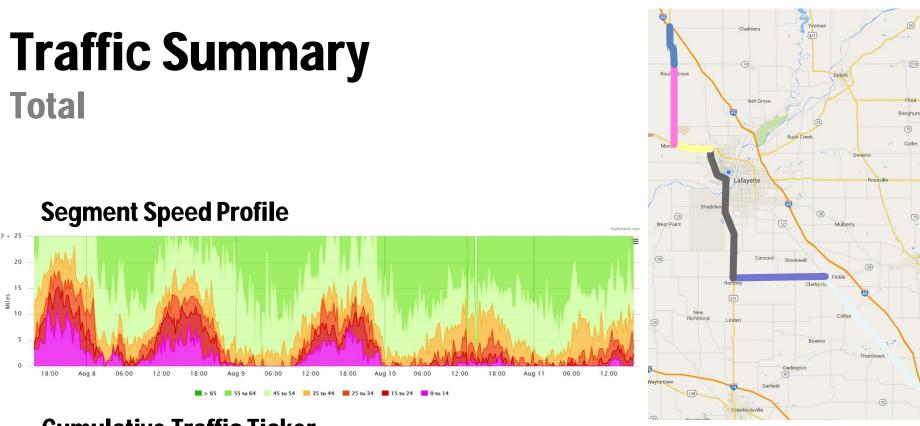
Segment Speed Profile \equiv Miles 06:00 12:00 18:00 Aug 8 06:00 12:00 18:00 Aug 9 06:00 12:00 06.00 12:00 18:00 Aug 11 55 to 64 45 to 54 0 to 14



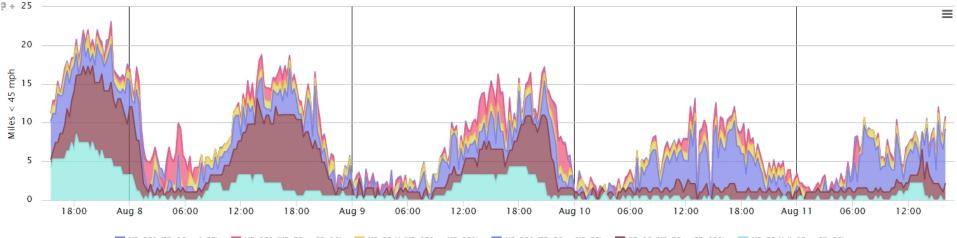
Cumulative Traffic Ticker



US-231 (SR-18 to I-65) US-231 (US-52 to SR-18) US-52 N (US-231 to US-231) US-231 (SR-28 to US-52) SR-28 (US-52 to SR-231)







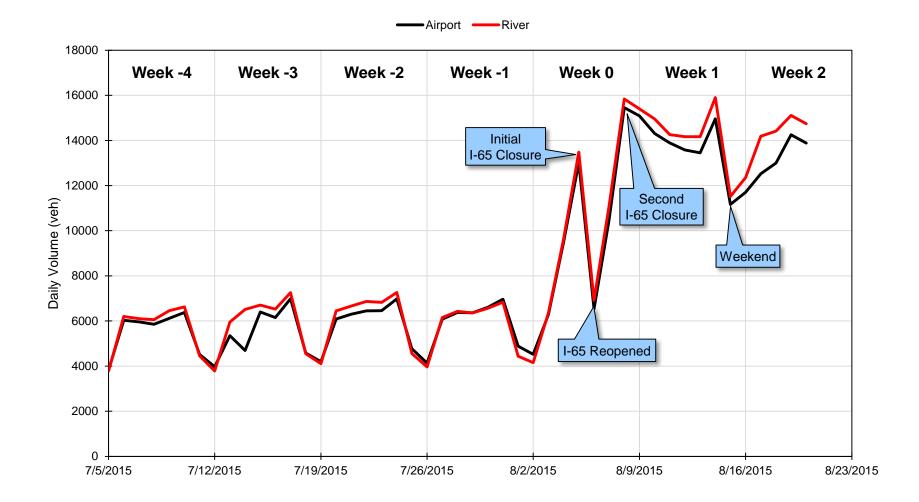
US-231 (SR-18 to I-65) US-231 (US-52 to SR-18) US-52 N (US-231 to US-231) US-231 (SR-28 to US-52) ISR-28 (US-52 to SR-231)

SR-231) US-52 N (I-65 to SR-28)

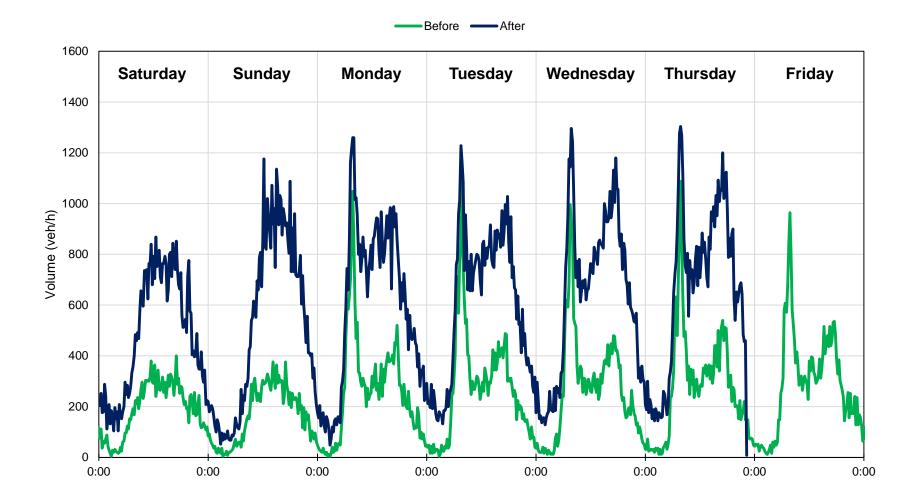
38

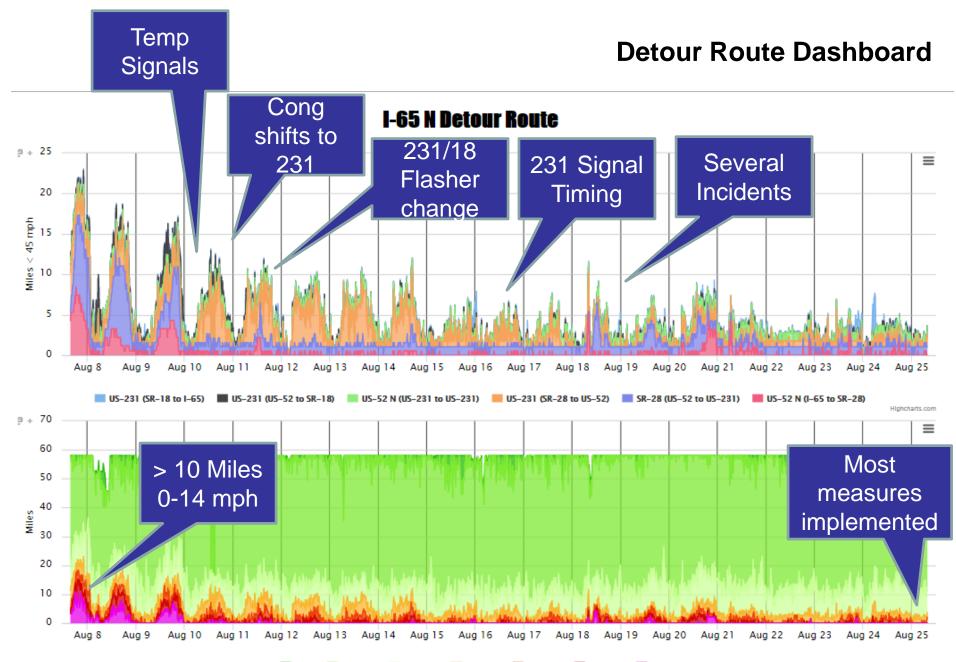
(39)

Daily Northbound Volumes – US-231 NB approaching Lafayette

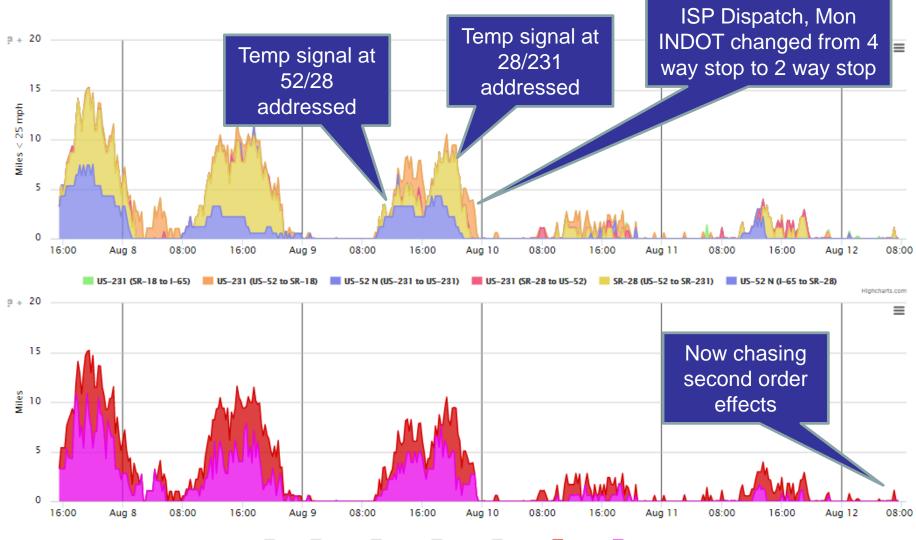


US-231 @ River Road – Typical Week Before and After (Week of 7/25 vs. Week of 8/15)





Signalization Impact



🔳 > 65 📕 55 to 64 📕 45 to 54 📕 35 to 44 📕 25 to 34 📕 15 to 24 📕 0 to 14

Impact of change from 4 way stop to 2 way stop (Aug 11)



SR 28/US 231 Temporary Signal



Sunday, August 9, 2015 Ed Cox / Jim Sturdevant @ 231/28

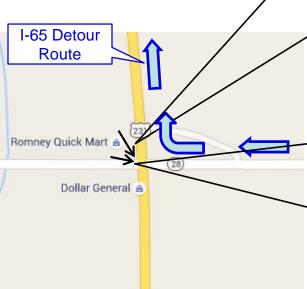


SR 28/US 52 Temporary Signal

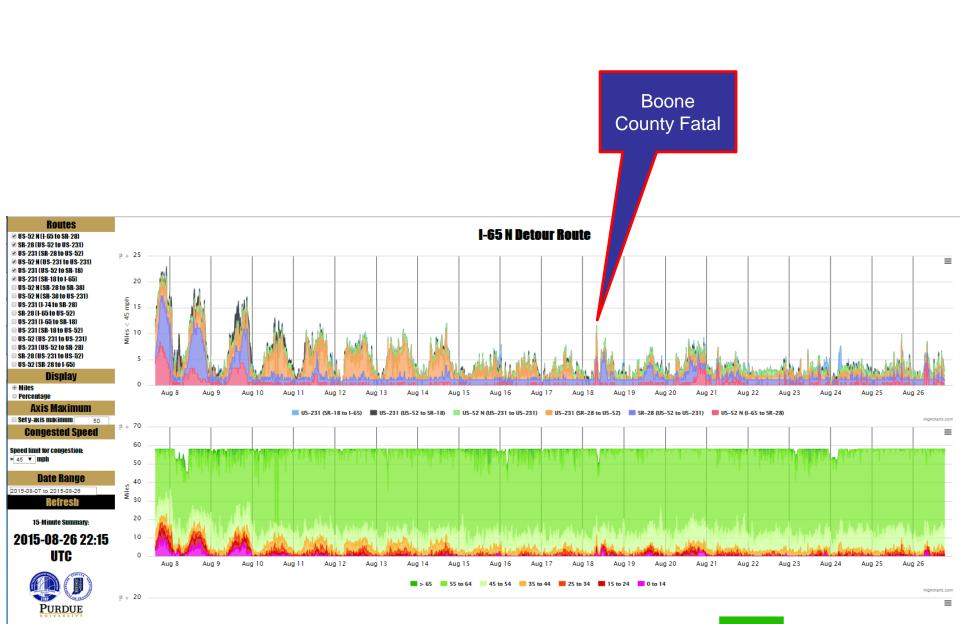


Temporary Signal at US 231 & SR 28- Romney

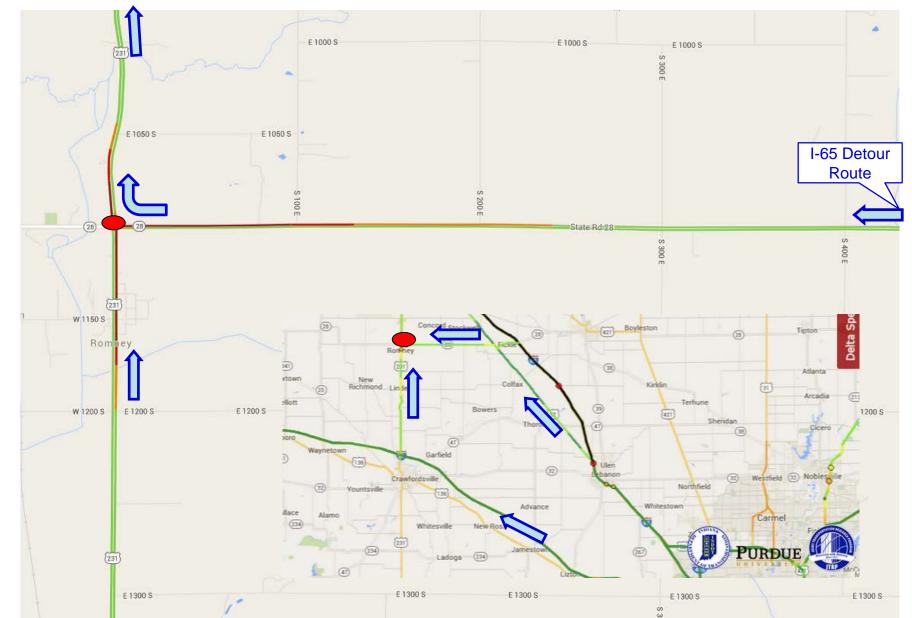
- 2 phase signal
- Installed cell modem for remote access
- Monitored remotely and adjusted splits based on INRIX/Google traffic queuing







Temporary Signal at US 231 & SR 28 "All roads lead to Romney"

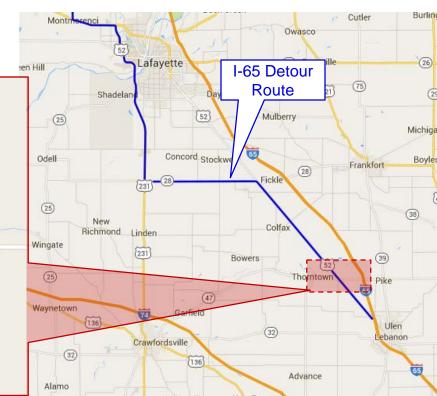


Temporary Signal at US 52 & SR 47

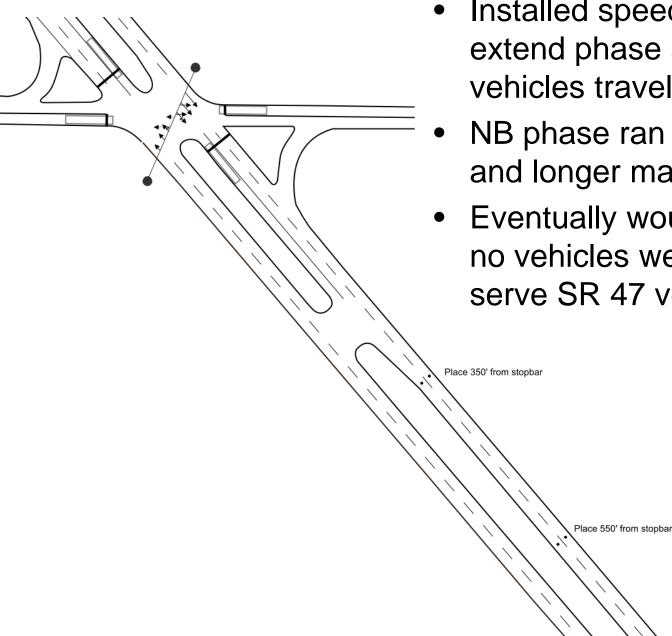
- Safety concern at US 52 & SR 47
 - 2 way stop controlled E/W
 - High crash history prior to closure
- Signal installed to increase safety
 - Constructed overnight, ~12 hours
- Special detection installed to limit dilemma zone issues, red light running



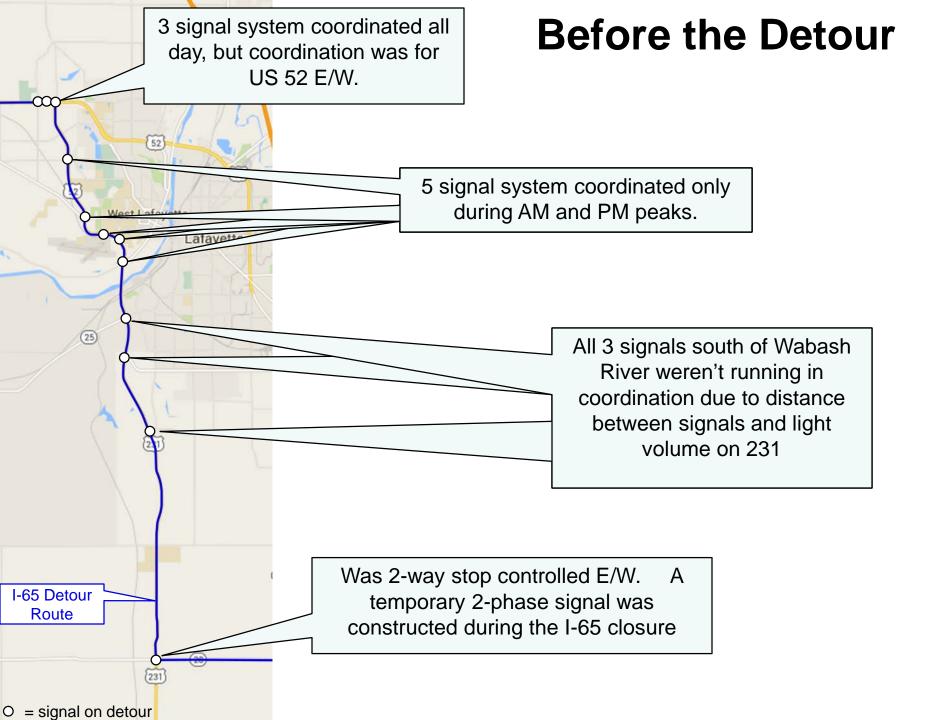


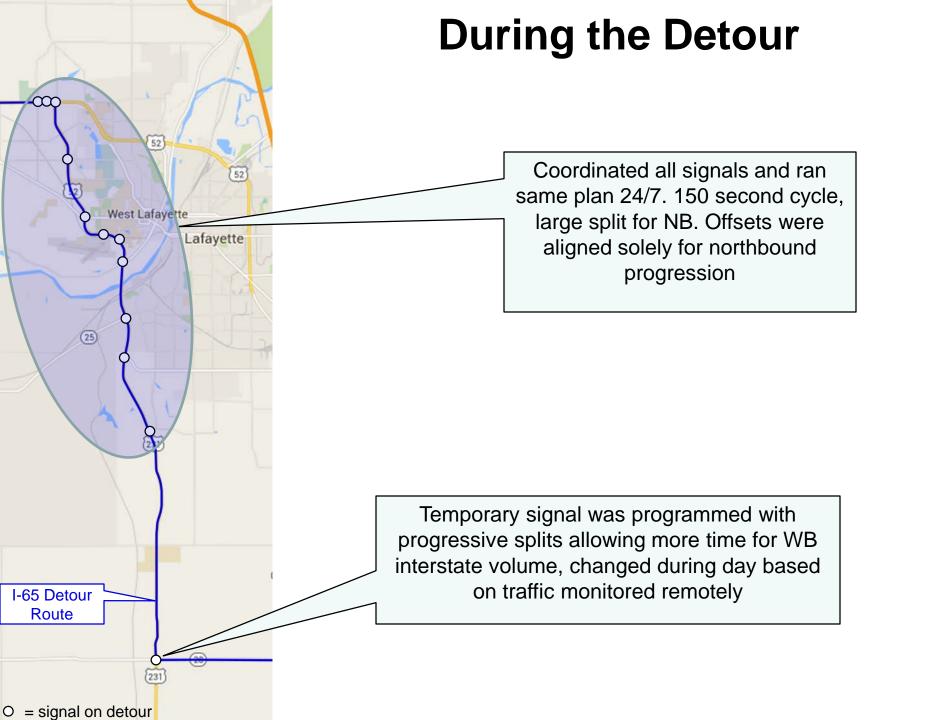


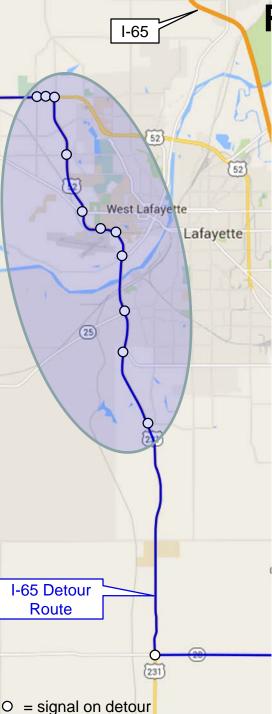
Temporary Signal at US 52 & SR 47



- Installed speed sieve detection to extend phase safely for all vehicles travelling 40-70mph
- NB phase ran free with long min and longer max
- Eventually would gap out when no vehicles were approaching, serve SR 47 vehicles safely

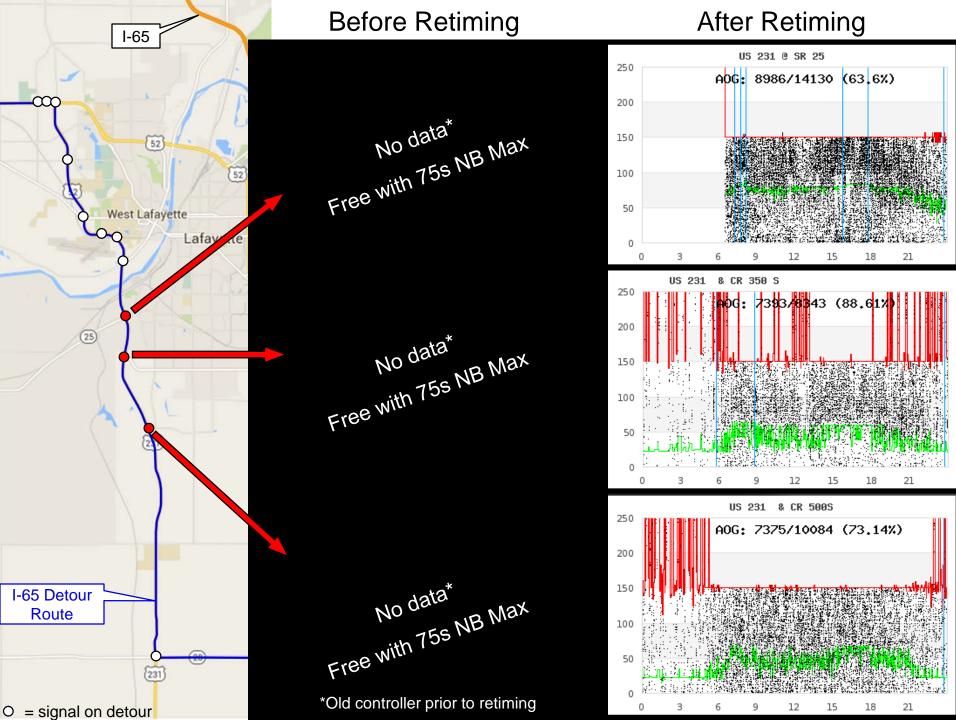


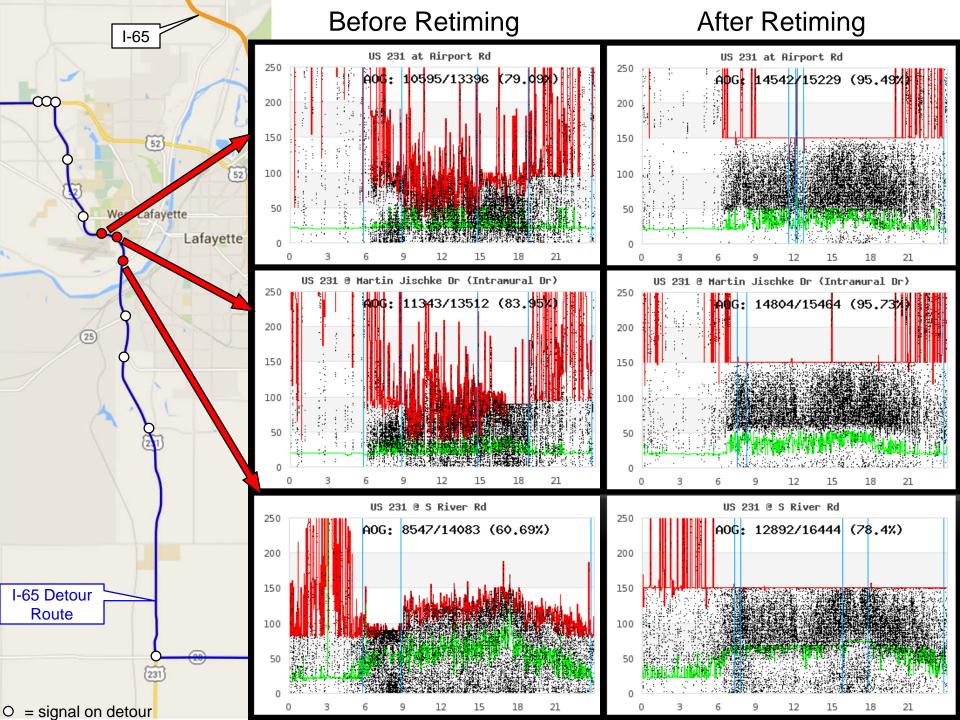


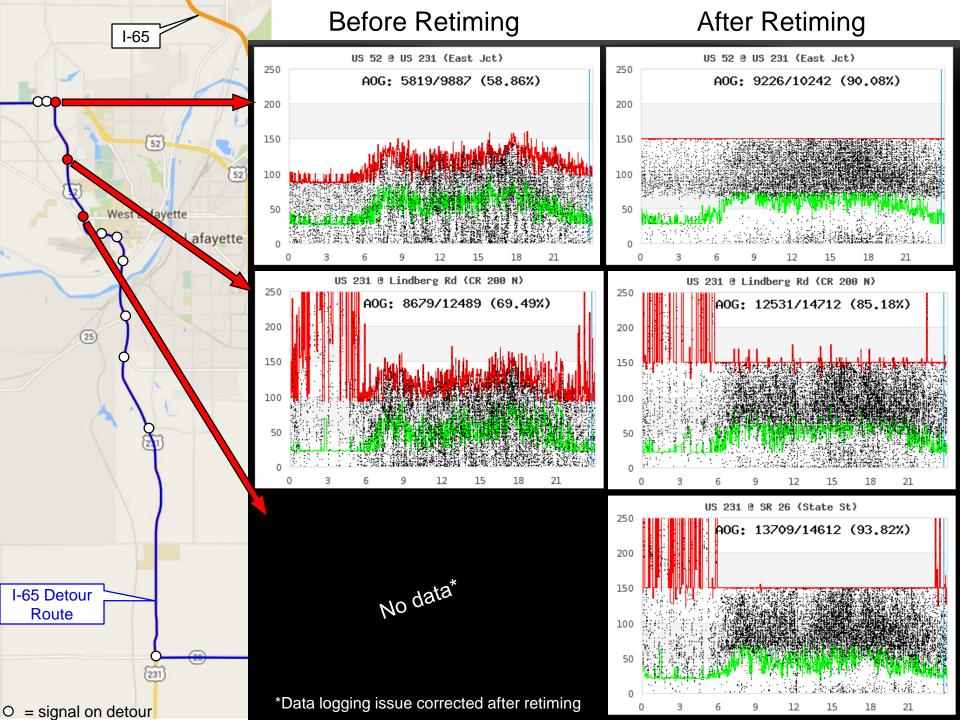


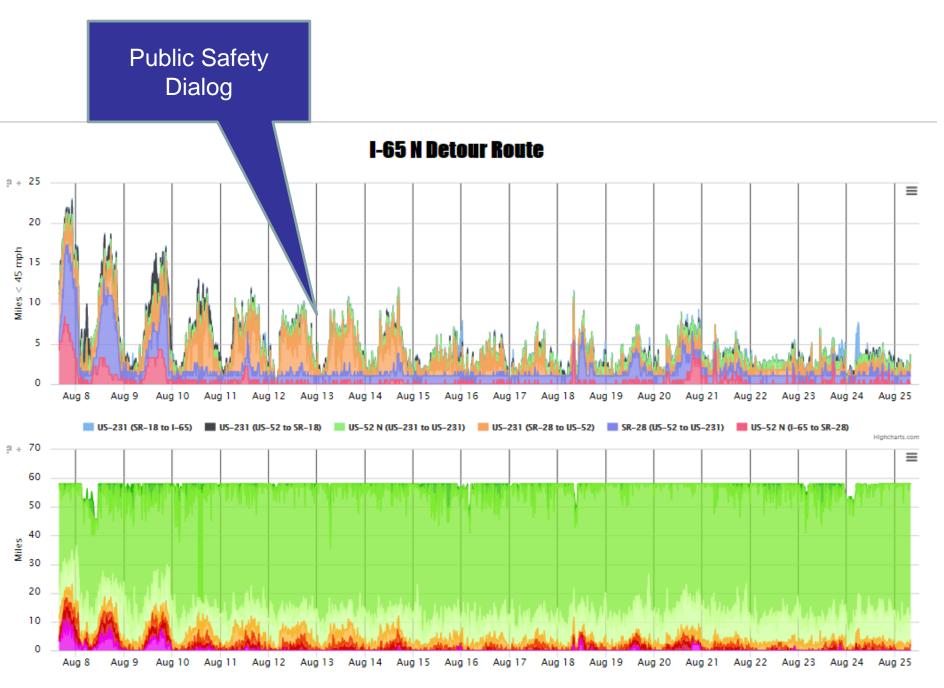
Retiming the Greater Lafayette Corridor

- All signals were retimed during the first week of the closure
- Coordinated every signal, only caring about northbound progression
- 150 second cycle length, heavily favoring northbound phase, (or westbound on north end)
- Adjusted offsets with goal of all signals having > 90% arrivals on green

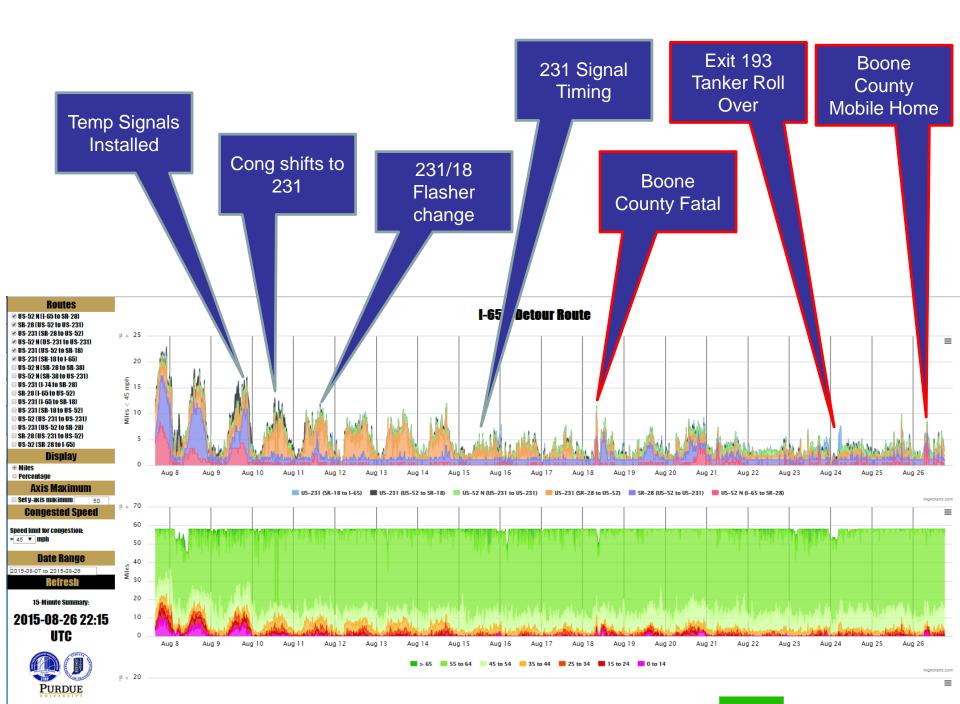




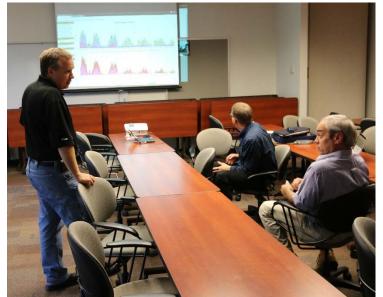


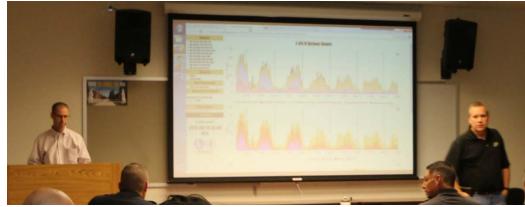


- CE - EE 45 47 47 45 45 47 48 - 25 45 44 - 25 45 24 - 15 45 24 - 0 45 1



Public Safety Workshop: August 13, 2015





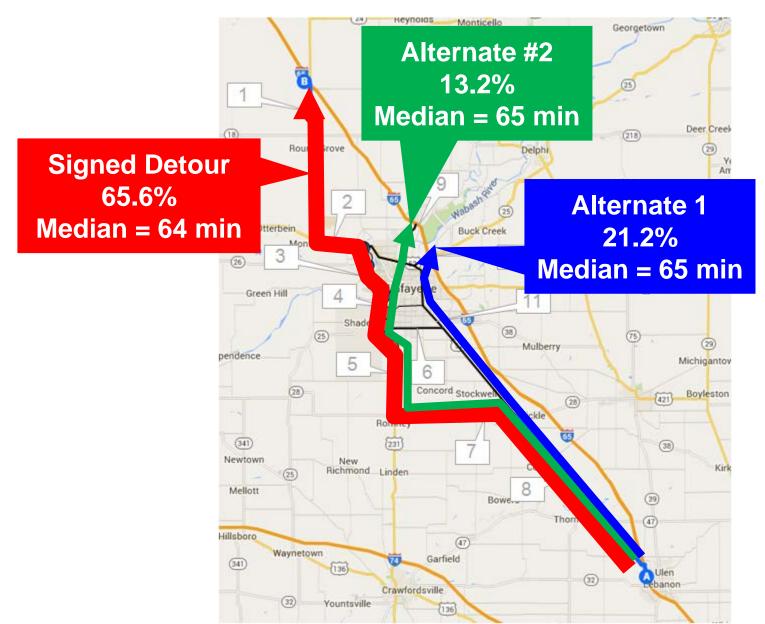




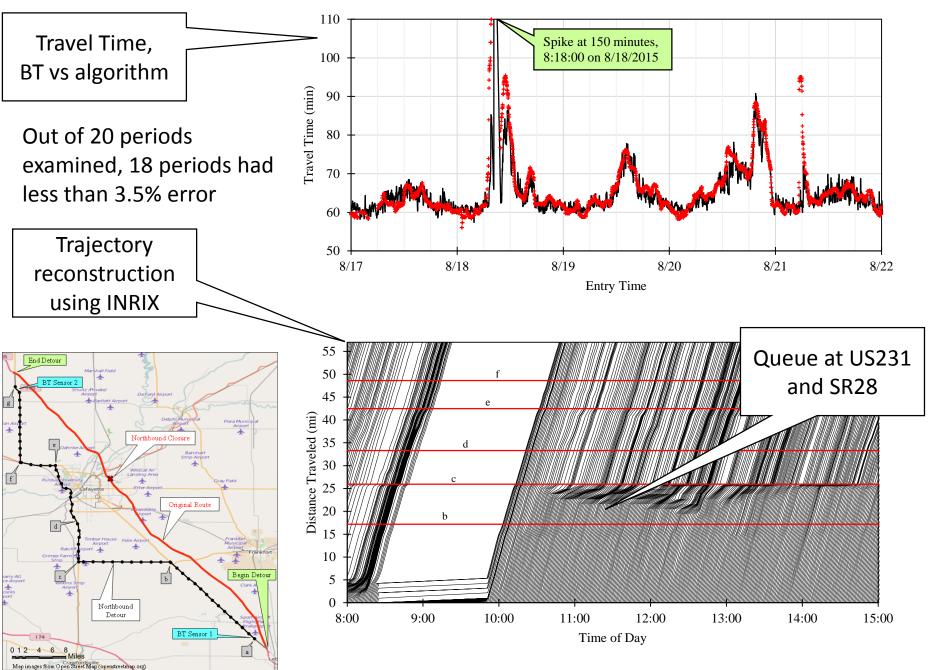
Blue Tooth Data Collection Locations to assess route choice and validate INRIX...



Did Motorists Favor the Detour Route?



+ Median Bluetooth — Probe Data Estimate



Using Metrics to change the narrative.



- Improvement to drive ~60 miles from 4 hours to about 64 minutes
- Bad news stories stopped being published
- Many reports of driving detour with zero to one stop!
- Media advocating use of the detour.

Thank you

- <u>darcy@purdue.edu</u>
- @darcybullock (Twitter)

Thank you!!

Questions?

ONLY

- Contact:
 - Jim Sturdevant jsturdevant@indot.in.gov

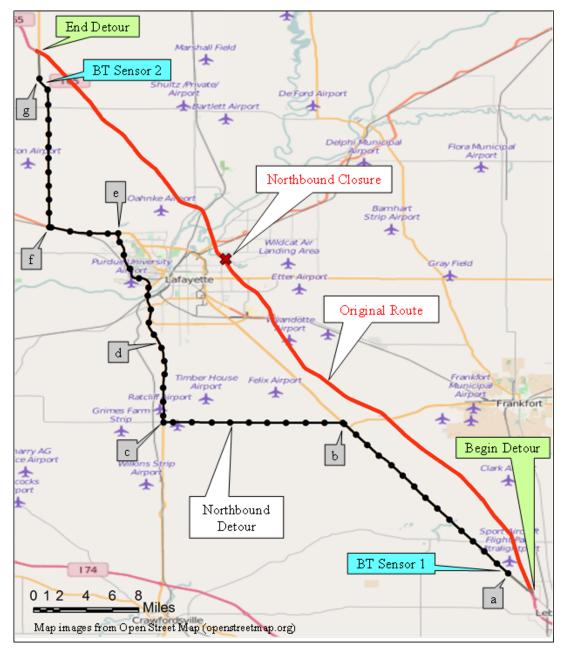
000

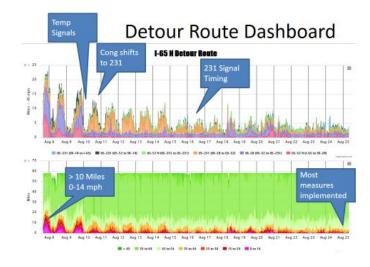
000

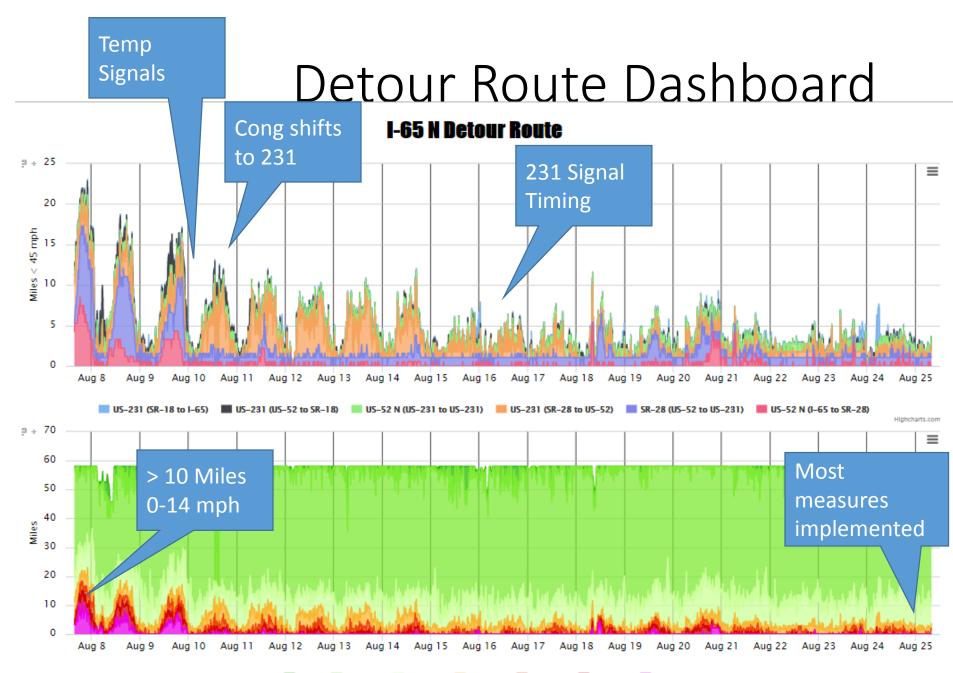
Ed Cox Ecox@indot.in.gov

ONLY

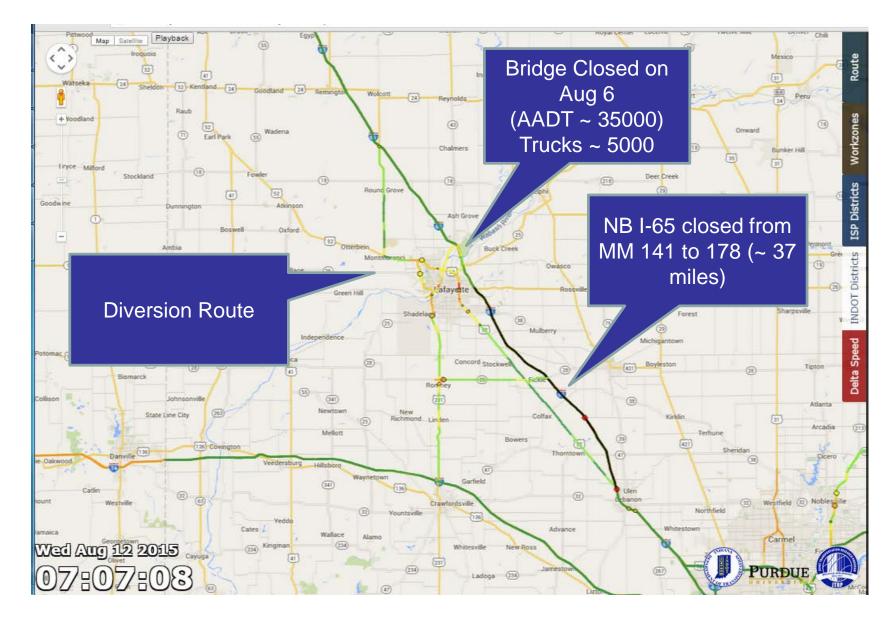
Route Builder and Trajectory Analysis







Interstate Diversion



Northbound I-65 Bridge Closure... The Problem



Ash Grov

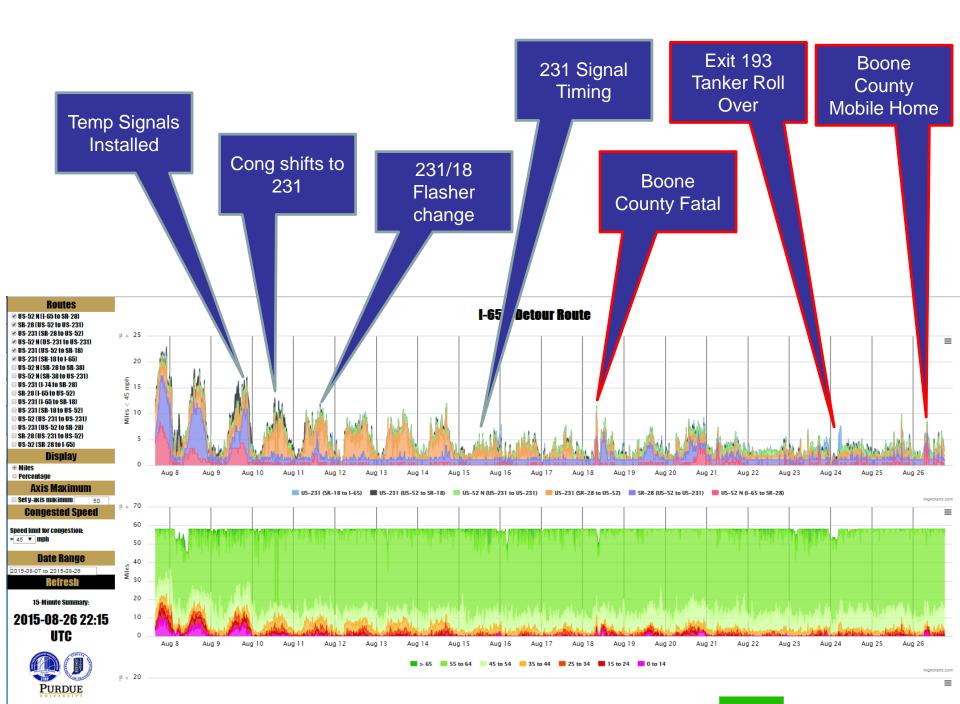
Buck Creek

SR 28/US 231 Temporary Signal



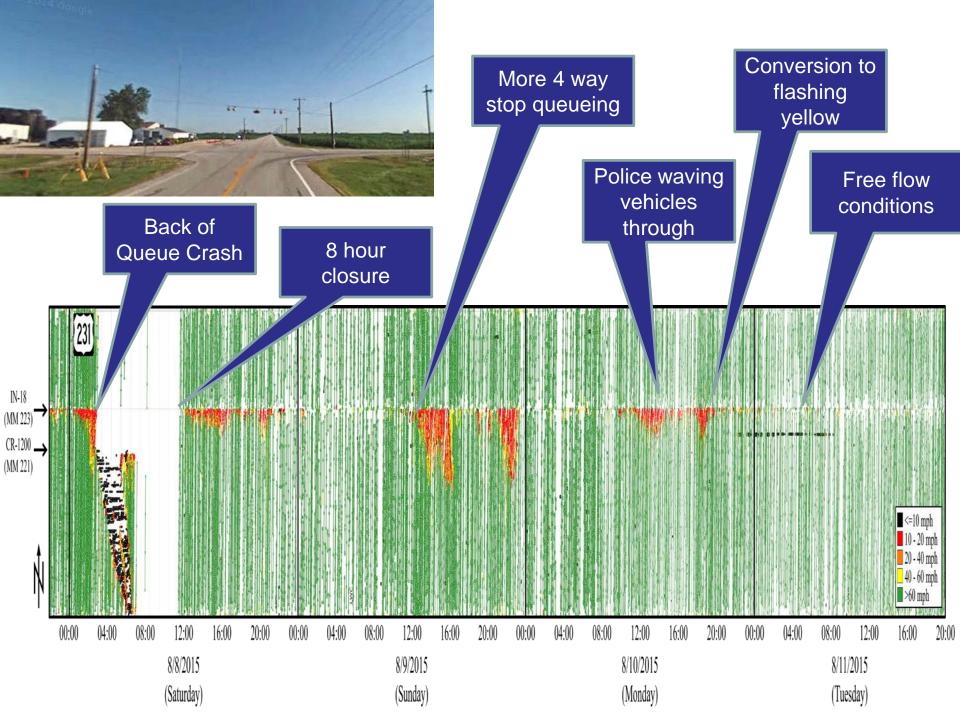
SR 28/US 52 Temporary Signal



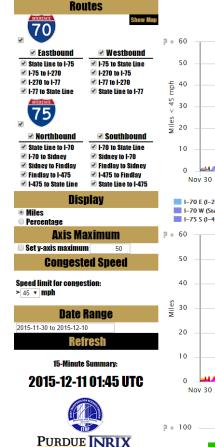


Impact of change from 4 way stop to 2 way stop (Aug 11)





Ohio Traffic Ticker



Ohio Interstate System Dashboards

