U.S. Department of Transportation
Federal Highway Administration

Congestion Management Process in the US – A Federal Requirement

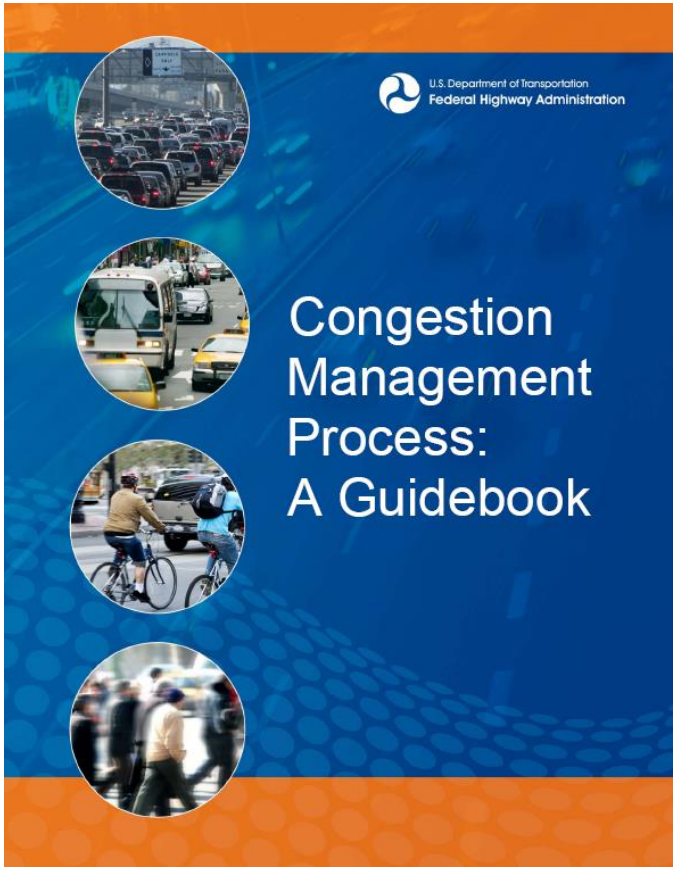
ITS Argentina
November 6, 2013

U.S. Department of Transportation
Federal Highway Administration

Outline of Seminar

- Discussion of *Congestion Management Process: A Guidebook*

- Highlight innovative CMP practices



Outline of Document

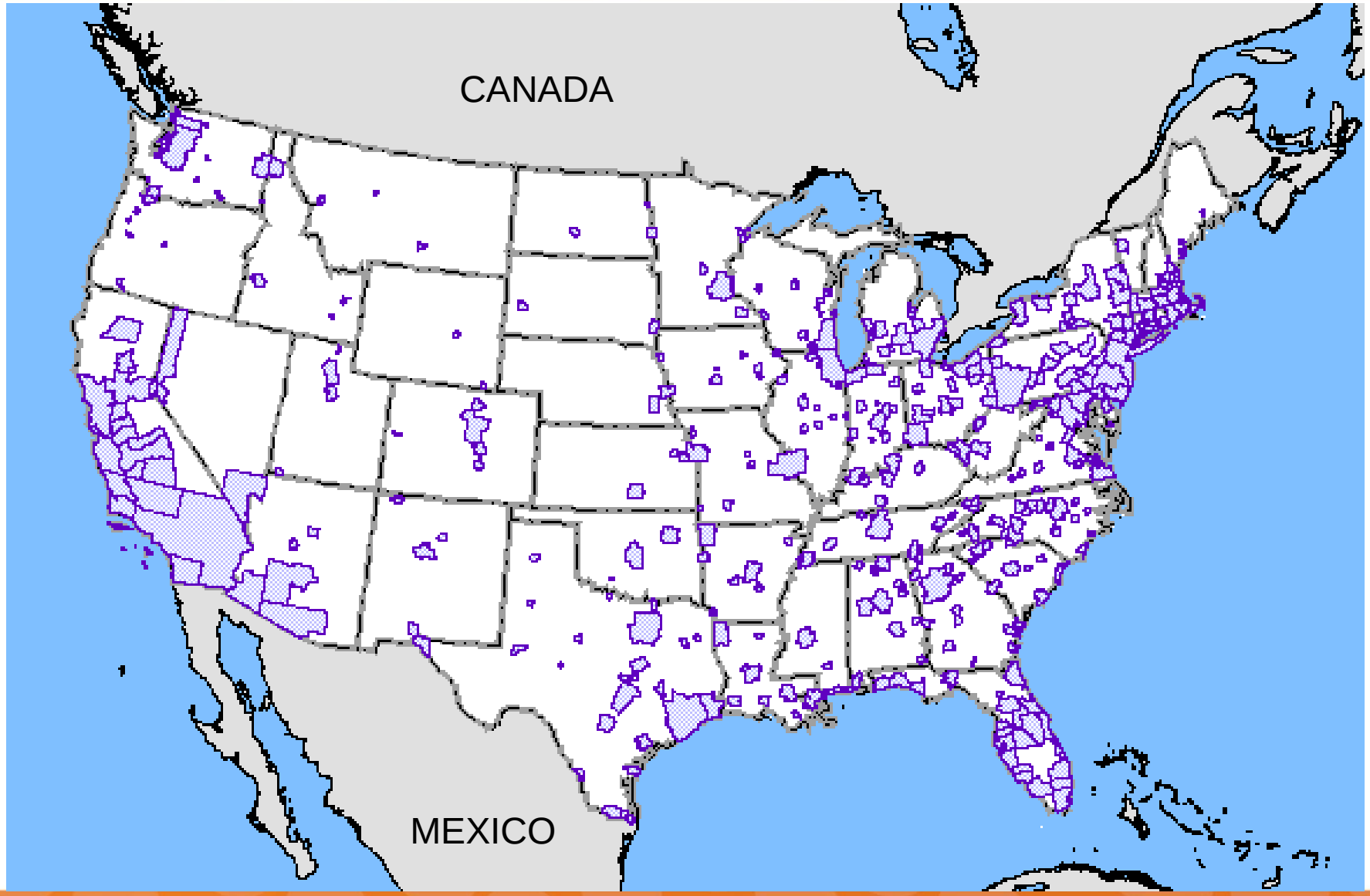
- Introduction, including role of CMP within MPO planning process
- Recommended CMP Process Model
- Special topics related to the CMP
  - Collaboration among stakeholders
  - Livability and multimodal considerations
  - SOV Capacity-adding projects and Demand Management/Operations Strategies
  - NEPA and Project Development
  - Documentation
- Visualization in the CMP

What is in the Guidebook?

Introduction and Background Material

- What is a CMP?
- History of the CMP
- Why is a CMP useful?
- What is the purpose of this guidebook?
- The CMP as an integral part of the metropolitan planning process

MPOs in the US



384 MPOs

CMP as Part of the Metropolitan Transportation Planning Process

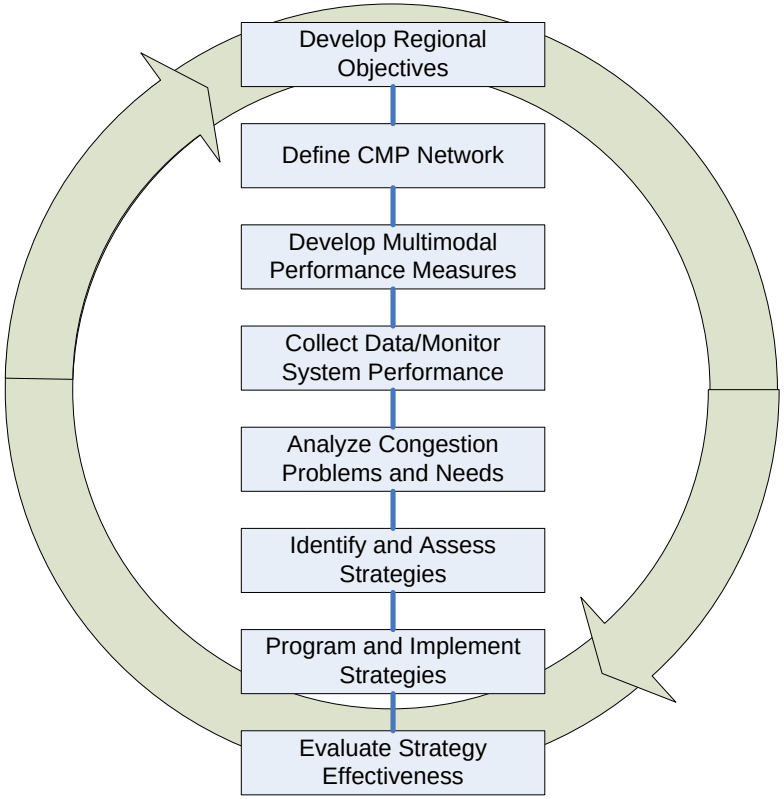
- The CMP is intended to serve as an integrated element of the planning process
- The CMP can be an important source of information, particularly for project selection, in both the long range plan and the Transportation Improvement Program (TIP)

What is in the Guidebook?

CMP Process Model

8 Actions

- Recognizes general sequence but also iterations and variations
- Notes cyclical nature of process (related to planning process)



Action 1: Develop Regional Objectives for Congestion Management

- Congestion management objectives define what the region is trying to achieve
- Eliminating congestion may not be possible or desirable, so it is important to define what is an "unacceptable" level of congestion
- Need to understand what the public wants
- Objectives should be "SMART" (Specific, Measurable, Agreed, Realistic, and Time-bound)

Action 1: Example (CDTC)

- Capital District Transportation Committee (Albany, NY) CMP Goals
  - Limit "excess delay" to support economic activity and quality of life
  - Implement TDM first, before adding SOV capacity
- Selected CMP Principles
  - Demand management is preferable to accommodation of single-occupant vehicle demand growth
  - Cost-effective operational actions are preferable to physical highway capacity expansion
  - Significant physical highway capacity expansion is an appropriate congestion management action only under certain circumstances
  - Incident management is essential to effective congestion management

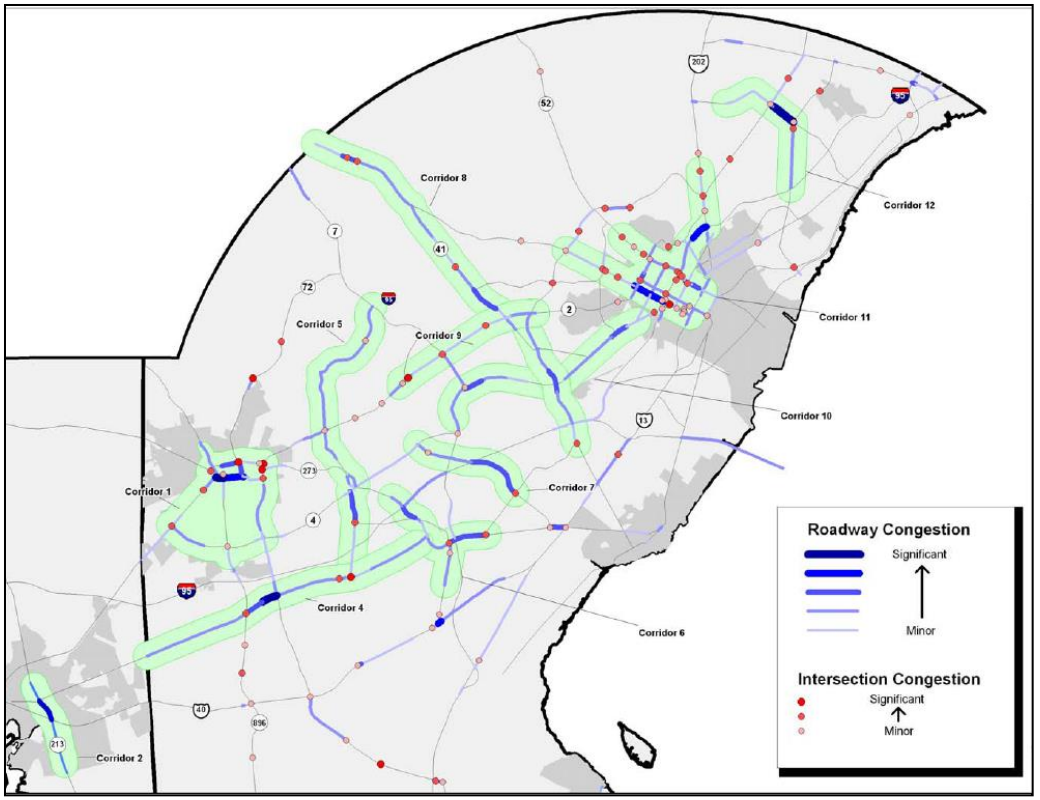
Source: Capital District Transportation Committee

Action 2: Define CMP Network

- Must define the geographic boundary of the study area (typically the MPO boundary)
- Must define the system components to analyze (network of surface transportation facilities)
  - Freeways and Arterial Roadways
  - Transit Services (rail, bus, etc.)
  - Bicycle and Pedestrian Networks

Action 2: Example (WILMAPCO)

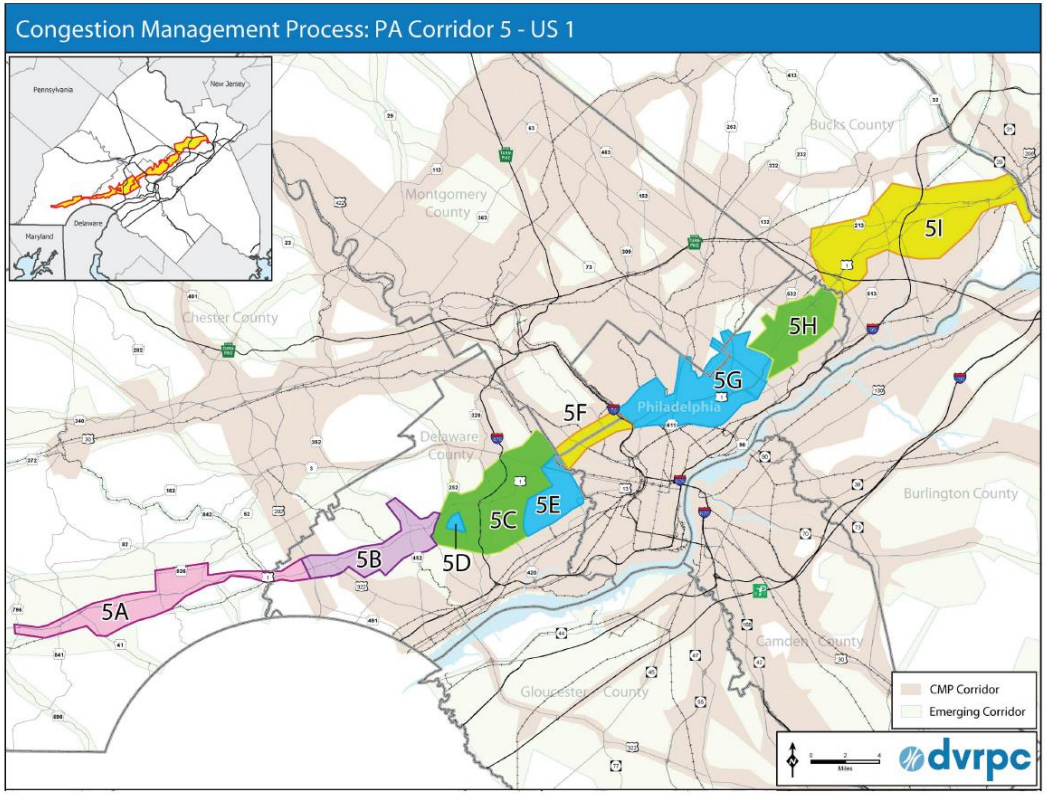
- Wilmington Area Planning Council (Wilmington, DE)
  - Two-tiered system of collecting data on all roadways classified as arterials or higher
  - Defines a limited set of CMP corridors based on the results of the data collection



Source: "2009 WILMAPCO Congestion Management System Summary", Wilmington Area Planning Council, 2009.

Action 2: Example (DVRPC)

- Delaware Valley Regional Planning Commission (Philadelphia, PA)
  - Uses evaluation criteria to define a network of major CMP corridors,
  - Corridors are further divided into subcorridors



Source: "Maps of Pennsylvania Congested Corridors", Delaware Valley Regional Planning Comission, 2009.

Action 3: Develop Multimodal Performance Measures

- CMP must identify/include appropriate performance measures to
  1. assess extent of congestion, and
  2. support evaluation of the effectiveness of implemented congestion management strategies
- Measures can be region-wide or location-specific
- Performance measures can be adjusted and adapted over time
- MPOs should try to measure the intensity, duration, extent, and variability of congestion

Action 3: Develop Multimodal Performance Measures

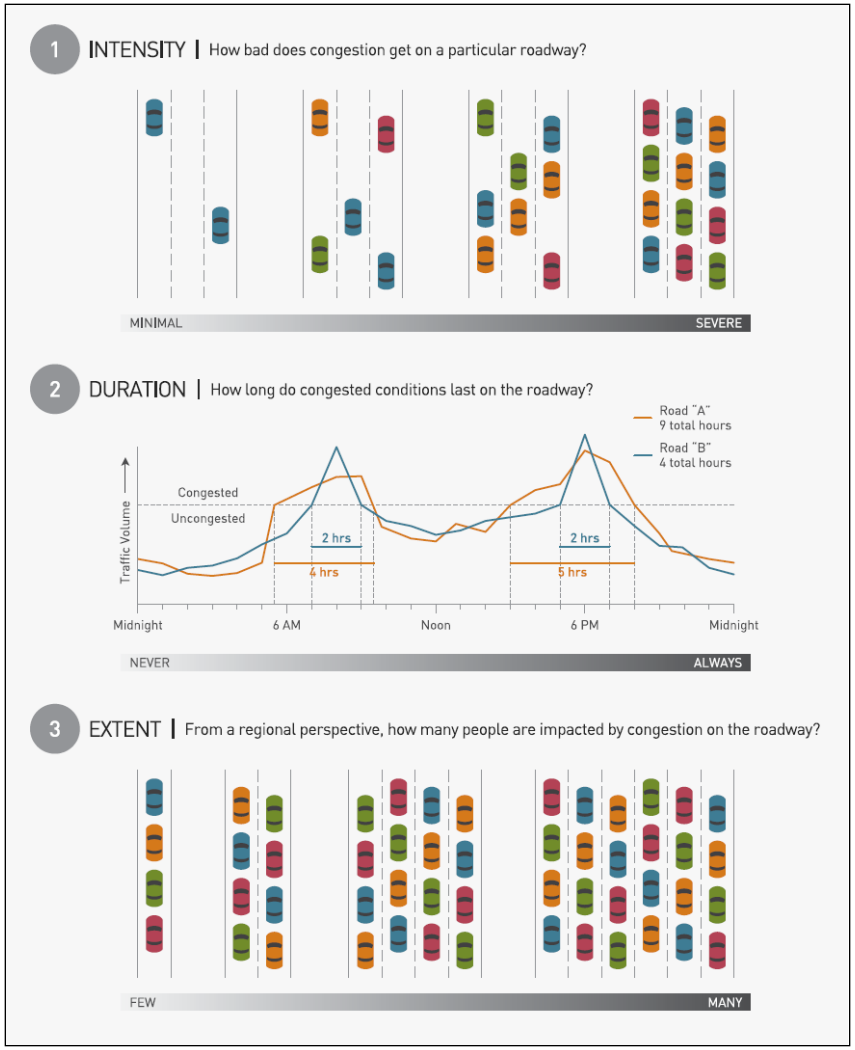
- Not just Volume/Capacity Measures
- A Wide Range of Potential Performance Measures:
  - Travel Time Measures
    - Ratio of peak to off-peak travel time
  - Reliability Measures
    - Planning time index
    - Crash rate
  - Transit Travel Conditions
    - Passenger crowding
    - On-time performance
  - Multimodal Availability
    - Existence of sidewalks
    - Existence of bicycle lanes
  - Accessibility Measures
    - Share of regional jobs within ¼ mile of transit
  - Land Use Measures
    - Jobs-housing balance
  - Congestion Costs
    - Wasted fuel
  - Traveler Information
    - Share of bus stops with "next bus" information

Action 3: Develop Multimodal Performance Measures

- Use multiple performance measures
  - Use screening measures, with additional measures for identified congested locations
- Focus on persons or goods, rather than vehicles
  - Person-hours of delay, rather than vehicle-hours of delay
- Define different levels of performance acceptable in different circumstances
  - Different expectations for HOV lane or transit priority corridor than general highway lane
- Consider use of performance measures in communicating information

Action 3: Example (ARC)

- Atlanta Regional Commission (Atlanta, GA) uses three measures, as portrayed in the graphic at right



Source: Atlanta Regional Commission, Congestion Management Process, 2006

Action 4: Collect Data/Monitor System Performance

- Often the most time/budget-consuming element of the CMP
- Serves important role in objective decision making
- Sources for data:
  - collected by in-house staff or consultants,
  - purchased from data vendors, or
  - gathered from planning/operations partners (such as local governments, state DOTs, transit agencies, etc.)

Action 4: Collect Data/Monitor System Performance

- Common types of data
  - Traffic volume counts (automated or manual)
  - Speed and travel time data (in-vehicle sampling, or purchased data)
  - Archived ITS and operations data
  - Other electronic datasets
  - Aerial-photography-based congestion data
  - Transit data
  - Bicycle/pedestrian data (location of facilities, usage)
  - Crash data

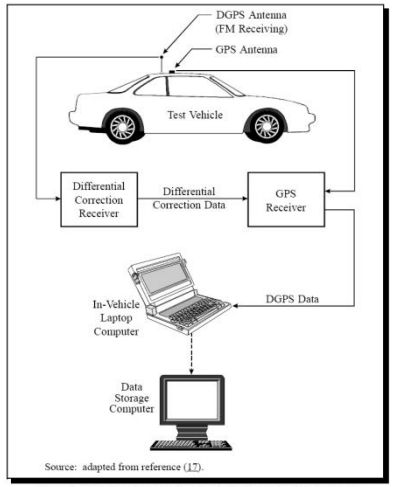
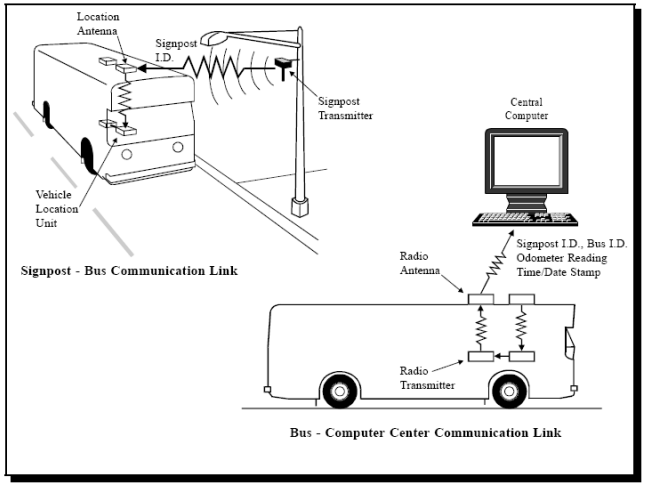


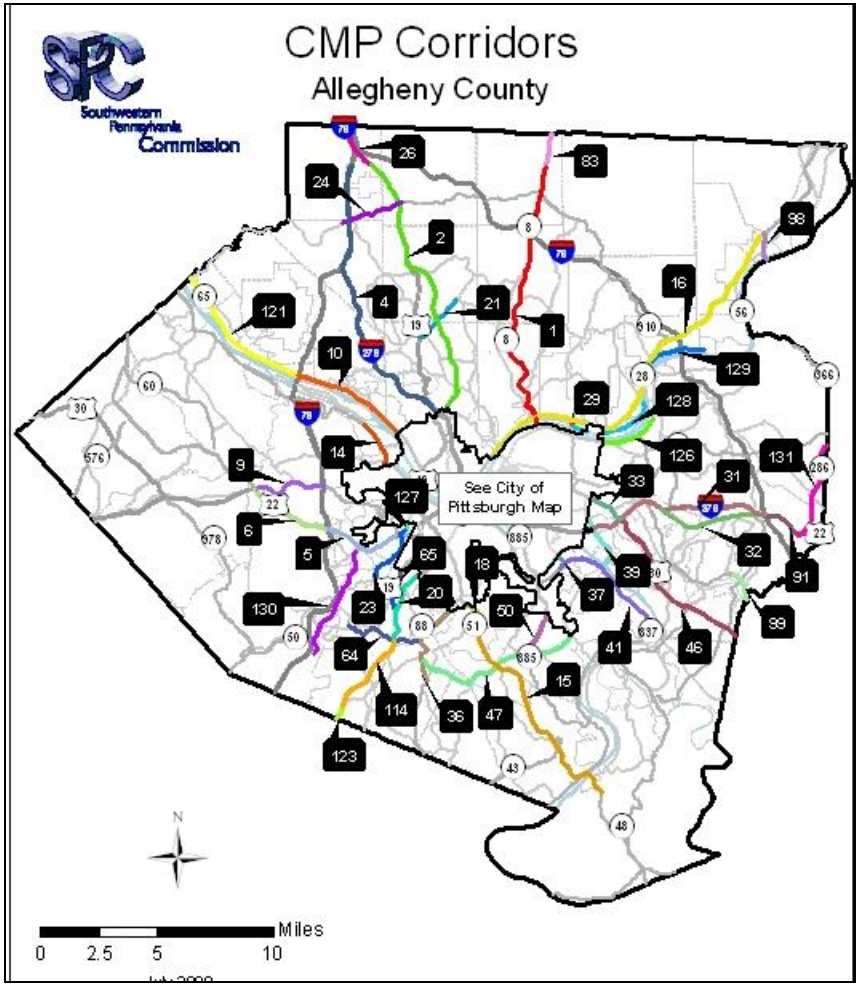
Figure 3-6. Typical Equipment Setup for GPS Test Vehicle Technique



Source: FHWA, Travel Time Data Collection Handbook, 1998

Action 4: Example (SPC)

- Southwestern Pennsylvania Commission (Pittsburgh, PA)
  - collects data on travel time, speed, and delay on a three-year cycle using in-house staff and equipment



Source: Southwestern Pennsylvania Commission, "Congestion Management Process: Allegheny County CMP Corridors", (from website) 2010

Action 4: Example (PSRC)

- Puget Sound Regional Council (Seattle, WA)
  - primarily uses data collected by member agencies, viewing its role as the collator, coordinator, and analyzer of the data

Source: Puget Sound Regional Council, DRAFT T2040 Monitoring: Congestion and Mobility Report, 2010 Existing Conditions.

Action 5: Analyze Congestion Problems and Needs

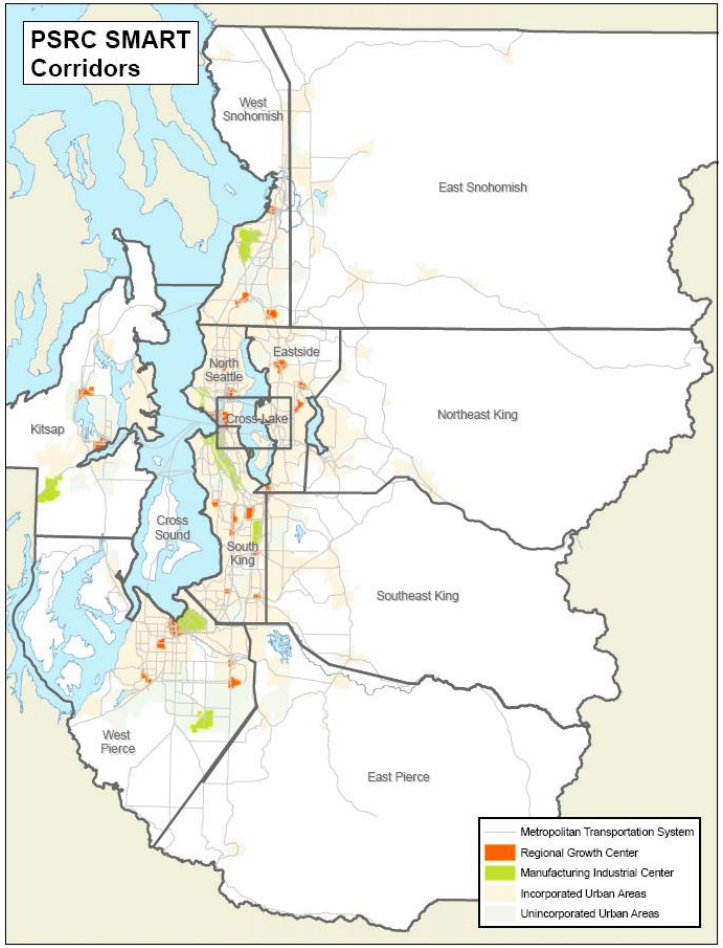
- Before congestion management strategies can be identified, it is necessary to identify:
  - What the problems are;
  - Where they are located; and
  - What is causing them.

- This action serves as a critical link between data collection and strategy identification.

- Raw data must be translated into meaningful measures to allow comparison of conditions

Action 5: Example (PSRC)

- Puget Sound Regional Council (Seattle, WA)
  - Member agencies identify the causes of congestion through route development and corridor studies.
  - Studies have been completed on almost every major facility in the region.
  - PSRC "rolls-up" the causes of congestion identified by member agencies and uses the information as an input to discussions on the development and evaluation of congestion management strategies.



Source: Puget Sound Regional Council, DRAFT T2040 Monitoring: Congestion and Mobility Report, 2010 Existing Conditions.

Action 6: Identify and Assess CMP Strategies

- A set of recommended solutions to effectively manage congestion and achieve congestion management objectives
- Strategy selection should consider the stated congestion management objectives, local context, contribution to other regional goals and objectives, and implementation jurisdiction
- Strategies are typically selected for individual corridors/locations based on a larger defined set of strategies that could apply in the region

Action 6: Example Strategies

- Congestion management strategies typically fall into four broad categories:
  - Demand Management
    - Examples: promotion of alternative transportation, flexible work hours, telecommuting, land use changes, and congestion pricing
  - Traffic Operations
    - Examples: ramp metering, access management, signal timing optimization, and improved incident response
  - Public Transportation
    - Examples: new or improved transit services, improved bicycle and pedestrian access to transit, and dedicated transit rights-of-way
  - Road Capacity
    - Examples: intersection improvements, HOV lanes, and additional travel lanes

Action 7: Program and Implement CMP Strategies

- At the regional level, the CMP serves as a tool for identifying and prioritizing projects listed in the MTP and TIP (CMP measures are often used as criteria in the decision-making process)
- Some MPOs explicitly set aside funding for projects identified through the CMP (often specifically for operations or demand management projects)
- Many MPOs conduct corridor studies to develop more detailed strategies for specific corridors
- Important to note opportunities for operations and demand management strategies to be included along with capacity-adding projects (supplemental strategies)

Action 7: Example (DVRPC)

- DVRPC identifies supplemental congestion management strategies to implement as part of capacity-adding projects

Table A-1. MPMS# 69815, 69816 and 69817 US 322 Widening (US 1 to I-95)			
Commitment	**Status**	**Lead Agency/ Organization**	**Comments/Appropriate Strategy**
Add bus stops on US 322	Planned	PennDOT / SEPTA	Improved Transit Service
Widen shoulder to 10' for bicycle improvements	Planned	PennDOT	Pedestrian and Bicycle Improvements
Install sidewalks for project area	Planned	PennDOT	Pedestrian and Bicycle Improvements
Install Park and Ride lot in project area	Planned	PennDOT	TDM Strategies
Upgrade signals and tie into Concord Township's closed-loop system	Planned	PennDOT	Basic Signal Upgrade
Extend closed-loop system throughout US 322 Corridor	Planned	PennDOT	ITS
Maintain website to provide public with information about project progress and development	Completed	PennDOT	www.us322-conchester.com

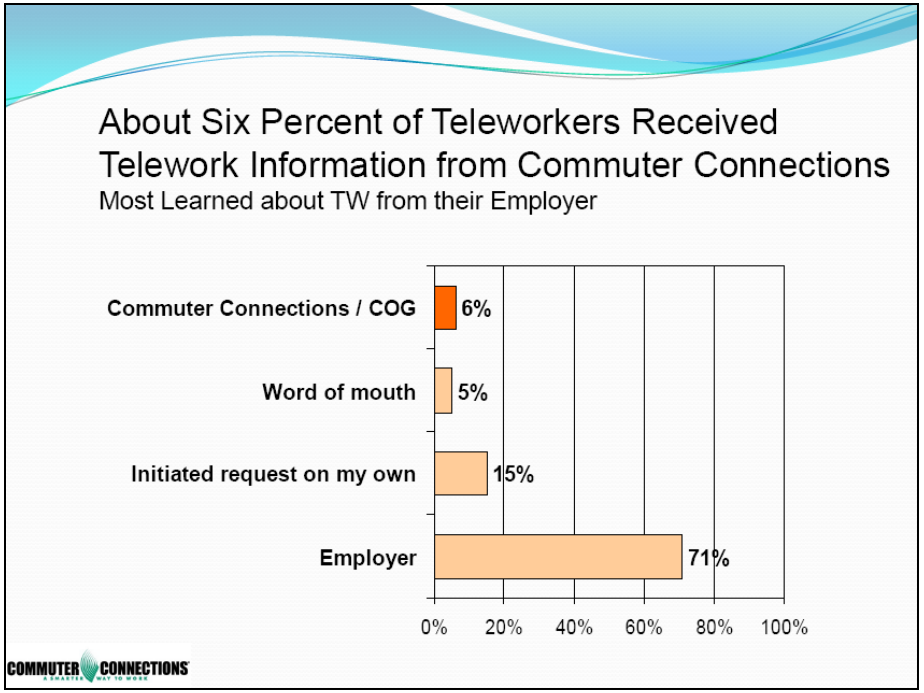
Source: "2009 Congestion Management Process Supplemental Projects Status Memorandum", Delaware Valley Regional Planning Commission, 2008.

Action 8: Evaluate Strategy Effectiveness

- Ensures that implemented strategies have been effective and allows changes to be made if strategies are ineffective
- Two primary methods of evaluation:
  - System-level performance evaluation
  - Strategy effectiveness evaluation
- Can be an on-going process, or a sequential step within the CMP process

Action 8: Example (TPB)

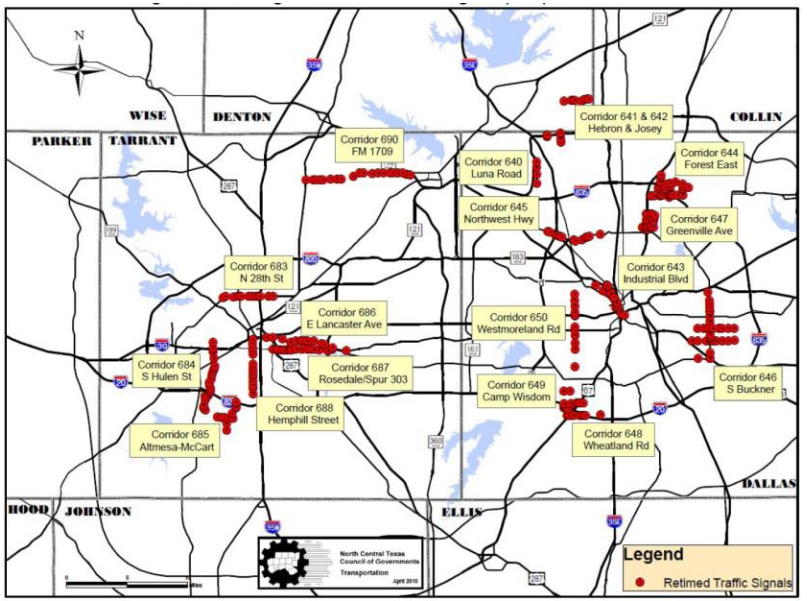
- The National Capital Region Transportation Planning Board (Washington, DC)
  - Uses surveys to estimate the impacts generated by demand management programs such as ride sharing and “Guaranteed Ride Home”



Source: Commuter Connections, “2010 State of the Commute Presentation to the National Capital Region Transportation Planning Board”, 2010.

Action 8: Example (NCTCOG)

- The North Central Texas Council of Governments (Dallas, TX)
  - Conducted analyses of its signal timing program to show the environmental and mobility benefits of the improvements



Corridor		Number of Signals: Along Travel Time Route	Number of Signals: Corridor Total	Average Daily Traffic	Benefits: From Travel Time Runs [A]: Travel Time (seconds)	Stops	Delay (veh-sec)	From Synchro™ [A,D]: Total Signal Delay (veh-hours)	Stops	Total Travel Time (veh-hours)	Fuel Consumed (gallons)	CO Emissions (kilograms)	NOx Emissions (kilograms)	VOC Emissions (kilograms)	Daily User Savings [B]: Corridor Total	Per Intersection
640	Luna Road	6	6	17,700	-192	-3	-153	-57	-5,944	-51	-125	-8.75	-1.70	-1.97	$713	$119
641	Hebron	7	7	39,100	-448	-10	-432	-173	-8,474	-125	-166	-11.65	-2.24	-2.70	$2,163	$309
642	Josey	4	4	34,000	-136	-3	-133	-354	-1,238	-366	-262	-18.10	-3.50	-4.21	$4,425	$1,106
643	Industrial Blvd	15	15	36,800	-772	-22	-778	-760	-13,382	-720	-607	-42.46	-8.26	-9.88	$9,500	$633

Source: NCTCOG "Thoroughfare Assessment Program Phase 3.2, Executive Summary", June 2010.

The CMP Within the Regional Transportation Planning Context

- Collaboration among stakeholders
- Livability and multimodal considerations
- SOV capacity-adding projects and the role of demand management and operations strategies
- Linkage to NEPA and the project development process
- Documentation of the CMP

Stakeholder Collaboration in the CMP

- Collaboration and coordination with stakeholders is an important foundation for an effective CMP
- Stakeholders include MPO planners, State DOT operations and planning staff, transit agencies, local governments, toll authorities, and the private sector, among others
- Collaboration is particularly useful for:
  - Developing regional objectives and performance measures
  - Sharing and analyzing data
  - Identifying and prioritizing strategies

Stakeholder Collaboration in the CMP

- Many MPOs have developed advisory committees to guide the CMP process
- Capital Area MPO (Austin, TX)
  - extensive use of working groups and committees to support the congestion management process
- WILMAPCO (Wilmington, DE)
  - involvement of citizens and technical staff on the CMP advisory committee

Livability and Multimodal Considerations

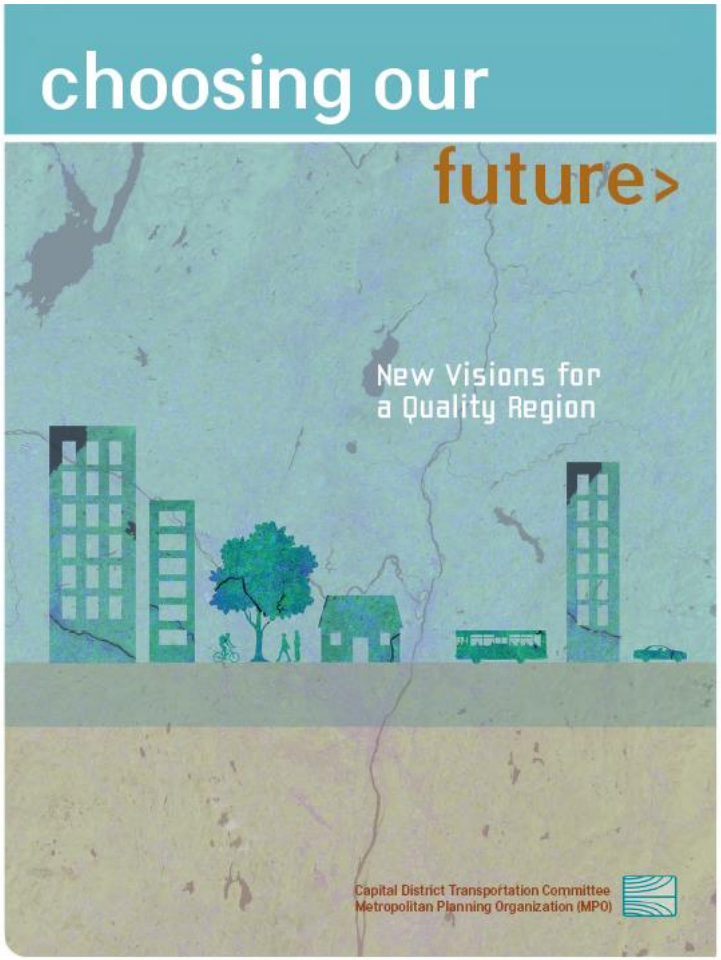
- There are several ways in which the CMP can support livable communities:
  - By developing congestion management objectives that account for community issues, not just vehicle traffic
  - By setting multimodal performance measures that focus on people, not just vehicles
  - By identifying the most appropriate congestion management strategies for specific locations, based on their positive contributions to communities and neighborhoods

Livability Principles

- Provide more transportation choices
- Promote equitable, affordable housing
- Enhance economic competitiveness
- Support existing communities
- Coordinate policies and leverage investment
- Value communities and neighborhoods

Livability and Multimodal Considerations

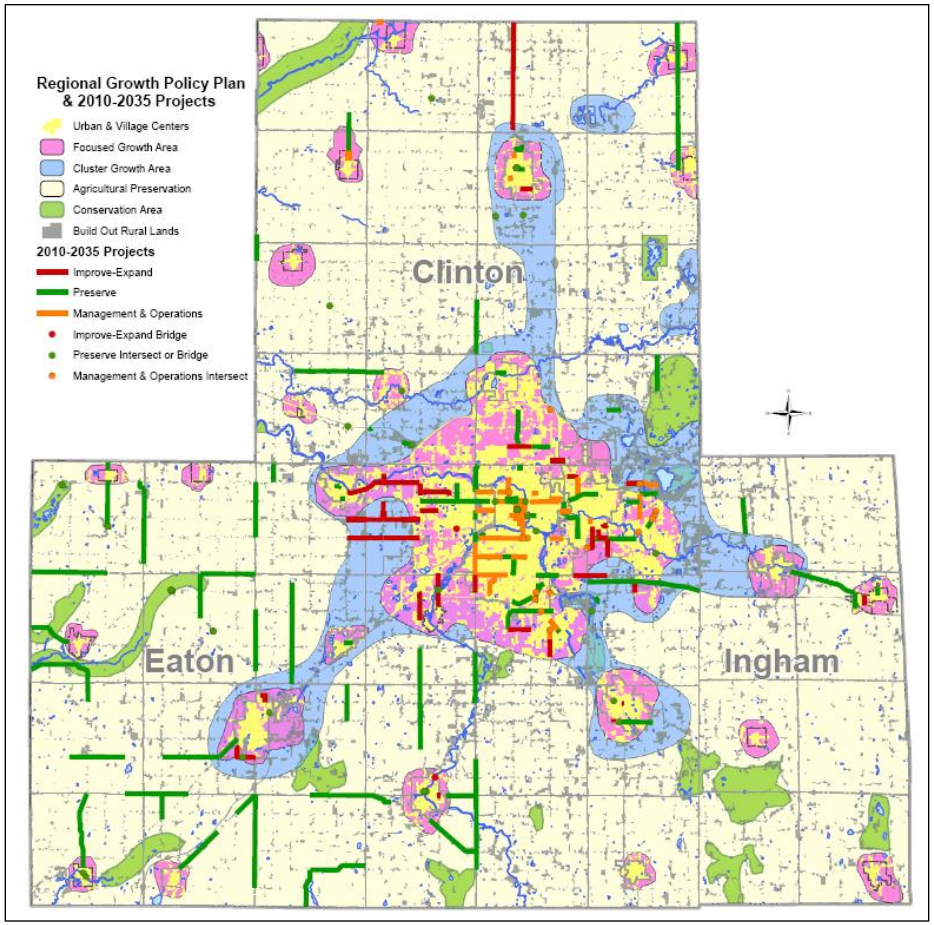
- Capital District Transportation Committee (Albany, NY)
  - focus on livability has placed a strong emphasis on management and operations strategies as a key approach for congestion management.
  - Reducing traffic congestion is balanced with other regional objectives



Source: Capital District Transportation Commission, 2007
http://www.cdtcmpo.org/rtp2030/brochure.pdf

Livability and Multimodal Considerations

- Tri-County Regional Planning Commission (Lansing, MI)
- Columbia Area Transportation Study (Columbia, SC)
  - land use and growth management as first level of congestion management strategies considered



Source: "Regional Growth Policy Plan & 2010-2035 Projects" Tri-County Regional Planning Commission, 2010

Livability and Multimodal Considerations

- Many MPOs have identified both performance measures and congestion management strategies related to multimodal transportation, particularly with regard to transit.
- Puget Sound Regional Council (Seattle, WA)
  - Developed detailed performance measures related to bus operations/performance, such as
    - re-entry delay,
    - bus queuing delay,
    - loading congestion, and
    - mobility-device loading delay

Source: Puget Sound Regional Council, DRAFT T2040 Monitoring: Congestion and Mobility Report, 2010 Existing Conditions.

SOV Capacity-Adding Projects

In areas that are designated as non-attainment or maintenance areas for ozone and carbon monoxide:

- No federal funding for SOV capacity-adding projects unless the project is addressed through the CMP
- Must analyze reasonable demand management and operations strategies for a corridor in which an increase in SOV capacity is proposed.
- If a capacity-adding project is warranted, must also identify and incorporate reasonable travel demand reduction and operational strategies.

Example: Delaware Valley Regional Planning Commission (Philadelphia, PA) supplemental strategy requirement

Table A-1. MPMS# 69815, 69816 and 69817 US 322 Widening (US 1 to I-95)			
Commitment	**Status**	**Lead Agency/ Organization**	**Comments/Appropriate Strategy**
Add bus stops on US 322	Planned	PennDOT / SEPTA	Improved Transit Service

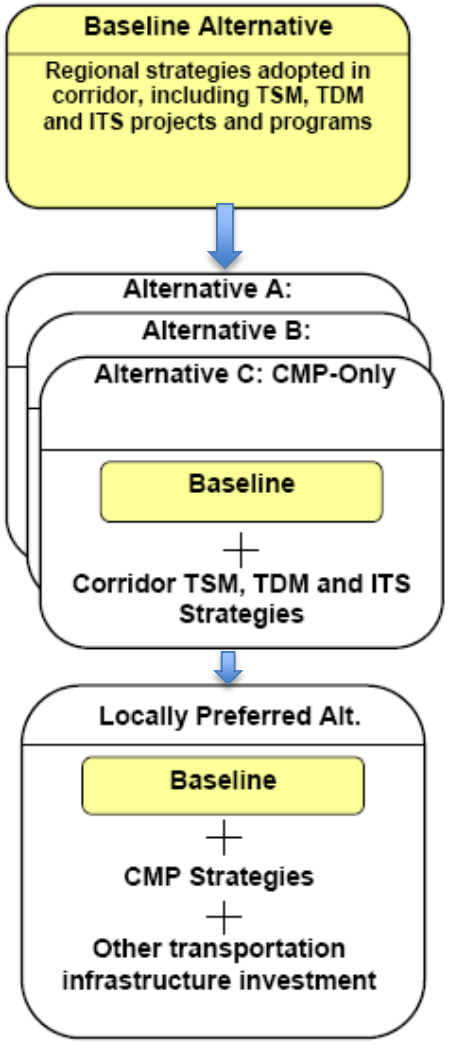
Source: "2009 Congestion Management Process Supplemental Projects Status Memorandum", Delaware Valley Regional Planning Commission, 2008.

CMP-NEPA Linkage

- Several ways for the CMP to inform the NEPA process:
  - Documentation of the need for capacity enhancement supports the NEPA Purpose and Need
  - Project alternatives to be studied in NEPA include the congestion management strategies identified in the CMP
  - Collection of before-and-after data as part of the implemented projects supports the strategy evaluation element of the CMP
- One key element: Work with NEPA practitioners to ensure that documentation developed for the CMP will be adequate for use in NEPA

CMP-NEPA Linkage

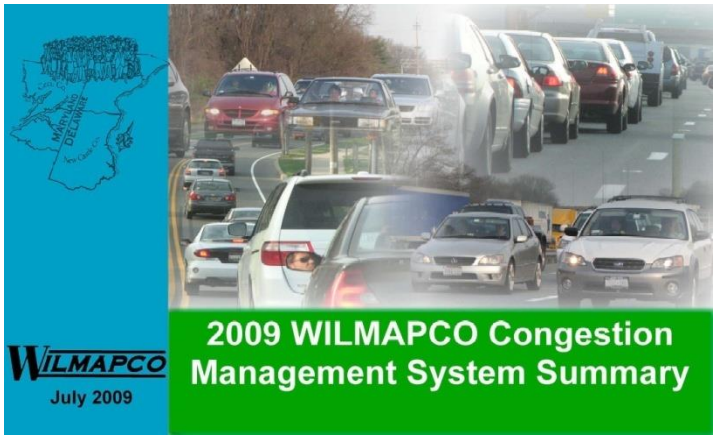
- North Central Texas Council of Governments (Dallas, TX)
  - When NCTCOG reviews draft NEPA documents, they analyze the document for consistency with the CMP and will not endorse the NEPA document unless the two match (sometimes requiring revision of either the NEPA document or the MTP/CMP).
  - Operations and demand management strategies identified in the NEPA document are incorporated into the CMP and MTP and are considered to be funded commitments

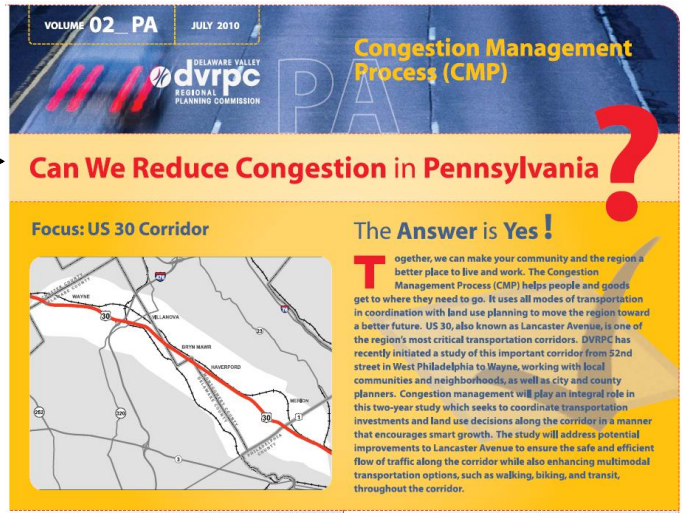


Source: "Overview of the Dallas-Ft. Worth Congestion Management Process", North Central Texas Council of Governments.

CMP Documentation

- There are many ways of documenting the CMP, associated data, and evaluation results:
  - Incorporate description of CMP into MTP
  - Provide information (including collected data) on a website
  - Produce annual or periodic reports, including maps and charts, for the public and decision-makers
  - Develop brochures/newsletters for the public
  - Develop detailed technical reports and guidebooks on congestion management for use by the MPO and partner agencies





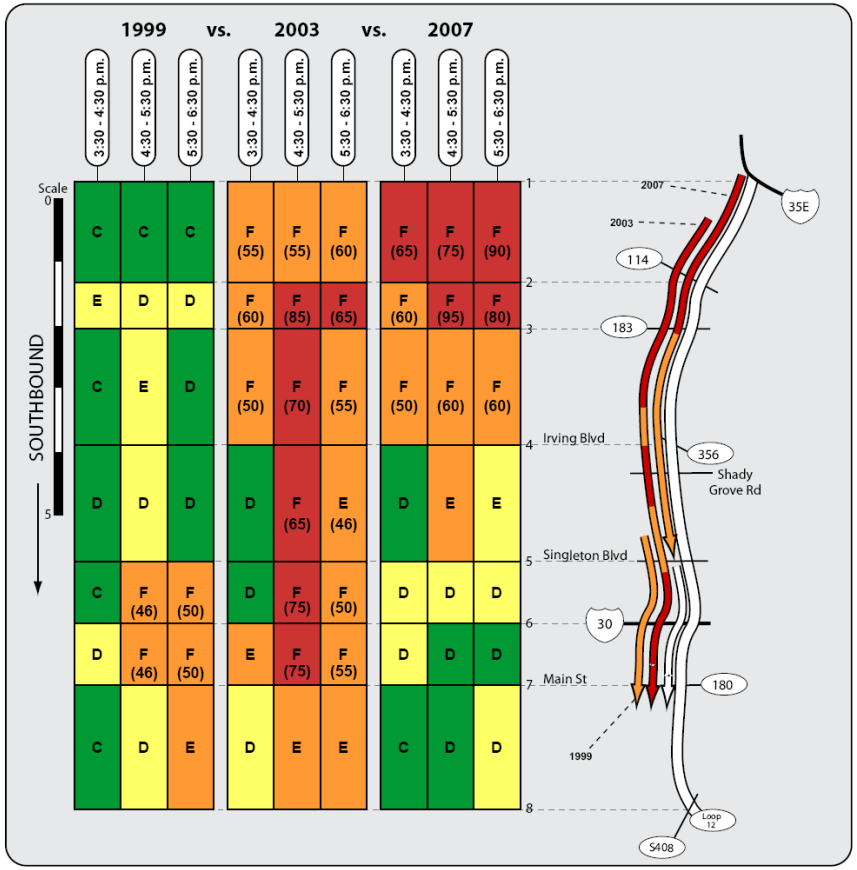
Sources: "2009 WILMAPCO Congestion Management System Summary," WILMAPCO, 2009.
"CMP Newsletter: US 30 Corridor " Vol. 2 – PA, Delaware Valley Regional Planning Commission, 2010.

Visualization in the CMP

- Visualizations serve an important role in the CMP, as both an analysis and a communication tool
- Variety of types:
  - Simple displays, such as charts, graphs, and simple maps
  - More complex displays, such as photosimulations, three-dimensional illustrations, videos, and animation

Visualization in the CMP

- Congested Conditions over Time – North Central Texas Council of Governments (Dallas-Fort Worth, TX)



Source: "2007 Traffic Conditions in the Dallas-Fort Worth Metropolitan Area", North Central Texas Council of Governments, 2007.

Visualization in the CMP

- Travel Time Contour Maps – Atlanta Regional Commission (Atlanta, GA)

Figure 5-4: PM Period Travel Time Contours (15 minutes) from Downtown-Midtown Activity Center (2005)

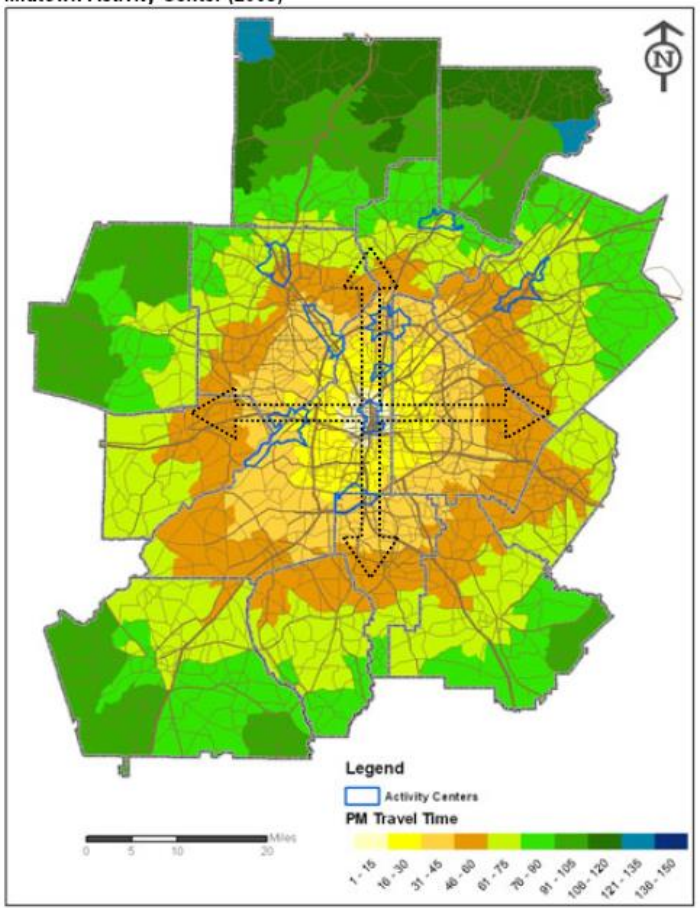
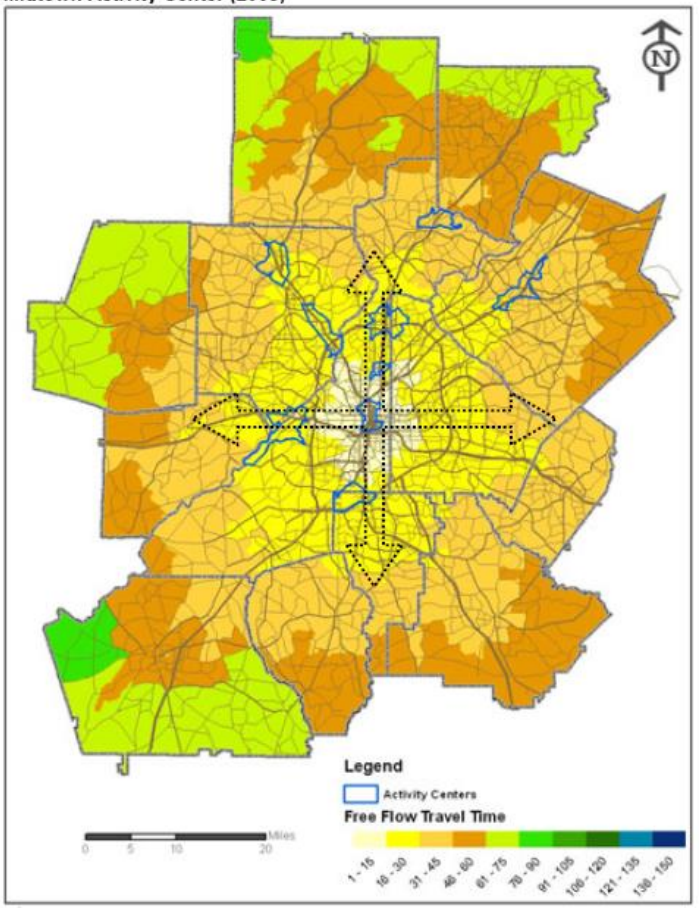


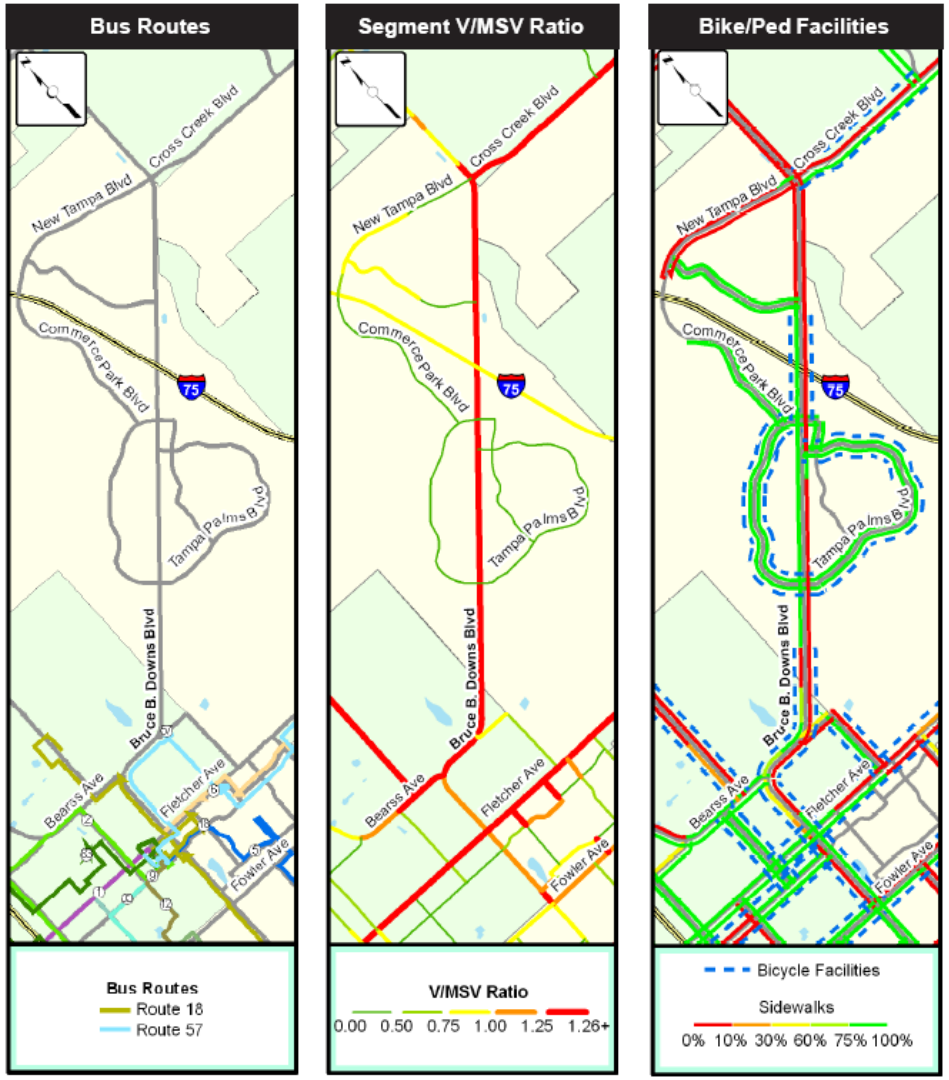
Figure 5-2: Free Flow Travel Time Contours (15 minutes) from Downtown-Midtown Activity Center (2005)



Source: "Congestion Management Process Update 2005: Technical Memorandum 5", Atlanta Regional Commission, 2005.

Visualization in the CMP

- Side-by-side Displays of Multimodal Information – Hillsborough County MPO (Tampa, FL)



Source: "Congestion Management System Performance Report", Hillsborough County MPO, 2005.

Visualization in the CMP

- Photosimulation of potential strategies – Capital District Transportation Committee (Albany, NY)

Source: Capital District Transportation Committee

Visualization in the CMP

- Google Maps – Wilmington Area Planning Council (Wilmington, DE)
  - www.wilmapco.org/cms/
- Time-Speed-Location Diagrams – Chicago Metropolitan Agency for Planning (Chicago, IL)
  - www.cmap.illinois.gov/scans/
- Before and After Video – Southwestern Pennsylvania Commission (Pittsburgh, PA)
  - www.spcregion.org/downloads/signals/beforeafter.wmv

For More Information

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CMP Guidebook available at:
http://www.fhwa.dot.gov/planning/