Congestion Management System Practices

by

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CHAPTER 1. IMPROVING THE CMS PROCESS

INTRODUCTION

This report describes the summary of Congestion Management System (CMS) processes currently in use around the United States. The primary objectives of the activities described in this report were to: 1) update the 1999 CMS Improvement Process Report, 2) understand how they use their CMS processes, and 3) review Federal Highway Administration (FHWA) material on examples of successful CMS processes in place.

Research was accomplished for this memorandum by contacting Metropolitan Planning Organizations around the nation by phone and email. Extensive searches of internet websites also provided helpful information. A personal visit was conducted with the North Central Texas Council of Governments to attend their CMS meeting and discuss the CMS process with staff. Finally, FHWA staff was contacted to discover which MPOs exemplify good CMS practices. This technical memorandum summarizes the findings.

The first section of this report contains information on those MPOs which were included in the 1999 CMS Improvement Report. The second section consists of those MPOs which were identified as having good CMS processes by FHWA. Within each MPO section, three questions are answered. These questions are indicated below:

- *How do they assess future congestion levels and how is it used in the CMS process?*
- *How do they report network conditions and performance?*
- *How are TDM measures evaluated and incorporated into projects?*

It is the intent of the author to understand and convey how these MPOs have handled their CMS processes in order to develop recommendations for an improved program in the Capital Area Metropolitan Planning Organization (CAMPO). Task 2 will include recommendations for this CMS process improvement.

BACKGROUND

The Congestion Management System is required by the federal government in metropolitan areas with populations exceeding 200,000. Section 500.109, Congestion Management System of 23 CFR Part 500, Management and Monitoring Systems defines CMS as *a systematic process for managing traffic congestion that provides information on transportation system performance and on alternative strategies for alleviating congestion and enhancing the mobility of persons and goods to levels that meet state and local needs (1).* The rule states that in all TMAs, the CMS shall be developed, established and implemented as part of the metropolitan planning process in accordance with 23 CFR 450.320 and shall include:

1. *Methods to monitor and evaluate the performance of the multi-modal transportation system, identify the causes of congestion, identify alternative actions, assess and implement cost-effective actions, and evaluate the effectiveness of implemented actions;*

2. *Definition of parameters for measuring the extent of congestion and for supporting 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 and service thresholds should be tailored to the specific needs of the area and established cooperatively by the State, affected MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area;*
3. *Establishment of a program for data collection and system performance monitoring to define the extent and duration of congestion, to help determine the causes of congestion, and to evaluate the efficiency and effectiveness of implemented actions. To the extent possible, existing data sources should be used, as well as appropriate application of the real-time system performance monitoring capabilities available through Intelligent Transportation Systems (ITS) technologies;*
4. *Identification and evaluation of the anticipated performance and expected benefits of appropriate traditional and nontraditional congestion management strategies that will contribute to the more efficient use of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, should be appropriately considered for each area: Transportation demand management measures, including growth management and congestion pricing; traffic operational improvements; public transportation improvements; ITS technologies; and, 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 efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision makers to provide guidance on selection of effective strategies for future implementation (1).*

Although the CAMPO region is currently designated as in attainment for air quality, there are reports that the area will likely be designated as non-attainment in the near future. As such, there is a renewed interest in setting policies and establishing processes which comply with the regulations for this designation. In Section 450.320 (b), the Federal guidelines state the following:

> *In TMAs designated as nonattainment for ozone or carbon monoxide, Federal funds may not be programmed for any project that will result in a significant increase in carrying capacity for single occupant vehicles (a 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 results from a congestion management system (CMS) meeting the requirements of 23 CFR Part 500 (2).*

The majority of metropolitan planning organizations highlighted in this report are designated as non-attainment for air quality.

CHAPTER 2. MPO'S HIGHLIGHTED IN 1999 CMS IMPROVEMENT REPORT

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) - DALLAS/FORT WORTH, TEXAS

The Dallas-Forth Worth Metropolitan Area is the ninth largest metropolitan area in the country according to the 2000 Census data, with 4.5 million persons. In 1999, the daily vehicle miles of travel within the region totaled 125 million. During the peak hour, 38 percent of all roadways were congested. Within the NCTCOG Transportation Management Area (TMA) are Collin, Dallas, Denton, and Tarrant Counties. Together these four counties have been designated as a non-attainment area for pollutant ozone. Sections of five other counties are also included in the NCTCOG region and there is discussion of further increasing the size of the region.

Within the Transportation Department of NCTCOG there are approximately 60 employees. The staff of NCTCOG does not serve on the Travel Demand Management Committee. Instead, they participate by making presentations, answering questions, and providing reports on various matters of the region. Staff cannot vote on any issues. The committee is made up of persons who work in the transportation field and/or have a strong interest in improving the congestion in the area. Representatives from Dallas Area Rapid Transit, the Forth Worth Transportation Authority, TxDOT Dallas District, TxDOT Fort Worth District, Texas Turnpike Authority, and local governments. Presently, the committee is seeking participation from private companies who have exemplified model Transportation Demand Management (TDM) programs for their employees. For example, American Airlines offers a host of TDM-type options and opportunities for employees and could provide beneficial information concerning how these programs were implemented. The committee meets every other month. They have a secretary, vice chair and chair of the committee, which rotate from the east section of NCTCOG to west section.

The Congestion Management System is integrated into the total transportation planning and programming processes. Figure 1 shows a flow chart of how the CMS process is implemented *(4).* First the system is monitored, then strategies are developed to mitigate congestion, and these strategies go into the various plans (Transportation Improvement Program, Major Investment Studies, or Metropolitan Transportation Plan). Congestion management strategies, including transportation system management (TSM), travel demand management (TDM), bicycle/pedestrian, rail and bus transit, high occupancy vehicle (HOV) and toll roads comprise $9 billion (48%) of the total capital cost of the future transportation system *(3).*

How do they assess future congestion levels and how is it used in the CMS process?

The DFW Regional Travel Model is used to project future travel conditions and evaluate the performance of HOV lanes, rail, freeway and regional arterial systems for inclusion in the Mobility 2025 Plan *(3).* The forecasting technique is based on a four-step sequential process. The following information is estimated in this technique: urban activity, trip frequency, destination choice, and mode choice which are determined as either roadway route choice or transit route choice.

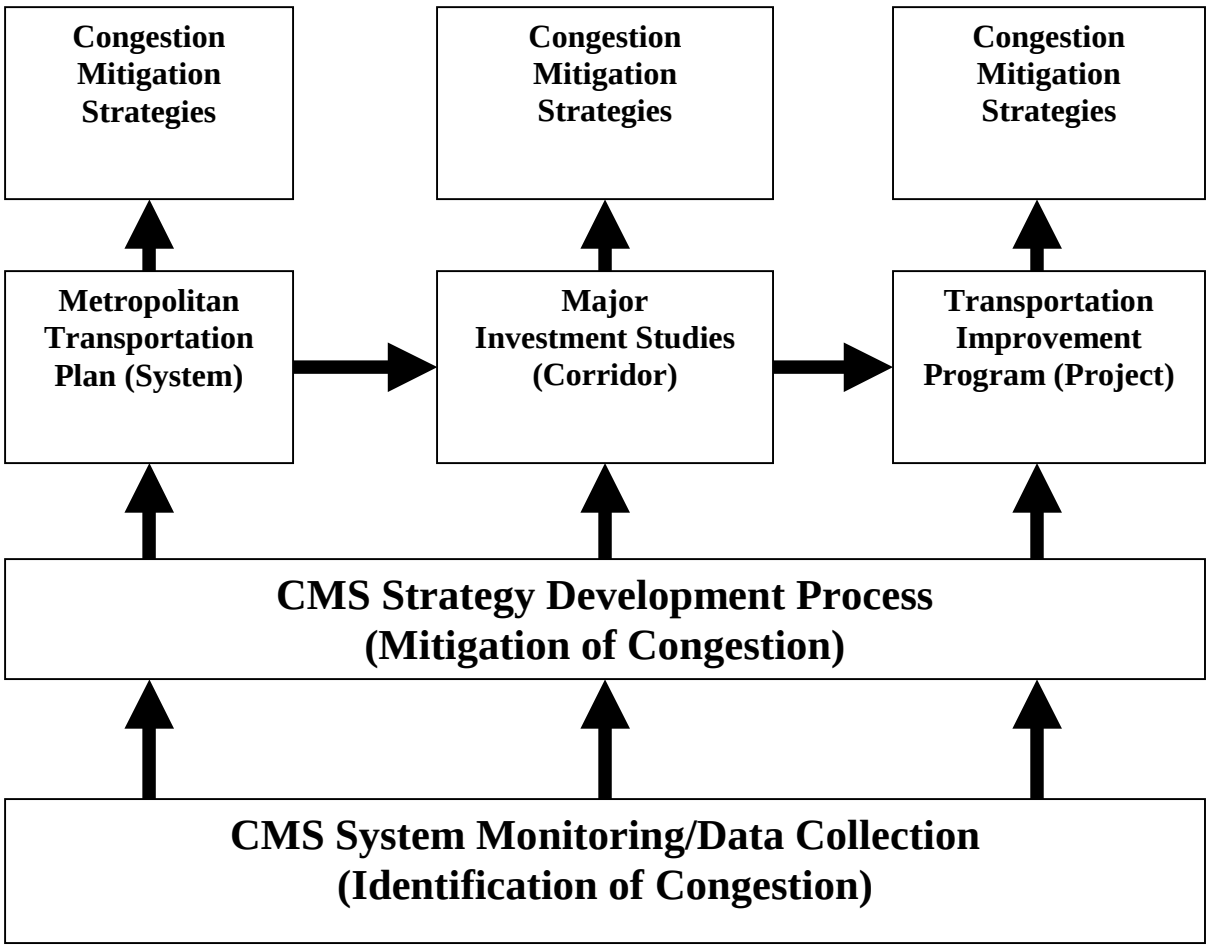


Figure 1. NCTCOG Congestion Management System: Foundation for Transportation Planning & Programming.

In the Mobility 2025 Update *(5)*, the plan development process includes projects which attain conformity as the highest priority (see Figure 2). Secondly, they ensure that maintenance funds are available. Third, CMS strategies including Transportation Systems Management, Transportation Demand Management, bicycle and pedestrian projects are funded. Next, if funds are still available, rail and bus and then HOV facilities are included. Finally, freeway/tollway and arterial capital projects are funded. There is no competition for the funds in this long range plan.

As decision makers go down the list, funds are dedicated to each project area. For example, since CMS projects are third down from the top, it is likely that these projects will be funded, whereas freeway projects may or may not receive funding since they are on the bottom of the priority list.

How do they report network conditions and performance?

Vehicular volume data is collected by the Texas Department of Transportation and local agencies on roadways of all functional classifications. This information is updated every five years and collected using pneumatic tubes. In addition, aerial photography is conducted every three years, with the baseline study completed in 1999 and 2000. It includes a timeslice of one-hour segments on freeways during the morning and evening peak travel periods. The findings highlight the locations of peak period traffic bottlenecks, identify heavy truck traffic corridors, and assess the impacts of congestion caused by incidents and accidents. With this information, they can determine the vehicle density which is then translated into level of service. The data will enable decision makers to compare long-term congestion trends and to evaluate the benefits of the transportation improvement strategies being implemented over the next few years.

Ms. Christie Jestis, Transportation Planner at NCTCOG, reported in a telephone conversation that they are currently piloting the use of archived data collected through their Intelligent Transportation Systems (ITS) efforts. Currently, this pilot is being conducted on principal arterials only. If specific projects are going to be completed, then before and after data collection may be conducted.

How are TDM measures evaluated and incorporated into projects?

As mentioned above, there is no competition for projects in the long-range plan. The short range Transportation Improvement Program projects, however, are ranked by criteria that exude the characteristics of a particular funding category.

Projects within each funding category are selected based on a fully competitive process, with an emphasis on public and local elected officials' involvement. Further, the selection of projects for funding centers on a technically based project selection and evaluation process. This selection process ensures that the most cost-effective projects are chosen when balanced against additional criteria deemed important to the region including air quality, mobility, financial commitment, and intermodalism.

The selection process includes cost-effectiveness (current and future), air quality/energy conservation, project commitment/local cost participation, and intermodal/multimodal/social mobility. The projects submitted for Surface Transportation Program-Metropolitan Mobility (STP-MM) funding consideration are analyzed on the basis of their cost-effectiveness (current and

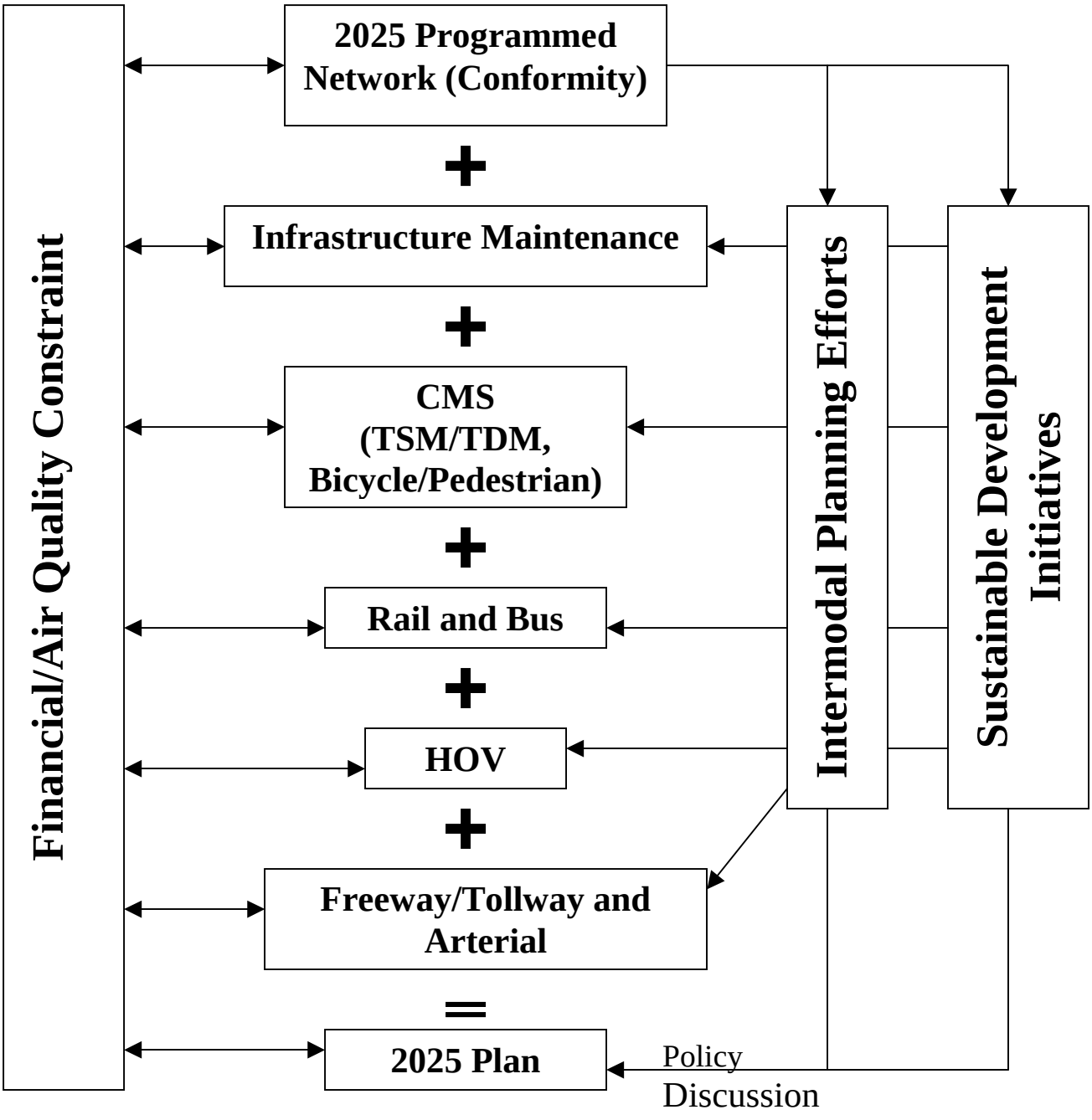


Figure 2. Mobility 2025 Update Plan Development Process.

future), air quality considerations, local funds available for the project, and whether the project encourages multiple-occupant vehicle travel. The Congestion Mitigation and Air Quality (CMAQ) Improvement Program is designated for areas that do not comply with the federal clean air standards. Projects submitted for the CMAQ program are evaluated based on their ability to reduce congestion and improve air quality in a cost-effective manner.

HOUSTON-GALVESTON AREA COUNCIL (H-GAC) – HOUSTON, TEXAS

The Houston-Galveston Area Council (H-GAC) is the MPO responsible for implementing the CMS in the Houston-Galveston Transportation Management Area (TMA). The TMA is a 13-county Gulf Coast Planning Region, an area of 12,500 square miles with almost 4.6 million people. The Environmental Protection Agency has designated the Houston-Galveston Area Council (H-GAC) TMA as a non-attainment area for ozone. According to the H-GAC website, there are 45 employees in the Transportation Planning section. Four of these persons work on the CMS. For the three year period covered by the 2002-04 Transportation Improvement Program, $3.5 billion is programmed for all capital projects, both roadway and transit projects *(6).*

How do they assess future congestion levels and how is it used in the CMS process?

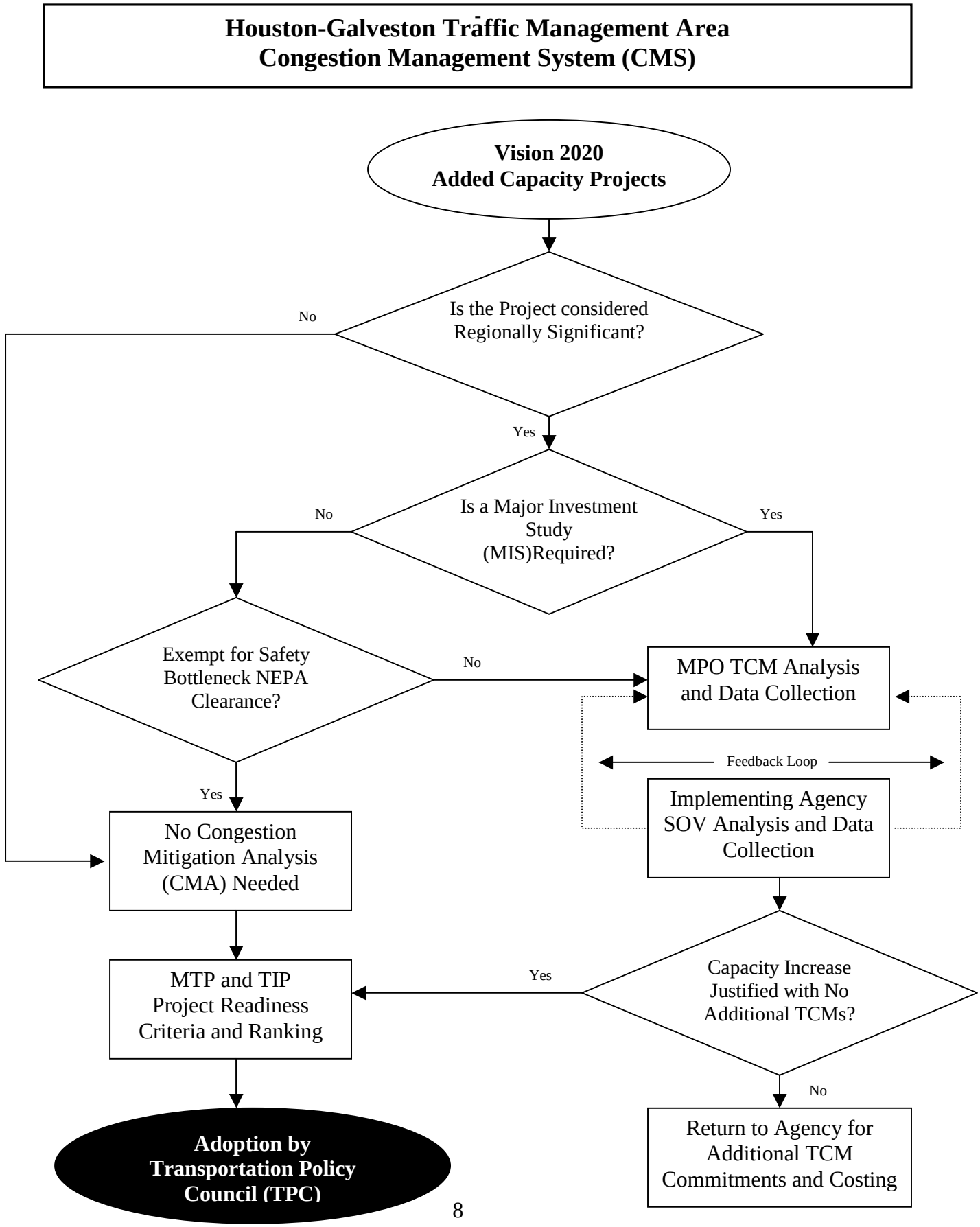
The H-GAC is currently updating the twenty-year Metropolitan Transportation Plan (MTP) for the Houston-Galveston region. The 2022 MTP is the latest approved 20-year plan *(7).* In this plan, a national econometric model (REMI) was used to test future development scenarios for the H-GAC region, including the sensitivity of regional growth to levels of transportation infrastructure development. The location of future demographic and economic growth in the eight-county area was also updated, as the distribution of population and employment determines travel patterns by establishing where many trips will originate and terminate. The location of persons and jobs also determine the preferred mode of travel. They included an evaluation of how the price of national crude oil would influence the economy and growth in the region thereby affecting the demand on the transportation infrastructure.

By 2022, vehicle miles traveled (VMT) is expected to reach 168 million miles on typical weekdays, an increase of 82 percent since 1990 *(7).*

How do they report network conditions and performance?

The analysis used for the CMS process is called the Congestion Mitigation Analysis (CMA). See Figure 3 for the flowchart of the CMA process *(8).* The existing and future congestion levels are estimated by calculating the existing and future level of mobility (LOM), which is basically the volume-to-capacity ratio (v/c ratio). During the CMA, the congestion level, estimated in terms of v/c ratio, is calculated using the Capacity Tables produced by H-GAC (Capacity Tables provide the adjusted capacity of the Roadway). Capacity Tables are based on typical Highway Capacity Manual (HCM) *(9)* factors and procedures for different facility and area types.

Figure 3. H-GAC Congestion Mitigation Analysis Process



The following data is determined in order to obtain the adjusted capacity of the roadway and perform the CMA using the Capacity Tables:

- Existing Twenty-Four Hour Traffic Volume
- Projected Twenty-four Hour Traffic Volume
- Roadway Type (Functional Classification)
- Area Type (Urban, Suburban, Rural, etc.)
- Percent Trucks
- Percent Left-Turns
- Number of Existing Lanes
- Peak Hour Factor
- Lane Utilization Factor
- Peak-Hour Directional Factors
- Traffic Signal Timing (Green/Cycle Length Ratio or G/C Ratio)

Added capacity is justified if the v/c ratio is equal to or greater than 0.85. In order to drive down the v/c ratio, they apply Transportation System Management (TSM) techniques. These include two categories: Transportation Control Management (TCM) where travel time data is collected and the Transportation Demand Management (TDM) where travel volume data is collected. They ask the project sponsors to improve traffic signal timing and synchronization and/or implement ITS technologies, and if they still have a ratio that is too high, then it is included in the TIP.

Traffic data is collected on the particular section of the road for which a project is being done. The volume data is collected by consultants for their congestion mitigation analysis. Consultants are also contracted to conduct travel time runs before and after projects are constructed and is done during the same time of the traffic volume data collection. This information is put into vehicle volume per lane for comparison purposes. Before and after studies are only done when the project includes traffic control measures (including traffic signal, changeable message signs or other ITS) or is a Transportation System Management project. Roadways are included in the CMS network if they are classified as major arterials or higher classification in the urban area. In rural areas, minor arterials and higher are included in the CMS network. If, however, an environmental assessment was completed before April 1993 and the project has a finding of no significant impact (FONSI), then it is waived from the CMS process. Congestion Mitigation Analyses do not have to be completed on these projects.

Region-wide data collection for the purposes of monitoring only is not conducted. However, a new system is planned called the Regional Computerized Traffic System (RCTS). This system will control the traffic signals from a remote location – the Transportation Management Center. A pilot project of these remote controlled signals began in 1998. To date, 48 intersections have been linked to the center. Simulations have been conducted on these intersections where SynchroPro was used for the data input and SimTraffic was used for the actual analysis. In an effort to calibrate the system, traffic time runs are being completed and compared to the simulations. If this pilot study is successful, then they plan to remotely connect the 1500 signals in the region.

Presently, the CMS Plan is used to perform added-capacity project level analysis, rather than a network analysis. Analysis is done on the candidate TIP roadway projects that increase capacity. Presently, work is underway to explore the option of using micro-simulation analysis for future corridor congestion and air quality analysis.

How are TDM measures evaluated and incorporated into projects?

Since the H-GAC region is in non-attainment for air quality, all capacity increasing projects in the Transportation Improvement Program (TIP) must have a CMA. Exceptions to this rule are if the project has been waived from the requirement of the CMS Plan for not being significant or if it is not in the CMS network. For all of the regionally significant added-capacity roadway projects, which are candidates for the upcoming TIP, the existing traffic volume is collected in the field using tube counters.

The stated policy of the CMS plan is to apply cost-effective demand and system management measures as the first component of all congestion reduction strategies *(8).* By using the computer package TCM Analysis Toolbox developed for the Houston-Galveston Region, the congestion mitigation impacts resulting in effective trip reduction are evaluated. Regionally significant added capacity roadway projects are justified only if cost-effective demand management and system management strategies fail to reduce vehicular congestion to acceptable levels (v/c ratio less than 0.85). All of the TCM/TDM projects that have cumulative impact of more than 1 percent on the congestion mitigation (v/c ratio) on an added-capacity project are considered to be significant. As such, the implementing agency has to commit to their implementation by issuing a Letter of Commitment.

The Houston-Galveston Area Council is also charged with tracking and evaluating TCM/TDM measures selected for implementation in conjunction with the added-capacity projects. They require confirmation of commitment and the expected operational date of each TCM/TDM project being implemented with the added-capacity project. For all significant TCM/TDM measures, the H-GAC collects the "before implementation" traffic data (signal timing, travel time, classification counts, etc., as applicable). Reporting the post-implementation evaluation of the TCM/TDM commitments is also the responsibility of the H-GAC.

SAN ANTONIO-BEXAR COUNTY METROPOLITAN PLANNING ORGANIZATION – SAN ANTONIO, TEXAS

The San Antonio Metropolitan Statistical Area (MSA) is the largest MSA in the United States that is in attainment of air quality standards. Although San Antonio ranks as one of the least congested cities compared to other major American Cities, there are locations in the area which experience traffic delays and are perceived as congested. These congested areas are major contributors to the air quality concerns and to the overall efficiency of the area wide transportation system. With non-attainment of air quality standards rapidly becoming a real possibility for this area, congestion management strategies and transportation control measures must be applied effectively toward relieving a substantial portion of these concerns.

The estimated 2000 population of the San Antonio-Bexar County MPO region was 1,505,759. San Antonio and Bexar County receive over a hundred million dollars annually in federal and state transportation funding. This is accomplished primarily through three related activities - the Metropolitan Transportation Plan (MTP), the Transportation Improvement Program (TIP), and the Unified Planning Work Program (UPWP). Eight persons are on staff at the San Antonio-Bexar County MPO. In addition to their Transportation Steering Committee (TSC) which is the policy

body, they have a Technical Advisory Committee who is responsible for reviewing the planning activities of the MPO. The Bicycle Mobility Task Force (BMTF) and the Pedestrian Mobility Task Force (PMTF) advises the MPO Transportation Steering Committee on bicycling and pedestrian issues for the metropolitan area *(10).*

Two essential components of the Congestion Management System are: (1) Monitoring Program and (2) Assessment Process. The Monitoring Program is designed "for data collection and system performance monitoring to define the extent and duration of congestion, to help determine the causes of congestion, and to evaluate the efficiency and effectiveness of implemented actions." The assessment process is designed "for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures" *(11).*

How do they assess future congestion levels and how is it used in the CMS process?

According to Ms. Jeanne Geiger, Senior Transportation Planner with the MPO, the Congestion Management System was developed running 2025 trip tables on the 1995 travel demand model network. In 1995, vehicle occupancy counts and travel time data were collected manually. Volume-to-capacity ratios are used to predict congested corridors from the 2025 vehicle trip table to assigned 1995 network. Those roadways with v/c >1.0 are in the congestion management system.

How do they report network conditions and performance?

Existing traffic congestion within the study area has been locally defined as any functionally classified roadway that has a volume over capacity ratio (v/c) of greater than 1.0. A congested corridor is defined as an area one fourth of a mile wide on each side of an identified congested facility for the length of that facility. This one-half mile wide corridor can be considered as the area of influence along a particular congested roadway in terms of intersecting streets.

In the future, the MPO staff are looking to ITS technology to assist in the volume of data that is collected. The Texas Department of Transportation's (TxDOT) "smart highway" project called TransGuide became operational on July 26, 1995. TransGuide, an Intelligent Transportation System, was designed to provide information to motorists about traffic conditions, such as accidents, congestion, and construction. With the use of cameras, message signs, and fiber optics, TransGuide can detect travel times and respond rapidly to accidents and emergencies. Partners in the TransGuide project include TxDOT, the City of San Antonio (police/fire/EMS/traffic), and VIA Metropolitan Transit. Currently, the TransGuide system covers 72 miles of San Antonio highways. The goal is to cover 289 miles of highways. The website (www.transguide.dot.state.tx.us) is available for more information about the system. From the TransGuide system, the MPO will be able to get travel time data and spot speeds on six major congested freeways and seven arterial roadways.

How are TDM measures evaluated and incorporated into projects?

The San Antonio-Bexar County MPOs Congestion Mitigation Program includes six steps. They are as follows:

1. Establish initial program inventory.
2. Establish strategy performance effectiveness measures to be used in assessment process.
3. Interview key personnel representing agencies responsible for implementation of strategies.
4. Identify status of each selected strategy as of the end of each fiscal year.
5. Outline proposed work and anticipated results for the next fiscal year.
6. Identify issues and problems associated with each strategy.

As the data is updated and there is an indication that congestion is continuing to increase along a particular corridor, research is initiated to find out why. The database identifies the strategies applied to the corridor and the strategies are examined to determine if one or more is ineffective or if the increase in congestion is due to a changing situation or unique circumstance. If it is failure of strategy, then the situation is investigated to ascertain whether the strategy (or strategies) is inappropriate for that corridor of if they are not being properly implemented.

The Congestion Management Element of the Mobility 2025 MTP report includes two groups of strategies: Transportation System Management Strategies and Transportation System Investment Strategies. Corridor improvements fall under the System Investment Strategies and include: 1) capacity improvements (55.8 percent of funds targeted), 2) preservation improvements, consisting of operational and rehabilitation improvements (37.8 percent of funds targeted), 3) bicycle facilities (3.2 percent of the funds targeted), and 4) pedestrian facilities (3.2 percent of funds targeted). These are the projects that go into the Transportation Improvement Program (TIP). Each type of improvement makes up the projects funded through the Surface Transportation Program – Metropolitan Mobility (STP-MM) and is evaluated following a point system *(12),* as shown below:

- Added capacity projects – 40 percent of the project score is for existing and projected congestion levels based on 2025 conditions and inclusion of the project/corridor in the CMS, 20 percent of the project score is based on project cost/VMT, 10 percent safety benefit, 10 percent transit usage, 10 percent gap completion, and 10 percent critical intersection

- Preservation – rehabilitation projects – 40 percent of the project score is based on existing pavement conditions, 20 percent project cost/VMT, 10 percent safety benefit, 10 percent transit usage, 10 percent operational improvement, 5 percent projected year 2025 VMT, and 5 percent gap completion

- Preservation – operational improvement projects – 40 percent of the project score is based on operational improvement, 25 percent project cost/VMT, 20 percent safety benefit, 5 percent transit usage, 5 percent projected year 2025 VMT, and 5 percent existing pavement condition

- Bicycle projects – 50 percent of the project score is based on mobility and access, and 50 percent bicycle level of service

- Pedestrian projects – 25 percent of the project score is based on the safety benefit, 20 percent connectivity, 20 percent functionality, 20 percent intermodality, 10 percent project cost/VMT, and 5 percent on projected year 2025 traffic volumes

In addition, bonus points are added to roadway projects that include either bicycle or pedestrian facilities, or both – five points for bicycle and five points for pedestrian facilities.

HILDALGO COUNTY MPO - MCALLEN, TEXAS

Located within the southern tip of the State of Texas, Hidalgo County is adjacent to the international border with Mexico. The Hidalgo County Metropolitan Area is the 6th largest in the state, with an estimated population of over 500,000 and the fourth largest on the U.S. – Mexican border. The Hidalgo County MPO (sometimes known as the Lower Rio Grande Valley Development Council) is currently in attainment under all categories of the National Ambient Air quality Standards, according to the EPA classification. The FY 02-04 Transportation Improvement Plan includes $200 million in programmed funds *(13).*

How do they assess future congestion levels and how is this information used in the CMS process?

The Hidalgo MPO uses TransCAD to estimate future traffic volume and levels of service. They use the information gathered through the CMS to provide input to the transportation planning process for consideration at a system level.

How do they report network conditions and performance?

The congestion analysis is performed by comparing the free flow speed to average travel speed. Travel time runs are conducted once a year during morning and evening peak hours using GPS technology and averaged in order to calculate this average travel speed. The system includes 54 different roadways comprising 500 miles of roadway in the county. Hidalgo County MPO uses summary levels to understand the congestion that occurs. The summary levels are classified as congested, stable or free flow. They are then scored as 1, 0, or –1 (where 1 equals congested, 0 equals stable, and –1 equals free flow). Each corridor's score is then multiplied by that corridor's length in order to create weighted results. Finally, the weighted mean overall MPO network value is obtained by dividing the sum of the weighted scores for all corridors by the total length of the corridors. Level of service is determined based upon the average travel speed over the arterial segment being considered. A Congestion Management System Report is done each year to identify problem areas using travel time studies and to prepare recommendations to improve the traffic flow on the transportation system as a whole and on specific corridors. The results of this study are used as factors in prioritizing needed improvements *(14).*

How are TDM measures evaluated and incorporated into projects?

Projects are evaluated using the following criteria to prioritize *(13):*

Criterion A.	Cost Effectiveness (cost/vehicle mile)	30 points
Criterion B.	Safety Index (accidents/vehicle mile)	15 points
Criterion C.	Existing Pavement Condition	15 points
Criterion D.	Local Participation	10 points
Criterion E.	Environmental	10 points
Criterion F.	Adjacent land development/connective	5 points
Criterion G.	Project R.O.W. Status	5 points
Criterion H.	International Border Crossing/Intermodal Terminal	10 points
	Total possible	100 points

According to Mr. Edward Molitor, Transportation Planning Director of the Lower Rio Grande Valley Development Council, the MPO has not done any TDM projects. If they were to consider TDM projects, they would analyze them with the same criteria as shown above. However, on their website, the MPO does encourage demand reduction activities in order to contribute to cleaner air.

CORPUS CHRISTI METROPOLITAN PLANNING ORGANIZATION – CORPUS CHRISTI, TEXAS

The Corpus Christi Metropolitan Area includes the urbanized areas of the City of Corpus Christi and the City of Portland and parts of rural areas of Nueces and San Patricio Counties. As an area that is in attainment for air quality, the Corpus Christi MPO is trying to prevent congestion from occurring. The 1996 population of the urbanized area was 289,500. Growth has been slow during recent years (less than 0.5 percent per year). However, there has been an increase in drive-alone trips (approximately 13 percent since 1964) *(15).* According to Mr. Muhammad Amin Ulkarim, Transportation Planning Director at the MPO, because they are still in attainment, they have still not implemented much. They are, however, creating a subcommittee for transportation control measures.

The City of Corpus Christi is designated as the Metropolitan Planning Organization for the Corpus Christi Urbanized Area, with the Corpus Christi Transportation Planning Committee serving as the Policy Committee. The MPO has a two-committee organizational structure. The Transportation Policy Committee (with seven voting members) is at the top of the organization and provides policy guidelines and approves the work of the Technical Advisory Committee. The Technical Advisory Committee (also with seven voting members) provides technical support and direction necessary in the transportation planning process. They are appointed by the Transportation Policy Committee for their technical expertise in transportation planning. The MPO has established the Congestion Management System Committee (CMC) comprising of all the members of the Technical Advisory Committee. CMC is responsible for preparing and implementing the Congested Management System Program. The MPO staff assists this committee *(15).* The MPO includes three full-time professional, one para-professional, and one administrative person. Additional clerical and professional support staff is drawn from the City of Corpus Christi *(16).*

The citizens' involvement is vital in the success of transportation planning. The MPO staff is continuously involved in enhancing the public role in transportation planning. The MPO staff holds meetings to interact with the public in an informal environment. The citizens are informed of the MPO plans and activities through public notices, advertisements, newsletters, brochures, press releases, and radio and TV announcements.

The Surface Transportation Program apportionment for the Corpus Christi urbanized area for fiscal year 2000 was $5.4 million.

How do they assess future congestion levels and how is this information used in the CMS process?

Population forms the basis of estimating trips. For accurate simulation of existing demand, demographic information is compiled for a reasonable size unit called the Traffic Analysis Zone (TAZ). An in-depth analysis of demographic trends is done to estimate the base year and the future years' trip generation to estimate the transportation system needs for the future. Land use and socio-economic information directly affecting traffic generation is put into the model. Model refinements allow the MPO and the Planning and Programming Division of the Texas Department of Transportation to review the trip generation, trip attraction, and trip distribution tables before executing all or nothing and capacity restraint assignments. They calibrate the base year model showing existing network and traffic volume matching the traffic counts, and forecast traffic volume for the future year transportation network. Texas DOT, Transportation Planning and Programming Division, is the agency that completes the travel demand model with the MPO providing the classification, vehicle volume counts, population, and other data.

The Travel Demand Model provides data that will help public officials and the MPO to make decisions on which projects and road improvements should be developed in the area, not only a long term, but also a short term for the Transportation Improvement Program *(16).* The MPO updates the population, employment and network data every five years to facilitate the decision making process and the public's understanding of the transportation infrastructure development process.

They are trying to better analyze land use patterns and manage growth through current land use data. They have allocated funds for the City of Corpus Christi to collect and store land use data.

How do they report network conditions and performance?

The Corpus Christi MPO just started doing a study where they collect travel time data at selected points on major arterials every two years. Travel time is collected using the "floating car" method to make five runs in each direction of the sample segment during the two peak time periods. The two-person operation requires stopwatches, data collection forms, clipboards, and a test vehicle. In the report, "Travel Time and Delay Study", they indicate that approximately one-half of the principal arterial streets and one-third of the minor arterial streets are experiencing free flow conditions *(17).* Free flow speed can be defined as average desired speed of all drivers on that street segment. Travel speed and stopped delay are the performance measures used to understand the traffic conditions.

The speed and travel time information collected during the travel time runs will be compared to the data collected two years previously. This information will enable them to understand how the congestion levels are changing. Traffic volume data is collected on the segments of streets under study. They have not yet applied the results of these studies to evaluate projects, but intend to do so in the future.

How are TDM measures evaluated and incorporated into projects?

The congestion levels determined through the traffic volume, operational speed and delay are used to provide TDM and TSM solutions to the problems.

In order to be included in the TIP, potential projects must go through the process illustrated in the flow chart in Figure 4 *(18).* There are many opportunities for public participation. According to Mr. Ulkarim, the TIP process shown in the flow chart has not successfully occurred. For instance, there is some reluctance on the part of the City of Corpus Christi staff as to the necessity to complete an alternative mode analysis for projects. Therefore, this step has never been conducted. The MPO is urging the City to take a lead role in the TIP development process.

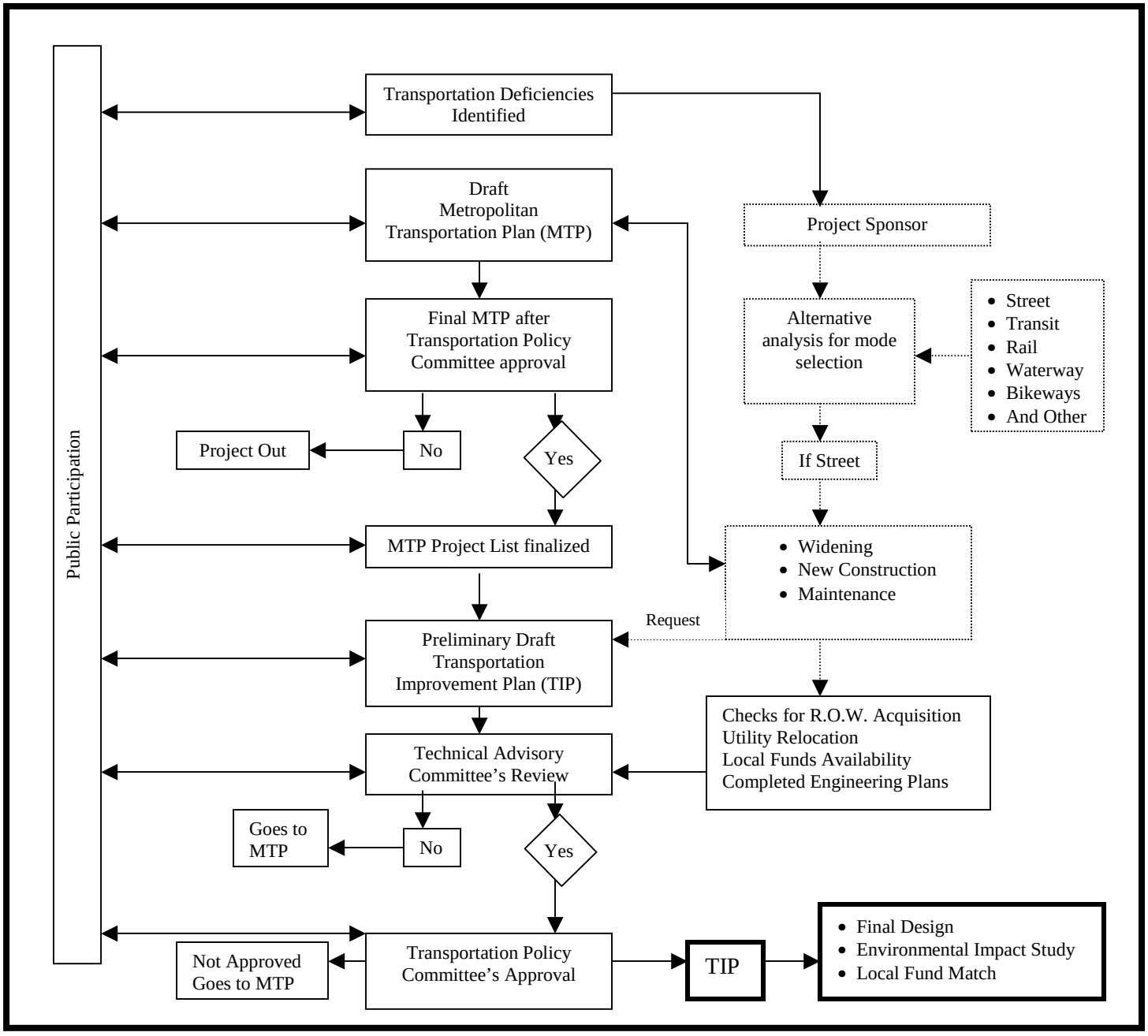


Figure 4. Corpus Christi MPO TIP Process.

BAY AREA METROPOLITAN TRANSPORTATION COMMISSION (MTC) - SAN FRANCISCO, CALIFORNIA

The Bay Region embraces nine counties and 100 cities. Over 6 million people reside within its 7000 square miles. There are approximately 130 employees in the Bay Area MTC. The budget for transportation expenditures during fiscal year 2000-2001 was $57 million *(19).* The Environmental Protection Agency designated the Bay Area as non-attainment for ozone.

The region MTC serves is unique in that there are eight primary public transit systems as well as numerous other local transit operators, which together carry an average weekday ridership of about 1.5 million. The combined annual operating budget of the transit agencies is over $1 billion, placing this region among the top transit operating budgets in the nation. In addition, there are numerous specialized services for elderly and disabled travelers, some 18,000 miles of local streets and roads, 1400 miles of highways, six public ports and five commercial airports.

How do they assess future congestion levels and how is this information used in the CMS process?

The Bay Area forecasts the trips that residents and commuters will take at regional, county and superdistrict levels. It is supplemented by the Vehicle Ownership Forecasts. Both of these reports are based on MTC travel models and the Association of Bay Area Governments' (ABAG) Projections '98. The auto ownership model uses demographic data provided by ABAG to produce estimates of households by vehicles in the household and by number of workers in the household. Travel demand is forecasted using BAYCAST-90 (San Francisco Bay Area travel demand model system), which was developed by the MTC *(20).*

How do they report network conditions and performance?

Performance measures play a vital role in the planning process in the Bay Area. As a new feature of the 2001 Regional Transportation Plan (RTP), the Metropolitan Transportation Commission completed and adopted the Performance Measures Report in August 2001 *(20).* Performance measurement is viewed as a tool to inform investment decisions and increase accountability for these decisions. Current efforts also place greater emphasis on making performance data accessible to the public, through readily understood measures.

For the 2001 RTP, they have selected performance measures in five different categories: mobility, safety, economic vitality, community vitality, the environment, and equity. Travel time and accessibility to jobs and shopping opportunities make up the mobility performance measure category. They determine the aggregate travel time and travel time distribution as well as the travel time between selected origins and destinations. Also identified in this performance measure report is the need for testing additional measures including person trips in the peak period and economic efficiency measured as a net discounted benefit, accounting for the value of travel time as well as user costs and public expenditures.

Although they do not currently have a monitoring program to gauge how the existing transportation system is performing, they recognize the need and have begun the process of developing such a program.

How are TDM measures evaluated and incorporated into projects?

The process by which a project is selected for programming in the TIP depends on the type of project, and the specific funding source being sought. The MTC passed resolutions describing the selection processes. One of these resolutions pertains to the STP/CMAQ funding category. Over $314 million is available for STP/CMAQ projects. Included in this amount is $53 million for Corridor Management projects and is further divided by county according to the county population. The resolution includes a list of eligible corridor management strategies such as HOV lane improvements, park and ride lots, real-time traveler information, traffic management centers, bike racks on transit, and weigh-in motion projects. Safety strategies also compete for funding in the corridor management track and can include low cost safety improvements on highways and arterials, intersection enforcement, pedestrian crossings and crossing protection and railroad crossing protection devices.

The resolution states that to the extent possible TCMs should be given priority for CMAQ funding. In addition, they urge congestion management agencies to consider regional interests such as: 1) projects that enhance goods movement; 2) priority strategies included in the MTS Arterial Management Strategy; and 3) multi-jurisdictional and multi-modal projects that enable seamless operation of the transportation system *(21).*

METRO - PORTLAND, OREGON

Metro serves 1.3 million people who live in Clackamas, Multnomah and Washington counties and the 24 cities in the Portland metropolitan area. Metro provides transportation and land-use planning services and oversees regional garbage disposal and recycling and waste reduction programs. It manages regional parks and green spaces and the Oregon Zoo. Metro oversees operation of the Oregon Convention Center, the Civic Stadium, the Portland Center for the Performing Arts, and the Portland Metropolitan Exposition Center, all managed by the Metropolitan Exposition-Recreation Commission. The organizational structure includes six departments: Transportation, Growth Management Services, Regional Environmental Management, Regional Parks and Greenspaces, Administrative Services and the Zoo. The Transportation and Growth Management Services Departments have recently merged to form the Planning Department.

Metro has the responsibility of providing long-range regional growth management and transportation planning in the tri-county metropolitan area. Local governments carry out local planning functions such as zoning, permitting, and local street and neighborhood design. Metro assures that local planning is coordinated throughout the metropolitan area in order to protect air quality, address traffic congestion and protect farm and forest lands outside the urban growth boundary, as required by state law *(22).* Their 2040 Growth Concept directs most new development to mixed-use centers with higher densities of development and along existing major transportation corridors *(23).*

Metro is governed by an executive officer, elected regionwide, and a seven-member council elected by districts. An auditor, also elected regionwide, reviews Metro's operations. There are

currently 688 full time equivalents employed at Metro. For FY 2001-02 Metro had a budget of $414 million.

Portland is currently designated a maintenance area for the National Ambient Air Quality Standards (NAAQS) for ozone and carbon monoxide under the Clean Air Act Amendments of 1990.

How do they assess future congestion levels and how is this information used in the CMS process?

The 2000 Regional Transportation Plan (RTP) is a 20-year plan, with a 2020 forecast developed from 1994 base data. Metro produced an updated 2020 forecast that accounts for urban reserve actions, and estimates the amount of jobs and housing expected in urban reserves in 2020. They update the 2020 population and employment allocations periodically to reflect local and regional land-use decisions. For example, changes to the 2020 population and employment allocations could result if an urban reserve area is reduced in size or taken out altogether if the urban growth boundary is expanded or if local zoning capacity is amended to increase or decrease. Using the 2040 Growth Concept, population and employment is expected to increase by 46 percent and 68 percent respectively between 1994 and 2020 within the urban growth boundary *(23).*

A financial analysis completed in the 2000 RTP indicates a dramatic shortfall in the region's ability to fund the 2020 Preferred system identified, with needed improvements costing more than three times the current revenue projections. The shortfall could affect all aspects of the regional transportation system, in particular limiting the region's ability to expand existing roadways, transit service as well as adequately serve the region's pedestrian, bicycle and freight needs. Therefore, METRO has developed the 2020 Priority System which is a statement of the highest priority need, given current transportation funding constraints, which includes a modest increase of existing resources.

At the regional level, TDM reductions to non-SOV trips are assumed in their travel forecasting. TDM policies are regional in nature, however local transportation system plans are required to identify how they will make progress toward meeting the TDM assumptions used in the regional traffic model.

How do they report network conditions and performance?

In the 2000 RTP, Metro lays out a new way of evaluating traffic congestion and its impact on community livability. They have established regional motor vehicle performance measures of level of service. Acceptable thresholds and operating standards vary by roadway classification and by time of day. In addition, there is a performance measure named Areas of Special Concern which is used for mixed use developments and are characterized by physical, environmental or other constraints that limit the range of acceptable transportation solutions for addressing a level-of-service need, but where alternative routes for regional through-traffic are provided. In these areas, substitute performance measures are allowed *(23).*

Traffic volume counts are collected every two years on even number years by the five jurisdictions in the Metro Area (Clackamas, Multnomah, and Washington Counties; the City of Portland, and

the Oregon DOT) and submitted to METRO. The data is mainly used to calibrate the model and is called the "Cutline Traffic Count Program."

How are TDM measures evaluated and incorporated into projects?

Once a transportation need has been established, an appropriate transportation strategy or solution is identified through a two-phased process. The first phase is system-level planning, where a number of transportation alternatives are considered over a large geographic area such as a corridor or local planning area, or through a local or regional Transportation System Plan (TSP). The purpose of the system-level planning step is to:

- Consider alternative modes, corridors, and strategies to address identified needs
- Determine a recommended set of transportation projects, actions, or strategies and the appropriate modes and corridors to address identified needs in the system-level study area.

After a project has been incorporated in the RTP, it is the responsibility of the local sponsoring jurisdiction to determine the details of the project and reach a decision on whether to build the improvement based upon detailed environmental impact analysis and findings demonstrating consistency with applicable comprehensive plans. If this process results in a decision not to build the project, the RTP will be amended to delete the recommended improvement and an alternative must be identified to address the original transportation need.

A process is in place for ranking projects by transportation mode (see Figure 5). After projects are ranked, they are reviewed at a series of public workshops and hearings held throughout the region. Transportation Demand Management (TDM) measures are included in the ranking process and given a higher range of points than roadway, pedestrian, and bicycle projects *(24).* However, CMS actions are required on a concurrent basis, rather than once the plan-year system is in place. Mr. Bill Barber, on staff at Metro, indicated that they are making changes to the criteria for the next selection round which will be incorporated into their next MTIP update.

The most recent funding package broke new ground in Metro's objective of creating strong linkages between planned land-uses and the allocation of transportation funding.

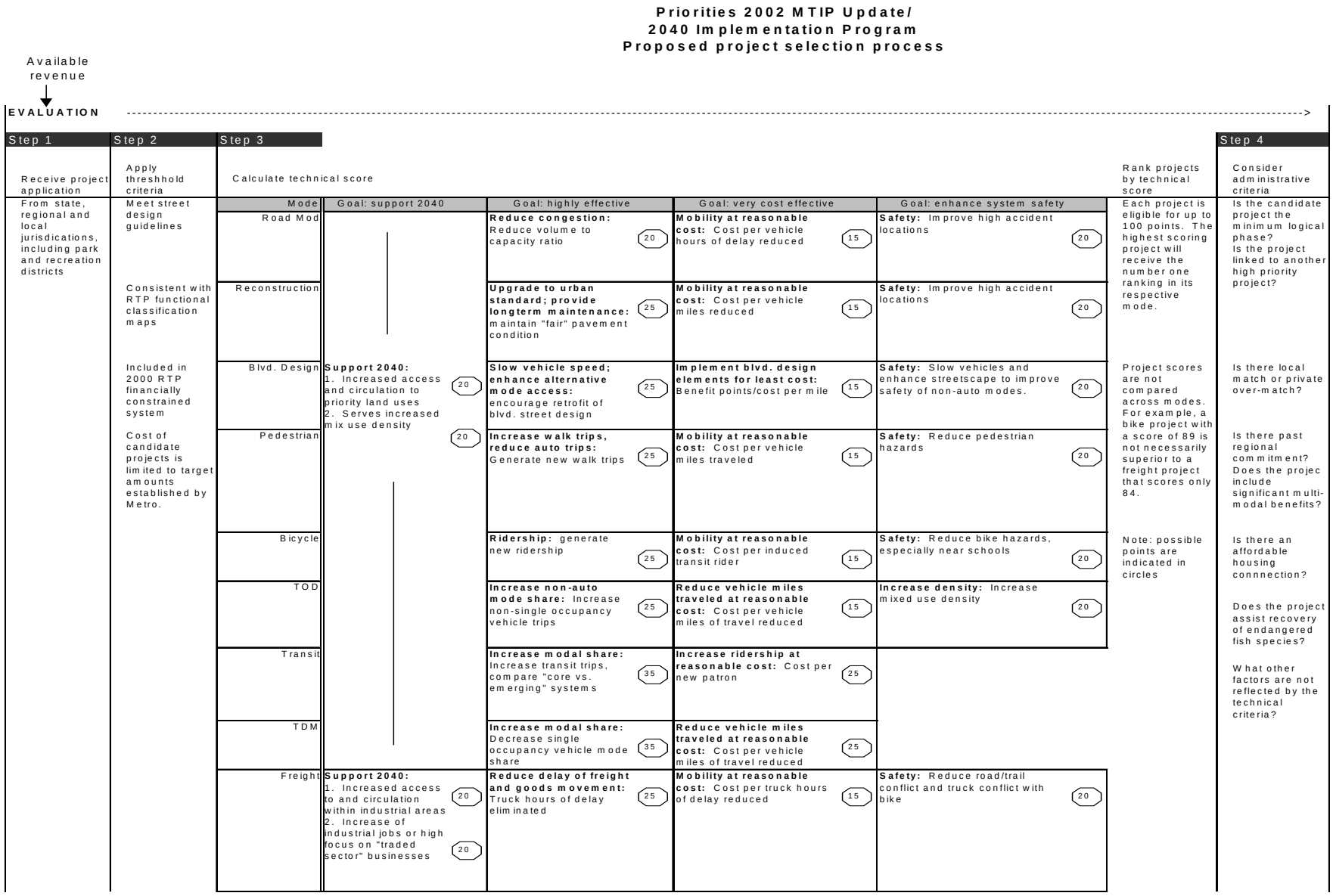


Figure 5. Priorities 2002 MTIP Update/2040 Implementation Program, Proposed Project Selection Process.

CAPITAL DISTRICT TRANSPORTATION COMMITTEE - ALBANY, NEW YORK

The Capital District Transportation Committee (CDTC) area is classified as marginal non-attainment for ozone. As the capital of New York, Albany and its surrounding metropolitan area have a population of over 800,000. The existing commitments of the FY 2001-06 TIP totaled $447 million in matched federal-aid from Federal Highway Administration fund sources. As of October 2000, the CDTC employed 12 persons. Mr. Chris O'Neill, CDTC Senior Transportation Planner, indicates that the CDTC is currently struggling with their project selection process. On a phone interview, he said that forecasting a future congestion problem is not enough to justify a capacity increasing project. If the roadway is classified as a critical congestion corridor in the current year, then capacity should be added. Agencies are taking the position of designing projects for additional capacity in order to meet a LOS C classification in 2025. This approach, according to Mr. O'Neill, is not consistent with the philosophy of the CDTC. Consequently, the CDTC is revisiting some of their policies and meeting with agencies to develop new guidelines.

In addition to the Policy Board, the CDTC has a planning committee and several task forces. These include the Demographics and Growth Futures Task Force, Transit Futures Task Force, Special Transportation Needs Task Force, Infrastructure Task Force, Goods Movement Task Force, Expressway Management Task Force, Arterial Corridor Management Task Force, Bicycle and Pedestrian Issues Task Force, and Urban Issues Task Force. Each of these task forces have CDTC staff liaison *(25).*

How do they assess future congestion levels and how is this information used in the CMS process?

Travel forecasts were developed for the years 2000, 2015, and 2021 using the CDTC Systematic Traffic Evaluation and Planning (STEP) Model. For the 2021 plan update, traffic counts throughout the 1990's were reviewed and compared with STEP Model estimates. The STEP Model forecast an average annual growth rate of 2.5 percent for the 1990's for PM peak hour VMT. For the first eight years of the decade, daily VMT on the State touring routes increased at an average annual rate of 1.9 percent. Over the past 20 years, the cost of fuel per mile dropped 40 percent, single occupant commuting increased 86 percent and carpooling declined by 32 percent *(26).*

Unfortunately, an assessment of the delay projections during the last ten years indicates that the expected delay has not been realized. The CDTC is currently trying to understand why the forecast has not been accurate. They are transitioning to a new model which is expected to give them some answers.

How do they report network conditions and performance?

The CDTC collects traffic volumes on freeways and arterials every three years. Some freeway sections have continuous counters operated by the New York State Department of Transportation and forwarded to the CDTC. The Capital District Transportation Authority (CDTA) has implemented a full passenger count monitoring program, giving ridership levels by route, location and bus trip. In addition, the CDTC recognizes the need for auto occupancy data in order to understand the effectiveness of TDM strategies. Currently they extract auto occupancy data from the Department of Motor vehicles traffic accident data files *(27).*

The CDTC uses delay values to quantify congestion on their roadways. Travel time runs are completed in order to obtain this delay information. Excess delay values are determined by calculating the difference between the existing delay (those classified as LOS E and F only) and acceptable delay (LOS D). Table 1 below indicates the thresholds for excess delay that CDTC currently uses *(27).*

Table 1. Excess Delay Thresholds.

Excess Delay Thresholds	
Facility Type	**Excess Delay Threshold**
Intersection	40 seconds stopped delay
Freeway	1500 vehicles/lane, one direction/hour
Multi-lane Arterial with median	1400 vehicles/lane, one direction/hour
Multi-lane Arterial without median	1250 vehicles/lane, one direction/hour
Two-lane Arterial and collector	1000 vehicles/direction/hour
Local (residential) road	625 vehicles/direction/hour

If the roadway is a critical congestion corridor where relatively high levels of excess delay exist compared to other roadways in the region, then projects increasing capacity may be warranted. Additional thresholds exist if a roadway is experiencing significantly greater congestion than typical, as seen below in Table 2 *(27).*

Table 2. Thresholds for Significant or Critical Status.

Magnitude of PM Peak Hr Excess Delay		**Severity of PM Peak Hr Excess Delay**	
Magnitude	Qualifications	Severity	Qualifications
0	0.0 hours excess delay	0	0.0 excess delay/1000 pmt
1	0.1 - 29.9 hours	1	0.1 – 2.4 excess hours/1000 pmt
2	30.0 – 59.9 hours	2	2.5 – 4.9 excess hours/1000 pmt
3	60.0 – 199.9 hours	3	5.0 – 9.9 excess hours/1000 pmt
4	200 or more hours	4	10.0 or more hours/1000 pmt
A value of 2 rates as significant. A value of 3 or 4 rates as critical.		A value of 2 rates as significant. A value of 3 or 4 rates as critical. Minimum of 2000 PM peak hour vehicle miles of travel pmt = person miles of travel	

How are TDM measures evaluated and incorporated into projects?

According to The Metropolitan Congestion Management System, one of the primary goals of the CDTC is to avoid and mitigate congestion on all modes by implementing demand management programs first, before performing capacity expansions. In addition to TDM measures, they stress the need to look at ITS, TSM, land use and other possibilities prior to adding capacity.

Candidate projects for the TIP are widely sought from all units of government, interested parties and a general call to the public. The intent of this outreach and open TIP development process is to assure that the pool of candidate projects is robust and includes innovative proposals. All projects go through a screening process to meet three requirements: consistency with the long range plan and the CMS component of the long range plan, local land use management, the plans of adjacent jurisdictions and the ISTEA mandated factors; financial reasonableness; and project

specific eligibility and justification. The evaluation process includes two significant features relating to the congestion management system *(27):*

a. The evaluation process includes quantitative measurement of mobility and infrastructure projects. Measurement includes ten-year forecasts of excess delay reductions; cost-effectiveness of excess delay reductions; emission reductions; cost-effectiveness of emission reductions; travel time, safety and operating cost impacts; and overall benefit-to-cost ratio. This process has in the past led to the recognition of the cost-effectiveness of several demand management and systems management actions.

b. The programming decision is based upon a fact sheet containing narrative descriptions of project effects on such factors as access to public transportation, provision of alternative modes, system continuity and consistency with land use plans.

The TIP process includes an attempt to balance the program by geographic area, mode and project type.

NORTHWEST LOUISIANA COUNCIL OF GOVERNMENTS - SHREVEPORT, LOUISIANA

Shreveport's Northwest Louisiana Council of Governments (NLCOG) serves the Caddo-Bossier Metropolitan Planning Area. The transportation study includes the urbanized area of Shreveport, Bossier City, Caddo Parish and Bossier Parish. There are 10 persons employed by NLCOG. The Caddo-Bossier Metropolitan Planning Area is currently designated as in attainment for Mobil Source Emissions and therefore is not subject to the conformity analysis process. The area receives $16.23 million annually in federal, state, and local funding exclusive of Interstate funds ($2.34 million of this amount is for projects identified for STP funds) *(28).*

How do they assess future congestion levels and how is this information used in the CMS process?

The NLCOG currently utilizes a travel demand model (TransCAD) to determine future performance deficiencies along the transportation network. They plan on using the TransCAD output and comparing the results against the more static CMS performance report to determine if CMS identified improvements need to be revised with regard to future travel demand forecasts.

How do they report network conditions and performance?

Using the travel speed, NLCOG figures the difference of the average off peak travel speed minus the average peak period travel speed (of each 0.2 mile segment) to represent the condition of the network. This performance measure is used to identify congestion along the CMS study corridors. The larger the difference, the more delay exists and there is more likelihood of congestion.

How are TDM measures evaluated and incorporated into projects?

According to Mr. Chris Petro, Planner/Programmer for NLCOG, the project prioritization process includes a transit measure (amount of bus mileage and ridership along that corridor). The CMS process includes the development of recommended improvements.

CHAPTER 3. FEDERAL HIGHWAY ADMINISTRATION - GOOD CMS PRACTICES

The Institute of Transportation Engineers (ITE) has formed a committee to develop an informational report on the best practices of Congestion Management Systems programs. Mr. Brian Betlyon with the Federal Highway Administration chairs this committee and provided the MPOs most likely to be included in this report. He indicated that the report is expected to be complete in the spring of 2002. In a recent presentation, Mr. Betlyon mentioned several other MPOs that are receiving good marks in their certification reviews. Most of those are included in this report.

MARICOPA ASSOCIATION OF GOVERNMENTS - PHOENIX, ARIZONA

The Maricopa Association of Governments (MAG) membership consists of the 24 incorporated cities and towns within Maricopa County, the Gila River Indian Community, the Salt River Pima Maricopa Indian Community, Maricopa County, the Arizona Department of Transportation and the Citizens Transportation Oversight Committee. Currently, portions of Maricopa County are designated as non-attainment areas with respect to the national ambient air quality standards for three criteria pollutants, carbon monoxide (CO), ozone and particulate matter under ten microns in diameter.

Of the $12 used to support MAG activities in fiscal year 2002, $3.5 (28%) is designated for transportation programs. There are 18 professionals on staff at MAG, five of which are in Transportation Planning and Programming. As of 2000, the Phoenix metropolitan area consisted of 3.2 million persons.

How do they assess future congestion levels and how is this information used in the CMS process?

The MAG socioeconomic forecasting process starts with county control totals for population and employment which are developed by the Department of Economic Security. Key input into the forecasting process includes local land use plans which reflect "local/central city development goals (community, economic, housing, etc.)." Local land use plans also incorporate projections of "environmental protection, growth management and land use activities". MAG socioeconomic projections are the basic input into the MAG transportation models which forecast transportation demand. The projection process is based on the MAG DRAM/EMPAL model and results are reviewed and adjusted by local officials through the MAG Population Technical Advisory committee. MAG socioeconomic forecasts focus on projections of population and employment at the Traffic Analysis Zone (TAZ) level (often corresponds to the square mile). Other variables include household size and income *(29).*

Mobility zones were developed as an analytical tool that considers geography and land use density with respect to several transportation strategies. Four types of Mobility Zones were identified: Core Zones (the most dense areas), Developed Zones (existing developed areas), Developing Zones (with some vacant and some built-up areas), and Rural Zones (not expected to develop by 2015). Land use and transportation strategies for each of these zones are ranked by order of preference and then used in the TIP rating system. The preference order of the strategies was defined by the CMS Working Group. Preferred transportation strategies within each of the

Mobility Zones are given points (when projects are submitted for the CMS and TIP processes) which relate the importance of the strategy to the zone. See Table 3 for points associated with various strategies. Similarly, preferred land use development procedures within each of the zones are identified and receive points that relate the importance of the strategy to the zone.

Each year, as the jurisdictions prepare their TIP submittals, they know which kinds of projects will receive the most points and plan their submittals accordingly. For example, higher congestion is expected in the Central Business Districts. Thus, transit, TDM and HOV facilities and services are emphasized more in these areas, where the expansion of road capacity may be very expensive or difficult to develop. In Developing Zones, congestion will typically be lower but basic road infrastructure may not be fully developed and could lead to future congestion unless the issue is addressed now. In this example, the development of arterials and freeways are the preferred modes *(29)*. Therefore, the effectiveness expected from any one strategy is dependent upon the location of the segment under consideration with respect to the Mobility Zone in which it is located. Rating system points are awarded accordingly.

How do they report network conditions and performance?

Because average daily traffic is collected on a regular basis by local agencies, MAG uses volume-to-capacity ratios and the subsequent Level of Service as performance measures. They determine the current lane congestion (based on the latest MAG traffic volume map) and future lane congestion (based on a 20-year, No-Build traffic model network) to show areas where future congestion creates a need for projects. The freeway and arterial congestion criteria pertains to the following V/C ratios:

Low or No Congestion	V/C ratio <= 0.8
Medium Congestion	0.8 < V/C ratio <= 0.99
High Congestion	1.0 < V/C ratio <= 1.24
Serious Congestion	V/C ratio >1.24

Transit performance is measured by passengers per mile, as measured by boardings per mile of bus travel. A “serious” congestion rating would be greater than 3 passengers per mile; “high” congestion is 2-3 passengers per mile; “medium” congestion is 1-2 passengers per mile; and “low” congestion is less than 1 passenger per mile. For bicycle performance, MAG uses the availability of bike lanes and whether they are full 4-foot wide striped lanes or merely wide outside lanes marked by Bike Route signs.

In 1998, the Maricopa Association of Governments (MAG) completed a regional congestion study. The MPO staff not only coordinates regional planning studies, but has also been an important source of transportation data used in various traffic engineering studies and roadway design projects. Consequently, they have a responsibility to ensure the validity and credibility of the decisions that may be based on these studies. The 1998 MAG Regional Congestion Study provides data that is used to: 1) ensure that the travel demand forecast models created and maintained by MAG continue to provide a reasonable representation of current and future traffic conditions, 2) provide input to the regional transportation planning studies, and 3) provide information needed for local traffic studies and roadway design projects.

Table 3. MAG Congestion Management Strategies by Mobility Zones.

	CMS STRATEGY POINTS RANKED BY MOBILITY ZONE:			
PREFERRED TRANSPORTATION MODE:	Core Zones	Developed Zones	Developing Zones	Rural Zones
Arterials	2	1	6	6
Bike Lanes	3	3	3	4
Freeways	1	2	5	5
HOV Facilities	4	5	2	1
TDM/TSM Programs	5	6	1	2
Transit Lines	6	4	4	3

PREFERRED LAND USE PROCEDURES:	CMS BONUS POINTS FOR LAND USE CONSIDERATIONS:			
	Core Zones	Developed Zones	Developing Zones	Rural Zones
Community has a multimodal trans. Plan.	1	1	1	1
Community land use plan has multi-use higher density activity centers.	2	1	--	--
Community has an open space plan.	--	--	1	2
Plans limit growth to activity centers in seriously congested areas.	1	2	1	--
Development process meets transit needs.	2	1	1	1
Development process meets bike and pedestrian needs.	1	1	1	1
Development process meets street needs.	1	1	1	1
Plans balance location of jobs and housing.	1	1	2	1
Impact Fees used to pay for infrastructure costs.	--	1	1	2

* Notes: A project which is consistent with the most preferred mode in a Mobility Zone will receive 6 points. A project which is least consistent with the most preferred mode in a Mobility Zone will receive 1 point. Jurisdictions implementing the preferred land use procedures can receive up to 9 more points.

The Maricopa Association of Governments produces an annual report on the status of congestion in the region following the annual analysis and evaluation process. It assesses the progress of implementing identified congestion relief strategies and system improvements associated with implementing the five-year TIP. The report normally addresses the following subjects:

- Data and maps of existing and future congestion by link,
- Regional prototype projects that will address congestion according to the criteria established in the CMS report,
- Regional changes at the system level for travel speeds, travel times and overall cost effectiveness as required, and
- Suggested changes to the CMS process as additional information warrants.

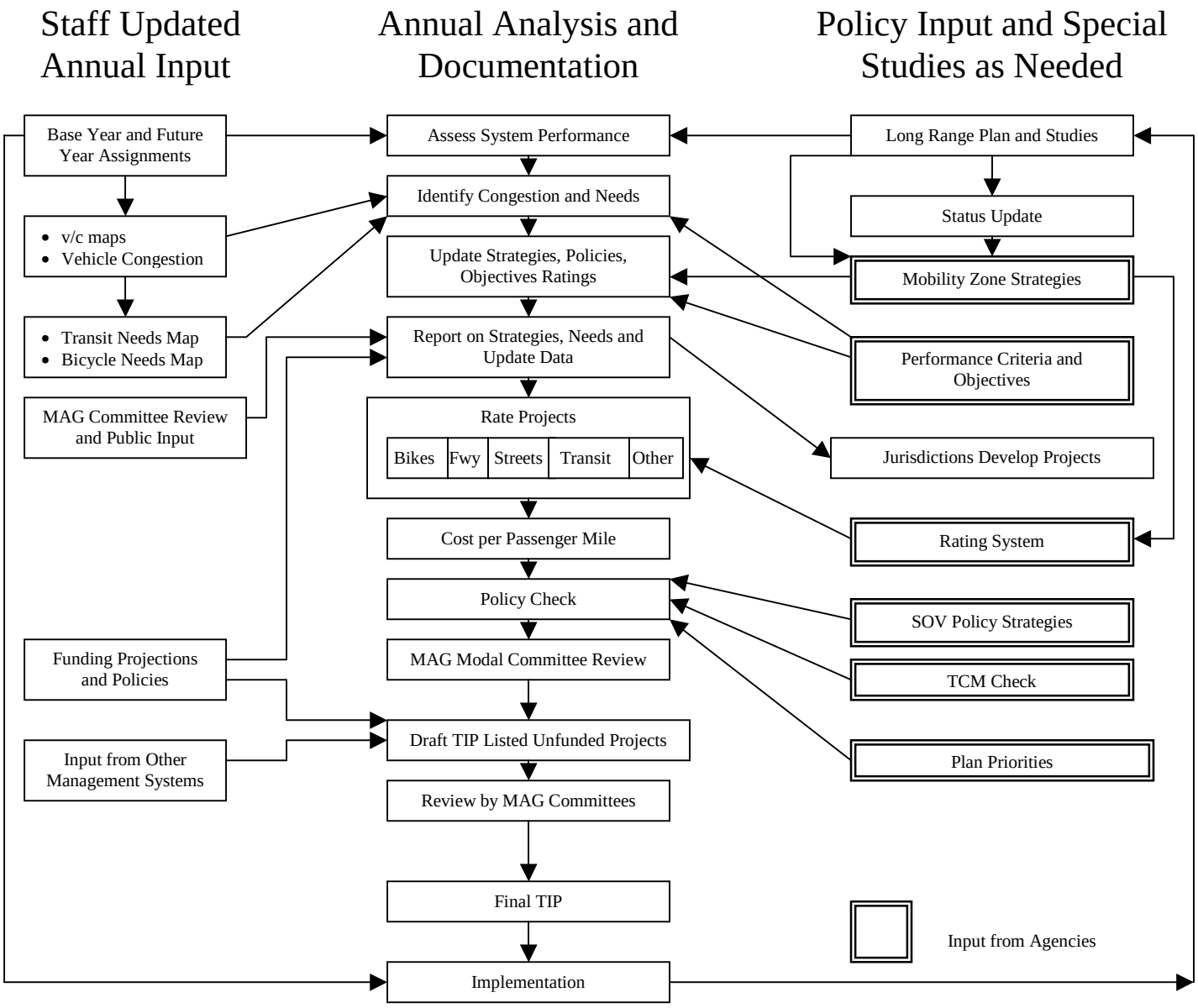
How are TDM measures evaluated and incorporated into projects?

The CMS Rating System evaluates freeway, arterial, transit and bicycle and other related projects based on volume to capacity ratios (V/C), performance (cost) effectiveness factors, mobility zone strategies, modal enhancements and a separate review process for projects that don't fit the other categories. Transportation Demand Management (TDM) and Transportation System Management (TSM) projects are also rated but through a staff and committee review process. This process is based on reviews by the MAG technical advisory committees, staff recommendations, and a review by the MAG Management Committee and Regional Council. The TDM and TSM projects are prioritized using, among other methods, the goals, policies and procedures identified in the CMS.

The CMS provides an appropriate analysis of all reasonable travel demand reduction and operational management strategies for the corridor in which a project that will result in significant increase in capacity for SOVs is proposed. If the analysis shows that travel demand reduction and operational management cannot fully satisfy the need for additional capacity in the corridor and additional capacity is warranted, then the CMS identifies all reasonable strategies to manage the SOV facility effectively. Other travel demand reduction and operational management strategies appropriate for the corridor, but not appropriate for incorporation into the SOV facility itself are also identified through the CMS.

The CMS process can be viewed in the flowchart shown in Figure 6 *(30)*. Once constructed, MAG has a process of evaluating the projects and the system performance. The length of time for construction, whether the project relieved congestion and by what amount, and the project cost information are requested from the jurisdictions. MAG monitors and evaluates strategies which are primarily composed of programs serving the whole region, such as TDM. Annual monitoring of the effectiveness of TDM strategies is conducted.

Figure 6. MAG Congestion Management System.



HILLSBOROUGH COUNTY MPO - TAMPA, FLORIDA

The Hillsborough County MPO uses their CMS study to identify congested corridors. From these corridors, a CMS "steering committee" made up of local transportation staffs, emergency response agencies, public safety, among others select two or three of the congested corridors for more detailed study. The total 1990 population for Hillsborough County was 834,054. There are several teams which make up the Planning Commission, Hillsborough River Interlocal Planning Organization and the Metropolitan Planning Organization. Eight staff are in the two teams dealing with transportation planning: Transportation Planning and Special Programs Team and Transportation Planning Modeling and Programs Team *(32).* According to Joseph Zambito, Senior Planning Manager and leader of the Transportation Planning Modeling and Programs Team, the steering committee selects corridors that are not likely to ever be widened due to high cost, business, environmental impacts, neighborhood impacts, political decisions, etc. The detailed studies identify improvements that can be made within the corridor to improve mobility and reduce congestion. These improvements can include, but are not limited to, transit improvements such as increasing bus frequency or adding shelters, intersection improvements such as turn lanes or optimized traffic signal timings, pedestrian improvements such as new sidewalks or crossings, bicycle lanes or trails.

The Tampa/Hillsborough County area is designated as an air quality "maintenance area."

How do they assess future congestion levels and how is this information used in the CMS process?

They estimate that by 2020 over 4.3 million person trips will occur in Hillsborough County daily. The majority of these will be on the highway system. In addition, 34 percent of all vehicle miles traveled will be on freeways and 51 percent will be on divided arterials. Because of these estimations, significant new capacity will be added to the freeway system. The projected transportation system volumes, levels of service and system needs are based on an analysis using the Florida Standard Urban Transportation Modeling Structure (FSUTMS) adopted and maintained by the Hillsborough County Metropolitan Planning Organization. The model uses daily trip generation rates that are specific to each category of land use. The socio-economic data developed for the model is based on the land uses proposed in the Future Land Use Map (FLUM), segregated into Transportation Analysis Zones *(33).*

By the year 2020, the roadway network planned for Hillsborough County will be close to being expanded to the maximum extent feasible. There will be fewer opportunities to build new roads and expand existing roads. There is a large focus on increasing the occupancy in order to achieve a more intensive use of existing and planning roads.

How do they report network conditions and performance?

In September of 2001, the Hillsborough County MPO recommended changes to their CMS, also known as the Mobility Management Plan (MMP), based on a review of the effectiveness of the existing performance measures to identify the location, scale and nature of transportation congestion in Hillsborough County. The recommendations include streamlining the existing process to use a limited number of primary performance measures to analyze congested corridors without compromising the effectiveness of the evaluation. Additional performance measures,

typically requiring more costly data collection and analysis, are recommended for selected detailed corridor analyses. Finally, system-wide mobility performance measures are recommended to evaluate the long term changes in the transportation system and the effectiveness of strategies implemented to improve mobility.

Primary performance measures are collected annually. Because of the frequency in collection, a screening system is employed in which congested corridors are identified through volume to capacity ratios of 1.0 or greater.

Corridor v/c ratio = Σ(segment v/c ratio X segment length) / corridor length

Additional primary performance measures (seen in Table 4) will be applied for each congested corridor *(34)*. The identification of and performance evaluations for each congested corridor will be conducted annually, and documented in a MMP System Performance Report. The Annual System Performance Report will provide the CMS Steering Committee with the necessary analysis and documentation to select corridors for further study.

Table 4. Hillsborough County Mobility Management Plan Recommended Primary Performance Measures.

Mode	Evaluates	Performance Measure	Data Requirement	Degree of Difficulty
Roadway	Utilization	Link Volume to Capacity Ratio*	traffic count data	1
Roadway	Utilization	Corridor Weighted Volume to Capacity Ratio*	Traffic count data	1
Bicycle	Accessibility	% of roadway corridor miles with bike lanes	GIS database	1
Pedestrian	Accessibility	% of roadway corridor miles with sidewalks	GIS database	1
Transit	Quantity	Passengers per revenue hour	Farebox counts by route / HART	2
Transit	Quality	Transit service headway (peak and off-peak periods)	HART service schedules	1

* These measures are used to identify congested corridors.

Degree of Difficulty:
1. Readily Available
2. Requires Coordination and Analysis
3. Costly, Requires Field Investigation and Analysis

Congested corridors are evaluated not only by link and corridor v/c, but also by percent of roadway corridor miles with bike lanes, percent of roadway corridor miles with sidewalks, number of passengers using transit per revenue hour, and transit service headway.

Corridor performance measures are recommended to evaluate the mobility of congested corridors selected by the CMS Steering Committee for detailed analysis. These measures typically require collecting data in the field to support the corridor evaluations. The purpose of the corridor evaluations is to identify "low cost" quick response strategies to improve mobility in the corridor. These recommended corridor performance measures (seen in Table 5) include average vehicle occupancy, percent trucks, average travel speed, accident rates, facilities LOS, bicycle counts, sidewalk connectivity, ADA compliance, pedestrian counts, percent of elderly, disabled, and low income population served, availability of transit amenities, employer participation in rideshare programs, and transit on-time performance *(34)*.

Table 5. Hillsborough County Mobility Management Plan Recommended Corridor Performance Measures.				
Mode	**Evaluates**	**Performance Measure**	**Data Requirement**	**Degree of Difficulty**
Roadway	Quantity	Average Vehicle Occupancy	vehicle occupancy surveys	3
Roadway	Quantity	% Trucks	vehicle classification counts	3
Roadway	Quality	Average Travel Speed	travel time runs	3
Roadway	Quality	Accident Rates	accident records -- sheriff's office / FDOT	2
Roadway	Quality	Facilities LOS	count data and roadway capacity spreadsheet	2
Bicycle	Quantity	Bicycle Counts	survey data	3
Pedestrian	Quality	Sidewalk Connectivity	GIS map and survey	2
Pedestrian	Quality	ADA Compliance	survey data	3
Pedestrian	Quantity	Pedestrian Counts	surveys and GIS database	3
Transit	Accessibility	% of elderly, disabled & low income population served	GIS database	1
Transit	Quality	Availability of Transit Amenities	HART database and survey	2
Transit	Quality	Employer participation in rideshare programs	BACS, TMO survey data	2
Transit	Quality	Transit on time performance	HART database and survey	3

Degree of Difficulty:
1. Readily Available
2. Requires Coordination and Analysis
3. Costly, Requires Field Investigation and Analysis

System-wide performance measures (shown in Table 6) should be used to evaluate the County's transportation system as a whole over time, and to determine whether implemented improvement strategies are achieving desired mobility objectives *(34).* Conducted every three to five years, these measures require minimal data collection and analysis.

Table 6. Hillsborough County Mobility Management Plan Recommended System-wide Performance Measures.				
Mode	**Evaluates**	**Performance Measure**	**Data Requirement**	**Degree of Difficulty**
Roadway	Quality	Vehicle miles traveled by level of service	Vehicle miles traveled by level of service	1
Roadway	Quantity	Number of carpools/vanpools	BACS Database	2
Bicycle	Accessibility	bike lane miles/roadway centerline miles	GIS database	1
Bicycle	Quality	Bicycle Accidents	accident records -- sheriff's office / FDOT	2
Bicycle	Quantity	Bicycle Counts*	survey data	3
Pedestrian	Accessibility	sidewalk miles/roadway centerline miles	GIS database	1
Pedestrian	Quality	Pedestrian Accidents	accident records -- sheriff's office / FDOT	2
Pedestrian	Quantity	Pedestrian Counts*	survey data	3
Transit	Accessibility	Availability of % of population within 1/4 mile of service	GIS database	1
Transit	Quantity	% of service by headway (peak and off-peak periods)	Route miles and headways	2
Transit	Quantity	Passengers / Revenue Hour	HART annual operations analysis	2
Transit	Quality	Transit level of service	HART data	2

* To be performed at locations identified by the Hillsborough County Bicycle and Pedestrian Advisory Committee.

Degree of Difficulty:
1. Readily Available
2. Requires Coordination and Analysis
3. Costly, Requires Field Investigation and Analysis

How are TDM measures evaluated and incorporated into projects?

As Hillsborough County MPO develops their Transportation Improvement Program (TIP), they invite local governments to submit project applications for improvements using available state and/or federal funds, of which Congestion Mitigation & Air Quality Funds – CMAQ is a source.

Far more requests for funds are received than they have available so they prioritize projects based on a number of factors, one of which is that the project implements the recommendations from the corridor studies. With respect to CMAQ funds, they require that any intersection improvement to be funded through CMAQ come from the corridor study recommendations. Zambito states that not all projects are identified through the CMS process, but projects that come from the CMS process are given higher priority for certain types of funds.

Congestion Management techniques are for constrained roads currently operating or projected to function at or below an acceptable level of service, but which cannot accommodate more lanes. These include car and vanpools, parking solutions to encourage mass transit patronage, flex time, staggered work hours, and other transportation demand management strategies.

WILMINGTON AREA PLANNING COUNCIL (WILMAPCO) -WILMINGTON, DELAWARE

With a 1999 population of over 560,000 the WILMAPCO region is classified as a Transportation Management Area (TMA) and therefore must develop and implement a CMS *(53).* In addition, the area is in non-attainment for ozone which means that all reasonable travel demand and operational management strategies must be evaluated and exhausted before a recommendation to add road capacity can be made. The total funding for the 2002-2004 TIP is $945,130,000 and is divided by mode: 47% for road projects, 22% for multi-modal projects, 13% for transit projects, 5% for bridge projects and 13% for other projects *(36).* There are 10 persons on the WILMAPCO staff including engineers, planners, transportation analysts, outreach managers and administrative staff.

The Wilmington Area Planning Council approved the 2001 Congestion Management System report in May 2001. It is written for two audiences: 1) those with and without transportation planning backgrounds and 2) those planners and planning managers at the Maryland Department of Transportation, the Delaware Department of Transportation, New Castle County, Cecil County and the Transportation Management Association of Delaware. They have a website which includes recent reports and presentations, information in layman's terms, current ozone levels, and numerous helpful links.

How do they assess future congestion levels and how is this information used in the CMS process?

Four scenarios were developed which encompassed a mixture of future growth locale, transportation investments, and the linkage of land use and transportation. One of the purposes of this analysis was to match the planned transportation investments with the forecasted location of population and employment. Particularly for employment, there was a concerted effort to make sure that the transportation projects were supporting economic development efforts in the region. WILMAPCO's Transportation Investment Area (TIA) Map includes the linking of transportation investment with population and employment forecasts, economic development plans, county zoning, and state investment plans.

The 2025 Metropolitan Transportation Plan (MTP) addresses congestion by investing in the expansion of highway, transit, bike route, sidewalk, intelligent transportation system, and transportation demand management efforts. The result of these investments, totaling more than

$1.3 billion, does not, however, keep up with the increasing amount of driving within the region. If they cannot address the congestion problem by adding more roadway capacity, then they examine congestion in the context of quality of life in the region. They make it clear in their MTP that congestion is not always a negative measure of quality of life. It is also a measure of economic activity. If all roadways were built to never experience level of service E or F during peak hour then there would be enormous unused capacity at all other times *(37).*

How do they report network conditions and performance?

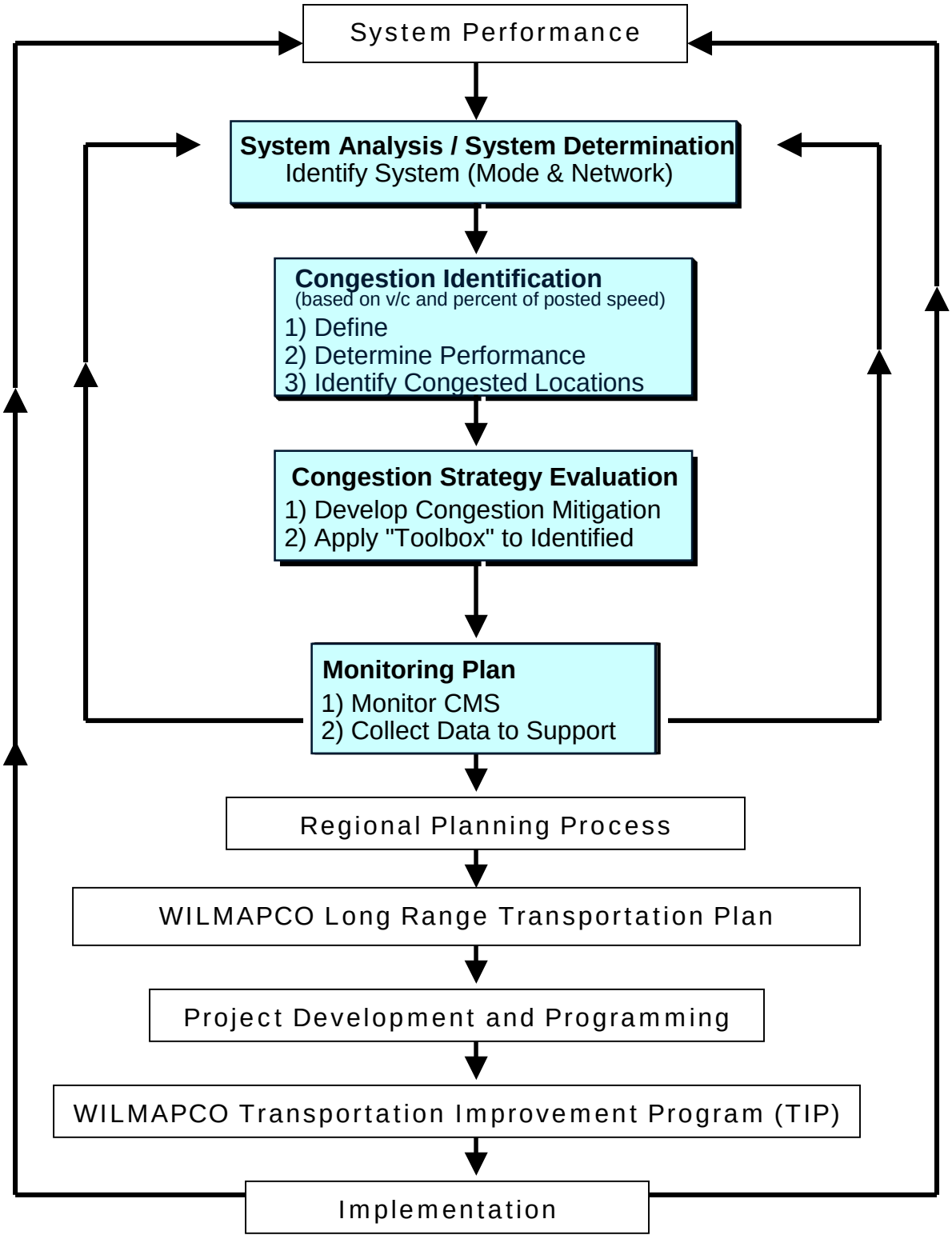
In order to quantify congestion, a set of objective performance measures was identified and approved. These include: roadway segment volume to capacity ratio; intersection level of service; and percent under posted speed.

Interestingly, WILMAPCO also completes a livability assessment which deals with the human element on an individual level. It specifically addresses the importance of qualities typically associated with livable communities such as safety, aesthetics, convenience, and reduced traffic conflicts. For a local or neighborhood street environment to be livable, traffic operations need to be calmed to reduce speed and volume. Increased or equal priority must also be afforded to pedestrians, transit and bicyclists within the street environment.

How are TDM measures evaluated and incorporated into projects?

The WILMAPCO CMS is designed to feed into and support the goals of their 2025 Metropolitan Transportation Plan (MTP), which were developed as a part of an extensive regional visioning process. The integration of the CMS into the overall WILMAPCO planning process is shown in Figure 7 *(35).* The process begins with an evaluation of the overall system performance. The CMS can be described in terms of a four-step process to define, identify, mitigate, and monitor congestion (shaded boxes). First, system definition includes the identification of the transportation mode(s) and network(s) for incorporation in the analysis. Secondly, congestion definition and identification includes the development of the definition of congestion (including objective congestion measures) and apply to the regional network determined in Step 1. Third, strategy evaluation is using the toolbox of congestion mitigation strategies to develop a methodology for applying them to the congested corridors identified. Included in the strategy evaluation step is the evaluation of congestion resolution strategies in priority order: 1) eliminate person trips or reduce VMT, 2) shift trips from automobile to some other mode, 3) shift trips from SOV to HOV auto/van, 4) improve roadway operations, and 5) add capacity. They determine which mitigation measure applies to each identified congested corridor and area. Finally, system monitoring includes outlining data collection and monitoring efforts to feed the system and to gauge the effectiveness of strategies recommended in the CMS report.

Figure 7. WILMAPCO CMS Procedural Overview.



HAMPTON ROADS PLANNING DISTRICT COMMISSION - NORFOLK, VIRGINIA

The Hampton Roads Planning District Commission (HRPDC) is one of the candidates for the Institute of Transportation Engineers CMS Success Stories, according to Brian Betlyon, Metropolitan Planning Specialist with the Federal Highway Administration. They are praised for their good CMS documentation, implementation and periodic reporting in their newsletter. The HRPDC includes ten transportation staff and two emergency management staff. Of these, three are responsible for CMS.

The Hampton Roads region, currently designated a maintenance area for air quality by the EPA, includes sixteen localities with a total population of 1.56 million (2000 Census) and is located on the southeastern coast of Virginia. While VMT has increased in recent years in Hampton Roads, other transportation trends in the region are mixed. Vehicle occupancy rates have decreased and HOV usage has not changed considerably, but transit usage has increased significantly. Transit usage has grown an average of almost 6 percent yearly in Hampton Roads, which is twice the rate of the large metropolitan area average. All of the 27 centerline miles of HOV lanes currently operate as HOV 2+ facilities and include both concurrent and barrier-separated reversible facilities. HOV vehicle volumes are collected three times per year by VDOT at four locations and indicate that the volumes have not significantly changed over the last eight years.

How do they assess future congestion levels and how is this information used in the CMS process?

The HRPDC uses a spreadsheet developed by the Florida Department of Transportation to forecast future traffic volumes for 2021. The spreadsheet is updated with the new Highway Capacity Manual *(9).* From this model, they are able to estimate volume-to-capacity ratios and level of service.

According to Census 2000, the population of Virginia has increased 14.4 percent in the last ten years. Hampton Roads has seen an 8.1 percent increase – an additional 115,283 people. It is estimated that most of the projected population and employment growth for 2020 will be outside the Hampton Roads beltway. Consequently, traffic projections for 2020 show the heaviest congestion will occur outside the beltway if nothing is done in addition to currently planned projects in the Transportation Improvement Program.

Hampton Roads' 2021 highway funding from federal, state and local sources is $10 billion. Forty-four percent of these highway dollars will be used to widen current roads, twenty-seven percent will be used to add new roads, six percent will be directed to intersection or interchange improvements, and one percent to other improvements *(38).*

How do they report network conditions and performance?

The HRPDC evaluates roadway conditions and identifies the severely congested roadways using level of service measured during peak travel periods between 5:00 am to 8:30 am and 3:00 pm to 6:30 pm. A roadway is classified as severely congested if they operate at level of service (LOS) E or F. According to data collected in 1994, out of the total 2690 miles of major highways, principal roads, and some minor roadways, 318 miles were severely congested *(39).*

Traffic congestion is being recorded on video at thirty-six sites during the AM and PM peak hour. The video footage is being used by HRPDC to document presentations and demonstrate present conditions in support future planning. In addition, they collect travel time and speed data using GPS technologies. They produce an isochronal map of travel times to major activity centers using 10-minute contours. Further analysis is done on congested corridors for more detailed corridor studies.

How are TDM measures evaluated and incorporated into projects?

Ms. Camelia Ravanbakht, Principal Transportation Engineer, considers the CMS to be for monitoring and assessing projects only. Congested corridors are defined in the CMS through levels of service and needed improvements. This information is used by the local governments to select projects for the TIP. The CMS information is also used in the project selection process for CMAQ and STP funded projects.

In order to set priorities for the Regional Transportation Plan, the Metropolitan Planning Organization (MPO) went through an evaluation process involving extensive documentation and critical analysis. As part of the process, the HRPDC conducted a study of current and future transportation conditions and needs, the impacts of seven major projects, and potential sources of funding. This initiative, done in a three-part series over five months, was presented through videos, PowerPoint presentations and accompanying hand-out materials. The results were summarized in a Transportation Special Report on Regional Priority Setting. Regional priority projects have been included in the 2021 Regional Transportation Plan.

BREVARD MPO - BREVARD COUNTY, FLORIDA

In a recent presentation by Mr. Betlyon, Metropolitan Planning Specialist with FHWA Eastern Resource Center, Brevard County, Florida MPO was highlighted as doing a good job in certification reviews. They are included in this section of the report because of this finding. The Brevard County MPO includes the cities of Cocoa, Cocoa Beach, Titusville, Palm Bay, West Melbourne and Rockledge.

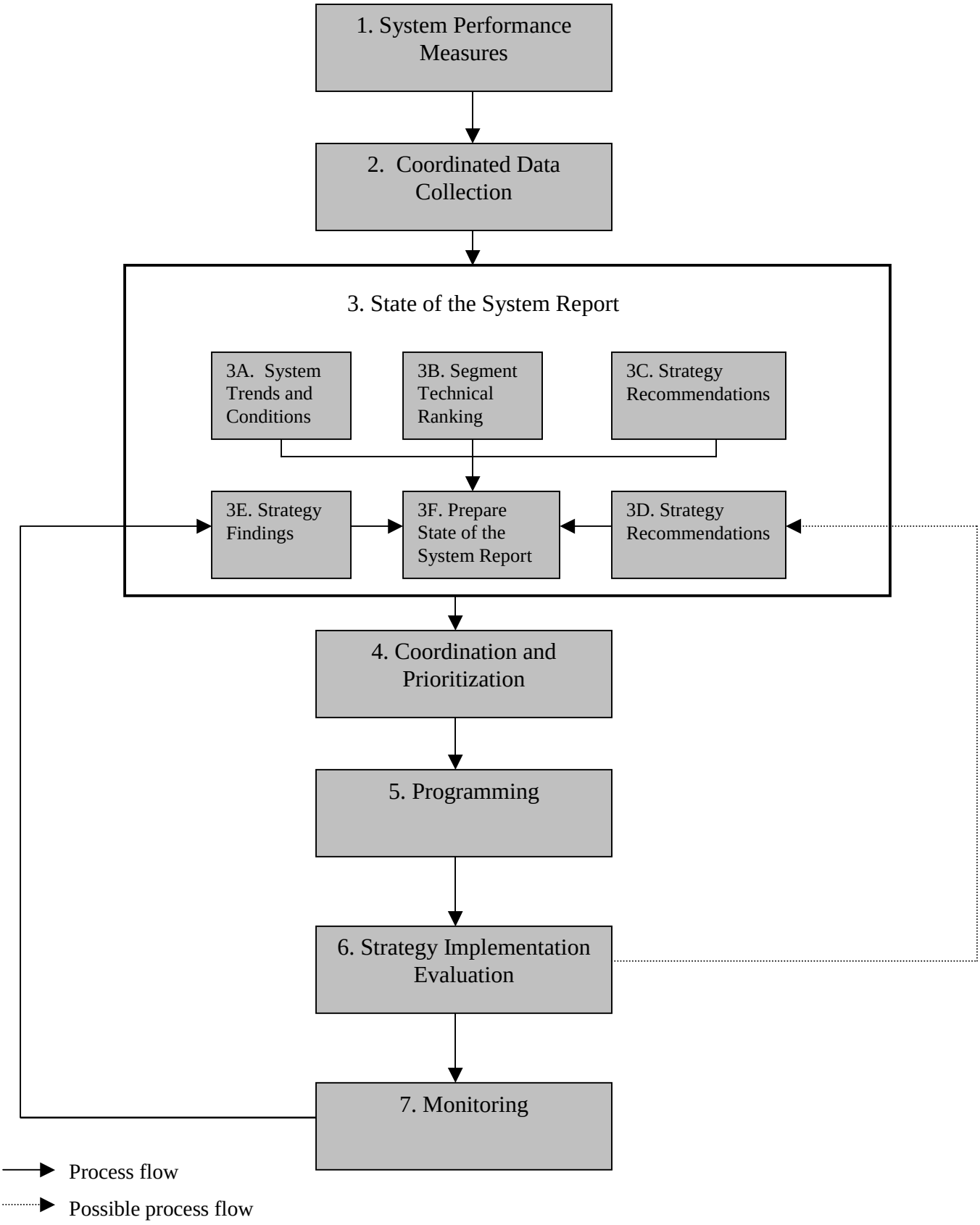
The MPO is responsible for planning and programming for the expenditure of state and federal (not local) transportation funds. The MPO also provides technical guidance to local governments regarding transportation planning issues. As a result, the MPO develops several work products, including annual project priorities, a five year transportation improvement program (developed cooperatively with FDOT) and a long range (2020) transportation plan. There are seven persons employed by the Brevard MPO. They have approximately $70 million in federal funding per year for MPO projects *(40).*

The Brevard CMS process is illustrated in Figure 8 *(41).*

How do they assess future congestion levels and how is this information used in the CMS process?

Future traffic projections are made using the county's traffic model and were based on updated countywide population and employment forecasts. The model uses these forecasts to compute

Figure 8. Brevard CMS Process



areawide vehicle trips. The trips were then assigned to the countywide roadway network to project 2020 volumes by roadway.

How do they report network conditions and performance?

Beginning in 1998 and annually thereafter, the Brevard County MPO produces the *State of the System Report* which provides updated information to the MPO as it prioritizes transportation improvement projects for includes in the TIP. It contains the five sections shown below *(41):*

- System Trends and Conditions – presents the system mobility trends in the CMS area using the system performance measures,
- Segment Technical Ranking – presents a congestion-based ranking of CMS network segments,
- Long Range Plan Projects – identifies Long Range Transportation Plan strategies for congested segments,
- Strategy Recommendations – presents summaries of evaluation recommendations and of on-going implementation efforts, and
- Strategy Findings – presents the effectiveness of recently implemented strategies.

The transportation trends are evaluated from year to year. A summary highlighting the most important conclusions is prepared and available on their website. Total travel, congested roadways, and transit use is described in layman's terms followed by a section on transportation priorities.

How are TDM measures evaluated and incorporated into projects?

In setting priorities for improvements all non-Florida Interstate Highway System (FIHS) segments in the CMS network are ranked based on the following factors:

- The severity of existing congestion;
- The severity of congestion by 2020 with no improvements;
- Most recent traffic volume;
- Intermodal connectivity and economic significance;
- Crash history;
- Hurricane evacuation; and
- Prior funding commitments.

FIHS roadway segments are ranked separately based on the first two items in the above list (severity of existing congestion and severity of congestion by 2020). Each factor is weighted to reflect its importance in determining roadway priorities. The top 25 congested non-FIHS roadways and top 10 congested FIHS roadways are included in Brevard County MPO's TIP and Long Range Transportation Plan (LRTP). Improvements identified in both the LRTP and TIP include adding lanes as well as traffic control measures, such as intersection improvements, access management strategies; and bicycle, pedestrian, and transit improvements *(41).*

METROPLAN ORLANDO - ORLANDO, FLORIDA

The Orlando Urban Area is designated as in attainment for air quality. The MPO planning boundary covers three counties: Orange, Seminole and Osceola, and approximately 1.5 million people. To help carry out the transportation goals of the region, Metroplan Orlando employs 16 staff members who are divided into three departments: Transportation Planning, Community Relations, and Finance and Administration, with approximately half of those involved in transportation planning. The Metroplan Orlando Board receives advice, guidance and information from four advisory committees (Citizens' Advisory Committee, Transportation Technical Committee, Bicycle and Pedestrian Advisory Committee, and the Transportation Disadvantaged Local Coordinating Board). The Transportation Technical Committee (TTC) is made up of technical staff, primarily planners and engineers who represent various local governments within the region. This advisory group evaluates the technical sufficiency, accuracy and viability of proposed plans and provides vital counsel to the Board *(42).*

With over $2 million available for CMS projects, Metroplan Orlando focuses on computerized traffic signals and ITS. The relationship of the CMS to the planning process can be seen in the flowchart on Figure 9 *(43).* According to Mr. Eric Hill, Manager of Systems Planning for Metroplan Orlando, the Walt Disney Property is a major attractor of the region. However, the company is less than participatory in the functions of the MPO. A Walt Disney representative is listed on the Transportation Technical Committee, but does not attend the meetings.

How do they assess future congestion levels and how is this information used in the CMS process?

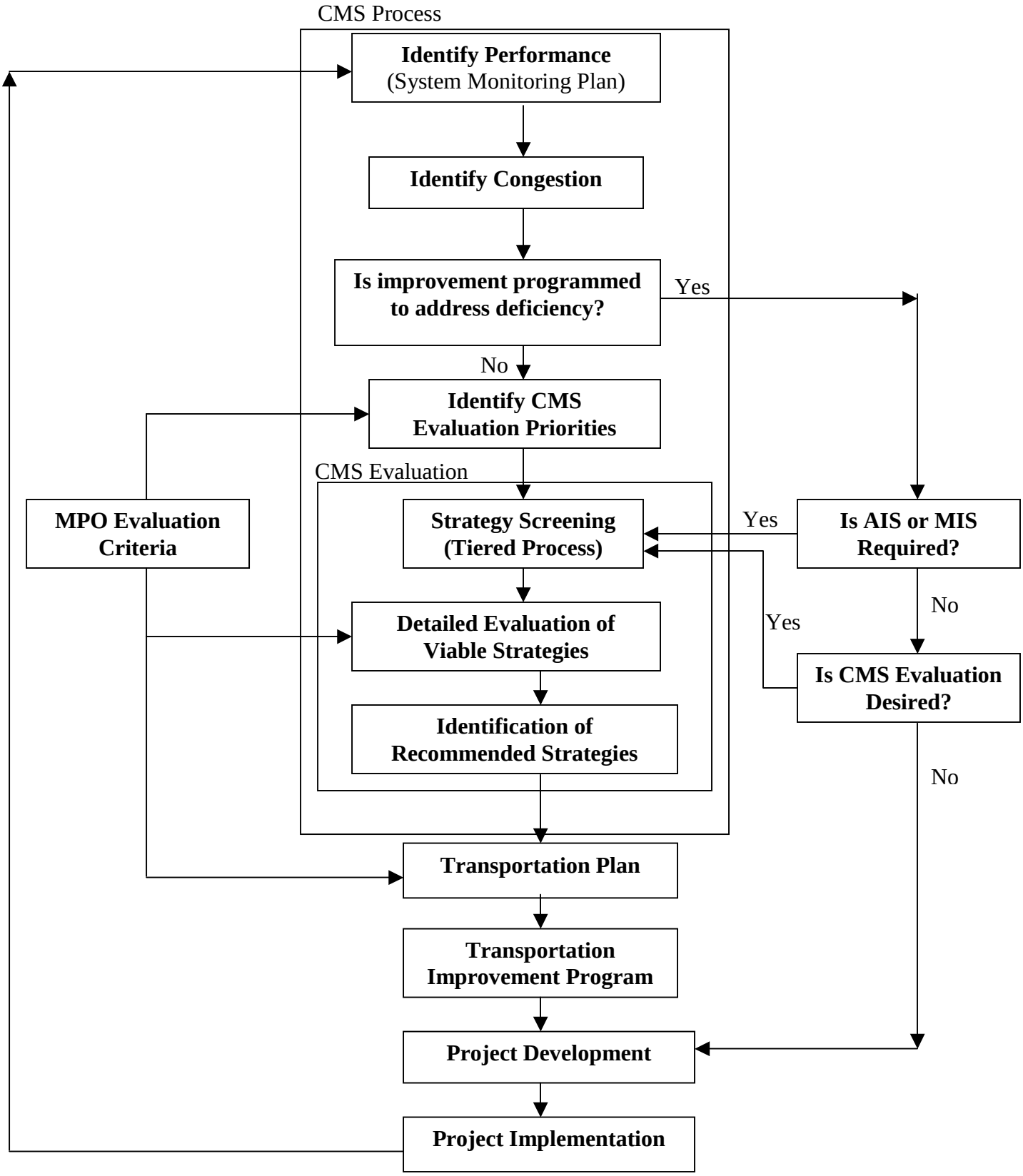
Metroplan Orlando uses the Florida Standard Urban Transportation Model Structure in estimating the future travel demands on the roadway system. The CMS system is made up of the roadways in the model network.

How do they report network conditions and performance?

The primary performance measure for the identification of highway congestion within the urban area is roadway level of service as defined by Florida DOT generalized tables. This measure would serve as a screening measure with more detailed analysis performed as part of the CMS to more accurately measure congested facilities. The more detailed analysis is performed using the FDOT ART_PLAN program. They also have systemwide performance measures which assist the MPO in monitoring conditions over time to determine the effectiveness of transportation investments. These include: 1) number of lane-miles and percentage of lane-miles that are congested by roadway functional classification, and 2) daily vehicle miles traveled and percentage of daily vehicle miles traveled operating under congested conditions *(43).*

For goods movement, Metroplan Orlando uses a systemwide performance measure: The number of freight priority route lane-miles and percentage of freight priority route lane-miles that are congested by functional class. Finally for transit, they evaluate corridors that have been identified as congested by the highway performance measure and use the availability of transit in a congested corridor, and service frequency in congested corridors.

Figure 9. Metroplan Orlando Relationship of CMS to the Planning Process.



How are TDM measures evaluated and incorporated into projects?

The criteria for project selection include local funding, safety, regional impacts, environmental issues, and traffic mitigation. The intent behind traffic mitigation is to create more mobility, mitigate congestion or increase the economic vitality of the region. They separate potential strategies into a hierarchical order that considers first those actions which address the fundamental transportation and land use relationships that cause vehicle trips. If the reason for the trip can be eliminated, so can the trip and its contribution to congestion. In successive rounds, the residual trips not mitigated by previous levels of actions are successively dealt with using techniques aimed at the next higher level of concern. The initial level includes actions that decrease the need for trip making (i.e. growth management, activity centers, congestion pricing, and some TDM measures). The second level includes actions that place trips into transit or other non-auto modes. The third level includes actions that put as many trips as possible into HOVs. The fourth level includes actions that optimize the highway system's operation for SOV trips and for all other trips using highway facilities/modes. The fifth and final level is the level of last resort and includes actions that increase the capacity of the highway system for SOVs by adding general purpose lanes *(42).*

They use a screening process to determine which strategies are applicable for a given deficiency. The screening must answer two questions: 1) does the potential strategy have a high probability of success for the given application, and 2) does the strategy adequately address the deficiency? They have screening questions for each strategy to assist in the selection of the appropriate action(s) and the potential impact on the level of service.

The primary outcome of the CMS is the identification of congestion management strategies for consideration in the development of the Transportation Plan and Transportation Improvement Program. The CMS evaluation process will identify appropriate strategies for inclusion in the Transportation Plan and the Transportation Improvement Program. For each strategy, the specific implementation responsibilities, schedule and possible funding sources should be identified.

ADDITIONAL NOTES

Although included in the 1999 CMS Improvement Process Report section, the North Central Texas Council of Governments was also identified as having "good" CMS practices. It should also be noted that the Birmingham, Alabama MPO and Durham/Chapel Hill, North Carolina MPO were both mentioned by Mr. Betlyon as doing a "good" job in their FHWA certification reviews. However, due to time constraints, the author was unable to gather information regarding their CMS processes for this report.

CHAPTER 4. SUMMARY AND CONCLUSION

There is quite a variation in the CMS processes currently utilized around the United States. This report includes a small fraction of MPOs in the country and gives a glimpse into the details of their CMS processes. Table 6 summarizes the information found through this research effort. Many more metropolitan planning organizations exist which may have very good examples of CMS process. With the information in this Task 1 report, however, it is the belief of the author that the Capital Area Metropolitan Planning Organization can develop improved methods for their Congestion Management System.

Exemplary CMS programs identified by FHWA include several key elements that may be beneficial to consider in Task 2 of this project. Some of the key elements noted by the author are as follows:

- Objectives of the CMS are consistent with clearly defined goals of the MPO. The quantitative and qualitative performance measures and acceptable threshold values that are used to evaluate the system and individual projects are established based on the goals and values developed by the MPO.
- The MPO establishes a hierarchy of priorities that guides the development of CMS strategies for the region or corridor, for example (Delaware WILMAPCO and Orlando METROPLAN):

  Priority 1 - Eliminate person trips or reduce VMT
  Priority 2 - Shift trips from automobile to other modes
  Priority 3 - Shift trips from SOV to HOV
  Priority 4 - Improve roadway operations
  Priority 5 - Add capacity.

- Policy-level working groups and technical advisory committees offer input into the CMS program.
- Integration of CMS into the planning process, TIP and CMAQ, where project selection criteria are clearly defined. Project selection criteria typically vary by funding category. Some MPOs define where regional policies feed directly into the CMS process flow chart.
- Comparison of forecasted congestion to current conditions using travel demand modeling. Some corridors that are not congested now may be added to the CMS network based on long-range modeling results.
- Use of performance measures that incorporate alternatives to the automobile, including alternative modes (transit and bicycle), and measures of person movement as well as goods movement.
- To address limited resources, some MPOs perform a two-step screening process to first narrow down the most congested locations, and then perform secondary data collection for more detailed evaluation.
- Several MPOs focus their CMS on corridors where widening is prohibitive, and instead examine transit, TDM, traffic operations and land use strategies for the corridor.
- More MPOs are making progress toward the use of ITS to collect performance monitoring data

- Greater consideration of land use in addressing mobility, such as measures of accessibility and growth management that support a decrease in trip-making as a CMS strategy.
- Development of an annual "State of the System" report that reviews trends in system and corridor performance.
- Communication of annual system monitoring results in two forms: non-technical (for those without transportation backgrounds) with a few easy-to-understand performance measures, and a technical version with more detail for agency staff. Utilization of alternative methods for disseminating performance monitoring results, such as Internet and newsletters.
- Continuous evaluation of CMS strategies as they are implemented to improve network performance over time.

The CMS is intended to be an integral part of the MPO's overall planning process. It should provide input for Transportation Improvement Programs and long range transportation plans. In looking to the future, the CAMPO area is expected to be designated as a non-attainment area for air quality by the Environmental Protection Agency. When this designation occurs, the staff must be prepared to show that all projects have gone through a CMS process. This Task 1 report provides the groundwork for a new process to be developed which enables the CAMPO region to continue into the future. Discussion concerning how the CMS process should be improved is warranted in order to develop the future program. Task 2 will begin with this discussion between the MPO and participating agencies to take what has been learned from around the country and, with this information, piece together a workable and clearly defined Congestion Management Plan for the Capital Area Metropolitan Planning Organization. The federal requirements, funding restrictions, needs of the community and other specifics related to the Capital Area will all be considered in the development of this CMS plan.

Table 7: Summary of MPO CMS Processes

Metropolitan Planning Organization	In Attainment?	How do they assess future congestion levels and how is it used in CMS process?	How do they report network conditions and performance?	How are TDM measures evaluated and incorporated into projects?	Contact Person	Phone	Agency	Website
From "1999 CMS Improvement Process Report"								
North Central Texas Council of Governments (Dallas-Ft Worth, TX)	No	DFW Regional Travel Model includes 4-step process: urban activity, trip frequency, destination choice and mode choice	Vehicle volume every 2 years, aerial photography every 3 years for LOS calculations	CMS strategies (TSM/TDM, bike and ped) are given high priority in the plan development process and are likely to receiving funding	Dan Rocha	817-640-3300	NCTCOG	www.dfwinfo.com
Houston-Galveston Area Council (Houston, TX)	No	REMI for future dev., future congestion estimated through level of mobility using v/c and is calculated using capacity tables	Volume-to-capacity ratio, more detailed data collected on roadways where projects are being done	Apply cost effective demand and system mgmt measures as the first component	Ilyas Choudry	713-993-4564	H-GAC	www.hgac.cog.tx.us
San Antonio-Bexar County MPO (San Antonio, TX)	Yes	2025 trip tables developed from 1995 travel demand model network. V/C calculated. If v/c>1, then in CMS network	Volume-to-capacity ratio, ITS technology being considered for collecting vehicle volume	TDM measures applied to congested facilities and continuously monitored	Jeanne Geiger	210-227-8651	SA-Bexar Co. MPO	www.sametroplan.org
Hidalgo County (Rio Grande Valley)	Yes	Uses TransCAD to estimate future traffic volume and levels of service. The CMS info is used in planning process	Compares free flow speed to average travel speed by conducting travel time runs	No TDM projects have been completed	Edward Molitor	956-682-3481	Lower Rio Grande Valley Development Council	www.lrgvdc.org
Corpus Christi MPO (Corpus Christi, TX)	Yes	Land use and socio-economic info directly put into model. TxDOT reviews info. MPO calibrates the base year model.	Travel time data being collected at selected points on major arterials every two years, traffic volume collected on segments under study	Congestion levels are used to provide TDM and TSM solutions to the problem segments	Muhammad Amin Ulkarim	361-884-0687	Corpus Christi MPO	www.corpuschristi-mpo.org

Table 7: Summary of MPO CMS Processes

Bay Area Metropolitan Trans. Commission (San Francisco, CA)	No	Travel demand forecasted using BAYCAST-90 (San Francisco Bay Area travel demand model system)	Travel time and accessibility to jobs and shopping opportunities make up the mobility performance measure. No monitoring program exists.	$53 million set aside for corridor management projects including HOV lane improvements, park and ride lots, traveler info, etc.	Chris Brittle	510-464-7700	San Francisco MTC	www.mtc.ca.gov
Metro (Portland, OR)	No	2020 forecast developed from 1994 base data accounting for urban reserve actions. Future congestion can be offset somewhat by assuming CMS actions will occur.	Level of Service and Areas of Special Concern allows substitute performance measures	TDM projects given higher range of points	Bill Barber	503-797-1758	METRO	www.metro-region.org
Capital District Transportation Committee (Albany, NY)	No	CDTC Systematic Traffic Evaluation and Planning (STEP) Model, past delay projections have not been realized.	Excess delay is used to quantify congestion. Travel time runs are conducted during peak periods	Implement TDM projects first to avoid congestion	Chris O'Neil	518-458-2161	CDTC	www.cdtcmpo.org
Northwest Louisiana COG (Shreveport, LA)	Yes	TransCAD model used and compared to CMS performance report	Travel speed collected and the difference of average off peak speed minus the average peak period speed is used to represent the condition	Prioritization process includes a transit measure	Chris Petro	318-841-5950	NLCOG	www.nlcog.org
FHWA - Good Practices								
Maricopa Association of Governments (Phoenix, AZ)	No	MAG socioeconomic projections input for traffic demand. Mobility Zones concerning development potential and land use exist. Point system for transportation strategies in each of the zones	Volume-to-capacity for fwy, arterials; psgrs boarding per mile for transit; availability of bike lanes	If TDM and operational management strategies cannot fully satisfy the need for capacity, then CMS identifies all options to manage the SOV facility	Mark Schlappi	602-452-5021	Maricopa Assn of Gov	www.mag.maricopa.gov

Table 7: Summary of MPO CMS Processes

Hillsborough County MPO (Tampa, FL)	Maintenance	Florida Standard Urban Trans Modeling Structure used to get volumes, levels of service and system needs. CMS techniques recommended for constrained roadways projected to operate below acceptable LOS.	Tiering system uses roadway v/c as a screening tool. Volume-to-capacity for roadways; % of roadway corridor miles with bikeways/sidewalks; transit service headway	Corridor studies are completed on roadways that advance to the second tier. Projects must implement recommendations that come out of the corridor studies. Projects originating from CMS have higher priority	Joseph Zambito	813-273-3774 ext.330	Hillsborough County MPO	www.plancom.org
Wilmington Area Planning Council (Delaware, NH)	No	Transportation Investment Area links transportation investment with population and employment forecasts, economic plans, and county zoning.	Roadway segment volume-to-capacity ratio, intersection level of service and percent under the posted speed; also have a livability assessment	Priority system: 1) eliminate person trips, 2) shift trips from autos, 3) shift trips to HOV, 4) improve roadway conditions, 5) add capacity	Dan Blevins	302-737-6205 ext.21	WILMAPCO	www.wilmapco.org
Hampton Roads Planning District Commission (Norfolk, VA)	Maintenance	Uses spreadsheet developed by FDOT to forecast future traffic volume. They estimate v/c ratios and levels of service with this info	Level of Service	Congested corridors defined in the CMS and used to select projects	Camelia Ravenbakht	757-420-8300	HRPDC	www.hrpdc.org
Brevard MPO (Brevard County, FL)	Yes	Use the county's traffic model to forecast vehicle trips and estimate traffic volumes	State of the System Report done annually	Ranked by severity of existing and future 2020 (without improvements) congestion	Kama Dobbs	321-690-6890	Brevard County MPO	www.brevardmpo.com
Metroplan Orlando (Orlando, FL)	Yes	Florida Standard Urban Transportation Model Structure. The CMS system is made up of those roadways in the model network.	Level of Service calculated and used to screen for further analysis	First try to eliminate the trip; second change mode to transit or non-auto mode; third put trips into HOV; optimize hwy operation; fifth increase capacity	Eric Hill	407-481-5672 ext.316	METROPLAN	www.metroplanorlando.com

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