

# Congestion Management Process

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Toolbox



**WAMPO**

Wichita Area Metropolitan Planning Organization



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# Introduction

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The CMP Toolbox is an addendum that discusses ways to reduce congestion and improve regional air quality. These strategies for reducing congestion, used in conjunction with the identified areas of congestion provided in the Regional Congestion Analysis (RCA), will supply decision makers with options to improve the operational efficiency of the region's transportation system.

There are two categories of congestion reduction strategies included in the Toolbox:

1. *Transportation System Management:* Transportation System Management (TSM) refers to a broad range of non-capital intensive operational improvements that reduce traffic congestion. These can include Travel Demand Management (TDM) strategies, traffic operations improvements, and public transportation enhancements.
2. *Added Capacity:* Adding capacity to the region's transportation system (e.g. more lanes) is a traditional approach in reducing traffic congestion.

A broad spectrum of TSM solutions should be considered before the addition of general purpose lanes is determined to be the preferred option. This is due to the high cost of adding infrastructure. TSM solutions offer more cost effective solutions to congestion problems. Furthermore, if adding capacity is the most appropriate congestion management strategy, explicit consideration should be given to future TSM opportunities that preserve the integrity of these lanes.

The intent of the Toolbox is not to discourage capacity projects. Without question, major capacity investments are needed to meet growing travel demands and keep the region's economy globally competitive. Rather, this document provides an overall management solution by identifying projects that add system capacity as well as those which manage demand and reduce congestion at a much lower cost.

## Transportation System Management

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Transportation System Management (TSM) refers to a broad range of non-capital intensive operational improvements that reduce traffic congestion. There are three categories of TSM solutions identified in the toolbox:

1. Travel Demand Management (TDM) Strategies
2. Public Transportation Enhancements
3. Traffic Operations Improvements

Conventional wisdom and established decision making processes are heavily biased towards the implementation of capacity projects. Tempering the traditional conventions with TSM solutions maximizes scarce financial resources and creates a balanced transportation system.

### *Travel Demand Management*

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Travel Demand Management (TDM) is a general term for demand management strategies that reduce traffic congestion. TDM has recently emerged as the movement to optimize transportation system performance by:

1. Discourage Single Occupant Vehicle (SOV) travel and encourage more efficient modes of travel (e.g. carpool, public transit).
  - Employer-based: Employer-based strategies to decrease SOV travel have proved to be effective in many states across the U.S. After the formation of the *Commute Trip Reduction (CTR)* program in Washington, it was estimated that 26,000 fewer vehicle trips were made, and SOV travel declined by slightly over 5% from 1993-2007 for the participating worksites. Examples of employer based strategies include: alternative work hours, compressed work weeks, telecommuting, carpooling, and incentives for using other alternative modes of transportation (e.g. biking, walking, public transportation).
  - Public Transit: Park and Ride systems are becoming more popular to connect drivers with the public transit system. Park and Rides can be used for commuting to work/school or attending special events. The enhancement of the Public Transportation system can also help decrease SOV travel (see Public Transportation Enhancements on the following page, TB-5).
  - Other: Carpool/Rideshare programs assist employers as well as individuals in finding travel opportunities with other commuters. Many of these programs have included a guaranteed ride home in case of personal emergencies.
2. Promoting local regulations that are beneficial to TDM initiatives (e.g. Zoning, employer flextime).
3. Providing travelers with “real time” traffic information (e.g. media outlets) so they can make better travel related decisions based on current conditions.

The soaring cost of construction coupled with the inability to quickly add new infrastructure has accelerated the TDM movement. TDM strategies are often quick to implement and are typically cost-effective solutions to congestion-related issues. They also potentially yield multiple benefits including reduced congestion, decreased accidents, energy cost savings, and improved air quality. Studies have shown many transportation issues cannot be fully addressed without some level of TDM. From a “big picture” standpoint, a TDM program that includes a number of complementary strategies is a beneficial, cost-effective way to improve the efficiency of a transportation system.

A wide variety of TDM strategies and case studies can be found in the *Federal Highway Administration’s (FHWA) Travel Demand Management Toolbox*. This toolbox provides a number of resources including publications, web links, and training offerings. To remain a cutting edge planning device, this toolbox is continuously updated by FHWA as resources become available. The strategies identified in this toolbox were considered when developing TDM solutions to address traffic congestion.

*The FHWA Travel Demand Management Toolbox:*  
<http://ops.fhwa.dot.gov>

## Public Transportation Enhancements

Public transportation (mass transit) is a system that is set up to transport members of the general public, normally at a charge. This mode of travel generally includes bus, paratransit van, and passenger rail services. Wichita Transit (WT) operates a fixed-route bus service along with a paratransit van service for mobility impaired individuals. Coordinated Transit District 12 (CTD-12) also administers paratransit services for the mobility impaired in a three county area: Butler, Harvey, and Sedgwick Counties.

Citizens in the WAMPO planning area typically travel via personal vehicles. Although public transportation is not yet widely used “choice,” ridership has been on the rise in recent years. Mass transit is also seen as an attractive alternative for those unable and/or unwilling to incur the expenses associated with automobile ownership.

In terms of the CMP Toolbox, public transportation projects can reduce traffic congestion and improve regional air quality by limiting the number of personal vehicles on the roadway network. WT is currently exploring opportunities to extend services between outlying communities and major employment centers. This type of initiative would provide additional transportation options and could reduce the number of vehicles present during peak periods. Keep in mind, service expansion alone may not be completely effective and should be paired with TDM strategies to further reduce peak hour congestion.

WT is also implementing an ITS project that will streamline transit operations. This project has a broad scope and includes the following elements:

1. Automatic Vehicle Location (AVL)
2. Automated Stop Announcement system
3. External Vehicle Identification system
4. Computer Aided Dispatch (CAD) system with Mobile Data Terminals (MDT)
5. Automated Passenger Count system
6. Customer Service system (e.g. web information)
7. Vehicle Diagnostic system

The elements of this project will enhance delivery of service and are critical public transportation enhancements that can reduce traffic congestion and improve regional air quality. It is recommended that expansion of service, improvements to transit operations, and incorporation of TDM strategies should be considered as part of a multi-pronged congestion management /air quality improvement program.

Additional information may be found at the following resources:

*WT Homepage:*  
[www.wichita.gov](http://www.wichita.gov)

*Federal Transit Administration (FTA) – Planning and Environment Homepage:*  
[www.fta.dot.gov](http://www.fta.dot.gov)

## Traffic Operations Improvements

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Traffic Operations Improvements reduce traffic congestion by maximizing safe and efficient traffic movements. There are six operational improvement strategies identified in the Toolbox:

1. Traffic signal coordination
2. Deployment of ITS technologies
3. Efficient intersection design
4. Construction of auxiliary lanes
5. Traffic calming initiatives
6. Access management strategies

### 1. Traffic Signal Coordination

Coordinated traffic signals are able to communicate electronically with one another and work in unison. When traffic signals are coordinated, it is more likely motorists will be able to travel through consecutive stoplights without having to stop. This strategy is typically used along heavily traveled arterial streets with closely spaced traffic signals. A typical scheme gives priority to the heaviest traffic movements and usually means side street traffic will experience a longer wait time. Although traffic signal coordination can reduce travel delays (e.g. red lights) along a corridor, motorists may not always experience “non-stop” free-flow conditions.

Traffic signals can be controlled from a central point (e.g. Traffic Operations Center) or by a field technician. Transportation officials typically prefer signals to be monitored from a central location to allow for immediate notification of equipment failure or changes in traffic conditions. To maintain a robust program, timing schemes

should be continually monitored for effectiveness and adjusted as needed.

Per FHWA, the following bullet points hallmark the benefits some regions have realized through a signal coordination program.

- The *Traffic Light Synchronization Program* in Texas shows that every dollar spent on synchronization can produce a savings of \$62. Other benefits found from this program include; a 24.6% reduction in delay time, 9.1% savings in fuel consumption, and 14.2% fewer stops.
- The *Fuel Efficient Traffic Signal Management Program* in California showed that every dollar spent on traffic signal management produced a cost savings of \$17. Other benefits from this program include a 14% reduction in delay time, an 8 % savings in fuel consumption, 13% fewer stops, and an 8% decrease in travel time.
- In St. Augustine, Florida, improvements to traffic signal timing were made on 11 arterial intersections. These improvements produced a 36% reduction in delay time, a 49% decrease in stops, and a 10% reduction in travel time; resulting in an annual fuel savings of 26,000 gallons and a cost savings of \$1.1 million.

A wide variety of signal coordination strategies and case studies can be found in the *FHWA Traffic Signal Timing Toolbox*. This toolbox also provides a number of resources including publications, web links, and training offerings. To remain state of

the art, this toolbox is continuously updated by FHWA as new resources become available. It is recommended that the strategies identified in this toolbox be considered when developing signal timing programs to address traffic congestion.

*The FHWA Traffic Signal Timing Toolbox:*  
<http://ops.fhwa.dot.gov>

## 2. Deployment of ITS Technologies

Intelligent Transportation Systems (ITS) is a general term for adding technology to the multimodal transportation system. The very concept of ITS includes a broad range of electronic technologies. When integrated with the transportation system these technologies can help reduce traffic congestion by maximizing efficient movement of people and goods. Three of the more common ITS applications are described below:

1. *Closed Circuit Television (CCTV) Cameras:* The placement of CCTV cameras allows a technician to monitor traffic conditions. The technician is able to detect an incident, verify an incident has occurred, and depending on the level of resolution provided by the CCTV camera, may be able to provide additional details (e.g. which lane, travel direction, number of vehicles involved, severity) to first responders. Camera monitoring has been shown to decrease emergency response times and restore normal traffic operations more quickly.

The video feed from these cameras can also be channeled to the Internet and prospective motorists can view “real time” traffic conditions, thus enabling

citizens to make informed travel related decisions.

2. *Dynamic Message Signs (DMS):* A DMS is an electronic sign placed along a roadway that displays changeable messages. A DMS makes drivers aware of upcoming traffic delays and typically advise motorists of alternate routes.
3. *Transit Automatic Vehicle Location (AVL) System:* A transit AVL system uses advanced technology, such as Global Positioning Systems (GPS), to monitor the real-time location and movement of vehicles. The objectives of implementing a transit AVL system include developing more efficient schedules and improving the ability of dispatchers to adjust on-street operations.

These are only a few of the many ITS applications currently in use around the country. ITS technologies are thoroughly discussed in the Wichita Area Regional ITS Architecture (RA). The RA is a blueprint identifying how ITS can be deployed regionally in a coordinated, interoperable manner. This document is continuously updated as new technologies become available.

*The Wichita Area Regional ITS Architecture:*  
[www.wampoks.org](http://www.wampoks.org)

*The FHWA ITS Joint Program Office  
Homepage:*  
[www.its.dot.gov](http://www.its.dot.gov)

### 3. *Efficient Intersection Design*

Traffic congestion normally occurs during the peak periods and is most apparent at intersections (includes interchanges). Intersections naturally act as bottlenecks when large numbers of vehicles are present. Improvements such as dedicated turn lanes, better signing and pavement marking, enhanced traffic channelization, and signal coordination are cost effective treatments that can reduce congestion by making intersections function more efficiently. Furthermore, these types of improvements address both recurring and non-recurring congestion by maximizing operational efficiency and reducing collisions by limiting the number of vehicular conflict points.

Intersections that are already congested run the serious risk of becoming more congested over time. Traditional approaches may temporarily reduce congestion but additional capacity may eventually be necessary. In some extreme cases, construction of a grade-separated interchange, Continuous Flow Intersection (CFI), or a flyover may be the solution.

A wide variety of resources are available that address efficient intersection design standards. The most comprehensive resource is the *AASHTO Green Book*, available at the following website:

*AASHTO Bookstore:*  
<https://bookstore.transportation.org>

At this time, the CMP does not monitor congestion levels at railroad crossings. These intersections can cause significant traffic congestion, especially in urban areas where traffic volumes are typically high and

trains move at reduced speeds. The planning area currently has just under 300 railroad crossings. Staff does not have the resources to effectively monitor congestion levels at these locations; however, WAMPO will continue to explore methods to monitor traffic congestion resulting from railroad crossings.

The *WAMPO Railroad Crossing Plan* presents a number of strategies to minimize automobile/railroad interactions. The plan discusses consolidation of at-grade crossings and implementing grade-separation projects, among other things. It is recommended that the strategies identified in this plan be reviewed and considered when addressing traffic congestion attributed to railroad crossings.

*The WAMPO Railroad Crossing Plan:*  
[www.wampoks.org](http://www.wampoks.org)

### 4. *Construction of Auxiliary Lanes*

Auxiliary lanes help eliminate conflicts that occur when cars merge on and off the freeway. These facilities connect interchanges and allow local traffic to use the freeway without impeding through traffic, thereby helping maintain the operational integrity of a corridor.

The addition of auxiliary lanes has been recommended as part of the recently completed KDOT study of I-235 at Kellogg and Central. The consultant team has concluded that auxiliary lanes on the I-235 mainline between Kellogg and Central will greatly enhance traffic operations along the corridor. Information regarding auxiliary lanes can be found at the following web resources:

I-235 at Kellogg/Central study details:  
[www.ksdot.org](http://www.ksdot.org)

The FHWA Freeway Management and  
Operations Handbook:  
<http://ops.fhwa.dot.gov>

## 5. Traffic Calming Initiatives

Traffic calming refers to strategies that slow down or reduce local traffic, thereby improving pedestrian safety, reducing congestion, and enhancing overall livability for residents. There are three guiding principles (Three 'E' Doctrine) transportation professionals refer to when discussing traffic calming. Transportation officials often recommend that traffic calming initiatives incorporate all three guiding principles to maximize benefit. Shown below identifies and explains the Three 'E' Doctrine.

1. Engineering: All physical elements of a street that are modified as part of a traffic calming initiative (e.g. speed bumps, roundabouts).
2. Education: Neighborhood traffic studies show that residents largely contribute to excessive speed and traffic problems. Raising awareness and educating citizens is an effective means of modifying driver behavior.
3. Enforcement: Law enforcement agencies are key players in modifying driver behavior (e.g. writing tickets!).

A number of treatments can be used in order to slow down or reduce local traffic. Common traffic calming measures include lane narrowing, road diets (reduction in

travel lanes), addition of on-street parking, and reduced building setbacks. These types of measures are often effective because when motorists feel confined, vehicle speeds are reduced and driver awareness increases. Engineers and planners may also employ physical traffic calming devices. Examples include speed bumps/humps, speed cushions, full or partial road closures, roundabouts, and raised pedestrian crosswalks.

These are only a few of the many traffic calming techniques currently in use around the country. The industry leading resource listed below is continuously updated as new traffic calming mechanisms are developed.

Traffic calming resource:  
[www.trafficcalming.org](http://www.trafficcalming.org)

## 6. Access Management Strategies

Access Management refers to the regulation of access points, driveways, and median openings along a roadway. The primary objective of Access Management is to allow motorists access to adjacent development while maintaining / increasing roadway safety and capacity (e.g. efficient mobility). Some of the more common Access Management strategies are discussed below:

1. Center Left Turn Lanes (CLTL): A CLTL, also known as a *Two-Way Left Turn Lane (TWLTL)*, is a single lane in the center of the road. Traffic from both directions pull into this lane to make a protected left turn. These lanes increase safety and preserve roadway capacity by reducing interactions between

“turning” and “through” traffic. This strategy is commonly used throughout the WAMPO region along the CMP Network’s Regional Arterial System (RAS).

2. **Shared Driveway:** A single driveway providing access to a number of lots is considered a shared driveway. This reduces the number of driveways on a roadway and helps to increase safety and preserve capacity.
3. **Cross Access:** This practice, also known as *On-Site Circulation*, allows vehicle access between two or more lots. Thus, in order to access separate developments, motorist can avoid use of the “mainline”.

Access Management is most effective when adopted as part of local/regional policy. Many regional policies express preference towards Access Management strategies because they address both recurring and non-recurring congestion by maximizing traffic flow and minimizing accidents, respectively.

These are only a few of the many Access Management techniques currently in use around the country. The following resources provide additional information that is continuously updated as Access Management continues to evolve:

*Kansas Department of Transportation (KDOT)*  
– Access Management:  
[www.ksdot.org](http://www.ksdot.org)

*Federal Highway Administration (FHWA)* –  
Access Management:  
<http://ops.fhwa.dot.gov>

## Added Capacity

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Without question, major capital investments are needed to meet growing travel demands. There may be situations where TSM solutions do not ease traffic congestion and the addition of general purpose lanes to the CMP Network is the only practical option. A broad spectrum of TSM solutions should be considered before the addition of general purpose lanes is determined to be the preferred option. Furthermore, if adding capacity is the most appropriate congestion management strategy, explicit consideration should be given to future TSM opportunities that preserve the operational integrity of these lanes.

A wide variety of resources are available that address these types of projects. The most comprehensive resource is the *AASHTO Green Book*, available at the following website:

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