NASHVILLE AREA METROPOLITAN PLANNING ORGANIZATION

CONGESTION MANAGEMENT PROCESS (CMP)

Amended September 19, 2007

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EXECUTIVE SUMMARY

Update Process

The original Congestion Management System (CMS) plan was adopted by the Nashville Area MPO in April 1995. At that time, the document was required by planning requirements adopted as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA).

Changes to the CMS were proposed after the Federal Highway Administration highlighted the document in their 2003 certification review of the MPO. They found that the MPO needed to provide for periodic reviews and updates to the CMS, and to indicate how the document is used in the long-range transportation planning process.

The chairman of the MPO's Technical Coordinating Committee appointed a subcommittee to work with staff on updates to the CMS. The subcommittee was chaired by Mr. Jim White of the Greater Nashville Regional Council. Other members included Mr. Robert Weithofer, Transportation Manager for Metro Nashville/Davidson County; Mr. Timothy Sanderson, planning director for the Metro Transit Authority, and Mr. Tom Brashear, Wilson County planning director. The subcommittee met several times with staff to discuss proposed changes to the existing document. Their conclusions were incorporated into the existing document, then brought before the MPO's Technical Coordinating Committee and Executive Board for review and adoption in 2004.

On February 14, 2007 Federal Regulations pertaining to Statewide and Metropolitan Transportation Planning were finalized, providing the implementing rule for carrying out current federal transportation legislation (e.g. Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) which was signed into law August 10, 2005). SAFETEA-LU regulations revised previous federal transportation legislation (e.g. ISTEA and TEA-21) with various changes to the transportation planning process at both the state and metropolitan planning level including changing the MPOs requirement from having a congestion management system (CMS) to having a congestion management process (CMP). The change from CMS to CMP is more of a change in concept than to one of function. With a focus on "process" opposed to "system" the intended results or outcomes of the CMP is a process by which congestion management is addressed as an integrated part of the overall transportation planning process.

This Executive Summary highlights changes to the MPO's CMP made as part of the 2004 update and as part of the SAFETEA-LU in 2007.

SAFETEA-LU Update

Since 1991, MPO transportation management areas (TMAs) have been required to account for and address congestion management through a congestion management system (CMS). This update reflects revising the CMS to reflect SAFETEA-LU requirements and to change the reference of the MPO's CMS to the MPO's congestion management process (CMP).

2004 Update

Revised system boundaries

The MPO's Congestion Management System was originally developed to cover the entire five-county study area. In 2004 this coverage area was revised to cover only the urbanized area, in recognition that the vast majority of the region's congestion problems occur on urban freeways and arterials.

By reducing the coverage area and concentrating on particular roadway facilities, the MPO can conduct a more useful and cost-efficient data collection effort. Prior to 2004, data were collected on a relatively small number of facilities each year, and rarely collected on the same facility twice. This "shotgun" approach made it all but impossible to monitor any changes in congestion. Today, the MPO through various means collects annual data on urban freeways and arterials.

One source of information that remains to be collected at the regional level is citizen complaints. As described in Section 2, local governments in rural areas of the MPO continue to monitor citizen complaints about congestion. If three or more citizen complaints of congestion are documented within a year at the same location on a rural roadway, the issue will be examined more closely through "Tier 2 analysis" to determine the cause of the problem.

Re-evaluated performance measures

The CMP no longer includes Level of Service as the primary performance measure. Its primary value in the original CMS (adopted in the mid-1990s) was that it was relatively easy to calculate, since the Tennessee Department of Transportation provides an extensive database of annual vehicle traffic counts. However, Level of Service has a number of drawbacks as a performance measure. First, it is primarily oriented to the vehicular mode of travel and is not very useful from a multi-modal perspective. Also, Level of Service only provides a measurement of performance at a specific location, rather than system-wide. Finally, Level of Service is a measurement of the amount of traffic which travels through a section of roadway during a specified period. The measurement of Level of Service does not always reflect the actual travel demand.

Average route speed provides a similar measure that is more understandable to the average traveler and can be monitored annually for any changes. It can be obtained for current conditions through the MPO's data collection program; future conditions can be obtained as an output of the MPO's regional travel demand model. Average route speed will be used to define a congested corridor as one where it takes at least 30% longer to travel during peak hours than it does to travel the same distance during off-peak hours.

Vehicle occupancy has remained virtually unchanged since the MPO began monitoring this measure several years ago. Although most of the urban interstates now have HOV lanes, the lanes operate only two hours a day, and are not heavily enforced. In addition, the HOV system still lacks its most critical segments – exclusive lanes once a vehicle actually reaches downtown Nashville. Until these commitments are made to the HOV system, it is not practical to continue full-scale monitoring of vehicle occupancy. The MPO will therefore perform only a small sample every 2 years (at one or two interstate locations). If the sample detects a significant change, further data will be collected system-wide.

Some of the performance measures collected for the CMP are direct measures of the change in congestion, such as average route speed and transit delay. The other measures are actually

indicators of how effective certain strategies are. For example, vehicle occupancy and VMT per licensed driver help indicate the effectiveness of the region's ridesharing programs and other travel demand reduction strategies.

Use of CMP to help select projects for the Long Range Transportation Plan

The scoring system for the Long Range Transportation Plan is consistent with and linked to the CMP. A certain number of points are awarded to projects that the CMP has identified as a congested corridor.

In 2004, the congestion management system targeted improvements to the "Tier 2" analysis process. The original congestion management process already contained an excellent procedure; it simply needed to be followed.

When an MPO member submits a request for a transportation project in a congested corridor, they are supposed to include an analysis that identifies what is causing the congestion and shows that they have considered the entire "toolbox" of strategies in the adopted CMP. This includes a wide range of tools to manage or reduce travel demand, such as ridesharing. It also includes improvements to public transit, bicycle and pedestrian facilities, growth management, and road access policies.

This Tier 2 analysis is especially important in regions like the Nashville Area MPO, which is currently in a deferred non-attainment status for air quality standards. Federal regulations require that in a non-attainment area, when a project is proposed that would add general purpose lanes or build a new road in a congested corridor, an analysis must be done to show that the need for additional capacity cannot be fully satisfied by better operational management and/or travel demand reduction. The Tier 2 analysis required by the CMP would identify any additional improvements that could be made without road widening or new construction. Furthermore, if the Tier 2 analysis finds no other options, its conclusions could be used to satisfy the federal requirements noted above.

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SECTION 1.0 INTRODUCTION

1.1 Overview of Federal Transportation Legislation

With the passage of the U.S. Congress' Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, a new approach to transportation planning in the United States was put in motion. ISTEA emphasized a multi-modal approach to transportation and a more efficient use of existing transportation facilities which today still remains a requirement under SAFETEA-LU legislation. One key goal of current federal transportation legislation is the increased mobility and efficiency of the nation's transportation system. The objective of the legislation is the improved performance of statewide and metropolitan transportation systems through enhancements to current capacity and operations.

As mandated by federal transportation regulations, Congestion Management Processes (formerly referred to as a Congestion Management System – CMS) are to be developed and implemented in Transportation Management Areas (TMAs), defined as metropolitan areas with a population over 200,000 people. In cooperation with MPOs, local governments, transit operators, and other cooperating agencies, state Departments of Transportation are encouraged to identify, develop, and implement the necessary data collection programs to address specific levels of congestion for transportation facilities. For the purposes of CMP development, congestion is defined as the level at which transportation system performance is no longer acceptable due to traffic interference.

State and metropolitan planners are expected to design and implement a Congestion Management Process to be more than data collection activities. In fact, the CMP should include the use of travel demand reduction techniques and operational management strategies. An effective CMP identifies potential congestion management strategies and analyzes how effectively they meet the goals of individual congestion mitigation programs. Planners are expected to create a system in which proposals for transportation improvements are reviewed with preference to travel demand reduction strategies rather than road building activities.

1.2 SAFETEA-LU Requirements for CMP in Transportation Management Areas

According to 23 CFR Part 450, Section 450.320:

(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. 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/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.

SECTION 2.0 CMP COMPONENTS

2.1 Congestion Management Objectives

As part of the MPO's Long Range Transportation Plan, the MPO established the reduction of congestion as one of five guiding planning goals of the MPO.

MPO Long Range Transportation Plan

Goal 3: Reduce Congestion
Address traffic congestion through strategies that seek first to reduce vehicle-trip demand and second, to increase the operating capacity of the existing and planned transportation system.

Objectives

- Encourage measures that reduce the number of vehicle trips and miles traveled, such as: transit, high-occupancy vehicle facilities, mixed land use patterns, telecommuting, parking management, and trip reduction ordinances.
- Apply traffic management techniques that increase transportation system capacity and minimize disruptions to normal operations, such as: traffic surveillance and control systems, motorist information systems, computerized and coordinated signal systems, incident management, intelligent transportation systems (ITS), and reversible lanes
- Integrate performance measures, functional standards, and strategies from the congestion management system into the regional Transportation Plan.

From this goal and associated congestion management objectives, specific measures and congestion thresholds have been established as part of the MPO CMP and are shown in Table 1. These measures are directly linked to the performance criteria of the MPO Long Range Transportation Plan and create the alignment between the above stated congestion management goal and objectives and implementing strategies of the CMP.

2.2 Definition of Congestion

Managing congestion requires an understanding of congestion and a definition of what constitutes congestion. The definition selected for the Nashville Area CMP is the same one established in the federal regulations, i.e. "The level at which transportation system performance is no longer acceptable due to traffic interference."

2.3 Data Collection and System Performance Evaluation

When the original congestion management system was developed in 1995, each MPO member was surveyed to determine what kind of data they were collecting on the performance of the transportation system. Generally, adequate data is available for land use-related items such as zoning, existing population and employment, and forecast population and employment. Topographic maps, aerial photographs, and road classification/right-of-way information are available from most of the jurisdictions.

However, the amount of traffic data being collected by local governments is relatively low. Most of the roadway data collection being done is performed by TDOT. Yearly Average Daily Traffic (ADT) counts and accident studies are conducted by TDOT on numerous roadway segments throughout Tennessee. Turning movement counts are performed by TDOT on an "as-needed"

basis. TDOT also maintains the Tennessee Roadway Information Management System (TRIMS), which includes information about roadway classification, roadway and right-of-way width, roadway surface, and speed limit for many public roadways within the MPO area.

The only other transportation data which is consistently available to measure system performance are the travel times conducted by the MPO, transit travel time information available from the Metropolitan Transit Authority and future travel times produced from the MPO's regional travel demand model. The CMP has therefore been developed to make the best possible use of the information which is regularly collected and available.

2.4 Transportation Modes Monitoring

Based on present levels of usage for the various modes considered and the cost effectiveness of data collection and analysis, the following modes of transportation are being monitored as part of the CMP:

- Private vehicles traveling on highways
- Public transit

Other modes, such as pedestrian, bicycle, and rail, were considered but not included for monitoring. However, alternative modes are a vital part of the congestion management "toolbox" presented in Section 3.

2.5 Transportation System

The majority of congestion problems within the Nashville Area MPO occur on the major roadways and within the urbanized areas. For this reason, the CMP monitoring will consider the following components of the transportation system:

- Roadways – Monitoring will be performed for all roadways with a minor arterial classification or higher within the Nashville or Murfreesboro urbanized areas. Collector roadways in the urbanized areas can be included in monitoring if desired by cities and counties, but the data collection will be the responsibility of the particular city or county.
- Fixed transit routes – All fixed transit routes will be monitored.

2.6 Performance Measures

The purpose of establishing performance measures is to enable transportation professionals and policy makers to make factual, rational, and cost-effective decisions based on a comprehensive view of the transportation system. The agencies responsible for maintaining and operating an area's transportation system need consistent, systematic, and comprehensive information about the recurrence of traffic congestion on their system.

Federal regulations require that the CMP include performance measures that:

1. Describe the extent of congestion, and
2. Help evaluate the effectiveness of various strategies used to reduce congestion.

The performance measures must accurately identify existing as well as potential future traffic congestion, for a range of transportation facilities and modes. They must assist in the analysis of

complex traffic congestion problems, yet be relatively easy to understand since they will be used by many different professionals and reviewed by elected officials.

An extensive evaluation of possible performance measures was conducted, including consideration of the data that would need to be collected, ease of application, and effectiveness of the output. After discussion by the MPO's CMP subcommittee, a set of performance measures were selected and are shown in Table 1.

TABLE 1. RECOMMENDED PERFORMANCE MEASURES

Performance Measure	Area Type	Threshold
Average Route Speed	Urbanized area	= 30 % of free flow speed
Projected Average Route Speed (Future)	Urbanized area	= 30% of free flow speed
Transit Delay	Urbanized area	= 30% of free flow speed
Vehicle Miles Traveled (VMT) per licensed driver	Entire MPO area	Percent change compared to previous years
Vehicle Occupancy	Urbanized area	Percent change compared to previous years
Citizen Complaints	Rural areas (outside urbanized area)	Three complaints per year at a specific location

2.6.1 Average Route Speed (travel time)

Average route speed is a time-based measurement and is more understandable to most people than a capacity-based measurement such as Level of Service. This performance measure is based on actual vehicle speeds traversing a corridor, whereas Level of Service focuses more on a particular roadway segment with a given cross-section. Unlike Level of Service, which is primarily oriented to the vehicular mode of travel, average route speed is more useful from a multi-modal perspective.

If peak travel times are compared to off-peak travel times, this measure also helps evaluate the reliability of the system, which is particularly important in a region like Nashville's, where the system carries a large percentage of freight traffic.

The congestion threshold for urban and suburban roadways was set at a value less than or equal to 30% of the free-flow speed. This value is generally comparable to Level of Service "D" for arterials, as presented in the *Highway Capacity Manual*.

2.6.2 Future Average Route Speed

Projected average route speed on major arterials and interstates indicate how well a segment or route is expected to accommodate future travel demand. Even though some segments and routes may be operating efficiently at current levels, they may not be able to handle anticipated future traffic volumes. Conversely, the segments and routes which are currently experiencing poor

operating conditions may be improved to acceptable average route speeds as a result of certain travel demand and supply strategies and/or infrastructure improvements.

Output from the MPO's regional travel demand model will be used to identify future average route speeds. As with existing conditions, congestion is measured as the condition when peak-hour speeds are at 30% or less of the free-flow speed.

2.6.3 Transit Delay

Transit delay is a measure of the average time for which transit users must wait for their rides and are delayed getting to their destinations. This performance measure indicates the efficiency with which transit vehicles are transporting people to their destinations. High delays indicate low efficiency, and passengers may become frustrated with their delays.

The Metropolitan Transit Authority (MTA) currently collects data on travel time for bus routes. These data can be used to calculate the transit delay performance measure.

This measure has the following limitation: as defined here, transit delay is affected by the congestion of the street system. Therefore, it should be realized that transit delay will not always identify operational issues with the transit system itself. The two-tiered process of the CMP (outlined in Section 3) includes a step for validation of congestion. This will be invaluable in effectively evaluating the true causes of the congestion that are identified by this measure.

The threshold for transit delay – a value of less than or equal to 30% of free-flow speed – was established by reviewing previous data collected for various MTA routes and comparing the results with free-flow speeds of the routes.

This threshold was re-confirmed with MTA staff as appropriate to maintain for the 2004 update. It was noted that delay should also be analyzed in light of ridership on a given route. If there are significantly more riders on a route, some delay may be created by the need to make more stops, or waiting for a greater number of passengers to board the vehicle.

It was also noted that MTA periodically changes route times if bus drivers have difficulty meeting their schedule due to congestion. MTA will help identify these times that the "congestion alarm" should be triggered, by notifying the MPO whenever it makes such changes to its bus schedules.

The Franklin Transit Authority, which started service in 2003, will collect similar information on route delay. However, it should be noted that Franklin's transit service does not operate any exclusive fixed routes; each vehicle may deviate to provide flexible service within a certain distance from the regular route. Thus it may be difficult to isolate the effects of congestion from other causes of delay.

2.6.4 Vehicle Miles Traveled (VMT) per Licensed Driver

The use of VMT has a multi-modal component, since increases in ridesharing, transit use, pedestrian travel and bicycle travel will result in a reduction in VMT. While not a direct measure of alternative modes, VMT can be an indirect measure of how successful a region's travel demand policies are. Its primary limitation is that it does not provide much information about the actual cause of a VMT increase or decrease.

ADT volumes, which are available from the TDOT annual counts, can be used along with driver licensing information to create a baseline value of VMT per licensed driver. Each year, the

updated ADT counts and license information can be used to calculate a new value of VMT per licensed driver. Comparing each year's value to the baseline (and to previous years) will show whether the regional rate of travel demand is increasing or decreasing.

The first year's value of VMT per licensed driver was used as the threshold. Succeeding years will be compared to that threshold, and to the previous year's values.

2.6.5 Vehicle Occupancy

This is a measure of the average number of persons in each vehicle. Higher occupancy rates indicate a more efficient use of roadway facilities. Increasing demand for roadway travel can be compensated by increasing vehicle occupancy. Therefore, travel demand and supply strategies which increase the vehicle occupancy rate may replace or delay the need to expand existing roadway infrastructure.

Each year's vehicle occupancy rate will be compared to the prior year's threshold, and to the overall trend of previous years' values.

During the 2004 update, it was determined that the region's vehicle occupancy rate had remained virtually unchanged for several years. The data will therefore be collected only as a small sample (one or two interstate locations) every two years. If any significant change is indicated by that sample, a region-wide data collection effort will be undertaken.

2.6.6 Citizen Complaints

The number and intensity of complaints by facility users and those residing near heavily-traveled routes can provide some indication of how efficiently those routes are operating. Many concerned citizens have valid complaints and can offer feasible solutions to the problems with capacity provisions and the existing infrastructure. Since this measure will apply only in rural portions of the MPO (outside the urbanized area), it may also help identify possible problems at locations that would not otherwise receive attention through the current data collection program.

One limitation of this measure is that citizen complaints are not always valid indications of congestion problems. Also, some citizens have a tendency to complain often. However, the two-tiered process of the CMP (outlined in Section 3 of this report), includes the validation of congestion, which should screen out complaints which are not supported by data pertaining to traffic volumes and roadway conditions.

The threshold is established as a total of three citizen complaints received within a year regarding traffic congestion at a specific location on a rural roadway.

2.7 Data Collection Requirements

For each of the performance measures discussed in the previous section, specific data must be collected and analyzed. Table 2 contains a summary of the necessary data, and the agency responsible for collecting it.

TABLE 2

PERFORMANCE MEASURES
AND DATA COLLECTION REQUIREMENTS FOR CMP

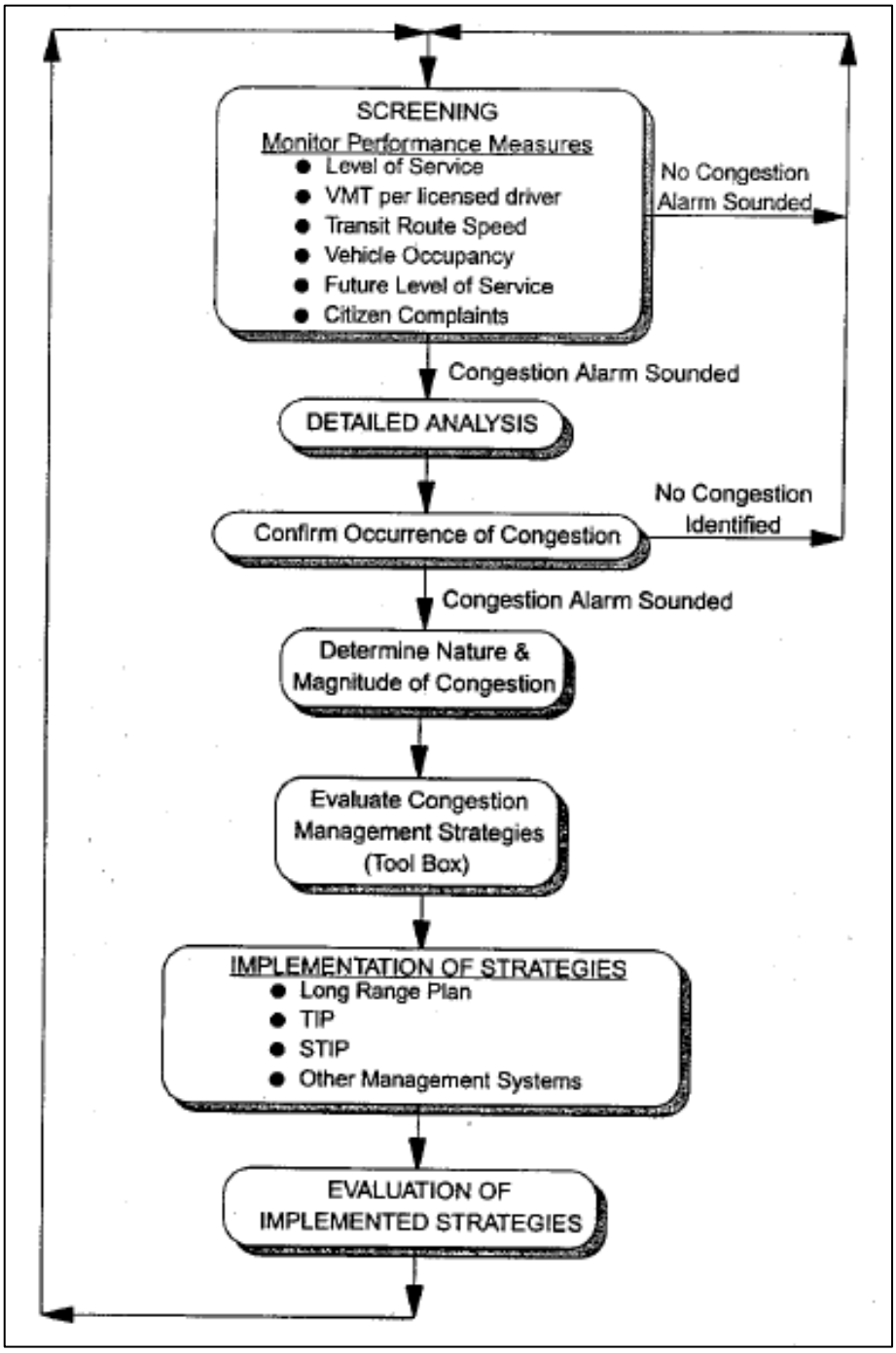
Performance Measure	Data to be Collected & Analyzed	Agency Responsible for Data Collection
Average Route Speed	Travel times on roadways	MPO responsible for urban arterials and freeways. Cities/counties responsible for any other locations they wish to add.
Future Average Route Speed	Model projections, including land use data, population and employment projections that must be input into model	MPO, cities & counties
Transit Delay	Average route speed	MTA, Franklin Transit Authority
VMT per Licensed Driver	ADT counts on freeways and principal arterials Number of licensed drivers in MPO region	TDOT MPO
Vehicle Occupancy	Occupancy counts	MPO
Citizen Complaints	Log of complaints on roadways outside Nashville Urbanized Area and Murfreesboro Urbanized Area	Counties

SECTION 3.0 OPERATION OF THE CMP

3.1 Overview of Process

A flowchart showing the CMP process for the Nashville Area MPO is presented in Figure 1.

Figure 1 Flowchart of Procedures for the Congestion Management Process



3.2 System Monitoring – Tier 1 and 2 Screening

The CMP performance measures will be monitored at least once a year, in a two-tiered process.

Tier One is a screening process to determine whether the threshold for each performance measure has been exceeded at a particular location or within an area. This identifies locations which at least exhibit the characteristics of traffic congestion.

If a threshold has not been exceeded, no further analysis is needed for that location until the next year's monitoring cycle. However, if a threshold is exceeded, a "congestion alarm" is set off. This triggers Tier Two of the analysis.

Tier Two is a more detailed study of the location to determine the extent, nature, and cause of the congestion, and to identify the appropriate tools to use to manage the congestion.

3.2.1 Tier 1 – General Screening

Methodologies for conducting screening for each performance measure are described below.

Average Route Speed (travel time)

The MPO will conduct travel time surveys on selected routes annually to compare peak period travel time with free flow travel time. Travel times will be collected on all freeways and arterials within the urbanized area if possible, or as many of those routes as possible within the available budget. Any cities or counties in the MPO region that conduct separate travel time studies will provide that information to the MPO staff for analysis as well.

Urban and suburban routes with peak period travel times that are less than or equal to 30% of free flow speed will be identified as congested.

Future Average Route Speed

The MPO will maintain the regional travel demand model regularly to ensure that it contains the latest significant changes in the transportation network, as well as land use changes. Cities and counties will provide information to the MPO about significant land use changes on at least an annual basis.

The traffic assignments generated by the model will be used to predict future average route speeds for the regional transportation network. These results will be reviewed annually to identify locations that are projected to experience congestion in the future. Urban or suburban roadways that are projected to have peak period travel times that are less than or equal to 30% of free flow speed will be identified as congested.

Vehicle Miles Traveled (VMT) per Licensed Driver

The ADT counts conducted by TDOT will be used to calculate VMT on all radial freeways and radial principal arterials within the MPO region. At each location analyzed, the ratio of VMT to the total number of licensed drivers in the MPO region will be determined. These ratios will be used to identify annual increases and decreases in VMT along the routes analyzed. A "congestion alarm" will be triggered if the increase in VMT for a specific year is greater than the increase in VMT for the previous year.

Transit Delay

On at least an annual basis, the Metro Transit Authority will conduct studies to identify the average route speeds for routes in service. Free flow speeds for each route will be compared to peak period travel times results. Routes with peak period travel times less than or equal to 30% of free flow speed will be identified as congested.

MTA will also notify the other MPO members if it decides to modify the schedule of any routes due to slower bus travel in congested conditions, even if the congestion has not reached the threshold.

Vehicle Occupancy

The MPO will conduct limited vehicle occupancy counts biennially at one or two interstate locations to monitor for any significant change. If a significant change is detected, they will conduct system-wide data collection. If additional vehicle occupancy studies are conducted by cities, counties, or the TDOT, they will provide that information to the MPO staff for analysis.

At such time that a system-wide collection effort takes place, a "congestion alarm" will be triggered if a decrease of more than 0.5% in the vehicle occupancy rate is observed on a particular route.

Citizen Complaints

Complaints about traffic congestion will be monitored on a continual basis by each county in the MPO region. If a county receives three or more citizen complaints in the same year about congestion at a location outside the urbanized area, a "congestion alarm" will be triggered.

3.2.2 Tier 2 – Detailed Analysis (Validation)

Each time an established threshold for a specific performance measure is exceeded and a "congestion alarm" is triggered at the Tier 1 screening level, additional study of the location will be undertaken.

The additional study will be conducted by a consultant or the responsible agency (city, county, or TDOT) with technical assistance from the MPO staff. The purposes of the study are to:

- Validate that a congestion problem is actually occurring;
- Define the magnitude and cause of the congestion; and
- Identify the appropriate strategies to manage the congestion and establish a schedule for implementing those strategies.

Step 1. Validate Congested Location

For most locations, a simple review of the traffic counts, travel times, or other performance measures (as well as local knowledge) can be used to quickly confirm that congestion is occurring at locations identified through the Tier 1 screening process. For example, several major arterial roadways such as West End Avenue, Hillsboro Road and Murfreesboro Road have been experiencing recurring congestion for years. Thus, the traffic counts and travel time runs conducted on these roadways will almost certainly trigger a "congestion alarm."

However, for some locations, the Tier 1 screening process will not be adequate to validate actual congestion. For instance, a particular count station could exhibit an unusually high ADT for a

specific year. The Tier 1 screening process may not clearly indicate whether the high ADT is an anomaly, or the traffic volumes actually increased substantially over previous years. As another example, a very low travel speed could be measured one year on a previously uncongested route. This low travel speed may actually be due to a new congestion problem, or it could be due to an unusual condition that occurred on the day the data were obtained. For these types of situations, additional data collection and analysis are required to validate actual congestion. These additional analyses should indicate whether or not congestion is taking place at the location identified by the CMP screening process.

Step 2. Define Magnitude & Causes of Congestion

Once congestion has been confirmed at a specific location, the next step is to define its magnitude and causes. Without accurate determination of these factors, the right tools may not be selected to manage the problem.

Various levels of analysis may be required. It could be as simple as conducting a field visit to identify a traffic signal timing problem, or it could require a major land use and transportation study for a corridor. The additional study may include site visits, traffic counts, collection and analysis of accident data, Level of Service calculations, travel time surveys, transit delay analysis, or vehicle occupancy counts. Alternatively, a much more detailed study such as a major land use study, a corridor study, or Major Investment Study may be required.

For many situations, this analysis can be conducted by the responsible city or county, with technical assistance by the MPO staff. For certain problems, a consultant may need to be hired to conduct the required analysis.

Step 3. Evaluate Congestion Management Strategies

After determining the level of congestion occurring at a location and its causes, the next step is to evaluate strategies from the congestion management "toolbox" to address that location. (For the complete toolbox, see Table 3.) Analyses will be conducted to test the effect that each tool – or combination of tools – has on the congestion problem.

Federal regulations for the CMP require the region to first consider strategies that emphasize the reduction of single occupancy vehicles (SOVs) and improve the operations of the existing transportation system. In addition to reducing congestion, these strategies also tend to be the same ones that improve air quality – a key consideration in the Nashville Area MPO region, since the region has been designated by the U.S. Environmental Protection Agency as violating the 8-hour standard for ozone pollution.

The toolbox is therefore set up to emphasize balanced, multi-modal solutions for managing congestion problems in the region. In most situations, the appropriate response may be the simultaneous use of several tools.

Detailed analysis techniques include:

- Capacity analyses for roadways, intersections, pedestrian facilities, bicycle facilities, and transit facilities, using the procedures outlined in the *Highway Capacity Manual*.
- Traffic signal optimization analysis, using software programs such as TRAFSIM, SYNCHRO, TRANSYT-7F, PASSER, SOAP, and NETSIM
- Queuing analysis using software programs such as TransCad, which include a Travel

Demand Management and mode split component.

- Air quality analysis using modeling programs such as MOBILE.
- Parking analyses including inventory, accumulation and generation studies.

Based on the detailed analyses conducted, a recommendation will be made as to which tools should be used to manage the identified congestion problems. The study will then identify a recommended strategy, which typically will consist of a combination of tools from the toolbox.

In developing the strategy, it is critical that transportation planners consult with land use planners responsible for the area. Depending on the community's land use goals for that location, certain congestion management strategies may be ruled out. For example, a wider curb radius may promote vehicular flow at a particular intersection.

However, it also allows vehicles to make the turn at higher speeds, which may be inappropriate in an area where the goal is to encourage high levels of pedestrian activity.

Each city or county, with assistance from the MPO staff, will be responsible for identifying the recommended congestion management strategies for specific congestion problems that occur on the transportation system elements under their responsibility. If the congestion problem is on an interstate or state highway, TDOT will be involved in identifying the recommended congestion management strategy.

Table 3 shows the range of strategies in the CMP "toolbox."

TABLE 3. TOOLBOX OF CONGESTION MANAGEMENT STRATEGIES

STRATEGY	TOOLS
Transportation Demand Management	Carpools, vanpools Ridesharing Park 'n Ride Lots Flex time (work, school, compressed work week) Telecommuting Guaranteed Ride Home Congestion pricing (HOT lanes, toll roads) Speed Control Measures Trip Reduction Ordinances Employer-based Transportation Management Programs -carpool / vanpool -shuttles and transit benefits Public/Private Partnerships -Transportation Management Associations (TMAs) -development or impact fees - assessment districts - tax increment financing Parking Management - public parking - shared parking - fee structures - remote parking - preferential parking for HOV Transit or pedestrian-only zones

STRATEGY	TOOLS
	Goods Movement Management - delivery truck restrictions - improved shipping/receiving points
Traffic Operational Improvements	Turn lanes Intersection widening Channelization / wider curb radius Turn restrictions Median Center turn lane Traffic Signal Improvements - signal retiming, phasing modifications - time-based coordination - interconnect coordination - removal of existing signals - installation of new signals Reversible lanes One-way street
Traffic Operational Improvements (cont.)	Intersection realignment Frontage roads Grade-separated interchange Traffic and Incident Monitoring Systems Traffic and Incident Management Systems - construction management/coordination - incident response program - special e vent plans for traffic - emergency vehicle signal pre-emption Traveler Information Systems Ramp metering
High Occupancy Vehicle (HOV) Use	HOV lanes HOV ramp bypass lanes Guaranteed Ride Home Employer Trip Reduction Ordinance
Transit Improvements (Capital)	Rail line (light rail, heavy rail, trolley, people-mover) Bus Rapid Transit (fixed guideway) Bus lanes Bus bypass ramps Park ‘n Ride lots Intermodal transit center Transfer center (mini-hubs) Paratransit Local circulators for large campuses/activity centers Transit-oriented design (buildings, roadways)

STRATEGY	TOOLS
Transit Improvements (Operational)	Service Enhancement - added hours - added days - more vehicles (reduces time until next bus) - more stops - fewer stops - express service Service Expansion (new or extended routes) Improvements at Transit Stops (access, shelter, amenities) Traffic Signal Pre-emption for transit vehicles Fare Reduction - free fare zone - reduced fare at certain times of day - passes Transit Information Systems
Non-Auto Modes	Pedestrian facilities - sidewalks or paths - links between developments - pedestrian signals - pedestrian bridges and underpasses - pedestrian-only zones Bicycle facilities - bike routes - bike paths - wide curb lanes - bike lockers and racks
Land Use Planning	Zoning and subdivision controls Comprehensive and subarea land use plans Major thoroughfare plans Mixed use zoning districts Transit-friendly design policies for development Pedestrian and bike-friendly design policies for development
Access Management	Access controls Access consolidation Cross-access easements between parcels or developments

3.3 Single Occupancy Vehicle (SOV) Capacity

Federal Regulations (23 CFR Part 450.320 (d and e) stipulate that MPOs classified as a Transportation Management Area (TMA) which are designated as non-attainment for ozone or carbon monoxide (e.g. the Nashville Area MPO) can not program any project that will result in a significant increase in the carrying of 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. The regulations further state that an appropriate analysis of reasonable 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 is required. 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).

The MPO CMP fulfills this requirement and the review and analysis of the Tier 1 and Tier 2 screening processes (as described on pages 11 through 16) are designed to provide the appropriate level of travel demand and operational management strategies for consideration in each said facility.

SECTION 4.0 CMP EVALUATION METHODOLOGIES

4.1 Analysis for Performance Measures

Specific methods for analyzing the performance measures have been established. For the most part, these analysis methodologies follow accepted traffic engineering and transportation planning analysis techniques. Descriptions of each analysis method are presented below.

Level of Service

For both roadway segments and intersections, Levels of Service are to be determined using the procedures outlined in the Highway Capacity Manual. With known traffic volumes, planners can analyze signalized and unsignalized intersections, two-lane highways and arterials, and multi-lane highways and arterials. The Manual provides the information needed to determine how efficiently an intersection or roadway segment is operating. The vast majority of monitored locations will be TDOT count stations. For these locations, capacities can be calculated, based on the type of facility and number of lanes. Actual volumes can then be quickly compared to the calculated capacities to identify congested locations.

Vehicle Miles Traveled (VMT) per licensed driver

This measure is to be determined using a surrogate value for actual VMT. A cordon is to be established for Davidson County and for each city within the MPO. TDOT ADT counts along major radial roadways will be selected. Each ADT value is to be multiplied by the distance from that particular count station to a centroid in the particular city's CBD. The products are then summed to obtain a surrogate measure for total VMT in the Nashville Area MPO. Also, State records are available to determine the number of licensed drivers. With this information, planners can annually determine VMT per licensed driver. By tracking how this value changes over time, planners can discern the effectiveness of congestion management strategies as well as assess changes to travel demand.

Transit Delay

Ideally, the transit travel time data compiled by MTA is used to determine whether the public transportation system is providing adequate service. If delays are considerable, then planners should review ridership data to determine whether the number of buses in operation is sufficient to handle the demand. Also, planners may choose to explore the adequacy of the routes currently traversed. However, the results determined from this performance measure should be evaluated carefully since high delays may indicate congestion on the roadways, and adding more buses to the roadways will not necessarily result in an improvement in the performance measure.

Average Route Speed

Using the results from the speed surveys conducted annually by the MPO, planners can compare each route's free-flow speed (approximated by the speed limit) to the speed at which vehicles are actually traversing the specific links. If actual speeds are considerably lower than the posted speed limit, congestion is probably occurring along that route. If actual speeds are the same as the speed limit or higher, traffic is likely traversing the route at comfortable speeds. These comparisons are to be made annually to assess how well congestion management strategies are performing.

Some of the jurisdictions may want to conduct travel time surveys in addition to those conducted by the MPO. The procedures for conducting and analyzing travel time surveys are documented in the Manual of Transportation Engineering Studies, published by the Institute of Transportation Engineers.

Vehicle Occupancy

The MPO's annual studies of vehicle occupancy are to be used to compare current year occupancy rates to results from previous years. Planners can ascertain how effective demand management strategies are in reducing the number of single-occupancy vehicles during peak periods. By tracking how this value changes over time, planners can get feedback on which tool from the congestion management toolbox is applicable for particular situations.

Jurisdictions may want to conduct additional vehicle occupancy counts. The procedures for conducting and analyzing vehicle occupancy studies have been established by the MPO.

Future Level of Service

Like current Levels of Service, future Levels of Service are to be determined using the procedures outlined in the Highway Capacity Manual. Planners are to use projected traffic volumes output from the TransCad model to estimate the Levels of Service that are expected on roadway segments and at intersections. These calculations can also take into consideration any planned improvements to the existing infrastructure. Also, the projected traffic volumes may reflect demand management strategies that are to be implemented as part of the CMP. The future Levels of Service are to be compared to existing Levels of Service in order to ascertain whether the programs implemented as part of the CMP are effective in managing the existing and projected traffic congestion.

Citizen Complaints

A log of citizen complaints regarding congestion is to be maintained by the cities and counties within the MPO. This log should include the citizen's name, address, and phone number, the location of the reported problem, and a description of the reported problem.

4.2 Examples of the Operation of the CMP

Several examples have been developed to illustrate the operation of the CMP. An example for each CMP performance measure is presented below.

Example 1. Evaluation of the Level of Service Performance Measure Situation

The TDOT ADT counts reveal that at a certain count station, a two-lane arterial carries an ADT of 20,000 vehicles per day. The CMP monitoring process (Tier 1- Screening) sets off a congestion alarm, which identifies this location as congested.

CMP Process

Step I -Validate Congested Location

A review of the TDOT ADT counts at this location is conducted. The review shows that traffic volumes at this location have increased steadily by approximately 4% per year over the past five years. Based on this information, the 20,000 vehicles per day count appears to be representative of the typical traffic on this roadway. A field review reveals that a three-mile segment of the arterial has a two-lane cross-section. The remainder of the arterial is a three-lane roadway. During the field review, it is observed that congestion occurs along the two-lane section of roadway, especially at the major intersections in the vicinity of the count location. The field review also indicates that significant residential construction has occurred in this area over the past few years. This analysis of the count along with the development information confirms that congestion is a valid problem for the two lane segment of this arterial.

Step 2- Define Magnitude & Causes of Congestion

Additional data are collected and analyzed for this location. Peak period turning movement counts are conducted at the two main intersections along the arterial, and delays and Levels of Service for these intersections are calculated. Pedestrians crossing the intersections are included in the counts. Also, peak period vehicle occupancy counts are conducted and analyzed to evaluate the current level of ridesharing. The results of these counts and analyses show that poor Levels of Service (LOS E) occur at the two intersections, primarily due to the lack of left turn lanes on the arterial. Moderate pedestrian activity, primarily related to a nearby elementary school, is identified. The analysis of the vehicle occupancy counts show that the current average vehicle occupancy rates are relatively low.

Step 3- Evaluate Congestion Management Strategies

The toolbox of congestion management strategies is reviewed to determine the strategies which might be effective for this situation. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

TRANSPORTATION DEMAND MANAGEMENT MEASURES

- Carpool
- Vanpool
- Ridesharing
- Park-and-Ride Lots

TRAFFIC OPERATIONAL IMPROVEMENTS

- Intersection Widening
- Turn Lanes
- Center Turn Lane

NON-TRADITIONAL MODES

- Bicycle Facilities
- Pedestrian Facilities

GROWTH MANAGEMENT AND ACTIVITY CENTERS

- Zoning Controls
- Long Range Plans
- Major Route Plans
- Land Use Planning
- Impact Fees

As part of Step 3 of the CMP process, additional analyses are conducted to evaluate the anticipated effects of the various strategies listed above. Based on those analyses, the following improvements are recommended to solve the congestion problem.

1. Widening of the arterial to provide a center turn lane along the length of the segment which is currently two lanes.
2. Construction of sidewalks along the arterial and on the roadways providing access to the elementary school.
3. Implementation of a local program to encourage increased carpooling and vanpooling, and construction of a park-and-ride lot within the area to support the increased ridesharing.

The recommended improvement program is submitted to the MPO as a TIP project, and responsibilities, funding sources, and priorities are identified. The improvements are then implemented. After the improvement program is implemented, the effectiveness of the strategies is evaluated by analyzing the next year's ADT volumes and determining the resulting Levels of Service. Also, the vehicle occupancy counts for the next year are analyzed to determine whether increases in occupancy rates have occurred. If this follow-up screening indicates that the congestion problem has been solved, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that congestion still occurs, the toolbox is once again reviewed, and additional strategies are evaluated for possible implementation.

Example 2. Evaluation of the VMT per Licensed Driver Performance Measure Situation

The VMT per licensed driver total for a certain year shows that there is a significant increase in VMT compared to the previous year. The CMP monitoring process (Tier 1 - Screening) sets off a congestion alarm.

CMP Process

Step 1 - Validate Congestion

The VMT performance measure is an area-wide measure and therefore does not give detailed information regarding a specific location. The TDOT ADT counts which are used to calculate VMT are reviewed. This review shows that noticeable increases in ADT occurred at eight count stations in the southeastern part of the MPO and at four count stations in the northeastern portion

of the MPO. It is determined that these ADT increases are primarily responsible for the VMT increases. After reviewing each count and comparing it to counts from previous years, it is determined that the current counts appear to be accurate. Therefore, the VMT calculation appears to be valid.

Step 2 - Define Magnitude & Causes of Congestion

Additional data are collected and analyzed. Sample vehicle occupancy counts are done for the freeways and major arterials in the northeastern and southeastern areas of the MPO. The analysis of the vehicle occupancy counts show that average vehicle occupancy rates are relatively low. Building permits in the affected counties are also reviewed to identify estimates of employment and population increases. The results show that there has been a noticeable increase in the rate of residential development in the northeastern portion of the MPO over the past two years. In the southeastern part of the MPO, large increases in employment were identified.

Step 3- Evaluate Congestion Management Strategies

The toolbox of congestion management strategies is reviewed to determine possible strategies which might be effective in reducing the VMT per licensed driver value. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

TRANSPORTATION DEMAND MANAGEMENT MEASURES

- Carpool
- Vanpool
- Flex Time
- Telecommuting
- Parking Management
- Guaranteed Ride Home
- Trip Reduction Ordinance
- Ridesharing
- Park-and-Ride Lots
- Transportation Management Association (TMA)
- Employer-Based Transportation Management Programs

HIGH OCCUPANCY VEHICLE (HOV) USE

- HOV Lanes
- HOV Ramp Bypass Lanes
- Guaranteed Ride Home
- Employer Trip Reduction Ordinance

PUBLIC TRANSIT CAPITAL IMPROVEMENTS

- Light or heavy rail line

- Bus Lanes
- Bus Bypass Ramps
- Park-and-Ride Lots
- Transit-Oriented Design

PUBLIC TRANSIT OPERATIONAL IMPROVEMENTS

- Service Enhancements
- Service Expansion
- Traffic Signal Preemption
- Improved Transit Stops

NON-TRADITIONAL MODES

- Bicycle Facilities
- Pedestrian Facilities

As part of Step 3 of the CMP process, additional analyses are conducted to evaluate the anticipated effects of the various strategies listed above. Based on those analyses, the following improvements are recommended:

1. Improved bus service is recommended for the northeastern area. New express bus routes are proposed to run in the AM and PM peak hours between downtown Nashville and the northeastern area.

2. To improve the travel time for the existing bus routes, a signal preemption system is recommended for a section of the major radial arterial serving the northeastern area.

3. A new park-and-ride lot is recommended in the northeastern area to support the improvements to the bus service.

4. For the southeastern area, the recommendations include forming a Transportation Management Association to encourage ridesharing, flex-time, and telecommuting. Also, HOV ramp bypass lanes are recommended at two interchanges to encourage increased HOV lane usage.

The recommended improvements are submitted to the MPO as TIP projects, and responsibilities, funding sources, and priorities are identified. The improvements are then implemented. After the improvements are implemented, the effectiveness of the strategies is evaluated by analyzing future VMT per licensed driver values and by evaluating vehicle occupancy rates in each of the corridors. If this follow-up screening indicates that the congestion problem is solved, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that congestion still occurs, the toolbox is once again reviewed and additional strategies are evaluated for possible implementation.

Example 3. Evaluation of the Transit Delay Performance Measure Situation

The MTA route surveys reveal that during the AM and PM peak periods, a certain route experiences an average route speed which is less than 30% of the free flow speed. The CMP

monitoring process (Tier 1 -Screening) sets off a congestion alarm, which identifies this bus route as congested.

CMP Process

Step 1- Validate Congested Location

A review of the MTA data for this route is conducted to ensure its accuracy. The data appear to be valid and are supported by several passenger complaints regarding the route.

Step 2- Define Magnitude & Causes of Congestion

Additional data are collected and analyzed for this location. The ADT counts from TDOT are reviewed to determine whether the low transit route speed could be due to a lack of roadway capacity. The review of the counts indicates that roadway capacity is not a problem. The number of peak hour bus routes and ridership figures are reviewed to evaluate the benefits of providing additional peak hour bus routes or adding an express bus route. These reviews show that ridership for the route is high and there appears to be demand for additional buses.

Step 3 - Evaluate Congestion Management Strategies

The toolbox of congestion management strategies is reviewed to determine possible strategies which might be effective in improving the average route speed. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

PUBLIC TRANSIT CAPITAL IMPROVEMENTS

- Bus Lanes

PUBLIC TRANSIT OPERATIONAL IMPROVEMENTS

- Service Enhancement
- Service Expansion
- Traffic Signal Preemption
- Improved Transit Stops

As part of Step 3, additional analyses are conducted to evaluate the anticipated effects of the various strategies listed above. These analyses indicate that since roadway capacity is not a problem, constructing bus lanes or providing signal preemption would probably not be effective. The following improvements are recommended:

1. Provide two additional buses for the route during the peak periods.
2. Improve several bus stops by providing shelters and benches.

The recommended improvements are implemented by the MTA. After the improvements are implemented, the effectiveness of the strategies is evaluated by analyzing future average route speed values. If this follow-up screening indicates that the congestion problem is solved, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that congestion still occurs, the toolbox is once again reviewed and alternative strategies are evaluated for possible implementation.

Example 4. Evaluation of the Average Route Speed Performance Measure Situation

The travel time runs conducted by the MPO show that a certain segment of a five lane major urban arterial within a densely developed commercial area has average route speeds which are less than 30% of the free flow speed. The CMP monitoring process (Tier 1 - Screening) sets off a congestion alarm, which identifies this location as congested.

CMP Process

Step 1 -Validate Congested Location

A review of the ADT counts for this arterial shows that traffic volumes are above capacity levels. This is an area of town well known for peak period and weekend congestion due to a high concentration of existing retail development. This information confirms that congestion is a valid problem for this arterial.

Step 2- Define Magnitude & Causes of Congestion

A corridor study is initiated to identify the magnitude and causes of congestion and to develop recommendations for managing the congestion. As part of the corridor study, additional data are collected, including turning movement counts, inventories of roadway, pedestrian, and bicycle facilities, transit ridership information, and existing and projected land use information. Analyses of these data are performed. The results of the analyses show that the traffic conditions within the corridor are characterized by poor Levels of Service at intersections, closely spaced curb cuts along the arterial, inefficient traffic signal timing and signal progression, low pedestrian activity due to lack of sidewalks, low transit ridership, and lack of available parking at certain locations. There is limited right-of-way for the corridor, which most likely precludes a major widening project.

Step 3- Evaluate Congestion Management Strategies

The toolbox of congestion management strategies is reviewed to determine the strategies which might be effective for this situation. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

TRANSPORTATION DEMAND MANAGEMENT MEASURES

- Carpool
- Vanpool
- Parking Management
- Trip Reduction Ordinance
- Goods Movement Management
- Ridesharing
- Park-and-Ride Lots
- Transportation Management Association (TMA)

TRAFFIC OPERATIONAL IMPROVEMENTS

- Intersection Widening

- Channelization
- Traffic Surveillance Systems
- Traffic Control Centers
- Traffic Signal Improvements
- Turn Lanes
- Providing Additional Lanes without Widening
- Reversible Lanes
- Turn Restrictions
- Frontage Roads

PUBLIC TRANSIT CAPITAL IMPROVEMENTS

- Rail Line
- Busway (Fixed Guideway)
- Bus Lanes
- Park-and-Ride Lots
- Transfer Center
- Transit-Oriented Design
- Inter-site Circulators

PUBLIC TRANSIT OPERATIONAL IMPROVEMENTS

- Service Enhancement
- Service Expansion
- Traffic Signal Preemption
- Improved Transit Stops

NON-TRADITIONAL MODES

- Bicycle Facilities
- Pedestrian Facilities
- Inter-Parcel Accesses
- Pedestrian Malls

GROWTH MANAGEMENT AND ACTIVITY CENTERS

- Zoning Controls
- Subdivision Regulations
- Land Use Planning

- Impact Fees
- Special Zoning Districts
- Transit Friendly Design
- Pedestrian and Bicycle Friendly Design

ACCESS MANAGEMENT

- Access Controls
- Access Consolidation
- Inter-Site Accesses

Additional analyses are conducted as part of the corridor study to evaluate the anticipated effects of the various strategies listed above. Based on those analyses, the corridor study presents the following recommendations:

1. Construct turning lanes at several of the main intersections within the corridor in order to improve the intersection Levels of Service.

2. Retime and modify the phasing of the signalized intersection along the arterial.

3. Construct sidewalks along the arterial, as well as between adjacent neighborhoods and the major commercial areas within the corridor.

4. Develop an access management plan for the arterial to consolidate several of the access points along the arterial and to control the design and location of future curb cuts.

5. Enhance transit service within the corridor by constructing a transit center, with trolley service between the various commercial establishments in the area. A pedestrian mall connecting the transit center to a major retail area is also recommended.

6. Develop a parking management program to more efficiently utilize the available parking in the area.

The recommended improvements are submitted to the MPO as TIP projects, and responsibilities, funding sources, and priorities are identified. The improvements are then implemented. After the improvement program is implemented, the effectiveness of the strategies is evaluated by analyzing the next year's average route speeds for the corridor. If this follow-up screening indicates that the congestion problem is solved, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that congestion still occurs, the toolbox is once again reviewed and additional strategies are evaluated for possible implementation.

Example 5. Evaluation of the Vehicle Occupancy Performance Measure Situation

The vehicle occupancy rate determined for a certain section of freeway shows that the vehicle occupancy rate has decreased at this location compared to the previous year. The CMP monitoring process (Tier I -Screening) sets off a congestion alarm.

CMP Process

Step 1 - Validate Congestion

The ADT counts for the freeway are reviewed. This review shows that noticeable increases in ADT occurred for the segment of freeway where the decreased vehicle occupancy rate was identified. Furthermore, it is determined that a widening project was completed for the freeway during the past year. The freeway had been widened from four to eight lanes, with one HOV lane provided in each direction. As a result of the widening project, the ADT volumes for the freeway are well below capacity levels and vehicle delay does not appear to be a problem for this location. Additional sample vehicle occupancy counts are conducted along the freeway. These counts also show a decrease in vehicle occupancy rates for the freeway compared to the counts from the previous year. These results confirm that the vehicle occupancy rate has dropped and there is a congestion problem worthy of further study.

Step 2- Define Magnitude & Causes of Congestion

Additional data are collected and analyzed. Counts are performed to determine the utilization of the new HOV lanes. These counts show that the lanes are under-utilized. A review of the future land use in the corridor and the resulting traffic projections indicates that substantial growth in traffic is expected, which will result in a degradation in Level of Service for the freeway unless increased utilization of the HOV lane is realized.

Step 3- Evaluate Congestion Management Strategies

The toolbox of congestion management strategies is reviewed to determine possible strategies which might be effective in increasing the vehicle occupancy rate for this freeway. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

TRANSPORTATION DEMAND MANAGEMENT MEASURES

- Carpool
- Vanpool
- Flex Time
- Guaranteed Ride Home
- Ridesharing
- Park-and-Ride Lots
- Employer-Based Transportation Management Programs

HIGH OCCUPANCY VEHICLE (HOV) USE

- HOV Ramp Bypass Lanes

PUBLIC TRANSIT CAPITAL IMPROVEMENTS

- Bus Lanes
- Bus Bypass Ramps

GROWTH MANAGEMENT AND ACTIVITY CENTERS

- Zoning Controls
- Land Use Planning

- Impact Fees

As part of Step 3 of the CMP process, additional analyses are conducted to evaluate the anticipated effects of the various strategies listed above. Based on those analyses, the following improvements are recommended:

1. Construct two park-and-ride lots near freeway interchanges, and provide express bus service between these lots and downtown Nashville.

2. Develop marketing programs to encourage ridesharing and to promote the park-and-ride lots and express bus service.

3. Provide rideshare matching services to promote the establishment of several new vanpools in the corridor.

4. Construct HOV Bypass ramps at three interchanges to encourage HOV lane usage.

The recommended improvements are submitted to the MPO as TIP projects, and responsibilities, funding sources, and priorities are identified. The improvements are then implemented. After the improvements are implemented, the effectiveness of the strategies is evaluated by reviewing subsequent vehicle occupancy rates for the freeway. If this follow-up screening indicates that the congestion problem has been solved, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that congestion still occurs, the toolbox is once again reviewed and additional strategies are proposed for possible implementation.

Example 6. Evaluation of the Future Level Of Service Performance Measure Situation

The MPO's future traffic projections reveal that within about 10 years, a major five lane radial arterial in Metro Nashville will experience ADT volumes well in excess of the roadway capacity. The CMP monitoring process (Tier 1 -Screening) sets off a congestion alarm, which identifies this location as congested.

CMP Process

Step 1- Validate Congested Location

A review of the MPO land use data is conducted and the TransCad network for the area under consideration is checked for accuracy. This review shows that the land use and network have been coded in correctly, and the future projections appear to be reasonable. This analysis confirms that future congestion for this arterial is a valid concern.

Step 2- Define Magnitude & Causes of Congestion

Future Levels of Service, projected delays, and mode splits are evaluated for the arterial. Analysis of the future traffic volumes projected for the area is conducted, and planned transportation improvements are identified. These analyses show that Level of Service F is projected, with substantial delays for the roadway. Moderately high residential and commercial densities are projected for the area. The widening of the arterial is not proposed over the next 20 years due to right-of-way limitations.

Step 3 - Evaluate Congestion Management Strategies

The toolbox of congestion management strategies is reviewed to determine the strategies which might be effective for this situation. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

TRANSPORTATION DEMAND MANAGEMENT MEASURES

- Carpool
- Vanpool
- Flex Time
- Trip Reduction Ordinance
- Ridesharing
- Park-and-Ride Lots

HIGH OCCUPANCY VEHICLE (HOV) USE

- HOV Lanes
- HOV Ramp Bypass Lanes

PUBLIC TRANSIT CAPITAL IMPROVEMENTS

- Rail Line
- Busway (Fixed Guideway)
- Bus Lanes
- Bus Bypass Ramps
- Park-and-Ride Lots
- Transit-Oriented Design

PUBLIC TRANSIT OPERATIONAL IMPROVEMENTS

- Service Expansion
- Traffic Signal Preemption

CONGESTION PRICING

- Impact Fees

GROWTH MANAGEMENT AND ACTIVITY CENTERS

- Zoning Controls
- Long Range Plans
- Major Route Plans
- Land Use Planning
- Impact Fees
- Special Zoning Districts
- Mixed Use Ordinances

Additional TransCad model runs are conducted to evaluate the anticipated impacts of the various strategies. Based on the analyses, the following policies are recommended for this area:

1. A commuter rail line is to be extended to serve the area and provide an alternative mode of transportation for commuters traveling to and from Nashville.

2. Intensification of the residential land use densities in the area is proposed. The purpose of these increased land use densities is to provide additional support for the commuter rail line.

3. A policy of requiring transit-oriented design for new commercial and mixed-use developments is established.

The recommended policies are submitted to the MPO for inclusion in the next update to the Long Range Plan. The policies are endorsed by the Metro Planning Commission and made part of subsequent Subarea Plans. The effectiveness of the strategies is evaluated by analyzing subsequent future traffic projections based on updated land use and network information. If these follow-up analyses indicate that the recommended policies should be effective in managing the future congestion, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that future congestion is still projected, the toolbox is once again reviewed and additional strategies are proposed for consideration.

Example 7. Evaluation of the Citizen Complaint Performance Measure Situation

Numerous citizen complaints are received by a county regarding long traffic queues on an interstate off-ramp during the afternoon peak periods. The complaints indicate that delays are very high for traffic exiting the interstate and that exiting traffic often backs up from the ramp onto the freeway. Since there are more than three complaints at this location, the CMP monitoring process (Tier 1 - Screening) sets off a congestion alarm.

CMP Process

Step 1 - Validate Congested Location

A field review is conducted to determine the validity of the complaints, it is observed that traffic delays at the off-ramp are considerable, and traffic often backs onto the freeway. These observations confirm that congestion occurs at this location.

Step 2 -Define Magnitude & Causes of Congestion

Maintenance and improvements to an interstate ramp are the responsibility of the State. Therefore, TDOT is notified of the congestion problem. A study is undertaken by TDOT to identify the magnitude and causes of congestion. Additional data are collected and analyzed for this location. Peak period turning movement counts are conducted for the off-ramp intersection, and Levels of Service for the intersection are calculated. The study shows that the traffic volumes on the off-ramp have grown considerably over the past several years due to development in the area. The ramp intersection is unsignalized with a one-lane exit, and the existing capacity is insufficient to accommodate the traffic using the off-ramp. A Level of Service F occurs at the intersection during the PM peak hour.

Step 3 - Evaluate Congestion Management Strategies

As part of the TDOT study, the toolbox of congestion management strategies is reviewed to determine the strategies which might be effective for this situation. Based on a review of the toolbox matrix, it is determined that the following tools should be considered for application:

TRANSPORTATION DEMAND MANAGEMENT MEASURES

- Carpool
- Vanpool
- Ridesharing
- Park-and-Ride Lots

TRAFFIC OPERATIONAL IMPROVEMENTS

- Intersection Widening
- Channelization
- Traffic Signal Improvements
- Turn Lanes

PUBLIC TRANSIT OPERATIONAL IMPROVEMENTS

- Service Expansion

HIGH OCCUPANCY VEHICLE (HOV) USE

- HOV Lanes
- HOV Ramp Bypass Lanes

As part of Step 3 of the CMP process, additional analyses are conducted to evaluate the anticipated effects of the various strategies listed above. Based on those analyses, the following improvements are recommended:

1. Widening of the off-ramp to provide a two-lane exit ramp
2. Signalization of the ramp intersection.
3. Installation of a closed loop signal system. This signal system will be used to coordinate the new signal with an existing signal at the adjacent interchange ramp intersection and with other nearby signals in the area.

The recommended improvements go through the MPO's TIP process, where responsibilities, funding sources, and priorities are identified. After the improvements are implemented, the effectiveness of the strategies is evaluated by reviewing future complaints recorded by the CMP. Also, field visits are conducted to observe traffic conditions and determine if the congestion problem is solved. If this follow-up screening indicates that the congestion problem is solved, no further action is taken other than the ongoing screening called for in the CMP. If the follow-up screening shows that congestion still occurs, the toolbox is once again reviewed and alternative strategies are proposed for possible implementation.

SECTION 5.0 PERIODIC ASSESSMENT AND MODIFICATIONS TO THE CMP

5.1 Periodic Assessment of Implementation Strategies

The MPO will periodically assess the effectiveness of implemented strategies employed as part of the CMP. The process for evaluating the effectiveness of implemented strategies will occur as part of the development of a new Long Range Transportation Plan by the MPO. The assessment will take into consideration those projects implemented since the last Plan in which projects were assessed as part of the CMP Tier 2 process. A representative sample of projects will be evaluated and the results of the analysis will be used by the MPO as part of the transportation planning process to provide guidance to decision-makers and the public on selection of effective strategies for future implementation. Ultimately the results will provide guidance to the MPO for changes/modifications to the CMP.

5.2 Modifications to the CMP

Consistent with the periodic assessment described above, experience with the operation of the CMP over time may reveal the need for certain modifications. It may be desirable to delete certain performance measures if experience shows that they are ineffective in accurately identifying congested locations or if the associated data collection needs are too burdensome for the jurisdictions within the MPO. New and effective performance measures which are not too data intensive may be developed over time as well. Also, new analysis methods may be put into practice.

Modifications to the CMP should be relatively simple. Any desired additions or deletions should be initiated at the MPO Technical Coordinating Committee (TCC) level. After proper evaluations and consideration of the proposed changes by the TCC, recommended modifications are to be sent to the MPO Executive Board for approval, if approved by the Executive Board, all modifications to the Nashville CMP are to be submitted to TDOT for inclusion in the State CMP.

The following describes the process for identifying exceptions to the CMP Tier 2 Analysis requirement.

"It is the policy of the Nashville Area MPO that a project which has all of the following characteristics will be considered to be in full compliance with the CMP Plan:

- *Project was in an adopted Long Range Transportation Plan (LRTP)*
- *Project was then included in an adopted Transportation Improvement Program (TIP)*
- *Any phase of P S & E has been initiated prior to the adoption of the CMS of 2004 based on the above"*

SECTION 6. CONCLUSIONS

The purpose of a CMP is to provide more factual and comprehensive information into the transportation planning and decision making processes. The CMP for the Nashville Area MPO has been developed to be a comprehensive, user friendly, and effective system for evaluating and implementing congestion management strategies. The CMP will address existing and future transportation conditions within the five county MPO area by facilitating planning activities.

The CMP provides a foundation upon which planners are able to evaluate a wide range of alternative strategies for managing congestion.

It is envisioned that the CMP will have to be a dynamic system in order to meet the needs of the MPO. Modifications will be necessary as conditions within the MPO change and as planners gain experience from the implementation of this initial CMP. The CMP has been designed to be flexible so that these modifications can be made quickly and effectively.

APPENDIX A. DATA COLLECTION SURVEYS

CONGESTION MANAGEMENT SYSTEM (CMS) FOR THE NASHVILLE AREA MPO

SURVEY OF EXISTING DATA COLLECTION EFFORTS

1. LAND USE DATA

1.1 Briefly describe how your city/county keeps track of existing land use.

1.2 Briefly describe how your city/county keeps track of existing zoning.

1.3. Briefly describe how your city/county keeps track of existing population and employment.

1.4 Briefly describe the methods that your city/county uses for forecasting population and employment and the frequency of these forecasts.

1.5 How does your city/county aggregate land use data (e.g. Traffic Analysis Zones, census tracts, etc.)?

1.6 Briefly describe other types of land use data that are developed, used or maintained by your city/county.

2. ROADWAY MAPPING DATA

2.1 Has a Major Route Plan been developed for your city/county?

2.2 If a Major Route Plan has been developed, when was it last updated?

2.3 If a Major Route Plan has been developed, was it based on a transportation planning model? If so, which software package was used?

2.4 What are the classifications of roadways/streets within your city/county? (e.g. local, collector, arterial, etc.)

2.5 How does your city/county keep track of existing right-of-ways for roadways?

2.6 Does your city/county maintain an inventory of existing roadway widths and geometrics?

2.7 If an inventory of existing roadway widths and geometrics is maintained, describe the methodology used and the frequency that the inventory is updated.

2.8 Does your city/county maintain an inventory of existing speed limits?

2.9 If an inventory of existing speed limits is maintained, describe the methodology used and the frequency that the inventory is updated.

2.10 Does your city/county maintain an inventory of topo maps?

2.11 If a topographic map inventory is maintained, what is the frequency for updating the maps?

2.12 Does your city/county maintain an inventory of aerial photos?

2.13 If an aerial photo inventory is maintained, what is the frequency for updating aerials?

2.14 Does your city/county utilize GIS?

2.15 If your city/county utilizes GIS, briefly explain the ways that it is used.

2.16 Briefly describe any other types of roadway mapping data that your city/county maintains.

3. TRAFFIC DATA

3.1 Does your city/county collect Average Daily Traffic (ACT) counts (other than TOOT counts) on a regular basis?

3.2 If ACT counts are collected describe the frequency, the methods used, and the approximate number of locations counted.

3.3 Does your city/county collect turning movement counts at intersections on a regular basis?

3.4 If turning movement counts are collected describe the frequency, the methods used and the approximate number of locations counted.

3.5 Does your city/county collect vehicle occupancy counts on a regular basis?

3.6 If vehicle occupancy counts are collected describe the frequency, the methods used, and the approximate number of locations counted.

3.7 Does your city/county conduct speed surveys on a regular basis?

3.8 If speed surveys are conducted describe the frequency and methods used.

3.9 Does your city/county conduct travel time or delay surveys on a regular basis?

3.10 If travel time or delay surveys are conducted describe the frequency and methods used.

3.11 Does your city/county maintain an inventory of existing roadway signs, traffic signals, and/or pavement markings that have been installed?

3.12 If signing, signal, and/or marking inventories are maintained, briefly explain the format of the inventories.

3.13 Are accident data provided to your city/county planning and/or engineering department?

3.14 If accident data are provided, briefly describe the format of the accident data (accident report, computer summary printout, etc.).

3.15 Does your city/county collect transit ridership and/or ridesharing data on a regular basis?

3.16 If transit ridership and/or ridesharing data are collected describe the frequency and methods used

3.17 Does your city/county collect any types of data regarding rail, water, or air transportation usage on a regular basis?

3.18 If rail, water, or air transportation usage data are collected, type, frequency and methods used.

3.19 Does your city/county collect data regarding bicycle and/or pedestrian travel on a regular basis?

3.20 If bicycle and/or pedestrian travel data are collected, describe the type, frequency and methods used.

3.21 Briefly describe any other types of traffic data that are collected by your city/county.

4. TRAFFIC STUDY DATA

4.1 Are Traffic Impact Studies required by your city/county for new development projects?

4.2 If Traffic Impact Studies are required, briefly describe the conditions that warrant the requirement of a Traffic Impact Study.

4.3 Does your city/county conduct capacity analyses of roadways and/or intersections on a regular basis?

4.4 If capacity analyses are conducted describe the frequency and methods used.

4.5 Does your city/county conduct accident analyses for roadways and intersections on a regular basis?

4.6 If accident analyses are conducted describe the frequency and methods used for the analyses.

4.7 Briefly describe any other types of traffic studies or traffic analyses that are conducted by your city/county.

Thank you for your assistance. Please fill in the information below. Send the completed form by July 15, 1994 to:

Bob Murphy
RPM & Associates
7003 Chadwick Drive, Suite 280
Brentwood, TN 37027

City/County completing survey _____
City/County contact person _____

LAND USE DATA

Jurisdiction	Existing Land Use	Existing Zoning	Existing Population and Employment
Portland	Contract with state planning for mapping	State Planning Office assists in zoning(Zoning by ord inance)	Office of Economic and Community Development and State Planning
Williamson Co	Maintained by the Assessor of Properties Office	Planning Dept. maintains maps(1"=400')	Annually, building permit data
Brentwood	Building permits; comprehensive plan update	Update of zoning map	Periodic census (5/1/94 pop. 19,393);comprehensive plan update
Gallatin	mapped	Mapped, updated after council reading at council	By state census and City Chamber of Commerce
Goodlettsville	Surveys done to them (irregular basis)	Official zoning map	Census, published estimates, and permits for housing
Smyrna	No formal process	Central maps at zoning office	census data used (Chamber of Commerce figures,employment)
Rutherford Co.	GIS mapping (land use/ tax maps)	Logged on tax maps/ input to GIS	Federal/State data sources Woods & Poole, Inc. data
Wilson Co.	Zoning Atlas	Zoning Atlas	Census data/Chamber of Commerce
Lebanon	Zoning Atlas	Zoning Atlas	Census data/Chamber of Commerce
Murfreesboro	Windshield survey (to be sure input to GIS)	Overlayed on property tax mini - maps and digitized in GIS	Planning staff estimates population, then compares data/periodic census

Jurisdiction	Forecasting Population and Employment	Aggregation Land Use Data
Portland	Office of Economic and Community Development and the State Planning Consultant use past and current trends	Past and current trends and anticipated traffic patterns Zoning by traffic patterns and utility development
Williamson Co	Figures from MPO staff for population; Employment distribution within TAZs	No
Brentwood	Building permit data; annually	TAZ
Gallatin	State and MPO forecasts	County Tax Records
Goodlettsville	As needed -- Coordinated with G.N.R.C.	Total city, MPO has traffic zones
Smyrna	No methods in place	No method
Rutherford Co.	Utilize Woods/ Poole, Inc. Data	Poorly
Wilson Co.	Extensions of recent trends	*
Lebanon	Start of parts on pop growth/employment concentrations	*
Murfreesboro	Housing based projection and comparisons with other agencies	City wide or annexed

AMENDED SEPTEMBER 19, 2007

ROADWAY MAPPING DATA

Jurisdiction	Major Route Plan	MRP Last Updated	MRP Based on a Model	Classification of Roadways
Portland	Yes	1993	No	Urban Interstate; Freeways and Expressways; Urban Principal Arterial; Urban Minor Arterial Urban Collector; Local
Williamson Co	Yes	1992(update contracted)	No	Freeway; Expressway; Arterial; Collector; Scenic Route; Local
Brentwood	Yes	1993	No	Arterial; Collector; Minor Residential; Marginal access; Dead-end & cul-de-sac; Alleys; Commercial/Industrial
Gallatin	Yes	1979	No	Local; Minor & Major collector; Minor & Major arterial; Major Thoroughfare
Goodlettsville	Yes	1989	No	Freeway; Major Urban Arterial; Ma 2,4,6; Rural Arterial; R 2,4; Collector
Smyrna	Yes	October, 1991	No	Local-50'ROW; Collector-60'; Minor arterial-80'; Principle arterial-100'; Interstate-150'
Rutherford Co.	No	N/A	N/A	Interstate; Principal Arterial; Minor Arterial; Rural Major Collector; Rural Minor Collector; Local
Wilson Co.	Yes	1990	N/A	Local; Collector; Arterial
Lebanon	Yes	1991	No	Local; Collector; Arterial
Murfreesboro	Yes	9/90 - schd (94-95 UPWP)	QRS II	Urban principal arterial; Urban minor arterial; Urban collector; Local

Jurisdiction	Existing R.O.W.s	Inventory of Existing Widths and Geometrics	Methodology Used and Frequency of Updating	Inventory of Existing Speed Limits	Methodology Used and Frequency of Updating	Inventory of Topo Maps
Portland	Planning Office and mapping	No	N/A	Yes	Speed Records at Public Safety Building	No
Williamson Co	No	No	N/A	No	N/A	USGS only
Brentwood	Street Inventory System	Yes	RSMS;annually	No	N/A	Yes
Gallatin	Yes	Yes	Updated when repaved	No	N/A	Obtaining GIS 2' contors
Goodlettsville	As shown on Official Base Map	No	N/A	No	N/A	On base map
Smyrna	Subdivision plats and Co. Tax maps	No	N/A	No	N/A	No
Rutherford Co.	Highway Department	Widths only	Highway Department	Yes	Highway Department	Yes
Wilson Co.	County road list	Road widths only	When improved or maintained	No	N/A	Yes-USGS
Lebanon	City engineer's office records	Yes, basic info only	When improved or maintained	No	N/A	Yes, Incorporated on GIS
Murfreesboro	GIS	New roads, yes (GIS); old from aerials	GIS;Plats;Const plans;Updated on change/time permits	Yes	Windshield survey and incorporated in to GIS	Yes

Jurisdiction	Frequency of Updating Topo	Inventory of Aerial Photos	Frequency of Updating Aerials	Utilize GIS	Uses of GIS	Other Types of Roadway Mapping
Portland	N/A	No	N/A	No	N/A	None
Williamson Co	N/A	No	N/A	Under Developement	N/A	None
Brentwood	USGS updates	Yes	None specified	No	N/A	Construction plans
Gallatin	N/A	No	N/A	Near future	Utilities location, property data, FEMA info to sell Industrial park sites, marketing, and site data	None
Goodlettsville	When new subdivisions are developed	No	N/A	No	N/A	None
Smyrna	N/A	Mapped 1993(Caddum, Inc.)	N/A	Yes	Record keeping - expanded tax map showing structures, fences, utilities, etc.	None
Rutherford Co.	As per USGS	Yes	10 Years	Yes	All mapping purposes	None
Wilson Co.	Very Infrequently	Yes (1988)	not been updated	No	N/A	None
Lebanon	With each project	Purchased in 1988	No update yet	Yes	Flood info main focus	None
Murfreesboro	Varies(Updated when re-flown)	Yes	As growth dictates	Yes	All mapping for city; special computer graphics	None

TRAFFIC DATA

Jurisdiction	ADT Counts	Frequency; Methods; Number of Locations	Turning Movement Counts	Frequency; Methods; Number of Locations	Vehicle Occupancy Counts	Frequency; Methods; Number of Locations	Speed Surveys
Portland	No	N/A	No	N/A	No	N/A	No
Williamson Co	No	N/A	No	N/A	No	N/A	No
Brentwood	No	N/A	No	N/A	No	N/A	No
Gallatin	As needed(specific studies)	N/A	No	N/A	No	N/A	As needed
Goodlettsville	No	N/A	No	N/A	No	N/A	No
Smyrna	No	N/A	No	N/A	No	N/A	No
Rutherford Co.	No	N/A	No	N/A	No	N/A	No
Wilson Co.	No	N/A	No	N/A	No	N/A	No
Lebanon	No	N/A	No	N/A	No	N/A	No
Murfreesboro	Yes	As needed – machine counts and signal sensors	Yes	As needed – manual counts	No	N/A	As required

Jurisdiction	Frequency and Methods Used	Travel Time or Delay Surveys	Frequency and Methods Used	Inventory of Roadway Signs; Traffic Signals; Pavement Markings	Format of Inventories	Accident Data Provided to Planning/Engineering
Portland	N/A	No	N/A	No	N/A	Yes
Williamson Co	N/A	No	N/A	No	N/A	Upon Request
Brentwood	Radar System	No	N/A	No	N/A	No, not unless requested
Gallatin	N/A	No	N/A	Just beginning one	software(TTAP)	As requested
Goodlettsville	N/A	No	N/A	Yes	Files	No
Smyrna	N/A	No	N/A	No	N/A	Yes
Rutherford Co.	N/A	No	N/A	No	N/A	No (could be)
Wilson Co.	N/A	No	N/A	No	N/A	No
Lebanon	N/A	No	N/A	No	N/A	No
Murfreesboro	Machine counted and signal sensors	As needed	DMI and laptop computer(for signal system timing evaluation)	Yes (Traffic signals only)	Database	Yes

Jurisdiction	Format of Accident Data	Transit Ridership Data	Frequency and Methods Used	Data on Rail, Water, Air Usage	Type; Frequency; and Methods Used	Bicycle or Pedestrian Travel	Type; Frequency; and Methods Used	Any other Travel Data Collected
Portland	Public Safety Maintains Reports	No	N/A	No	N/A	No	N/A	None
Williamson Co	Computer Summary	No	N/A	No	N/A	No	N/A	None
Brentwood	Accident reports summary from PD	No	N/A	No	N/A	No	N/A	None
Gallatin	Police accident reports	No	N/A	No	N/A	No	N/A	None
Goodlettsville	N/A	No	N/A	No	N/A	No	N/A	None
Smyrna	By Police dept staff as reports	No	N/A	No	N/A	No	N/A	None
Rutherford Co.	N/A	No	N/A	No	N/A	No	N/A	None
Wilson Co.	N/A	No	N/A	No	N/A	No	N/A	None
Lebanon	N/A	No	N/A	Airport record of fuel sales	N/A	No	N/A	None
Murfreesboro	Both report and summary form(fro	No	N/A	No	N/A	No	N/A	Vehicle Classification Counts

TRAFFIC STUDY DATA

Jurisdiction	Traffic Impact Studies Required	Conditions that Warrant a Study	Capacity Analyses	Frequency and Methods Used
Portland	No	N/A	No	N/A
Williamson Co	Yes	If over 400 PM trips	No	N/A
Brentwood	At option of Brentwood Planning Comm.	Large scale commercial or residential development	No	N/A
Gallatin	On larger projects	Size of project	No	N/A
Goodlettsville	Depends on magnitude of Proposal	Commercial rezoning; Multi-Family Rezoning; Large Commercial Buildouts	No	N/A
Smyrna	Major Developments (Industrial and Commercial mostly)	Decision of Smyrna Planning Commission based on amount of trips	No	N/A
Rutherford Co.	As needed	Major development	No	N/A
Wilson Co.	No	N/A	No	N/A
Lebanon	Yes	On large Developments	No	N/A
Murfreesboro	Some	Determined by Planning Commission – Usually large developments	Only as needed	In house – HCS – Use project consultants also

Jurisdiction	Accident Analyses for Roadways and Intersections	Frequency and Methods Used	Other Types of Traffic Studies or Analysis	Person to Contact
Portland	No	N/A	Does not provide traffic analysis and studies on congestion in conjunction with the M.P.O.	Fred J. White
Williamson Co	No	N/A	N/A	Joe Horne
Brentwood	No	N/A	N/A	Jody Bass
Gallatin	No	N/A	N/A	P. A. Bevier
Goodlettsville	No	N/A	Corridor study done on Conference Drive	Bill Terry
Smyrna	No	N/A	State DOT does studies of intersections when Smyrna requests traffic signals	Mark Medved, P.E.
Rutherford Co.	No	N/A	N/A	Jim Brady
Wilson Co.	No	N/A	N/A	Rick Gregory
Lebanon	No	N/A	N/A	Rick Gregory/Jeff Baker
Murfreesboro	Only as needed	Manufacture collision diagrams from reports	Bicycle studies – long and short plan; Pedestrian trail study	Dana Richardson

APPENDIX B. CMP TOOLBOX DEFINITIONS

DEFINITIONS OF ELEMENTS OF THE CONGESTION MANAGEMENT TOOLBOX

1. TRANSPORTATION DEMAND MANAGEMENT MEASURES

A. Carpool - an administrative operation which matches drivers with similar origins and destinations for use of one privately-owned commuter vehicle

B. Vanpool - an administrative operation which matches multiple drivers with similar origins and destinations for use of one public or private van for commuting

C. Flex Time - providing staggered or special times for arrival and departure to reduce peak hour loading

a. work - staggered arrival and departure times for workers

b. school - staggered arrival and departure times for grades within a school or schools within an area

c. compressed workweek - a work schedule which fulfills hourly requirements for a workweek in a manner such that certain working days are either skipped or their hours decreased (i.e., working four 10 hour days and being off every Friday)

D. Telecommuting - using technology (such as modems, faxes, etc) to work at home or a remote location rather than at the work site

E. Parking Management - administrative operations to more effectively use parking and decrease the impact of vehicle travel through special parking uses

a. public parking - providing readily-available parking for the general populace

b. shared parking - allowing adjacent developments which have dissimilar parking requirements to use the same parking spaces

c. fee structures - modifying the fee paid for parking based on arrival time and/or departure time

d. remote parking - providing parking away from the intended final destination

e. preferential parking - providing better parking for special cases such as carpools and vanpools

F. Guaranteed Ride Home - providing those who use carpools, vanpools, or public

transit a failsafe way home should special circumstances arise

G. Trip Reduction Ordinance - a governmental ordinance which requires a specified decrease in the traffic generated by an employer or a site

H. Goods Movement Management - providing for the efficient administration of moving and delivering goods

   a. delivery truck restrictions - specifying zones for times of the day during which trucks are not allowed to make deliveries

   b. improved shipping/receiving points - providing well-designed loading facilities which do not impede traffic flow

I. Ridesharing - an administrative operation which has a central database to match drivers for carpools and vanpools

J. Park-and-Ride Lots - a parking tot provided for parking of vehicle for transfer to carpools, vanpools, or public transit

K. Transportation Management Association (TMA) - a corporation founded for promoting travel demand measures in a particular area

L. Toll Roads - a roadway constructed with the intent and facilities to charge each vehicle a specified amount of money to use the facility

M. Public-Private Partnerships - a partnership formed for a limited duration between a governmental body and a private concern for implementing travel demand measures

   a. assessment districts - a special designated area for which fees are collected from land owners for the provision of public services

   b. tax increment financing - establishment of a particular tax rate based on a unit of activity for the provision of public services

   c. development or impact fees - a fee charged to a developer based on the potential impact of the development on public services

N. Speed Control Measures - use of design, enforcement, or devices to reduce travel speeds, particularly in residential areas (such as speed humps)

0. Employer-Based Transportation Management Programs - administrative programs implemented by an employer to reduce travel demand

   a. carpool/vanpool - an administrative operation which matches drivers for use of one commuter vehicle

b. shuttles and special transit provisions - provision of private shuttle buses for transfers from remote lots or special benefits for employees which use transit

P. Auto Restricted Zones - a geographical area in which automobiles are not allowed to enter, either permanently or based on time of day

2. TRAFFIC OPERATIONAL IMPROVEMENTS

A. Intersection widening - providing wider travel lanes or turning paths at an intersection

B. Channelization - providing islands to promote more rapid exit of vehicles from the travel stream

a. curb radius improvements - increasing curb radii to provide ease of movement around corners (particularly for trucks and buses)

C. Traffic Surveillance Systems - use of electronic technologies to centralize surveillance of traffic conditions

D. Motorist Information Systems -use of electronic technologies to relay transportation information to the motoring public

E. Ramp Metering - providing signalized control of traffic entering a freeway

F. Traffic Control Centers -a location which serves as a clearinghouse for transportation system monitoring, automated traffic control, and information dissemination

G. Traffic Signal Improvements - improvements to the traffic signal system

a. signal retiming and phasing modifications -modifications to existing signals to respond more accurately to traffic conditions

b. time base coordination - providing progressive movement between signals through the use of an accurate time clock reference

c. interconnect coordination (traffic responsive) - providing progressive movement between signals using hardwire (or radio) communication. Can also provide a feedback mechanism and adoption of the system to changing traffic conditions

d. removal of existing signals - removing traffic signals no longer needed

e. installing new signals - installing new signals which conditions warrant

H. Turn Lanes - providing exclusive left and right turn lanes

I. Providing Additional Lanes without Widening - judicious use of wide lanes and shoulders to provide additional through or turn lanes

J. Reversible Lanes - a lane or lanes which operate in opposite directions based on time of day or traffic flow changes

K. One Way Streets - converting a roadway from two way to one way operation

L. Turn Restrictions - restricting turns based on time of day or permanently

M. Grade-Separated Interchange - use of overpass and ramps to delete an at-grade intersection

N. Median - a physical barrier separating opposing lanes of traffic flow

0. Center Turn Lane - a continuous two way left turn lane

P. Intersection Realignment - removal of "dog leg" offset intersections

Q. Frontage Roads - a service road which "collects" traffic from multiple access points, and allows access to the main road only at certain points

3. HIGH OCCUPANCY VEHICLE (HOV) USE

A. HOV Lanes - a lane which may be used by a vehicle only with multiple passengers

B. HOV Ramp Bypass Lanes - a special ramp constructed for use of only HOV vehicles

C. Guaranteed Ride Home - providing those who use carpools, vanpools, or public transit a fail-safe way home should special circumstances arise

D. Employer Trip Reduction Ordinance - a governmental ordinance which requires a specified decrease in the traffic generated by an employer or a site

4. PUBLIC TRANSIT CAPITAL IMPROVEMENTS

A. Rail Line - a public transit facility which makes use of a track or set of tracks

a. light rail - a public transit facility which operates on a track or set of tracks, and

is characterized by small and/or single vehicles

b. heavy rail - a public transit facility which uses a track or set of tracks, and is characterized by large and/or multiple vehicles

c. trolley - a public transit facility which is usually nostalgic in nature, and generally uses electric powered vehicles operating on a set of tracks laid in the roadway

d. people mover - using a system involving moving sidewalks, escalators, or low-speed open-air cars

B. Busway (Fixed Guideway) - a roadway facility for independent use by buses

C. Bus Lanes - specific lanes on public roadways which can only be used by buses

D. Bus Bypass Ramps and Lanes - special ramps, lanes on ramps, or lanes at intersections which can only be used by buses

E. Park-and-Ride Lots - a parking lot provided for parking of vehicles for transfer to carpools, vanpools, or public transit

F. Intermodal Center - a facility which accommodates the transfer of persons or goods from one mode of transportation to another

G. Paratransit - a public transit operation aimed at service to the elderly and handicapped

H. Transfer Center - a facility which accommodates bus line transfers

I. Transit-Oriented Design - design of facilities to better accommodate transit vehicles and operations

a. buildings - design of buildings with bus loadings spots and parking areas through which buses can maneuver

b. roadways - design of roadways with bus lanes, bus bypass lanes, pull-offs, and other related improvements to facilitate transit operations

J. Inter-site Circulators - use of small vehicles (such as rubber tired trolleys) to provide an alternate means of travel between uses in a small area

5. PUBLIC TRANSIT OPERATIONAL IMPROVEMENTS

A. Service Enhancement - improving the service on existing transit lines

   a. added hours - running a transit line more hours during the day

   b. added days - running a transit line additional days during the week

   c. more vehicles - adding vehicles on a transit line to reduce headway

   d. more stops - serving more stops on an existing transit line

   e. fewer stops - eliminating under-used stops

   f. express service - providing closed-door bus service between major locations

   g. demand-responsive stops - stop only if someone wants to get on or off the bus

B. Service Expansion - increasing service area, hours, or days system-wide

C. Traffic Signal Preemption - providing a mechanism by which buses can override traffic signals

D. Fare Reduction - reducing fare or changing fare structure to promote ridership

   a. free fare zone - a geographic area of free transit service

   b. reduction by time of day - special fare rates to be applied at certain times of day

   c. passes - long terms cards which can be purchased at a reduced price

E. Transit Information Systems - a technology which disseminates transit information to the general public

F. Improved Transit Stops - providing improved facilities at high-demand transit stops

   a. benches - seat for passengers at the stop b. shelters - cover from the elements

   b. facilities - providing restrooms, vending, pay phones, water fountains, etc.

   c. lighting - increased nighttime lighting

   d. landscaping - aesthetic enhancements to improve the area of transit stops

6. NON-TRADITIONAL MODES

A. Bicycle Facilities -facilities provided to encourage commuter use of bicycles

a. bike routes - designated routes on public streets which bicycles are encouraged to use

b. bike paths - off-roadway paths for the use of bicycles

c. wide curb lanes - providing 15-16 foot curb lanes to facilitate bicycle travel

d. lockers and racks - providing secure facilities for storage of bicycles

B. Pedestrian Facilities - facilities provided to encourage walking

a. sidewalks - separate paved path for pedestrians along or apart from roadways

b. pedestrian signals - pedestrian indications and controls for crossing of roadways

c. overpasses and tunnels - grade-separated pedestrian facilities for crossing roadways and other barriers

C. Ferry - a boat used for transportation of people, goods, automobiles, etc.

D. Greenways - a facility designed for the use of pedestrians, bicycles, and other similar modes of transportation, usually not adjacent to public roadways

E. Inter-Parcel Accesses - accesses between sites to discourage short trips on public roadways

F. Historical/Cultural Enhancements - providing facilities, markers, rehabilitation efforts, and other such activities to preserve the historical and/or social characteristics of an area, particularly as related to transportation

G. Mapping - providing useful mapping of facilities such as bicycle routes or walking trails

H. Pedestrian Malls - usually a roadway that is closed to vehicle traffic and redesigned into a pedestrian-friendly environment

I. Auto Trains - a train used to transport automobiles across long distances

7. CONGESTION PRICING

A. Toll Roads - a roadway constructed with the intent and facilities to charge each vehicle a specified amount of money to use the facility

B. Impact Fees - a fee charged to a developer based on the potential Impact of the development on public services

8. GROWTH MANAGEMENT AND ACTIVITY CENTERS

A. Zoning Controls -special elements of zoning legislation which deal with travel demand reduction measures

B. Land Use Planning - directing the course of development of land in such a manner as to reduce the transportation impact of the development pattern

C. Impact Fees - a fee charged to a developer based on the potential impact of the development on public services

D. Special Zoning District - a zoning overlay designated for particular areas which has regulations to decrease the transportation impacts of an area

E. Auto Restricted Zones - a geographical area in which automobiles are not allowed to enter, either permanently or based on time of day

F. Transit-Oriented Design - design of facilities to better accommodate transit vehicles and operations

   a. buildings - design of buildings with bus loadings spots and parking areas through which buses can maneuver

   b. roadways - design of roadways with bus lanes, bus bypass lanes, pull offs, and other related improvements to facilitate transit operations

G. Pedestrian and Bicycle Friendly Design - design of facilities such as roadways and building to accommodate and enhance use of bicycles and walking as a means of commuting

H. Mixed Use Ordinances - an ordinance which allows adjacent but dissimilar sites to rely upon sharing of facilities (such as parking) to meet regulations and/or codes

I. General Plans - plans which are developed and enacted to direct future development and related activities in a manner which minimized adverse Impacts on transportation

a. major thoroughfare plans - a plan which outlines corridors for new roadways and recognizes the importance of existing roadways

b. land use plans - a plan which directs the course of development of land in such a manner as to reduce the transportation impact of the development pattern

c. subdivision regulations - development regulations which can be used to specify transportation-specific design elements

9. ACCESS MANAGEMENT

A. Access Controls - zoning controls which limit the number or design of site access points

B. Access Consolidation - reducing the number of accesses into a site or allowing adjacent sites to share access points

C. Inter-Site Accesses - accesses between sites to discourage short trips on public roadways

10. INCIDENT MANAGEMENT

A. Incident Detection - use of technology to rapidly identify when an incident has occurred that will affect transportation service

B. Incident Management - administrative and operational activities used to respond to incidents and lessen their severity in impact to the transportation system

C. Incident Teams - special teams formed to rapidly respond to various types of incidents

D. Cellular Breakdown Service - a special number which drivers can call for assistance in automobile breakdown situations

E. Emergency Vehicle Signal Preemption - providing a mechanism by which buses can override traffic signals

F. Special Event Plans - preparation In advance of traffic handling plans to accommodate increased traffic demand due to special events

G. Construction Zones - preparation In advance of traffic handling plans to accommodate construction activities

11. INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

A. Advanced Traffic Management Systems (ATMS) - use of current technology to provide governmental officials real-time traffic data and mechanisms by which traffic flows can be altered

B. Advanced Traveler Information Systems (ATIS) - use of current technology to disseminate transportation information to the general public

C. Advanced Vehicle Control Systems (AVCS) - use of in-vehicle technology to control operation of a vehicle or assist the driver in operation of the vehicle

D. Advanced Public Transportation Systems (APTS) - use of technology to enhance public transit operations

E. Advanced Commercial Vehicle Operations (ACVO) - use of technology to provide for more efficient use of commercial vehicles, such as trucks

12. ADDITIONAL GENERAL PURPOSE LANES

A. Toll Roads - a roadway constructed with the intent and facilities to charge each vehicle a specified amount of money to use the facility

B. New Roadways - a new public roadway constructed on an alignment which heretofore had no roadway

C. Additional Through Lanes - additional general purpose through movement lane constructed on an existing roadway

D. Bypass Roads - a new general purpose roadway constructed with the view of relieving traffic on an existing roadway

APPENDIX C. EVALUATION MATRIX FOR CMP TOOLBOX

EVALUATION MATRIX - CONGESTION MANAGEMENT TOOLBOX

TOOLS	Freeway Congestion	Arterial Congestion	Intersection Congestion	High VMT	Low Veh. Occ.	Low Veh. Spds.	Excess Cut Thru	High Accidents	Poor Signal Operation	Construction Delays	Low Transit Ridership	Congested Buses	Low Transit Speeds	Poor Ped/ Bike Facil.	Parking Congest.	Special Events
TDM Measures																
Carpool	●	●		●	●	●									●	
Vanpool	●	●		●	●	●									●	
Flex Time	●	●				●									●	
Telecommuting	●	●		●		●									●	
Parking Management	●	●								●					●	●
Guaranteed Ride Home	●	●		●						●	●				●	
Trip Reduction Ordinance	●	●		●		●					●					
Goods Movement Management	●	●		●						●						
Ridesharing	●	●		●	●	●				●						
Park-and-Ride Lots	●	●		●	●					●	●					●
Transportation Management Association (TMA)	●	●		●	●					●	●					
Toll Roads	●	●														
Public-Private Partnerships	●	●								●						●
Speed Control Measures							●	●								
Transportation Management Programs	●	●		●	●						●					
Auto Restricted Zones		●		●							●			●		
Traffic Operational Improvements																
Intersection Widening		●	●					●	●							
Channelization			●					●								
Traffic Surveillance Systems		●	●			●		●	●	●	●		●			●
Motorist Information Systems	●	●	●	●				●			●					●
Ramp Metering	●									●						
Traffic Control Centers	●	●	●						●	●			●			●
Traffic Signal Improvements		●	●			●		●	●					●		●
Turn Lanes			●					●	●							
Additional Lanes without Widening			●			●		●								
Reversible Lanes		●														
One Way Streets		●														
Turn Restrictions		●	●				●	●								
Grade-Separated Interchange		●	●													
Median		●				●	●	●								
Center Turn Lane		●				●		●								
Intersection Realignment		●	●					●	●							
Frontage Roads		●	●													
High Occupancy Vehicle (HOV) Use																
HOV Lanes	●			●	●											
HOV Ramp Bypass Lanes	●			●	●											
Guaranteed Ride Home	●			●	●											
Employer Trip Reduction Ordinance	●			●	●											
Public Transit Capital Improvements																
Rail Line	●			●									●			
Subway (Fixed Guideway)	●				●						●		●			
Bus Lanes	●				●						●		●			
Bus Bypass Ramps	●				●						●		●			
Park-and-Ride Lots	●	●		●	●						●		●			
Intermodal Center	●	●		●	●						●		●			
Paratransit					●						●		●			
Transfer Center				●	●						●		●			
Transit-Oriented Design		●		●	●						●		●			
On-site Circulators		●		●	●						●		●			

EVALUATION MATRIX - CONGESTION MANAGEMENT TOOLBOX

TOOLS	Freeway Congestion	Arterial Congestion	Intersection Congestion	High VMT	Low Veh. Occ.	Low Veh. Spds.	Excess Cyl Time	High Accidents	Poor Signal Operation	Construction Delays	Low Transit Ridership	Congested Buses	Low Transit Speeds	Poor Ped/ Bike Facil.	Parking Congest.	Special Events
Public Transit Operational Improvements																
Service Enhancement	●	●	●	●	●	●				●	●	●	●			●
Service Expansion	●	●	●		●	●				●		●	●			●
Traffic Signal Preemption		●			●	●				●	●		●			
Fare Reduction	●	●		●	●	●				●	●					
Transit Information Systems	●	●	●	●	●	●				●	●	●				
Improved Transit Stops		●		●	●	●				●	●	●	●			
Non-Traditional Modes																
Bicycle Facilities		●	●	●				●		●				●		
Pedestrian Facilities		●	●	●				●		●				●		
Ferry	●	●		●												
Greenways														●		
Inter-Parcel Accesses		●						●		●				●	●	
Historical/Cultural Enhancements					●									●		
Mapping				●						●				●		
Pedestrian Malls		●		●										●	●	
Congestion Pricing																
Toll Roads	●															
Impact Fees		●														
Growth Management & Activity Centers																
Zoning Controls	●	●												●	●	
Land Use Planning	●	●					●							●	●	
Impact Fees		●														
Special Zoning District		●													●	
Auto Restricted Zones		●		●										●	●	
Transit Friendly Design		●		●							●					
Ped and Bike Friendly Design		●	●	●				●						●		
Mixed Use Ordinances		●		●										●	●	
Access Management																
Access Controls		●				●										
Access Consolidation		●				●									●	
Inter-Site Accesses		●		●										●		
Incident Management																
Incident Detection	●	●	●			●			●	●			●			●
Incident Management	●	●	●			●				●			●			●
Incident Teams	●	●				●				●						●
Cellular Breakdown Service	●	●				●				●						
Emergency Vehicle Preemption	●	●				●				●						
Special Event Plans	●	●							●	●						●
Intelligent Vehicle Highway Systems																
Advanced Traffic Management Systems (ATMS)	●	●		●		●			●	●						●
Advanced Traveller Information Systems (ATIS)	●	●		●		●	●		●	●						●
Advanced Vehicle Control Systems (AVCS)	●	●				●			●	●						●
Advanced Public Transportation Systems (APTS)	●	●		●		●			●	●						●
Advanced Commercial Vehicle Operations (ACVO)	●	●		●		●	●		●	●						
Additional General Purpose Lanes																
New Roadways	●	●	●	●		●	●									
Additional Through Lanes	●	●	●			●	●	●	●							
Bypass Roads	●	●	●			●	●									