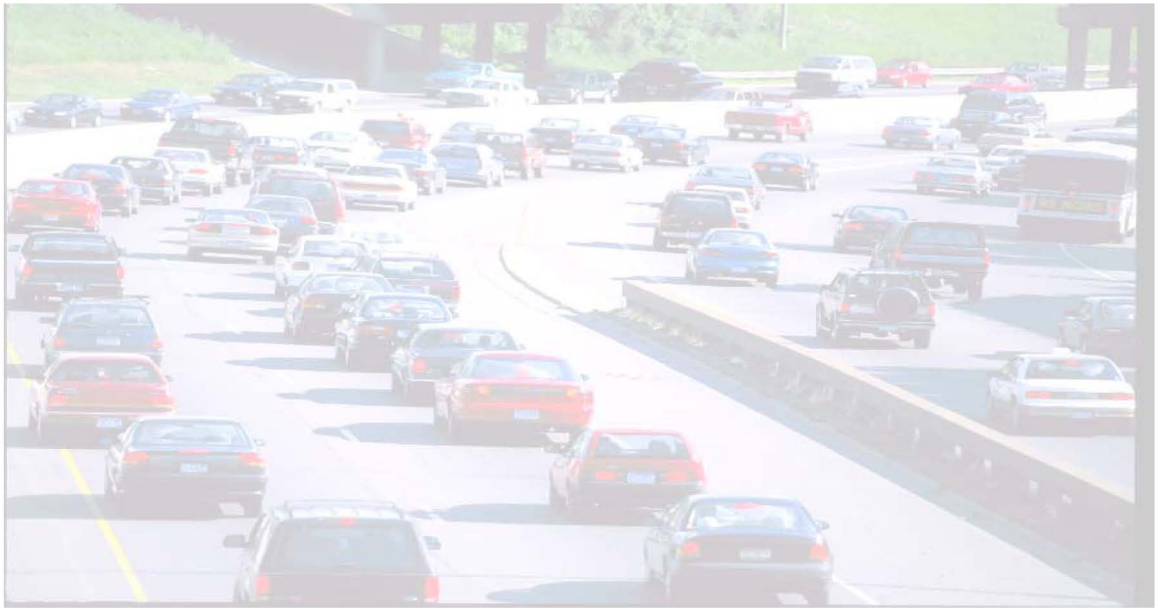
Metropolitan Freeway System 2006 Congestion Report



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

February 2007

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Metropolitan Freeway System 2006 Congestion Report

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 higher 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. 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.

Shock waves occur at highway locations when drivers' inattentiveness results in sudden braking in dense traffic. 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 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 85% of the metro area freeway system. For this report, the Regional Transportation Management Center collected October 2006 data from 2,600 detectors embedded in the mainline roadway (of a total of 4,300 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 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 entire 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 thirteen midweek days. 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.

The projected congestion levels are based on anticipated growth in traffic volumes (Vehicles Miles Traveled).

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 uses historical data from before a project began in some instances. These are described in detail in Appendix B but in general include the areas in and around the interchange of I-694 and I-35E, I-94 west of Weaver Lake Road and I-35W at Lake Drive. In addition field observations were used in this report for the 15% of the Twin Cities freeways without surveillance detectors and along I-494 between France Avenue and Carlson Parkway where road construction is complete but surveillance detectors were not yet operational. Again, see Appendix B for a detailed description of the areas without detectors in the roadway.

2006 Results

The total number of congested miles decreased for the third straight year from a peak of 293 miles in 2003 to 267 miles in 2006[1]. Although the long term trend of growing congestion continues in many areas of the Twin Cities, completion of a number of important construction projects again during this past year has dramatically improved conditions in other places. These capacity adding projects include:

- November of 2005: Addition of an auxiliary lane on I-394 westbound between Louisiana Avenue and the exit to TH 169.
- November/December of 2005: Addition of one lane in each direction to I-94 over McKnight Road.

[1] 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.

- August of 2006: Addition of one lane in each direction to I-494 between TH 5 and Carlson Parkway.
- October of 2006: Addition of one lane northbound and a collector/distributor lane southbound to TH 100 between TH 7 and I-394.
- October of 2006. Opening of the first of two bridges to carry I-494 over the Mississippi River, adding one lane in each direction.

Although each of the past few years has seen a number of important project completions that have lead to an overall decline in congested miles on the Twin Cities freeways recently, it is important to note that while large capacity adding projects are in progress or beginning shortly, few of these projects will be completed in the near term and so congestion is expected to again grow over the coming years. A new study known as the Congestion Management Planning Study will be working to identify small to mid level projects that will help to mitigate congestion in the near term. It is the intent of the study to identify a few projects that can be implemented within the next two years and beyond.

With 20.6% of the metro areas freeways congested in 2006, MnDOT has exceeded its performance target for the second straight year (as described in the graph on page 5).

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

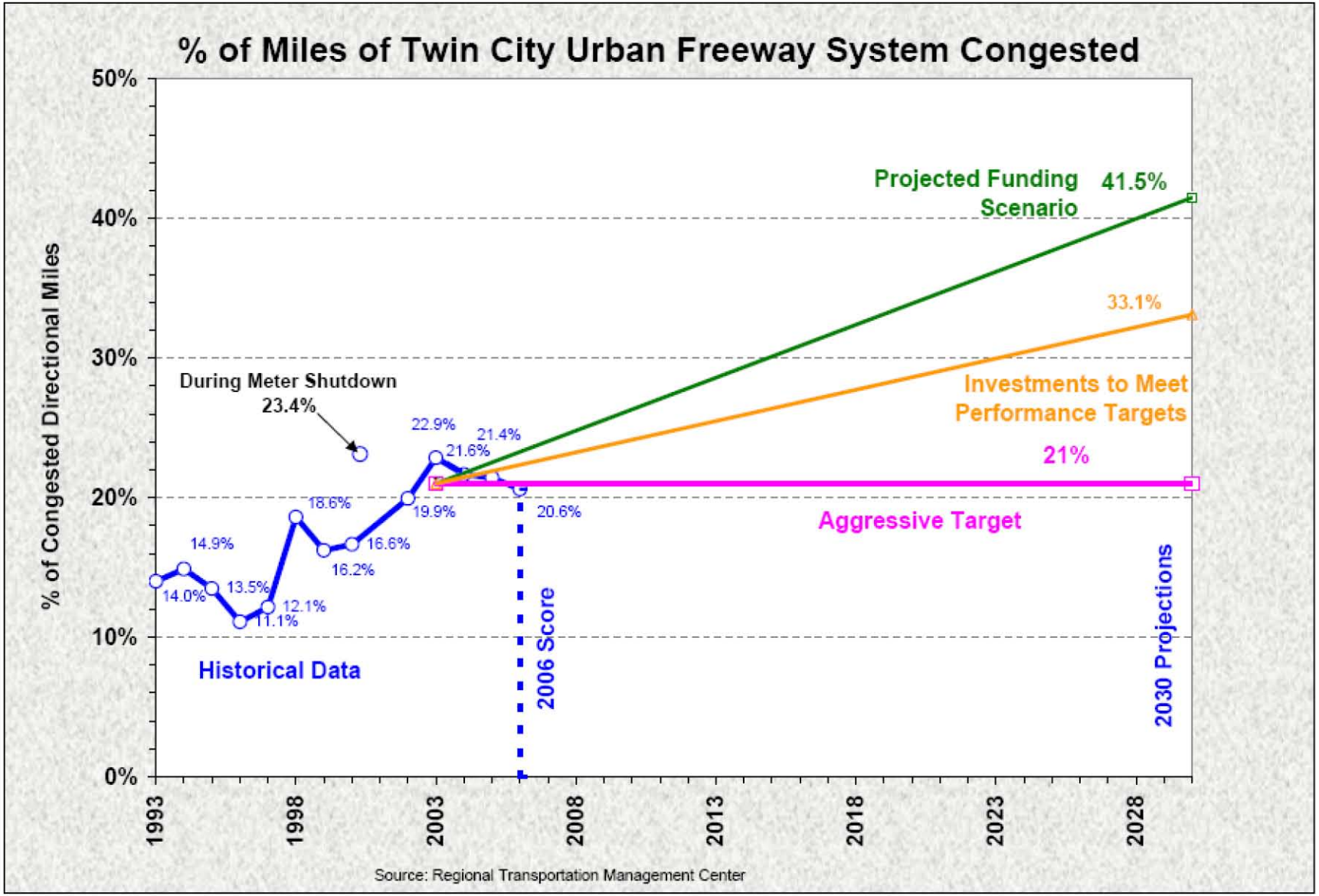
Mitigating congestion is critical to the travelling public. Mn/DOT has limited resources to slow projected increases in congestion. The graph that follows represents levels of congestion based on three scenarios.

The 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.

Metropolitan Freeway System 2006 Congestion Report



Metropolitan Freeway System 2006 Congestion Report

AM Plus PM Miles of Directional Congestion

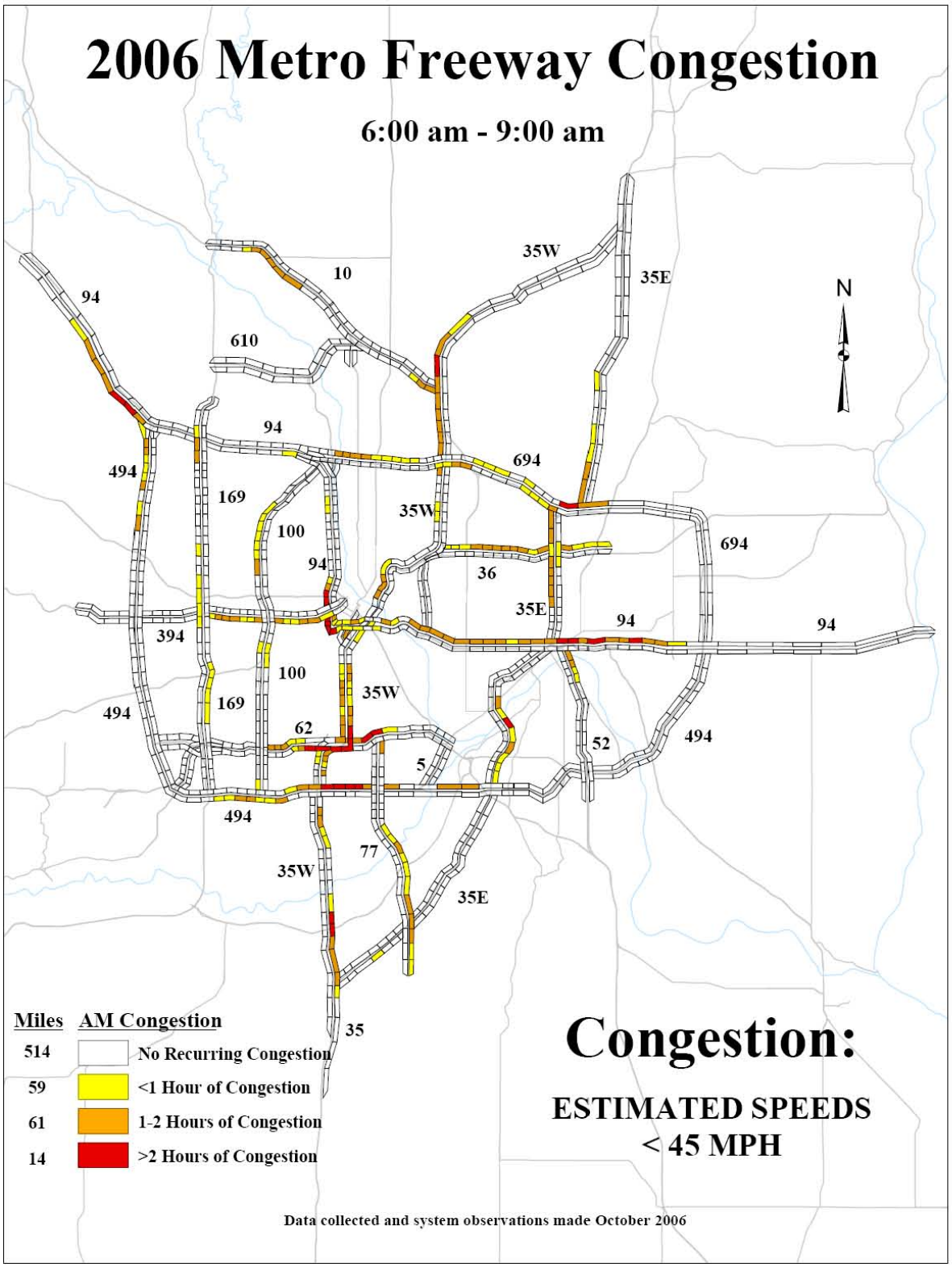
	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006
Severe	7	14	17	48	34	41	125	70	83	72	83	64
Moderate	52	47	54	64	77	68	93	84	105	105	94	97
Low	114	81	85	127	97	105	82	101	106	104	101	107
Total	173	142	156	238	208	213	300	255	293	280	277	267

AM Plus PM Percent of Miles of Directional Congestion

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

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 2006 Percent of miles of directional congestion = am + pm miles (table above) / 1296 miles. 1296 miles = 324 centerline


2006 Metro Freeway Congestion
6:00 am - 9:00 am
N
94
10
35W
35E
610
94
494
694
169
35W
100
94
694
36
35E
94
94
394
100
35W
169
494
62
52
494
5
494
77
35W
35E
35
Miles
AM Congestion
514
No Recurring Congestion
59
<1 Hour of Congestion
61
1-2 Hours of Congestion
14
>2 Hours of Congestion
Congestion:
ESTIMATED SPEEDS
< 45 MPH
Data collected and system observations made October 2006

Metropolitan Freeway System 2006 Congestion Report

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

Congested Interstate Miles (AM) [1]

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

Congested Trunk Highway Miles (AM) [1, 2]

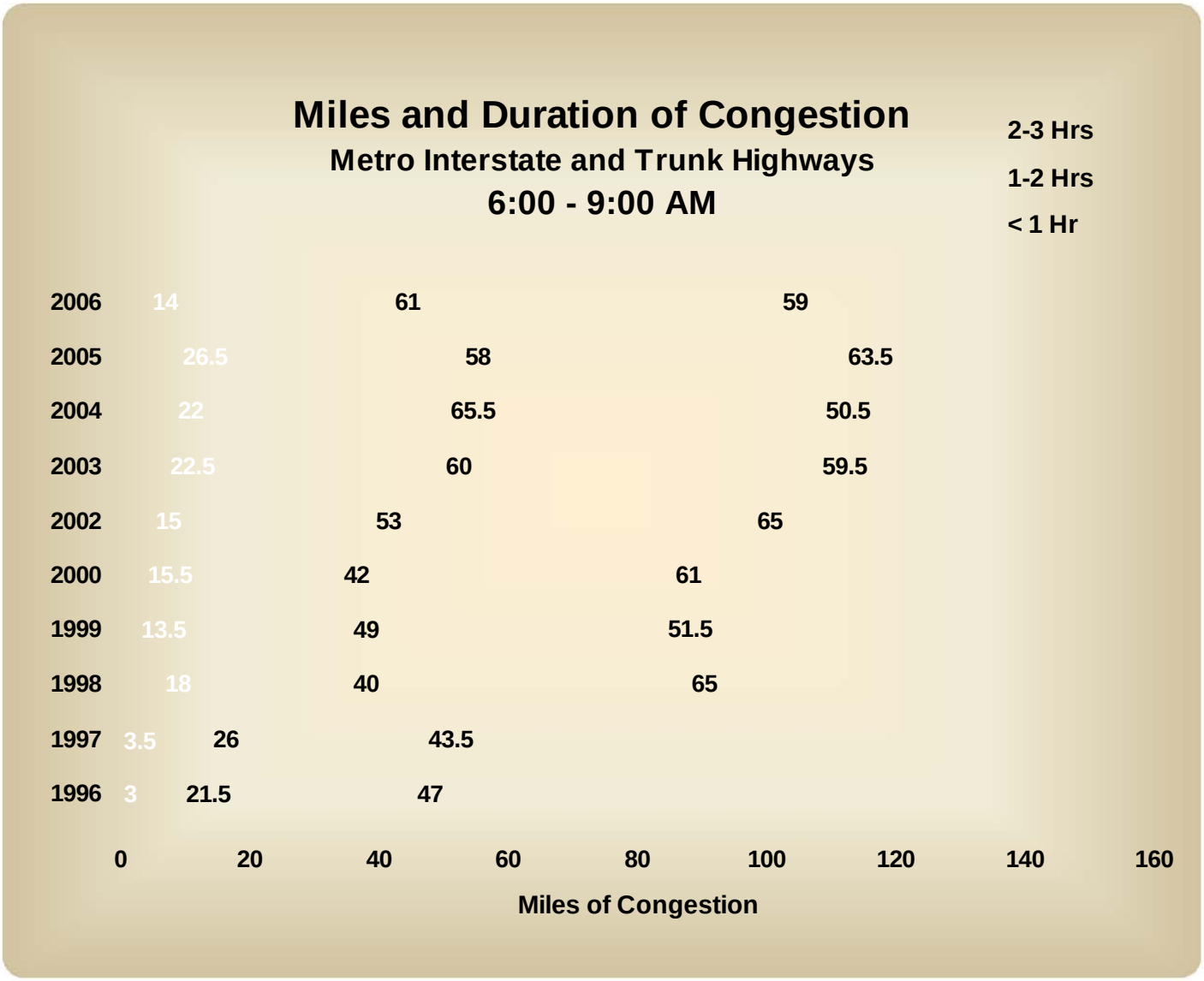
Highway	1994	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006
TH 5	0	0	0	0	0	0	0	0	0	0	0	0	0
TH 10	-	-	-	-	-	-	-	-	4.5	4.5	4.5	4.5	4.5
TH 36	2	2.5	1	1	4	3.5	6	6.5	6	7.5	7.5	7.5	7.5
TH 52	1	1	1	1	1	1	1	1	1	1	1	1.5	2
TH 62	7	7.5	7	8.5	10.5	10	10	8.5	9	10.5	9	6.5	6.5
TH 65	0	0	0	0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

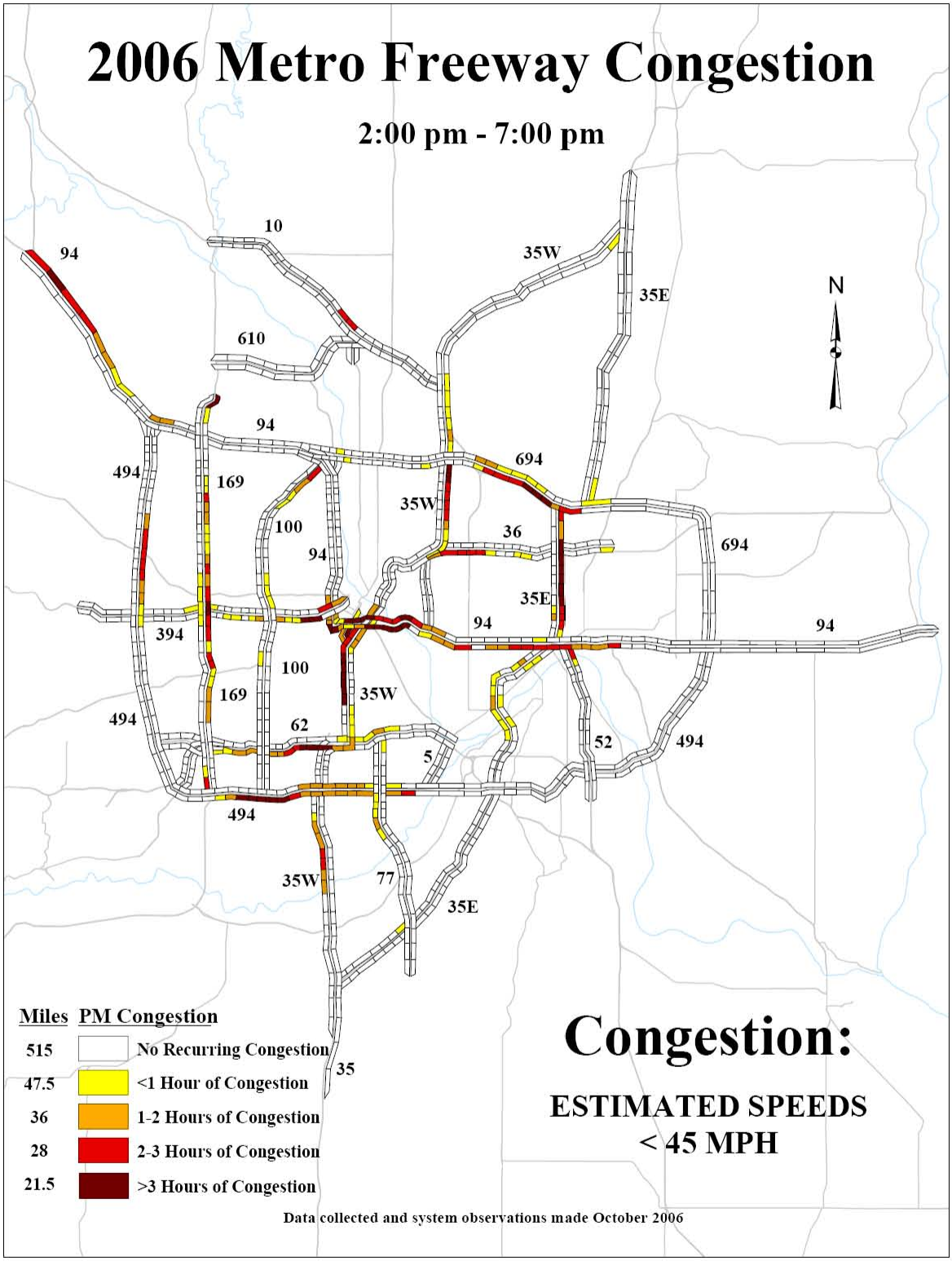
Total Congested Metro Freeway Miles (AM)

Grand Total	100	85.5	71.5	73	123	114	118.5	149.5	132	142	138	148	134

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


Miles and Duration of Congestion
Metro Interstate and Trunk Highways
6:00 - 9:00 AM
2-3 Hrs
1-2 Hrs
< 1 Hr
2006 14 61 59
2005 26.5 58 63.5
2004 22 65.5 50.5
2003 22.5 60 59.5
2002 15 53 65
2000 15.5 42 61
1999 13.5 49 51.5
1998 18 40 65
1997 3.5 26 43.5
1996 3 21.5 47
0 20 40 60 80 100 120 140 160
Miles of Congestion


2006 Metro Freeway Congestion
2:00 pm - 7:00 pm
10
94
35W
35E
N
610
94
694
494
169
35W
100
36
694
94
35E
394
94
94
100
169
35W
494
62
52
494
5
494
35W
77
35E
35
Miles PM Congestion
515 No Recurring Congestion
47.5 <1 Hour of Congestion
36 1-2 Hours of Congestion
28 2-3 Hours of Congestion
21.5 >3 Hours of Congestion
Congestion:
ESTIMATED SPEEDS
< 45 MPH
Data collected and system observations made October 2006

Metropolitan Freeway System 2006 Congestion Report

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

Congested Interstate Miles (PM) [1]

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

Congested Trunk Highway Miles (PM) [1, 2]

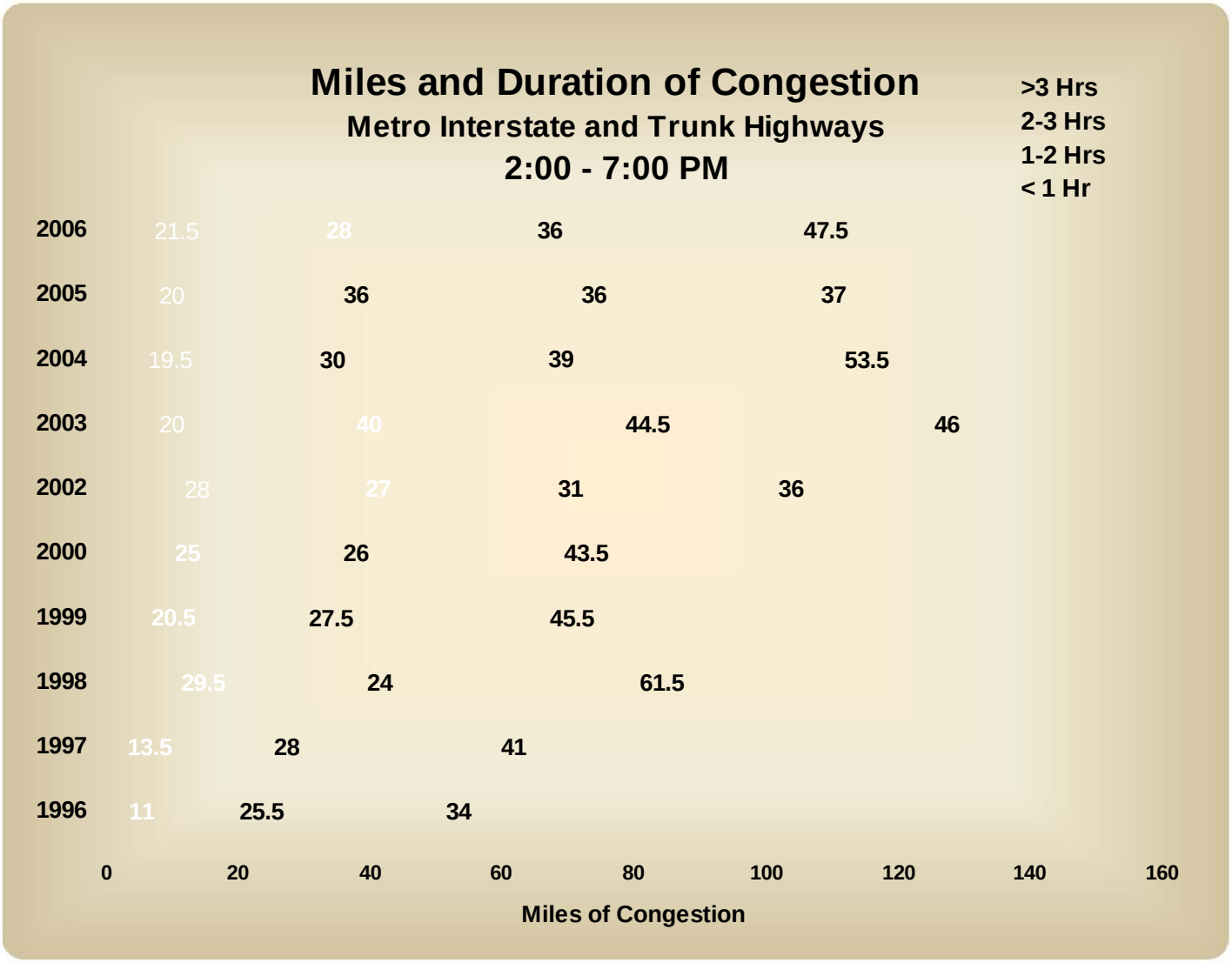
Highway	1994	1995	1996	1997	1998	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006
TH 5	0	0	0	0	0	0	0	0	0	0	0	0	0
TH 10	-	-	-	-	-	-	-	-	1.5	2.5	1.5	1	1
TH 36	0	1.5	0	0	0.5	2.5	2	4	3	4	4	3	4.5
TH 52	0.5	1	1	1	1	0.5	0.5	0.5	0.5	1	1	1.5	1
TH 62	9.5	7.5	6	10.5	11.5	8.5	7	8.5	7	9.5	11.5	7	8
TH 65	0	0	0	0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

Total Congested Metro Freeway Miles (PM)

Grand Total	90.5	87	70.5	82.5	115	93.5	94.5	149.5	121	151	142	129	133

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


Miles and Duration of Congestion
Metro Interstate and Trunk Highways
2:00 - 7:00 PM
>3 Hrs
2-3 Hrs
1-2 Hrs
< 1 Hr
2006
21.5
28
36
47.5
2005
20
36
36
37
2004
19.5
30
39
53.5
2003
20
40
44.5
46
2002
28
27
31
36
2000
25
26
43.5
1999
20.5
27.5
45.5
1998
29.5
24
61.5
1997
13.5
28
41
1996
11
25.5
34
0
20
40
60
80
100
120
140
160
Miles of Congestion

Appendix A: Centerline Miles Measured for Congestion

Highway	Centerline Miles of Highway	Limits	Additions for 2005
I-35	10	North split to Hwy 8 & South split to Cty 70	
I-35E	41	Entire Highway	
I-35W	44	Entire Highway	
I-94	51	Rogers to St. Croix River	
I-394/TH 12	13	Central Ave to Downtown Mpls	
I-494	43	Entire Highway	
I-694	23	Entire Highway	
Subtotal	225		

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

Grand Total	324		

Appendix B: 2006 Metro Freeway Data Sources