Memphis Urban Area
Metropolitan Planning Organization (MPO)
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# TABLE OF CONTENTS

1 **Introduction** ........................................................................................................................................... 5  
1.1 Foreword .................................................................................................................................................. 5  
1.2 Federal Legislation .................................................................................................................................. 7  
1.3 Air Quality ............................................................................................................................................... 9  
1.4 Plan Development ................................................................................................................................. 10  

2 **Regional Overview** ................................................................................................................................ 14  
2.1 Congestion Management Process .......................................................................................................... 15  
2.2 Defining Congestion ............................................................................................................................... 15  
2.3 Recurring Congestion ............................................................................................................................. 18  
2.4 Non-Recurring Congestion ..................................................................................................................... 19  
2.5 Multimodal Mobility ............................................................................................................................... 21  

3 **Congestion Management Strategies** ................................................................................................... 27  
3.1 MAP-21 National Performance Goals ................................................................................................... 27  
3.2 Regional Goals and Objectives .............................................................................................................. 28  

4 **Measuring Congestion** ......................................................................................................................... 29  

5 **CMP Network** ..................................................................................................................................... 32  
5.1 The Congested Network ......................................................................................................................... 32  

6 **Implementation** .................................................................................................................................... 39  
6.1 Potential Benefits of CMP Strategies ................................................................................................... 39  
6.2 Monitoring Congestion .......................................................................................................................... 44  
6.3 Summary and Conclusions .................................................................................................................... 45  

7 **List of Figures** ....................................................................................................................................... 46  

8 **Acronyms and Definitions** .................................................................................................................... 47
A RESOLUTION
BY THE
TRANSPORTATION POLICY BOARD
OF THE
MEMPHIS URBAN AREA METROPOLITAN PLANNING ORGANIZATION
ADOPTION OF THE CONGESTION MANAGEMENT PROCESS (CMP)

RESOLUTION # 2015-12

WHEREAS, the Memphis Urban Area Metropolitan Planning Organization (MPO) is the organization responsible for planning the creation of an efficient transportation system in the Memphis urban area and for the appropriate use of federal transportation funds in that area; and

WHEREAS, the MPO planning boundary has been designated by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) as a Transportation Management Area (TMA) which is defined as an urbanized area with a population over 200,000; and

WHEREAS, the Code of Federal Regulations (23 CFR 450.320) requires that the transportation planning process, in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53 through the use of travel demand reduction and operational management strategies; and

WHEREAS, notice of the availability of the draft plan to the public was released in the Memphis MPO planning area for a period of thirty (30) days prior to consideration by the Board to give the public an opportunity to review and comment on the plan; and

WHEREAS, the Tennessee Department of Transportation (TDOT), the Mississippi Department of Transportation (MDOT), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA) have reviewed said document; and

WHEREAS, the Engineering and Technical Committee (ETC) has reviewed the plan and have recommended approval to the Transportation Policy Board (TPB); and

WHEREAS, the Transportation Policy Board has reviewed the plan and has considered the public comments received, and concurs with the recommendations of the ETC.

NOW, THEREFORE, BE IT RESOLVED, that the Transportation Policy Board of the Memphis Urban Area Metropolitan Planning Organization does hereby adopt the Congestion Management Process.

Resolution duly passed on August 27, 2015

[Signature]
Mayor A. Keith McDonald, Vice Chairman
Memphis Urban Area Metropolitan Planning Organization
1 Introduction

Figure 1-1: Memphis Urban Area MPO Planning Area

1.1 Foreword

The Memphis Urban Area Metropolitan Planning Organization (Memphis MPO) was created in 1977, and is responsible for the development of transportation policy, planning, and programming for all of Shelby County, Tennessee and DeSoto County, Mississippi as well as portions of Fayette County, Tennessee and Marshall County, Mississippi. The Memphis MPO is heavily involved in multi-modal planning for the entire region to improve the efficiency, safety, and livability of the roadway and transit networks, bicycle and pedestrian...
facilities, and freight infrastructure. Some of the major plans that the Memphis MPO publishes are the Unified Planning Work Program (UPWP), the Transportation Improvement Plan (TIP), and the Regional Transportation Plan (RTP).

The Memphis MPO is committed to reducing congestion by undertaking a Congestion Management Process (CMP). The concept of Congestion Management Systems was introduced in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and was the basis for Congestion Management Plans used today. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) also designated urban areas with populations of 200,000 people or more as Transportation Management Areas (TMA’s) and required them to develop a CMP. The requirement for a CMP continued with the passing of Transportation Equity Act for the 21st Century (TEA-21), the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and the Moving Ahead for Progress in the 21st Century Act (MAP-21). MAP-21 places an increased emphasis on incorporating performance measures and performance targets to help track and evaluate congestion metrics.

The CMP is an important component of the Memphis MPO’s transportation planning process. The CMP describes processes used to identify existing and future congestion and provides strategies to mitigate congestion and improve mobility throughout the region. The CMP identifies strategies that manage demand, reduce single occupant vehicle (SOV) travel, and improve transportation system management and operations. The processes described in the CMP are used in the development of the RTP to identify and evaluate projects and programs. Projects and programs identified through the congestion management process and other mechanisms identified in the RTP are then prioritized. Congestion and Mobility/Accessibility are two main categories evaluated during the prioritization and project selection process for the RTP. Among others, the criteria used to rank and score projects include travel time delay, multimodal improvements, and access to community resources. The RTP is a financially constrained transportation plan. Projects that rank high in the prioritization process and can be funded within the horizon year of the RTP are included as plan projects. Information about the project evaluation, prioritization, and selection process can be found in the RTP documentation. Consideration of the results of the congestion management process in the RTP is consistent with the federal requirement provided in Title 23 of the Code of Federal Regulations (23 CFR 450.322(f)(4)).

While the RTP is a long range transportation plan, there are short and mid-term projects identified as well. Projects that are to be carried out within four years are a part of the TIP. The TIP is a subset of, and must be consistent with the RTP. The project ranking criteria for the TIP also takes into account the predicted improvements in the congestion levels when scoring projects. The prioritization process for the TIP accounts for projects that use Congestion Management Strategies.

The Goals and Objectives of the Livability 2040 Regional Transportation Plan provide the framework for the goals and objectives for the CMP. The Memphis MPO’s land use model and travel demand models are inputs to the Congestion Management Process and the Regional Transportation Plan. A household travel survey was conducted in the spring of 2014 to update the regional travel demand model. These models help identify future areas of congestion and the potential effectiveness of strategies aimed at reducing congestion. The role of the CMP in the development of the RTP is shown below in Figure 1-2.
1.2 **Federal Legislation**

The Federal Highway Administration (FHWA) under MAP-21 requires that metropolitan planning agencies overseeing TMA’s develop and implement a CMP that meets the requirements outlined in Title 23 of the Code of Federal Regulations (23 CFR 450.320) which reads as follows:

a) The transportation planning process in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53 through the use of travel demand reduction and operational management strategies.

b) The development of a congestion management process should result in multimodal system performance measures and strategies that can be reflected in the metropolitan transportation plan and the TIP. The level of system performance deemed acceptable by State and local transportation officials may vary by type of transportation facility, geographic location (metropolitan area or subarea), and/or time of day. In addition, consideration should be given to strategies that manage demand, reduce single occupant vehicle (SOV) travel, and improve transportation system management and operations. Where the addition of general purpose lanes is determined to be an appropriate congestion management strategy, explicit consideration is to be given to the incorporation of appropriate features into the SOV project to facilitate future demand management strategies and operational improvements that will maintain the functional integrity and safety of those lanes.
c) The congestion management process shall be developed, established, and implemented as part of the metropolitan transportation planning process that includes coordination with transportation system management and operations activities. The congestion management process shall include:

1. Methods to monitor and evaluate the performance of the multimodal transportation system, identify the causes of recurring and non-recurring congestion, identify and evaluate alternative strategies, provide information supporting the implementation of actions, and evaluate the effectiveness of implemented actions;

2. Definition of congestion management objectives and appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since levels of acceptable system performance may vary among local communities, performance measures should be tailored to the specific needs of the area and established cooperatively by the State(s), affected MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area;

3. Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/Intelligent Transportation Systems (ITS) data) and coordinated with operations managers in the metropolitan area;

4. Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, are some examples of what should be appropriately considered for each area:

   (i) Demand management measures, including growth management and congestion pricing;

   (ii) Traffic operational improvements;

   (iii) Public transportation improvements;

   (iv) ITS technologies as related to the regional ITS architecture; and

   (v) Where necessary, additional system capacity;

5. Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation; and

6. Implementation of a process for periodic assessment of the effectiveness of implemented strategies, in terms of the area’s established performance measures. The results of this evaluation shall be provided to decision makers and the public to provide guidance on selection of effective strategies for future implementation.

d) In a TMA designated as nonattainment area for ozone or carbon monoxide pursuant to the Clean Air Act, Federal funds may not be programmed for any project that will result in a significant increase in the carrying capacity for SOVs (i.e., a new general purpose highway on a new location or adding general purpose lanes, with the exception of safety improvements or the elimination of bottlenecks), unless the project is addressed through a congestion management process meeting the requirements of this section.
e) In TMAs designated as nonattainment for ozone or carbon monoxide, the congestion management process shall provide an appropriate analysis of reasonable (including multimodal) travel demand reduction and operational management strategies for the corridor in which a project that will result in a significant increase in capacity for SOVs (as described in paragraph (d) of this section) is proposed to be advanced with Federal funds. If the analysis demonstrates that travel demand reduction and operational management strategies cannot fully satisfy the need for additional capacity in the corridor and additional SOV capacity is warranted, then the congestion management process shall identify all reasonable strategies to manage the SOV facility safely and effectively (or to facilitate its management in the future). Other travel demand reduction and operational management strategies appropriate for the corridor, but not appropriate for incorporation into the SOV facility itself, shall also be identified through the congestion management process. All identified reasonable travel demand reduction and operational management strategies shall be incorporated into the SOV project or committed to by the State and MPO for implementation.

f) State laws, rules, or regulations pertaining to congestion management systems or programs may constitute the congestion management process, if the FHWA and the FTA find that the State laws, rules, or regulations are consistent with, and fulfill the intent of, the purposes of 23 U.S.C. 134 and 49 U.S.C. 5303.

Furthermore, Title 23 of the United States Code states that TMA’s classified as nonattainment for ozone or carbon monoxide pursuant to the Clean Air Act (42 U.S.C. 7401 et seq.), may not be advanced federal funds in such area for any highway project that will result in a significant increase in the carrying capacity for single-occupant vehicles unless the project is addressed through a congestion management process (23 U.S.C. 134 (n) (1)).

1.3 Air Quality

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for “criteria pollutants,” which include carbon monoxide, ozone, lead, sulfur oxides, nitrogen oxides, and particulate matter. Of these “criteria pollutants,” two have exceeded acceptable levels within the Memphis MPO boundary, Ozone (O₃) and Carbon Monoxide (CO). The non-attainment boundaries are shown below. In recognition of the negative externalities imposed by automobiles on air pollution, the Memphis MPO evaluates proposed transportation projects to ensure they do not result in an increase in air pollutant emissions, especially CO and the precursors for O₃¹. The CMP serves as an opportunity to reduce emissions and fulfill the obligations necessary to reach attainment.

¹ The precursors for O₃ are nitrogen oxides (NOx) and volatile organic compounds (VOC).
Ozone (O₃)
The EPA re-designated Memphis, TN-MS-AR as a 2008 8-hour ozone marginal non-attainment area effective July 20, 2012. The final ruling was published in the Federal Register (77 FR 30088) on May 21, 2012. Included in this designation were Shelby County, TN; Crittenden County, AR; and the portion of DeSoto County, MS in the Memphis MPO boundary (See Figure 1-3). The Memphis MPO is responsible for demonstrating conformance of the NAAQS for Shelby County, TN and the portion of DeSoto County, MS in the Memphis MPO boundary. The West Memphis MPO is responsible for demonstrating conformity of the NAAQS for Crittenden County.

Carbon Monoxide (CO)
Shelby County is also considered as a maintenance zone for Carbon Monoxide (CO). In 1978, the EPA designated Shelby County, TN, a moderate (less than 12.7 parts per million) non-attainment area for carbon monoxide (CO). Due to improvements in ambient air quality, EPA re-designated Shelby County to attainment for the CO standard on August 31, 1994 (See Figure 1-4). Since then Shelby County, TN entered into two 10-year maintenance periods. After the first 10 year period, Shelby County, TN was re-designated as a maintenance area with the second maintenance period scheduled to end in 2017.

1.4 Plan Development
1.4.1 CMP Best Practices Review
One of the first tasks of the CMP was to review the best practices of CMPs for other MPOs nationwide. Please refer to Appendix A for a summary of the best practices review. This task was completed in order to determine best practices performed by other MPOs during the development of a congestion management process. Each CMP was studied and summarized with respect to the CMP Process Model (See Figure 1-5). The Process Model is discussed in FHWA’s Congestion Management Process: A Guidebook, dated April 2011. The Process Model steps are listed below, with explanations for each step as shown in the FHWA document.
1.4.2 Outreach

The CMP’s development was driven by stakeholder participation and public input. During the project, the stakeholders worked together to provide guidance and vision for the congestion management process. Additionally, the study team used different channels to obtain public input on specific locations of concern throughout the region. For a summary of the plan’s development, please see Appendix A.

CMP Steering Committee

At the start of the project, a Congestion Management Process Steering Committee comprised of federal, state and local officials was formed to guide the development of the CMP. Supplemental input was gathered through one-on-one meetings with regional partners to ascertain their perspective on congestion and mobility. These individual meetings allowed regional stakeholders to provide input into further details concerning congestion and safety in their areas within the MPO boundary. Further information concerning the status of congestion related projects were gathered. Additionally, a Performance Measure (PM) workshop was held on October 2, 2014. At the PM workshop, the Steering Committee reviewed PMs used by Tennessee DOT and Mississippi DOT, reviewed notable PMs used by other MPOs, and discussed and proposed PMs to be used in the CMP. The performance measures used for the CMP are discussed later in the document. Below is the list of agencies who participated in the CMP Steering Committee:
Congestion Management Process (CMP)

CMP Steering Committee

- Mississippi DOT
- City of Memphis Engineering Division
- MATA
- West Memphis MPO
- City of Bartlett
- Fayette County Planning and Development
- Tennessee Highway Patrol
- Shelby County Office of Preparedness
- Town of Collierville
- Shelby County Health Department
- Tennessee DOT
- Memphis Urban Area MPO
- Marshall County Industrial Development Authority
- City of Memphis Fire Department
- DeSoto County Planning Department
- FHWA Tennessee Division
- Shelby County

Public Input

Public input was gathered by using a variety of outreach methods including:

Mobility Summit

On October 23, 2014, a “Mobility Summit” was held at the Salvation Army Kroc Center in Memphis, Tennessee. The summit was an important component in the development of the CMP, as it allowed the MPO to engage the public by giving them the opportunity to elaborate on issues specifically concerning mobility and congestion that exist throughout the region. The summit agenda included; giving the public an overview of the CMP and its purpose, discussing mobility in the area, engaging the participants by looking at corridors, and identifying the next steps to take to improve mobility.

During the summit, participants were asked to identify what mobility means to them. They defined mobility as the ability to conveniently and safely get from point A to Z, including access to medical facilities, shopping, work, school, home, and worship. The participants considered all modes of transportation, including pedestrian, bicycle, motor vehicle, and transit.

There were 24 participants at the summit, including private citizens and representatives from the following organizations:

- Memphis Area Transit Authority (MATA)
- Independent Transportation Network (ITN) Memphis
- Memphis Center for Independent Living (MCIL)
- Mississippi Department of Transportation (MDOT)
- The Sierra Club
- Gannett Fleming
- Premier Transportation Services

Other Outreach Efforts

Public meetings were held during the development of the Livability 2040 Regional Transportation Plan which provided an opportunity for participants to discuss their concerns regarding all modes of transportation, and transportation issues as they relate to congestion. There were a total of six public meetings held throughout this process. During these RTP meetings, an interactive survey was given in which participants identified issues of
primary need or importance related to the transportation system in the region. Congestion problems were a recurring theme. Additional information was gathered through the use of an online survey. The online survey and the interactive survey featured very similar sets of questions. Because the interactive surveys were given in person at the RTP meetings, the questions were slightly more tailored to the area in which the survey was given. Combining the online surveys and the interactive surveys, there were a total of 560 responses.

As part of the development of RTP, a project website was created. The website, located at www.livability2040.com, allowed the public to keep up with the RTP process and provide comments on livability within the Memphis MPO Planning Area. The site included a “Community Remarks” tool which was an interactive mapping and feedback platform used to collect and discuss transportation-related issues from the public (see Figure 1-6). Citizens posted location-based comments on an interactive webmap, and other visitors to the site could vote to agree or disagree with the comments. The tool received upwards of 200 comments. Congestion Concerns was one of the main components of the Community Remarks webpage.
2 Regional Overview

Figure 2-1: Memphis Urban Area MPO Regional Roadway Network

The Memphis Metropolitan Planning area encompasses over 1,513 square miles with a total population of 1,118,005 in 2010 and a projected population of 1,407,365 by 2040\(^2\). In addition, employment is projected to grow from 577,122 in 2010 to 873,293 in 2040\(^3\). There are currently 150 miles of freeways in the region, 1,004 miles of arterial roadways and an additional 763 miles of collector roadways. Efficient transportation is key to

\(^2\) 2040 population projections were prepared during the update of the Regional Land Use Model.
\(^3\) 2040 employment projections were prepared during the update of the Regional Land Use Model.
the area’s economy. The region is home to the Memphis Aerotropolis, which houses the region’s largest employer, FedEx. FedEx is the nation’s leader in parcel delivery service and contributes to Memphis’ standing as the second busiest cargo airport after Hong Kong’s.

Nationally, the issue of traffic congestion has received increasing attention from both the private and public sectors. If congestion problems continue to get worse, economic losses to area business could negatively affect regional economic development.

2.1 Congestion Management Process

A congestion management process (CMP) is a systematic and regionally-accepted approach for managing congestion that provides accurate and up-to-date information on transportation system performance. In order to meet state and local needs and budgetary constraints, the CMP assesses alternative strategies for congestion management that precede more costly strategies such as adding capacity by constructing new roadways or widening corridors. The CMP is intended to move these congestion management strategies into the funding and implementation stages outlined in the Regional Transportation Plan (RTP) published every four years. The Memphis MPO is committed to developing a CMP that emphasizes the need to link the effective management and operations of transportation systems to the planning process, environmental review process, and travel demand management.

2.2 Defining Congestion

The Federal Highway Administration (FHWA) defines traffic congestion as the level at which transportation system performance is no longer acceptable due to excessive travel times and delays (23 CFR 500.109). The Memphis MPO defines congestion as roadways that operate with a Level of Service (LOS) E or F. The operating Level of Service (LOS) E or F for a roadway is considered to be unacceptable system performance. The Regional Travel Demand Model estimates LOS by using roadway characteristics such as number of lanes, median type, lane width, and functional class as well as time of day, roadway capacity, and traffic volume to perform an assessment of a road’s operating condition, generally described using a scale of A (little congestion) to E/F (severe congestion). Figure 2-2 shows examples of each LOS.

**Figure 2-2: Examples of LOS by Mode for Urban Roadways**

![LOS by Mode for Urban Roadways](source: Florida Department of Transportation’s 2013 Quality/Level of Service Handbook)
According to the 2012 Urban Mobility Report, the yearly delay per auto commuter in metropolitan statistical areas was 37 hours in 2011. The Memphis, Tennessee/Mississippi/Arkansas metropolitan statistical area had 38 hours of delay per auto commuter in 2011, ranking it the 30th most congested region in the United States. This congestion cost $833 per auto commuter in 2011\(^4\). Figure 2-3 below shows the Memphis TN/MS/AR metro area delays and congestion costs in comparison to similarly sized metro areas.

<table>
<thead>
<tr>
<th>Metropolitan Statistical Area</th>
<th>2011 Population</th>
<th>Yearly Delay Per Auto Commuter (Total Hours)</th>
<th>Congestion Cost Per Auto Commuter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memphis TN/MS/AR</td>
<td>1,058,000</td>
<td>38</td>
<td>$833</td>
</tr>
<tr>
<td>Nashville-Davidson TN</td>
<td>1,145,000</td>
<td>47</td>
<td>$1,034</td>
</tr>
<tr>
<td>Jacksonville, FL</td>
<td>1,083,000</td>
<td>30</td>
<td>$635</td>
</tr>
<tr>
<td>Buffalo, NY</td>
<td>1,048,000</td>
<td>33</td>
<td>$718</td>
</tr>
<tr>
<td>Charlotte, NC/SC</td>
<td>1,070,000</td>
<td>40</td>
<td>$898</td>
</tr>
<tr>
<td>Oklahoma City, OK</td>
<td>983,000</td>
<td>38</td>
<td>$803</td>
</tr>
<tr>
<td>New Orleans, LA</td>
<td>1,065,000</td>
<td>28</td>
<td>$629</td>
</tr>
</tbody>
</table>

*Source: Texas A&M Transportation Institute’s 2012 Urban Mobility Report*

There are two, widely-accepted types of traffic congestion: recurring and non-recurring congestion. Recurring congestion is the type of congestion that occurs on a daily basis, usually during the peak hour periods. There are many strategies available to mitigate this type of congestion through demand management, operational improvements, and multimodal strategies.

Non-recurring congestion is unexpected and usually difficult to address without proper planning. These unexpected traffic delays can be caused by vehicle breakdowns, bad weather, traffic incidents, special events, work zones, etc. Unlike non-recurring congestion, the sources of recurring congestion are more easily identified and can be addressed by working to develop proper signal timing and focusing on reducing bottlenecks during peak commuting hours.

Figure 2-4 illustrates the distribution of the various types of congestion on U.S. transportation networks.

Figure 2-4: Causes of Congestion in the United States

Source: FHWA Active Traffic Management
2.3 Reoccurring Congestion

Figure 2-5: 2013 Average Annual Daily Traffic

Like most metropolitan areas, traffic congestion is experienced mainly during the morning peak and the afternoon peak hours. The morning peak time period is from 6 a.m. to 9 a.m. and the afternoon peak is from 2
p.m. to 6 p.m. Figure 2-5 exhibits the Average Annual Daily Traffic (AADT) within the MPO planning boundary for the year 2013.

The daily total vehicle miles traveled (VMT) within the Memphis Metropolitan Statistical Area (Memphis TN-MS-AR)\(^5\) comprises about 40% of all miles traveled within the region. Figure 2-6 below shows the trend in VMT per capita from 1982-2011.

![Figure 2-6: Daily Vehicle Miles Traveled per capita (1982-2011)](source)

\(^5\) The Memphis Metropolitan Statistical Area includes Crittenden County in Arkansas; Benton, DeSoto, Marshall, Tate and Tunica counties in Mississippi; plus Shelby, Fayette and Tipton counties in Tennessee

2.4 Non-Recurring Congestion

**Safety**

As shown in Figure 2-4, traffic incidents account for 25% of the congestion on U.S. roadway networks. Examples of traffic incidents range from a vehicle pulled onto the shoulder to repair a flat tire, to a complete road closure due to an overturned tractor trailer. Crashes are a significant source of non-recurring congestion. Improving safety to reduce the number and severity of crashes reduces non-recurring congestion. When traffic incidents, such as crashes, do occur, there are programs in place to help reduce the delay, clear the incident, and reduce the potential for secondary crashes.
The total amount of fatalities between the years 2010 and 2014 in Tennessee is 4,945, resulting in an average of 989 fatalities per year. For 2014, the number of fatalities fell below the average at 967. 6 Between 2000 and 2007, Mississippi averaged almost 900 traffic fatalities per year. The new goal of Mississippi’s Strategic Highway Safety Plan (SHSP) is to reduce annual traffic fatalities by 25 percent by 2017.7 Tennessee’s SHSP adopts a “Towards Zero Deaths” vision statement, which is the vision of a national and collaborative effort entitled Toward Zero Deaths: National Strategy on Highway Safety.8

The Memphis MPO’s Regional Bicycle and Pedestrian Plan outlines the crash data for pedestrians and bicyclists and presents statistics such as crash frequency, crash event density, crash severity, crash time and location, etc. Between 2009 and 2013, 2,026 unique crash events occurred involving pedestrians with 89 of them resulting in fatalities and 179 in incapacitating injuries. For bicyclists, 513 unique crash events occurred in the same time period with 6 of them resulting in fatalities and 29 in incapacitating injuries. Most of these crash events occurred in the densely populated areas and during the peak hour periods.

Another safety issue is work zones. A work zone is typically an area of highway construction, maintenance, or utility work activities. Other activities may be considered as work zones such as traffic stops by patrol and towing activities. Work zones often reduce the capacity of a road temporarily and pose a safety threat for workers as well as motorists passing by. Figure 2-7 below provides a summary of reported worker fatalities in work zones.

There are strategies that can help mitigate the traffic impacts and congestion associated with crashes and other traffic incidents. For example, TDOT operates Incident Management Program (HELP) trucks in Tennessee’s most heavily congested urban areas, including Memphis. These HELP trucks patrol 44 miles of Memphis freeways and are equipped with tools and material to assist with clearing incidents. HELP supervisors and operators also work closely with local towing and recovery companies to implement quick clearance of incidents. ITS components, such as TDOT’s 511 traveler information system, highway advisory radio (HAR), and dynamic message signs, alert motorists of areas with non-recurring congestion so they can be actively avoided.

**Figure 2-7: Fatal occupational injuries at road construction sites, 2003-2013**

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<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
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<td>116</td>
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<td>105</td>
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<td>Tennessee</td>
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<td>5</td>
<td>8</td>
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<td>6</td>
<td>7</td>
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<td>5</td>
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</tr>
<tr>
<td>Arkansas</td>
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<td>N/A</td>
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<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Mississippi</td>
<td>N/A</td>
<td>N/A</td>
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<td>N/A</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>


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6 TDOT Crash Data [https://www.tn.gov/safety/article/crashdata](https://www.tn.gov/safety/article/crashdata)
**Special Events**

There are a number of special events within the region that temporarily affect traffic patterns in the region. Downtown is home to a litany of these special events including the Memphis Grizzlies basketball games, the University of Memphis Tigers basketball games, Memphis in May, and concerts. Other events throughout the region such as the Cooper Young festival, the St. Jude Marathon, Mid-South fair and sporting events cause temporary congestion issues that are effectively managed with the help of crossing guards in coordination with TDOT’s Traffic Management Center (TMC) and local law enforcement agencies.

*Figure 2-8: Flooded roadways – Shelby County, TN Office of Preparedness*

**Extreme Weather**

The region experiences heavy rainfall for short periods of time creating a high amount of excess runoff. This excess runoff can lead to many problems which include the forming of potholes, sinkholes and erosion. Other effects of the heavy rain include flooding, fallen trees, and blackouts. Additional impacts to the transportation system are caused by extremely cold weather. These include potholes, traffic incidents, fallen trees, iced bridges, and bridge scouring.

2.5 **Multimodal Mobility**

**Freight**

Due to its location on the Mississippi River, roadway infrastructure, railroad network, and international airport, the Memphis area has developed into a major hub for freight:

- Five Class 1 railroads serve the region – Burlington Northern Santa Fe, Union Pacific, Norfolk Southern Railroad, CSX, and Canadian National. Each railroad operates intermodal facilities at the following locations:
  - Burlington Northern Santa Fe - 4814 Lamar Avenue, Memphis.
  - Union Pacific - 5500 Kuhn Road, Marion, AR.
  - Norfolk Southern Railroad - 2600 Spottswood Avenue, Memphis and 3000 Norfolk Southern Way, Collierville.
  - CSX and Canadian National – 3588 Paul R. Lowry Road, Memphis.
- The Port of Memphis is the fourth largest inland port in the United States.
- Memphis International Airport is the second busiest cargo airport in the world.
- Memphis serves 152 metro markets through overnight truck service.⁹

---
• Interstates 40, 240, and 55 are the interstate roadways and US-78, SR 385, and SR 175 are the non-interstate roadways frequently used by truck traffic in the region. Due to the volume and importance of the Memphis freight industry, the economic consequences of delayed freight goods caused by congestion would very significant. These consequences can be mitigated by proper congestion management. Figure 2-9 shows the amount of freight traffic passing through the region, and Figure 2-10 shows the growth in truck traffic that the State of Tennessee and the State of Mississippi had experienced and will experience in the future, re-emphasizing the importance to address congestion.

**Figure 2-9: 2012 Regional Freight Movements**

**Inbound**

<table>
<thead>
<tr>
<th>Region</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>East South Central</td>
<td>42,546,663</td>
</tr>
<tr>
<td>West South Central</td>
<td>6,034,092</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>4,355,170</td>
</tr>
<tr>
<td>Pacific</td>
<td>2,112,213</td>
</tr>
<tr>
<td>East North Central</td>
<td>1,645,729</td>
</tr>
<tr>
<td>West North Central</td>
<td>810,733</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>745,350</td>
</tr>
<tr>
<td>Mountain</td>
<td>331,283</td>
</tr>
<tr>
<td>New England</td>
<td>84,136</td>
</tr>
</tbody>
</table>

**Outbound**

<table>
<thead>
<tr>
<th>Region</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>East South Central</td>
<td>52,241,100</td>
</tr>
<tr>
<td>West South Central</td>
<td>12,153,213</td>
</tr>
<tr>
<td>West North Central</td>
<td>8,402,111</td>
</tr>
<tr>
<td>East North Central</td>
<td>3,905,935</td>
</tr>
<tr>
<td>Pacific</td>
<td>2,904,907</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>2,366,955</td>
</tr>
<tr>
<td>Mountain</td>
<td>808,960</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>794,322</td>
</tr>
<tr>
<td>New England</td>
<td>160,946</td>
</tr>
</tbody>
</table>

*Source: Freight Analysis Framework (FAF)*
Figure 2-10: Major Flows by Truck To, From, and Within Tennessee and Mississippi Year 2007, 2010 and 2040

Transit

The Memphis Area Transit Authority (MATA) is the primary public transportation provider in the region. MATA provides fixed route bus service, rail trolley, paratransit, and event shuttles. These services are primarily available in the City of Memphis; however, neighboring municipalities within Shelby County such as Germantown and Bartlett also have transit routes. MATA also provides service to West Memphis, Arkansas. The fixed route bus service includes 34 routes that transport about 9.3 million passenger trips per year. Figure 2-11 shows the fixed route system map.

Ancillary Transit Services

There are several ancillary transit services within the region. In Mississippi, the Delta Area Rural Transit System (DARTS) provides local bus service in the counties of Desoto, Tunica, Coahoma, Tallahatchie, Quitman, Panola, and Tate. DARTS provides access to affordable, Americans with Disabilities Act (ADA) accessible, rural general public transportation through passenger service, vehicle maintenance, and transit system management and other related services. In Tennessee, the Delta Human Resources Agency (Delta HRA) provides transportation services for the economically disadvantaged, elderly and handicapped persons in the counties of Tipton, Lauderdale and Fayette and in rural Shelby.

<table>
<thead>
<tr>
<th>NAME</th>
<th>REVENUE MILES</th>
<th>REGULAR TRIPS</th>
<th>REVENUE HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DARTS (MS)</td>
<td>568,314</td>
<td>128,770</td>
<td>27,591</td>
</tr>
<tr>
<td>Delta HRA (TN)</td>
<td>1,998,702</td>
<td>46,011</td>
<td>66,511</td>
</tr>
</tbody>
</table>

Source: 2012 National Transit Database

For long distance trips, private bus companies, such as Greyhound and Megabus, provide bus service into and out of the Memphis region. In addition, the Amtrak “City of New Orleans” route runs through Memphis and offers train travel between New Orleans and Chicago.
Bicycle Facilities

There are over 500 miles of bicycle and pedestrian facilities within the region. Within the last decade, the region has made significant gains toward enhancing the mobility and safety for bicyclists and pedestrians. In 2008 and 2010, the City of Memphis was once considered one of the worst cities for bicyclists and is now recognized as the most improved city for bicycling.\(^{10}\)

**Figure 2-13: Bicycle & Pedestrian Facilities in the Region**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Existing (Miles)</th>
<th>Programmed (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle Lanes</td>
<td>Several jurisdictions around the Memphis MPO area presently offer bicycle lanes. Bicycle lanes are provided along several roads in Memphis, Germantown, Bartlett, Collierville and Hernando.</td>
<td>88.7</td>
<td>82.3</td>
</tr>
<tr>
<td>Paved Shoulders</td>
<td>Paved shoulders are located in more rural areas throughout the region. Examples exist in Fayette and DeSoto Counties and the City of Germantown.</td>
<td>28.5</td>
<td>4.2</td>
</tr>
<tr>
<td>Marked Shared Lanes</td>
<td>The City of Memphis has marked shared bicycle lanes.</td>
<td>7.4</td>
<td>11.3</td>
</tr>
<tr>
<td>Signed Shared Lanes</td>
<td>Unmarked shared bicycle lanes are found throughout the MPO area.</td>
<td>147.1</td>
<td>61.7</td>
</tr>
<tr>
<td>Shared Use Paths</td>
<td>Almost all jurisdictions within the region have shared-use bicycle/pedestrian paths. For example, shared use paths are provided on the Wolf River Greenway, Shelby Farms Greenline, the Memphis Light, Gas and Water Trail in Germantown, the Nonconnah Greenbelt Trail in Collierville, and the Woodhills/Lakewood Trail in the north central part of the City of Memphis.</td>
<td>57.2</td>
<td>37.3</td>
</tr>
<tr>
<td>Cycle Tracks</td>
<td>There are currently four cycle tracks in the Memphis MPO region.</td>
<td>4.7</td>
<td>20.8</td>
</tr>
<tr>
<td>End-of-Trip Facilities</td>
<td>The City of Memphis has end-of-trip facilities such as bicycle racks, lockers, water fountains, restroom facilities, etc.</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

\(^{10}\) Gerety, Alyssa, “America’s Most Improved Bike city”. Bicycling.com Accessed: 3-10-2015
### Pedestrian Facilities

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidewalks</td>
<td>While sidewalks are a common feature throughout the Memphis MPO area, not all communities have a comprehensive sidewalk network in place. In the communities that do have extensive sidewalks, many are damaged and in need of repair.</td>
</tr>
<tr>
<td>Crosswalks</td>
<td>In the Memphis MPO area, crosswalks appear at many street intersections and, increasingly, at mid-block locations.</td>
</tr>
<tr>
<td>Enhanced Pedestrian Treatments</td>
<td>In certain locations along a roadway, a marked crosswalk may not suffice for that area’s high level of pedestrian activity, or perhaps the roadway’s high level of vehicular traffic. These crossings require an enhanced treatment to improve safety. Two examples of such facilities are curb extensions (also known as bulb-outs) and refuge islands. Examples of these already exist in the City of Memphis and a couple other municipalities in the region.</td>
</tr>
<tr>
<td>Pedestrian Overpasses</td>
<td>Pedestrian overpasses exist in the City of Memphis.</td>
</tr>
<tr>
<td>Pedestrian Amenities</td>
<td>Facilities that improve the walking experience and that encourage increased levels of walking are known as pedestrian amenities. Such facilities may address the goal of creating a pleasant and enjoyable walk through better aesthetics, while others may target convenience. Still other amenity types improve personal security. Best examples of these facilities in the Memphis area exist in the downtowns and historic town centers of the region’s communities, as well as on college campuses.</td>
</tr>
<tr>
<td>Shared Use Paths</td>
<td>As mentioned previously, almost all jurisdictions have shared-use bicycle/pedestrian paths.</td>
</tr>
<tr>
<td>Curb Ramps</td>
<td>Curb ramps are found throughout the Memphis MPO area, as they are connected to the sidewalks and federal legislation requires the installation of curb ramps at all intersections and mid-block locations where pedestrian crossings exist.</td>
</tr>
<tr>
<td>Transit Stops</td>
<td>Transit stops are found along many of the transit routes in the Memphis MPO region, in some suburban Shelby County locations, and in West Memphis, AR.</td>
</tr>
<tr>
<td>Pedestrian Signals</td>
<td>Pedestrian signals are found in the City of Memphis and other urban areas in the region where pedestrian traffic is expected at signalized intersections. There are also examples of pedestrian and school signs with flashing LED lights in the City of Memphis.</td>
</tr>
</tbody>
</table>
3 Congestion Management Strategies

3.1 MAP-21 National Performance Goals

The MAP-21 National Performance Goals provide the framework for identifying the appropriate strategies to resolve congestion issues. They include Safety, Infrastructure Condition, Congestion Reduction, System Reliability, Freight Movement and Economic Vitality, Environmental Sustainability, all of which apply to different congestion management strategies to be implemented and evaluated. Below is a table of the MAP-21 National Performance Goals:

<table>
<thead>
<tr>
<th>Goal area</th>
<th>National goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>To achieve a significant reduction in traffic fatalities and serious injuries on all public roads</td>
</tr>
<tr>
<td>Infrastructure condition</td>
<td>To maintain the highway infrastructure asset system in a state of good repair</td>
</tr>
<tr>
<td>Congestion reduction</td>
<td>To achieve a significant reduction in congestion on the National Highway System</td>
</tr>
<tr>
<td>System reliability</td>
<td>To improve the efficiency of the surface transportation system</td>
</tr>
<tr>
<td>Freight movement and economic vitality</td>
<td>To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development</td>
</tr>
<tr>
<td>Environmental sustainability</td>
<td>To enhance the performance of the transportation system while protecting and enhancing the natural environment</td>
</tr>
<tr>
<td>Reduced project delivery delays</td>
<td>To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies’ work practices</td>
</tr>
</tbody>
</table>

In addition to the MAP-21 goals, the FHWA’s Management & Operations in the Metropolitan Transportation Plan Guidebook outlines strategies and objectives vital for congestion management using SMART regional objectives. When developing objectives, it’s important to consider the following:

- **Specific**: It provides sufficient specificity to guide formulation of viable approaches to achieving the objective without dictating the approach.
- **Measurable**: It includes quantitative measurements, saying how many or how much should be accomplished. Tracking progress against the objective enables an assessment of effectiveness of actions.
- **Agreed**: Partners come to a consensus on a common objective. This is most effective when the planning process involves a wide-range of stakeholders to facilitate regional collaboration and coordination.
- **Realistic**: The objective can reasonably be accomplished within the limitations of resources and other demands. The objective may be a "stretch" and require substantial coordination, collaboration, and investment to achieve. Because how realistic the objective is cannot be fully evaluated until after strategies and approaches are defined, the objective may need to be adjusted to be achievable.
- **Time-bound**: The objective identifies a timeframe within which it will be achieved (e.g., "by 2012").
3.2 Regional Goals and Objectives

The CMP objectives were drawn from the Memphis MPO’s 2040 RTP goals and objectives and define the direction for development of the CMP. Figure 3-2 below shows the Livability 2040 RTP goals and corresponding objectives that address congestion management:

**Figure 3-2: Regional Goals and Objectives**

<table>
<thead>
<tr>
<th>Goals</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce travel delay for people and goods</td>
<td>Address critical highway bottlenecks as a priority</td>
</tr>
<tr>
<td></td>
<td>Improve system operations through technology applications</td>
</tr>
<tr>
<td>Improve multimodal access to community and employment resources</td>
<td>Improve bicycle and pedestrian access to educational, health, and recreational opportunities</td>
</tr>
<tr>
<td>Ensure the region is well positioned to remain a leader in global logistics and freight movement</td>
<td>Reduce truck delay on critical freight corridors and within key freight hubs</td>
</tr>
<tr>
<td>Minimize adverse impacts of transportation investment on the (social, natural, historic) environment and improve public health</td>
<td>Provide multimodal, active transportation options that reduce vehicle miles travelled and air pollution and improve public health</td>
</tr>
</tbody>
</table>

The regional goals and objectives are primary points of connection between the CMP and RTP. The goals and objectives identified in the RTP provided the framework for identifying the appropriate strategies to resolve congestion issues. The CMP identifies multi-modal strategies to reduce congestion in the region by providing improved access and mobility using a broad range of strategies and solutions. Finding strategies to reduce congestion is an important component in the Congestion Management Process. Over 40 strategies have been evaluated and grouped into 10 distinct categories that cover a large cross-section of transportation planning. These strategies have been shared with the CMP Steering Committee, whose feedback was essential in helping to determine the 10 categories of congestion management strategies. These strategies do not only exist as reference information for transportation professionals, but will be applied to the horizon year congested road network to determine how these comprehensive strategies can help reduce congestion in the future, before adding capacity to the roadways. The 10 congestion mitigation categories are listed below, followed by a strategy toolbox which provides a description of the strategy as well as which MAP-21 Goals it addresses. Lastly, current related activities are indicated in the final row to highlight some of the existing plans, policies or programs that are occurring in the Memphis MPO Area. The following are the 10 categories identified as part of the CMP which are organized as they relate to the FHWA groupings.

**Demand Management**
1. Land use
2. Commuter programs

**Operational Improvements**
3. Operational improvements & ITS
4. Incident management
5. Intersection improvements
6. Freight improvements

**Multimodal Strategies**
7. Transit improvements
8. Bicycle & Pedestrian facilities

**Strategic Capacity Enhancements**
9. General purpose lanes
10. Dedicated lanes

To see the strategy toolbox, please see Appendix B.
4 Measuring Congestion

In order to measure and manage congestion and improve mobility throughout the Memphis MPO region, performance measures were defined. The CMP is a continual process where performance measures are routinely updated to assess and monitor the performance of the transportation system. It is an ongoing, iterative process where existing and newly implemented strategies are frequently evaluated for their effectiveness. These performance measures will be incorporated into the development of the region’s Congestion Management report to evaluate system performance. This report will be published every other year.

There will be occasions where detailed “before and after” analyses need to be performed in order to accurately measure a strategy’s effectiveness. These types of analyses require more effort in collecting data to measure the improvement in mobility. The data collection may include intersection turning movement counts, travel time studies, speed studies, or public opinion surveys in order to benchmark conditions before and after the improvements are implemented.

The use of performance measures intrinsically serve multiple purposes, including:

- Characterizing existing and anticipated conditions on the regional transportation system
- Tracking progress toward meeting regional objectives
- Identifying specific locations with congestion to address
- Assessing congestion mitigation strategies, programs, and projects
- Communicating system performance to decision makers, the public, and other stakeholder agencies

Multimodal performance measures were developed in order to assess system performance for various modes of travel. The several factors involved in determining the appropriate performance measures were the availability of data and the technical resources available to the MPO and its member jurisdictions. The following is a list of CMP performance measures. The rest of this section discusses each PM and how the metric can be calculated from the existing sources.

1. Volume to Capacity Ratio
2. Travel Time Index, Planning Index, and Buffer Index
3. Number of Crashes
4. Transit Passenger Trips and Bus On-Time Performance
5. Miles of Bike Lanes or Shoulders
6. Truck Hours of Delay

1. Volume to Capacity Ratio

Volume to capacity ratio is the ratio between traffic volumes on a roadway and the estimated capacity of the roadway. This performance can be used to help determine where strategic capacity enhancements can be implemented.
The future volume to capacity ratio is a direct output from the Travel Demand Model (TDM). The TDM is a tool for forecasting impacts of developments on travel patterns, as well as testing various transportation alternative solutions to traffic patterns.

2. **Travel Time Index, Planning Index, and Buffer Index**

Travel Time Index, Planning Index, and Buffer Index can be used to determine the need for operational improvements and strategic capacity improvements.

**Travel Time Index** is the ratio of the travel time during the peak period to the time required to make the same trip at free-flow speeds. A value of 1.3, for example, indicates a 20-minute free-flow trip requires 26 minutes during the peak period.

\[
\text{Travel Time Index} = \frac{\text{Actual Travel Time During Peak}}{\text{Travel Time Based on Free Flow Speed}}
\]

**Planning Index** is the ratio of travel time on the worst day of the month (95\textsuperscript{th} percentile travel time) compared to the time required to make the same trip at free-flow speeds. A value of 1.8, for example, indicates a 20-minute free-flow trip requires 36 minutes during the worst peak period.

\[
\text{Planning Index} = \frac{95\textsuperscript{th} Percentile Travel Time}{\text{Travel Time Based on Free Flow Speed}}
\]

**Buffer Index** is a measure of the reliability of travel service, and can be viewed as the extra time that travelers must add their average commute to ensure an on-time arrival most of the time. It is calculated as the ratio between the difference of the 95th percentile travel time and the average travel time divided by the average travel time.

\[
\text{Buffer Index} = \frac{95\textsuperscript{th} Percentile Travel Time - \text{Average Travel Time}}{\text{Average Travel Time}}
\]

*Source: FHWA Traffic Congestion and Reliability*

The Memphis MPO can use vehicle probe traffic data provided in the National Performance Management Research Data Set (NPMRDS) to calculate each index. The NPMRDS is a data set of roadway segment travel times binned in five minute intervals. This data set provided by FHWA on a monthly basis. The data includes travel time for all vehicles, passenger vehicles, and freight trucks; however, this data only covers the National Highway System (NHS).

3. **Number of Crashes**

Tracking the number of crashes on the region’s roadways is important for determining operational improvements to make roadways safer. The Memphis MPO has access to Tennessee DOT and Mississippi DOT ArcGIS crash data that can be used to track high-crash locations.

4. **Transit Passenger Trips and Bus On-Time Performance**

The number of transit passenger trips and bus on-time performance measures can be used to assess multimodal strategies throughout the region. MATA releases monthly performance measure reports that track passenger trips and on-time performance, among other metrics. The reports are available online at: [http://www.matatransit.com/aboutus/insidemata/performance-measures/](http://www.matatransit.com/aboutus/insidemata/performance-measures/).
5. **Miles of Bike Lanes or Shoulders**

The Memphis MPO maintains an ArcGIS database that can be used to track bicycle infrastructure in the region and determine where enhancements can be made.

6. **Truck Hours of Delay**

Because of the region’s importance in the freight industry, truck delay should be a performance measure that is tracked by the MPO. The Memphis MPO could use the NPMRDS to create a freight truck travel time index to measure freight congestion.

Efforts are currently underway at the Federal level to establish performance targets to meet the requirements of MAP-21. Once released, the State DOTs and the MPOs will use the federal guidance as the basis to develop performance targets for their area. Currently, discussions are underway between the MPO and State DOTs to explore the available data sources to ensure this effort is coordinated between the entities.
5 CMP Network

5.1 The Congested Network

This chapter provides a visual snapshot of congestion and mobility in the Memphis MPO Planning Area based on displaying current congestion, travel time reliability, safety and input from local practitioners and the general public. These maps help visualize some of the CMP performance measures, safety terminology and congestion concerns. The congested corridors are identified based on several factors, which include:

2010 Roadway Level of Service (LOS)

The operating Level of Service (LOS) E or F for a roadway is considered to be unacceptable system performance. In the travel demand model, LOS is determined using roadway characteristics based on number of lanes, median type, lane width, and functional class as well as time of day, roadway capacity, and traffic volume. Figure 5-1, 5-2 and 5-3 on the following page exhibits the level of service for the AM Peak period. Most of the heavy congestion is on corridors that have high traffic volumes within the MPO area, such as I-40, I-55, I-240, etc. Congestion is also observed along Germantown Road, which is one of the commercial corridors in the MPO area. Similarly, in Mississippi, Goodman road is congested especially close to the I-55 interchange where most of the retail and the medical facilities are concentrated.

Travel Time Reliability

Steps were taken to ensure the identification of the network includes measures that address system performance and reliability. Reliability is defined by the variability of travel times over a given period of time. To do so, travel time data was used to prepare a buffer index. The process of calculating a buffer index is explained in Chapter 4. Figure 5-4 below displays the buffer index for the AM Peak period from November 2013. Travel times on most corridors are shown as reliable. When compared with the LOS map in figure 5.1, some of these corridors can be considered as “reliably congested.” But there are other locations i.e. portions of I-240 and Goodman Road @I-55 that are congested as well as have low reliability.

Crash Density

Crash data helps identify corridors or intersections with high levels of crash activity that cause non-recurring congestion. Figure 5-5 below is a map displaying the intensity of crashes per square mile for blocks within the region. High crash areas are along corridors that have high traffic volumes. Higher crashes are also noticed at intersections along the same corridors. This also correlates with the locations that have higher population and commercial activities.

Public Comments

Comments received throughout the development of the plan were used to help identify congestion and safety concerns. Observational input was used to supplement technical data as it is important to develop a comprehensive snapshot of congestion and mobility in the region. See Figure 5-6. Public comments substantiated the observed data as shown in figures 5-1 to 5-5.
5.1.1 **Level of Service (Existing Congested Network-2010)**

*Figure 5-1: 2010 Level of Service A and B for AM Peak period.*
Figure 5-2: 2010 Level of Service C and D for AM Peak period.
Figure 5-3: 2010 Level of Service E and F for AM Peak period.
5.1.2 Travel Time Reliability

Figure 5-4: November 2013 Buffer Index - National Performance Management Research Data Set (NPMRDS)
5.1.3 **Safety**

Figure 5-5: Crash data provided by TDOT and MDOT
5.1.4 **Public Comments**

*Figure 5-6: Locations of concern identified through public input*
6 Implementation

6.1 Potential Benefits of CMP Strategies

It is important to note that the CMP is an ongoing, iterative process. Once strategies are selected and implemented, their effectiveness can be evaluated to assess whether or not they addressed the congestion issues as intended. This is an important aspect of the CMP because it allows the stakeholders to discover what strategies have the potential to work best for the region. Although many of the strategies outlined in the toolbox have proven to be effective for many regions throughout the U.S., they may not yield similar results in the Memphis MPO region.

Congestion management solutions are grouped into four categories:

1. Demand Management (DM) – Demand management strategies attempt to address congestion at the root of the problem by reducing the total number of vehicles on the road.

2. Operational Improvements (OP) – Operational improvements are geared toward improving the “supply side” of the transportation system. This means that the existing transportation system is improved so that mobility is enhanced.

3. Multimodal Strategies (MS) – Multimodal strategies aim to make various modes of transportation (e.g., walking, bicycling, and public transit) more attractive to a person than riding alone in a car. These strategies will reduce the number of single-occupant vehicles (SOV) on the road.

4. Strategic Capacity Enhancements (SC) – Strategic capacity enhancements are improvements aimed to increase the capacity of the roadway network.

With development of the Regional Transportation Plan (RTP), solutions from Categories 1 through 4 are applied to each congested corridor, if applicable, until an acceptable LOS is achieved. This assumes that demand management is the preferred solution if possible, and that capacity enhancements (such as adding general purpose lanes) will be applied only if all other solutions do not resolve congestion. The following are the 10 categories identified as part of the CMP which are organized as they relate to the FHWA groupings.

Demand Management
1. Land use
2. Commuter programs

Operational Improvements
3. Operational improvements & ITS
4. Incident management
5. Intersection improvements
6. Freight improvements

Multimodal Strategies
7. Transit improvements
8. Bicycle & Pedestrian facilities

Strategic Capacity Enhancements
9. General purpose lanes
10. Dedicated lanes
For the majority of the solutions identified, an off model estimate of level of improvement will be used in the development of the RTP. The benefit to each congested corridor from each strategy is estimated in terms of improved travel speed, reduction in delay, or reduction in volume. The resulting volume to capacity and roadway level of service will be reported as part of the RTP. Adding general purpose lanes along congested corridors are considered if congestion is not resolved using all other applicable strategies. For those roadways that need additional laneage to resolve congestion, an estimate of the total number of lanes will be provided. Additional information regarding the off model estimates for congestion reduction associated with application of the congestion management strategies will be provided with the RTP.

6.1.1 Effectiveness of CMP Strategies

The ability of CMP strategies to reduce congestion varies greatly depending on a number of factors. To estimate the future level of effectiveness of these strategies, historic data from both local programs and from national research was reviewed. The following describes each strategy and the evaluation of its effectiveness.

Demand Management

I. Land use

Local governments play a crucial role in the development of the community through land use planning, zoning, and development ordinances. The Memphis and Shelby County Office of Planning and Development (OPD) developed the Unified Development Code (UDC) to guide future growth and development in the City of Memphis and the unincorporated areas of Shelby County. As is often the case with this type of ordinance, it will likely be used as a guide for other municipalities throughout the region.

Best practices in Smart Growth involve developing areas of employment, shopping, and recreation with high concentrations of both workers and users. Dense mixed-use development generally corresponds well with high transit ridership. According to the Puget Sound Regional Vanpool Study conducted for the Puget Sound Regional Council, “change from Single Occupant Vehicles (SOV) to other modes becomes significant at higher densities of greater than 50 employees per gross acre. At densities greater than 125 employees per gross acre a majority of trips are made using modes other than SOV”.

A study conducted by Portland State University shows a 0% to 5% decrease in single occupant vehicle use over the short term and a 0% to 10% decrease in SOV’s use over the long term where growth management strategies are used. A corresponding increase in transit use of 0% to5% may be realized using growth management strategies.

II. Commuter programs

Ridesharing includes carpooling, vanpooling, guaranteed ride home programs, alternative work hours, telecommuting, paratransit services, and park and ride facilities. This strategy for reducing congestion may be employer based, government sponsored, or based on agreements between private individuals. There is an existing government-sponsored rideshare program in the metropolitan area maintained by the Shelby County Health Department. The rideshare program has one worksite that is the Veteran’s Administration (VA), which has 27 vans. Based on transportation plans from other regions, the
estimated percent reduction in single occupant vehicle use per worksite for carpooling and vanpooling was 1%-5% and 1%-2%, respectively. Commuter programs have the potential to reduce single occupant vehicle use across roadway functional types, but are usually most effective on arterial roadways and interstate/freeway facilities.

Operational Improvements

I. Operational improvements & ITS
Operational improvements consist of access management, one-way street to two-way flow operation, constructing two-way left turn lanes, parking management, and weather or incident alerts for motorists. These type of improvements can be applied to arterial, collector and local roadways. The reduction in congestion that can be expected from these types of improvements varies greatly depending on the improvement strategy, roadway characteristics, traffic volume, and many other factors.

Access management is a broad strategy which can include policies, design changes, and infrastructure that minimizes the number of driveways and intersecting roads on a corridor. This is accomplished by adding parallel roads, shared driveways, median barriers, and proper curb cuts. The operational benefit to facilities with access management is a reduction in delay and travel time. For example, a 10% to 15% reduction in travel time along a segment of arterial roadway can be realized by eliminating 20 access points per mile.

Reducing or eliminating on-street parking can result in a reduction in delay and an increase in roadway capacity. The increase in roadway capacity with elimination of parking depends on the number of parking maneuvers per hour and the number of existing through lanes. For example, elimination of parking on a four lane collector roadway could increase capacity by 5% to 17%.

Intelligent Transportation Systems (ITS) are the application of electronic technologies and communications to improve the operation of the transportation system. Examples of these technologies include detectors, cameras, dynamic message signs, and real time information on traffic conditions and bus locations. ITS applications can be used to help provide for congestion mitigation and avoidance for both recurring and non-recurring congestion. The level of benefit for congestion associated with ITS depends on the type of application, and the functional and operational characteristics of the facility. The Memphis MPO’s Regional ITS Architecture and Deployment Plan provides a long-range plan for deployment, integration, and operation of ITS in the Memphis metropolitan planning area.

II. Intersection improvements
Traffic signals can be interconnected and coordinated to provide progression for motor vehicles along a corridor. Traffic signal coordination along urban signalized corridors can increase both capacity and free-flow speed. Based on traffic signal coordination projects implemented in the region, the average increase in travel speed was 3.5% to 5% for arterial roadways following signal interconnection and coordination.
Intersection capacity can also be increased with the addition of exclusive lanes on intersection approaches for right and left turns. This allows for more free-flow movement of the through lanes at the intersection. The benefit of adding turn lanes at intersections depends heavily on the volume of turning vehicles and their opposing volume. Isolated intersection capacity could be improved by 10% to 25% with the addition of exclusive turn lanes.

III. Incident management
Intersection improvement strategies could also provide tools to reduce the impact of non-recurring congestion, such as Incident Management. When crashes, disabled vehicles or other interruptions create congestion, the traffic surveillance and control systems could be equipped to provide information to the traffic control centers and allow the operators to either implement alternative signal timing or provide information to the motorists regarding alternative routes.

Incident management is an effective tool for reduction of delays and non-recurring congestion subsequent to an incident. Incident management techniques have already been implemented on all of the interstate and freeway roadways throughout Shelby County. Therefore, it is assumed that the majority of the measurable benefits have already been realized for this strategy and no additional credits will be included for this strategy. This strategy will impact freight movements throughout the area. Since the majority of freight movements occur on the freeway and interstate system, the benefits of this strategy on freight movement are already being realized. Primary Incident Management benefits will be the continued ITS development and signalization improvements.

IV. Freight improvements
A reduction in delay and congestion could be realized for truck freight by freight diversion or an increase in capacity on truck freight routes. An alternative to the truck freight mode in the region includes rail, waterways, and air. Capacity for freight rail systems can be increased by improving or adding to the infrastructure, increasing size of trains/rail cars, increasing rolling stock, and allowing for higher speeds and more efficient operations. To be effective for a reduction in truck freight congestion in this region, these types of improvements must be implemented across a regional or national rail network. Depending on the location, type, and frequency of intermodal operations, freight diversion to rail could potentially result in an increase in delay due to intermodal operations. Freight diversion to waterways is limited due to the type of bulk commodity that is generally shipped using this mode. Because of these issues, the effectiveness of truck freight related congestion management strategies is limited to increases in capacity of truck freight routes.

Capacity enhancements related to freight include intersection and operational improvements to reduce delay, ITS applications, dedicated lanes, and ultimately adding general purpose lanes. These strategies are applied to interstates/freeways and arterial roadways identified as truck routes.
Multimodal Strategies

I. **Transit improvements**
According to the Puget Sound Regional Vanpool Market Study completed by the Puget Sound Regional Council, depending upon the type, amount, and cost of increased service, up to a 5% reduction in area-wide VMT can be expected with enhanced transit service. These enhancements include increased frequency of service, decreased wait times, and decreased travel time. Improvement in transit service in the Memphis MPO region is likely to have less impact on the overall congestion on the roadways. It is anticipated that improved transit service or expansion would reduce area-wide traffic volumes on the roadway by less than 2%.

II. **Bicycle & Pedestrian facilities**
Non-motorized transportation generally consists of walking and bicycling. The Memphis MPO’s updated Regional Bicycle and Pedestrian Plan provides a ranking of corridors in need of bicycling and walking facilities. For the CMP, a factor was applied to a reduction of vehicles based on a study conducted by the Comsis Corporation. The study found that by increasing the walk and bike mode share by 1%, commute trips would approximately be reduced by 0.5% and 0.9%, respectively.\(^\text{11}\)

**Strategic Capacity Enhancements**

III. **Dedicated lanes**
A number of studies have been completed regarding the impact of High Occupancy Vehicle (HOV) lanes on vehicle occupancy. For studies that have before and after data, there was an average 13% increase in vehicle occupancy. If the number of person trips remains the same, this increase in vehicle occupancy has the effect of reducing the number of vehicles on the roadway. The effectiveness of this strategy depends on the level of congestion on the existing general purpose lanes.

HOV and bus bypass lanes and ramps are facilities used to improve the travel time associated with high occupancy vehicles. In the Memphis area, HOV lanes have been considered a method to increase vehicle occupancy on an interstate type facility. Used alone, these lanes are effective for commuters arriving from suburban areas. As HOV’s attempt to enter or exit the HOV lanes, friction between HOV’s and other vehicles in the general-purpose lanes occur as these vehicles move toward the access points to the freeway system. This problem is made worse as the interchange density increases. Several methods have been developed to address this issue. These include HOV and bus bypass lanes and ramps. These exclusive facilities enable HOV’s to access the freeway system without encountering delay either by providing direct exclusive access to the freeway system or by providing separate non-metered ramps. These strategies are effective in increasing HOV use when coupled with other HOV strategies.

High-Occupancy Toll (HOT) lanes are high occupancy vehicle facilities similar to HOV lanes that are also available to single-occupancy vehicles that pay a toll to use the dedicated lanes. Tolls for HOT lanes are

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\(^{11}\) Comsis Corporation. *Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience.* FHWA. 1993.
Congestion Management Process (CMP) usually collected on single-occupant vehicles electronically. This technology also allows for changing the toll rates based on the amount of congestion on the adjacent general purpose lanes. There is currently no tolling authority in Tennessee, Mississippi, or Arkansas. In Tennessee, special legislation is required in order to implement a toll on public roadway facilities. The benefit of HOT on congestion is highly variable based on the specific routes termini, the level of existing or projected congestion, the cost of the toll, the trip purpose of those anticipated to use the facility, and motorist’s willingness to pay for a reduction in travel time. The benefits to congestion associated with HOT lanes are difficult to assess as part of a regional plan and must be evaluated at an individual project level where proposed.

IV. General purpose lanes

This strategy has the potential to have the most impact on congestion relief. It also will likely have the highest cost and could potentially increase vehicle miles traveled (VMT) and, in some cases, emissions. Therefore, the addition of general purpose lanes is considered only after all of the other strategies have been evaluated and found to be ineffective. In some cases, where the other strategies will not provide the needed level of congestion relief, the addition of general purpose lanes will be required.

The increase in capacity on a roadway facility with the addition of general purpose lane varies based on the number of lanes to be added, roadway functional classification, area type, traffic signal density, presence of traffic signal coordination, type of roadway median, and a number of other variables. For example, adding one lane in each direction to a two-lane rural roadway interstate facility could increase its capacity by over 50%. Evaluation of the impact of adding general purpose lanes on travel demand and roadway capacity at a regional level is conducted using the Memphis MPO’s Travel Demand Model. The methodology used to estimate roadway volume and capacity is provided in the travel demand model documentation.

6.2 Monitoring Congestion

A critical step in maintaining the Congestion Management Process is the development of a biannual report that all of the participating agencies agree upon. The biannual report will work in concert with other monitoring programs such as air quality, finance, and plan implementation to present a snapshot of transportation system performance and progress towards the region’s policy goals and objectives identified in the RTP. Performance monitoring is not a one-time event, but rather an ongoing activity that must be matched to the existing and future resources of each participating agency. This is how the MPO will monitor not only the ongoing performance of the region’s transportation system, but also the effectiveness of the strategies and projects that are put in place. By evaluating congestion in the area, the MPO and its member agencies can determine which strategies worked the best in mitigating specific types of congestion, and which had the least impact. This will in turn identify the best actions in subsequent CMP, TIP, RTP updates. Through the biannual reports, the MPO will disseminate information about the congestion related issues in the region.

The CMP provides a framework for weighing congestion relief projects against one another in terms of effectiveness, but does not establish priorities for the region. To effectively monitor the performance of the system, access to good, reliable and consistent data is pertinent. In some areas, there have been longstanding data collection efforts, such as pavement conditions and, crashes, but there are issues related to standardization...
of data, as data collection methodology varies by different agencies and software’s used. The MPO relies heavily on the data collection efforts of our partner agencies and project implementers. The MPO is committed to an effective regional transportation monitoring system. It is important for the MPO and the participating agencies to engage in a cooperative process to ensure the data collection efforts are coordinated to facilitate meaningful and efficient analysis.

6.3 Summary and Conclusions

In summation, evaluation of the CMP will be conducted on an as needed basis, to ensure its effectiveness in addressing the regional congestion issues. The CMP will be reviewed during the development of regional transportation plans, due to the interrelationship between the two documents. The Memphis MPO will release a bi-annual report which will include a snapshot of the region’s congestion issues, to inform the different stakeholders as well as the public. The Memphis MPO will continue to partner with its member agencies to obtain before and after data as projects are implemented. As information is provided, the MPO will review the information and update the evaluation criteria for future long range plan and transportation improvement program development.
7 List of Figures

Figure 1-1: Memphis Urban Area MPO Planning Area.................................................................5
Figure 1-2: Memphis MPO Regional Transportation Plan (RTP) Process Model.................................7
Figure 1-3: Ozone (O3) Non-Attainment Area ........................................................................ 10
Figure 1-4: Carbon Monoxide (CO) Maintenance Area ............................................................. 10
Figure 1-5: FHWA Congestion Management Process Model .................................................. 11
Figure 1-6: Community Remarks Webpage ............................................................................. 13
Figure 2-1: Memphis Urban Area MPO Regional Roadway Network ....................................... 14
Figure 2-2: Examples of LOS by Mode for Urban Roadways ..................................................... 15
Figure 2-3: National Congestion Comparison .......................................................................... 16
Figure 2-4: Causes of Congestion in the United States ............................................................. 17
Figure 2-5: 2013 Average Annual Daily Traffic ....................................................................... 18
Figure 2-6: Daily Vehicle Miles Traveled per capita (1982-2011) ............................................. 19
Figure 2-7: Fatal occupational injuries at road construction sites, 2003-2013 .......................... 20
Figure 2-8: Flooded roadways – Shelby County, TN Office of Preparedness ............................ 21
Figure 2-9: 2012 Regional Freight Movements ........................................................................ 22
Figure 2-10: Major Flows by Truck To, From, and Within Tennessee and Mississippi Year 2007, 2010 and 2040. 23
Figure 2-11: Fixed Transit Route System .................................................................................. 24
Figure 2-12: 2012 Sub-Recipient Service Data - National Transit Database .............................. 24
Figure 2-13: Bicycle & Pedestrian Facilities in the Region ....................................................... 25
Figure 3-1: MAP-21 National Performance Goals .................................................................. 27
Figure 3-2: Regional Goals and Objectives ............................................................................. 28
Figure 5-1: 2010 Level of Service A and B for AM Peak period ............................................. 33
Figure 5-2: 2010 Level of Service C and D for AM Peak period ............................................. 34
Figure 5-3: 2010 Level of Service E and F for AM Peak period ............................................. 35
Figure 5-4: November 2013 Buffer Index - National Performance Management Research Data Set (NPMRDS) 36
Figure 5-5: Crash data provided by TDOT and MDOT .......................................................... 37
Figure 5-6: Locations of concern identified through public input ............................................ 38
8 Acronyms and Definitions

**ADA - Americans with Disabilities Act of 1990**: A wide-ranging civil rights law that prohibits discrimination based on disability. Requires covered employers to provide reasonable accommodations to employees with disabilities, and imposes accessibility requirements on public accommodations.

**ADT - Average Daily Traffic**: The number of vehicles passing a fixed point in a day, averaged over a number of days. The number of count days included in the average varies with the intended use of data.

**AMPO - Association of Metropolitan Planning Organizations**: A national nonprofit membership organization serving the interests of metropolitan planning organizations nationwide.

**AVL - Automatic Vehicle Location**: A means for automatically determining and transmitting the geographic location of a vehicle. This data, from one or more vehicles, may then be collected by a vehicle tracking system for a picture of vehicle travel.

**AVO - Average Vehicle Occupancy**: The ratio of person trips to vehicle trips; often used as a criteria in judging the success of trip reduction programs.

**AVR - Average Vehicle Ridership**: The number of employees scheduled to start work during specified hours divided by the number of vehicles arriving at the site during those same hours.

**CAAA - Clean Air Act Amendments**: 1990 amendments to the federal Clean Air Act which classify non-attainment areas and provide for rules dealing with air pollution in such areas; specifically brought transportation decisions into the context of air quality control.

**CCTV - Closed Circuit Television**: The use of video cameras to transmit a signal to a specific place, on a limited set of monitors. The signal is not openly transmitted. Most often refers to surveillance in areas that need monitoring.

**CMAQ - Congestion Mitigation and Air Quality Improvement Program**: A Categorical funding program created under ISTEA, which directs funding to projects that contribute to meeting national air quality standards in non-attainment areas.

**CMP - Congestion Management Process**: A systematic process required under MAP-21 for all TMAs that shall address congestion management through the metropolitan planning process that provides for effective management and operation, based on a cooperatively developed and implemented metropolitan-wide strategy of new and existing transportation facilities eligible for funding under title 23 and chapter 53 of title 49 through the use of travel demand reduction and operational management strategies. The CMP is required under 23 CFR 500.109 and shall include methods to monitor and evaluate the performance of the multimodal transportation system, identify causes of congestion, identify and evaluate alternative actions, provide information supporting the implementation of actions, and evaluate the efficiency and effectiveness of implementation actions. The CMP is periodically reviewed for efficiency and effectiveness of the implemented strategies, the results of this...
Congestion Management Process (CMP)

evaluation shall be provided to decision-makers to provide guidance on selection of effective strategies for future implementation purposes.

**CO - Carbon Monoxide:** Colorless, odorless, tasteless gas that is toxic to humans.

**DARTS - Delta Area Rural Transit System:** A regional transportation system that operates throughout a 7 county region of Mississippi. DARTS operates over 28 multi-passenger vehicles that connect people with jobs, shopping, and wide variety of uses.

**DMS - Dynamic Message Sign:** An electronic traffic sign often used on roadways to give travelers information about special events. Such signs warn of traffic, roadwork zones, or speed limits.

**DOT - Department of Transportation:** Agency responsible for transportation at the local, state, or federal level. For title 23 U.S.C. federal-aid highway actions, this would mean the Federal Highway Administration and for federal-aid transit actions under title 49 U.S.C., this would mean the Federal Transit Administration.

**EIS - Environmental Impact Statement:** A National Environmental Policy Act (NEPA) document that explains the purpose and need for a project, presents project alternatives, analyzes the likely impact of each, explains the choice of a preferred alternative, and finally details measures to be taken in order to mitigate the impacts of the preferred alternative.

**EPA - Environmental Protection Agency:** An agency of the U.S. federal government which was created for the purpose of protecting human health and the environment.

**ETC - Engineering and Technical Committee:** A standing committee represented by all Engineers of the jurisdictions in the metropolitan planning organizations (MPOs); function is to provide advice on plans or actions of the Memphis MPO from planners, engineers and other staff members (not general public).

**Environmental Justice:** Describes the impact of transportation plans or projects, either positive or negative, on a particular community or population. Derived from Title VI of the Civil Rights Act of 1964, Environmental Justice strives to ensure public involvement of low income and minority groups in decision making, to prevent disproportionately high and adverse impacts on low income and minority groups, and to assure that these groups receive equal benefits from transportation improvements.

**FAF - Freight Analysis Framework:** Integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation.

**FHWA - Federal Highway Administration:** Division of the U.S. Department of Transportation responsible for administrating federal highway transportation programs under title 23 U.S.C..

**Fiscal Constraint:** A requirement, originally of ISTEA, that all plans be financially – constrained, balanced expenditures to reasonably expected sources of funding over the period of the TIP or RTP.

**FTA - Federal Transit Administration:** Federal entity responsible for transit planning and programs under title 49 U.S.C.
**Functional Classification**: Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Basic to this process is the recognition that individual roads and streets do not serve travel independently in any major way. Rather, most travel involves movement through a network of roads. It becomes necessary then to determine how this travel can be channelized within the network in a logical and efficient manner. Functional classification defines the nature of this channelization process by defining the part that any particular road or street should play in serving the flow of trips through a highway network.

**HOT - High Occupancy Toll**: A type of HOV lane that allows vehicles that don’t qualify as HOV to pay a fee in order to access the lane.

**HOV - High Occupancy Vehicle**: In Texas, vehicles carrying two (2) or more people receive this designation and may travel on freeways, expressways and other large volume roads in lanes designated for high occupancy vehicles.

**IMS - Incident Management System**: A systematic process required under SAFETEA-LU to provide information on accidents and identify causes and improvements to the Transportation system to increase safety of all users.

**ISTEA - Intermodal Surface Transportation Efficiency Act of 1991**: A U.S. federal law that presented an overall intermodal approach to highway and transit funding with collaborative planning requirements, giving significant additional powers to metropolitan planning organizations.

**ITS - Intelligent Transportation System**: Use of computer and communications technology to facilitate the flow of information between travelers and system operators to improve mobility and transportation productivity, enhance safety, maximize the use of existing transportation facilities, conserve energy resources and reduce adverse environmental effects; includes concepts such as “freeway management systems,” “automated fare collection” and “transit information kiosks.”

**LOS - Level of Service**: A qualitative assessment of a road’s operating condition, generally described using a scale of A (little congestion) to E/F (severe congestion).

**MAP-21 - Moving Ahead for Progress in the 21st Century Act**: A funding and authorization bill to govern United States federal surface transportation spending. The bill was signed in 2012.

**MATA - Memphis Area Transit Authority**: The public transit agency for the Memphis urban area.

**MDOT - Mississippi Department of Transportation**: State agency responsible for transportation issues in Mississippi.

**MPA - Metropolitan Planning Area**: The geographic area for which the MPO conducts planning activities.

**MPO - Metropolitan Planning Organization**: The forum for cooperative transportation decision-making; required for urbanized areas with populations over 50,000.

**NEPA - National Environment Policy Act**: A U.S. environmental law that established a national policy promoting the enhancement of the environment. The law was signed in 1970.
**NHS - National Highway System:** Consists of major roadways important to the nation’s economy, defense, and mobility. This includes: interstate, other principal arterials, strategic highway network, major strategic highway network connectors, and intermodal connectors. The NHS was developed by the Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs).

**NPMRDS - National Performance Research Data Set:** A national data set containing varied information related to vehicle travel.

**O₃ - Ozone:** A gas that is formed from dioxygen by the action of ultraviolet light and also atmospheric electric charges. It is present in low concentrations throughout the Earth’s atmosphere.

**Officials:** Are people who have governmental decision-making, planning or administrative responsibilities that relate to MPO activities.

**PM - Performance Measure:** A tool to help organizations understand, manage, and improve upon what they do. Used as a way to evaluate performance.

**PMS - Pavement Management System:** A systematic process utilized by state agencies and MPOs to analyze and summarize pavement information for use in selecting and implementing cost-effective pavement construction, rehabilitation, and maintenance programs; required for roads in the National Highway System as a part of ISTEA; the extent to which the remaining public roads are included in the process is left to the discretion of state and local officials; criteria found in 23 CFR Part 500

**Public Participation:** Is an integral part of a planning or major decision-making process. It provides opportunities for the public to be involved with the MPO in an exchange of data and ideas. Public participation offers an open process in which the rights of the community, to be informed to provide comments to the Government and to receive a response from the Government, are met through a full opportunity to be involved and to express needs and goals.

**ROW - Right-of-Way:** Real property that is used for transportation purposes; defines the extent of the corridor that can be used for the road and associated drainage.

**RTP - Regional Transportation Plan (Long Range Transportation Plan):** A 20 year forecast plan required of state planning agencies and MPOs; which must consider a wide range of social, environmental, energy, and economic factors in determining overall regional goals and consider how transportation can best meet these goals.

**SAFETEA-LU - Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users:** a funding and authorization bill that governed United States federal surface transportation spending. The bill was signed in 2005.

**SCCMP - Shelby County Congestion Management Program:** The local congestion management plan for Shelby County, TN.

**SOV - Single-Occupant Vehicle:** A privately operated vehicle whose only occupant is the driver.
**STIP - State Transportation Improvement Program:** A statewide prioritized listing/program of transportation projects covering a period of four years that is consistent with the long-range statewide transportation plan, metropolitan transportation plans, and TIPs, and required for projects to be eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53.

**STP - Surface Transportation Program:** Provides funds to states and localities for projects on any roads that are not classified as local or rural minor collectors. Requires non-federal share of 20%.

**TDM - Travel Demand Model:** This is a tool for forecasting impacts of urban developments on travel patterns as well as testing various transportation alternative solutions to traffic patterns. The travel patterns are determined from US census results and in simple terms tell where residents live and where they go to work or school on a regional wide basis.

**TDOT - Tennessee Department of Transportation:** State agency responsible for transportation issues in Tennessee.

**TEA-21 - Transportation Equity Act for the 21st Century:** Signed in 1998, TEA-21 authorized federal surface transportation programs for highways, highway safety, and transit for the period of 1998-2003. Because Congress could not agree on funding levels, the Act was allowed to lapse.

**TIM - Traffic Incident Management:** A planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible.

**TIP - Transportation Improvement Program:** A priority list of transportation projects developed by a metropolitan planning organization that is to be carried out within the four (4) year period following its adoption; must include documentation of federal and state funding sources for each project and be consistent with adopted MPO long range transportation plans and local government comprehensive plans.

**TMA - Transportation Management Area:** An area designated by the U.S. Department of Transportation given to all urbanized areas with a population over 200,000 (or other area when requested by the Governor and MPO); these areas must comply with special transportation planning requirements regarding congestion management systems, project selection and certification.

**TOC - Traffic Operations Center:** A control center that acts as a hub for the operations of the city traffic network.

**TPB - Transportation Policy Board:** The forum for cooperative decision-making on transportation related matters. All meetings of the TPB are open to the public. The TPB is comprised of the principal elected officials of the governmental jurisdictions participating in the Memphis urban area transportation planning process, along with the chairpersons of the major providers of local and regional transportation facilities.

**Transportation Demand Management:** The application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or time.

**Transportation Enhancements:** Specific activities which can be funded with Surface Transportation Program (STP) funds; activities include pedestrian/bicycle facilities, acquisition of scenic easements and scenic historic sites, scenic or historic highway programs, scenic beautification, historic preservation, rehabilitation/operation
of historic transportation structures, railway corridor preservation, control/removal of outdoor advertising, archeological planning/research and mitigation of highway runoff water pollution.

**TSM - Transportation Systems Management:** Strategies to improve the efficiency of the transportation system through operational improvements such as the use of bus priority or reserved lanes, signalization, access management, turn restrictions, etc.

**UPWP - Unified Planning Work Program:** Developed by Metropolitan Planning Organization (MPOs); identifies all transportation and planning activities anticipated within the next one to two years, including a schedule for the completion of the identified tasks and activities.

**USC - United States Code:** A consolidation and codification by subject matter of the general and permanent laws of the United States. It is prepared by the Office of the Law Revision Council of the United States House of Representatives.

**V/C Ratio Volume over Capacity Ratio:** This is a roadway performance measure to show how a highway volume compares with a highway’s capacity.

**VMT - Vehicle Miles Traveled:** This is an output of the travel demand model and is a measure of traffic flow over a highway segment.