



# Metropolitan Freeway System 2007 Congestion Report



**Minnesota Department of Transportation**  
Office of Traffic, Safety and Operations  
Freeway Operations Section  
Regional Transportation Management Center

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## Purpose and Need

The Metropolitan Freeway System Congestion Report is prepared annually to document those segments of the freeway system that experience recurring congestion. This report is prepared for these purposes:

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

## Introduction

### What is Congestion?

Mn/DOT defines congestion as traffic flowing at speeds less than or equal to 45 miles per hour (M.P.H.). This definition does not include delays that may occur at speeds greater than 45 M.P.H. The 45 M.P.H. 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 M.P.H. there is a distinct difference in traffic flow above and below the 45 M.P.H. 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 intersections 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 breaking 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 collisions increases. Multiple shock waves can spread from one instance of a slowdown in traffic flow and blend together

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with other extended periods of “stop-and-go” traffic upstream. This condition is referred to as a “breakdown” in traffic.

Usually it lasts 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 freeway system.

## Methodology

Mn/DOT began collecting and processing congestion data in 1993. Since this time, Mn/DOT 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. The following are key dates on the progression of developing congestion information in the metro area:

- 1989: Mn/DOT formed a committee to evaluate congestion on Twin Cities metro freeways
- 1993 – 2003: Rapid expansion of the freeway management systems
- Late 1990’s: Change in approach from “reducing” congestion to “slowing projected increases” in congestion
- 2001 – 2003: Evaluation and adjustments of ramp metering
- 2002: Completion of detection calibration

## How is Congestion Measured?

For this report, Mn/DOT derived its congestion data using two processes:

- Surveillance detectors in roadways
- Field observations

Electronic surveillance systems exist on about 95% of the metro area freeway system. For this report, the Regional Transportation Management Center collected October 2007 data from 2,700 detectors embedded in the mainline roadway (of a total of 4,800 surveillance detectors that also includes ramps) of the Twin Cities freeways.

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 projects are completed and weather conditions are still generally favorable.

The RTMC evaluates the 648 directional miles of the Twin Cities urban freeway system to develop the AM Plus PM % 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

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the AM and PM peak periods (648 miles AM and 648 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 6:00 AM to 9:00 AM and 2:00 PM to 7:00 PM for the fourteen midweek days in October. Mn/DOT 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.

## Historical Data

Since large construction projects can dramatically change traffic patterns, these patterns can be highly variable due to ongoing changes to the roadway and these projects often remove surveillance detectors from operation. This report, therefore, uses historical data from before a project began in some instances. These areas are described in a map in Appendix B (along with the areas without detection) and include the "Unweave" project at the interchange of I-694 and I-35E and the "Crosstown" project at the interchange of I-35W and TH 62.

## 2007 Results

The total number of congested miles increased for the first time in four years from 267 in 2006 to 305 in 2007<sup>1</sup>. This growth can be attributed to both the absence of capacity-adding project completions this past year and the collapse of the I-35W bridge. The launch of the "Crosstown" project, at the interchange of I-35W and TH 62, is also a significant factor that affected congestion levels this past year.

Though the long term trend is upwards, from 2004 to 2006, congestion declined each year. Many factors affect congestion levels (local economy, population growth, gas prices, transit ridership), but these recent declines are largely attributed to the completion of major capacity-adding projects. These included:

- New bridge carrying I-35E over the Mississippi River
- Addition of lanes in each direction along I-694 from Brooklyn Boulevard to I-494

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<sup>1</sup> Congested miles is calculated as the sum of those experiencing at least five minutes of recurring congestion during the AM peak period and those during the PM peak period.

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- Addition of lanes in both direction along I-494 from TH 55 to France Avenue
- Addition of lanes on I-94 over McKnight Road
- Addition of lanes on TH 100 at TH 7
- Completion of the first of two bridges carrying I-494 over the Mississippi River adding a lane in each direction

However, this past year saw the completion of no major capacity adding projects. The long term trend of growth in congestion can be seen throughout the region.

The collapse of the I-35W bridge had impacts on congestion in both its immediate area and also across much of the Twin Cities freeway network. Although congestion likely would have increased, it would not have been so dramatic without the collapse of this bridge. Several temporary projects were immediately completed afterwards to minimize the affect it has had on congestion levels. These include<sup>2</sup>:

- TH 280 conversion to a freeway and addition of a Traffic Management System
- I-94 conversion of shoulders to an additional lane in each direction between TH 280 and I-35W
- TH 100 addition of auxiliary lane southbound between Duluth St and TH 55 and addition of one lane to northbound exit to eastbound I-694
- I-694 addition of one eastbound lane at TH 47
- I-35W at 4<sup>th</sup> Ave southbound exit and northbound entrance converted to two lanes

The value of these projects is demonstrated by the shoulder lanes added to I-94. Daily trips increased in this area from 175,000 before the I-35W bridge collapse to 210,000 afterwards. Congestion in the AM peak is less now and in the PM it remains stable since last year. Despite efforts to minimize the impacts of the bridge collapse, congestion on parallel routes grew dramatically, including in the AM on TH 280, TH 100, TH 169 and I-694 westbound west of I-35W. In the PM peak, TH 280, I-694 and TH 100 experienced the most dramatic increases in congestion.

Significant congestion relief is anticipated with the completion of the I-35W bridge and with major capacity improvements that are currently in progress. These projects include the "Unweave the Weave" project at the interchange of I-35E and I-694 and the Crosstown project at I-35W and Highway 62.

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<sup>2</sup> A complete list of projects is available at [http://www.dot.state.mn.us/i35wbridge/traffic\\_changes.html](http://www.dot.state.mn.us/i35wbridge/traffic_changes.html)

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The Congestion Management Planning Study was completed in 2007 to identify low cost projects that can have a high benefit in helping to mitigate congestion in the near term. These projects are similar to projects completed in recent years on I-394 from Louisiana Ave. to Highway 169 or on Highway 100 at Highway 7. Mn/DOT is continuing to explore the feasibility of similar projects that could be implemented in the next two years.

Mn/DOT plans to manage congestion on additional fronts with the Urban Partnership Agreement (UPA), a joint proposal by Mn/DOT and the Metropolitan Council to improve transit use and traffic speed on I-35W and Highway 77 from Minneapolis to the southern suburbs. The proposal includes bus rapid transit, park-and-ride lots, high occupancy toll lanes similar to I-394 and the promotion of telecommuting.

Although the three years before this one saw a number of important project completions that lead to some modest declines in congested miles on the Twin Cities freeways and this year's dramatic increase was largely related to the collapse of the I-35W bridge. Without additions to freeway capacity, we can expect the future to continue the long term trend of growth in congestion.

## Explanation of % Miles of Twin City Urban Freeway System Congested Graph

Mitigating congestion is critical to the travelling public. Mn/DOT has limited resources to slow projected increases in congestion. The graph that follows represents levels of congestion based on three scenarios. The projected congestion levels are based on anticipated growth in traffic volumes (Vehicles Miles Traveled).

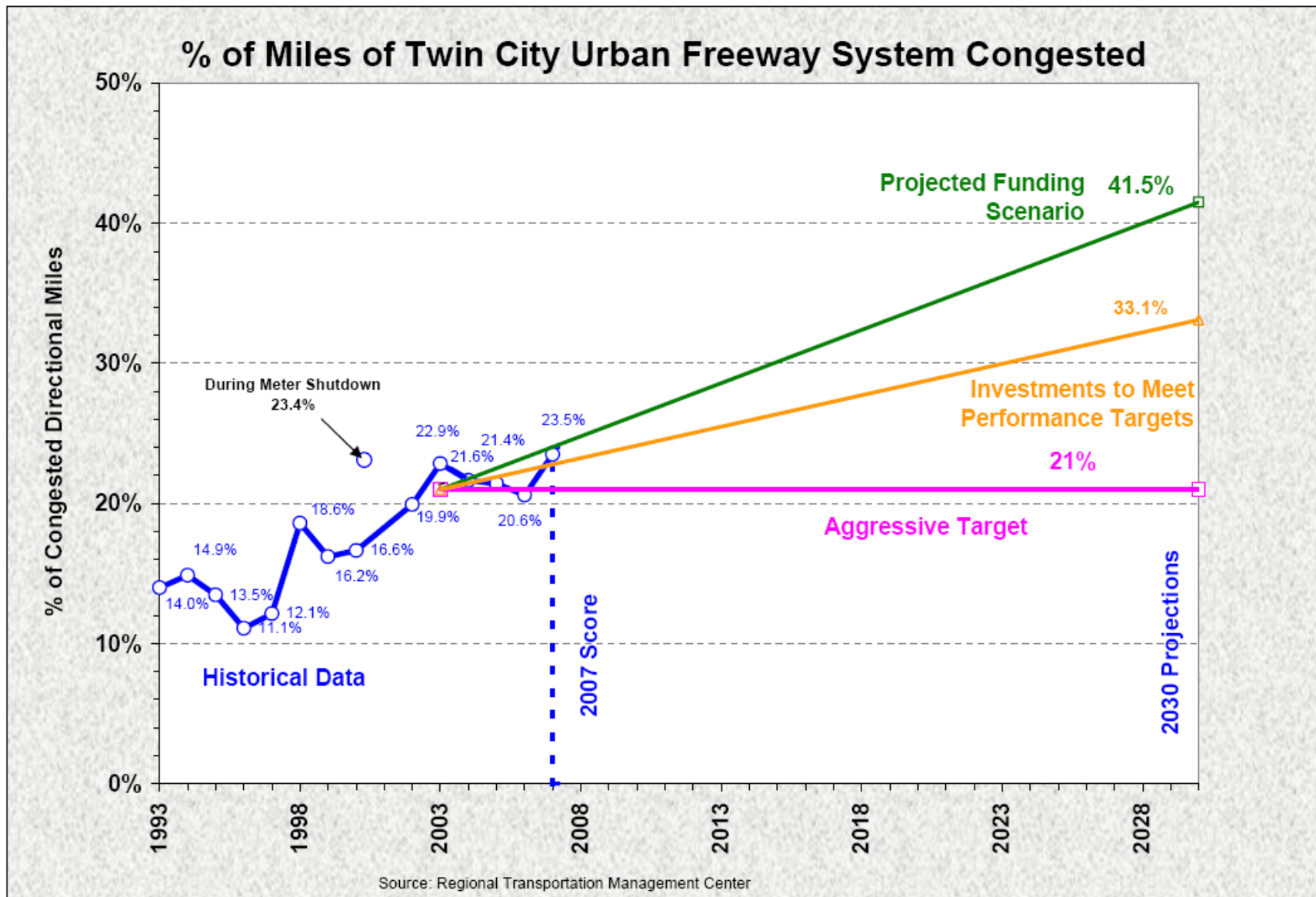
The green line shows the "projected funding scenario," where there are no new funding sources or increases in funding. Congestion could increase to the level of 41.5% by the year 2030.

However, if Mn/DOT received the "investment needed to meet its performance targets," as established in the 2003 Statewide Plan, congestion would be expected to grow to the level of 33% by 2030. The gold line demonstrates this scenario. This long-term "moderate" target reduces the rate of growth in congestion.

Finally, maintaining congestion at the "aggressive" target of 21% (pink line) though the year 2030 would require a significant, yet undetermined, commitment.



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**AM Plus PM Miles of Directional Congestion**

	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007
<b>Severe</b>	7	14	17	48	34	41	125	70	83	72	83	64	82
<b>Moderate</b>	52	47	54	64	77	68	93	84	105	105	94	97	112
<b>Low</b>	114	81	85	127	97	105	82	101	106	104	101	107	111
<b>Total</b>	173	142	156	238	208	213	300	255	293	280	277	267	305

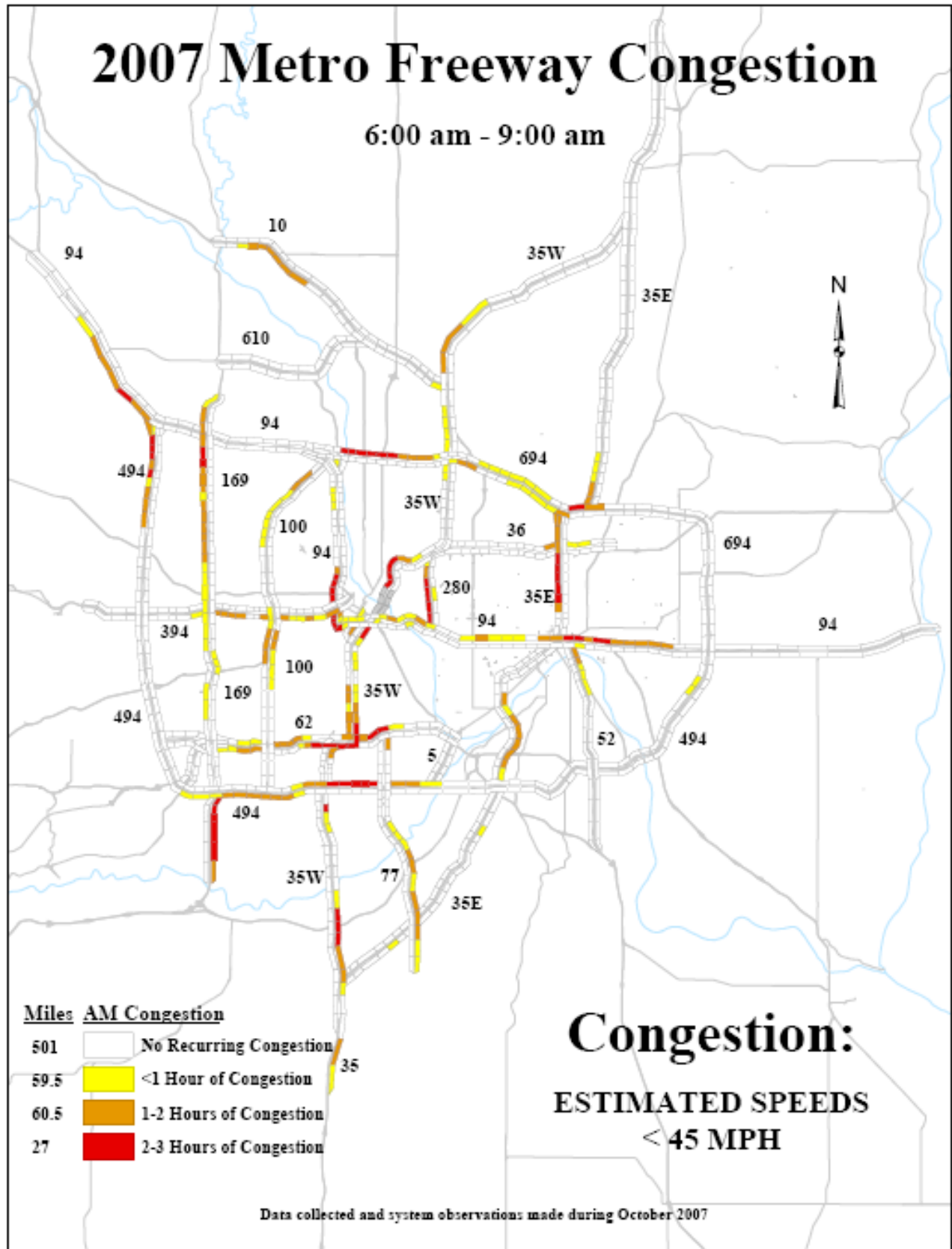
**AM Plus PM Percent of Miles of Directional Congestion**

	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004*	2005*	2006*	2007*
<b>Severe</b>	0.5%	1.1%	1.3%	3.7%	2.7%	3.2%	9.8%	5.5%	6.4%	5.5%	6.4%	4.9%	6.3%
<b>Moderate</b>	4.1%	3.7%	4.2%	5.0%	6.0%	5.3%	7.3%	6.6%	8.2%	8.1%	7.3%	7.5%	8.6%
<b>Low</b>	8.9%	6.3%	6.6%	9.9%	7.6%	8.2%	6.4%	7.9%	8.2%	8.0%	7.8%	8.2%	8.6%
<b>Total</b>	13.5%	11.1%	12.1%	18.6%	16.2%	16.6%	23.4%	19.9%	22.9%	21.6%	21.4%	20.6%	23.5%

For years prior to 2004, Percent of miles of directional congestion = am + pm miles (table above) / 1280 miles. 1280 miles = 320 centerline miles X 2 (directional miles) X 2 (am and pm)

\* For 2004 to 2007 Percent of miles of directional congestion = am + pm miles (table above) / 1296 miles. 1296 miles = 324 centerline miles X 2 (directional miles) X 2 (am and pm)

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## Directional Metro Freeway Miles Congested 6:00 AM - 9:00 AM

### Congested Interstate Miles (AM) <sup>1</sup>

Highway	1994	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007
I-35	0	0	0	0	0	0	0	0	0	0	0	0	0	1
I-35E	6.5	6	5.5	5	7	6.5	7.5	10	10	9	9.5	15	12.5	13
I-35W	20.5	10	9	11	24.5	24	27	33.5	25.5	25	23	26.5	27	22
I-94	12	11.5	13	10.5	17	17.5	16	26	23.5	23	23.5	24.5	26	24.5
I-394/TH 12	9	6.5	6	5	8.5	8.5	6.5	6	7	8.5	8.5	4	6.5	6
I-494	14.5	15.5	10	12.5	23	15.5	20	23	15.5	19	18.5	13	13	16.5
I-694	7.5	6.5	4	4	6	8.5	8	9	9	9.5	9.5	12.5	10.5	12.5
<b>Subtotal</b>	<b>70</b>	<b>56</b>	<b>47.5</b>	<b>48</b>	<b>86</b>	<b>80.5</b>	<b>85</b>	<b>107.5</b>	<b>90.5</b>	<b>94</b>	<b>92.5</b>	<b>95.5</b>	<b>95.5</b>	<b>95.5</b>

### Congested Trunk Highway Miles (AM) <sup>1,2</sup>

Highway	1994	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007
TH 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TH 10	-	-	-	-	-	-	-	-	4.5	4.5	4.5	4.5	4.5	4
TH 36	2	2.5	1	1	4	3.5	6	6.5	6	7.5	7.5	7.5	7.5	1.5
TH 52	1	1	1	1	1	1	1	1	1	1	1	1.5	2	2.5
TH 62	7	7.5	7	8.5	10.5	10	10	8.5	9	10.5	9	6.5	6.5	10
TH 65	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0.5	1
TH 100	4	4	5	4.5	5	5.5	5.5	6	5	4.5	4.5	10.5	5	9
TH 169	12	10.5	7	7	13	10	8	16	11.5	13	12.5	15.5	6.5	14
TH 212	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TH 280	0	0	0	0	0	0	0	0	0	0	0	0	0	3.5
TH 610	-	-	-	-	-	-	-	-	0	0	0	0	0	0
TH 77	4	4	3	3	3.5	3.5	3	4	4.5	6.5	6.5	6	6	6
<b>Subtotal</b>	<b>30</b>	<b>29.5</b>	<b>24</b>	<b>25</b>	<b>37</b>	<b>33.5</b>	<b>33.5</b>	<b>42</b>	<b>41.5</b>	<b>48</b>	<b>45.5</b>	<b>52.5</b>	<b>38.5</b>	<b>51.5</b>

### Total Congested Metro Freeway Miles (AM)

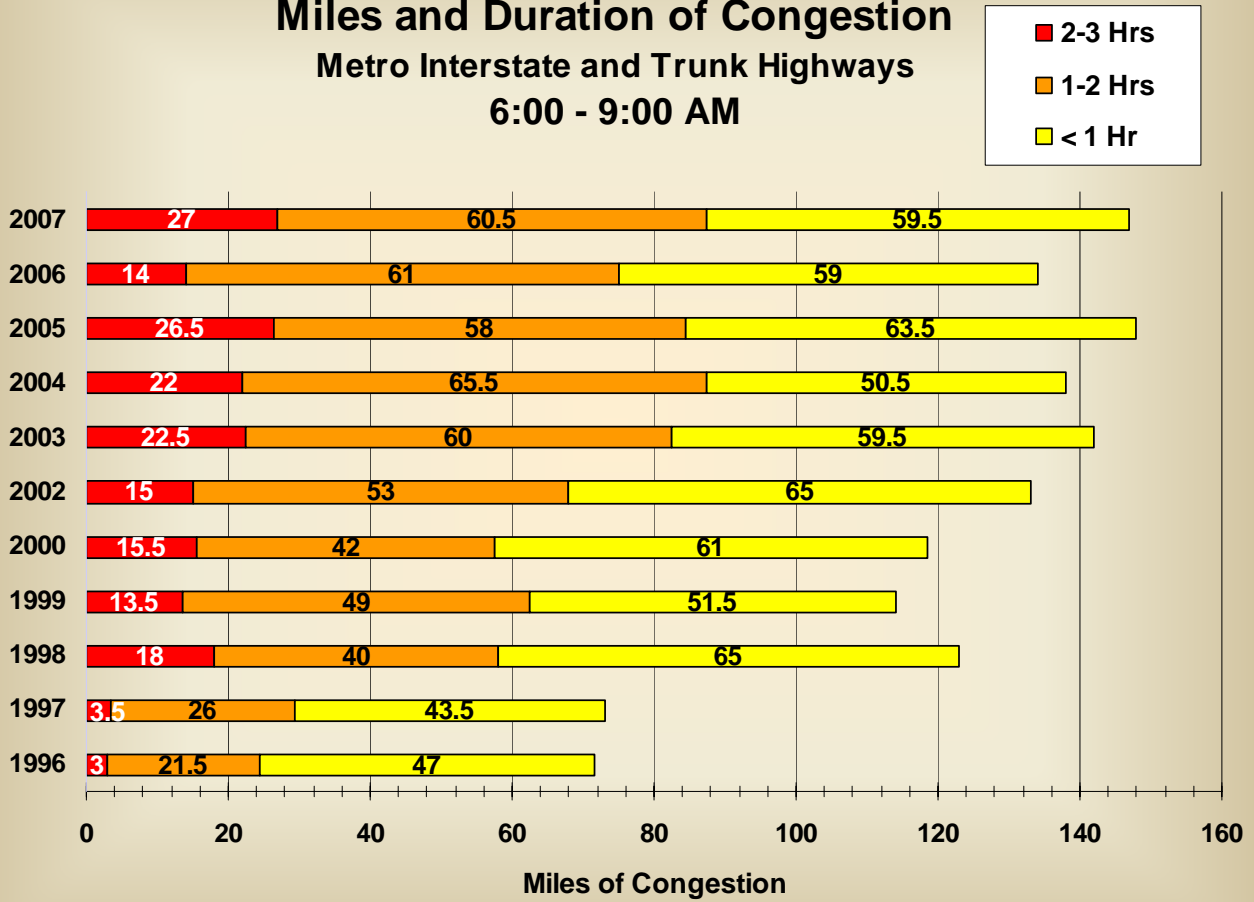
<b>Grand Total</b>	<b>100</b>	<b>85.5</b>	<b>71.5</b>	<b>73</b>	<b>123</b>	<b>114</b>	<b>118.5</b>	<b>149.5</b>	<b>132</b>	<b>142</b>	<b>138</b>	<b>148</b>	<b>134</b>	<b>147</b>
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1 Before 2004: Interstate Miles = 450 TH Miles = 190 Total Miles = 640  
 Since 2004: Interstate Miles = 450 TH Miles = 198 Total Miles = 648

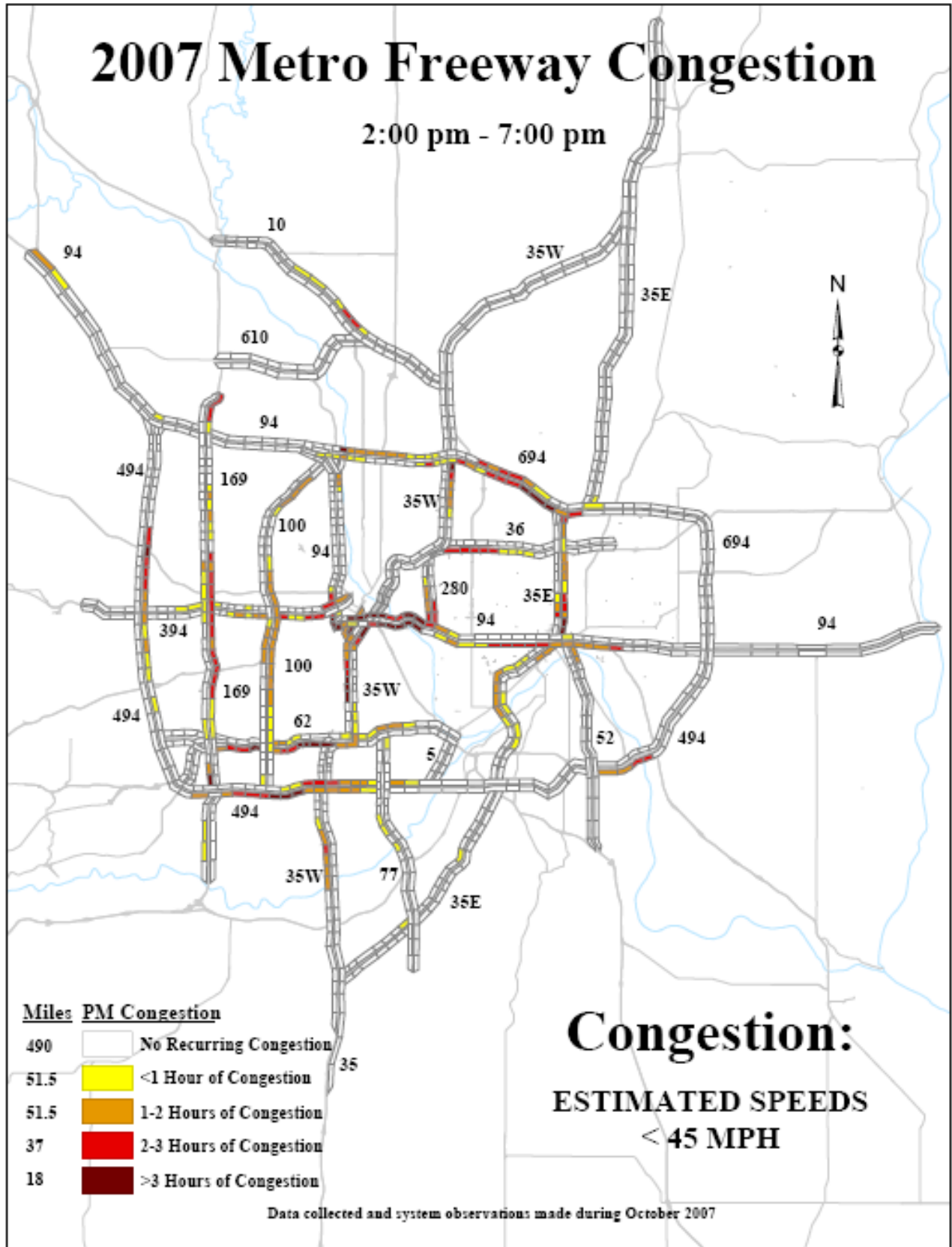
2 Congestion was measured for the *freeway* segments of trunk highways

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## Miles and Duration of Congestion Metro Interstate and Trunk Highways 6:00 - 9:00 AM



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## Directional Metro Freeway Miles Congested 2:00 PM - 7:00 PM

### Congested Interstate Miles (PM)<sup>1</sup>

Highway	1994	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007
I-35	-	-	-	-	-	-	-	-	-	0	0	0	0	0
I-35E	4	5.5	4	3.5	6	4.5	3.5	8.5	6.5	15	9.5	8.5	14.5	16.5
I-35W	16	7	5.5	13.5	18.5	16	19	27.5	23	26	24.5	25	22	14.5
I-94	12	16	10.5	15	23.5	21	17.5	33	25.5	31	29	23	26.5	24.5
I-394/TH 12	7	7	4	6.5	7.5	7.5	8	10.5	10.5	11	10	5	6.5	8
I-494	14	15.5	16	14	20	14.5	15.5	26.5	16	20	20.5	17.5	16.5	21
I-694	6	3	4	4.5	6.5	5	5	5	6.5	9	9	11.5	9	19.5
<b>Subtotal</b>	59	54	44	57	82	68.5	68.5	111	88	112	102.5	90.5	95	104

### Congested Trunk Highway Miles (PM)<sup>1,2</sup>

Highway	1994	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007
TH 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TH 10	-	-	-	-	-	-	-	-	1.5	2.5	1.5	1	1	3
TH 36	0	1.5	0	0	0.5	2.5	2	4	3	4	4	3	4.5	4.5
TH 52	0.5	1	1	1	1	0.5	0.5	0.5	0.5	1	1	1.5	1	1
TH 62	9.5	7.5	6	10.5	11.5	8.5	7	8.5	7	9.5	11.5	7	8	10.5
TH 65	0	0	0	0	0	0	0	0	1.5	1	1.5	1.5	1.5	1.5
TH 100	6.5	7	4.5	5.5	6.5	7	8	10.5	6	6	5	9	4	12.5
TH 169	11	12.5	12	5	10.5	6	8	14	12	14	12.5	14.5	15	16
TH 212	0	0	0	0	0	0	0	0	1	0	0	0	0	0
TH 280	0	0	0	0	0	0	0	0	0	0	0	0	0	3
TH 610	-	-	-	-	-	-	-	-	0	0	0	0	0	0
TH 77	4	3.5	3	3.5	3	0.5	0.5	1	0.5	1	2.5	1	3	2
<b>Subtotal</b>	31.5	33	26.5	25.5	33	25	26	38.5	33	39	39.5	38.5	38	54

### Total Congested Metro Freeway Miles (PM)

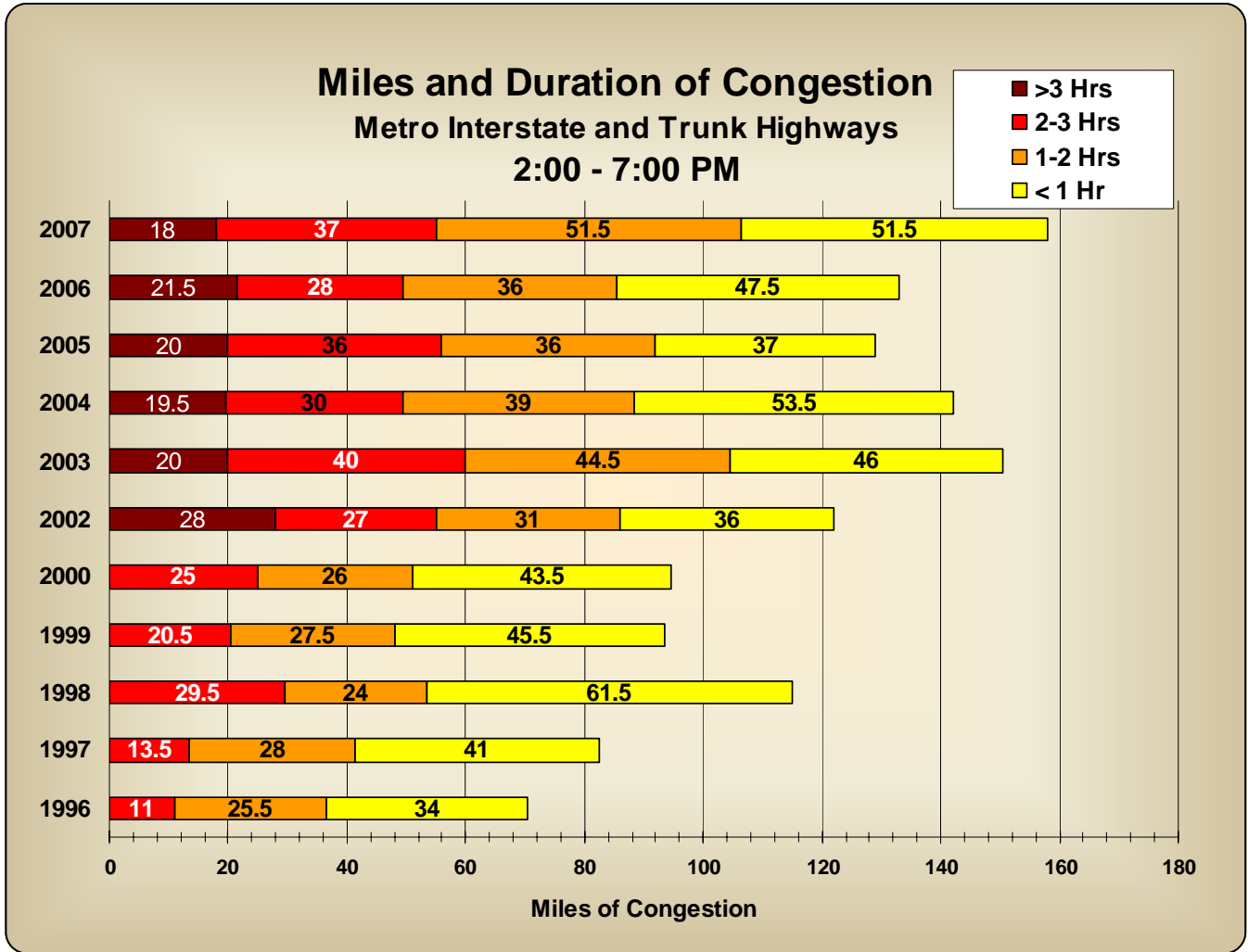
<b>Grand Total</b>	90.5	87	70.5	82.5	115	93.5	94.5	149.5	121	151	142	129	133	158
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1 Before 2004: Interstate Miles = 450 TH Miles = 190 Total Miles = 640

Since 2004: Interstate Miles = 450 TH Miles = 198 Total Miles = 648

2 Congestion was measured for the *freeway* segments of trunk highways

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## Appendix A: Centerline Miles Measured for Congestion

<i>Highway</i>	<b>Centerline Miles of Highway</b>	<b>Limits</b>	<b>Additions for 2007</b>
<b>I-35</b>	10	North split to Hwy 8 & South split to Cty 70	
<b>I-35E</b>	41	Entire Highway	
<b>I-35W</b>	44	Entire Highway	
<b>I-94</b>	51	Rogers to St. Croix River	
<b>I-394/TH 12</b>	13	Central Ave to Downtown Mpls	
<b>I-494</b>	43	Entire Highway	
<b>I-694</b>	23	Entire Highway	
<b>Subtotal</b>	225		

<i>Highway</i>			
<b>TH 5</b>	3	I-494 to Miss Rvr	
<b>TH 10</b>	13	Hwy 169 to I-35W	
<b>TH 36</b>	7	I-35W to English St	
<b>TH 52</b>	6	I-94 to Upper 55th St	
<b>TH 62</b>	12	I-494 to Hwy 55	
<b>TH 65</b>	1	10th St to I-35W	
<b>TH 100</b>	16	I-494 to I-694	
<b>TH 169</b>	17	I-494 to 77th Ave	
<b>TH 212</b>	3	I-494 to Hwy 62	
<b>TH 610</b>	8	Hwy 169 to Hwy 10	
<b>TH 77</b>	10	138th St to Hwy 62	
<b>TH 280</b>	3	I-94 to Broadway	
<b>Subtotal</b>	99		

<b>Grand Total</b>	324		
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## Appendix B: 2007 Metro Freeway Data Sources

