10.0 Congestion Management Process

10.1 CMP Summary

The identification and evaluation of projects for the Livability 2040 Regional Transportation Plan (RTP) was a multiple step process. The needs for transportation improvement projects were identified through the Memphis MPO's Congestion Management Process (CMP), the involvement of key stakeholders, the public involvement process, and the results of the existing conditions and needs assessment. Projects were then evaluated using a set of criteria based on the Vision, Goals and Objectives of the Plan.

In order to measure and manage congestion throughout the Memphis MPO region, multimodal performance measures were developed in order to assess system performance for various modes of travel. These measures include:

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

More information on the CMP analysis process can be found in the CMP document (http://www.memphismpo.org/sites/default/files/public/CMP%20Report_FINAL.pdf).

The Transportation Policy Board of the Memphis MPO adopted the CMP on August 27, 2015. The CMP complies with the requirements of the Moving Ahead for Progress in the 21st Century Act (MAP-21). Further, consideration of the results of the CMP 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)).

The CMP is an important component of the Memphis MPO's transportation planning process and is integral to the development of the RTP. 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 CMP provides a consistent basis to evaluate transportation investment decisions relating to traffic congestion that provide for the safe and effective management and operation of the region's multimodal transportation system. The projects evaluated through the CMP provide multimodal strategies to reduce congestion and improve air quality in the region by providing for improved access and mobility using a broad range of strategies and solutions.

10.1.1 Future Year Congested Network

The RTP horizon year 2040 congested roadway network was estimated using the Regional Travel Demand Model to screen roadway segments based on the volume to capacity ratio (v/c ratio) and Level of Service (LOS). The Memphis MPO defines congestion as those roadways that operate with LOS E or F. The Existing and Committed (E+C) roadway network is used to estimate where congestion is likely to occur in the future if no other transportation improvements are implemented. The roadways in the E+C network are those roadways currently open for traffic and those that are identified in the Transportation Improvement Program (TIP) with construction funding anticipated to be open for traffic before the end of the current TIP cycle.

Therefore, the horizon year 2040 demographic and employment data was evaluated using the E+C roadway network in the evaluation of projected future congestion. Using the E+C roadway network with the future year employment and demographic data demonstrates the traffic impact of not constructing roadway capacity improvement projects beyond those projects that have been committed. Once the horizon year 2040 congested network was identified, applicable strategies from the CMP were applied to the congested corridors to estimate the impacts to congestion.

10.1.2 Identification of CMP Strategies

The CMP identifies potential strategies to mitigate existing and future year congestion. Categories of strategies include demand management, operational improvements, multimodal strategies, and strategic capacity enhancements. There were ten congestion management strategies from the CMP evaluated as part of the RTP development. A listing and description of each strategy by category is provided below:

Demand Management

1. Land use – Developing areas of employment, shopping, and recreation with high concentrations of both workers and users that allows use of alternative travel modes.

2. Commuter programs – Carpooling, vanpooling, guaranteed ride home programs, alternative work hours, telecommuting, paratransit services, and park and ride facilities to encourage reduction in SOV use.

Operational Improvements

3. Operational improvements & ITS – Access management, one-way flow operation, constructing two-way left turn lanes, parking management, and weather or incident alerts for motorists to improve traffic flow and provide information about alternative routes.

4. Incident management – Traffic surveillance, dynamic message signs, and control systems to reduce recurring and non-recurring congestion.

5. Intersection improvements – Interconnected and coordinated signals, and addition of exclusive lanes to improve traffic flow and reduce congestion.

6. Freight improvements – Freight diversion, increase in capacity on truck freight routes, and improvement of alternative freight modes to reduce travel time.

Multimodal Strategies

7. Transit improvements – Increased frequency of service, decreased travel times, and transit information systems to encourage more transit use.

8. Bicycle & Pedestrian facilities – Facilities to accommodate bicyclists and pedestrians to reduce SOV use.

Strategic Capacity Enhancements

9. General purpose lanes – Adding capacity by providing additional unrestricted laneage on existing roadways or by providing routes on new location to improve traffic flow and reduce congestion.

10. Dedicated lanes – High Occupancy Vehicle (HOV), bus bypass lanes, and High-Occupancy Toll (HOT) to reduce SOV use.

Each of the corridors on the congested network were reviewed to determine the strategies most appropriate to resolve congestion. Some of the strategies are more regional, while others are corridor specific. The selection of these strategies also considered the future congestion network to ensure that the strategies selected will address both the existing and future congestion networks.

10.1.3 Effectiveness of CMP Strategies

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

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 is also used as a guide for other municipalities in the region.

A stated purpose of the UDC is that it is designed and enacted for "promoting the health, safety and welfare of the residents of the City of Memphis and Shelby County by lessening or preventing congestion in the public streets…and encouraging such distribution of population and such classification of land uses as will tend to facilitate and conserve adequate provisions for transportation…."

Tools used to guide development to cause less impact on the transportation infrastructure include:

- Compact residential development,
- Compact employment and activity centers,
- Mixed land uses,
- Connectivity,

- Transit and pedestrian-oriented development,
- Jobs/Housing balance,
- Affordable housing, and
- Development impact mitigation.

Activity center strategies 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.

Access management is a tool to control the design, spacing, and location of driveways, medians and median openings, intersections, and interchanges. Access management improves the efficiency of the arterial and major collector roadways. Generally, as the number of driveways increases on a roadway, the capacity of the roadway decreases. Conversely, with fewer driveways, or access points, to the roadway, the capacity of the roadway typically increases. A related benefit associated with a reduction in the number of driveways along a roadway is a potential for decrease in the number of crashes. Although difficult to quantify, a reduction in the number of crashes will result in reduced congestion on the arterial roadways.

Planning and education is critical to implementation of access management, as some of the techniques may be perceived as resulting in adverse impacts to existing access to residents and businesses along the roadway. Example roadways in the metropolitan area that currently employ access management techniques are:

- Germantown Parkway from the Wolf River to U.S. 64/Stage Road, Memphis;
- U.S. 72/SR 86 from Poplar Avenue to Quinn Road, Collierville;
- Singleton Parkway from Austin Peay Highway to Paul Barrett Parkway, Shelby County; and
- Houston Levee Road from Poplar Avenue to the Wolf River, Collierville.

Commuter Programs

Rideshare programs include 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.

Generally rideshare programs are more productive if there are employee or provider incentives, if the cost of parking is high, and if the average one-way trip length is 30 miles or greater. Information related to the Memphis Area Rideshare program can be found on the website (www.vride.com).

Guaranteed Ride Home Programs provide rides for people using the carpool, vanpool or rideshare programs that, due to extenuating circumstances, require a ride separate from their standard mode of transportation. For instance, if someone participating in a vanpool program has a family emergency and must leave work early, the guaranteed ride home program would provide a means for that person to leave early to attend to the emergency. The benefits of this strategy typically are applied with and considered a part of the carpool, vanpool, or rideshare program.

Alternative work hours require cooperation from employers and are currently conducted locally on a relatively small scale. There are several large employers in the Memphis MPO region, such as FedEx, that maintain operations in the off peak periods. If an aggressive campaign to promote alternative work hours was executed, a reduction in vehicular traffic during the peak periods could be experienced.

Park and ride lots are facilities provided for motorists to park and transfer to public transit, carpool, vanpool, or other means of transportation with a higher occupancy rate. In the metropolitan area there are existing park and ride facilities, and a number of future park and ride facilities are identified as part of the RTP.

Operational Improvements and ITS

Intelligent transportation systems (ITS) include advanced public transportation system technology, incident management, and motorist information services. The U.S. Department of Transportation defines ITS as "the integration of current and emerging technologies in fields such as information processing, communications, and electronics applied to solving surface transportation problems." ITS utilizes a large range of technologies and techniques including:

- Traffic signal control systems,
- Freeway management systems,
- Transit management systems,
- Incident management systems,
- Railroad grade crossing warning systems,
- Emergency management systems, and
- Regional multimodal traveler information systems.

ITS has the potential to reduce both recurring and non-recurring congestion. The Memphis MPO Regional ITS Architecture provides for transportation system integration. The MPO Regional ITS Architecture update was completed in October, 2014; with approval from FHWA on November 12, 2014. More information on the Memphis MPO's ITS Architecture can be found at http://www.memphismpo.org/its/web/index.htm.

Incident management is an effective tool for reduction of delays and non-recurring congestion subsequent to an incident. In Tennessee, the incident management is addressed as part of the SmartWay system. The SmartWay system includes TN511, the HELP program, and the overall Intelligent Transportation System. The SmartWay system provides up to date traffic information for motorists on traffic congestion, incidents, construction zones, and roadway conditions. Additional information about TDOT's SmartWay System can be found at www.TNSmartWay.com.

TDOT's TN511 system allows for telephone callers to use an automated voice response system to guide them through a series of requests related to the roadway system throughout Tennessee. With this system, motorists can dial 511 on a cellular phone or land line, and receive information about traffic congestion, construction delays, tourism, or other travel related data. Additionally the Freeway Management System provides dynamic message signs (DMS) along the freeway system, which can be used to alert motorists of delays and provide general information on roadway and traffic conditions.

MDOT is currently working on training programs for first responders. A 511 system covers major highways in Mississippi, and a TMC in Southaven monitors traffic conditions.

Highway information systems consist of changeable message signs, highway advisory radio, and/or in-vehicle navigation and information systems. These systems are provided to convey information to the traveler on the roadway or prior to departure regarding delays from non-recurring congestion, construction delays, speed limits, weather conditions, and other items.

Commonplace in-vehicle and phone global positioning systems (GPS) allow travelers to navigate and to notify travelers of non-recurring congestion issues, construction delays, and weather alerts. In-vehicle information systems are generally developed by non-governmental agencies to provide data available from government agencies to the motorist.

Coordinated traffic signal systems are in place or are planned for implementation throughout the region. These projects are located on major and minor arterial roadways. Traffic signal coordination and synchronization increases intersection capacity and reduces delay by providing progressed traffic flow along a corridor. Traffic signal coordination is a congestion management strategy usually applied to urban major and minor arterial roadways.

Intersection Improvements

Intersection capacity can also be improved through a number of operational modifications 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 while the turning movements are stored in an exclusive lane waiting to be served by the signal or find a gap in traffic to make the turning movement. The benefit of adding turn lanes at intersections depends on the volume of turning vehicles and their opposing volume. Additional intersection improvements can involve widening lanes, establishing proper curb radii, utilizing roundabouts, upgrading traffic control devices, or other innovative intersection treatments that can promote better traffic flow and reduce delays and queues.

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 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 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.

Transit Improvements

Improvements to transit encourage a mode shift from single occupant vehicles, which can help to reduce congestion. Transit improvements include transit service enhancement or expansion, transit information service, transit traffic signal preemption, exclusive transit right-of-way, and mode change facilities. Transit service could be enhanced on arterial and major collector roadways with the installation of transit traffic signal preemption. Traffic signal preemption for transit vehicles provides an extended amount of green time for an approaching bus or trolley. On-street transit vehicle preemption is generally limited to the extension of green time for the approach on which the transit vehicle is traveling. It will not truncate the green phase for an opposing direction. For transit vehicles in separate rights-of-way, preemption of traffic signals occurs in a manner similar to railroad preemption.

Providing real time transit information to those accessing the transit system is an enhancement that may increase ridership over time. Information regarding the status of the service may include bus arrival times, headways, and

route identification of the next bus. This real time information could be provided to those at the local bus stop, via the Internet or mobile devices, or through in-vehicle systems. Further study should be conducted to determine the potential impact of this strategy in increasing transit ridership. This strategy becomes more important with the expansion of the fixed rail transit systems. MATA currently provides real time transit information for its riders.

Bicycle and Pedestrian Facilities

Provision for bicyclists and pedestrians promotes their use as a travel mode and has the potential to reduce single occupant vehicle use. The Memphis MPO's updated Regional Bicycle and Pedestrian Plan provides a proposed bicycle and pedestrian network intended to guide the implementation of the RTP.

Recommendations and strategies to expand the network of sidewalks, on-street bicycle facilities, and off-street facilities such as shared-use paths are provided in Section 8.1, with details in the Regional Bicycle and Pedestrian Plan. Recommendations for engineering, education, encouragement, enforcement, and evaluation strategies to maintain safe and efficient facilities are provided.

Dedicated 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 interstate type facilities. 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.

General Purpose Lanes

In cases where the other strategies will not provide congestion relief, the addition of general purpose lanes may be required. It generally has the highest cost and tends to 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. Evaluation of the impact of adding general purpose lanes is conducted using the Memphis Travel Demand Model.

10.1.4 Project Evaluation and Project List

As applicable, CMP strategies 1 through 8 and 10 were applied to corridors in the future year congested network based on the facility type, area type, and type of strategy. These strategies do not provide capacity through the addition of general purpose lanes on the roadway network. The benefit of each of these strategies was evaluated using an off-model approach to identify the resulting Level of Service. For those facilities that remained congested following application of the non-capacity adding strategies, the addition of general purpose lanes (strategy 9) was evaluated using the Travel Demand Model. Projects were coded into the Travel Model and the resulting level of services was identified. The results of the evaluation of the existing and committed congested corridors for the RTP Plan horizon year of 2040 are shown in Appendix G. The table in this appendix shows the limits of each congested corridor, volume to capacity ratio (v/c), LOS, and peak hour volume of the congested corridors before application of the CMP strategies. The off-model CMP strategies evaluated and the resulting Level of Service are also provided.