OZARKS TRANSPORTATION ORGANIZATION

A METROPOLITAN PLANNING ORGANIZATION

Congestion Management Process

Congestion Monitoring and Strategy Evaluation

Board of Directors Adoption: *18 June 2020*

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Maps

Report Highlights

This report offers an updated looked at congestion in the OTO area. Data on current congestion was collected and recent system improvements, either capacity or operations related, were added to a list of completed projects. Changes in congestion and implemented projects were compared to determine if regional investments were having a positive impact on congestion.

The following are highlights found during the Congestion Monitoring Process.

Volume-to-Capacity Ratio

- Only 5.8 miles of roadway, of the 134 miles with data available for comparisons, have seen peak hour volumes rise above roadway capacities since the publication of the 2016 CMP update
- Approximately 90 of the 134 miles of roadway with volume data available have remained or improved to an acceptable Volume-to-Capacity ratio

Crash Frequency

- 130 of 175 signalized intersections have an average or below average frequency of crashes
- 18% of CMP mileage have crash frequencies above the MPO average for a given road type
- The percentage of roads and intersections with above-average crash frequencies is higher than recorded in the 2017 CMP.

Average Travel Speeds

- The average delay increased from 8.8 to 9.0 mph below posted speed limits since 2016.
- PM Northbound, Southbound, and Westbound traffic have the highest average delay.
- Travel speeds have increased along freeway segments with recently added capacity.

Intersection Level-of-Service

- 93% of intersections during the AM commute and 95% of intersections during the PM period have an acceptable LOS.
- More intersections experienced declines in service than experienced improvements.
- Only 7 intersections function at an LOS F, all during the AM commute.

Congested Facilities and Facility of Concern

Congested Facilities, 2019	
Method #1	**Method #2**
Crashes, V/C Ratio, Travel Speed	Intersection LOS, V/C Ratio, Travel Speed
Campbell	Campbell and Republic
Primrose to Republic	Kansas and Sunshine
Glenstone	Kansas and Walnut Lawn
At Kearney	Kansas and WB James River Freeway
Chestnut to Monroe	Sunshine and National
Portland/Cinderella to Battlefield	US 60 and Rt. MM/M
Kansas	
Talmage to Kearney	

Continued on following page.

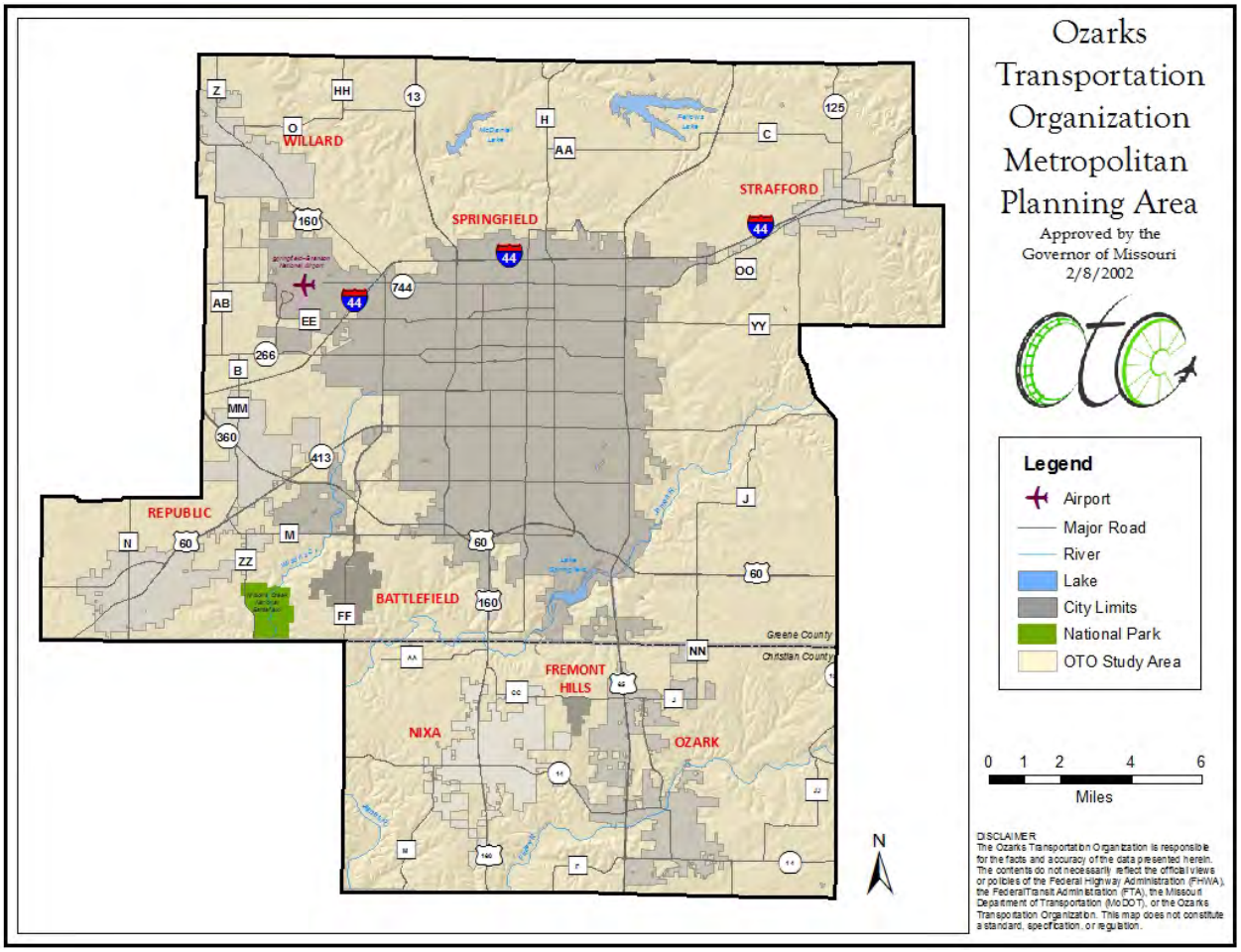
Congested Facilities, 2019, *continued*		
Method #1		**Method #2**
Crashes, V/C Ratio, Travel Speed		Intersection LOS, V/C Ratio, Travel Speed
Kansas (*continued*)		
Bennett to Sunshine		
Battlefield to James River Freeway		
Kearney		
US 65 to Le Compte		
National		
At Battlefield		
Sunshine		
At Campbell		
National to Glenstone		
Lone Pine to Oak Grove		
Deeswood to US 65		
US 160		
Rt. AA to Rt. CC		
US 60		
MO 174 to Oakwood		

Facility of Concern

There is one area that has been identified as a *Facility of Concern*. Route CC, between 22nd and US 65, has issues related to all four congestion indicators but there isn't sufficient overlap to meet the strict definition of congestion using Method #1 or Method #2. There are safety and capacity concerns throughout this area. The intersection at 22nd has LOS issues, and there are speed issues related to the interchange.

Introduction

The Congestion Management Process (CMP) is a systematic approach to addressing congestion within the Ozarks Transportation Organization's (OTO) planning area, shown in **Map 1**. The process was developed through a collaborative effort involving area jurisdictions and technical experts. The intent of the CMP is to improve the efficiency and effectiveness of both the existing and future transportation system through the implementation of Transportation System Management (TSM), which includes Intelligent Transportation Systems (ITS) and Travel Demand Management (TDM) techniques.



Map 1: Ozarks Transportation Organization Metropolitan Planning Area Map

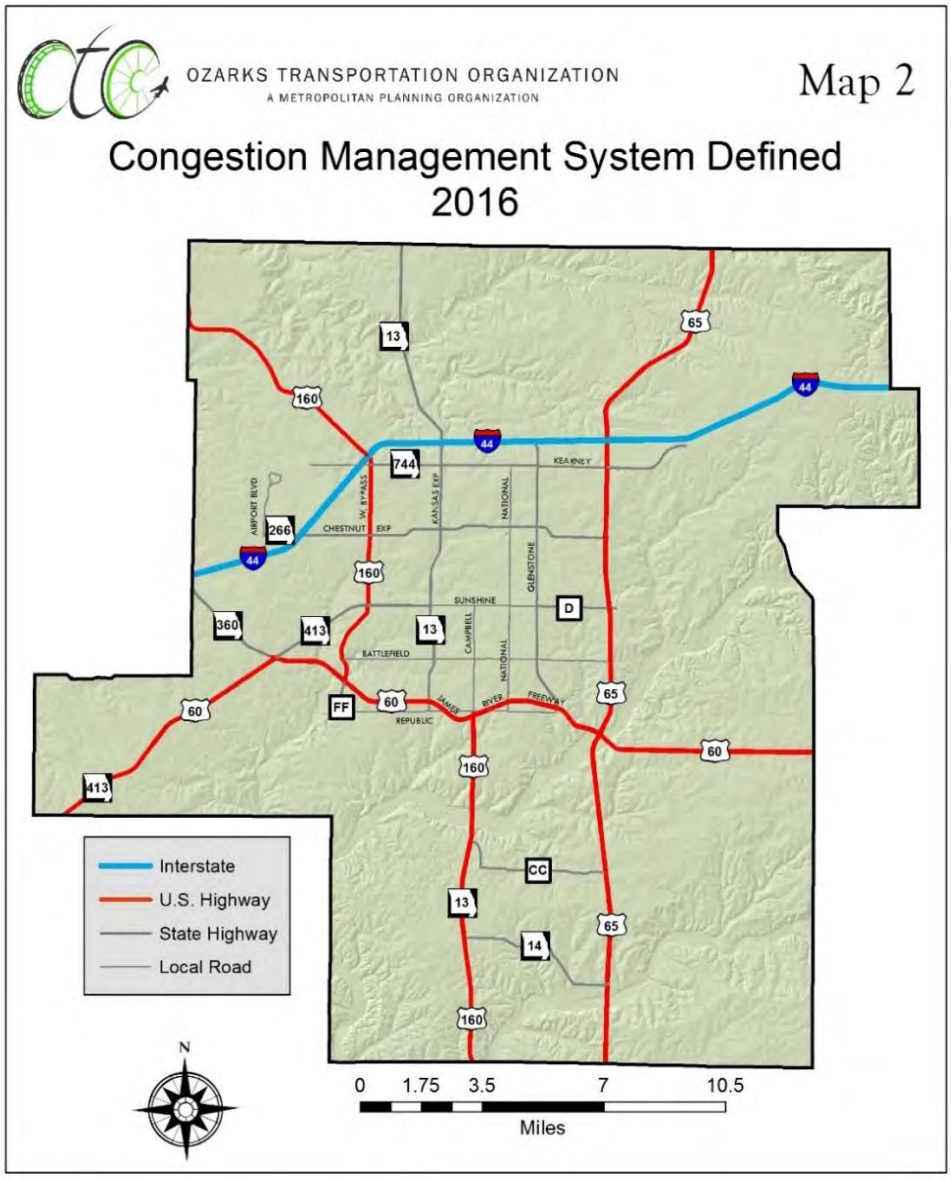
Overview of Previous Phases

The CMP consists of three main phases. Phase I, completed in 2005, is a methodology to identify congestion and designate specific strategies to address congestion. Phase II, completed in 2008, is the identification of where congestion is occurring or is expected to occur during the 20-year plan horizon and the implementation of identified strategies. Phase III, first completed in 2012, is the development of a monitoring program to determine if selected strategies are effective in dealing with congestion at

identified locations, and if not, identify other strategies to alleviate congestion. This 2020 Congestion Monitoring report is an update to Phase III and should be updated every three to five years.

Overview of CMP Network

Phase I and II of the CMP identified the CMP network as OTO-area roadways that are part of the National Highway System (NHS). With passage of MAP-21, the CMP network was expanded in Phase III to include the Enhance-NHS, the traditional NHS and principal arterials. In addition, committee members chose to include segments of some principal arterials not included in the Enhanced-NHS, such as National north of Chestnut Expressway or Kearney west of I-44. These additional segments provide useful local information. No major changes were made in response to the passage of the FAST Act. The CMP network defined in 2016 can be seen in **Map 2** below.



Congestion Monitoring

The following four measures are the indicators the OTO has elected to monitor to determine where congestion is occurring. These measures are *(1)* Volume-to-Capacity Ratio, *(2)* Crash Frequency, *(3)* Average Travel Speed, and *(4)* Intersection Level of Service. These measures are defined in this congestion monitoring report.

1. Volume-to-Capacity Ratio

The first measure OTO utilizes to monitor congestion is peak hour volume-to-capacity ratio. This ratio is used to determine which roads have peak volumes that exceed the road's capacity and which roads are approaching capacity. Peak hour traffic volumes that are used in the ratios can be found on **Map 3.1**. These traffic volumes are calculated from intersection turning movement studies and segment counts conducted over the last few years. Data is not available for all road segments. Roadway capacities are a function of the number of traffic lanes. Capacities have been calculated for each type of road in the OTO area, including the section of 4+1 lane expressway National Avenue, south of Walnut Lawn, and the 5+1 lane section of Campbell, south of Primrose. An important indicator of traffic volumes is Vehicle Miles Traveled (VMT). The indicator represents the total number of miles driven by the OTO population each day. If VMT is rising, it is likely associated with increased traffic volumes. Recent trends show a rebound in VMT for the area.

Table 1: OTO Daily Vehicle Miles Traveled

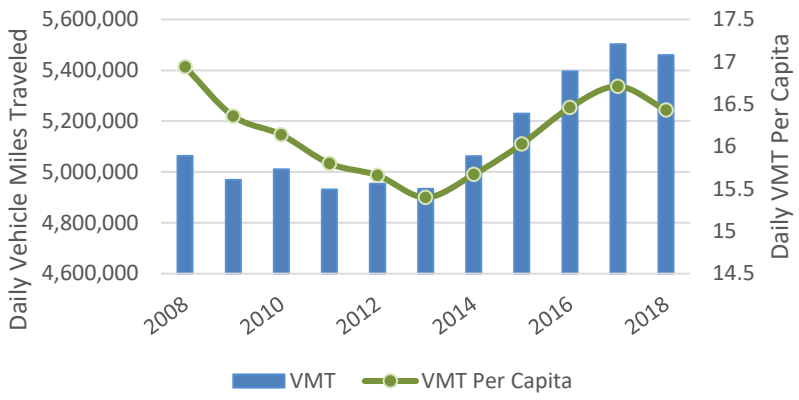
Year	VMT	OTO Population	VMT per Capita
2018	5,460,490	332,321*	16.43
2017	5,502,933	329,330*	16.71
2016	5,395,874	327,861*	16.46
2015	5,229,938	326,321*	16.03
2014	5,061,794	323,031*	15.67
2013	4,933,188	320,259*	15.40
2012	4,954,024	316,298*	15.66
2011	4,931,037	312,126*	15.80
2010	5,010,884	310,283	16.14
2009	4,969,336	303,720*	16.36
2008	5,063,022	298,910*	16.94

*Census Estimate

Daily Vehicle Miles Traveled (VMT)

Table 1 shows the 2018 VMT for the OTO area is down from 2017, but is generally continuing to follow the upward trend that has existed since 2014. The overall increase is associated with a strong national economy and low energy costs. Data shows the VMT increase of 527,303 miles traveled, or 10.7 percent, since 2013. Per Capita VMT, as shown **Figure 1**, has experienced more change over the last decade. Since 2013, has track closely with VMT. This suggests VMT is rising faster than population growth. People are driving more.

Figure 1: Daily Travel Patterns, 2008-2018



Volume-to-Capacity Ratio

Map 3.1 includes volume-to-capacity ratios broken into three categories: *below capacity*, *nearing capacity*, and *at or above capacity*. Segments with a volume-to-capacity ratio of 0 to 0.77 are *below capacity* and offer an LOS of A, B, or C. Segments with a ratio of .78 to .86 are *nearing capacity* and offer a LOS of D. Ratios of 0.86 or above offer LOS E or F and are *at or above capacity*. For purposes of this study, LOS A, B, C, or D are acceptable. The Volume to Capacity status of roads can be reviewed in **Table 2** below. Approximately 90 of the 134 miles of roadway with volume data available have remained or improved to an acceptable Volume-to-Capacity ratio, as shown in **Figure 2**.

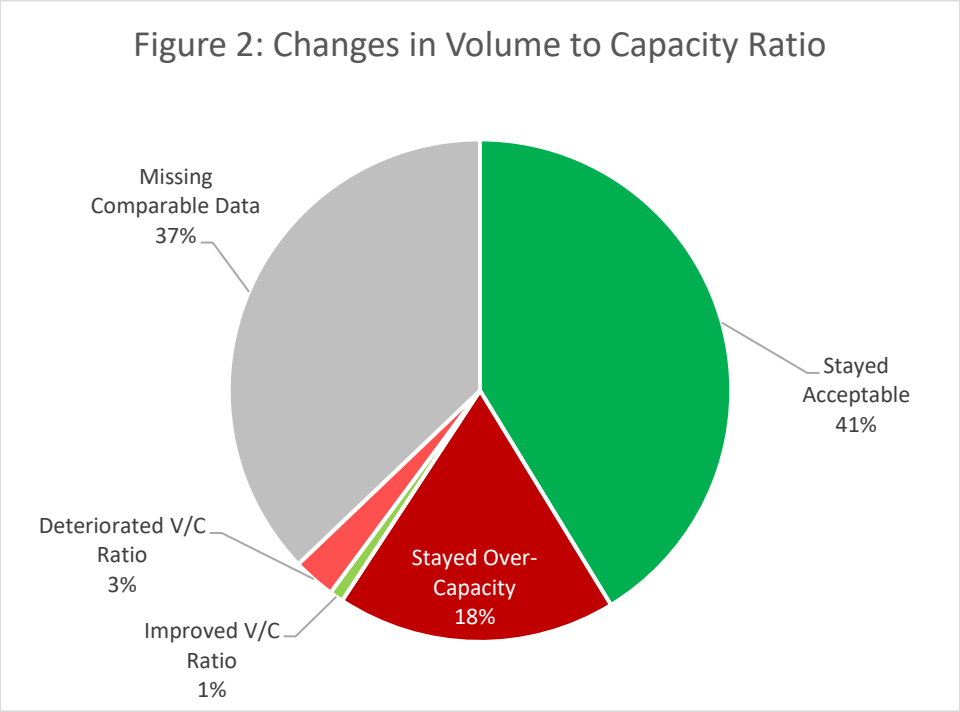
Table 2: Volume to Capacity Ratio Status, 2016-2019

Stayed Acceptable	Stayed Over-Capacity	Improved V/C Ratio	Deteriorated V/C Ratio	Missing Data
I-44				
Entire OTO segment				
James River Freeway *(I-44 to US 65)*				
I-44 to Campbell	Campbell to US 65			
US 65				
I-44 to Division	Battlefield to US 60			Division to Sunshine
Sunshine to Battlefield				South of US 60
US 60 West / MO 413				
Illinois to Hines	Oakwood to Rt MM			Rt MM to JRF
JRF to McCurry				
US 60 East				
Rt. NN/J to MO 125				US 65 to Rt. NN/J
US 160 North *(Willard to I-44)*				
OTO Line to Fm Rd. 94	Fm Rd 94 to I-44			
US 160 South *(Nixa to Springfield)*				
JRF to Melbourne	Rt AA to Rt CC	Bentwater to Tracker	Rt CC to Bentwater	Melbourne to Rt CC
Kathryn to OTO Line				
MO 13 *(North of Springfield)*				
Radio Ln to I-44				OTO Line to Radio Ln
West Bypass / Rt F *(I-44 to Republic Rd)*				
Entire OTO segment				
Kansas Expressway				
	Chestnut to JRF		I-44 to Division	Division to Chestnut
				JRF to Republic

Table 2: Volume to Capacity Ratio Status, 2016-2019, cont.				
Stayed Acceptable	**Stayed Over-Capacity**	**Improved V/C Ratio**	**Deteriorated V/C Ratio**	**Missing Data**
Campbell *(Sunshine to JRF)*				
	Sunshine to Broadmoor			Broadmoor to Primrose
	Primrose to JRF			
National				
Primrose to JRF	St Louis to Battlefield			Battlefield to Primrose
Kearney to St Louis				
Glenstone				
Battlefield to JRF	I-44 to Sunset		Scenic to Battlefield	
Kearney				
General Aviation to Glenstone	US 65 to Le Compte	Glenstone to Barnes		Le Compte to I-44
Barnes to US 65				
Chestnut Expressway				
West Bypass to West St.	Belcrest to US 65	Grant to Drury		Airport Blvd to West Bypass
Kansas to Grant				
Drury to Belcrest				
Sunshine				
McCurry to Kansas	Kansas to US 65			
Battlefield				
West Bypass to Scenic	Scenic to Kansas			Fort to Fremont
Kansas to Fort	Lone Pine to US 65			
Glenstone to Lone Pine				
Republic				
Fremont to Harvard	Harvard to JRF/Glenstone			Golden to Broadway
Rt. CC				
US 160 to Main				Main to US 65
MO 14				
	Fort to 22nd	US 160 to Fort		22nd to US 65

Volume-to-Capacity Level of Service Summary

Only 5.8 miles of roadway, of the 134 miles with data available for comparisons, have seen peak hour volumes rise above roadway capacities since the publication of the 2017 CMP update. During this time, 6,000 people have moved to the region and daily VMT has increased by 4.4%.



The pace at which roads are becoming overcapacity seems to correspond with the region's overall growth.

2. Crash Frequency

Crash frequency is important to consider because it affects the reliability of the transportation system. A fender bender may only cause traffic to back up for a few minutes, but for every minute a lane is blocked, it takes four minutes for traffic to return to normal flows. This slow recovery helps contribute to congestion. Crash data used in this analysis is provided by the Missouri Highway Patrol and the Missouri Department of Transportation. Crash frequencies are analyzed for both intersections and along roadways. For comparison purposes, intersections are divided into major intersection (*over 30,000 entering volume*) and minor intersections (*under 30,000*). Range, or roadway, crash frequencies are compared to same year MPO crash frequencies for each type of road; such as freeway, expressway, 5-lane, or 3-lane. **Map 4.1** and **4.2** contains crash frequency information for both intersections and segments, for the OTO entire area and focused on the City of Springfield respectively.

Range Crash Frequency

The roadway segment crash frequency is calculated by using the formula below. The 3-year crash frequency for each segment is then compared to the MPO average crash frequency for that period for that type of segment, i.e. freeway or 5-lane.

Formula for Crash Frequency (Range): Segment Crash Frequency = $\frac{\text{Number of Crashes (3yr)}}{\text{Length of Segment}}$

Below Average: Crash frequency for that segment is 50% or less of the MPO average crash frequency for that type of road during the same period.

Average: Crash frequency for that segment is between 50.1% and 150% of the MPO average crash frequency for that type of road during the same period.

Above Average: Crash frequency for that segment exceeds 150% of the MPO average crash frequency for that type of road during the same period.

Table 3 shows the change in crash frequencies along CMP road segments. Five segments along four roads experienced decreased crash frequencies relative to the average, and 15 segments along eight roads experienced increases relative to the average.

Table 3: Road Segments Experiencing a Change in Crash

Decline in Crashes		Increase in Crashes	
Above Average Segment Now in **Average** or **Below Average** Category		Segment Moved into **Above Average** Category	
Glenstone		**Battlefield**	
Division to Chestnut		Lone Pine to US 65	
US 65		**Kansas**	
SB Evans to County Line	NB Kearney to I-44	SB Kearney to Grand	NB JRF to Battlefield
US 160 *(North Of Springfield)*		**James River Freeway**	
Farm Road 102 to I-44		WB Campbell to Kansas	WB US 65 to Glenstone
US 160 *(South of Springfield)*		EB National to Glenstone	
Farm Road 186 to to JRF		**MO 14**	
		US 160 to Cheyenne	EB Fremont to US 65
		Rt. CC	
		US 160 to Cheyenne	Fremont to US 65
		US 60 *(West)*	
		Oakwood to MO 174	
		US 65	
		SB Battlefield to Glenstone	NB Business 65 to MO 14
		US 160 *(South of Springfield)*	
		SB County Line to Rt. CC	NB Rt. CC to County Line

Overall, 18% of CMP segment length, both divided and undivided, have crash frequencies above the MPO average. This amount is a sizeable increase from 2016, when only 10% of segment length had above average frequencies.

Intersection Crash Frequency

The intersection crash frequency is calculated by using the formula below. The 3-year crash frequency for each intersection is then compared to MPO average intersection crash frequencies for that period. Two values are calculated for MPO intersection crash averages, intersections at or above 30,000 entering volumes and intersections below 30,000 entering volumes.

Formula for Crash Frequency (Intersection):

Intersection Crash Frequency = Number of Crashes (3yr)

Below Average: An intersection is considered to have a below average crash frequency if the three-year crash frequency is 50.0 percent or less of the MPO average crash frequency for signalized intersections during the same period.

Average: Intersection is considered to have an average crash frequency if the three-year average crash frequency for that segment is between 50.1 percent and 150.0 percent of the MPO's average crash frequency for signalized intersections during the same period.

Above Average: An intersection is considered to have an above average crash frequency if the three-year crash frequency for that segment exceeds 150.0 percent of the MPO's average crash frequency for signalized intersections during the same period**.**

Tables 4 shows changes in crash frequencies at CMP intersections. Twenty-one intersections experienced increases in crashes, compared to MPO averages. Twelve intersections experienced decreases in crashes. 166 of 220 measured signalized intersections have an acceptable frequency of crashes. Conversely, 25% of measured signalized intersections have an above-average crash frequency. This is an increase as compared to approximately 19% of measured intersections having an above-average crash frequency in 2016.

Table 4: Intersections Experiencing a Change in Crashes			
Decline in Crashes		**Increase in Crashes**	
Above Average Intersection Now in **Average** or **Below Average** Category		Intersection Moved into **Above Average** Category	
Battlefield		**Battlefield**	
Campbell[A]	Glenstone[B]	Fort	
Campbell		**Chestnut Expressway**	
Sunset	Battlefield[A]	Grant	
Chestnut		**Glenstone**	
Benton	National[C]	EB I-44 Ramp	
Glenstone		**Kansas Expressway**	
Bennett	Battlefield[B]	Mount Vernon	Elfindale
Kansas		**Kearney**	
Division	Walnut Lawn	Grant	Mayfair
National		NB US 65 Ramp	National[A]
Sunshine[D]	Chestnut[C]	**Republic**	
Republic		Cox	
Fremont		**Rt. CC**	
Sunshine		US 160[B]	
West Bypass[E]	National[D]	**Sunshine**	
US 60		Zimmer	
Rt. MM/Rt. M		**US 13** *(North of Springfield)*	
West Bypass		Rt. O	
Mt. Vernon	Sunshine[E]	**US 160** (*North of Springfield*)	
		Rt. AB	Jackson
		US 160 (*South of Springfield*)	
		Tracker	Aldersgate
		Wasson	Rt. CC[B]
		West Bypass (*I-44 to JRF*)	
		EB I-44 Ramp	Division
		WB JRF Ramp	
		National	
		Kearney[A]	

**Superscripts indicate a major intersection that is listed along both intersecting corridors.*

A total of 25% of signalized intersections on the CMP network have above average crash frequencies in 2019. This is an increase from 19% in 2016. These crashes are also negatively impacting the experienced level of service at the affected intersections.

Crash Frequency Summary

Within the OTO area, increasing numbers of crashes is concerning. Twenty-three intersections and 15 road segments moved into the above average category from 2016-2019.

3. Average Travel Speed

Historical data collected through real-time traffic monitoring programs Acyclica© and RITIS©, commonly referred to as probe data, was used to calculate travel speeds along the CMP network in 2019. Data from the morning rush, 7am-8am, and evening rush, 5pm-6pm in Springfield and 5:30-6:30 outside of Springfield, was during April and May 2019. Samples ranged from several hundred travel times to several thousand, depending on the corridor and time of day. To better represent the range in delay experienced, 25th percentile speeds were used in delay calculations. These 25th percentile speeds are then compared to posted speed limits to calculate delay. A road is considered severely delayed if the travel speed is greater than 20mph below the posted speed limit. **Maps 5.1** and **5.2** shows travel delay for the AM and PM peaks, respectively.

Table 5 identifies the average peak hour travel time delays in miles per hour by direction of travel. Overall, average delay is down. Delay is improved in three of the four AM commutes and in one of the four PM commutes. Overall delay has increased slightly when compared to 2016. PM Southbound continues to suffer the most delay of any commute.

Table 5: Average Delay-MPH Below the Posted Speed Limit

Peak Hour / Direction	2016 Average Delay	2019 Average Delay
AM Eastbound	7.2	7.0
AM Westbound	6.2	7.0
AM Northbound	8.0	7.2
AM Southbound	8.1	8.0
PM Eastbound	9.4	9.8
PM Westbound	9.0	10.1
PM Northbound	11.0	10.4
PM Southbound	12.9	13.5
Average	8.8	9.0

Travel Speed Summary

The corridors experiencing severe delay in 2019 are similar to the corridors identified in 2016. Many of these are urban primary arterials or expressways that carry significant traffic volumes. The corridors have constrained rights-of-ways and many intersecting streets. Highways, such as US 60 West and US 160 South, have ongoing planning and design projects aimed at improving traffic flow or evaluating the public's interest in maintaining traffic flow. The planned extension of Kansas Expressway to the south will also provide traffic relief for existing highways in southern Greene county. These projects and studies are important steps towards holding travel delay steady or seeing it decline.

4. Intersection Level of Service (LOS)

Intersection level of service is a function of delay. Accordingly, an intersection with LOS A would have a shorter delay than an intersection with LOS F. The longer traffic is delayed at an intersection, the lower/worse the level of service for that intersection. **Maps 6.1** and **6.2** show changes in intersection LOS for the entire OTO region. **Maps 6.3** and **6.4** show changes within the City of Springfield.

Level OF Service Scale:
LOS A, B, C (Green)
LOS D (Yellow)
LOS E (Orange)
LOS F (Red)

Table 6 and **Table 7** contain summaries of intersection LOS for the AM and PM commutes. All intersections with 2019 data are represented in the totals included in each table.

Table 6: AM Peak Intersection LOS Summary

LOS in 2019	Total, 2019	No Change Since 2016	LOS Improved from 2016			LOS Declined from 2016			
			From LOS D	From LOS E	From LOS F	From LOS A,B,C	From LOS D	From LOS E	From LOS E
LOS A,B,C	194	157	14	2	2	-----	-----	-----	-----
LOS D	30	11	-----	2	2	13	-----	-----	-----
LOS E	11	2	-----	-----	2	4	2	-----	-----
LOS F	7	0	-----	-----	-----	5	0	1	-----

Table 7: PM Peak Intersection LOS Summary

LOS in 2019	Total, 2019	No Change Since 2016	LOS Improved from 2016			LOS Declined from 2016			
			From LOS D	From LOS E	From LOS F	From LOS A,B,C	From LOS D	From LOS E	From LOS E
LOS A,B,C	178	140	13	3	3	-----	-----	-----	-----
LOS D	51	25	-----	2	4	16	-----	-----	-----
LOS E	12	1	-----	-----	0	3	7	-----	-----
LOS F	0	0	-----	-----	-----	0	0	0	-----

An intersection must have data for 2016 and 2019 for it to be represented in the change statistics shown in Table 6 and 7.

Intersection LOS Summary

Overall, OTO's intersections are providing acceptable service. A total of 24 intersections saw improved LOS and 25 intersections saw deteriorated LOS during morning commutes between 2016-2019. The PM commute saw similar movements, with 25 improving and 26 deteriorating.

5. Congested Facilities

There are two methods for identifying congested facilities used in this CMP. A facility must be shown as unacceptable for three different congestion measures. All facilities identified as congested have a Volume-to-Capacity ratio over 0.86 and a travel delay of 20mph or greater. Facilities identified with Method #1 also have above average crash frequencies, while facilities identified with Method #2 also have an intersection LOS of E or F. Method #1 identifies intersections and segments as congested since its three factors include both intersections and segments. Method #2 only identifies intersections as congested since all three factors do not contain segments. **Table 8** contains a listing of congested facilities identified with both methods. Congested Facilities are also shown in **Maps 7.1** and **7.2**, allow with data on the three relevant measures. New for 2020, one area has been identified as a *Facility of*

Concern. Facilities of Concern show as unacceptable by three or more congestion measures, but do not meet the strict definition of Method #1 or #2.

Table 8: Congested Facilities, 2019		
Method #1		**Method #2**
Crashes, V/C Ratio, Travel Speed		Intersection LOS, V/C Ratio, Travel Speed
Campbell		Campbell and Republic
Primrose to Republic		Kansas and Sunshine
Glenstone		Kansas and Walnut Lawn
At Kearney		Kansas and WB James River Freeway
Chestnut to Monroe		Sunshine and National
Portland/Cinderella to Battlefield		US 60 and Rt. MM/M
Kansas		
Talmage to Kearney		
Bennett to Sunshine		
Battlefield to James River Freeway		
Kearney		
US 65 to Le Compte		
National		
At Battlefield		
Sunshine		
At Campbell		
National to Glenstone		
Lone Pine to Oak Grove		
Deeswood to US 65		
US 160		
Rt. AA to Rt. CC		
US 60		
MO 174 to Oakwood		

The facilities identified in this CMP are comparable to the facilities identified in the 2017 CMP. Similar portions of Kansas Expressway, Campbell, National, Glenstone, Kearney, Sunshine, Battlefield, and south US 160 are congested in both study periods. There are some differences between the periods. US 65, south of US 60, is no longer considered congested, while US 60 at Rt. MM/M is now considered congested.

As discussed in the 2017 CMP, many of congested facilities are located within built-out urban areas. These roadways have constrained rights-of-way and strong travel demand from both workers commuting home and from local Springfield residents. Some portions of these roadways will likely always be congested.

Facilities of Concern

There is one area that has been identified as a *Facility of Concern*. This is a new designation, but it captures a known issue. Route CC, between 22nd and US 65, has issues related to all four congestion indicators but there isn't the required overlap to meet the strict definition of congestion using Method #1 or Method #2. There are safety and capacity concerns throughout this area. The intersection at 22nd has LOS issues, and there are speed issues related to the interchange.

Strategies for Recurring Congestion Mitigation

Phase I of the adopted Congestion Management Process outlined five main strategies on which to focus the OTO Congestion Management Process. Recent projects related to the five strategies are outlined below.

Strategy #1: Improve Roadway Operations

- **Intersection Geometric Improvements: Table 9** contains a selection of major interchange and intersection improvements were made to improve overall efficiency and operation of the CMP Network. Improvements listed for Congested Corridors and for other corridors in the CMP Network.

  Many projects have been completed and are planned along congested corridors. Many of these corridors are arterial streets that are right-of-way constrained and serve both local and through traffic. Improvements along US 60 and US 160 are addressing know bottlenecks.

Table 9: Congested Corridors with Projects to Improve *Intersection Geometrics* (*Non-Exhaustive*)

Recent Improvements	Programed / Under Construction Improvements
Glenstone Avenue	
Added turn lanes at Glenstone and EB I-44 Intersection	Intersection improvements at WB James River Freeway
Access to Glenstone Terrace removed at Peele St. Intersection and RIRO access added to Glenstone from Glenstone Terrace to the north.	Intersection improvements at EB James River Freeway
Signal Removed at Republic Ct. and access to E Republic Rd eliminated	
Added 4th leg to Independence St intersection to accommodate realigned E Republic Rd/Luster.	
Sunshine Street	
Added signal at McCurry and realigned Old Sunshine Road, eliminated access to Sunshine from Old Sunshine Rd to the east.	none
Kansas Expressway	
Added turn lanes for SB Kansas at EB James River Freeway	Intersection Improvements at Walnut Lawn St.
Added 2nd WB left turn lane to Norton St.	Intersection Improvements at Sunset St.
Kearney Street	
Added signal at Packer Rd.	Intersection improvements at West Bypass

Table 9: Congested Corridors with Projects to Improve *Intersection Geometrics* (*Non-Exhaustive*) (*continued*)	
Recent Improvements	**Programed / Under Construction Improvements**
Campbell Avenue	
Added 2nd SB left turn, 2nd WB left turn, and 2nd EB through lanes at Primrose intersection	Intersection improvements at Walnut Lawn St.
Added NB right turn lane at Grand	Intersection improvements at Republic Rd.
Intersection improvements at Plainview Rd.	
Realigned Weaver Rd and added new signal with turn lanes	
National Avenue	
Intersection improvements at Republic Rd.	Intersection Improvements at Sunset
US 160 (South to Nixa)	
Intersection Improvements at Mount Vernon (Rt. 14)	J-turn at Farm Road 192
	Intersection Improvements at Tracker Rd
US 60 West	
Intersection Improvements at Rt. M/MM	Intersection Improvements at Rt. 174

Improvements have also been made to the CMP Network to address issues before congestion develops, as shown in **Table 10**. These improvements have included interchanges on US 60 east and the intersection improvements apart of the US 160 widening project.

Table 10: Other CMP Corridors with Projects to Improve *Intersection Geometrics* (*Non-Exhaustive*)	
Recent Improvements	**Programed / Under Construction Improvements**
Chestnut Expressway	
Removed at-grade railroad crossing west of Ingram Mill Rd and added signal at Ingram Mill Rd	None
US 160 (North to Willard)	
None	Intersection improvements at Rt. AB
	Roundabout at Jackson
	Roundabout at Farm Road 94.
	J-turn at Farm Road 115
	J-turn at Farm Road 123
US 60 East	
Interchange at Rt. NN/J	Interchange at Rt. 125
Route CC	
Diverging diamond interchange at US 65	Intersection improvements at US 160
Add signal at 22nd St.	
Route 13 (north of Norton Rd.)	
Remove signal and add J-turn at Rt. O	None
J-turn at Rt. WW	
Interstate 44	
Ramp extensions at Kansas Expressway and West Bypass	None

- **Intersection Signalization Improvements:** Traffic engineers at the TMC of the Ozarks regularly observe individual intersections and corridors and make timing adjustments based on actual functionality. As technology allows, these improvements might be refined signal offsets, adjusted cycle lengths, changes to coordination status, creation of optional timing plans, or even peer-to-peer operations. **Table 11** contains a selection of signalization improvements made over the last few years.

Table 11: Selected Intersection Signalization Improvements

Adjusted Cycle Lengths	Changes to Coordination Status	Optional Timing Plans	Peer-to-peer operations
Kimbrough: Madison to Trafficway AM Peak Cycle length increased from 65 to 75 seconds	Division & Grant: Set to free operation	National & Sunshine: alternative patterns were created to accommodate the regular fluctuations during long PM Peak	Hammons: Trafficway to St Louis
National: Trafficway to Grand weekend peak plan increased from 90 to 100 seconds	Battlefield & Woodstock: set to run in free operation except the AM and PM peaks	Battlefield & Fremont: alternative patterns were created to accommodate the regular fluctuations during long PM Peak	Division: Cedarbrook to Packer
Battlefield: Lone Pine to US65 included in the 100 second Off Peak plan operational area	Kearney: Corridor coordinated	Campbell & Sunshine: alternative patterns were created to accommodate the regular fluctuations during long PM Peak	Division: Grant to Weaver pedestrian signal

- **Incident Management - Detection, Response & Clearance**: The OTO region continues to make great strides with its incident management program. The region's TIM committee meets quarterly and hosts an annual regional TIM exercise. Major incidents are debriefed at these quarterly meetings and actions are identified to address issues experienced during response efforts. The TMC of the Ozarks also continues to make progress in its ability to detect and track incidents. The TMC is able to deploy warnings on the region's digital message signs and make alterations to signal timing if needed.

- **Bus Turnout Construction:** The City Utilities has discontinued the construction of future turnouts due to transit service delays caused by reentry of buses into traffic flow. City Utilities has partnered with the City of Springfield to add signage and striping at bus turnouts along city streets. The goal is to encourage drivers not to block buses. Drivers have seen some improvements in their ability to reenter traffic, but City Utilities still does not plan to add additional turnouts to its system.

Strategy #2: Reduce Vehicle Miles Traveled (VMT) At Peak Travel Times

- **Land Use Policies/Regulations:** OTO communities have land use policies and regulations that support mixed use developments. These developments create the opportunity to live and work in the same location. Existing mixed-use developments include Farmers Park and Quarry Town in Springfield. Planned developments include Field Stone PDD in Republic and Gauge Crossing in Willard.

- **Employer Flextime Benefits/Compressed Work Week:** Encouraging employers to consider allowing employees to maintain a flexible schedule - thus allowing the employee the option to commute during non-peak hours. **Table 12** shows some of the public and non-profit employers than are offering flexible schedules.

Table 12: Flexible Work Schedules in the OTO Area

Flextime	Compressed Work Week	Non-Peak/Offset Schedules
MoDOT	City of Springfield	Area Schools
Ozarks Transportation Org	Greene County	Cox Hospital
City Utilities of Springfield		Mercy Hospital

Strategy #3: Shift Trips from Automobile to Other Modes

This strategy includes improvements beyond those made adjacent to roadways that are included in the Congestion Management Process network. Improvements made anywhere in the OTO study area that encourage people to use alternative modes may lessen the impacts of traffic system area wide.

- **Fleet Expansion/Bus Service Expansion:** City Utilities Transit has no plans to make any major fleet expansions in the next couple years. The utility has recently reduced the number of spare vehicles it has in its fleet to be better in line with FTA standards. The utility was also awarded two electric buses in late 2019. These new buses will be replacement vehicles. The utility continues to make incremental improvements to the new routes implemented in May 2016. Incremental improvements are aimed at improving on time performance. One feature of the new routes is each route stops at a Walmart. This reduces the need for riders to make transfers.

- **Improve/Expand Bicycle and Pedestrian Networks:** The region's overall bicycle and pedestrian network is growing each year, as shown in **Table 13**. Ozark Greenways has completed portions of the Trail of Honor and the Fullbright Springs Trail. As new subdivisions are built, the region's sidewalk network is expanded. Additionally, the municipalities are actively completing and implementing ADA Transition Plans on public rights-of-way. The construction work associated with these plans are improving the accessibility of the region's sidewalks. The OTO has also invested nearly $4 million in TAP funding towards sidewalk and trail projects that will be completed during 2020 and 2021.

Table 13: Bicycle and Pedestrian Network Size

Type of Network	2016	2017	2018
Bike lane (*SGF*)	28.69	28.78	29.44
Shared Lanes (*SGF*)	---	29.58	29.58
Trails	62.6	64.51	64.51
Sidewalks	1,048	---	1,115
Percent of Roads with Sidewalks	31.10%	32.07%	32.07%

Strategy #4: Shift Trips from SOV to HOV Automobile/Van

- **Rideshare Matching Services:** The OTO continues to offer carpool services through OzarksCommute.com. The service currently has 2,798 registered users.

- **Vanpool/Employer Shuttle Programs:** Several area employers and multifamily housing complexes have implemented vanpool or shuttle programs. Examples include Mercy Medical Center, TLC Properties, Missouri State University, and Prime Trucking.

- **Improved/Increased Park-and-Ride Facilities & Capital Improvement**s: There is one MoDOT park-and-ride lot at US 65 and Evans Road. The lot has 50 spaces and is currently underutilized. No expansions are planned.

Strategy #5: Add Capacity

The OTO recognizes that added roadway capacity is often not a long-term fix for a congestion problem. Induced demand and the continuation of existing development patterns often result in increased traffic volumes. However, additional capacity is often needed to serve growing traffic volumes. Capacity has been added to corridors than are identified as congested and to non-congested corridors that have a volume-to-capacity problem. Projects aimed to add capacity to congested CMP roads are listed in **Table 14**, while projects along non-congested CMP roads are shown in **Table 15**.

Table 14: Congested Corridors with Projects to *Add Capacity* (*Non-Exhaustive*)

Recent Improvements	Programed / Under Construction Improvements
Glenstone Avenue	
Added 6-lane segmented between Battlefield and James River Freeway	None
Kansas Expressway	
None	Extension of Kansas Expressway south of Republic Road to Plainview
Campbell Avenue	
Extend 3rd NB travel lane between Republic Rd and Primrose	
Extended 6 lane segment between Republic Road and south of Plainview Rd.	
National Avenue	
Add 3rd SB travel lane between Walnut Lawn St. and James River Freeway	Add 3rd SB travel lane between Battlefield and Walnut Lawn
US 160 (South to Nixa)	
Extend 2nd SB Travel Lane through Mount Vernon (Rt. 14) intersection	Capacity Improvements between Rt. AA and Rt. CC

Table 15: Other CMP Corridors with Projects to *Add Capacity* (*Non-Exhaustive*)	
Recent Improvements	**Programed / Under Construction Improvements**
US 160 (North to Willard)	
None	New 4-lane expressway segment between Jackson Rd and I-44
James River Freeway (I-44 to US 65)	
Add auxiliary lanes between Kansas Expressway and Campbell Ave.	Add 3rd travel lane between National and US 65
Add auxiliary lanes between Campbell Ave. and National Ave.	
Add auxiliary lanes between National Ave and Glenstone.	
Add SB auxiliary lane between Glenstone and US 65	
US 65	
Add auxiliary lanes between Sunshine and Battlefield	None
Extend 6-lane segment south between US 60 and Rt. CC	
Route CC	
Extend 5 lane segment from 22nd St. to 25th St.	
Route 14 (US 160 to US 65)	
Add 5-lane segment between US 160 and Fort St.	Add 5-lane segment between Fort St and east of Ridgecrest Ave.
	Add 5-lane segment between west of Fremont and 22nd St.
Republic Road	
Extend 5 lane segment from Golden to Rt. FF	Extend 5 lane segment from Republic Road to Chase
Extend 5 lane segment from Lark to Republic Rd	

Strategy Effectiveness

Efforts to maintain or improve congested conditions have had successes. Observable successes are primarily the result of two mitigation strategies: *Improving Roadway Operations* and *Adding Capacity*. Despite rising volumes, the region has maintained acceptable Intersection LOS at a vast majority of signalized intersections and has seen improved travel times associated with capacity projects. Strategies that rely on people using their automobiles less have been less effective. The region also has not had the same level of success getting businesses to alter work schedules. Many large employers have employee shift changes outside of peak commute times, but a large percentage of workers still work typical office hours and commute during peak commute times.

A complex geospatial statistical evaluation of was completed for the 2017 report, but the analysis was inconclusive. This analysis tried to identify connections between capacity or operational improvements

to changes in congestion. Some weak relationships were found, but no clear connections were revealed. A recommendation was made to focus on before/after analysis or other more anecdotal types of analysis. The following sections will describe observed successes.

Improve Roadway Operations

The City of Springfield and MoDOT work constantly to maintain and improve roadway operations throughout the OTO region. **Tables 6** and **7** contain the Intersection LOS data for 2019. Ninety-three percent of intersections during the AM commute and 95 percent of intersections during the PM period have an acceptable LOS, defined as LOS D or above. Of those intersections, 87 percent of acceptable intersections during the AM commute and 85 percent of intersections during the PM were acceptable during the 2017 CMP update. Additionally, 8 and 12 intersections improved to an acceptable LOS during the AM and PM commutes, respectively. The consistent performance of signalized intersections, despite the rise in VMT and per capita VMT outlined in **Table 1** and **Figure 1**, demonstrates the efforts of area traffic engineers have been successful.

Add Capacity

The region has been able to strategically add capacity to manage and mitigate congestion on the CMP network. A limited number of lane miles have seen traffic exceed capacity during the last three years. Additionally, added capacity has been able to improve the function of the system, as demonstrated in higher travel speeds.

Steady Volume-to-Capacity Ratios. The region has been able to successfully manage the growing volumes of traffic on CMP roads. As previously described, just under six miles of CMP roads, with data available, have experienced a shift to unacceptable volume-to-capacity ratios. This does not mean that capacity issues do not exist. Rather, it means the region has been able to limit the expansion of capacity problems. The region is successfully managing those areas nearing capacity.

Capacity and Travel Speed. Where capacity has been added along the region's freeways, travel speeds have increased. Volumes seem to be rising faster than capacity is being added, as seen in **Map 3.1**, but observed speeds are increasing. The improved speeds, despite the rising volumes, suggests that the added capacity has address bottlenecks. Anecdotally, drivers have more time to enter or exit the freeways and can maintain their travel speeds.

Table 16: Added Capacity and Associated Travel Speed Improvements

Recent Improvement	AM Travel Speed 2016/2019	PM Travel Speed 2016/2019
James River Freeway: Connected Ramps Between Kansas and Campbell	EB: 60/62 WB: 56/50*	EB: 60/63 WB: 55/46*
James River Freeway: Connected Ramps Between Campbell and National	EB: 60/62 WB: 60/62	EB: 58/62 WB: 60/62
James River Freeway: Connected Ramps Between National and Glenstone	EB: 58/61 WB: 60/62	EB: 54/58 WB: 59/63
US 65: Connected Ramps Between Sunshine and Battlefield	NB: 60/63 SB: 61/63	NB: 60/63 SB: 59/63

While adding capacity is no panacea, it can address bottleneck situations and improve travel speeds. Only WB traffic on James River Freeway between Campbell and Kansas saw slower speeds between the two analysis periods.

Action Plan

The OTO will continue to implement the five *Strategies for Recurring Congestion Mitigation* identified in Phase 1 of the CMP. These strategies represent the region's best opportunities for reducing congestion. Specific geometric and engineering solutions are included in the strategies, along with behavioral changes. Additionally, the OTO will evaluate the methods used to measure CMP congestion in light of MAP-21/FAST Act performance-based planning requirements. The OTO wants to ensure efficiency and limit duplication in its data collection and analysis.

Strategies for Recurring Congestion Mitigation

The five strategies for recurring congestion mitigation identified in OTO's CMP continue to be appropriate for the region. Engineering and behavior modifications are activities likely to reduce congestion. Recent priorities are in line with these broad strategies.

It is important to note congestion within the City of Springfield, such as along Glenstone, Battlefield from Campbell to Glenstone, or National from Battlefield to James River Freeway, will be difficult to improve with engineering solutions. Existing development patterns limit the ability to add capacity or remove traffic signals to improve traffic flow. Additionally, crashes in these areas not the result of poor engineering, but rather the result of human error. Significant behavioral changes by regional residents will be needed to address these problem areas.

Strategy #1: Improve Roadway Operations

The OTO has prioritized several projects to improve roadway for inclusion in the 2021-2024 Transportation Improvement Program (TIP) and has programed a number of projects in the 2020-2023 TIP. Prioritized projects include fiber connections between Springfield and Ozark and operational improvements along Kansas Expressway from Norton Road to James River Freeway. Programed Projects include an operational and safety study of US 60 from Main Street in Republic to James River Freeway, a study of US 160 between Rt. AA and Rt. CC, along with intersection improvements as Kansas and Sunset, Kansas and Walnut Lawn, Campbell and Walnut Lawn, Campbell and Republic Road, and Kearney and West Bypass. Additionally, funding has been set aside for improvements along Glenstone. These projects will help improve roadway operations.

Strategy #2: Reduce Vehicle Miles Traveled (VMT) At Peak Travel Times

The OTO will continue to encourage local business to offer flex time and move shift changes to non-peak travel times. The OTO will also work with area communities to encourage land use patterns that facilitate transit service and walking/biking. Behavioral strategies, such as this, rely on expanded cooperation between elected officials in OTO communities and business leaders to implement these local level decisions.

Strategy #3: Shift Trips from Automobile to Other Modes

The OTO will continue to pursue policies that encourage and facilitate alternative modes of transportation. For example, the OTO is working towards the completion of a Bike and Pedestrian Trail Investment Study. This study will help the OTO complete an integrated network of trails connecting OTO communities. This trail network will provide a viable alternative to autos for regional intercity travel. The

OTO has also prioritized sidewalk construction with all MoDOT sponsored projects. The OTO wants to see sidewalks built alongside road projects. The OTO is also involved with *Let's Go Smart: Transportation Collaborative*, a community partnership designed to encourage residents to consider their transportation choices every day. The organization encourages walking, biking, riding the bus, and other forms of active transportation. The City of Springfield's Sustainability Office helps coordinate city activities related to environmental sustainability, including the sustainability of transportation choices. This office is involved with many area transportation initiatives. These actions all make it easier for OTO residents to shift to other modes of travel.

Strategy #4: Shift Trips from SOV to HOV Automobile/Van

The OTO is working with the City of Springfield to market the OzarksCommute website for the OTO area. This new portal will offer expanded opportunities for area businesses to encourage carpooling and for residents to find rides on their own. Facilitating the creation of rideshare groups is an important way the OTO can encourage shifts in people's commuting behaviors.

Strategy #5: Add Capacity

The OTO recognizes that added roadway capacity is often not a long-term fix for a congestion problem. Induced demand and the continuation of existing development patterns often result in increased traffic volumes. However, additional capacity is often needed to serve growing traffic volumes. The OTO has prioritized additional travel lanes along US 60/James River Freeway and I-44. Projects have been programed along MO 14 and James River Freeway, and construction is underway along US 160 towards Willard. This added capacity will ensure efficient movement within and across the region as populations continue to grow.

Evaluation of Current Congestion Measurement

The performance-based planning required by MAP-21 and the FAST Act may result in the OTO reevaluating its methods for measuring congestion. Safety performance measures (PMs) for fatalities and serious injuries and system performance PMs for reliable travel will require annual data collection and analysis. The existing CMP processes may be replaced by these new performance management processes. The annual nature of performance management may result in the CMP being updated annually as well. The annual nature may also result in the simplification of the CMP process. The current CMP is too detailed to be completed on an annual basis. The OTO will not know how the CMP will be affected by the new performance management requirements until the new rules come into full effect. The OTO will ensure any changes made to the CMP will not lower the quality of the process.

Conclusion

This congestion monitoring report looks at the identified network and the efforts taken to address congestion. There have been extensive efforts undertaken in the past three years which are outlined in the implementation strategies section of the report. To summarize, there have been numerous geometric improvements and additions of capacity. Extensive work has been done to better time and coordinate the traffic signal system. Incident management remains a priority. Great strides have been made in new sidewalk and trail construction. Many miles of bicycle lanes have been signed and striped.

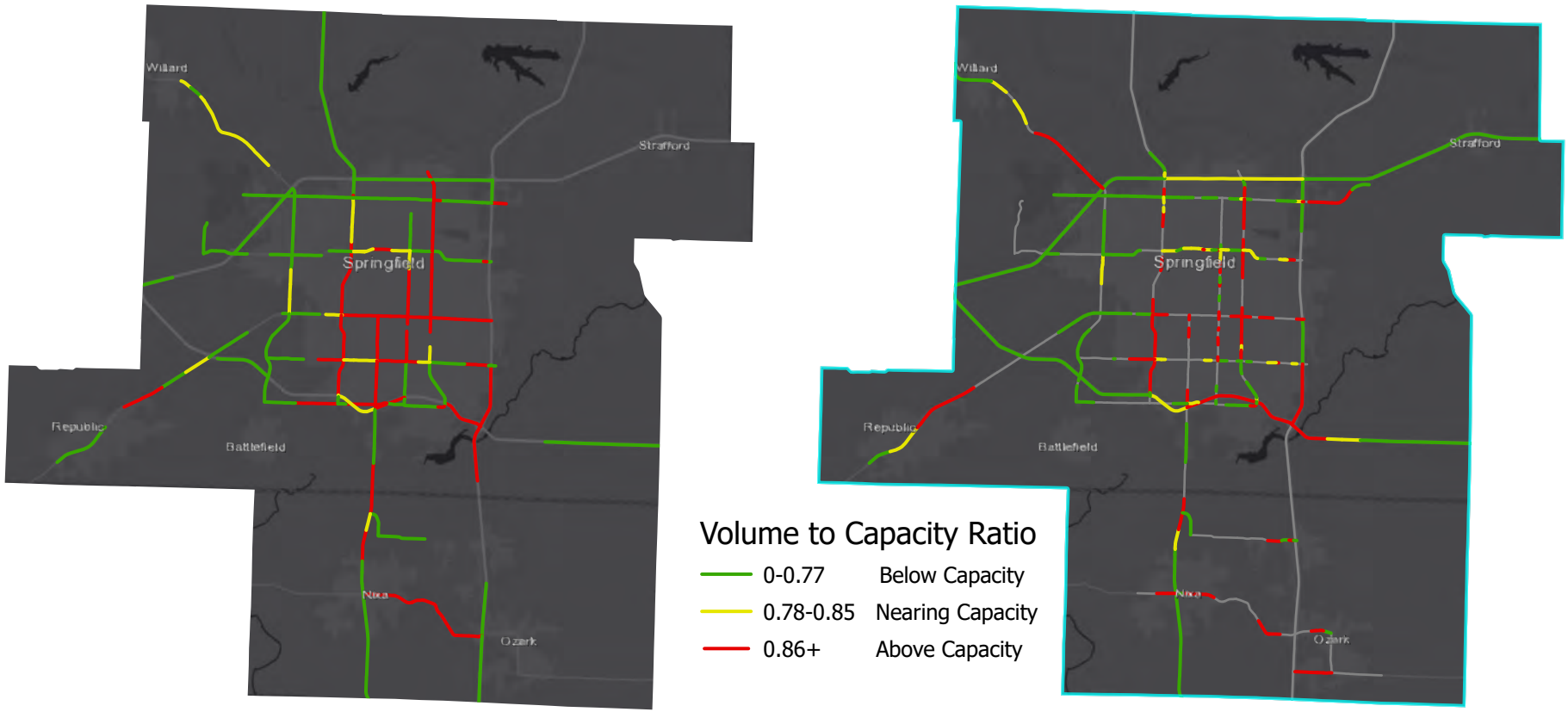
Four indicators of congestion were used to identify areas of significant congestion. Approximately 90 of the 134 miles of roadway with volume data available have remained or improved to an acceptable Volume-to-Capacity ratio. The crash frequencies showed some increase from 2016. The decline of average delay travel delay indicated an overall improvement in speeds. The intersection level of service ratings relatively unchanged. Ninety three percent of intersections in the AM commute and ninety five percent of intersections during the PM commute offered acceptable levels of service. There were only seven intersections with LOS F service.

The OTO will continue to pursue the five strategies for recurring congestion mitigation. The strategies include important engineering and behavior solutions for congestion. Early priorities for the 2021-2025 STIP include several projects drawing from these strategies.

The facilities identified in this CMP are comparable to the facilities identified in the 2017 CMP. Similar portions of Kansas Expressway, Campbell, National, Glenstone, Kearney, Sunshine, Battlefield, and south US 160 are congested in both study periods. There are some differences between the periods. US 65, south of US 60, is no longer considered congested, while US 60 at Rt. MM/M is now considered congested. Some physical improvements are possible along the region's freeways, but changes in transportation behavior are required to dramatically improve traffic on the region's arterial system.

OZARKS TRANSPORTATION ORGANIZATION
A METROPOLITAN PLANNING ORGANIZATION

Volume to Capacity Ratio



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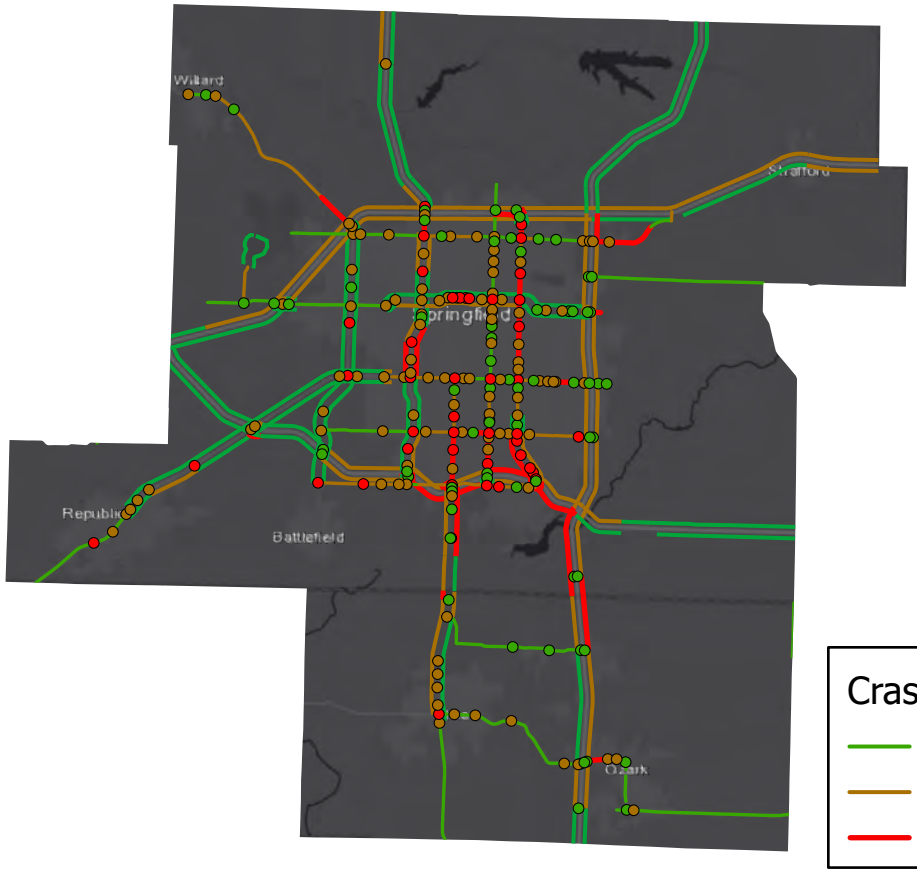
2019 Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

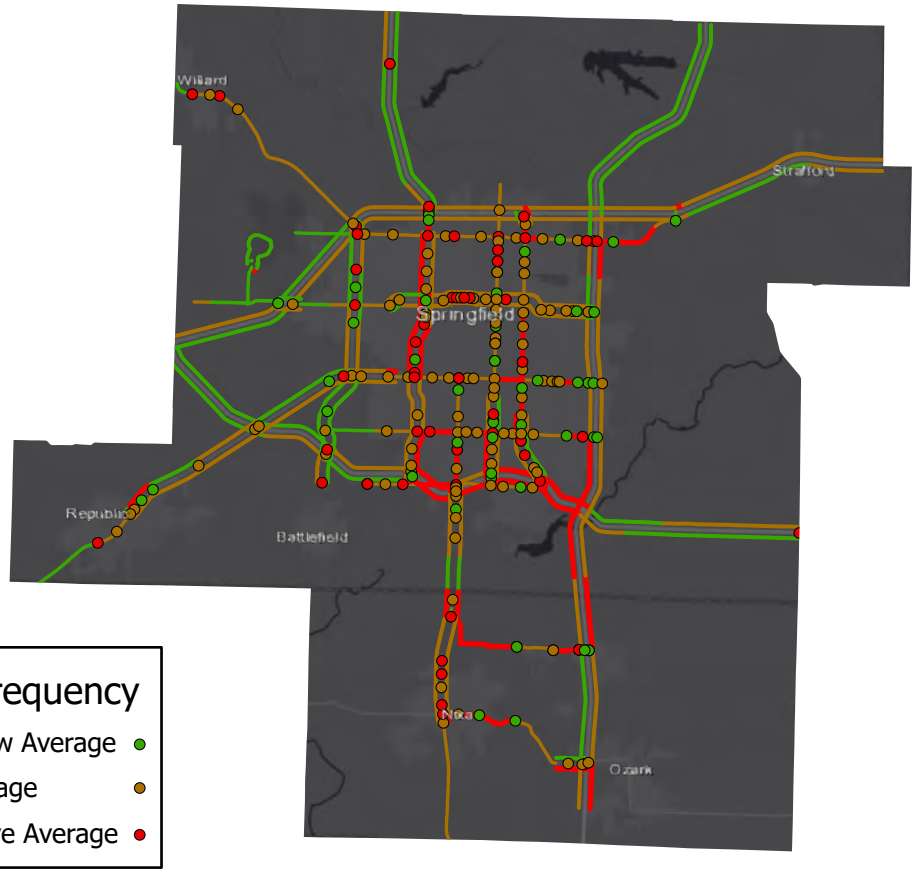
What facilities are at or above capacity?

Map 3.1

OZARKS TRANSPORTATION ORGANIZATION
A METROPOLITAN PLANNING ORGANIZATION

Crash Frequency





Crash Frequency
- Below Average
- Average
- Above Average

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2016

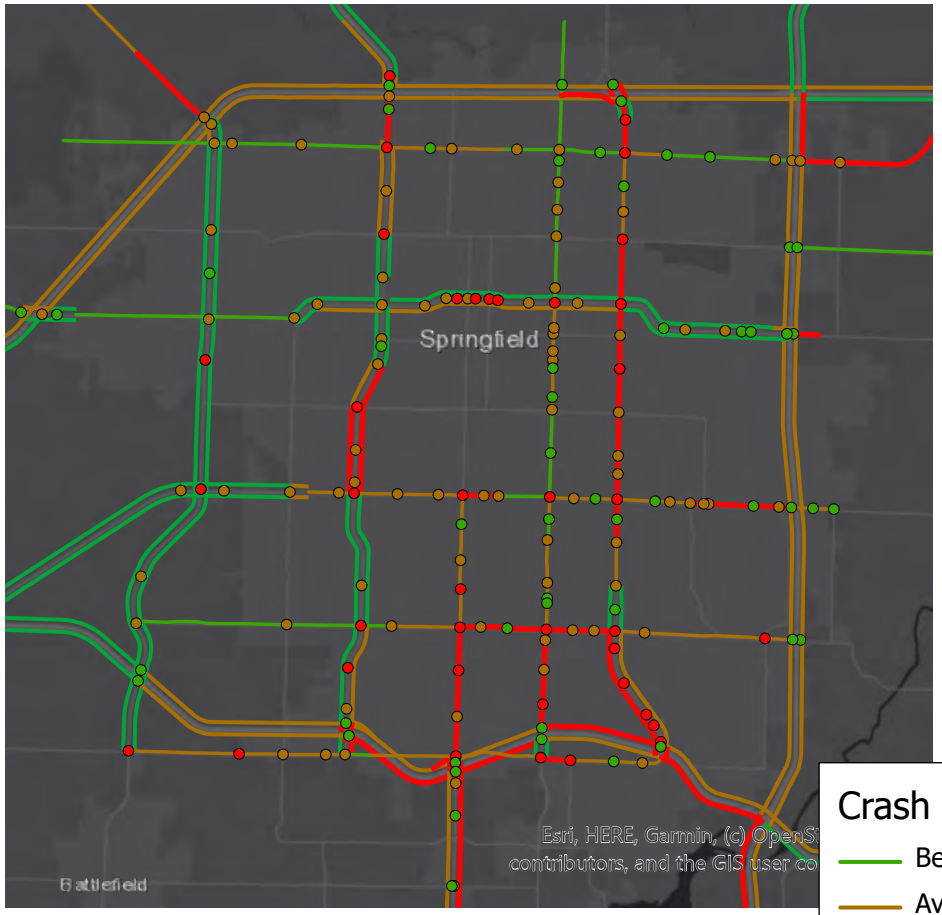
2019

Where are crashes frequently happening?

Map 4.1

OZARKS TRANSPORTATION ORGANIZATION
A METROPOLITAN PLANNING ORGANIZATION

Crash Frequency: Springfield Focus



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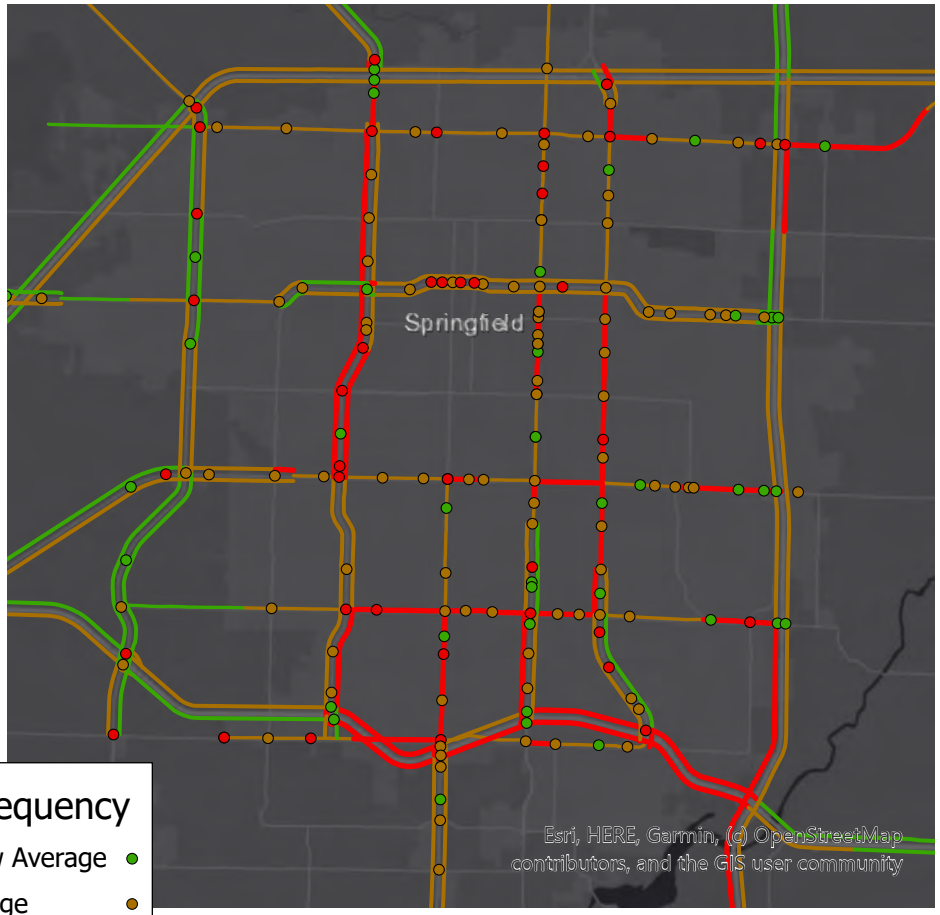


2019

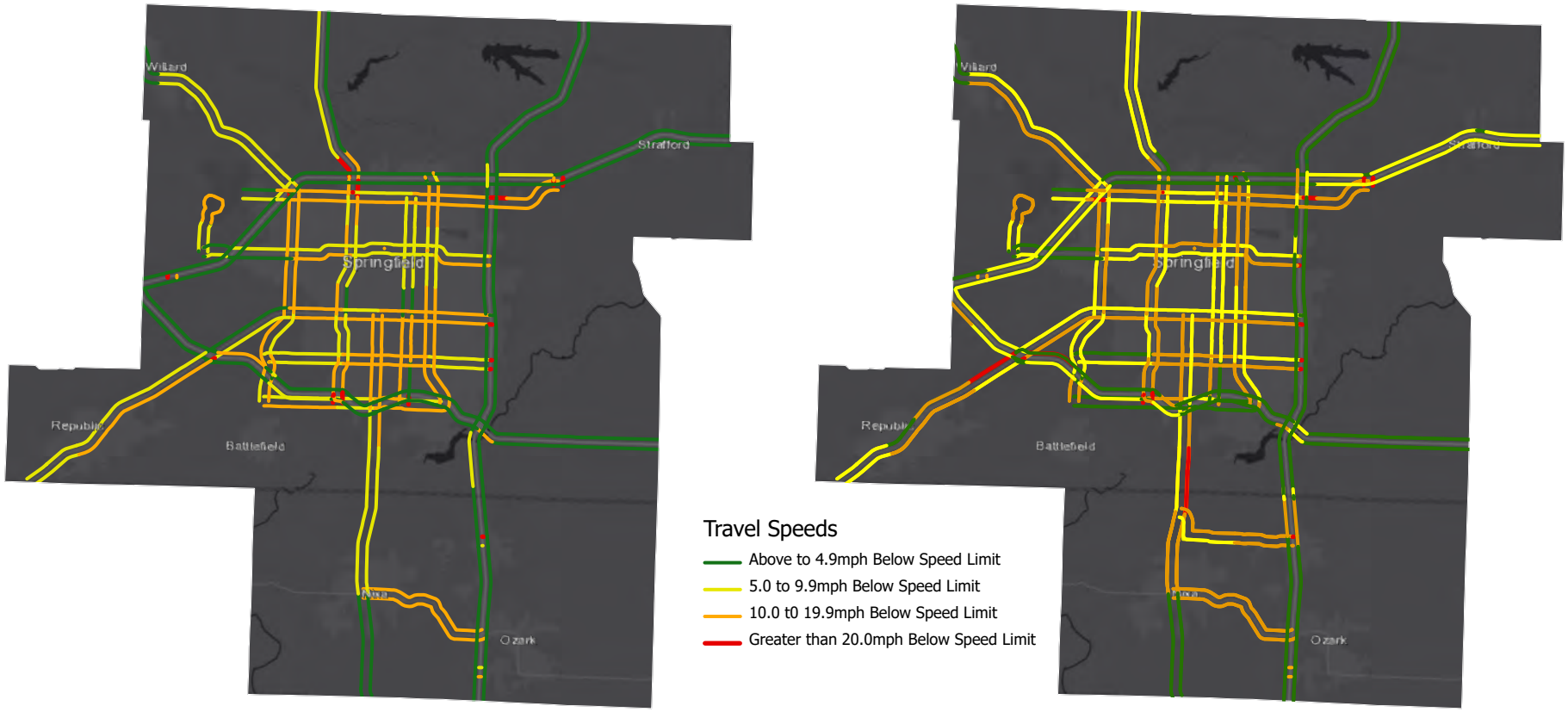
Crash Frequency
- Below Average
- Average
- Above Average

Where are crashes frequently happening?

Map 4.2

OZARKS TRANSPORTATION ORGANIZATION
A METROPOLITAN PLANNING ORGANIZATION

Morning Travel Delay



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2016

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2019

How badly are drivers delayed?

Map 5.1

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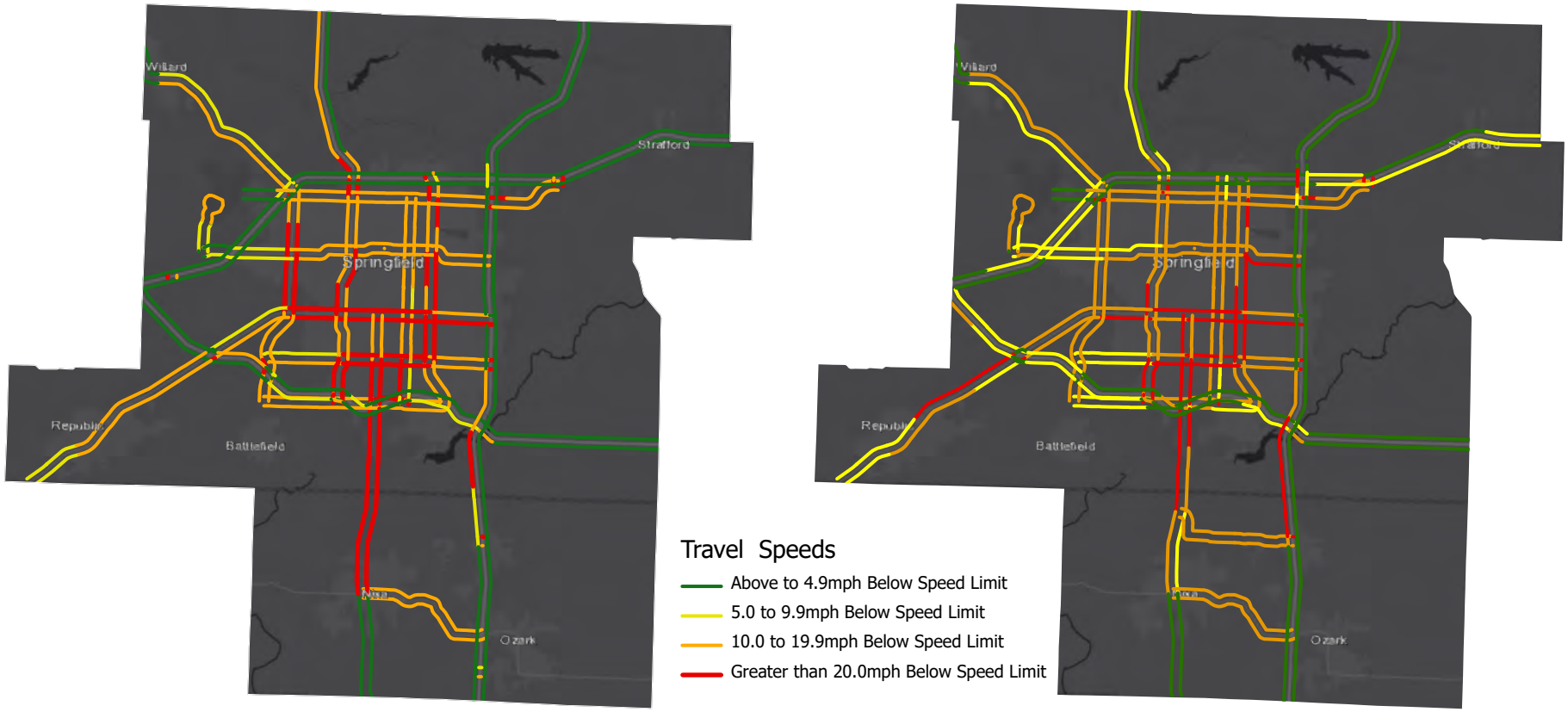
Evening Travel Delay



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2016

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2019

How badly are drivers delayed?

Map x.x

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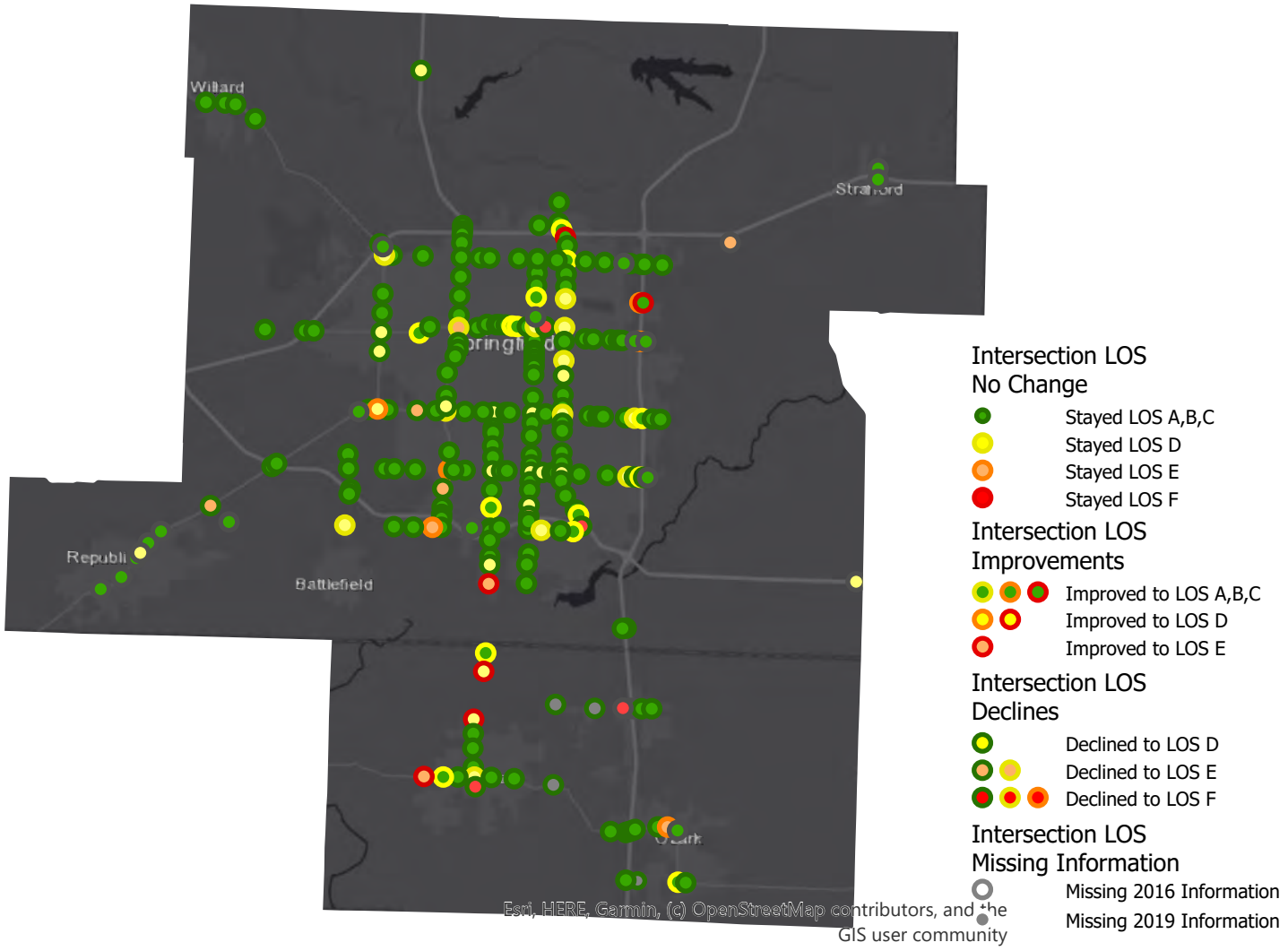
Morning Intersection Level of Service

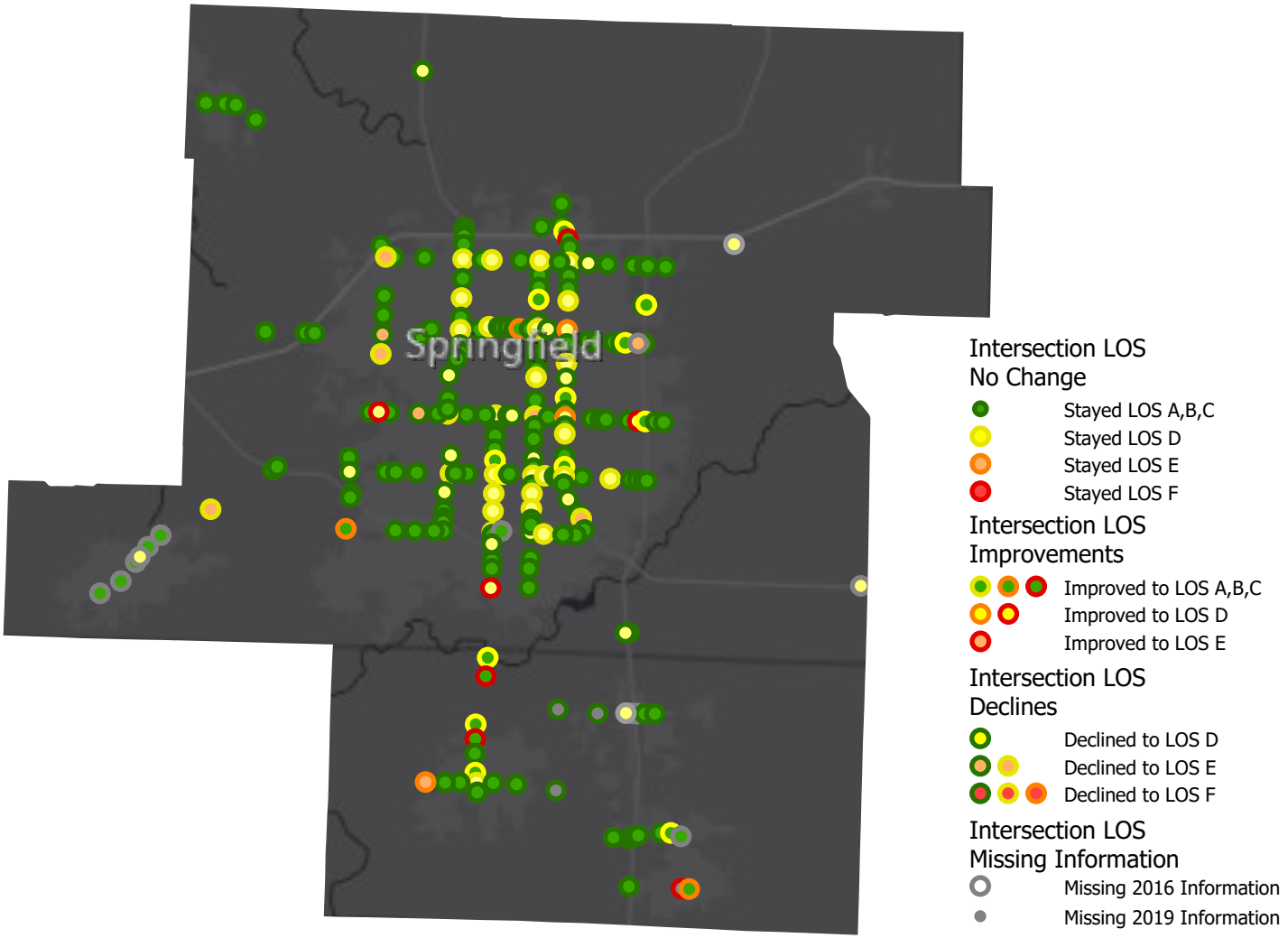


Where are intersections a source of congestion?

Map 6.1

OZARKS TRANSPORTATION ORGANIZATION
A METROPOLITAN PLANNING ORGANIZATION

Evening Intersection Level of Service



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Where are intersections a source of congestion?

Map 6.2

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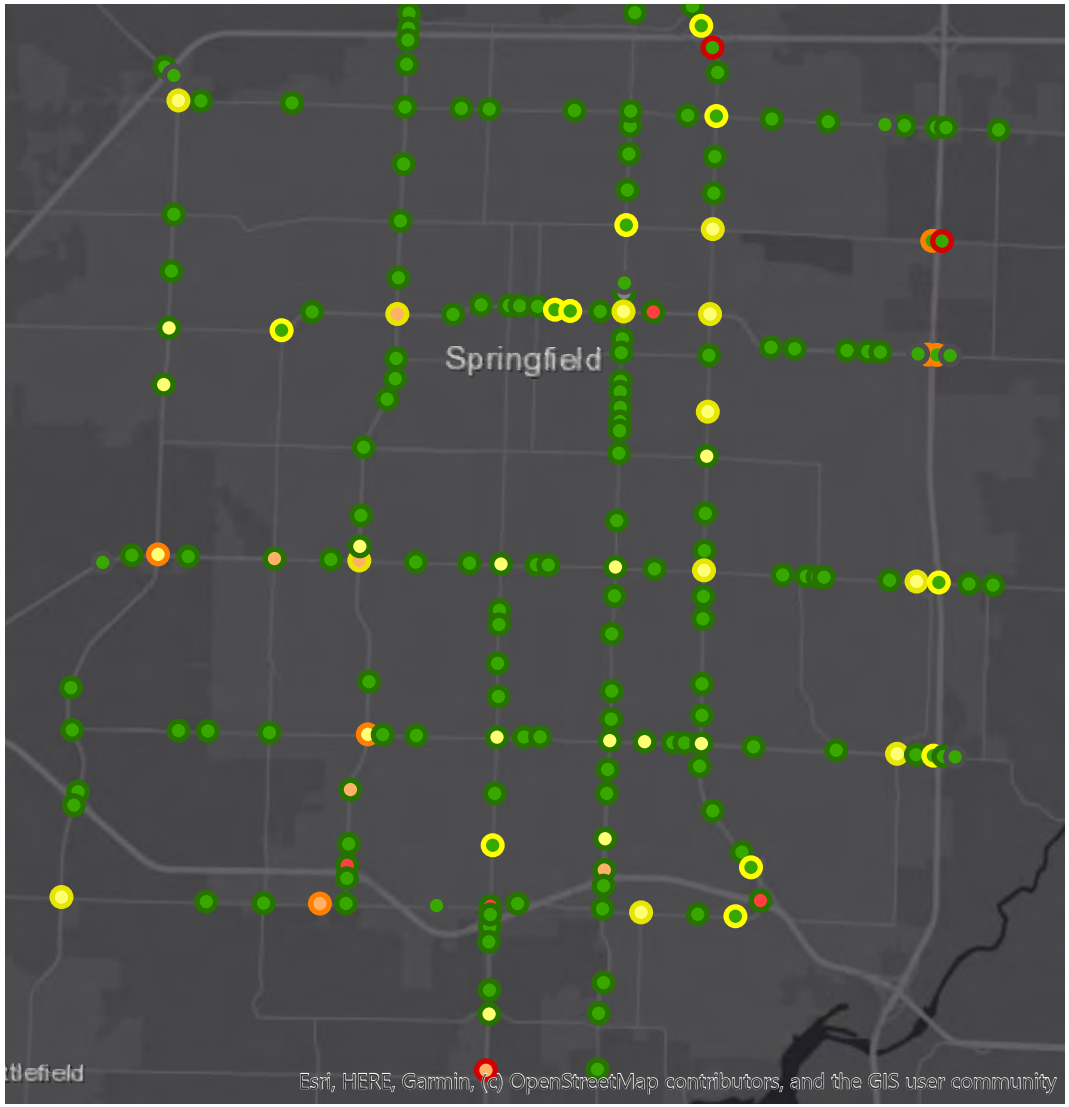
Morning Intersection Level of Service: Springfield Focus



Where are intersections a source of congestion?

Map 6.3

OZARKS TRANSPORTATION ORGANIZATION
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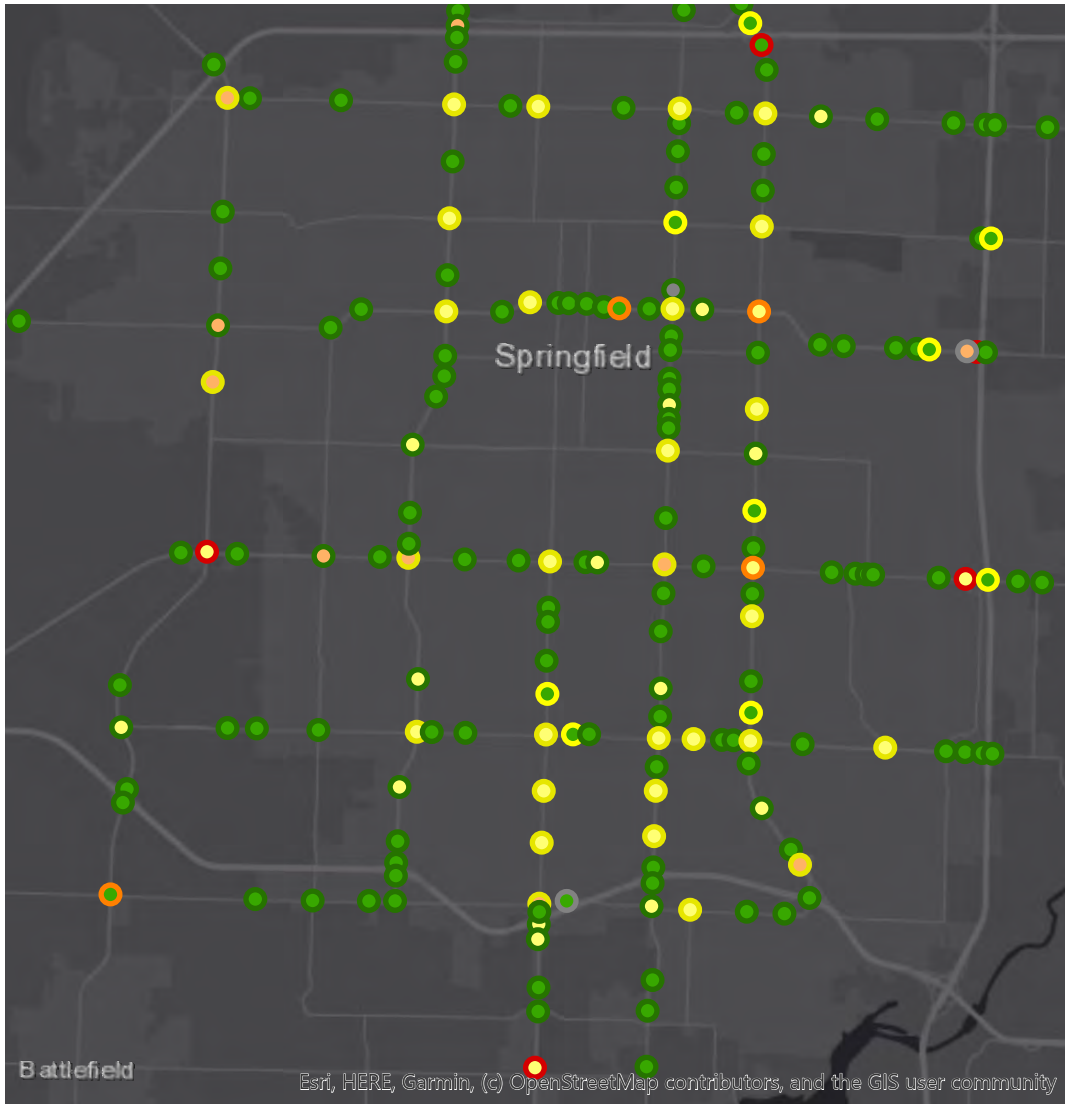
Evening Intersection Level of Service



Intersection LOS
No Change
- Stayed LOS A,B,C
- Stayed LOS D
- Stayed LOS E
- Stayed LOS F

Intersection LOS
Improvements
- Improved to LOS A,B,C
- Improved to LOS D
- Improved to LOS E

Intersection LOS
Declines
- Declined to LOS D
- Declined to LOS E
- Declined to LOS F

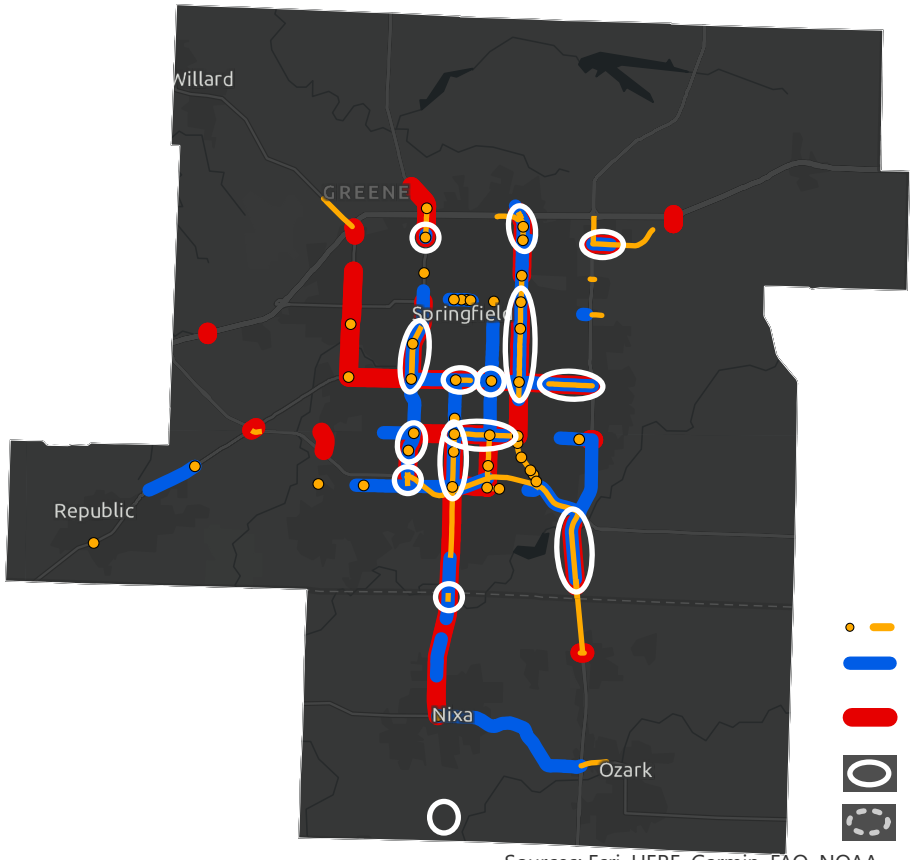
Intersection LOS
Missing Information
- Missing 2016 Information
- Missing 2019 Information

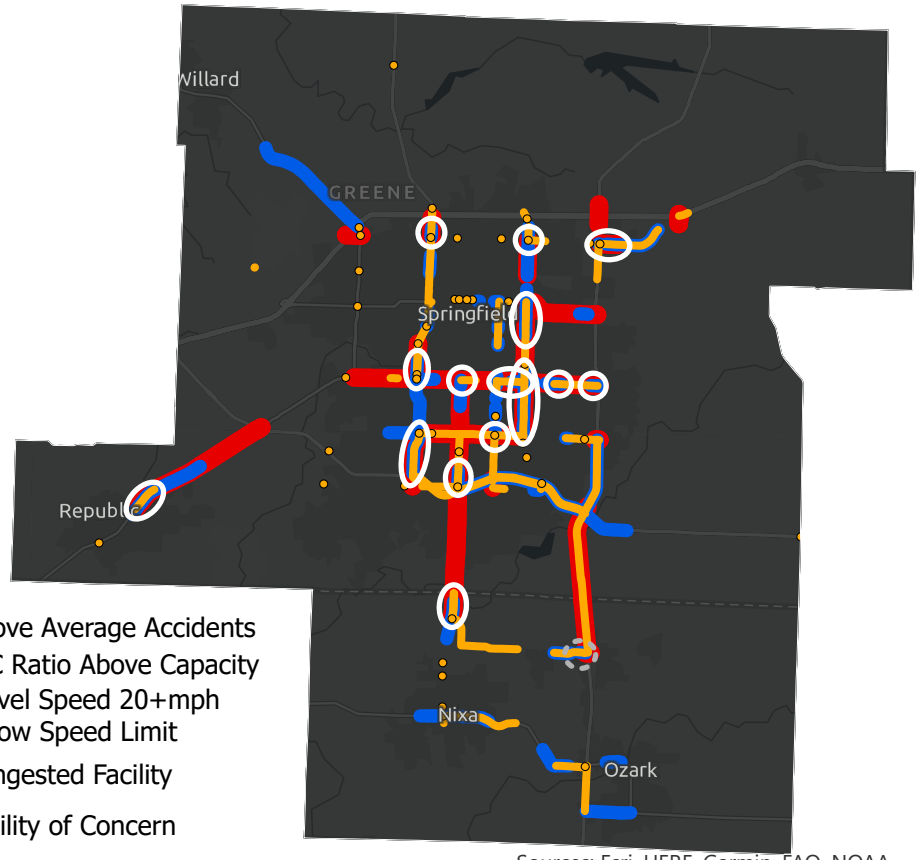
Where are intersections a source of congestion?

Map 6.4

OZARKS TRANSPORTATION ORGANIZATION
A METROPOLITAN PLANNING ORGANIZATION

Congested Facilities: Method #1





Above Average Accidents
V/C Ratio Above Capacity
Travel Speed 20+mph Below Speed Limit
Congested Facility
Facility of Concern

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2016

Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

2019

Which roads are delayed, very full, and prone to crashes?

Map 7.1

OZARKS TRANSPORTATION ORGANIZATION
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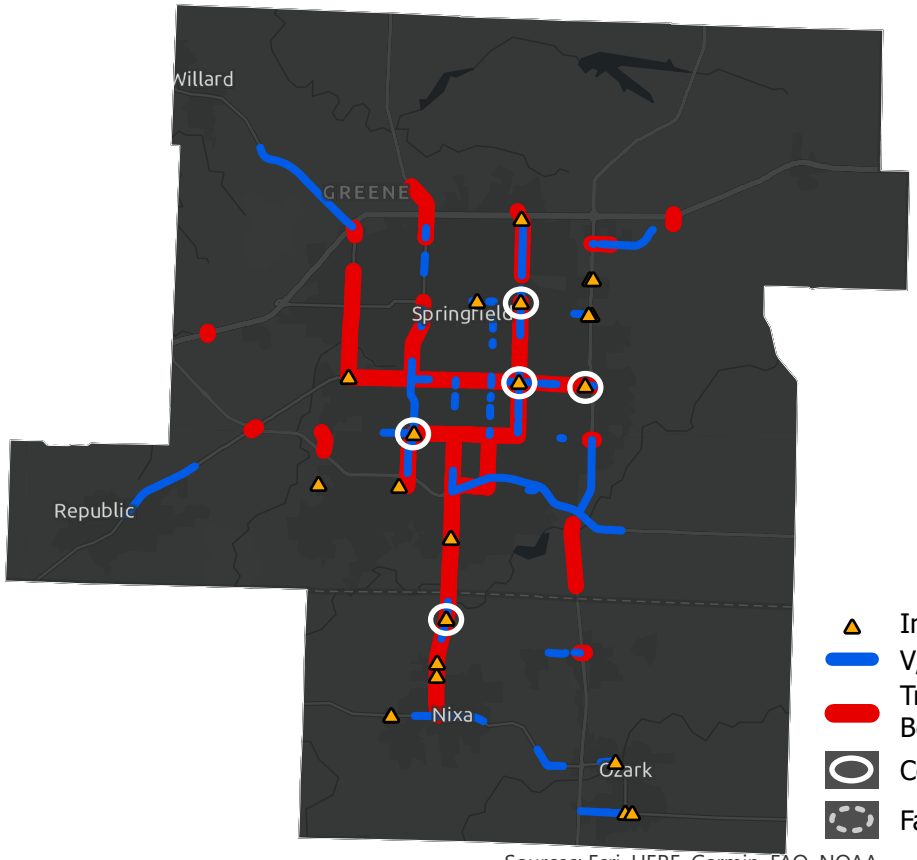
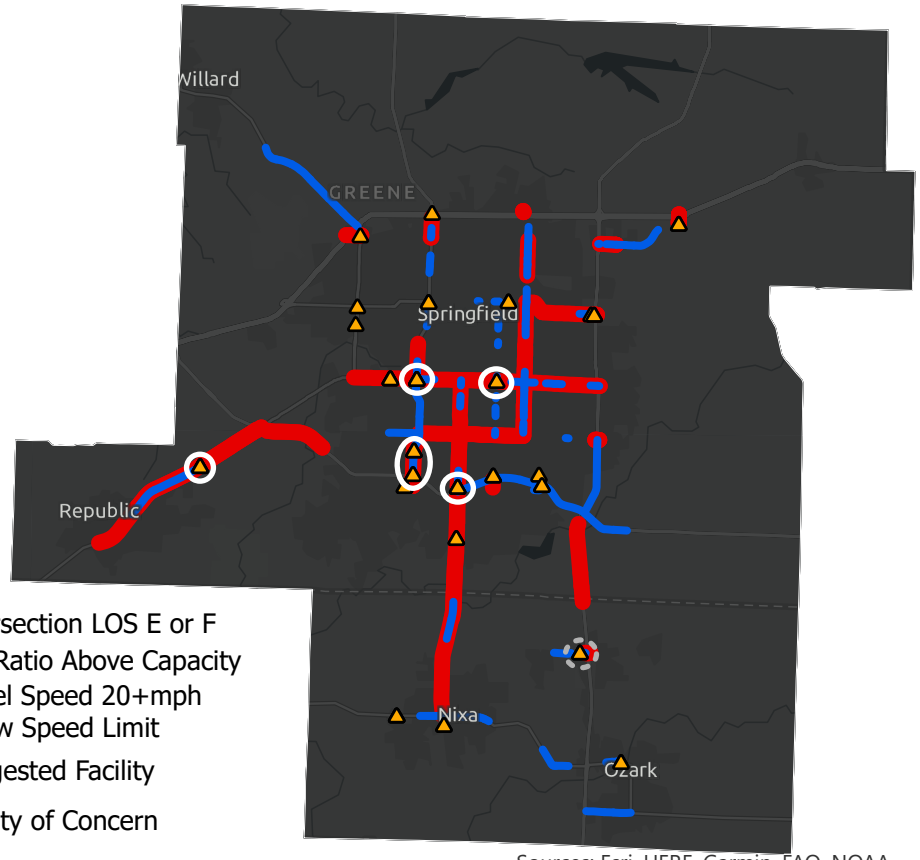
Congested Facilities Method #2



Intersection LOS E or F
V/C Ratio Above Capacity
Travel Speed 20+mph Below Speed Limit
Congested Facility
Facility of Concern



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2016

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2019

Which roads are delayed, very full, and have problem intersections?

Map 7.2