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TRANSPORTATION RESEARCH BOARD

Measures of Performance for Operating a Reliable Transportation System

July 30, 2020

@NASEMTRB
#TRBwebinar

PDH Certification Information:

- 1.5 Professional Development Hour (PDH) – see follow-up email for instructions
- You must attend the entire webinar to be eligible to receive PDH credits
- Questions? Contact Reggie Gillum at RGillum@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to participants that have registered and attended the entire session. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.

RCEP

REGISTERED CONTINUING EDUCATION PROGRAM

#TRBwebinar

Learning Objectives

1. Identify TMS performance measures for freeway system operations

2. Describe methods to manage systems for safety benefit evaluation and comparison

3. List performance measure data sources for facility, network, and regional levels

#TRBwebinar

Transportation Systems Management & Operations (TSMO)

TRB Webinar: Performance Management & Performance Measures

Brent Cain, PE
Director, TSMO Division
Arizona DOT
July 30th, 2020

“What gets measured gets done…”

- Regular measurement, management, and reporting keeps you focused – and to make informed decisions.

Transportation Systems Management & Operations (TSMO)

Traffic Maintenance

- *Statewide Signing and Striping*
- *Sign Factory*

Traffic Management

- *Traffic Operations Center*
- *Traffic Incident Management*
- *Emergency Management*

Systems Technology

- *Emerging Technologies*
- *System Performance*
- *ITS Operations and Communication*
- *Project Development Support*

Systems Management

- *Maintenance Administration*
- *Contracts and Management Services*
- *Feature Inventory Systems*
- *Statewide Permits*

Systems Maintenance

- *Signal Operations*
- *ITS Maintenance*
- *Pump Stations*
- *Lighting and Tunnel Operations*
- *Fiber Management*

Operational Traffic & Safety

- *Regional Traffic Engineering*
- *Road Safety Assessments*
- *Strategic Transportation Safety Plan*
- *Traffic Safety and Data*

Business Administration

- *Administration*
- *HR*
- *Budget*
- *Procurement*
- *Signal ITS Warehouse*

Fiscal Year 2019 Agency Performance Bowling Chart - Arizona Department of Transportation

Last Updated: 5/17/19

Performance Metric Title	Custom Field	JOP	YTD		July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
Strategic Metrics																
DTA2149 Agency Breakthrough - Decrease port of entry Level 1 inspection time to 45 minutes by June 30, 2019		7/1/2018	Target	45	45	45	45	45	45	45	45	45	45	45	45	45
		59	Actual	59	51	55	63	60	57	57	65	64	63	60		
DTA2150 Agency Breakthrough - 100% design delivery by June 30, 2019		7/1/2018	Target	83	8	16	25	33	41	50	58	66	75	83	91	100
		39	Actual	52	8	13	19	22	24	33	34	49	52	52		
DTA3246 Agency Breakthrough - 80% of CDL applicants receive road test within 7 days by June 30, 2019		7/1/2018	Target	80	80	80	80	80	80	80	80	80	80	80	80	80
			Actual	50				36	50	29	33	33	84	83		
DTA2136 Maintain urban MVD field office entrance to exit time at 25 minutes		7/1/2018	Target	25	25	25	25	25	25	25	25	25	25	25	25	25
		24.9	Actual	24.3	24.8	23.4	22.1	25.6	23.2	23.2	24.0	22.9	27.7	26.1		
DTA2148 Decrease Level 2 and Level 3 VIN inspection facility entrance to exit time to 32 minutes by June 30, 2019		7/1/2018	Target	32	32	32	32	32	32	32	32	32	32	32	32	32
		93	Actual	21	42	22	18	19	19	20	17	18	19	17		
DTA2154 Maintain the average speed of the Phoenix Metro system at 50 mile per hour or greater		7/1/2018	Target	50	50	50	50	50	50	50	50	50	50	50	50	50
		48.1	Actual	47.7	48.2	48.2	48	47.8	47.8	47.7	47.6	47.5	47.3	47.3		
DTA2139 Achieve 75% on-time construction by June 30, 2019		7/1/2018	Target	75	75	75	75	75	75	75	75	75	75	75	75	75
		70	Actual	70	57	33	79	64	85	77	50	50	100	100		
DTA2152 Deliver 90% of construction projects on-budget		7/1/2018	Target	90	90	90	90	90	90	90	90	90	90	90	90	90
		60	Actual	88	86	90	100	64	100	100	87	100	67	86		
DTA2151 Complete 100% of planned state highway pavement treatments (in miles)	Annual = 6,000	7/1/2018	Target	4,300	200	300	300	400	400	300	300	400	800	900	900	800
		3343	Actual	5,097	153	72	649	516	571	42	12	96	229	2,757		
DTA3244 # of Fatalities on state highway system		1/1/2018	Target	276	28	28	28	28	28	28	27	27	27	27	27	27
		396	Actual	341	26	34	38	29	28	37	45	27	42	35		
Statewide Reporting Metrics																
DTA3018 AMS Implementation Score		7/1/2018	Actual	2.68			2.54			2.73			2.76			
		2.51														
DTA3054 AMS Deployment %		7/1/2018	Actual	83			83			83			84			
		80														
DTA2982 # of Agency FTE Count		7/1/2018	Target	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763
		3574	Actual	3,585	3,600	3,590	3,581	3,568	3,569	3,566	3,595	3,597	3,593	3,588		

Custom Field Legend	
Goal 1	Promote Transportation Safety
Goal 2	Highly Engaged Employees
Goal 3	Deliver Customer Value
Goal 4	Maximize Resources

Performance to Targets Color Coding
100% of Target
Within 75% - 99% of Target
Within 0% - 74% of Target

Counter Measure Triggers
Strategic - 2 consecutive months **YELLOW** or **RED**
Operational - 2 consecutive months **YELLOW** or **RED**
Statewide - 2 consecutive months **YELLOW** or **RED**

Score Card – TSMO Division

FISCAL YEAR 2020 TSM&O DIVISION BOWLING CHART

Last Updated: [illegible]

PERFORMANCE METRIC TITLE	Custom Field	ADP		YTD	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE
ADMINISTRATION																
[#1] Keep Average Number of Days to Hire to Less than 30 Days	Speed	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#2] Maintain Variance of Budget Burn Rate Compared to Fiscal Year Burn Rate to less than 5%	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SYSTEMS MAINTENANCE																
[#3] Percent of Traffic Signals with Comm Equipment	Quality	[illegible]	Target	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#4] Maintain Phoenix Metro Roadway Lighting Operability at 95%	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#5] Metro Phoenix CCTV Camera Operability at [illegible]	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#[illegible]] TSD: WWD metric based on incursion data from pilot	Quality		Target													
			Actual													
[#6] Maintain Phoenix Metro Pump Stations at 98% Operability (Pump stations that dewater the freeway)	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SYSTEMS MANAGEMENT																
[#7] 100% of the process time for Complex Class C Over-Dimensional Permits at 20 days or Less	Speed	[illegible]	Target	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#8] Populate Statewide ITS inventory to 90% by December 2018	Speed	[illegible]	Target	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#[illegible]] Submit 100% of roadway service and material contracts to procurement early.	Speed	[illegible]	Target	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TRAFFIC MAINTENANCE																
[#9] Maintain Statewide Pavement Marking (in miles) at 95% of the proposed Federal Highway Administration (FHWA) Minimum Retroreflectivity.	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#10] Maintain Statewide Signing at 95% of the Minimum Sign Retroreflectivity Requirements per FHWA.	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#11] Complete 70% of the Phoenix Metro Traffic Interchanges with Lowered and Oversized WW Signs by June 2018.	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		
TRAFFIC MANAGEMENT																
[#12] Percent ADOT Personnel that are TIM Trained.	Quality	[illegible]	Target		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	Actual		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[#13] Reduce the Average Time to Clear all Lanes in Urban Areas to X minutes (priority 1 incidents).	Quality	[illegible]	Target													
		[illegible]	Actual													
[#14] Reduce the Average Time to Clear all Lanes in Rural Areas to X minutes (priority 1 incidents).	Quality	[illegible]	Target													
		[illegible]	Actual													

Performance Metric: Travel Time Reliability

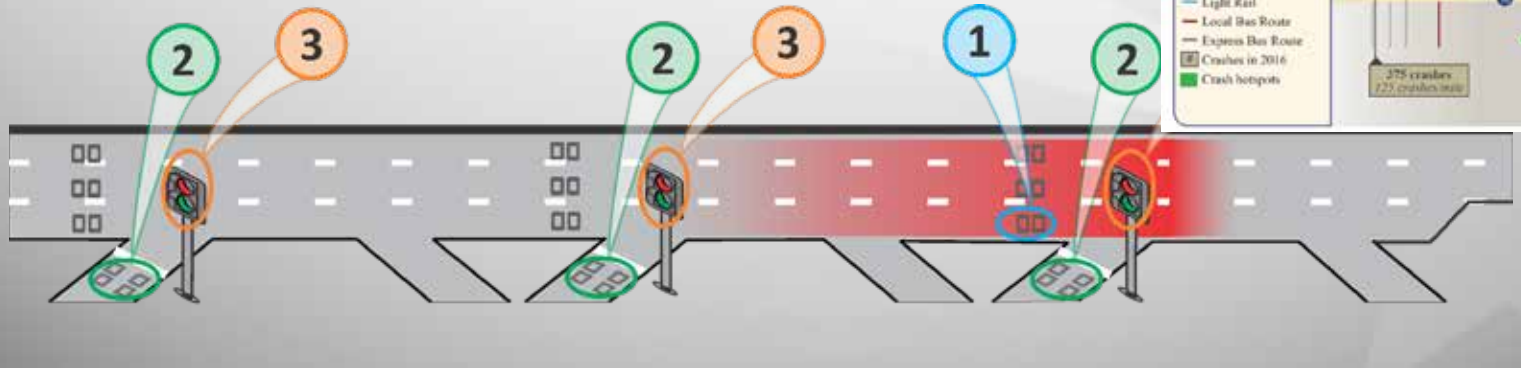
- FHWA - National Traffic Monitoring Program
- Corridor-based assessment
- Travel Time Reliability Metric:
  - ***Planning Time Index***

Example:

Free-flow Travel Time = 15 minutes
Planning Time Index = 1.60
Planning Time = 15 minutes x 1.60 = 24 minutes

Adaptive Ramp Metering and ICM

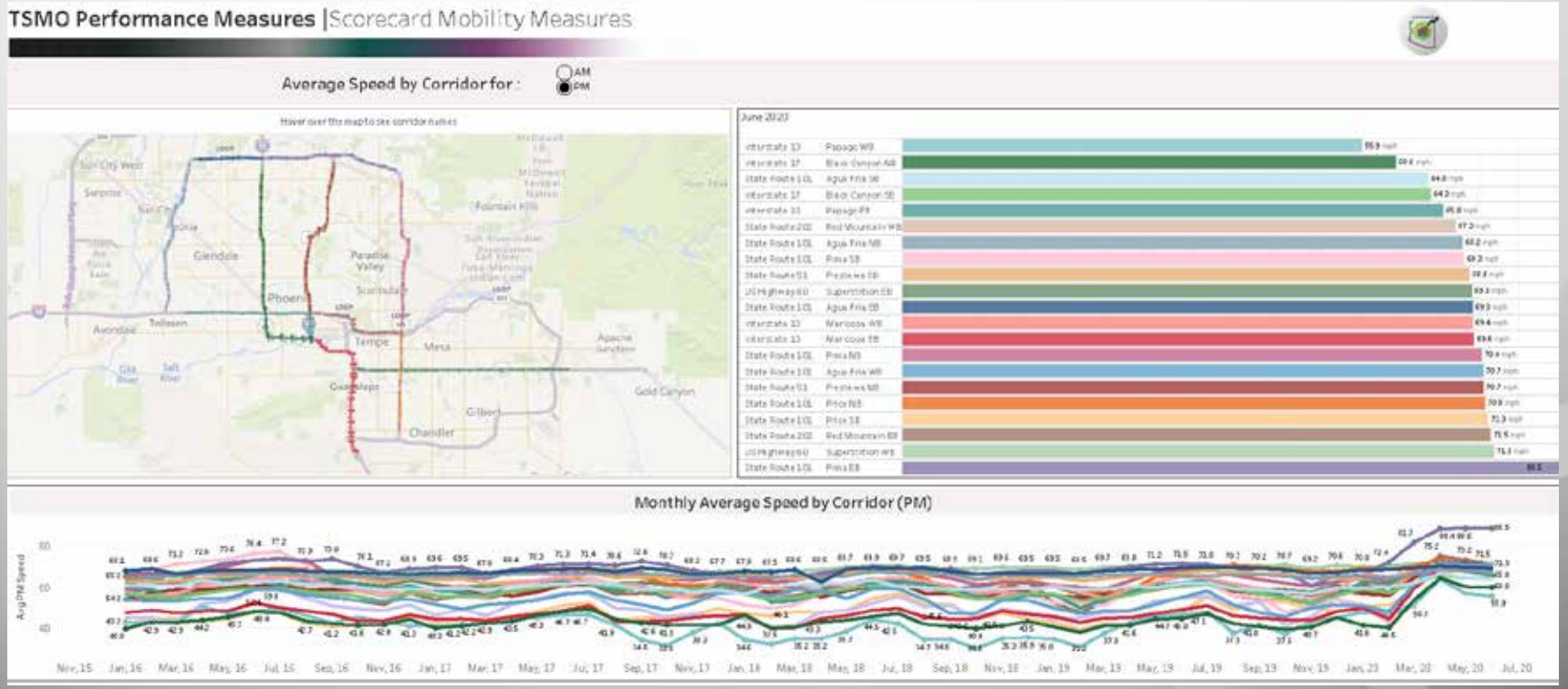
- Developing new ramp meter technology
- Developing a Decision Support System (DSS) for Incident Corridor Management (ICM)



Ramp Metering Analytics

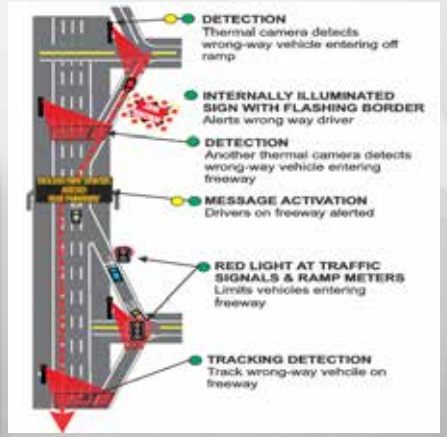
- Developing monitoring system of ramp meter controller status, traffic data, and Inrix travel time data
- Creating tool for TSMO staff to monitor and adjust ramp meter operations

Freeway Mobility – Average PM Operating Speeds



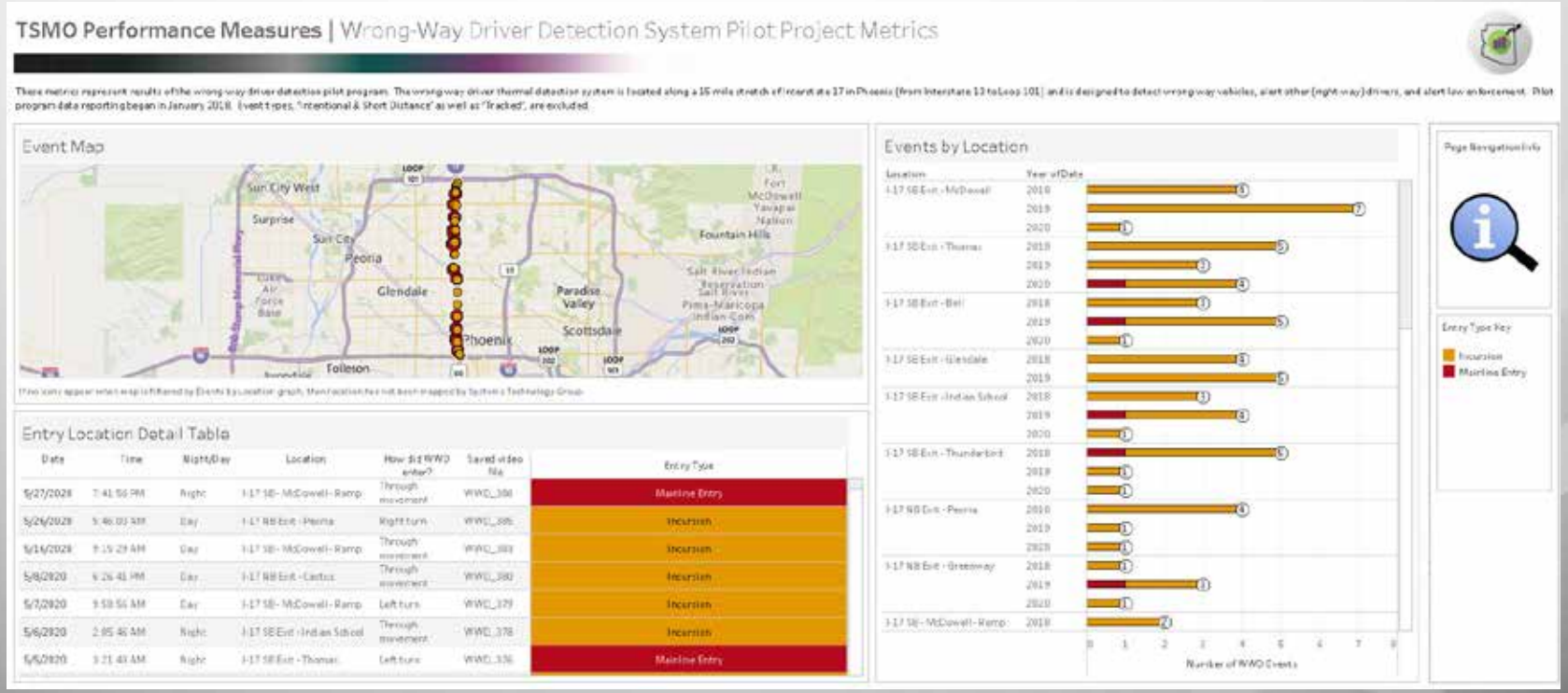
Traffic Incident Management

- Incident Response Unit (IRU)
- Quick Clearance Policy
- Co-location of State Troopers in the TOC
- After-Action Reviews

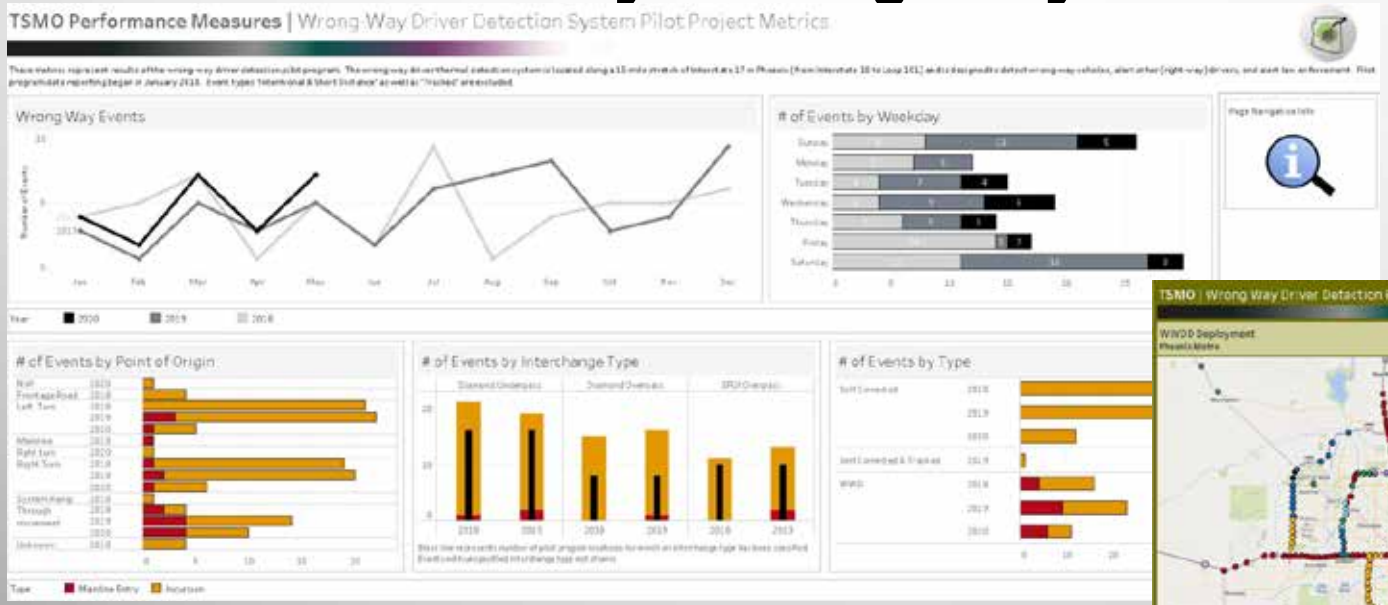


Images Source: "AZDPS Wrong Way Collisions and Contacts" December 5,

I-17 Freeway Wrong Way Driver Detection

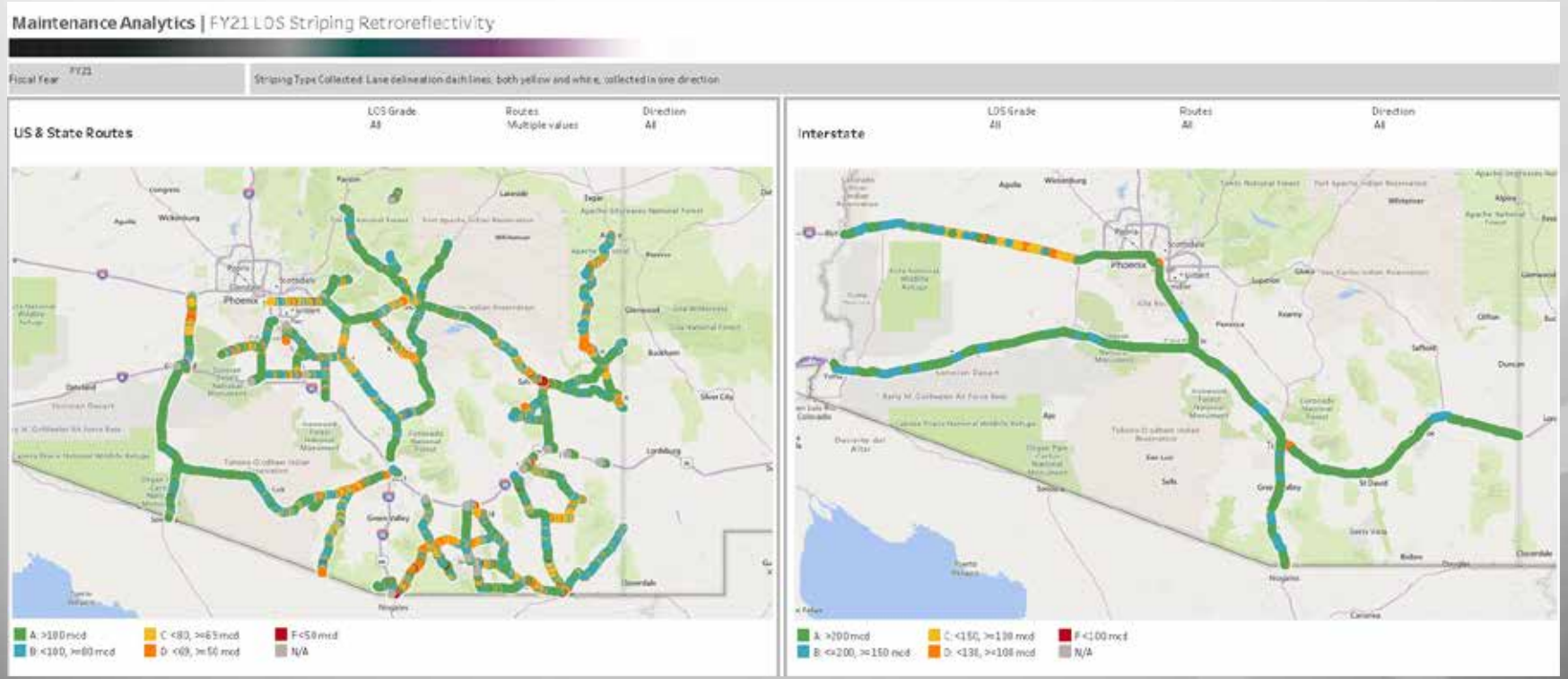


I-17 Freeway Wrong Way Driver Detection



Traffic Signal Communications

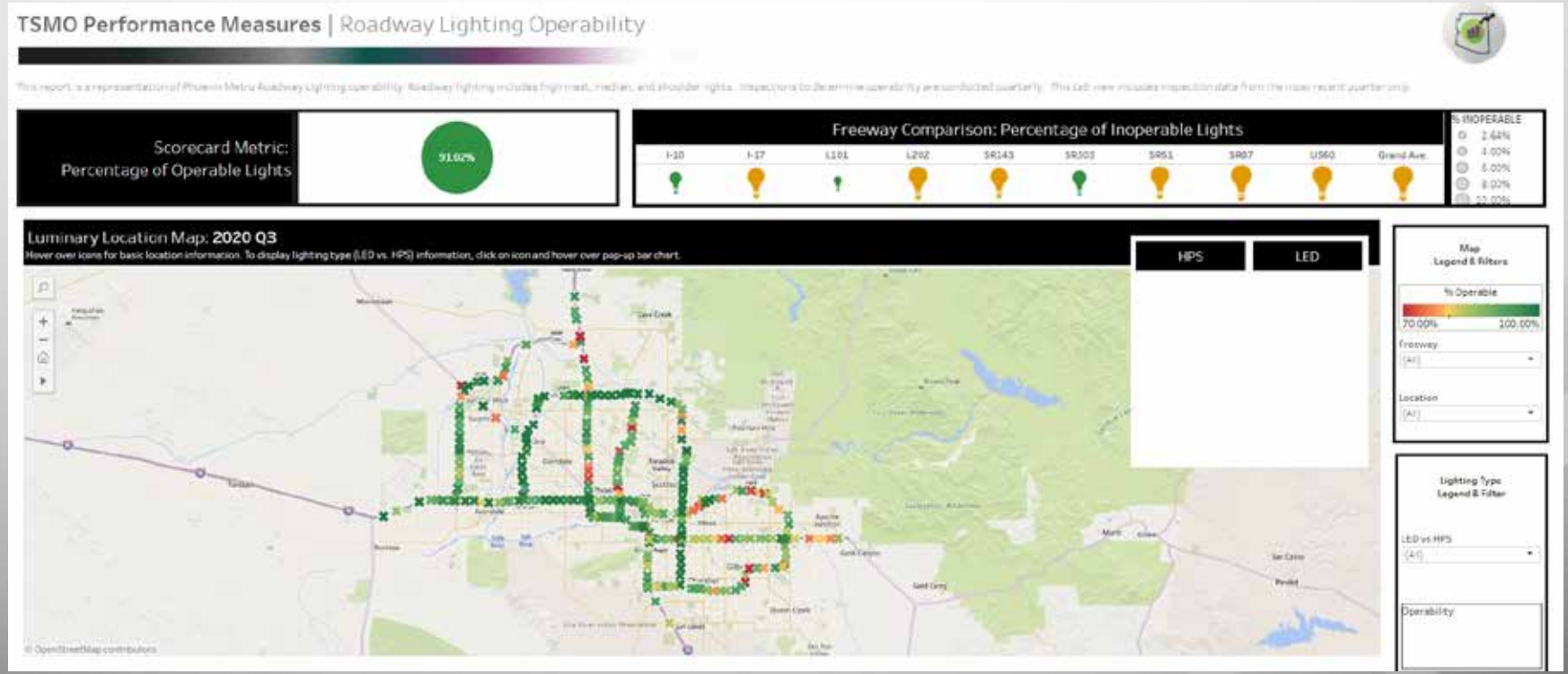
Roadway Striping Retroflectivity



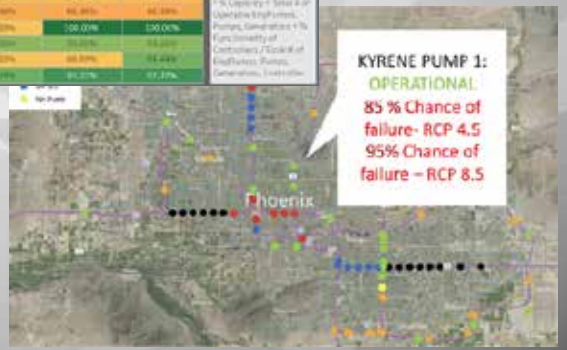
Roadway Sign Replacement

	Total Number of Signs Replaced in Month	Central Remain Number of Signs to be Replaced	Central % of Total in Given Month
Grand Total	**1,489.00**	**-489.00**	**149.90%**
June 2020	72.00	928.00	7.23%
May 2020	147.00	781.00	14.70%
April 2020	264.00	517.00	26.42%
March 2020	87.00	430.00	8.73%
February 2020	113.00	318.00	11.20%
January 2020	218.00	100.00	21.80%

Freeway Lighting Operability

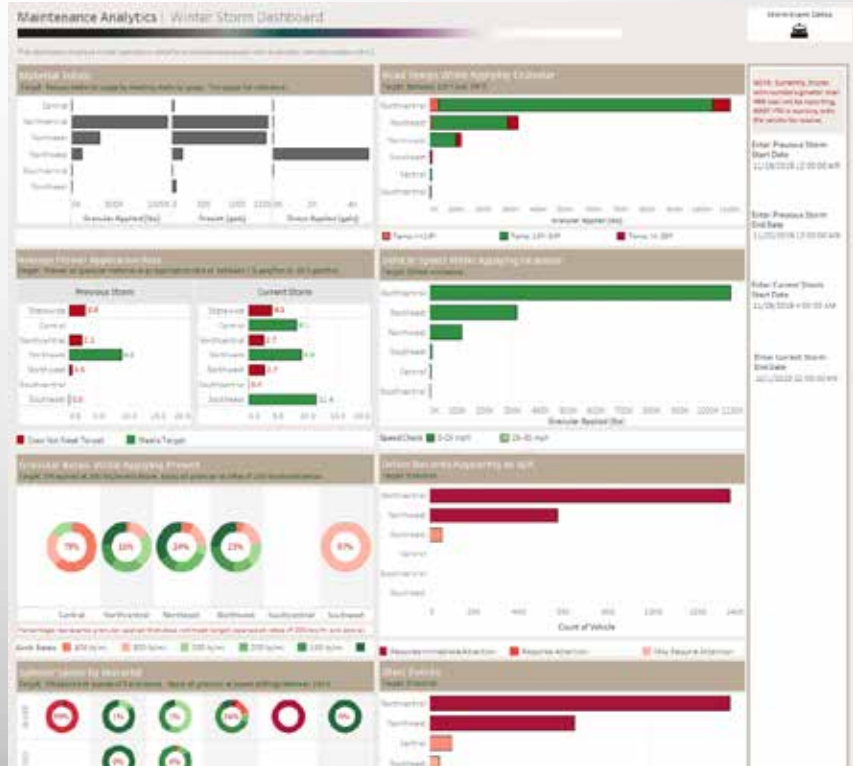


Freeway Pump Station Operations

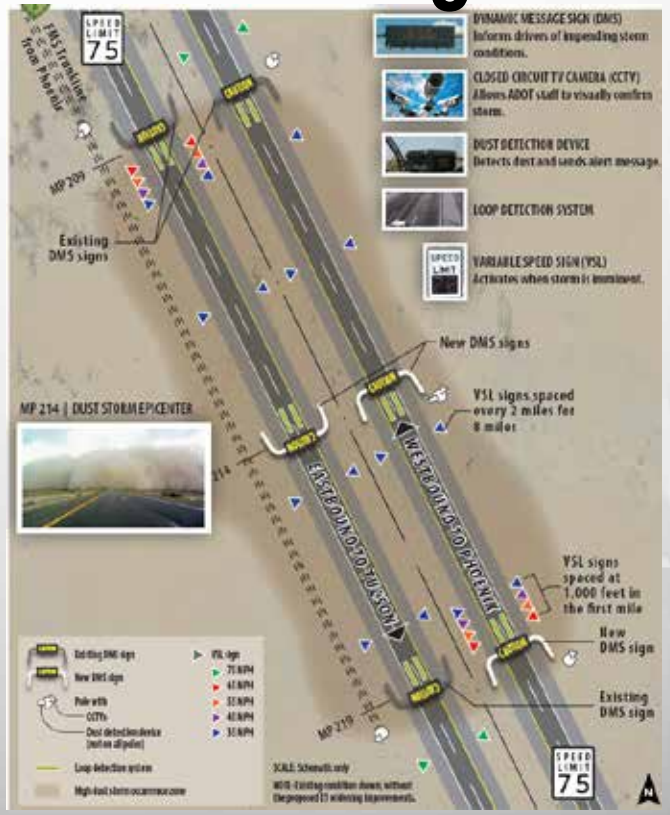


- Developing a predictive model of probability of pumping station failure
- Scenario analysis decision-support tool

Winter Storm Management



Dust Storm Management

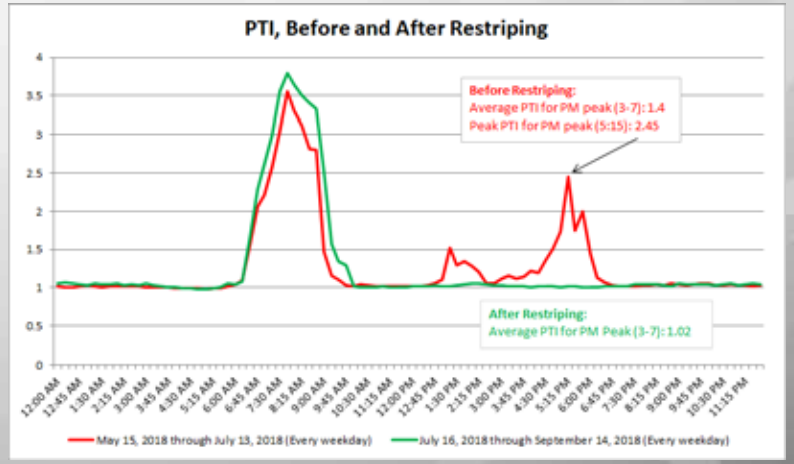


Best Practices and Innovation

- Bottleneck mitigation
- Low-Cost/High Impact Improvements
- 30 crashes per month to less than 1 per month = **90% reduction**
- Cost $276,000
- **Planning Time Index 2.45 to 1.02**
- **Benefit/Cost Ratio 850:1**

6’ shoulder/12’ lane/10’ shoulder

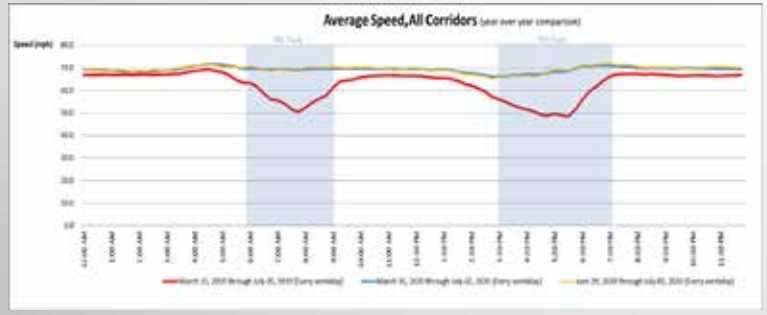
2’ shoulder/12’ lane/12’ lane/2’ shoulder



COVID Traffic Impacts – Phoenix Region Freeways

Average Speed and Volume Year-Over-Year Comparison

March 15 2020 through July 2 2020



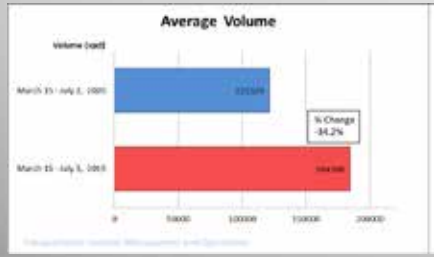
Traffic Volume

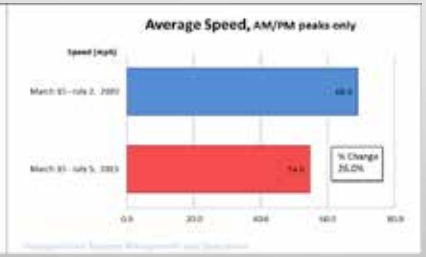
- **34.2% change**

Operational Speed

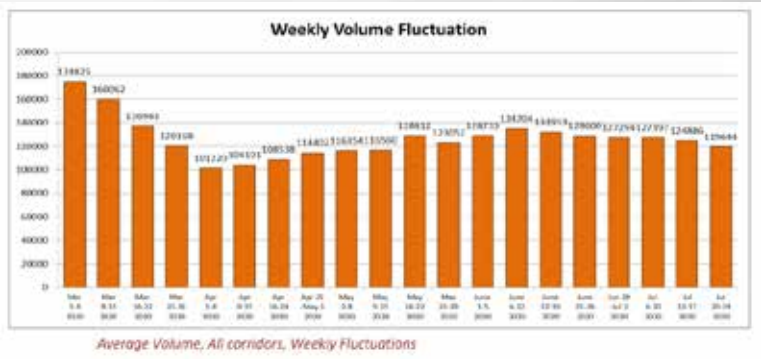
- **26.0% change**

Data sources: INRIX and RADS





Average Weekday Traffic Volume



Average Volume, All corridors, Weekly Fluctuations

Questions?

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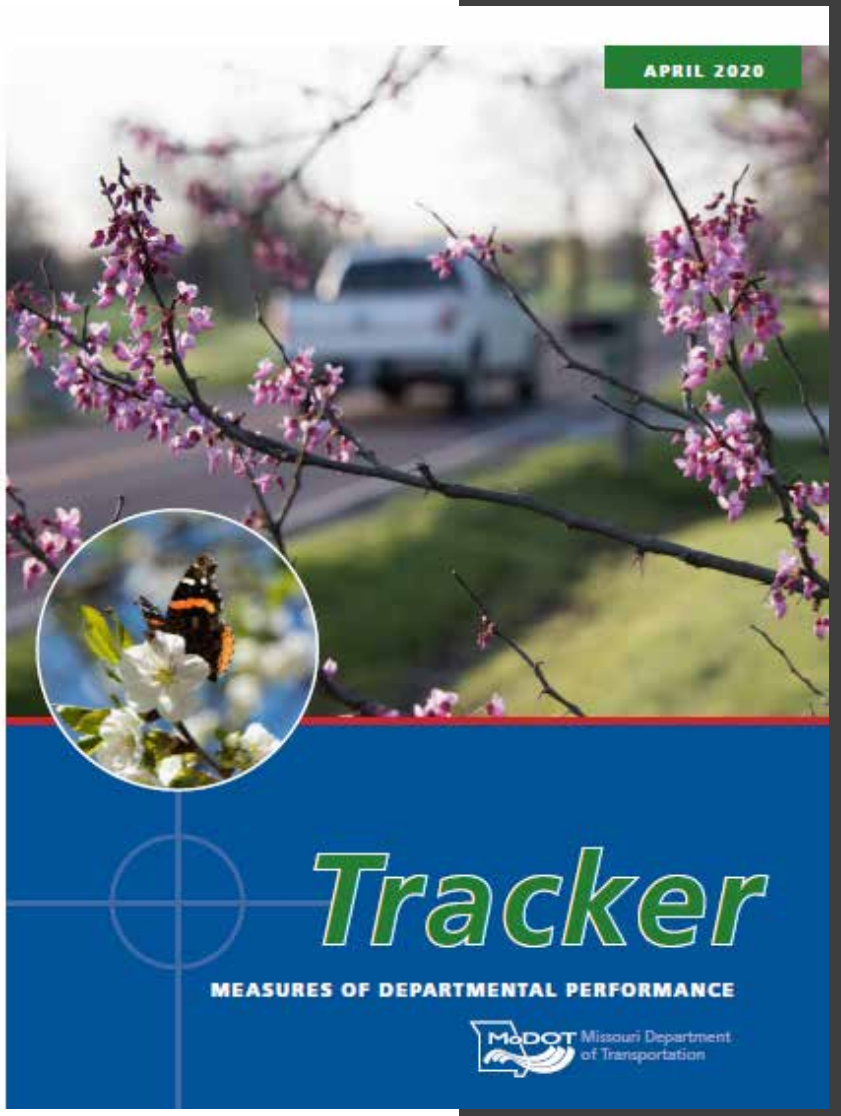


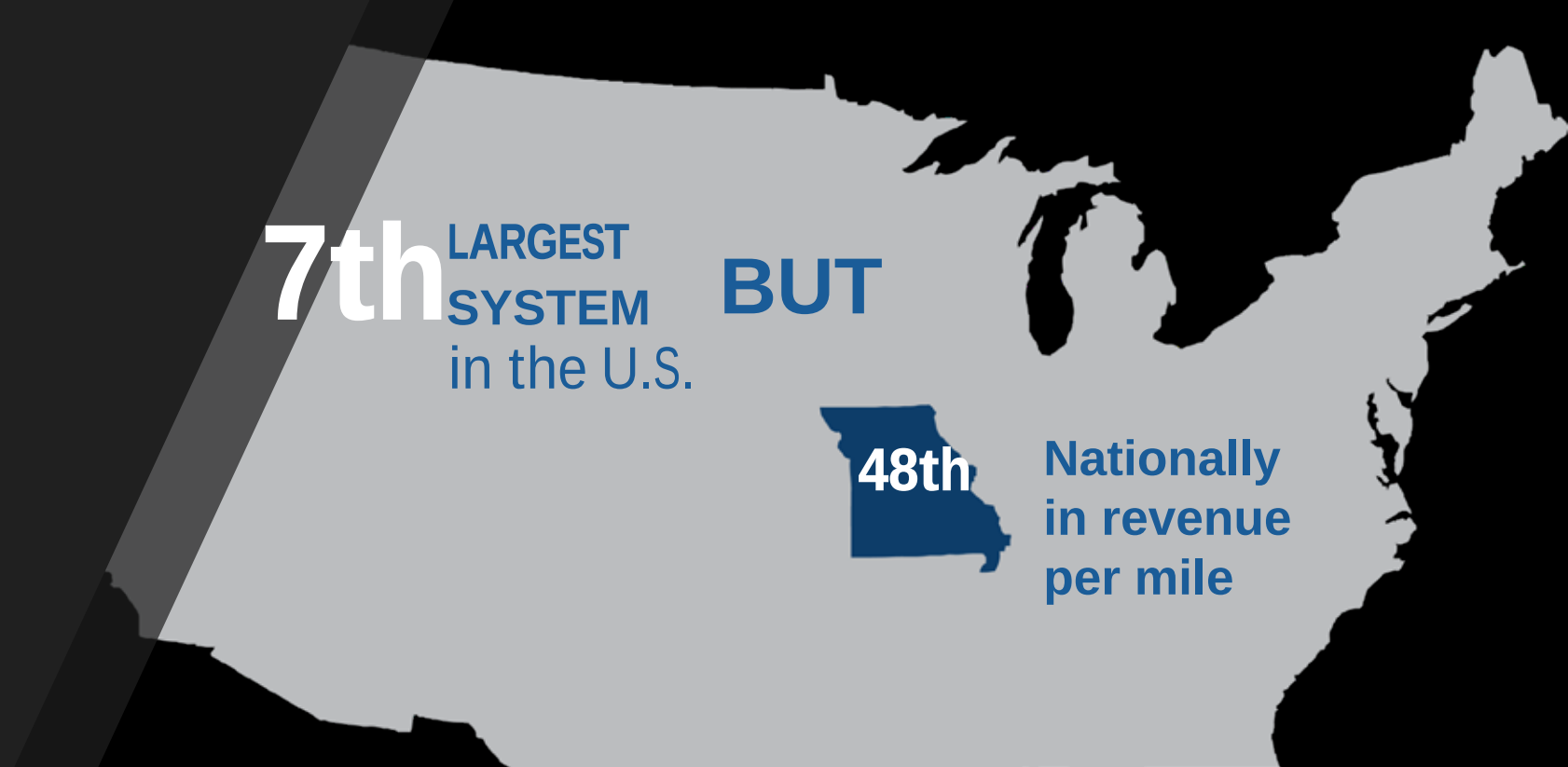
MEASURES OF PERFORMANCE FOR

Operating a Reliable Transportation System

Missouri Department of Transportation
Nicole Hood
July 30, 2020

WHO IS MODOT

- Commission
- 34,000 miles
- Priority
  - Take care of existing



TRACKER

Safety

- Moving Missourians Safely

Service

- Providing Outstanding Customer Service
- Delivering Efficient and Innovative Transportation Projects
- Operating a Reliable Transportation System

Stability

- Managing our Assets
- Stabilizing Resources and Engaging our Workforce
- Building a prosperous economy for all Missourians

Operating a Reliable Transportation System - Chapter 4

ourians expect to get to their destinations on time,
delay regardless of their choice of travel mode.

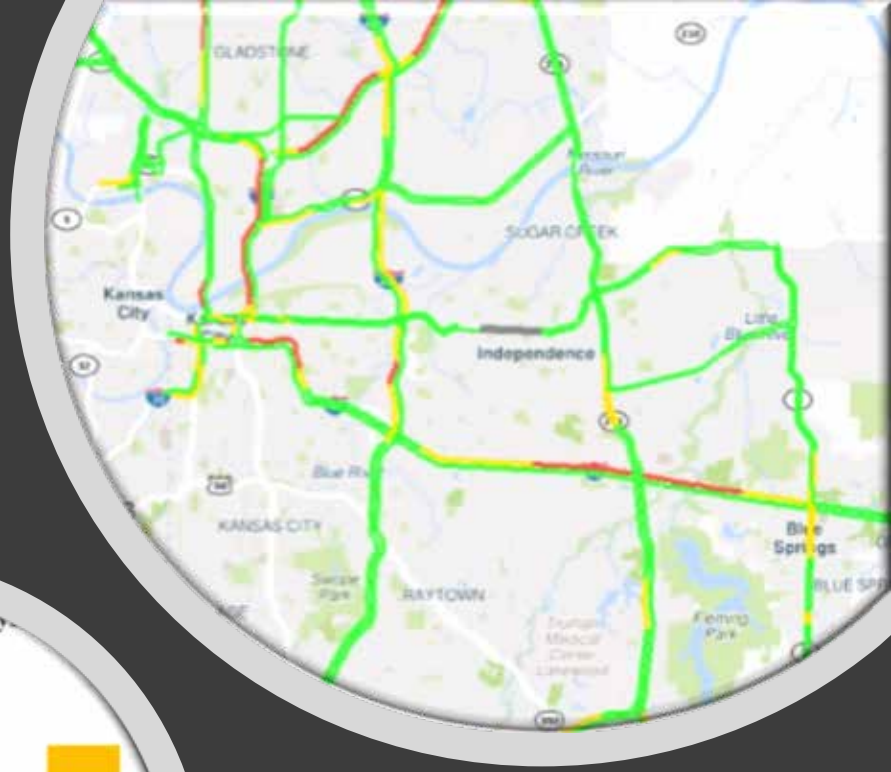
1ST QUARTER 2020

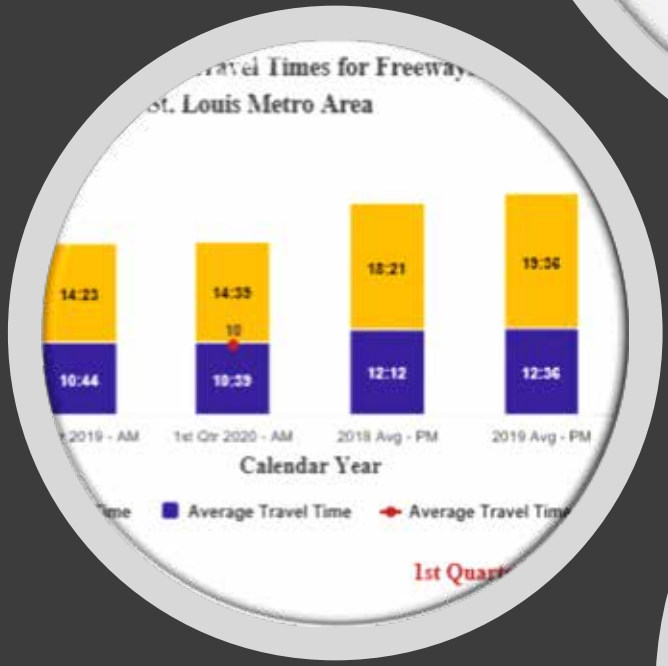
PERFORMANCE MEASURES

- Reliability on Major Routes
- Cost and Impact of Traffic Congestion
- Average Time to Clear Traffic Incidents
- Unplanned Incident Impacts on Major Interstate Routes
- Work zone Delays to the Traveling Public
- Winter Storm Operations

RELIABILITY on MAJOR ROUTES

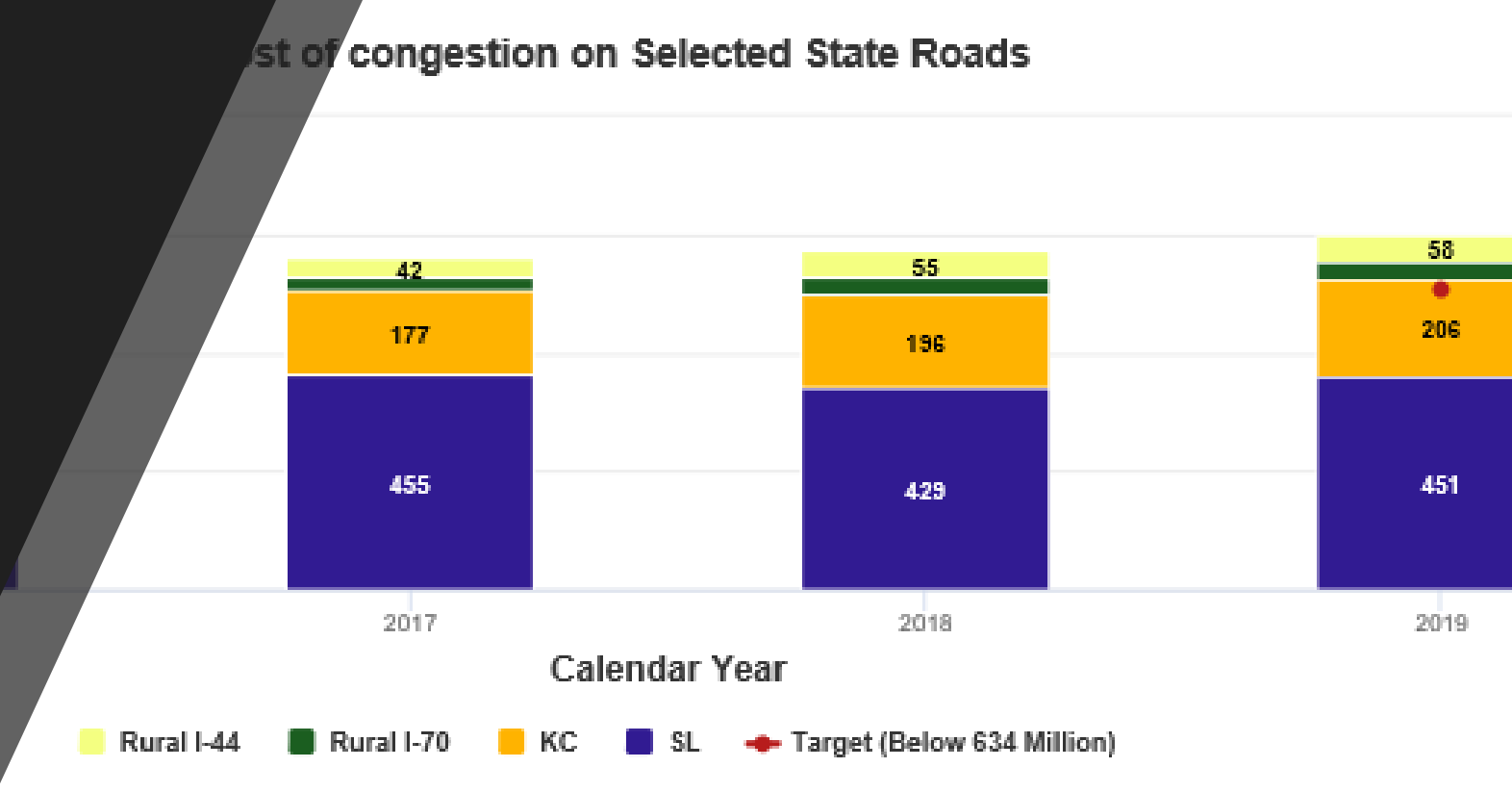
Knowing the trends of travel times in major cities such as Kansas City and St. Louis helps travelers better plan their commutes.



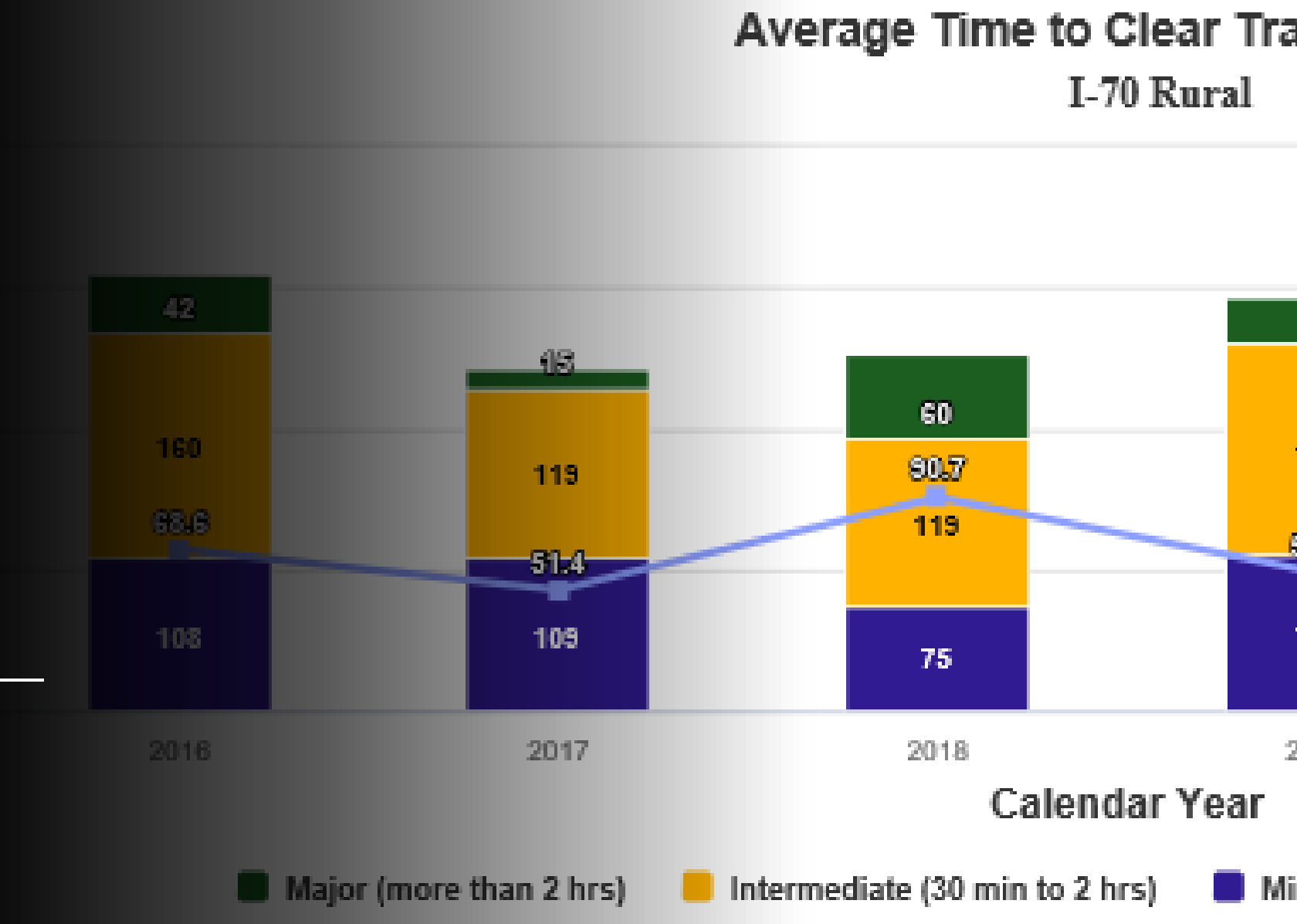


CONGESTION

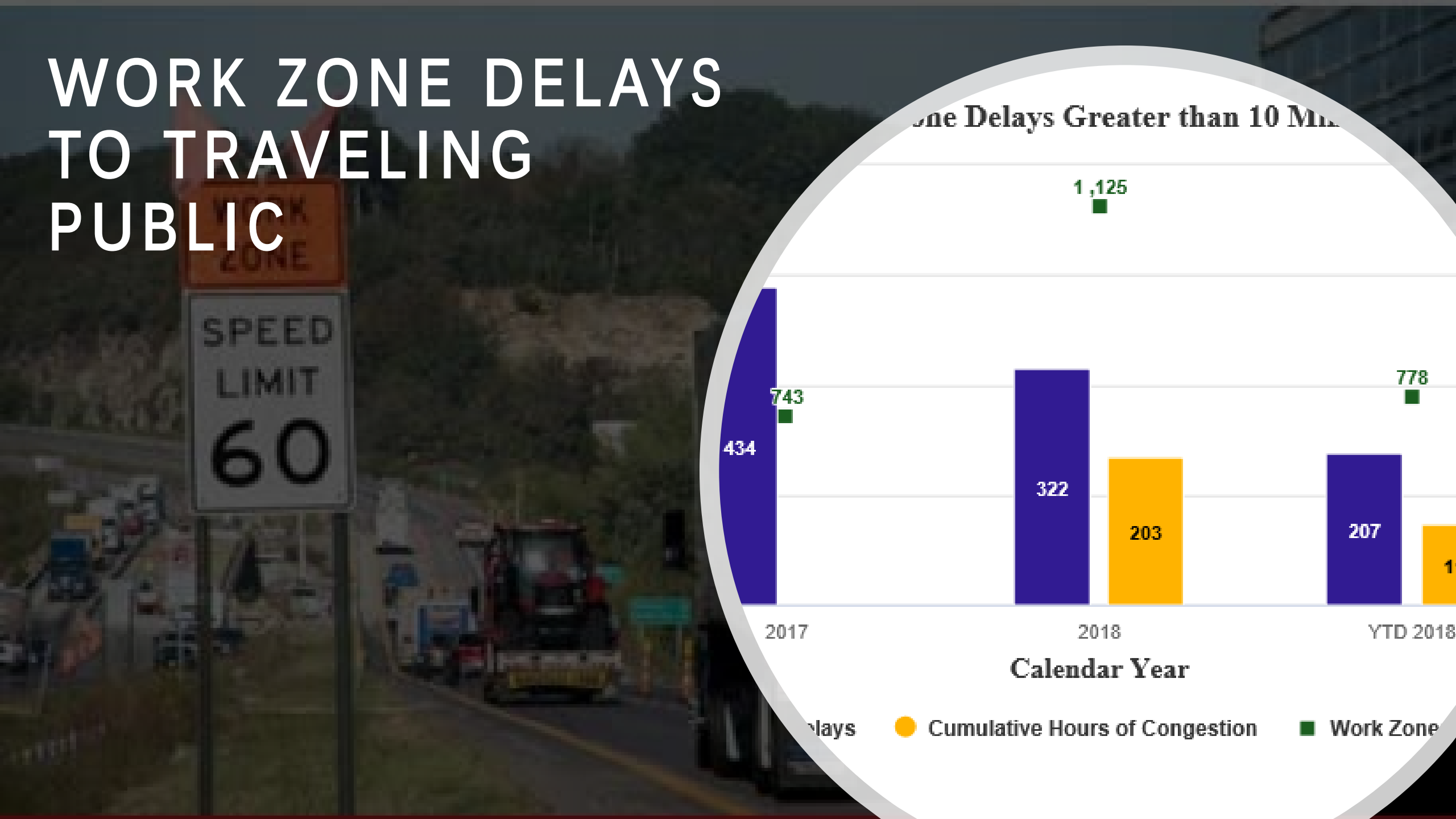
Annual cost and impact of traffic congestion to motorists for user delays and vehicle miles traveled



AVERAGE TIME TO CLEAR TRAFFIC INCIDENTS



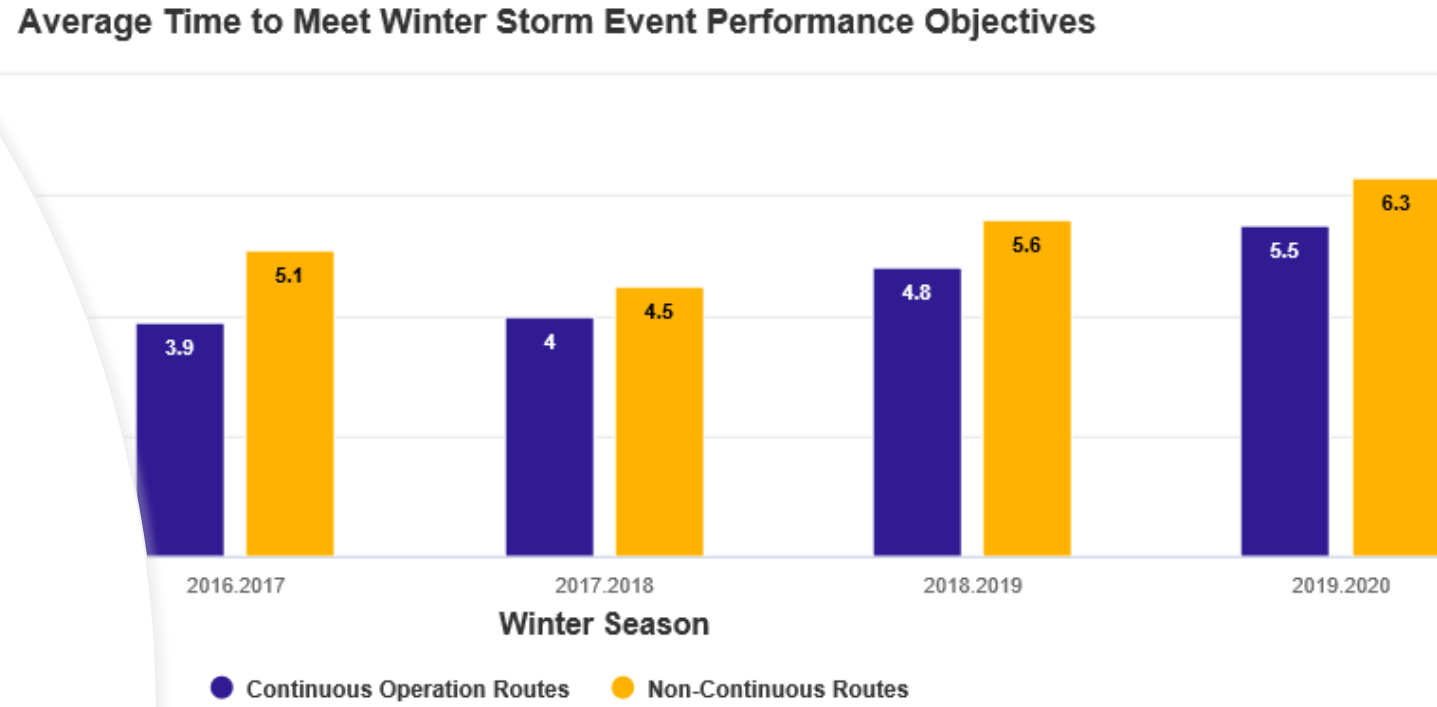
WORK ZONE DELAYS TO TRAVELING PUBLIC



WINTER STORM OPERATIONS

Tracks the amount of time needed to perform MoDOT's snow and ice removal efforts.

Reviews impacts of significant events and measures taken to minimize impacts.



ON LINE TRACKER COMPONENTS

CHAPTER 4: OPERATING A RELIABLE TRANSPORTATION SYSTEM

1st Quarter 2020

EXPLORE

- Tracker Home
- **Chapter Home**
  - Reliability on Major Routes -4a
  - Cost & Impact of Traffic Congestion -4b
  - Average Time to Clear Traffic Incidents -4c
  - Unplanned Incident Impacts on Major Interstate Routes -4d
  - Work Zone Impacts to Traveling Public -4e
  - Winter Storm Operations -4f
- Tracker Archive

Operating a Reliable Transportation System - Ch. 4

Reliability on Major Routes -4a

Knowing the trends of travel times in major cities such as Kansas City and St. Louis helps travelers better plan their commutes.

1ST QUARTER 2020

Cost & Impact of Traffic Congestion-4b

Recurring congestion occurs at regular times, although the traffic jams are not necessarily consistent day-to-day.

1ST QUARTER 2020

MoDOT Performance Highlights

www.modot.org/tracker

SAFETY

- 5% MORE ROADWAY FATALITIES THAN LAST YEAR
- 1% MORE EMPLOYEE-RECORDABLE INCIDENTS
- 88% SEAT BELT USE IN 2019

SERVICE

- 81% CUSTOMERS SATISFIED WITH MODOT CUSTOMER SERVICE
- 21% INCREASE IN SOCIAL MEDIA ENGAGEMENTS
- RUSH HOUR TRAVEL TIMES
  - KC: -5.1%
  - SL: -5.3%
- 88% PROJECTS COMPLETED ON TIME

STABILITY

- 13% EMPLOYEE TURNOVER PROJECTED FOR FY20
- 92% MAJOR HIGHWAYS IN GOOD CONDITION
- 909 BRIDGES IN POOR CONDITION

BUCKLE UP PHONE DOWN

TRACKER ONLINE

The Missouri Department of Transportation

Regional and Cross Border Performance Measures

Athena Hutchins, P.E.

Niagara International Transportation Technology Coalition

Presentation Overview

1. About NITTEC
2. Performance Measures for Operations
3. Performance Measures at the International Border
4. 2019 vs. 2020: Impacts of COVID-19 on Transportation Trends

NITTEC Coalition

- Established in 1995 with a Federal Mobility Grant
- Regional Collaboration and Leadership
  - Technology Deployment
  - Operations
  - Incident Management
  - Traveler & Traffic Information
- Multi-Agency Transportation Operations Coalition
  - 5 Policy Members, 9 General Members, 28 Affiliate Members
    - Transportation Agencies
    - Public Safety and Border Enforcement
    - Emergency Services and Recovery
  - Only Bi-national Coalition of its kind in U.S. / Canada

NITTEC Mission

To improve mobility, reliability and safety on the regional bi-national multimodal transportation network through information sharing and coordinated management of operations.

NITTEC Functions

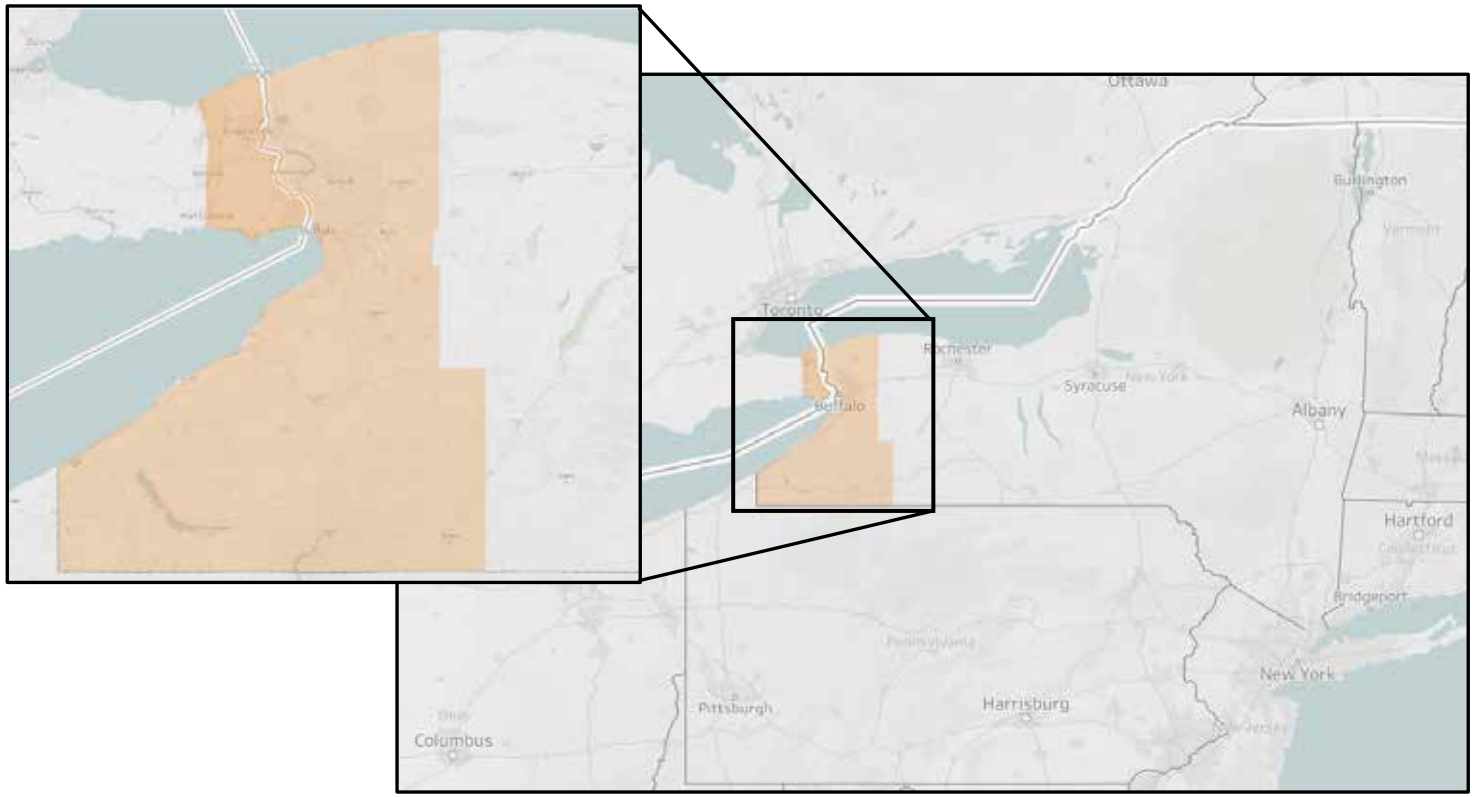
- Multi-agency Collaboration
- Traveler Information
- Border Traffic Management
- Emergency Management
- Incident Management
- Construction Coordination
- Traffic and Congestion Management
- Weather System Monitoring
- Special Event Planning and Management
- Transportation System Monitoring
- Performance Measures Reporting

NITTEC Operations Center

- Centralized 24/7 operations and traffic management services for bi-national region
- Information Clearinghouse
- Standardized Operations
- Multi-Agency Event Planning and Operations
- Multi-Agency ITS Deployment
- Regional Messaging Standards
- Traffic Management Plans

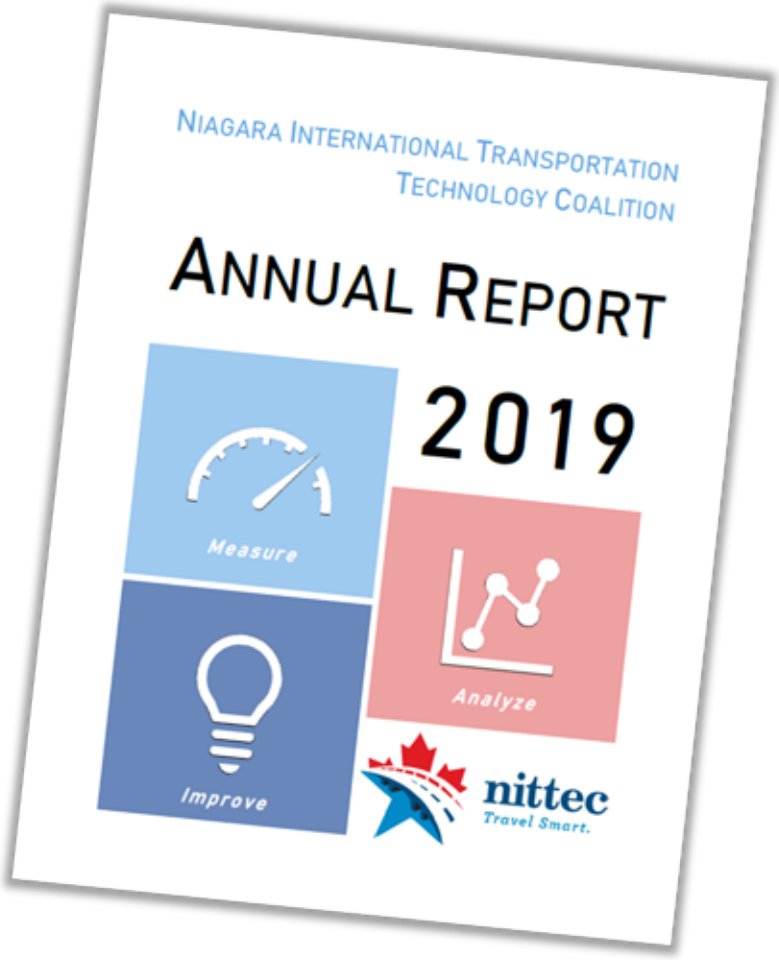
The Buffalo Niagara Region

- Vital International Border Crossing
- Millions of passenger trips and hundreds of thousands of freight trips each year
- Limited border crossing options make delays especially costly
- Need to provide travelers with accurate, real-time information in advance of key decision points

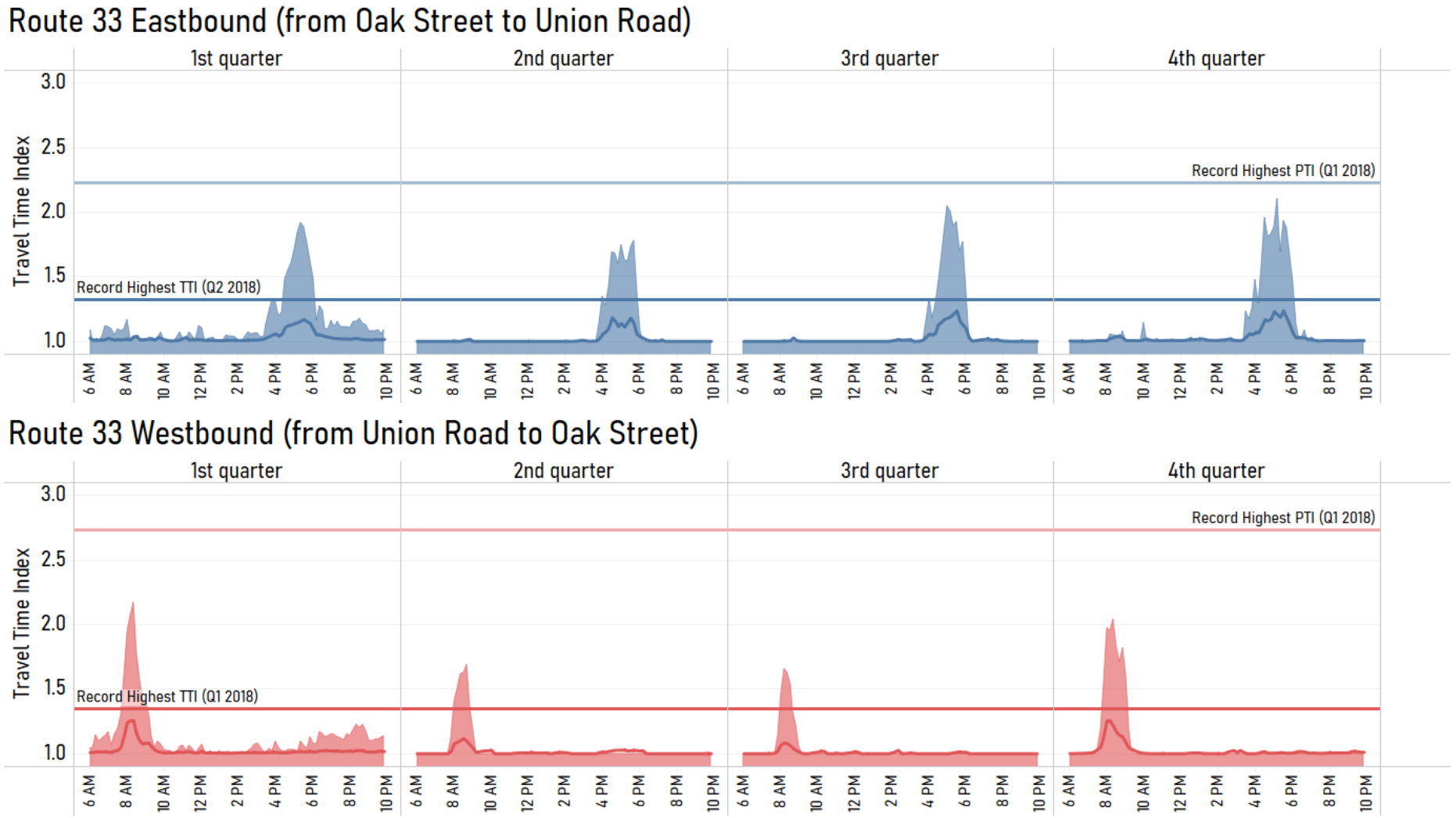


Performance Measures

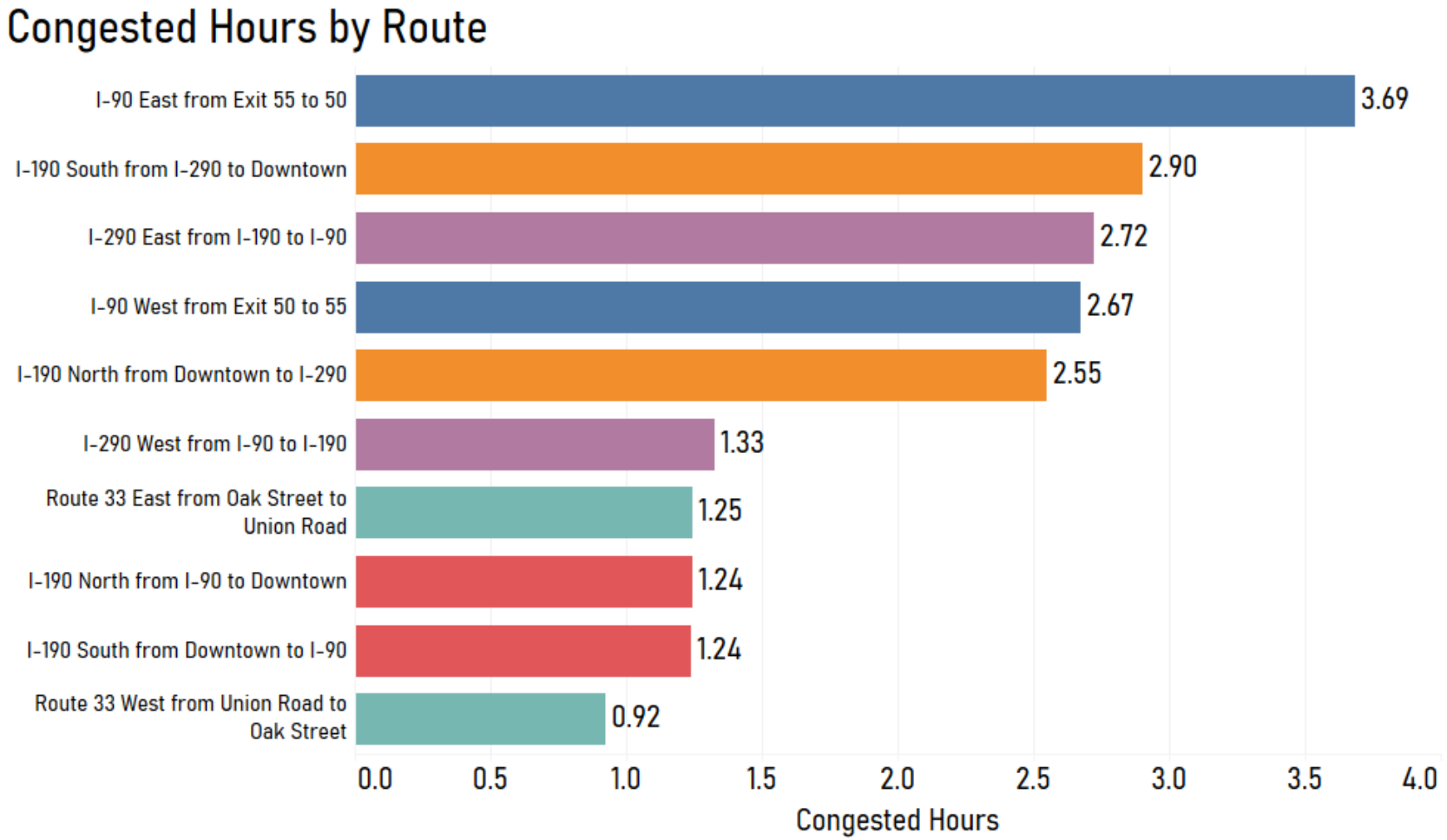
- Regional Performance Measures
  - Mobility (Travel Time Statistics by Corridor)
  - Event Detection & TOC Activity
  - Incident Management
- Cross Border Performance Measures
  - Delay
  - Volume Share
- 2019 vs. 2020
  - Impacts of COVID-19 on Transportation Trends



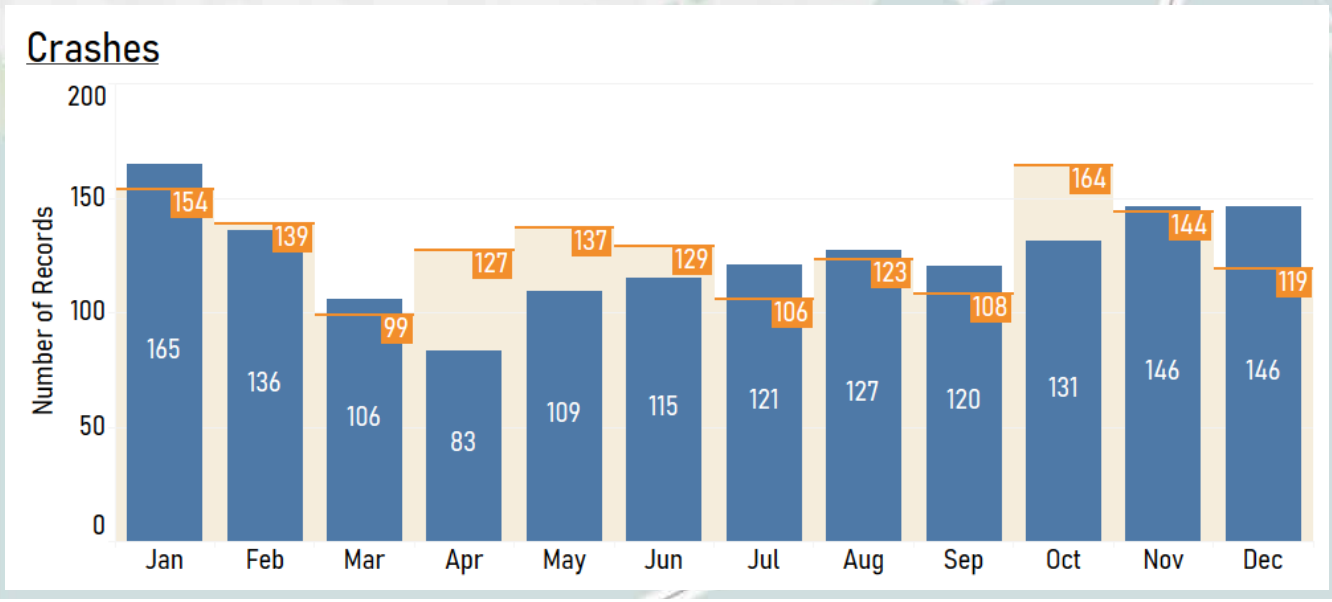
Travel Time & Reliability

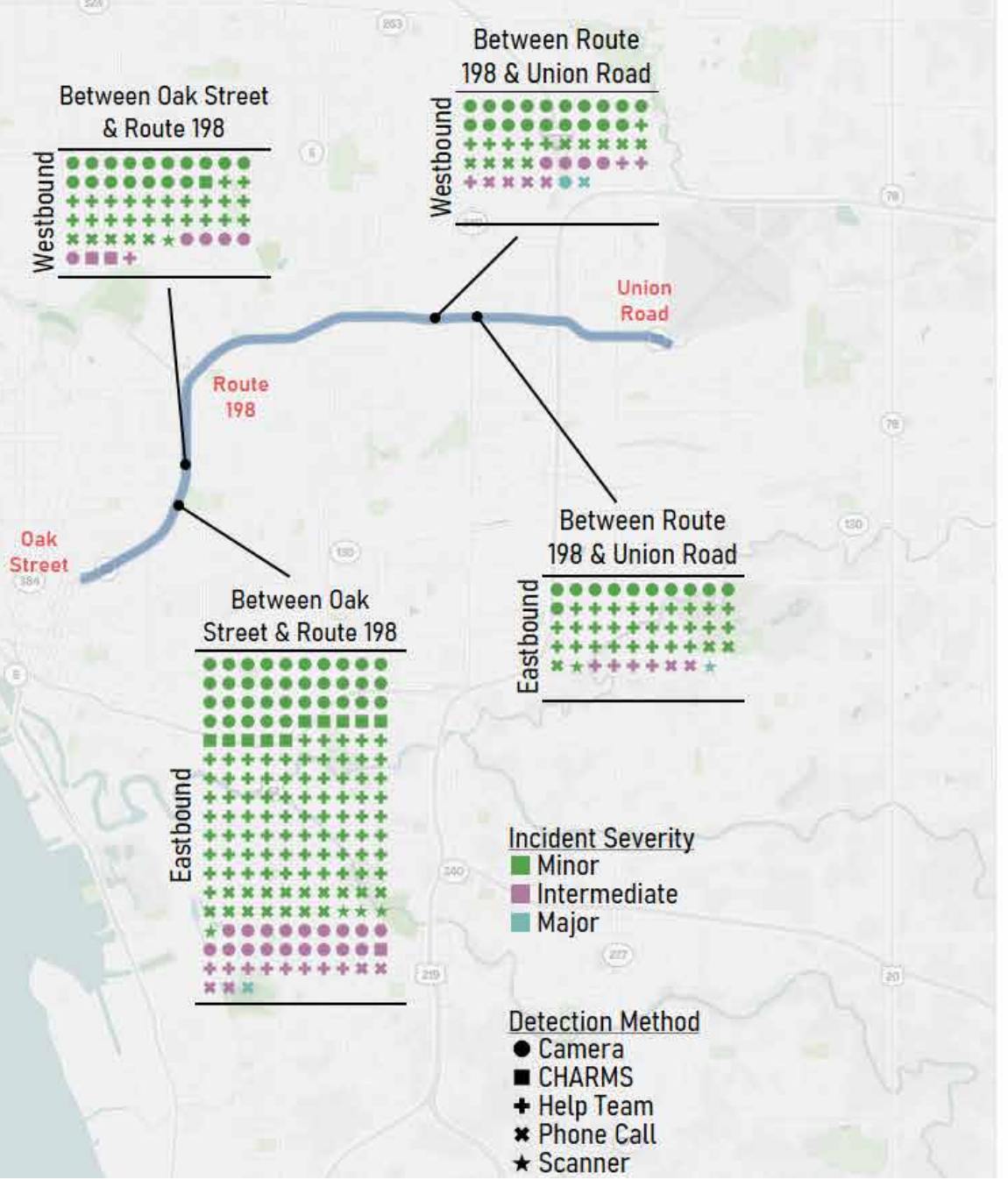


Congestion Metrics

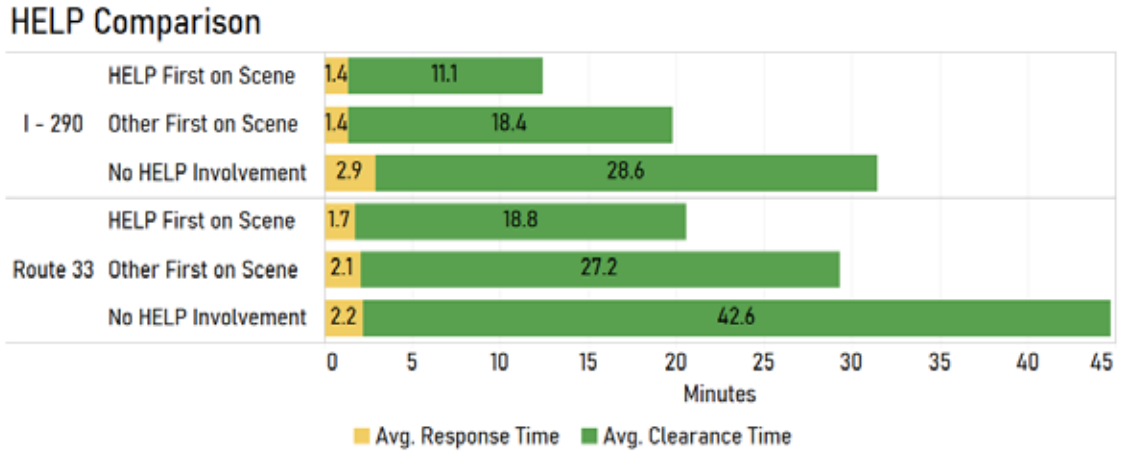


Event Detection





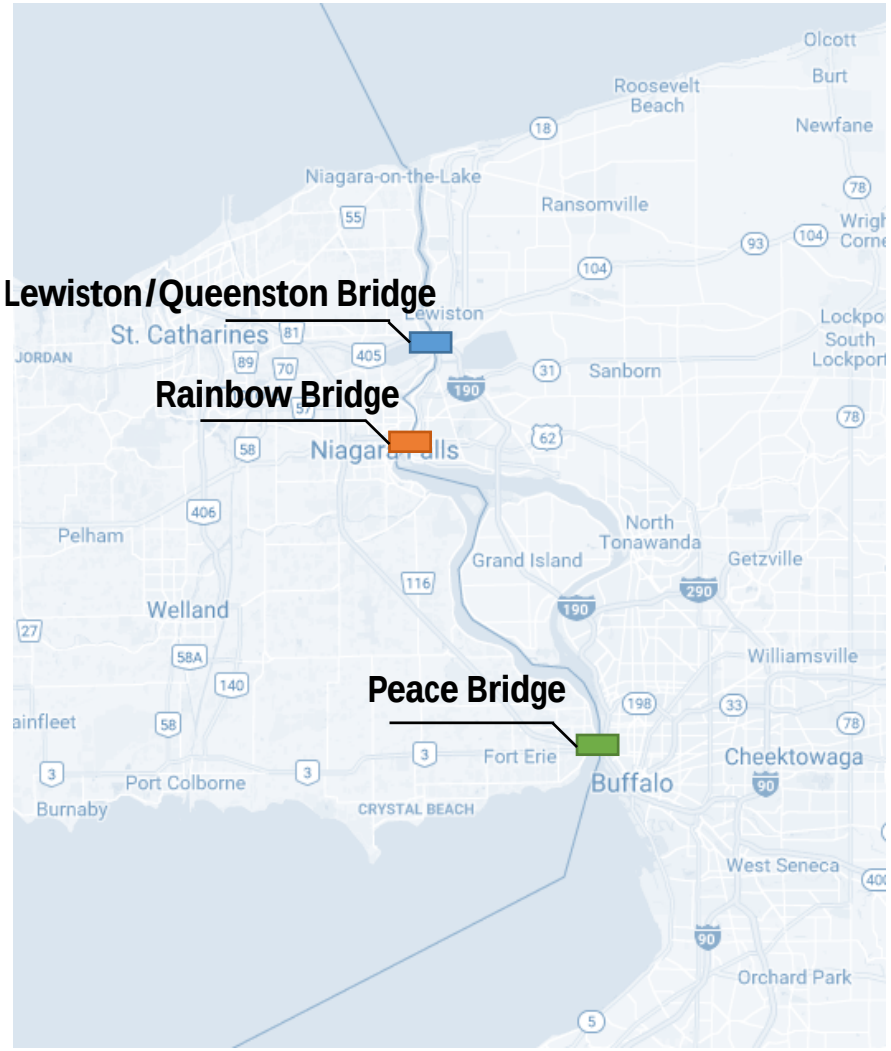
Incident Management

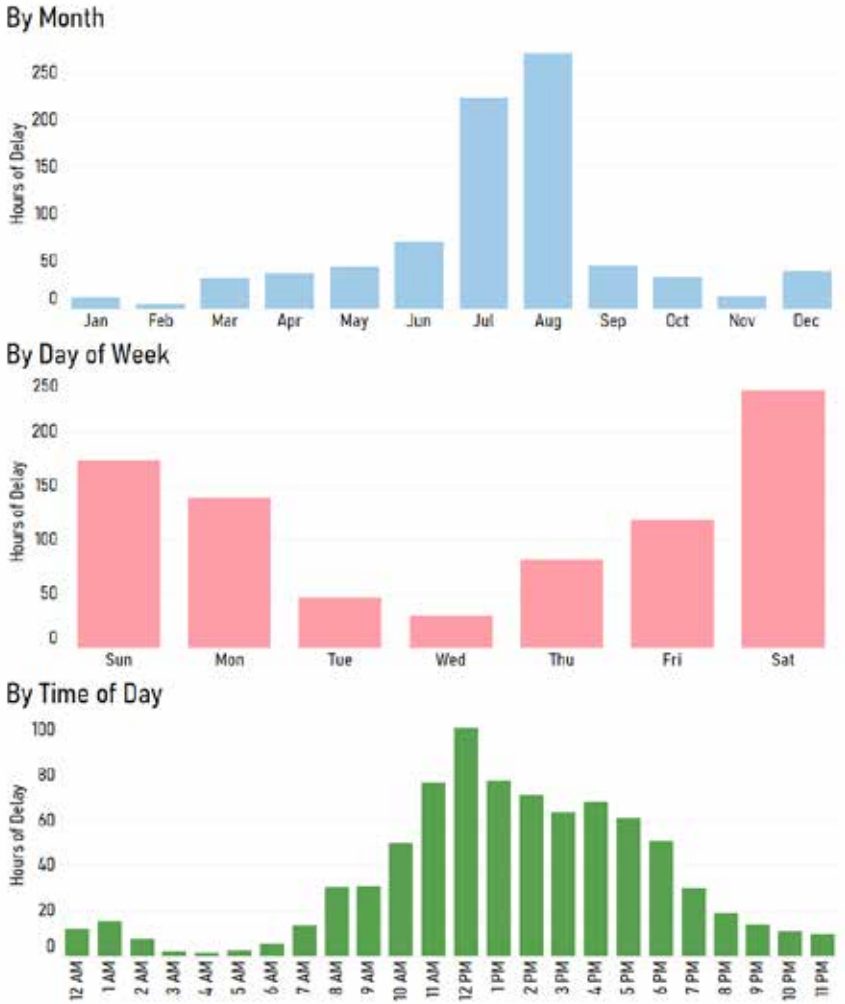


H.E.L.P.

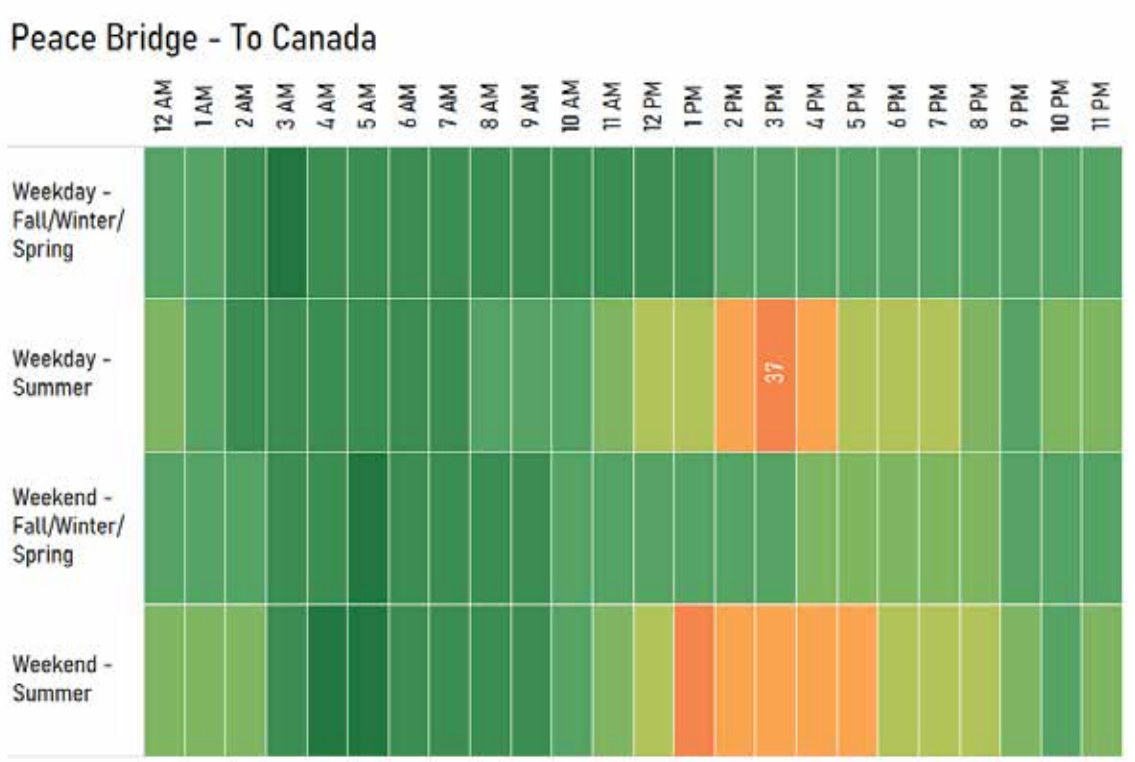
HIGHWAY EMERGENCY LOCAL PATROL

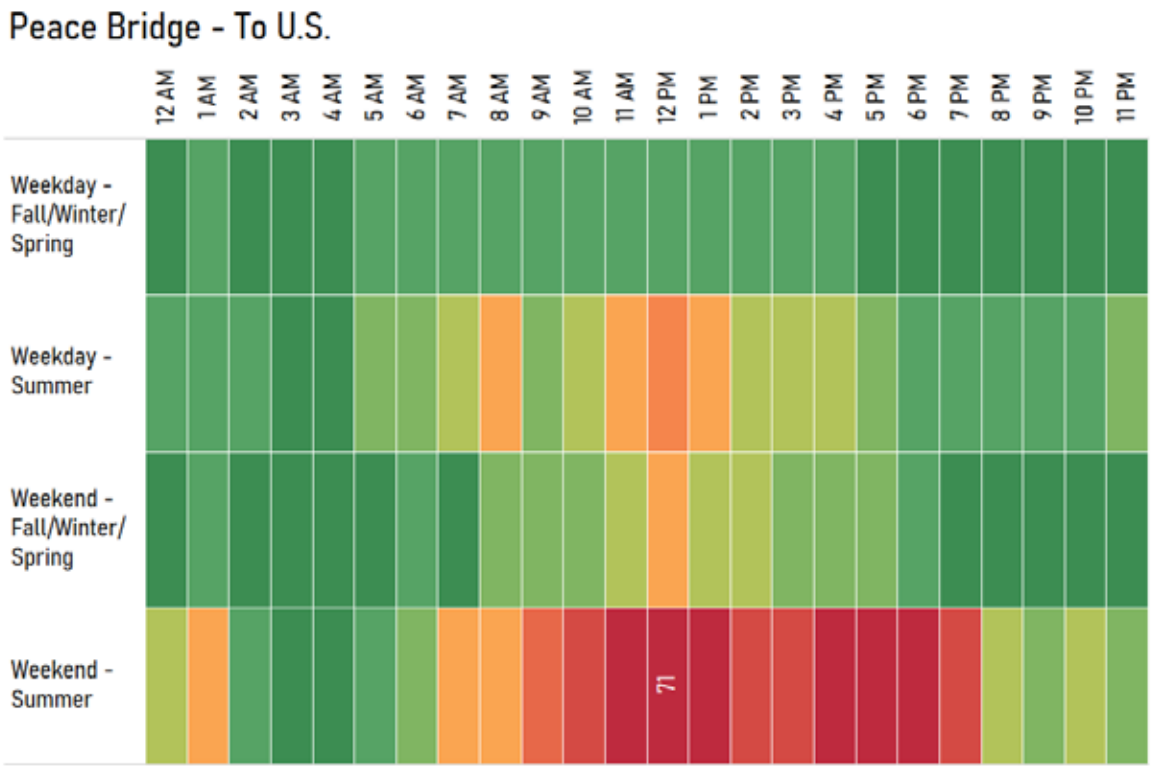
Cross Border Performance Measures - Delay

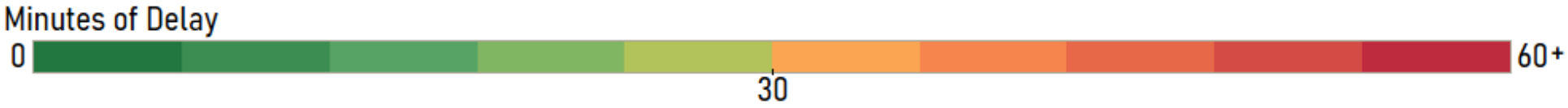




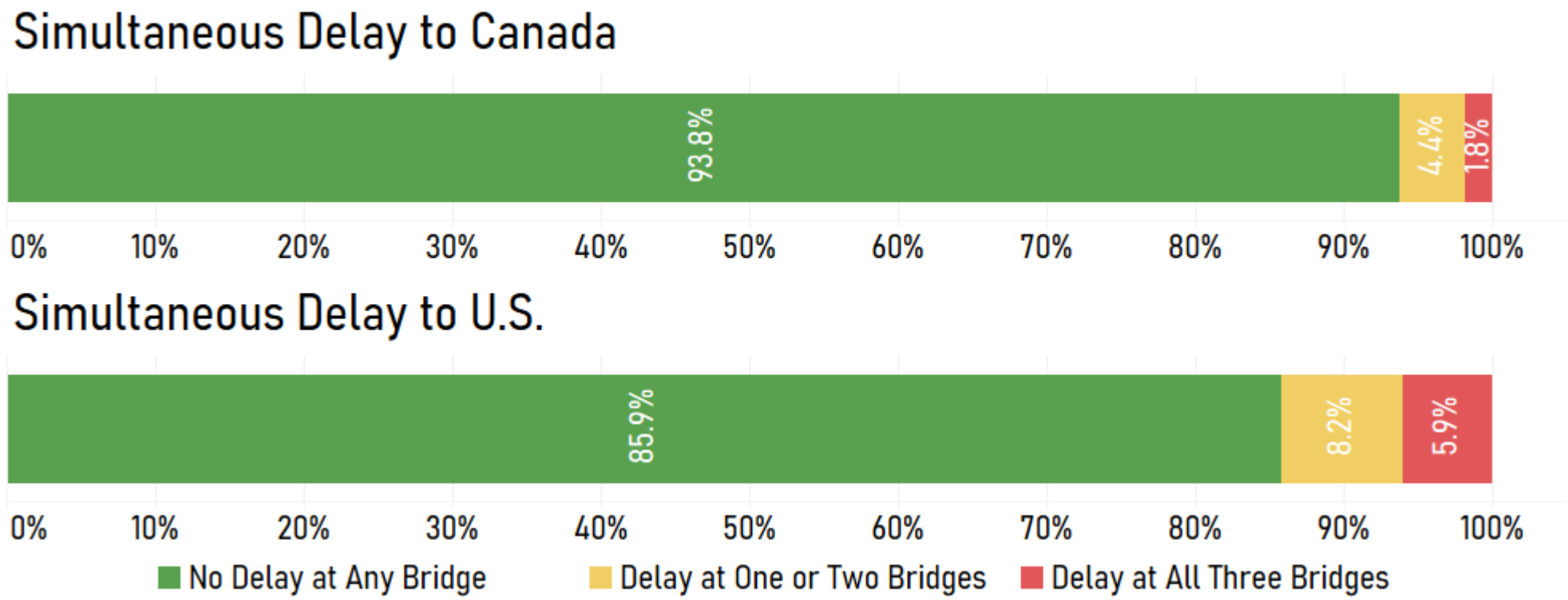
Border Crossing Delay



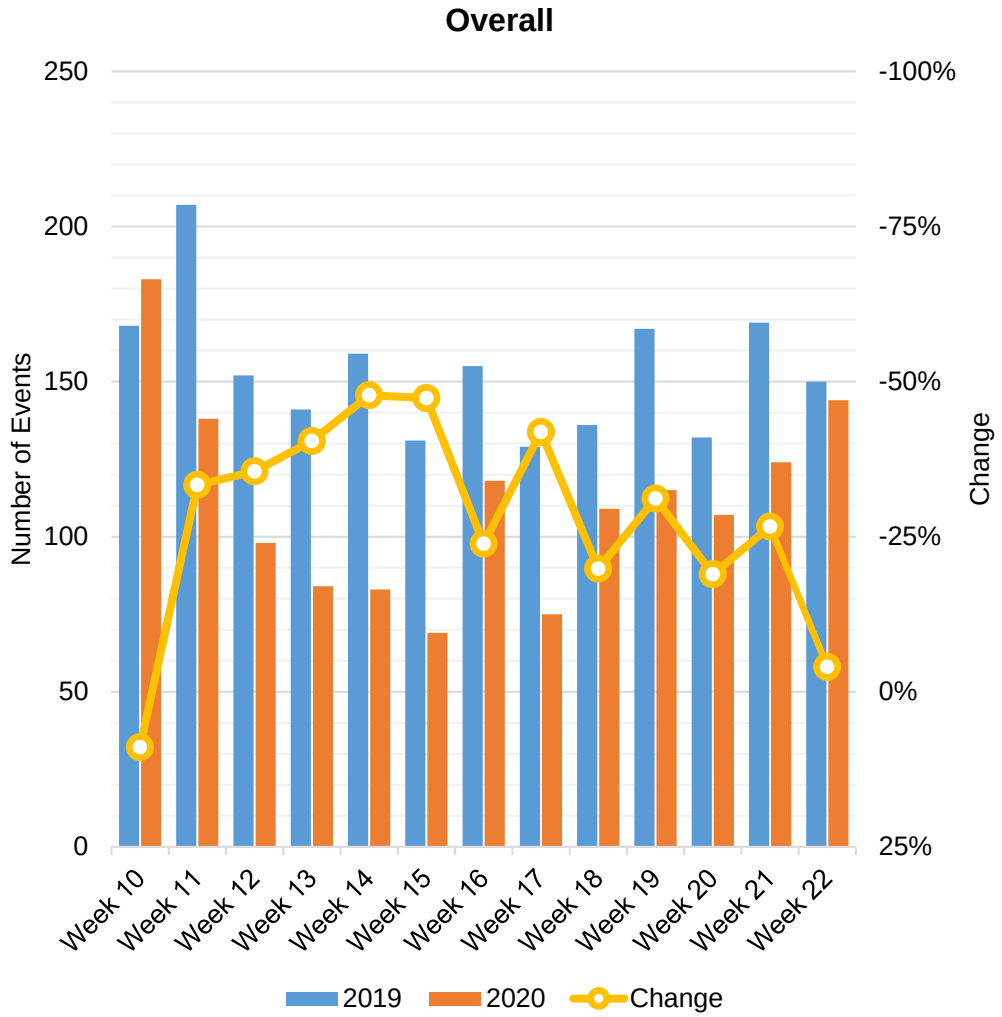


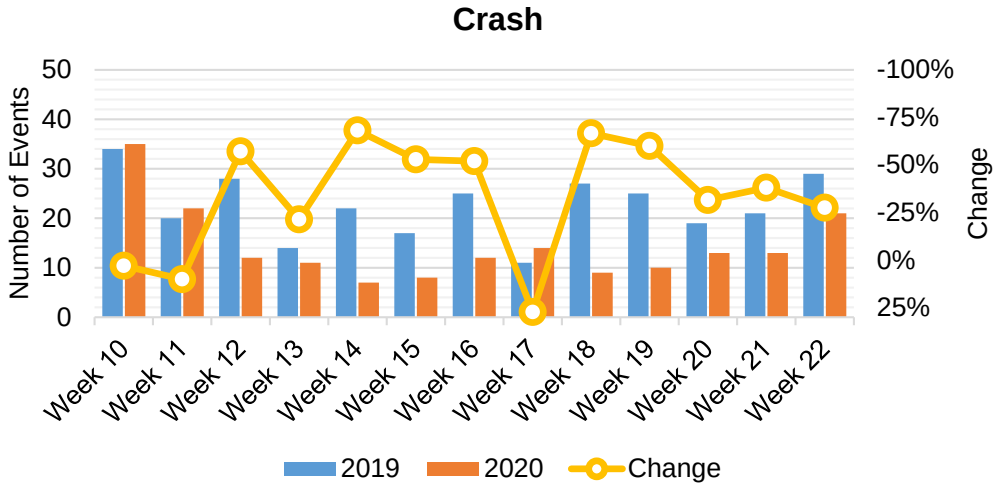


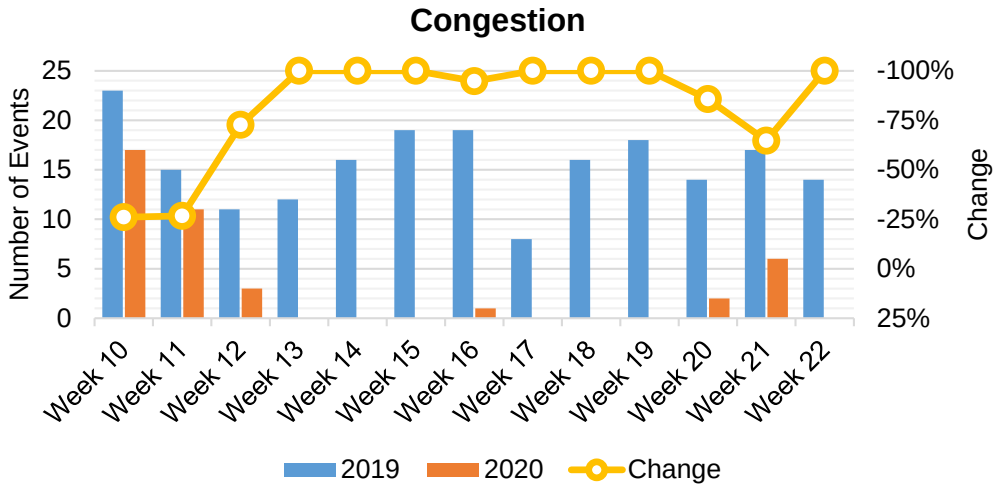
Simultaneous Border Crossing Delay



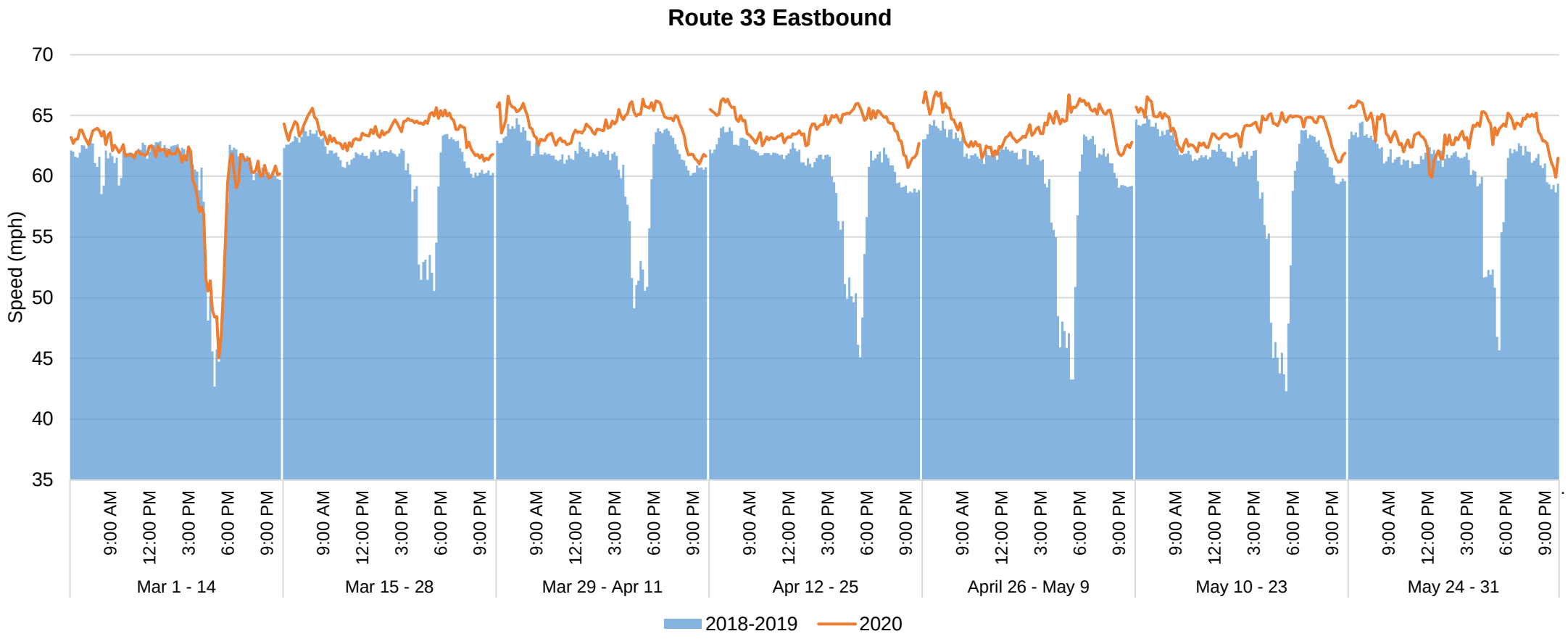
Regional Events – 2019 vs. 2020



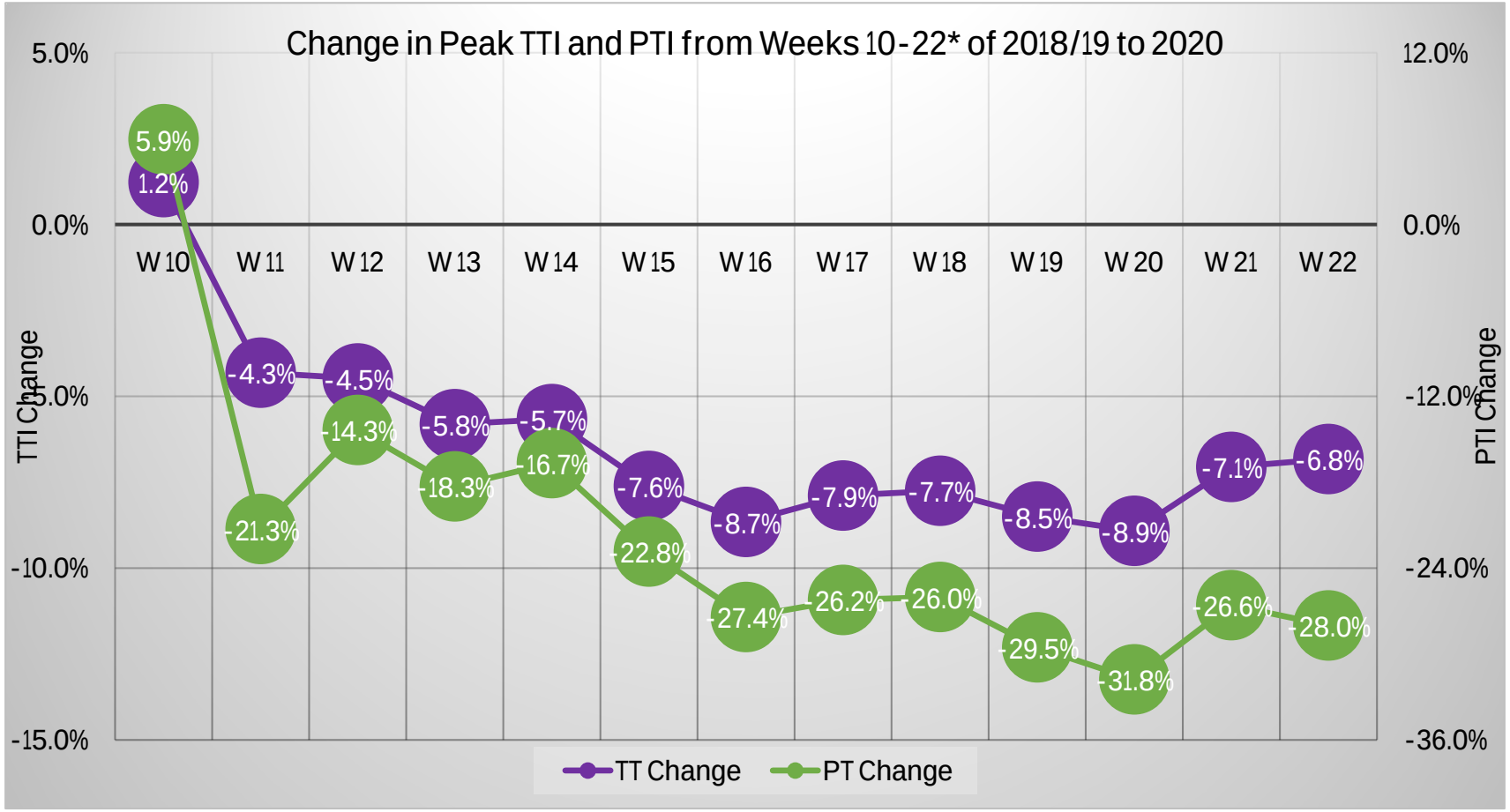




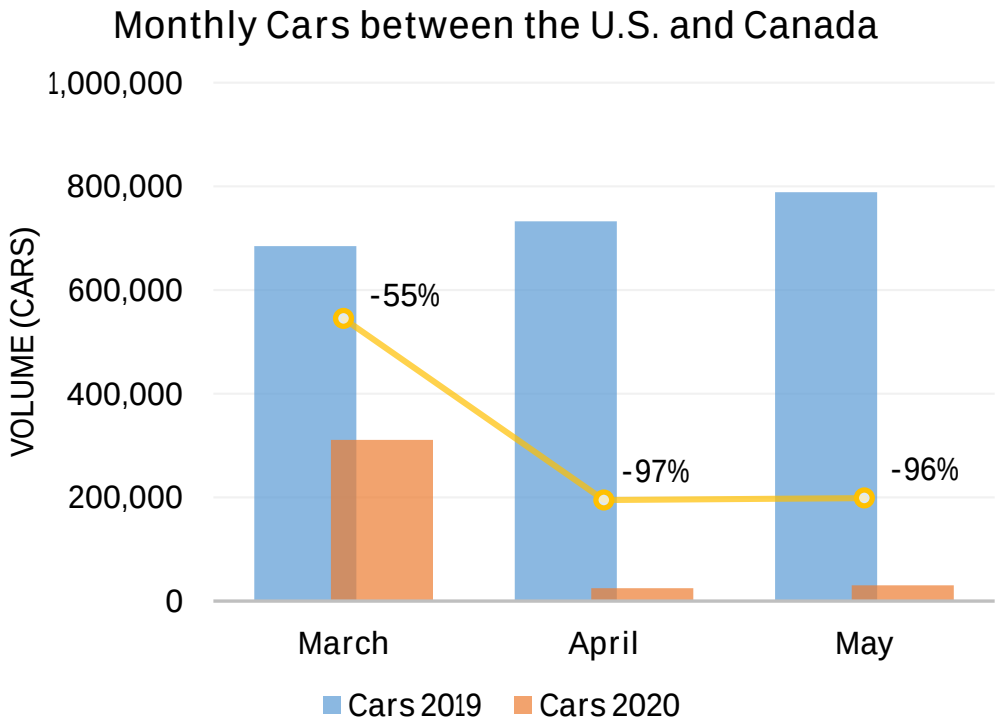
Regional Speed (Example) – 2019 vs. 2020

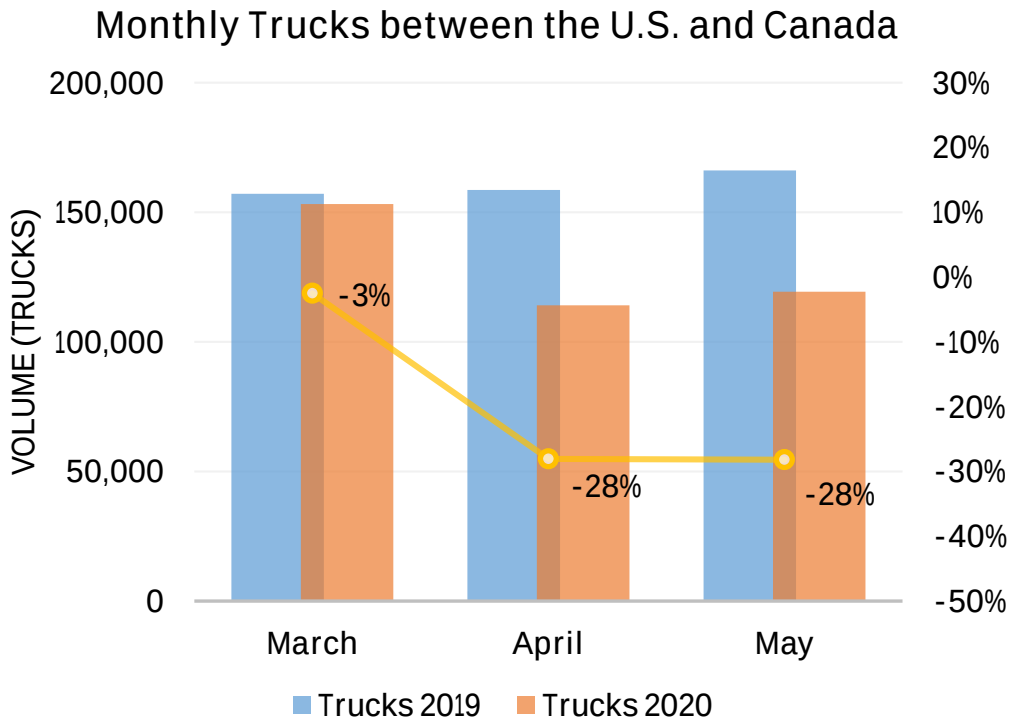


Change in Regional Travel Times

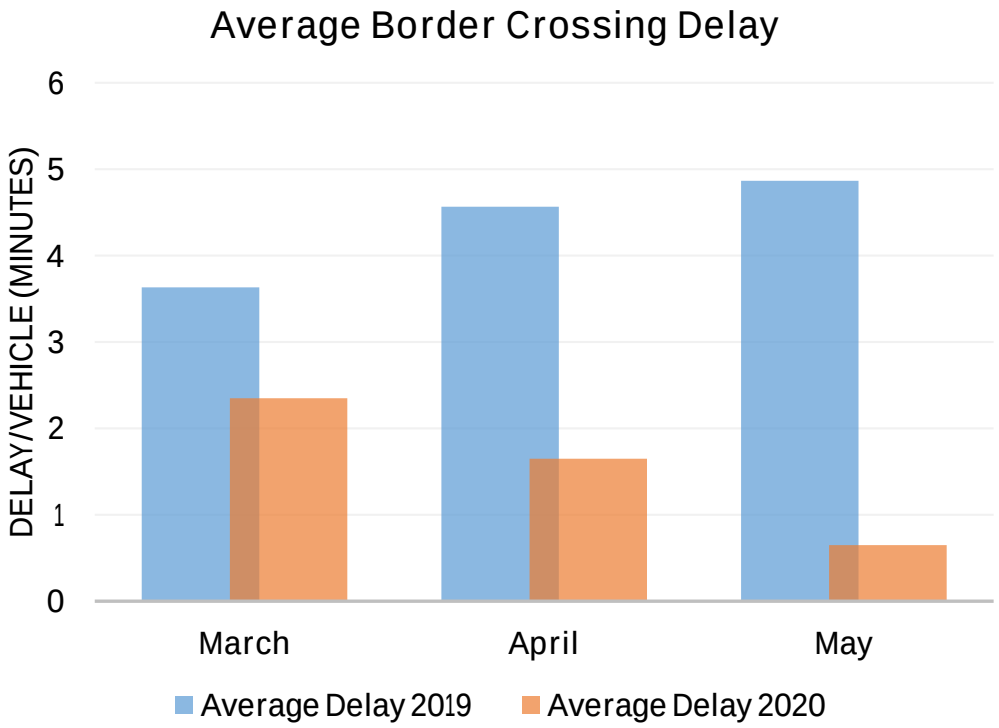


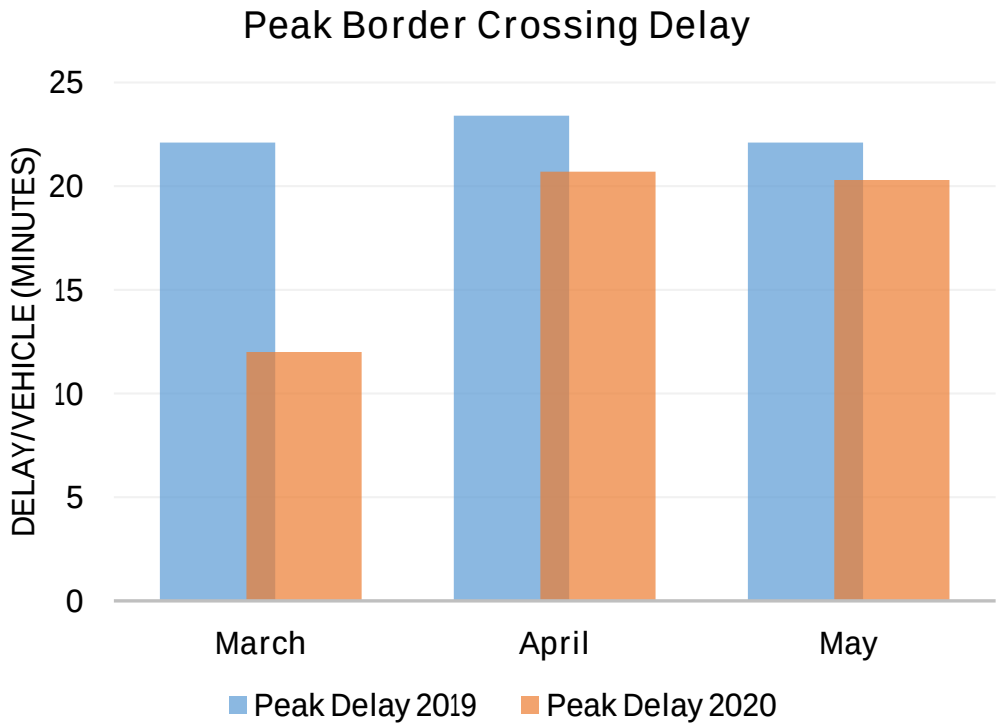
Cross Border – 2019 vs. 2020





Cross Border – 2019 vs. 2020





Questions

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Today's Presenters

#TRBWebinar

Moderator: Steve Latoski, *Mohave County Public Works, Arizona*

Nicole Hood, *Missouri DOT*

Brent Cain, *Arizona DOT*

Athena Hutchins, *Niagara International Transportation Technology Coalition*

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