2017 Freeway Congestion & Mobility Report

Chapter 4
METRO REGION SUMMARY
PROLOGUE

Since 2014, the Michigan Department of Transportation (MDOT) has used probe vehicle data to create an annual Freeway Congestion and Reliability Report. The probe vehicle data is collected anonymously from GPS enabled devices and in-vehicle telematics to provide real time speeds on roadways nationwide. Probe vehicles provide an enormous amount of data which can be difficult to manage, maintain, and analyze. The University of Maryland Center for Advanced Transportation Technology (CATT) Lab developed a visual analytics platform called the Regional Integrated Transportation Information System, or RITIS. This tool allows MDOT to monitor speeds, incidents, weather, special events, and many other data sources. Using the RITIS platform, the data was processed and compiled into a report summarizing all freeway routes in Michigan.

This report is composed of eight chapters. The first chapter summarizes the performance measures and statewide metrics. The remaining seven chapters use those performance metrics to characterize congestion in each of MDOT’s seven regions. This document is for internal use to help MDOT regions, Transportation Service Centers (TSC), and planners understand how Michigan freeways are operating over time, as well as where potential improvement projects may be necessary. This report is typically used as a starting point for more detailed analysis incorporating additional probe data, as well as other MDOT resources. If your area has plans to share this information externally, please contact the Congestion and Mobility Unit to ensure the correct measures are being used.

The report was prepared by the Wayne State University Transportation Research Group under the guidance of the Congestion and Mobility Unit at MDOT. Please contact the Congestion and Mobility Unit if you have any questions/comments or would like to have the actual data for further analysis.

ACKNOWLEDGEMENTS

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INTRODUCTION

The purpose of this document is to provide an overview of performance on Michigan freeways. Using probe vehicle data and systematic performance measures, a series of visualizations were created for each region in the state. Chapter 4 of this report provides an overview of Metro Region. Metro Region is made up of 3 counties and contains the cities of Detroit and Pontiac. Ten freeways are analyzed in the section below.
The probe data alone provides representative speeds on predefined segments of roadway every minute. Although this data is rich, it provides limited use to engineers and practitioners without well-defined aggregation techniques. Performance measures are growing in the transportation arena to better monitor traffic conditions, improve traveler information, and identify congested areas with the aim of improving operations on roadways. A summary of the performance measures used in this report can be seen in Table 1.

The goal of these performance measures are to quantify both the delay and reliability of the freeway network in Michigan. In this report, delay is quantified when the speed drops below 60 MPH, which is at least 10 MPH lower than the posted speed limit for the freeways (Figure 4). On segments with a speed limit of 55 MPH, delay is calculated when speed falls below that threshold. The lower the value is, the better the freeway segment is operating. The other element of interest is reliability. Reliability is a measure of the consistency of a travel time on a roadway. A roadway that has the same travel time every day is said to be reliable, while a roadways where the travel time varies greatly is said to be unreliable. MDOT’s goal is to provide reliable travel times with minimal delay. This is done through roadway improvement projects including additional lanes, pavement improvements, and adding intelligent transportation systems. These projects can reduce the travel time and also improve the travel time reliability. An example of this is shown in Figure 5.

**FIGURE 1. Delay Calculation**
Delay can also be represented by converting the user delay into a cost. The delay is multiplied by the number of vehicle that experience that delay. The hourly volumes are derived from Average Daily Traffic (ADT) and Commercial Average Daily Traffic (CADT). Hourly user costs are based on Federal Highway Administration (FHWA) publication number FHWA-SA-98-079, “Life-Cycle Cost Analysis in Pavement Design.” The values used in this report are shown in Table 2.
### TABLE 1. Performance Measures of Interest

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL DELAY</strong></td>
<td>Total delay is calculated by taking the difference between actual speeds when they fall below 60 MPH and the posted speed limit for freeways posted at 70 MPH. This is to take out the delay caused by the lower average speeds from commercial vehicles.</td>
</tr>
<tr>
<td><strong>TOTAL DELAY PER MILE</strong></td>
<td>Total delay per mile is calculated by taking the total delay and dividing it by the length of the freeway. This was performed for each route in each county.</td>
</tr>
<tr>
<td><strong>USER DELAY COST</strong></td>
<td>User Delay Costs (UDC) is calculated by multiplying delay x hourly volume per hourly user cost. Delay is calculated by taking the difference between actual speeds when they fall below 60 MPH and the posted speed limit.</td>
</tr>
<tr>
<td><strong>AVERAGE SPEED</strong></td>
<td>Average speed is determined by calculating the space mean speed of the worst ranked hour in the weekday AM peak (6:00 AM - 9:00 AM) and weekday PM peak (3:00 PM - 7:00 PM) periods for each segment of roadway. This is compared to the space mean speed of the previous five year period for the same hour.</td>
</tr>
<tr>
<td><strong>CONGESTION SEVERITY</strong></td>
<td>Congestion severity is calculated based on the worst hourly average speed experienced during the AM or PM peak period per traffic message channel (TMC) segment. A TMC segment is a standard for delivering real-time traffic information. They vary from tenths of a mile long to several miles long.</td>
</tr>
<tr>
<td><strong>TRAVEL TIME RELIABILITY</strong></td>
<td>Travel time reliability is a measure of travel time consistency over a period of time. When travel times are unreliable, customers are more likely to experience unexpected delays. Travel times are shown to be reliable when the 95\textsuperscript{th} percentile travel time remains close to the average travel time.</td>
</tr>
<tr>
<td><strong>AVERAGE TRAVEL TIME</strong></td>
<td>The amount of time a customer should budget to be on-time on average.</td>
</tr>
<tr>
<td><strong>95TH PERCENTILE TRAVEL TIME</strong></td>
<td>The amount of time a customer should budget to be on-time 19 out of 20 days (95% of the time). The 95\textsuperscript{th} percentile travel time is also known as the planning time.</td>
</tr>
</tbody>
</table>

*Note: May 1\textsuperscript{st} through September 30\textsuperscript{th} were used for the summer reliability calculations.*

### TABLE 2. Historical Hourly User Costs

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger</td>
<td>$17.09</td>
<td>$17.44</td>
<td>$17.70</td>
<td>$17.98</td>
<td>$18.00</td>
<td>$18.23</td>
</tr>
<tr>
<td>Commercial</td>
<td>$30.14</td>
<td>$30.77</td>
<td>$31.22</td>
<td>$31.73</td>
<td>$31.76</td>
<td>$32.26</td>
</tr>
</tbody>
</table>
PERFORMANCE MEASURES VISUALIZATIONS

Performance measure visualizations provide an easy to use graphic representation of the performance measures listed above. In this report four main visualizations are used, which are explained in detail below.

USER DELAY COST

Figure 3 is an example of the user delay cost graph. This figure represents I-96 through the Detroit TSC in the Metro Region. The user delay cost visualization displays which months are incurring the most UDC, while comparing how UDC patterns change from a 5-year historical average to the current year. Figure 3 shows the following:

a) 5-year historical average user delay cost (2012-2016).
b) Current year user delay cost (2017).
c) Total user delay cost in dollars.
d) Month of year.
e) Poor weather conditions in winter months severely impact the user delay cost.
f) Example of the current year outperforming the 5-year historical average in UDC.
g) Example of summer months where construction may impact the delay of a corridor.
h) Example of the current year underperforming the 5-year historical average in UDC.

![Figure 3. Example User Delay Cost Graph](image-url)
AVERAGE SPEED

Figure 4 is an example of the average speed graph. This figure represents westbound I-94 through the University Region. This performance metric visualizes the speeds on a given corridor during the AM and PM peak periods, along with a 5-year historical average of those speeds. Average speed graphs can display how morning and evening peak speeds can vary by time and magnitude. The following criteria was used in the making of these graphs:

a) Only weekdays (Monday – Friday) are included in the calculations.
b) The AM peak hour is the worst ranked hour between 6:00 AM – 9:00 AM.
c) The PM peak hour is the worst ranked hour between 3:00 PM – 7:00 PM.
d) The worst ranked hour is based on the lowest average speed and minimum speed experienced during the peak hours.

Figure 4 shows the following:

a) Legend.
b) Location of interchanges by exit/mile marker number.
c) Specific significant interchanges.
d) Direction of travel.
e) Average speed in MPH.
f) Example of low speed area during the PM peak while approaching M-10 interchange.
g) Example of location where PM peak speeds are lower than AM peak speeds.
h) Example of limited change in speed from year to year.
i) 2017 PM peak average speed is approximately 30 MPH at Exit 219.
j) Example of improvement in the current year as compared to the 5-year historical average.
FIGURE 4. Example Average Speed Graph
TRAVEL TIME RELIABILITY

Figure 5 is an example of the travel time reliability graph. This figure represents a portion of westbound I-96 through the Metro Region. This performance metric displays the reliability of a given corridor over time. A segment is deemed “reliable” when the average and 95th percentile travel times are constant. A segment is deemed “unreliable” when the average and 95th percentile travel times differ by a large amount of time. Figure 5 shows the following:

a) The 95th percentile travel time reliability and the average (50th percentile) travel time reliability.
b) Amount of time it will take a vehicle to drive the entire corridor in minutes.
c) Time of day.
d) Small difference between average and 95th percentile travel times (reliable).
e) Large difference between average and 95th percentile travel times (unreliable).

FIGURE 5. Example Travel Time Reliability Graph
CONGESTION SEVERITY

Figure 6 shows an example of the congestion severity figure. This figure represents Metro Region during the PM peak hour. This performance metric displays the amount of congestion on corridors during AM and PM peak periods by representing speeds in a color gradient. The color gradient consists of three different categories to distinguish severity levels:

a) Low (≥55 MPH).
b) Moderate (≥35 MPH & <55 MPH).
c) Severe (<35 MPH).

Figure 6 shows the following:

a) Location of no congestion in either direction during the PM peak hour.
b) Congestion exists only in the eastbound direction of travel from people commuting from work to home during evening hours.
c) Location of severe congestion in both directions of travel along I-94.
FIGURE 7. 2017 Metro Region AM Peak Congestion Severity
FIGURE 8. 2017 Metro Region PM Peak Congestion Severity
### METRO REGION: CONGESTION SEVERITY

#### TABLE 3. 2017 Congestion Miles by Severity - AM Peak

<table>
<thead>
<tr>
<th>Region</th>
<th>Low</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>788.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grand</td>
<td>667.6</td>
<td>31.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Metro</td>
<td>391.6</td>
<td>189.4</td>
<td>39.0</td>
</tr>
<tr>
<td>Southwest</td>
<td>484.0</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>University</td>
<td>721.1</td>
<td>35.4</td>
<td>11.4</td>
</tr>
<tr>
<td>North</td>
<td>392.6</td>
<td>1.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Superior</td>
<td>99.1</td>
<td>2.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>3544.1</td>
<td>264.6</td>
<td>51.7</td>
</tr>
</tbody>
</table>

#### TABLE 4. 2017 Congestion Miles by Severity - PM Peak

<table>
<thead>
<tr>
<th>Region</th>
<th>Low</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>788.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grand</td>
<td>659.3</td>
<td>27.9</td>
<td>11.7</td>
</tr>
<tr>
<td>Metro</td>
<td>364.0</td>
<td>167.5</td>
<td>88.4</td>
</tr>
<tr>
<td>Southwest</td>
<td>482.9</td>
<td>6.2</td>
<td>0.0</td>
</tr>
<tr>
<td>University</td>
<td>704.5</td>
<td>53.9</td>
<td>9.5</td>
</tr>
<tr>
<td>North</td>
<td>392.6</td>
<td>1.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Superior</td>
<td>97.8</td>
<td>3.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>3489.2</td>
<td>260.3</td>
<td>110.9</td>
</tr>
</tbody>
</table>
FIGURE 9. Metro Region User Delay Cost Trend
### TABLE 5. 2017 Metro Region User Delay Cost Data

<table>
<thead>
<tr>
<th>Rank</th>
<th>Location (Route, County)</th>
<th>2017 Total UDC ($)</th>
<th>2012-2016 Average Total UDC ($)</th>
<th>Change in Total UDC ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I-75 Oakland Co.</td>
<td>$44,357,000</td>
<td>$42,641,000</td>
<td>$1,716,000</td>
</tr>
<tr>
<td>2</td>
<td>I-696 Oakland Co.</td>
<td>$36,725,000</td>
<td>$28,334,000</td>
<td>$8,391,000</td>
</tr>
<tr>
<td>3</td>
<td>I-94 Detroit TSC (55 MPH Section)</td>
<td>$35,422,000</td>
<td>$22,723,000</td>
<td>$12,699,000</td>
</tr>
<tr>
<td>4</td>
<td>I-96 Oakland Co.</td>
<td>$21,881,000</td>
<td>$15,685,000</td>
<td>$6,196,000</td>
</tr>
<tr>
<td>5</td>
<td>I-96 Detroit TSC/LOCAL</td>
<td>$21,806,000</td>
<td>$28,503,000</td>
<td>-$6,697,000</td>
</tr>
<tr>
<td>6</td>
<td>I-94 Taylor TSC</td>
<td>$18,898,000</td>
<td>$16,017,000</td>
<td>$2,881,000</td>
</tr>
<tr>
<td>7</td>
<td>M-39 Detroit TSC (55 MPH Section)</td>
<td>$15,692,000</td>
<td>$12,836,000</td>
<td>$2,856,000</td>
</tr>
<tr>
<td>8</td>
<td>I-96 Taylor TSC</td>
<td>$12,852,000</td>
<td>$10,546,000</td>
<td>$2,306,000</td>
</tr>
<tr>
<td>9</td>
<td>I-94 Macomb Co.</td>
<td>$12,263,000</td>
<td>$14,114,000</td>
<td>-$1,851,000</td>
</tr>
<tr>
<td>10</td>
<td>I-75 Detroit TSC (55 MPH Section)</td>
<td>$12,218,000</td>
<td>$9,526,000</td>
<td>$2,692,000</td>
</tr>
<tr>
<td>11</td>
<td>I-275 Wayne Co.</td>
<td>$9,885,000</td>
<td>$9,914,000</td>
<td>-$29,000</td>
</tr>
<tr>
<td>12</td>
<td>I-696 Macomb Co.</td>
<td>$9,619,000</td>
<td>$9,326,000</td>
<td>$293,000</td>
</tr>
<tr>
<td>13</td>
<td>M-10 Detroit TSC (55 MPH Section)</td>
<td>$8,199,000</td>
<td>$9,596,000</td>
<td>-$1,397,000</td>
</tr>
<tr>
<td>14</td>
<td>M-59 Oakland Co. (70 MPH Section)</td>
<td>$7,943,000</td>
<td>$8,952,000</td>
<td>-$1,009,000</td>
</tr>
<tr>
<td>15</td>
<td>I-75 Taylor TSC</td>
<td>$4,393,000</td>
<td>$8,754,000</td>
<td>-$4,361,000</td>
</tr>
<tr>
<td>16</td>
<td>M-53 Macomb Co. (70 MPH Section)</td>
<td>$3,675,000</td>
<td>$5,259,000</td>
<td>-$1,584,000</td>
</tr>
<tr>
<td>17</td>
<td>M-10 Oakland Co. (70 MPH Section)</td>
<td>$3,091,000</td>
<td>$5,007,000</td>
<td>-$1,916,000</td>
</tr>
<tr>
<td>18</td>
<td>M-14 Taylor TSC</td>
<td>$2,494,000</td>
<td>$3,885,000</td>
<td>-$1,391,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>$281,413,000</strong></td>
<td><strong>$261,618,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Minor differences may occur due to rounding.*
### TABLE 6. 2017 Metro Region User Delay Cost Data per Mile

<table>
<thead>
<tr>
<th>Rank</th>
<th>Location (Route, County)</th>
<th>2017 UDC Per Mile ($)</th>
<th>2012-2016 Average UDC Per Mile ($)</th>
<th>Change in UDC Per Mile ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I-94 Detroit TSC (55 MPH Section)</td>
<td>$1,107,000</td>
<td>$710,000</td>
<td>$397,000</td>
</tr>
<tr>
<td>2</td>
<td>I-696 Oakland Co.</td>
<td>$896,000</td>
<td>$691,000</td>
<td>$205,000</td>
</tr>
<tr>
<td>3</td>
<td>I-75 Detroit TSC (55 MPH Section)</td>
<td>$679,000</td>
<td>$529,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>4</td>
<td>I-96 Oakland Co.</td>
<td>$641,000</td>
<td>$460,000</td>
<td>$181,000</td>
</tr>
<tr>
<td>5</td>
<td>I-96 Detroit TSC/LOCAL</td>
<td>$606,000</td>
<td>$792,000</td>
<td>-$186,000</td>
</tr>
<tr>
<td>6</td>
<td>I-96 Taylor TSC</td>
<td>$582,000</td>
<td>$477,000</td>
<td>$105,000</td>
</tr>
<tr>
<td>7</td>
<td>M-39 Detroit TSC (55 MPH Section)</td>
<td>$581,000</td>
<td>$475,000</td>
<td>$106,000</td>
</tr>
<tr>
<td>8</td>
<td>I-696 Macomb Co.</td>
<td>$534,000</td>
<td>$518,000</td>
<td>$16,000</td>
</tr>
<tr>
<td>9</td>
<td>I-75 Oakland Co.</td>
<td>$467,000</td>
<td>$449,000</td>
<td>$18,000</td>
</tr>
<tr>
<td>10</td>
<td>I-94 Taylor TSC</td>
<td>$420,000</td>
<td>$356,000</td>
<td>$64,000</td>
</tr>
<tr>
<td>11</td>
<td>M-59 Oakland Co. (70 MPH Section)</td>
<td>$331,000</td>
<td>$373,000</td>
<td>-$42,000</td>
</tr>
<tr>
<td>12</td>
<td>M-10 Detroit TSC (55 MPH Section)</td>
<td>$328,000</td>
<td>$384,000</td>
<td>-$56,000</td>
</tr>
<tr>
<td>13</td>
<td>M-10 Oakland Co. (70 MPH Section)</td>
<td>$281,000</td>
<td>$455,000</td>
<td>-$174,000</td>
</tr>
<tr>
<td>14</td>
<td>I-275 Wayne Co.</td>
<td>$220,000</td>
<td>$220,000</td>
<td>$0</td>
</tr>
<tr>
<td>15</td>
<td>I-94 Macomb Co.</td>
<td>$198,000</td>
<td>$228,000</td>
<td>-$30,000</td>
</tr>
<tr>
<td>16</td>
<td>M-53 Macomb Co. (70 MPH Section)</td>
<td>$193,000</td>
<td>$277,000</td>
<td>-$84,000</td>
</tr>
<tr>
<td>17</td>
<td>M-14 Taylor TSC</td>
<td>$166,000</td>
<td>$259,000</td>
<td>-$93,000</td>
</tr>
<tr>
<td>18</td>
<td>I-75 Taylor TSC</td>
<td>$137,000</td>
<td>$274,000</td>
<td>-$137,000</td>
</tr>
</tbody>
</table>

Note: Minor differences may occur due to rounding.
**METRO REGION: CORRIDOR GLOSSARY**

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate 75</td>
<td>Taylor, Detroit (55 MPH Section), and Oakland</td>
<td>Pg. 20</td>
</tr>
<tr>
<td>Interstate 94</td>
<td>Taylor, Detroit (55 MPH Section), and Macomb</td>
<td>Pg. 31</td>
</tr>
<tr>
<td>Interstate 96</td>
<td>Oakland, Taylor, and Detroit/LOCAL</td>
<td>Pg. 41</td>
</tr>
<tr>
<td>Interstate 275</td>
<td>Wayne</td>
<td>Pg. 53</td>
</tr>
<tr>
<td>Interstate 696</td>
<td>Oakland and Macomb</td>
<td>Pg. 58</td>
</tr>
<tr>
<td>Michigan 10</td>
<td>Detroit (55 MPH Section) and Oakland (70 MPH Section)</td>
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<tr>
<td>Michigan 14</td>
<td>Taylor</td>
<td>Pg. 73</td>
</tr>
<tr>
<td>Michigan 39</td>
<td>Detroit (55 MPH Section)</td>
<td>Pg. 76</td>
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<td>Macomb (70 MPH Section)</td>
<td>Pg. 82</td>
</tr>
<tr>
<td>Michigan 59</td>
<td>Oakland (70 MPH Section)</td>
<td>Pg. 87</td>
</tr>
</tbody>
</table>
INTERSTATE 75: TAYLOR, DETROIT (55 MPH SECTION), AND OAKLAND

a) Segment Map

b) UDC Graph

FIGURE 10. Taylor TSC I-75 Corridor Total User Delay Cost

2012-2016 Average User Delay Cost - $8,754,000
2017 User Delay Cost - $4,393,000
INTERSTATE 75: TAYLOR, DETROIT (55 MPH SECTION), AND OAKLAND

2012-2016 Average User Delay Cost - $9,526,000
2017 User Delay Cost - $12,218,000

FIGURE 11. Detroit TSC I-75 Corridor Total User Delay Cost
INTERSTATE 75: TAYLOR, DETROIT (55 MPH SECTION), AND OAKLAND

a) Segment Map

b) UDC Graph

FIGURE 12. Oakland County I-75 Corridor Total User Delay Cost
FIGURE 13. Metro Region I-75 Northbound
FIGURE 14. Metro Region I-75 Southbound
INTERSTATE 75: TRAVEL TIME RELIABILITY

FIGURE 15. Travel Time Reliability: I-75
FIGURE 17. Segment 2 - I-75 between M-39/Southfield Rd/Exit 41 and I-75/Chrysler Fwy/Exit 51
INTERSTATE 75: TRAVEL TIME RELIABILITY

![Travel Time Graph](image)

**FIGURE 18.** Segment 3 - I-75 between I-75/Chrysler Fwy/Exit 51 and I-696/Exit 61
INTERSTATE 75: TRAVEL TIME RELIABILITY

FIGURE 19. Segment 4 - I-75 between I-696/Exit 61 and M-59/Exit 77
INTERSTATE 75: TRAVEL TIME RELIABILITY

FIGURE 20. Segment 5 - I-75 between M-59/Exit 77 and US-24/Dixie Hwy/Exit 93
INTERSTATE 94: TAYLOR, DETROIT (55 MPH SECTION), AND MACOMB

**Segment Map**

**UDC Graph**

**FIGURE 21.** Taylor TSC I-94 Corridor Total User Delay Cost
INTERSTATE 94: TAYLOR, DETROIT (55 MPH SECTION), AND MACOMB

a) Segment Map

b) UDC Graph

FIGURE 22. Detroit TSC I-94 Corridor Total User Delay Cost
INTERSTATE 94: TAYLOR, DETROIT (55 MPH SECTION), AND MACOMB

FIGURE 23. Macomb County I-94 Corridor Total User Delay Cost
FREEWAY CONGESTION & RELIABILITY REPORT

Metro Region

Corridors

FIGURE 24. Metro Region I-94 Eastbound
FIGURE 25. Metro Region I-94 Westbound
FIGURE 26. Travel Time Reliability: I-94
**INTERSTATE 94: TRAVEL TIME RELIABILITY**

![Graph of travel time reliability for Interstate 94 in Metro Region, Corridors.](image)

*a) Eastbound*

*b) Westbound*

**FIGURE 27.** Segment 1 - I-94 between I-275/Exit 194 and M-39/Southfield Fwy/Exit 204
INTERSTATE 94: TRAVEL TIME RELIABILITY

INTERSTATE 94: TRAVEL TIME RELIABILITY

FIGURE 29. Segment 3 - I-94 between M-10/John C Lodge Fwy/Exit 215 and I-696/11 Mile Rd/Exit 229
INTERSTATE 94: TRAVEL TIME RELIABILITY

FIGURE 30. Segment 4 - I-94 between I-696/11 Mile Rd/Exit 229 and William P Rosso Hwy/Exit 240
INTERSTATE 96: OAKLAND, TAYLOR, AND DETROIT/LOCAL

2012-2016 Average User Delay Cost - $15,685,000
2017 User Delay Cost - $21,881,000

FIGURE 31. Oakland County I-96 Corridor Total User Delay Cost
INTERSTATE 96: OAKLAND, TAYLOR, AND DETROIT/LOCAL

a) Segment Map

b) UDC Graph

FIGURE 32. Taylor TSC I-96 Corridor Total User Delay Cost
INTERSTATE 96: OAKLAND, TAYLOR, AND DETROIT/LOCAL

FIGURE 33. Detroit TSC I-96 Corridor Total User Delay Cost

a) Segment Map

b) UDC Graph

- 2012-2016 Average User Delay Cost - $28,503,000
- 2017 User Delay Cost - $21,806,000
FIGURE 34. Metro Region I-96 Eastbound
FIGURE 35. Metro Region I-96 Westbound
FIGURE 36. Metro Region I-96 LOCAL Eastbound
FIGURE 37. Metro Region I-96 LOCAL Westbound
INTERSTATE 96: TRAVEL TIME RELIABILITY

a) Metro Region and Livingston County

b) Detroit, Michigan

FIGURE 38. Travel Time Reliability: I-96
INTERSTATE 96: TRAVEL TIME RELIABILITY

INTERSTATE 96: TRAVEL TIME RELIABILITY

**FIGURE 40. Segment 2 - I-96 between I-696/M-5/Exit 165 and I-275/M-14**
FIGURE 41. Segment 3 - I-96 between I-275/M-14 and I-96 LOCAL/M-39/Exit 183
INTERSTATE 96: TRAVEL TIME RELIABILITY

FIGURE 42. Segment 4 - I-96 between I-96 LOCAL/M-39/Exit 183 and I-75

a) Eastbound

b) Westbound
INTERSTATE 275: WAYNE

a) Segment Map

b) UDC Graph

FIGURE 43. Wayne County I-275 Corridor Total User Delay Cost
FIGURE 44. Metro Region I-275 Northbound
FIGURE 45. Metro Region I-275 Southbound
INTERSTATE 275: TRAVEL TIME RELIABILITY

a) Metro Region

b) Detroit, Michigan

FIGURE 46. Travel Time Reliability: I-275
INTERSTATE 275: TRAVEL TIME RELIABILITY

FIGURE 47. Segment 1 - I-275 between I-94/Exit 17 and I-96/M-14/Exit 29

a) Northbound

b) Southbound
INTERSTATE 696: OAKLAND AND MACOMB

FIGURE 48. Oakland County I-696 Corridor Total User Delay Cost
INTERSTATE 696: OAKLAND AND MACOMB

a) Segment Map

b) UDC Graph

FIGURE 49. Macomb County I-696 Corridor Total User Delay Cost
FIGURE 50. Metro Region I-696 Eastbound
FIGURE 51. Metro Region I-696 Westbound
INTERSTATE 696: TRAVEL TIME RELIABILITY

FIGURE 52. Travel Time Reliability: I-696
FIGURE 53. Segment 1 - I-696 between I-96/I-275/M-5/Exit 1 and M-10/Exit 10
INTERSTATE 696: TRAVEL TIME RELIABILITY

FIGURE 54. Segment 2 - I-696 between M-10/Exit 10 and I-75/Exit 18
INTERSTATE 696: TRAVEL TIME RELIABILITY

a) Eastbound

b) Westbound

FIGURE 55. Segment 3 - I-696 between I-75/Exit 18 and I-94
FIGURE 56. Detroit TSC M-10 Corridor Total User Delay Cost
MICHIGAN 10: DETROIT (55 MPH SECTION) AND OAKLAND (70 MPH SECTION)

a) Segment Map

b) UDC Graph

FIGURE 57. Oakland County M-10 Corridor Total User Delay Cost
FIGURE 58. Metro Region M-10 Northbound
FIGURE 59. Metro Region M-10 Southbound
FIGURE 60. Travel Time Reliability: M-10
FIGURE 61. Segment 1 - M-10 between US-24/Telegraph Rd and I-94/Edsel Ford Fwy
MICHIGAN 10: TRAVEL TIME RELIABILITY

**FIGURE 62.** Segment 2 - M-10 between I-94/Edsel Ford Fwy and M-1/Woodward Ave
FIGURE 63. Taylor TSC M-14 Corridor Total User Delay Cost

2012-2016 Average User Delay Cost - $3,885,000
2017 User Delay Cost - $2,494,000
FIGURE 64. Metro Region M-14 Eastbound
FIGURE 65. Metro Region M-14 Westbound
FIGURE 66. Detroit TSC M-39 Corridor Total User Delay Cost

- 2012-2016 Average User Delay Cost - $12,836,000
- 2017 User Delay Cost - $15,692,000
FIGURE 67. Metro Region M-39 Northbound
FIGURE 68. Metro Region M-39 Southbound
FIGURE 69. Travel Time Reliability: M-39
M-39: TRAVEL TIME RELIABILITY

**FIGURE 70.** Segment 1 - M-39 between I-94/Van Born Rd/Exit 1 and I-96/Exit 11
**M-39 TRAVEL TIME RELIABILITY**

![Travel Time Graph](image)

**FIGURE 71.** Segment 2 - M-39 between I-96/Exit 11 and Southfield Rd
MICHIGAN 53: MACOMB (70 MPH SECTION)

**Segment Map**

- Oakland
- Macomb
- Wayne

**UDC Graph**

- 2012-2016 Average User Delay Cost: $5,259,000
- 2017 User Delay Cost: $3,675,000

**FIGURE 72.** Macomb County M-53 Corridor Total User Delay Cost
FIGURE 73. Metro Region M-53 Northbound
FIGURE 74. Metro Region M-53 Southbound
**MICHIGAN 53: TRAVEL TIME RELIABILITY**

**FIGURE 75. Travel Time Reliability: M-53**

- **Metro Region**

- **Detroit, Michigan**
FIGURE 76. Segment 1 - M-53 between Van Dyke Rd and Van Dyke Ave
FIGURE 77. Oakland County M-59 Corridor Total User Delay Cost
FIGURE 78. Metro Region M-59 Eastbound
FIGURE 79. Metro Region M-59 Westbound
FIGURE 80. Travel Time Reliability: M-59
FIGURE 81. Segment 1 - M-59 between Van Dyke Ave and MLK Jr Blvd
CONCLUSION

This chapter summarizes the performance of the Metro Region. It is the Congestion and Mobility Unit's goal that these performance measures are not just numbers and figures, but information to help MDOT personnel understand how traffic is operating on its freeways and make actionable decisions on improving traffic. They could be used to help prioritize projects, determine where and when problems are occurring, and how significant they are. We intend to provide these performance measures on an annual basis to help identify trends on the system and to keep MDOT up to date on freeway operations. Various performance measures may change due to changing federal requirements or MDOT needs. As probe data improves, this may expand to non-freeway routes as well. The Congestion and Mobility Unit welcomes any feedback on this report to help us improve it in the future and maximize its usefulness.

CONTACT INFORMATION

Please contact the Congestion and Mobility Unit if you have any questions/comments or would like to have the actual data for further analysis.

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