DEPARTMENT OF TRANSPORTATION

2020 Congestion Report

Metropolitan Freeway System
June 2020

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Purpose and Need

The Metropolitan Freeway System Congestion Report is prepared annually by the Regional Transportation Management Center (RTMC) to document those segments of the freeway system that experience recurring congestion. This report is prepared for these purposes:

- Identification of locations that are over capacity
- Project planning
- Resource allocation (e.g., RTMC equipment and incident management planning)
- Construction zone planning
- Department performance measures reporting

Introduction

What is Congestion?

MnDOT defines freeway congestion as traffic flowing at speeds less than or equal to 45 Miles per Hour (MPH). This definition does not include delays that may occur at speeds greater than 45 MPH. The 45 MPH speed limit was selected since it is the speed where “shock waves” can propagate. These conditions also pose higher risks of crashes. Although shock waves can occur above 45 MPH there is a distinct difference in traffic flow above and below the 45 MPH limit.

What is a shock wave?

A shock wave is a phenomenon where the majority of vehicles brake in a traffic stream. Situations that can create shock waves include:

- Changes in the characteristics of the roadway, such as a lane ending, a change in grade or curvature, narrowing of shoulders, or an entrance ramp where large traffic volumes enter the freeway.
- Large volumes of traffic at major interchanges with high weaving volumes and entrance ramps causing the demand on the freeway to reach or exceed design capacity.
- Traffic incidents, such as crashes, stalled vehicles, animals or debris on the roadway, adverse weather conditions and special events.

Drivers’ habits can also contribute to shock waves. Drivers’ inattentiveness can result in minor speed variations in dense traffic or sudden braking in more general conditions. In these situations, shock waves move upstream toward oncoming traffic at rates varying according to the density and speed of traffic. As the rate of movement of the shock wave increases, the potential for rear end or sideswipe collision increases. Multiple shock waves can spread from one instance of a slowdown in traffic flow and blend together with other extended periods of “stop-and-go” traffic upstream. This condition is referred to as a “breakdown” in traffic.

Usually breakdowns last the remainder of the peak period if traffic volumes are close to or above design capacity. These types of breakdowns are typical in bottleneck locations on the freeways.

Methodology

MnDOT began collecting and processing congestion data in 1993. Since this time, MnDOT has improved its data processing and changes in methodology have occurred. These changes as well as variables affecting localized and region-wide traffic volumes, such as ramp metering algorithms, make it difficult to compare congestion from one year to the next.

How is congestion measured?

For this report, MnDOT derived its congestion data using two processes:

- Surveillance detectors in roadways
- Cellular probe data provided by HERE

Electronic surveillance systems exist on about 95% of the metro area freeway system. For this report, the Regional Transportation Management Center collected October 2020 data from 4,000 traffic sensors on Twin Cities Metro freeways which are either loop detectors embedded in the pavement or radar sensors mounted on the roadside. On corridors without electronic surveillance systems, the RTMC began using probe data provided by HERE which gives average vehicle speeds along a corridor over a given time.

Generally, the month of October is used for congestion reports since it reflects regular patterns of traffic. With summer vacation season over and school back in session, commuter traffic flows return to normal levels. During the month of October, most summer road construction project are completed and weather conditions are still generally favorable. MnDOT understands that some of the worst experiences with traffic congestion are caused by construction, incidents and weather, and the department expends considerable resources to minimize work zone delays, clear incidents quickly and address weather events to the extent possible. However, these causes of congestion occur sporadically and are therefore not factored into this analysis because it’s essential to understand how well existing freeway designs are performing under normal peak period traffic conditions.

The RTMC evaluates the 782 directional miles of the Twin Cities urban freeway system to develop the AM plus PM percentage of Directional Metro Freeway Miles Congested. It tracks the percentage of miles that operate at speeds below 45 MPH for any length of time during the AM and PM peak periods (782 miles AM and 782 miles PM). Mainline detectors are located in each lane of a freeway at approximately one-half mile intervals.

Individual lane detectors located at a given location along the same direction of the freeway constitute a station. For the purpose of this report, if any station’s detectors experience congestion at any given time, the station is identified as congested.

Speed data is based on the median value of data collected at detector locations. Median values are calculated for each five- minute interval for the periods of 5:00 AM to 10:00 AM and 2:00 PM to 7:00 PM for the twelve midweek days in October. MnDOT uses medians, rather than averages, to minimize the effects of extremes in the data. This process mitigates those occasions of roadwork lane closures, significant traffic incidents, and one-time traffic events not related to daily commuting patterns.

2020 Results

The Twin Cities freeway system had a decrease in the percentage of miles of freeway system congested, from 24.4% in 2019 to 1.4% in 2020. Many factors regularly affect congestion levels such as the local economy, population growth, gas prices, transit ridership and vehicle miles traveled (VMT). The COVID-19 pandemic had a major impact on congestion levels in 2020, as commuting patterns drastically changed under stay-at-home orders and due to significant numbers of people working remotely. This resulted in almost non-existent congestion during peak hours and very low transit ridership.

What are MnDOT’s strategies for addressing congestion and improving mobility in the Twin Cities?

Mitigating congestion is critical for the convenience of the traveling public and will also help improve air quality and public health for all Minnesotans. As a result, MnDOT seeks to get the highest possible return on its mobility investments using the following strategies and goals.

1. Active Traffic Management – The first priority to address mobility issues is active traffic management, which utilizes a wide variety of transportation technologies to ensure the existing freeway system is carrying people as efficiently and effectively as possible. Examples of active traffic management include real time traveler information systems, ramp meters, changeable message signs and FIRST response vehicles. These tools and technologies are coordinated out of MnDOT’s Regional Transportation Management Center and provide significant benefits to motorists (e.g. increased throughput, capacity and reliability; decreased incidents and travel times; improved safety). Due to its cost-effectiveness, active traffic management is the first priority for addressing congestion and mobility issues before pursuing larger cost capital projects.

2. Spot Mobility Improvements – The second priority for mobility investment is to implement lower cost, high benefit spot improvements at specific locations throughout the metro area. Typically, these projects are smaller in scope than traditional highway investments with the intent to allow quicker and simpler delivery. Their purpose is generally to improve traffic flow by relieving bottlenecks, improving geometric design and addressing safety issues. Some enhance capacity by adding auxiliary lanes or lengthening entrance/exit ramps. Others provide transit advantages such as bus-only shoulders. Most of these improvements are identified through MnDOT’s Congestion Management & Safety Plan (CMSP) studies.

3. Managed Lane System – If active traffic management or spot mobility projects will not adequately solve a congestion problem, then the third priority of mobility investment is managed lanes. Managed lanes may include strategies such as price managed lanes, high occupancy vehicle lanes or bus only shoulders. MnPASS is a form of priced manage lane that is in operation on I-394, I-35W and I-35E. It provides a more reliable, less congested travel option during peak travel periods for transit riders, carpoolers (vehicles with two or more occupants), motorcyclists and solo motorists who are willing to pay a fee. MnPASS lanes can improve highway efficiency and effectiveness by maximizing person throughput and providing long-term travel time reliability that is not possible with general purpose lanes. A MnPASS lane can move twice as many people as a general purpose lane during peak congestion. MnPASS also increases bus transit ridership and carpooling—approximately 80% of the people using and benefitting from the MnPASS lanes are riding on transit or in carpools. Bus only shoulders on over 300 miles of metro freeways provide improved travel times for transit during congested periods.

4. Strategic Capacity Enhancements – The fourth priority of mobility investments, strategic capacity enhancements (namely interchanges and general purpose lanes), are implemented when other previously described investments cannot improve travel conditions for people and freight. These more traditional projects utilize the existing pavement and right-of-way to the fullest extent possible.

Transportation Demand Management to reduce vehicle miles traveled. In 2021, MnDOT received a recommendation from the agency's Sustainable Transportation Advisory Council (STAC) to adopt a goal to reduce vehicle miles traveled (VMT) by 20% by 2050. The agency agreed to the preliminary goal and is engaging with the public and stakeholders to better understand the options that people in various communities need to reduce their own VMT. MnDOT plans to add a new first priority (above) for TDM to reduce VMT and help relieve congestion, while also supporting the agency's efforts to improve public health and reduce carbon pollution consistent with Minnesota's Next Generation Energy Act and Minnesota statute 174.01.

Mobility investments are made in lower cost projects that produce high benefits, even if these projects do not completely resolve the existing congestion problem. This approach recognizes the diminishing returns to higher levels of investments. For example, alternative intersection designs are often less expensive than traditional solutions and one way to foster cost savings along with right sizing the investments to the level of the problem. Cost savings can then be used to address other needs on the system, thereby stretching the region's transportation funds further and allowing for greater return on investment and regional balance of investments.

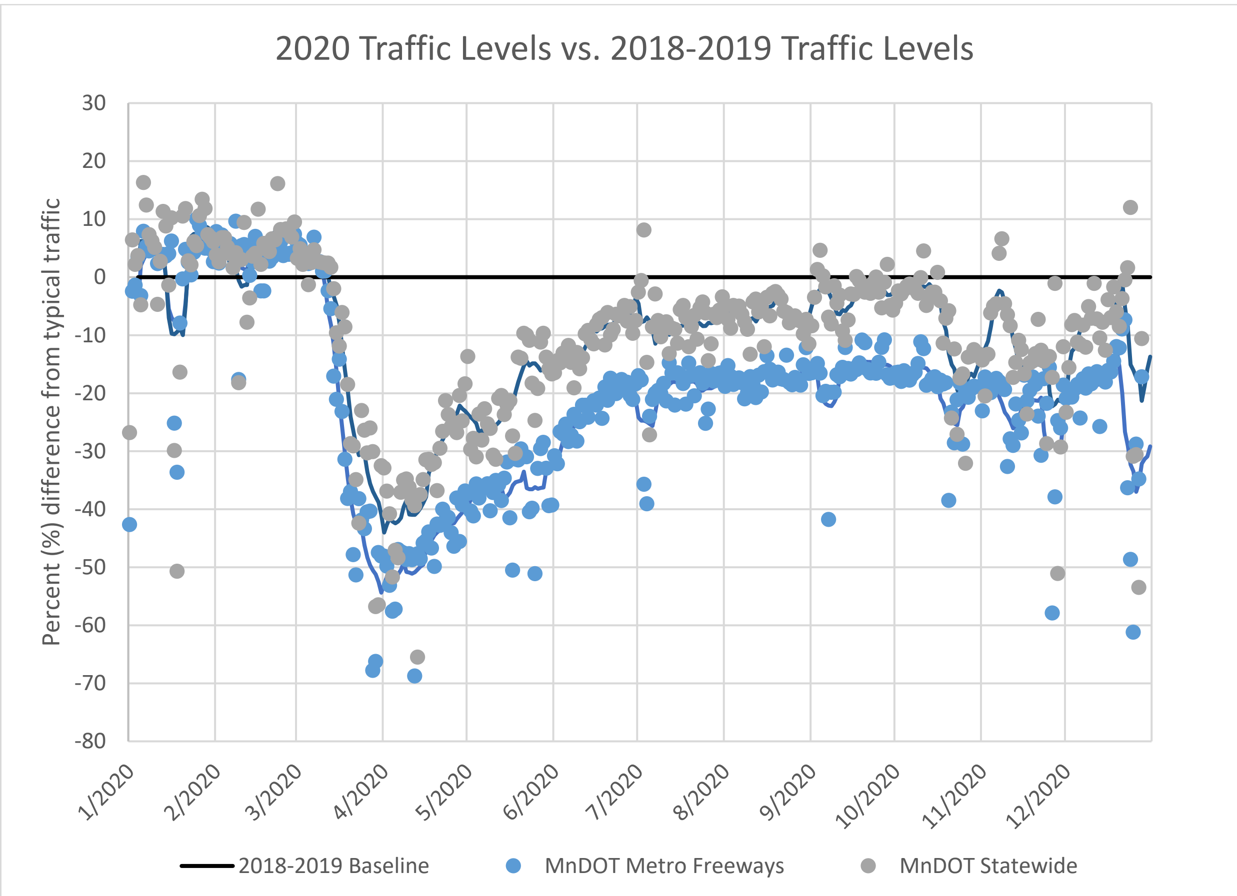
Mobility investments also focus on addressing today's problems given the limited funding and the backlog of existing, unresolved transportation needs. Future needs are anticipated, but projects are prioritized to address existing problems before problems that are forecasted to occur in 2040 due to growth.

MnDOT uses the existing infrastructure and right-of-way to the maximum extent possible when projects are designed and implemented. Significant right-of-way purchases for transportation projects are costly and can negatively affect local businesses and residents and are therefore avoided as much as possible.

MnDOT coordinates mobility investments with needed pavement and bridge preservation work to minimize cost and disruption to the travel public, as well as with local projects (including utility projects and private sector developments when possible) to combine multiple projects where appropriate and in other cases to avoid having multiple projects along nearby parallel corridors at the same time.

COVID-19 Traffic Impacts

The COVID-19 pandemic had a significant impact on traffic levels throughout the State of Minnesota. Highway volume decreased by as much as 50% on many corridors, providing congestion relief and improved air quality. As pandemic restrictions eased, teleworking remained a primary way to conduct business keeping traffic volumes below historical values. While statewide, traffic levels approached normal levels, Twin Cities metro freeway traffic volumes remained about 15% below the 2018-2019 volumes by December 2020.



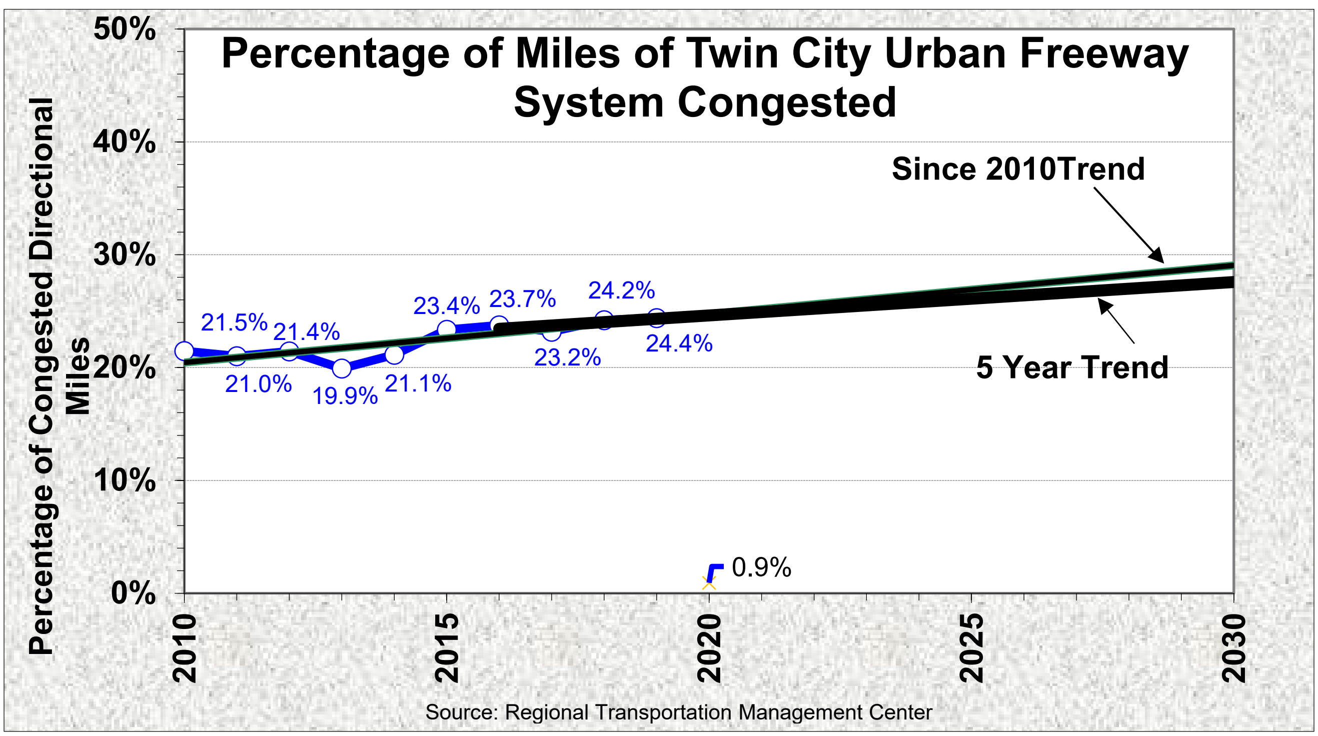
Data Source: Met Council and MnDOT

Potential benefits of teleworking on congestion

Although this report shows congestion levels from October 2020, the traffic effects from the pandemic indicate that telecommuting can be a promising, effective, and feasible form of travel demand management (TDM) in the Twin Cities Metro Area. The goal of TDM is to reduce the peak travel demand that often drives congestion and the needs on the system. An increase in telecommuting from the normal 5% of daily commuters up to 20% or even higher could begin to decrease miles of congestion in the metro area, reversing its historical upward trend. An increase in telecommuting will also reduce statewide vehicle miles traveled, vehicle emissions, and reduce the need for capital expenditures on mobility projects.

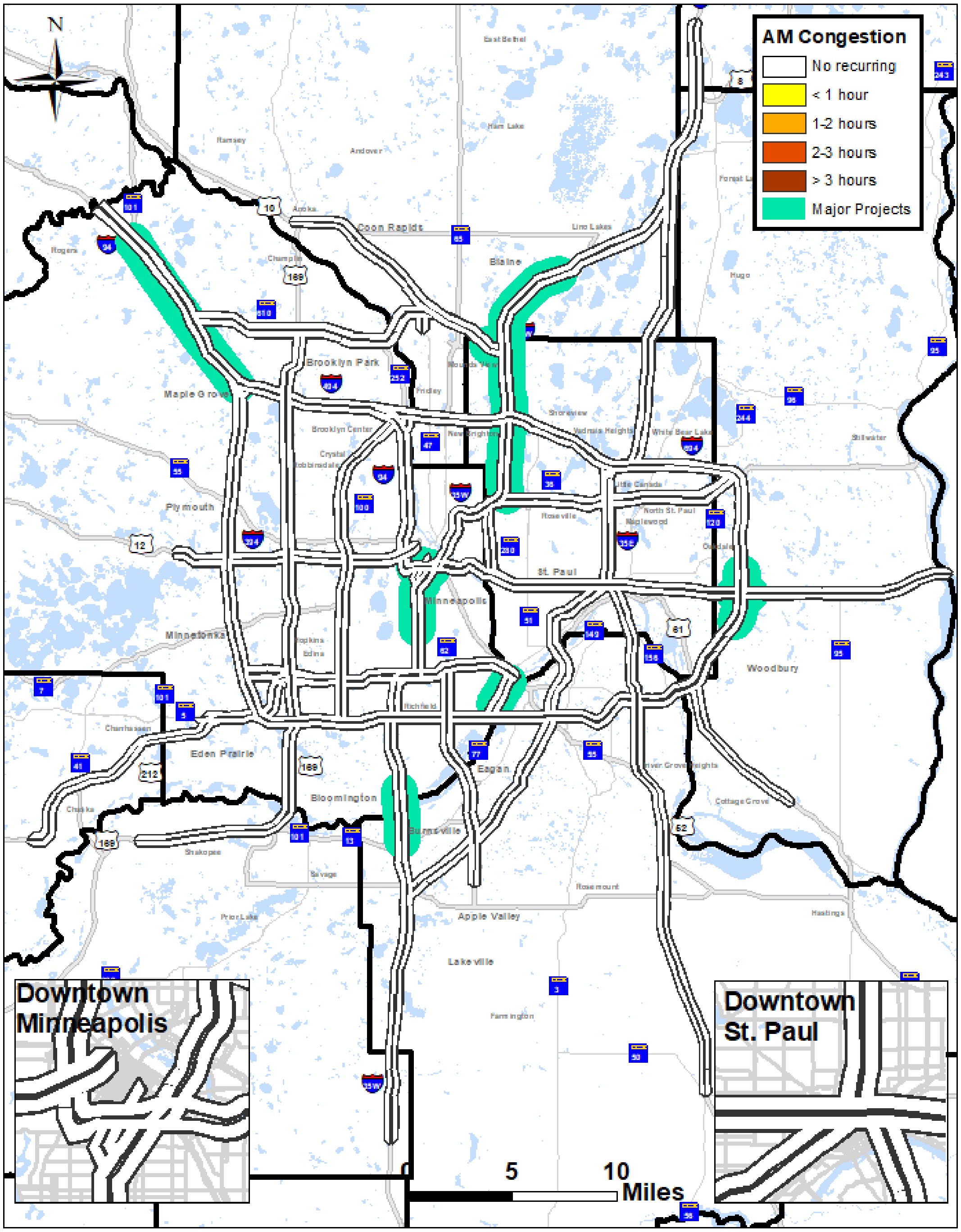
Explanation of Percentage Miles of Twin City Urban Freeway System Congested Graph

Mitigating congestion is critical to the traveling public. MnDOT has limited resources to slow projected increases in congestion. The graph that follows represents historical levels of congestion along with projected trend lines based on data collected since 2010 and the past 5 years of data. The anticipated trend of increased VMT and increasing construction costs are expected to cause congestion to grow in the long-term. Changes in commuter patterns due to teleworking and changes in economic conditions both due to COVID-19 could cause short-term decreases in congestion in the next few years. The trend lines in the graph below excludes the data point of 2020. We are excluding this data from the trend analysis due to the extreme traffic decline from the COVID-19 pandemic.

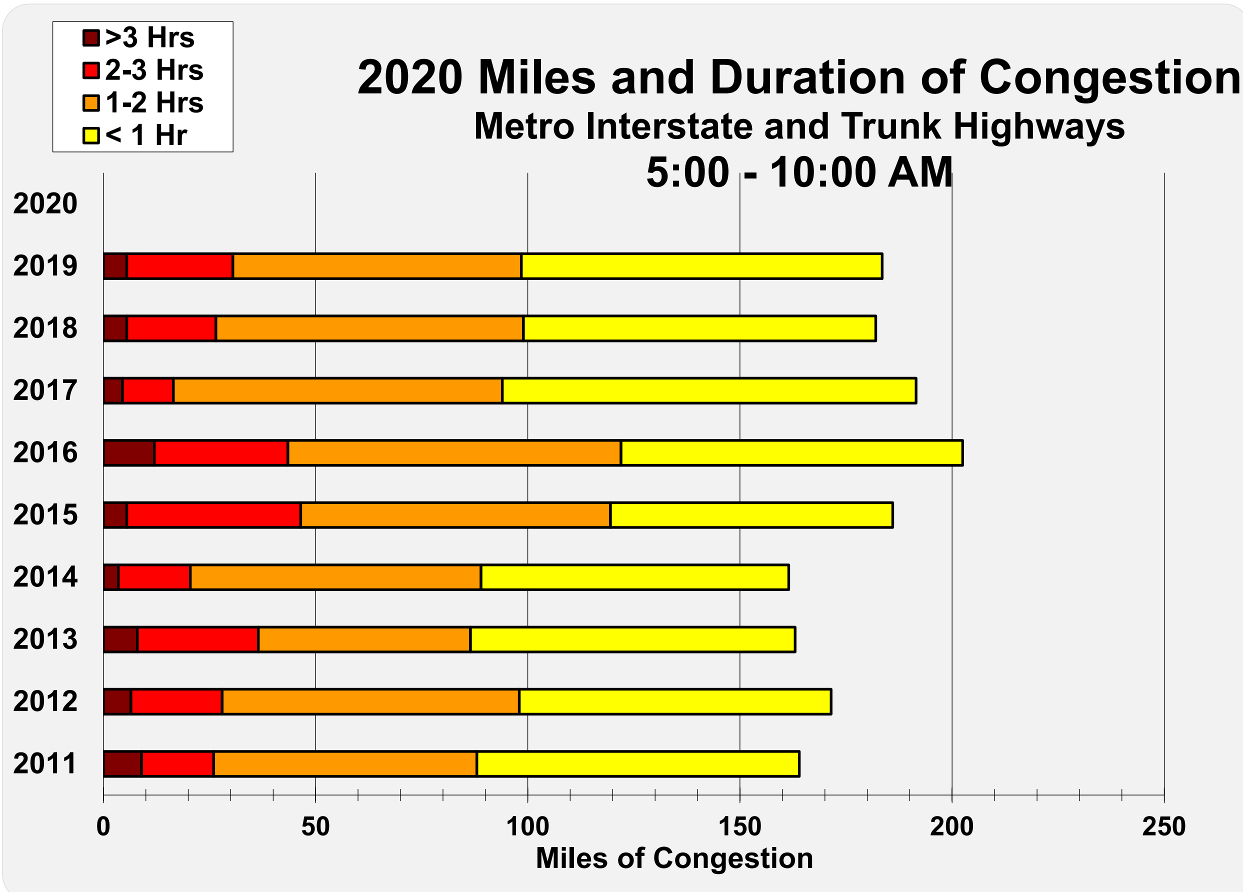


2020 AM Metro Freeway Congestion: 5 AM - 10 AM

Data collected during October, 2020. Congestion occurs when speeds drop below 45 MPH.

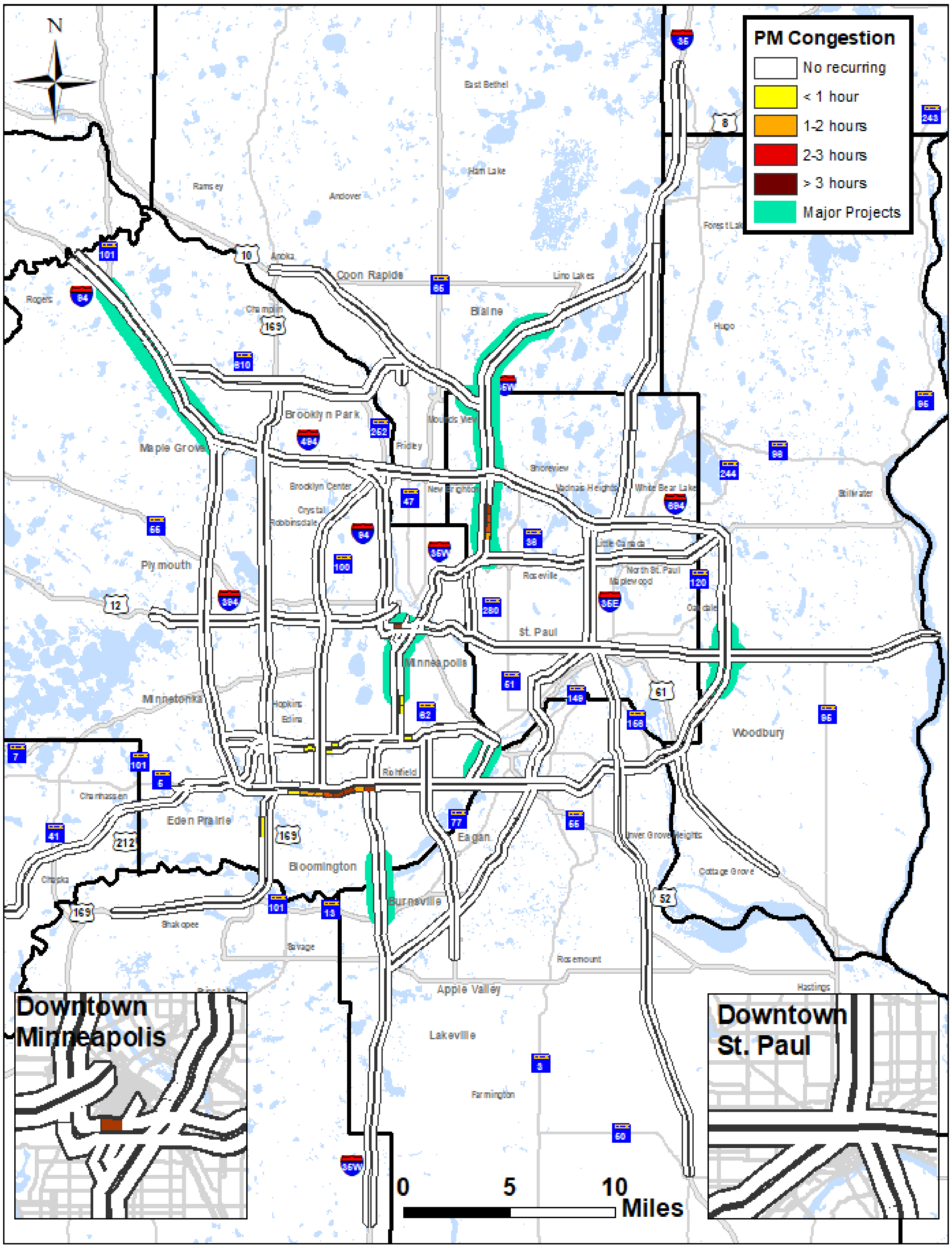


Miles and Duration of Congestion: 5:00 AM – 10:00 AM

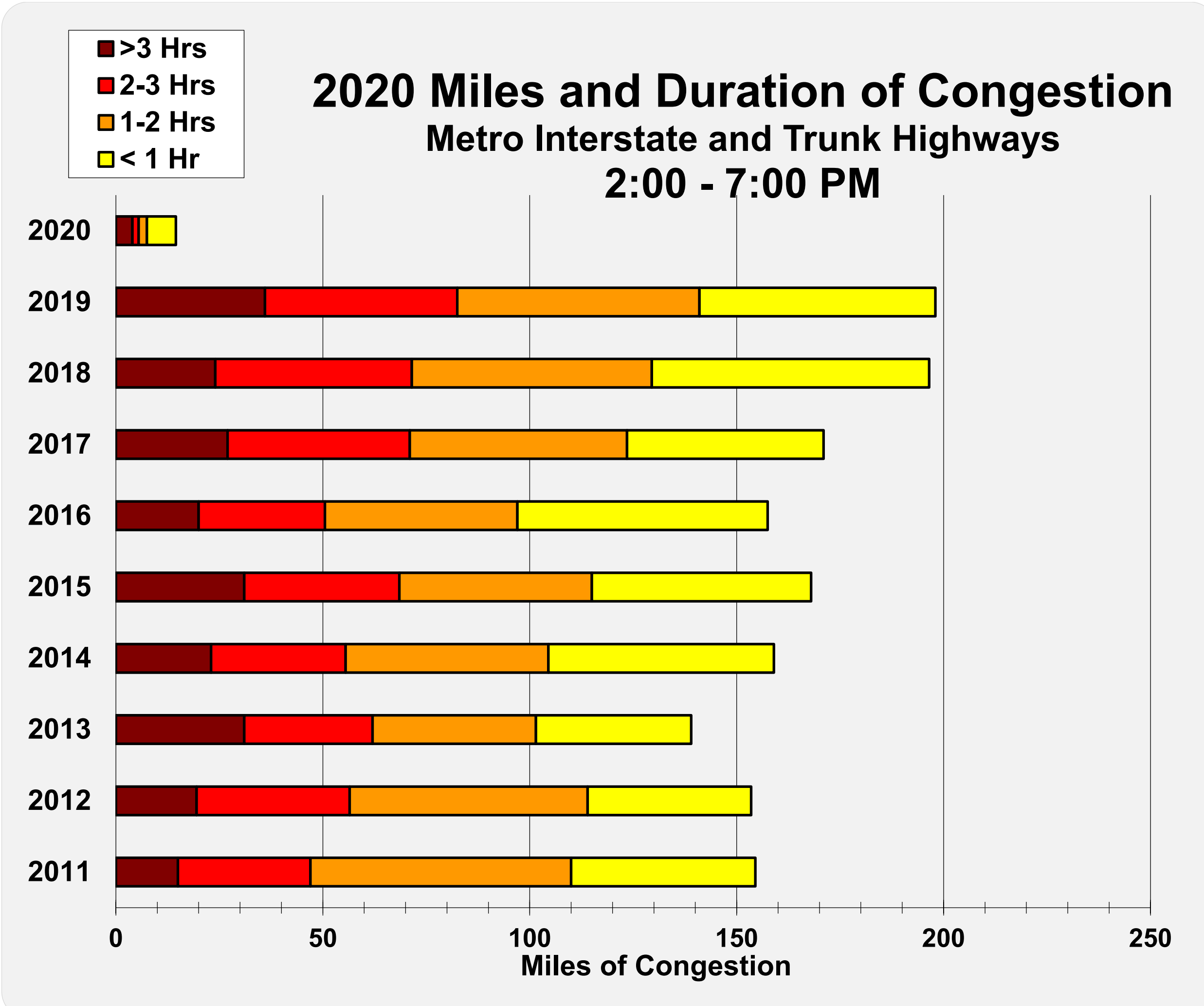


2020 PM Metro Freeway Congestion: 2 PM - 7 PM

Data collected during October, 2020. Congestion occurs when speeds drop below 45 MPH.



Miles and Duration of Congestion: 2:00 PM – 7:00 PM



Appendix A: Centerline Miles Measured for Congestion

Centerline Miles of Highway Measured for Congestion

Highway	Centerline Miles of Highway	Limits
I-35	16	North split to Hwy 8 & south split to Co Rd 2
I-35E	39	Entire Highway
I-35W	42	Entire Highway
I-94	54	Hwy 101 to St. Croix River
I-394/TH 12	12	Central Ave. to Downtown Mpls.
I-494	43	Entire Highway
I-694	23	Entire Highway
Subtotal	**229**	Interstate Highway Miles

Centerline Miles of Highway Measured for Congestion

Highway	Centerline Miles of Highway	Limits
TH 5	3	I-494 to Mississippi River
TH 10	12	Hwy 169 to I-35W
TH 36	11	I-35W to Century Ave.
TH 52	25	I-94 to Upper 55th St.
US 61	8	Co Rd 19 to I-494
TH 62	12	I-494 to Hwy 55
TH 65	1	10th St. to I-35W
TH 100	16	I-494 to I-694
US 169	31	Highwood Dr. to Co Rd 15 & I-494 to TH 610
US 212	17	Hwy 147 to Hwy 62
TH 610	12	I-94 to Hwy 10
TH 77	11	138th St. to Hwy 62
TH 280	3	I-94 to Broadway Ave.
Subtotal	**162**	Trunk Highway Miles

Centerline Miles of Highway Measured for Congestion Total

Grand Total	**391**	Highway Miles

Appendix B: Daily Congestion Map

2020 Metro Freeway Congestion

Data collected during October, 2020. Congestion occurs when speeds drop below 45 MPH.