

National Capital Region Transportation Planning Board

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Item #8

MEMORANDUM

TO: TPB Technical Committee

FROM: Andrew J. Meese, AICP
Systems Management Planning Director

Melanie Wellman
Transportation Planner

DATE: October 26, 2007

SUBJECT: 2007 CLRP Draft Congestion Management Process (CMP) Components

The draft CMP components for the 2007 CLRP are attached for Committee review and comment, and will be a topic of discussion at the November 2, 2007 Committee meeting. Briefings or earlier versions of the document have been presented to the Travel Management Subcommittee, Regional Bus Subcommittee, and Management, Operations, and Intelligent Transportation Systems (MOITS) Technical Subcommittee.

The CMP is one of the components required in order for the 2007 CLRP to be compliant with SAFETEA-LU regulations. It represents a significant revision of the Congestion Management System (CMS) information in previous CLRPs.

Consistent with the overall draft 2007 CLRP, the CMP components have been formatted in the structure of interlinked Internet Web pages, which are described and numbered accordingly in the attached document. A draft outline, also attached, shows the overall structure of these Web pages.

Following guidance from the Travel Management Subcommittee, this draft focuses on descriptions of the process and how it is integrated into the overall regional transportation planning process. Later this fiscal year, it is anticipated also to develop a more detailed technical CMP report which can delve into specific data on congested locations in the region, strategies to address congestion, and implemented programs. The current CMP is intended to serve as the initial CMP, and will be enhanced in future years with the guidance of the Technical Committee and its subcommittees.

If you have any comments on the documents, please provide them either at the Committee meeting on November 2, or by Friday, November 9 to Andrew Meese at ameese@mwkog.org. Thank you.

Attachment

**Congestion Management Process (CMP)
Components of the
2007 CLRP**

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October 26, 2007

CONGESTION MANAGEMENT PROCESS (CMP)
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Outline for CLRP

1. OVERVIEW

- i. What Is the CMP?*
- ii. What Are the Major Components of and Considerations for the CMP?*
 - a. Committing to Strategies to Address Congestion – Both Operational and Demand
 - b. Addressing SAFETEA-LU Requirements for Regional Transportation Processes

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- ii. Interactions with Supporting Committees and Program Areas*
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 - 2. Travel/Congestion Monitoring Program
 - 3. Management, Operations, and Intelligent Transportation Systems (MOITS) Program
 - 4. Commuter Connections Program
 - 5. Travel Management Program
- iii. Frequency, Timing, and Schedule and TPB Approval*

3. NEED FOR A CMP

- i. Congestion Management As a Goal of the TPB*
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 - a. Providing for Safe and Effective Integrated Management and Operation of the Multimodal Transportation System
 - b. Taking a Metropolitan-Wide, Systematic Approach
 - c. Addressing New and Existing Facilities
 - d. Using Travel Demand Reduction and Operational Management Strategies
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 - f. Considering the Results of the CMP

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- i. Evaluating transportation system performance*
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 - 2. Arterial Monitoring Program
 - 3. Regional Transportation Data Clearinghouse
 - 4. Special Studies and Data Collection Efforts
- ii. Defining and analyzing strategies*
 - a. Identifying existing and potential strategies by the TPB Technical Committee, subcommittees, and staff.
 - b. Compiling information on potential impacts of strategies, into a “short list” and “long list”
- iii. Implementing and Assessing Strategies*
 - a. Compiling information on strategies that have been implemented, particularly on a regional-level basis
 - b. Exploring how to assess previously implemented strategies
- iv. Compiling project-specific congestion management information*
 - a. Considering and including congestion management strategies in any major SOV capacity-increasing project.
 - b. Compiling and analyzing information in the Call for Projects documentation forms, which are submitted from regional agencies when CLRP is developed

5. MAJOR CMP STRATEGIES

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 - a. Defining what demand strategies the TPB is currently undertaking
 - i. Coordinating with various subcommittees, including Commuter Connections
 - b. Considering how these strategies are important to congestion management
 - c. Compiling existing information and data
 - d. Analyzing this information to help define congested conditions and locations
 - e. Considering results
- b. Demand Management Strategies**
 - i. Alternative Commute Programs*
 - ii. HOV Facilities and Value Pricing*
 - iii. Public Transportation Improvements*
 - iv. Multimodal Facility/Bicycle/Pedestrian Improvements*
 - v. Growth Management*

c. Operational Management Strategies

- i. Incident Management/Non-recurring Congestion Strategies*
- ii. ITS Technologies and Systems Management*
- iii. Capacity Increases (Where Necessary)*
 - 1. Elimination of Bottlenecks
 - 2. Safety Improvements
 - 3. Traffic Operational Improvements

6. CONSIDERING THE RESULTS OF THE CMP

- i. Integrating CMP Components*
 - 1. Considering Information on the Existence and Extent of Congestion
 - 2. Considering CMP Strategies
 - 3. Considering the Impacts of Implemented CMP Strategies
 - 4. Considering CMP Components of Major Projects
- ii. Future Outlook for Maintaining and Enhancing the CMP*

KEY TO OUTLINE:

7. NEW MAJOR PAGE

a. New Minor Page

- i. New Section within a Page*
 - 1. Subsection with Title
 - a. Content (No Title)*
 - i. Further Content (No Title)*

* Content listings will not appear in final Table of Contents

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Web Page 1 (Top Page)

OVERVIEW

What is the CMP?

The Congestion Management Process (CMP) is a systematic process in Transportation Management Areas (TMAs) that provides for safe and effective integrated management and operation of the multimodal transportation system. The process is based on a cooperatively developed metropolitan-wide strategy of new and existing transportation facilities.

Congestion is the level at which transportation performance is no longer acceptable due to traffic interference resulting in decreased speeds and increased travel times. As our region continues to experience dynamic economic and demographic growth, congestion remains a primary focus of the TPB.

What Are the Major Components of and Considerations for the CMP?

The CMP requires a systematic approach. The TPB's CMP is part of the regional transportation plan and includes the following:

- Methods to monitor and evaluate system performance
- Objectives and performance measures
- Data collection and analysis
- Identification and evaluation of anticipated performance and expected benefits of Congestion Management strategies, including:
 - Demand Management <<hyperlink>>
 - Traffic operational improvements <<hyperlink>>
 - Public Transportation Improvements <<hyperlink>>
 - ITS Technologies <<hyperlink>>
 - Additional system capacity, where necessary <<hyperlink>>
- Assessment of the effectiveness of previously implemented strategies

Proposed single-occupant vehicle (SOV) capacity-increasing projects must show that congestion management strategies have been considered. In addition, the regional transportation plan will consider the results of the CMP. <<hyperlink>>

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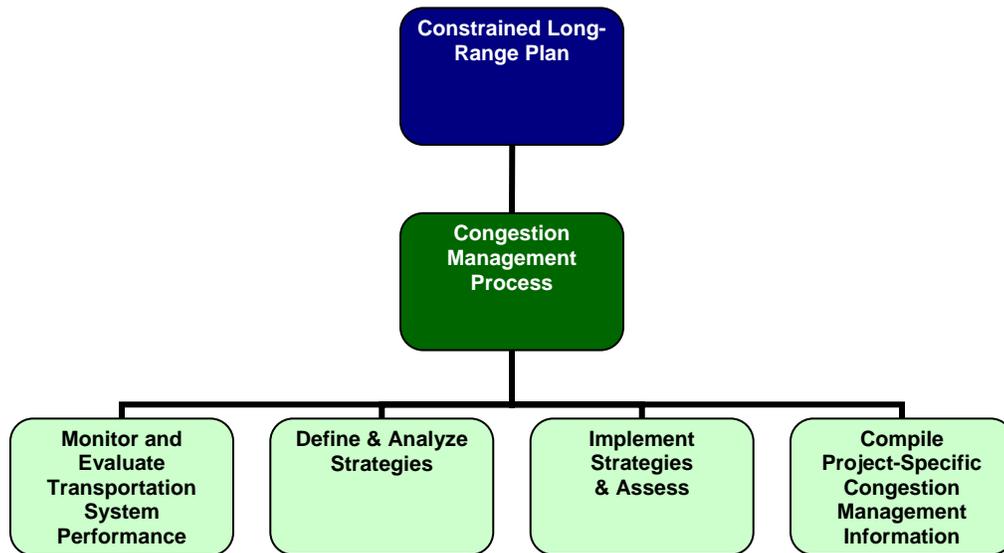
ADDRESSING THE CMP IN THE REGIONAL PLANNING PROCESS

Integrating CMP Components into the CLRP

Four major CMP components are integrated into the region’s CLRP. Each component reflects the federal law and regulations <<hyperlink>>

The components consist of:

- Monitoring and evaluating transportation system performance <<hyperlink>>
- Defining and analyzing strategies <<hyperlink>>
- Implementing strategies <<hyperlink>>
- Compiling project-specific congestion management information <<hyperlink>>



Interactions with Supporting Committees and Program Areas

- TPB Technical Committee Review

The TPB Technical Committee reviews and approves the CMP, based on interactions and feedback of various supporting subcommittees and program areas.

- The Travel/Congestion Monitoring Programs

The Travel/Congestion Monitoring programs identify the existence, location, and extent of roadway congestion for the CMP. Examples include TPB’s Freeway Monitoring Program and Arterial Monitoring Program. <<hyperlink >>

- *Travel Management Program*

The Travel Management Program focuses on strategy identification and analysis. <<hyperlink>>

- *Management, Operations, and Intelligent Transportation Systems (MOITS) Program*

MOITS provides information on incident management, non-recurring congestion, and ITS technology components of the CMP. <<hyperlink>>

- *Regional Bus Program*

The Regional Bus Program reviews the interaction of congestion and public transportation. <<hyperlink>>

- *Commuter Connections Program*

Commuter Connections provides information on the implementation and assessment of demand management alternatives. <<hyperlink>>

Frequency, Timing, Schedule, and TPB Approval

The initial CMP process focuses on developing and documenting components of the CMP. This component identifies congestion in the region, through available data such as the Freeway Monitoring Program. Ongoing congestion management strategies are documented and help form the CMP process.

The CMP is a living document addressing the region's congestion. It is updated as information becomes available. The results are incorporated into the CLRP when the CLRP is updated. A major update of the CLRP occurs every four years, with other significant updates occurring annually. The CMP can be updated at times that major new data or information become available.

The process itself can also be modified and enhanced as new information becomes available and additional strategies are considered.

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NEED FOR A CMP

Congestion Management as a Goal of the TPB

As the Washington region continues to grow, congestion management will remain a primary goal of the TPB. Over the years the TPB has implemented a number of demand and operational management strategies to address congestion. The TPB is committed to documenting these strategies in an enhanced structured process to get maximum benefit from new and existing transportation systems.

Federal Requirements

The Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU), enacted August 10, 2005, requires that metropolitan transportation planning processes include a CMP, similar to the Congestion Management System (CMS) requirements under previous federal transportation bills. In addition, the March 2006 Federal certification of the TPB process suggested that the region's CMP be enhanced. The TPB develops the CMP in concert with long-range transportation plan development.

The Transportation Planning Board (TPB) is committed to management of the existing and future transportation system through the use, where appropriate, of demand management and operational management strategies. These strategies, when taken as a whole, form a large portion of the CMP. <<hyperlink>>

The CMP addresses the SAFETEA-LU requirements, as laid out in the February 14, 2007 federal regulations (Source: §450.320(a), Metropolitan Transportation Planning, Final Rule, Federal Register, February 14, 2007). Overall, the TPB is committed to a CMP which includes the following:

- Providing for effective management and operation of new and existing transportation facilities eligible for funding under title 23 U.S.C. and title 49 U.S.C.
- Using operational management strategies <<hyperlink>>
- Being based on a cooperatively developed and implemented metropolitan-wide strategy

The CMP is important to the Washington region for many reasons. First, it provides for safe and effective integrated management and operation of the multimodal transportation system. Compiling information on congestion throughout the region can help determine priorities for regional transportation projects. The CMP takes a metropolitan-wide, systematic approach, in that congestion is examined over the entire metropolitan region, and the process is integrated into the Long Range Transportation Plan. <<hyperlink>>

Both new and existing transportation infrastructure is part of the CMP. This is important in determining what existing facilities could be improved upon to reduce congestion, and what congestion management strategies are appropriate for new facilities. Travel demand reduction strategies, such as alternative commute programs, growth management, and HOV facilities & value pricing, as well as operational management strategies such as identifying non-recurring congestion, ITS technologies, and capacity increases (where necessary), are potential strategies the CMP considers for new and existing facilities.

The CMP is important when considering single-occupant vehicle (SOV) capacity-increasing projects in the Long-Range Plan. Capacity increasing projects are sometimes necessary to eliminate bottlenecks, make safety improvements, and implement traffic operational improvements. However, in many instances, travel demand management or operational demand management strategies can be implemented in lieu of, or in conjunction with, capacity increase. Capacity-increasing projects are considered as a metropolitan-wide strategy, for new and existing transportation facilities. <<hyperlink>>

The results of the CMP are important to the long-range planning process. The locations and extent of congestion, along with which strategies are most successful, helps guide decision makers prioritize areas for current and future projects. The CMP is important to long-range planning to help determine priorities for implementation and funding.

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MAJOR CMP COMPONENTS

Monitoring and Evaluating Transportation System Performance

Freeway Monitoring Program

Freeways comprise the critical backbone of the region's roadway system, and provide the most important indicator of our overall system. This is the portion of the region's roadway system for which the most comprehensive data set is available.

- The TPB's regional freeway monitoring program is based upon comprehensive aerial photography of the region's freeways. Peak period congestion is monitored on a once-every-three-years cycle during the am and pm peak periods, and off-peak congestion is monitored once-every-five-year during weekday mid-day and weekend mid-day. It provides a comprehensive data set of the region's freeway conditions and congestion.
- The program and analysis provide the following information on the region's freeways:
 - A summary is developed of the overall conditions of the region's freeways. This data is then analyzed to indicate the most congested freeway locations, trends over time, and identification of factors associated with the congested conditions.
 - A summary and description is developed of the top congested freeway locations in the region. <<hyperlink to congested highway locations map>> Planning, congestion management, or construction activity at or near these locations is also indicated to show what is being done to address this congestion.
 - Significant changes to congestion levels are noted at given locations or to the overall system, based on trend analysis over time, including where the impacts of previously implemented projects or congestion management strategies are notable.
 - A summary of technical information is developed regarding how the freeway condition information was developed, as well as associated performance measures.
 - Off-peak and weekend traffic conditions are monitored once every five years.

Arterial Monitoring Program

The TPB's regional Arterial Monitoring Program is based upon travel time information collected on a sample basis on a number of the region's non-freeway arterial highways.

- The Program provides a data set of the region's arterial conditions and congestion. A sample of the arterials is taken, as there are thousands of miles of arterial highways in the region, and a comprehensive data collection effort would be cost-prohibitive. The data collection is limited to a number of important arterials, including the National Highway System (NHS).
- From these data, a summary of the overall conditions of the region's monitored arterials is produced. These are categorized into a number of key types of urban situations. Examples from the data set are analyzed to illustrate the types of and reasons for arterial congestion in the region. As data are available, trends over time are shown. See sample VA Route 7 arterials graphic <<hyperlink >>

Regional Transportation Data Clearinghouse

TPB compiles roadway usage data as available, collected from the region's agencies and jurisdictions. These data may come from jurisdictions' regular traffic counting efforts, special studies, permanent count stations, or other sources.

The Clearinghouse program transforms these data into a format associated with the region's travel demand forecasting model. Compiled data are also associated with the estimated capacity of links on the region's roadway network, providing the opportunity to calculate estimated volume-to-capacity (V/C) ratios, a widely-used performance measure.

Special Studies and Data Collection Efforts

The TPB and its member agencies undertake special studies or data collection efforts, on both one-time and recurring bases. Examples include monitoring of high-occupancy vehicle (HOV) systems, transit usage, and cordon counts of traffic on specified areas of the region.

Defining and Analyzing Strategies

This component involves identifying existing and potential strategies by the TPB Technical Committee, subcommittees, and staff. The TPB considers a number of demand management and operational management strategies.

To define and analyze CMP strategies, the TPB's efforts consist of the following:

- Compiling and analyzing information for each strategy
 - Committees and staff identifying and advising the TPB on the analysis, methods, criteria, and performance measures used to analyze CMP strategies. <<hyperlink>>
 - Compiling information on how and where a particular CMP strategy has been implemented.
 - Identifying a strategy as regional, corridor-wide, or local.
 - Performing qualitative or, if possible, quantitative analysis of the potential impacts of CMP strategies.

- Compiling information on potential impacts of strategies into summaries such as a “short list” and “long list.”

Implementing Strategies

This TPB effort is to focus on compiling information on strategies that have been implemented, particularly on a region-level basis. Also, the TPB is exploring how to assess previously implemented strategies. Feedback from the process is beneficial when it comes to updating the CMP and considering additional strategies and technical methods.

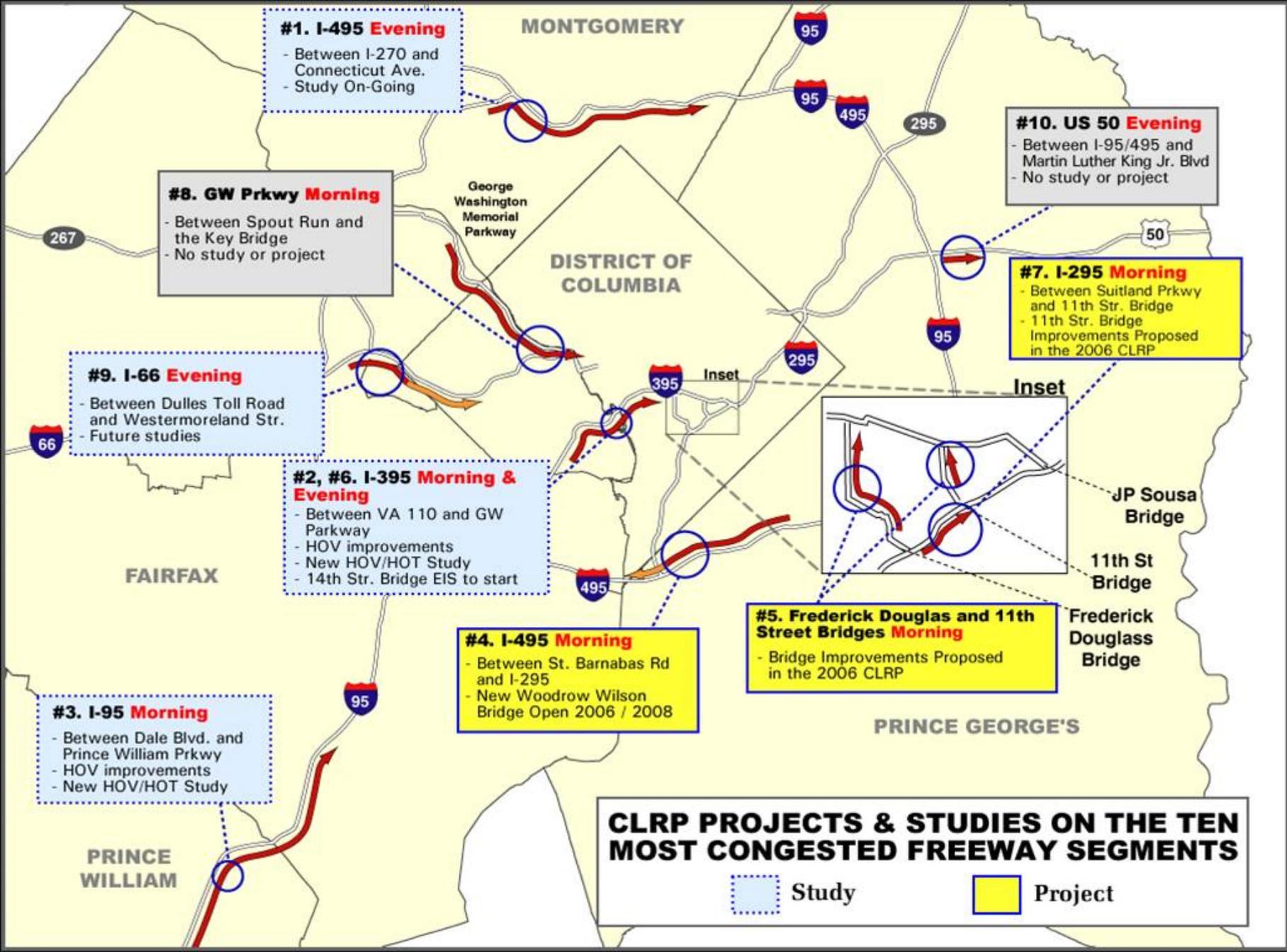
TPB currently reports on results of regional strategies implemented through the Commuter Connections Program. <<hyperlink>>

Compiling Project-Specific Congestion Management Information

Pursuant to Federal regulations, the TPB encourages consideration and inclusion of congestion management strategies in all major SOV capacity-increasing projects. This involves compiling and analyzing information in the Call for Projects documentation forms, which are submitted from regional agencies when the CLRP is developed.

The Call for Projects documentation requests any project-specific information available on congestion that necessitates or impacts the proposed project. Agencies compile this information from various sources, including TPB-published congestion information (if available), internal or other directly measured information, or by conducting engineering estimates of the Level of Service (LOS). TPB compiles and analyzes this submitted information, along with information from other CMP sources.

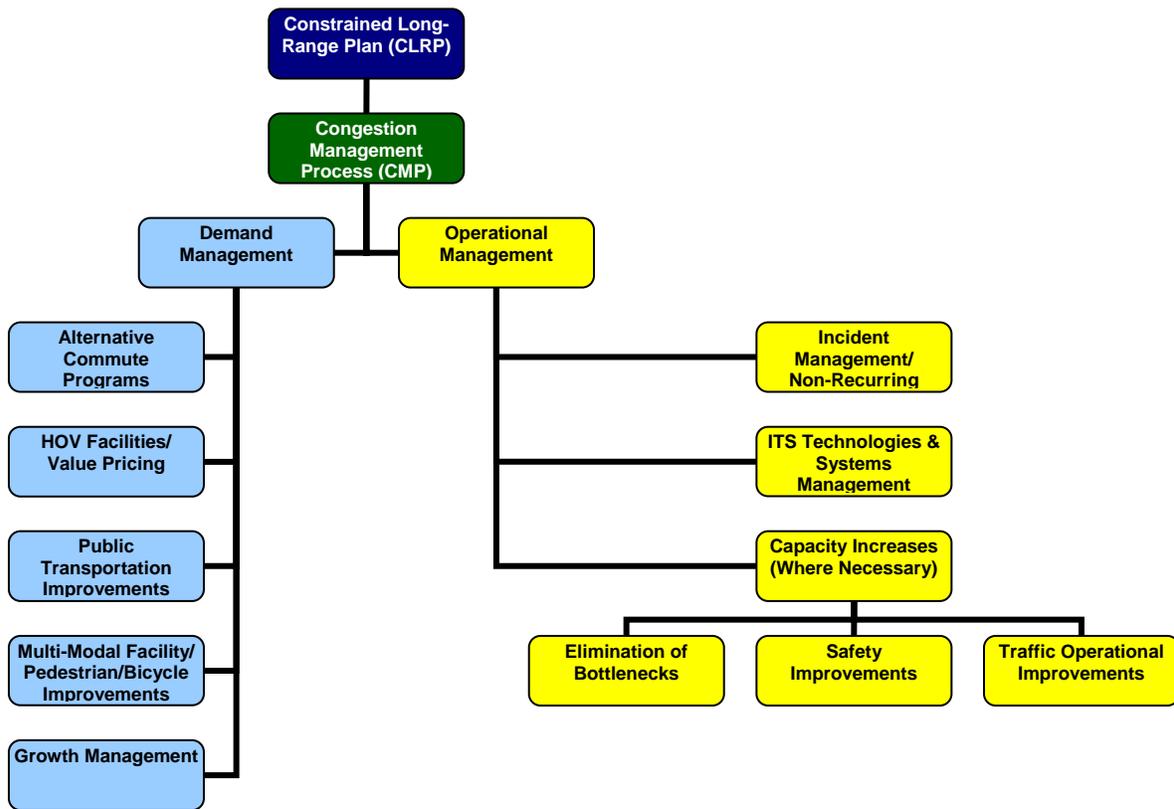
Specifically for major SOV capacity-increasing projects, the TPB requests documentation that the implementing agency considered all appropriate systems and demand management alternatives to the SOV capacity. In the Call for Projects documentation a special set of SOV questions is completed by implementing agencies and the TPB compiles this information.



MAJOR CMP STRATEGIES

Overview and Process

The TPB undertakes a wide range of congestion management strategies. These strategies generally fall into two categories – demand management strategies and operational management strategies.



Demand Management aims at influencing travelers' behavior for the purpose of redistributing or reducing travel demand. Examples of TPB's demand management strategies include alternative commute programs, HOV facilities and value pricing, public transportation improvements, multimodal facility/bicycle/pedestrian improvements, and growth management. <<hyperlink>>

Further demand management strategies and their impacts on the CMP are defined by coordinating with various subcommittees, including the Commuter Connections program, which provides information on alternative commute programs.

Operational management focuses on improvements made to the existing transportation system to keep it functioning effectively. Examples of TPB's operational management strategies include incident management/nonrecurring congestion strategies, ITS technologies and system management, and capacity increases (where necessary). <<hyperlink>>

Further operational management strategies and their impacts on the CMP are defined by coordinating with various subcommittees, including Management, Operations, and Intelligent Transportation Systems (MOITS), which provides information on incident management, ITS technologies, and system management.

TPB incorporates demand and operational management strategies into the CMP by:

- Compiling existing information and data.
- Considering how these strategies are important to congestion management.
- Analyzing this information to help define congested conditions and locations in the region.
- Considering the results strategies once implemented.

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DEMAND MANAGEMENT STRATEGIES

The TPB's CMP effort focuses on defining the existing demand management strategies that contribute to the more effective use and improved safety of existing and future transportation systems. The TPB is committed to a number of ongoing demand management strategies, such as:

Alternative Commute Programs

TPB's Commuter Connections program <<hyperlink>> encourages a number of alternative commute programs with an overall goal of taking more cars off the road, which is important to the CMP. These programs include:

- *Carpooling*, a popular commuting option of two or more employees sharing the ride to work in a private automobile.
 - TPB provides the public with tips on carpooling, ridesharing applications, and regional maps of park-and-ride lot locations.
- *Vanpooling*, when groups of commuter travel to work together in an owner-operated, third-party, or employer-operated van.
 - Maryland and Virginia participate in a number of vanpool incentive programs, such as VanStart and VanSave.
 - Frederick County and Prince George's County, MD provide funding and subsidies for new vanpools in the counties.
- *Telecommuting*, when employees work at their home or at a telework center near their home one or more days a week, is an effort to replace work-related travel.
 - TPB provides information on telecommuting to both employees and employers.
- *Transit*, consisting of buses and rail, is a popular option available to commuters in the District, Maryland, and Virginia
 - TPB provides a list of transit options to the public), and encourages the use of electronic transit payment systems such as Metrochek and SmarTrip.
- *Guaranteed Ride Home* encompasses all of the above commuting programs. It helps alleviate commuters concerns of using alternative commute methods by offering those who carpool, vanpool, bike, walk, or ride transit to work a free ride home incase an unexpected situation would arise.

- Bicycling to work employers are encouraged to set up programs to facilitate employees the option to bike to work by providing shower/locker, subsidy for purchasing bicycles, etc.
- Employer Outreach/Mass Marketing are two types of marketing programs the region uses to market all of the above alternative commute programs.

HOV Facilities and Value Pricing

TPB conducts analysis and documentation of HOV facilities in the region. These studies give the TPB, decision makers, and the public insight into the number of commuters using the HOV systems during peak hours and peak periods. Recent HOV studies include:

- Performance of Regional HOV Facilities on Freeways in the Washington Region, 2004
- Analysis of AM Peak Period Travel in Northern VA's I-66, and I-95/I-395 corridors

In addition, the TPB is studying the concept of "congestion pricing" through the Value Pricing Pilot Program awarded to the TPB. Congestion pricing is a demand management strategy, as it gives drivers a choice of time to travel or travel route.

- High-Occupancy Toll (HOT) lanes are in the 2006 CLRP for implementation along I-495 between I-270 and Connecticut Avenue, a segment ranked as the number one congested freeway location in the Freeway Monitoring Program.

Public Transportation Improvements

Public transportation offers a popular alternative to driving, and is important in reducing our region's congestion. The TPB commits to improvements that maintain a safe and effective transit system for the large amount of riders that use it. The TPB compiles and analyzes information collected on local transportation systems including:

- Local and regional rail agencies Amtrak, MARC, Virginia Railway Express (VRE), and Metrorail
- Local bus systems such as the District's Downtown Circulator, Georgetown Metro Connection, Metrobus, Maryland Transit Administration (MTA), county bus systems, and private bus companies that work with Commuter Connections <<hyperlink>>

Compiling existing information and data will allow the TPB to identify the needs and locations for public transportation improvements. Improving the region's public transportation system maintains and increases transit ridership, which is an important congestion management strategy.

Multi-modal Facility/Pedestrian/Bicycle Improvements

The TPB recognizes the benefit the Washington region's many bicycle and pedestrian facilities have on congestion management. Maintaining, updating, and implementing new facilities is important to increase multi-modal usage. The TPB compiles information on existing facilities and explores additional multi-modal improvements in our region.

- The *Bicycle and Pedestrian Plan for the National Capital Region* includes approximately 350 bicycle and pedestrian facility improvement projects from across the region, including two new bicycle and pedestrian crossings over the Potomac, the addition of locks and bike racks, and improvements to enhance the safety of pedestrians and cyclists. <<hyperlink>>
- Carsharing/short-term car rental programs are beneficial to congestion management in that they provide a convenient and cost-effective mobility option for those that typically do not have a need to own a car.

Growth Management

The TPB recognizes the importance of integrating land use and transportation planning at a regional level, and encourages the provision and availability of a variety of transit and commuting options as the region grows. The TPB views growth management as a beneficial congestion management tool, and analyzes data from the following programs for inclusion in the CMP:

- *Regional Activity Centers*, help coordinate transportation and land use planning in specific areas in the Washington region experiencing and anticipating growth. Focusing growth in Regional Activity Centers is important to congestion management, where transportation options for those who live and work there can be provided.
- *Transportation-Land Use Connection (TLC) Program*, providing support and assistance to local governments in the Washington region as they implement their own strategies to improve coordination between transportation and land use.
- *Live Near Your Work*, striving to bridge the gap between work and home
 - TPB's *2006 Regional Mobility and Accessibility Study* concludes that locating jobs and housing closer together can provide alternative commuting options that may not have been options otherwise.

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OPERATIONAL MANAGEMENT STRATEGIES

The TPB's CMP effort focuses on defining the existing operational management strategies that contribute to the more effective use and improved safety of existing and future transportation systems. The TPB is committed to a number of ongoing operational management strategies, such as:

Incident Management/Non-Recurring Congestion Strategies

According to FHWA, an estimated 50% of congestion is associated with incidents such as crashes, disabled vehicles, and traffic associated with special events. The TPB minimizes the impact these events have on the transportation network and traveler safety. If an incident disrupts traffic, it is important for congestion that normal flow resumes quickly. The TPB is compiles and analyzes data associated with these incident management programs.

- Maryland's Coordinated Highways Action Response Team (CHART) program
 - Provides TPB with information such as distribution of incidents and disabled vehicles by location; number and type of incidents responded to; reduction in secondary incidents; percent of incidents occurring on weekdays versus weekends; and roadway and roadway segments with highest number of incidents. <<hyperlink>>
 - This type of information is relevant to the CMP to the extent that we can focus implementation strategies at those times and locations when and where incidents are more frequent.
- DDOT's emergency incident plan
 - Provides information on many incident management areas, including updating and protecting communication network, deployment of evacuation dynamic message signs, emergency public address system, evacuation plans, and deployment of CCTV cameras.
- VDOT's Smart Traffic Control Center in Northern VA
 - Collects data from loop detectors and pavement sensors embedded in the roadways prompt an automatic incident detection system which alerts the traffic control center when there is an accident, complete with speed and occupancy data.
 - Monitors weather conditions, which can be especially important in the winter months when inclement weather can occur.
 - Alerting drivers of unexpected conditions with variable message signs and an AM radio station. Two radio sites are geared specifically toward the Springfield Interchange and Woodrow Wilson Bridge projects.

ITS Technologies & Systems Management

The TPB works with the region's jurisdictions and local transportation agencies to implement these ITS technologies, from which the TPB compiles and analyzes operational management data.

- Advanced Traffic Signal Systems applies computer and communications technologies to the operations of traffic signals in order to maximize safety and efficiency. Components of such systems include:
 - Interconnection of groups of signals to facilitate timing and coordination among them.
 - Application of computer analysis to determine the best traffic signal timing for efficiency while maintaining safety for all street and roadway users, including pedestrians.
 - Detection systems to help signals respond to real-time traffic conditions.
 - Countdown signals for pedestrians to bolster safety and walkability.
- Electronic Payment Systems uses cards or transponders carried by the user that electronically communicate with devices maintained by a transportation agency to conduct and record payment transactions.
 - WMATA's SmarTrip card, for uses on bus, rail, and WMATA parking lots, as well as the E-Z Pass toll system are examples of electronic payment systems in the region.
- Freeway Ramp Metering involves the implementation of traffic signals on freeway ramps that alternate between red and green to control the flow of vehicles entering the freeway.
 - Virginia implements ramp metering along the I-66 corridor.
- In-Vehicle Navigation Systems are global positioning system-based devices in motor vehicles that provide directional guidance and associated information.
 - These GPS devices are in a number of transportation agency vehicles and some devices are being deployed.
- Probe Technology is the collection of transportation systems' condition information, collected by tracking the location of numbers of vehicles on a roadway. The tracking is typically done with the collection of mobile phone data, GPS fleet-tracking data, or toll transponders.
 - This is currently being tested in the Baltimore region under MSHA and private sector partners. TPB and regional partners keep abreast of the results.
- Service Patrols involve specialized trucks or vans traveling the highways and rendering assistance where needed, such as pushing disabled vehicles off the road, providing gasoline, or changing tires.
 - DDOT, MDOT, and VDOT all implement service patrols on roadways. Also, Montgomery County is the first local jurisdiction in the area to have patrols (since 2006), which primarily on arterials.

- Advanced Traveler Information Systems (ATIS) are technology-based means of compiling and disseminating transportation system information on a real-time or near-real-time basis prior to or during tripmaking.
 - The Virginia 511 system via telephone and internet is an example of where this is currently implemented. This technology is under discussion in DC and MD.
- Bus Priority Systems detects approaching transit vehicles and alters signal timings to improve transit performance, such as extending the duration of green signals for buses running behind schedule.
 - Implementation includes three pilot programs in the region; used in the District of Columbia, Arlington, and Fairfax Counties.
- Variable Message Signs are changeable electronic signs usually installed along major highways to allow timely posting of warnings or other special messages.
 - Implemented by all three state DOTs; temporary successful deployment on construction projects, such as the Woodrow Wilson Bridge project.
- Transit Information Systems provide information to riders after their trips have started, including arrival and departure times, information on transfers and connections, and related services like park and ride availability.
 - Metrorail implements passenger information on platform displays, on the web, and via mobile phone.

Capacity Increases (Where Necessary)

Federal law and regulations list capacity increases as another possible component of operational management strategies, for consideration in cases of:

Elimination of bottlenecks

Generally, these situations are where a modest increase of capacity at a critical chokepoint can relieve congestion affecting a facility or facilities well beyond the chokepoint location.

A regional example to illustrate this was the widening of the ramp from I-495 Capital Beltway Outer Loop to westbound VA 267 (Dulles Toll Road) in 2005. Widening this one ramp from one to two lanes relieved miles of regularly occurring backups on the Beltway and across the American Legion Bridge. <<hyperlink>>

Safety improvements

Where safety issues may be worsening congestion, for example at high-crash locations, mitigating the safety issues may help alleviate congestion associated with those locations.

Traffic operational improvements

Examples of traffic operational improvements include adding or lengthening left turn, right turn, or merge lanes on reconfiguring the engineering design of intersections to aid traffic flow while maintaining safety.

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CONSIDERING THE RESULTS OF THE CMP

Integrating CMP Components

Considering Information on Existence and Extent of Congestion

The travel monitoring activities associated with the CMP inform decision makers on the region's congestion. Planning and programming decisions are able to be made with knowledge of the region's significant congestion issues.

The regional Congestion Monitoring Program is key to providing this information. Periodic congestion data on all 340 miles of freeway in the region shows the locations of significant congestion. These are then able to be cross-compared with other pertinent information, as shown in the figure below. Information for the region's numerous non-freeway arterial highways is compiled in the Arterial Monitoring Program, which provides general congestion information on a sample basis.

The region considers congested locations with a number of other types of information, such as:

- *Facility, corridor, or area studies*: Studies help agencies determine problems, solutions, costs, and related information to addressing transportation issues. The CLRP contains information on ongoing or proposed studies for facilities and corridors. Similar to the planned and programmed projects in the CLRP and TIP, the locations of studies is recommended to be cross-compared to the locations of congestion as noted from the CMP.
- *Regional Activity Centers and land use considerations*: Regional Activity Centers and clusters are identified throughout the region as locations experiencing a concentration of employment, housing, and activity. Movement to and from these Activity Centers, in addition to within them, is considered in the CMP. Activity Centers that have a mix of uses where people can live and work, along with having accessibility to other activity centers, is an important consideration in congestion management. In addition, because activity centers are often thought of to be pedestrian-oriented facilities and/or a higher density of development, safety issues are also concerns of the CMP.

This is also linked to Growth Management, an aim at ensuring that residents have access to a variety of transportation modes as this region grows.

- *Transportation safety information* is important to incident management and non-recurring congestion. Safety in itself is a primary concern in our region. However, congestion can often result from incidents and secondary incidents on our

roadways. A focus of the CMP is integrating and assessing incident management, ITS technologies, and other operational management strategies that can help prevent and clear incidents safely and efficiently.

Considering CMP Strategies

The region compiles information on the congestion management strategies considered, implemented, or committed to in conjunction with roadway projects or studies. This provides an overall picture of congestion in the region, and helps set the stage for agencies to implement CMP strategies, including those integrated into capacity-increasing roadway projects.

Considering the Impacts of Implemented CMP Strategies

Each strategy is assessed in the post-implementation phase. This determines the success each strategy has at reducing congestion. Considering the impacts and results becomes especially important when updating the CMP and considering adding new strategies to the process.

Considering CMP Components of Major Projects

For planned (CLRP) or programmed (TIP) projects, the locations of planned or programmed improvements on freeways are able to be noted with the locations of congestion. The level of correlation is shown between projects and congestion. This helps guide decision makers as to prioritize areas for current and future projects.

For the 2007 CLRP, the correlation between congested locations as shown in the CMP and planned or programmed projects was high. Most planned or programmed projects were in locations where significant congestion is being experienced.

Future Outlook for Maintaining and Enhancing the CMP

The CMP is to be a living document, and an ongoing and developing process. Congestion information will be updated as it becomes available. The process itself will be updated as is determined to be necessary. Addressing congestion and meeting regional goals is an integral part of the TPB's metropolitan planning process. As the Washington region continues to grow, congestion management will remain a primary goal of the TPB.