Section 6.8

Operations, Maintenance, and Systems Management

W A M P O

Wichita **A**rea **M**etropolitan **P**lanning **O**rganization

Section 6.8: Operations, Maintenance, and System Management

Overview

The day to day maintenance and capital improvements of various parts of the transportation system are the responsibility of the agencies that own them. The roadway network is operated and maintained by many agencies, such as the State and local jurisdictions. The transit system is operated and maintained by the many transit agencies in the region. Air, rail, bicycle, and pedestrian facilities are also operated and maintained by many different agencies.

Traffic Signals at Central and Seneca

Operations, maintenance, and management activities are important for the efficient movement of people and goods. With limited funding to meet all of the region's transportation needs, it is important to maintain and preserve existing transportation facilities.

This section of the MTP 2035 will define operations, maintenance, and system management. It discusses the importance and effects of maintenance and operations. It discusses the programs in place in the WAMPO region to address operations, maintenance, and system management as well as the responsibilities of various agencies. This section focuses on roadways and includes some discussion on transit, bicycle, and pedestrian facilities.

Cars at At-Grade Rail Crossing

What Is Operations and Maintenance?

Operations and maintenance covers a wide range of activities that are intended to keep transportation infrastructure, such as roads, paths, and buses, in good repair and functioning properly. Some of these activities include:

- Street sweeping.
- Snow and ice removal.
- Pavement and lane markings.
- Traffic sign and signal repair.
- Pothole and pavement patching.
- Bridge inspections and repair.
- Rail crossing inspections and repair.
- Pavement resurfacing.
- Vehicle maintenance.

What is operations and maintenance?

Operations and maintenance refers to the routine care and up keep of transportation system. Proper road, bridge, and fleet vehicle maintenance can extend the useful life of the transportation investments.

Construction on K-15

Sealed Pathway

Why Is Operations and Maintenance Important?

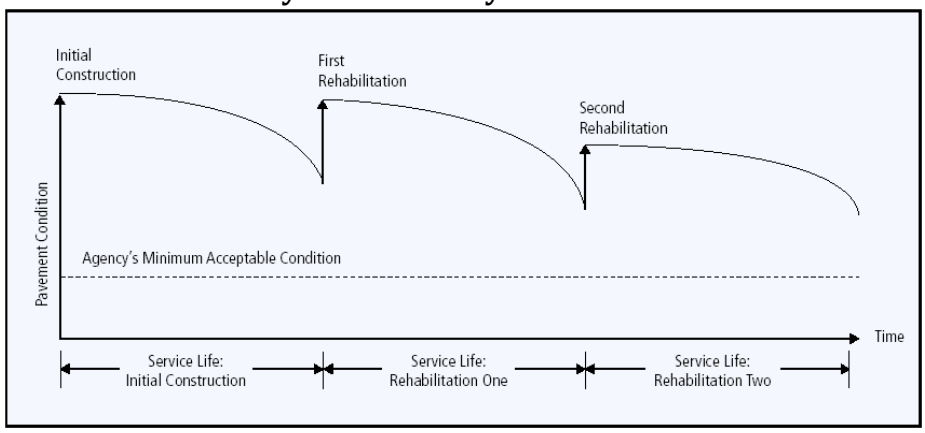
As mentioned earlier, operations and maintenance are important for the efficient movement of people and goods. The following paragraphs explain the importance and identify certain benefits.

Costs

Much like regular vehicle maintenance is necessary to extend the useful life of a car; roads, paths, bridges, and transit vehicles also require regular maintenance to reach the expected life of these investments. By extending the life of transportation infrastructure, they will need to be replaced less often, which costs less over the long-term.

A life-cycle cost analysis evaluates the initial cost of a project or infrastructure investment and the maintenance costs. It analyzes maintenance, reconstruction, rehabilitation, restoration, and resurfacing costs over the life of the infrastructure. **Exhibit 6.8.1** shows a generic life-cycle cost analysis.

Exhibit 6.8.1: Life-Cycle Cost Analysis



Transportation system users have the expectation of a clean and well maintained system. Crumbling pavement and roads filled with potholes do not meet the expectations of the user. In addition, these conditions reduce fuel efficiency, decrease safety, and increase travel times and vehicle operational costs to the user.

These additional costs also apply to transit vehicles that use the road system. Not only do transit users expect a relatively smooth ride, they also expect the transit vehicles to be clean and well maintained.

Safety

Not only does a well maintained transportation system decrease costs, it is also safer. Replacing traffic lights that have burned out, replacing signs that have fallen, and repainting lane and intersections markings are all examples of maintenance activities that keep the roads safe.

Rehabilitation of a Bridge over US-54/400 (Kellogg)

The result of not maintaining roads and bridges can be significant. Highway and bridge maintenance was in the national spotlight only a few years ago when the I-35W Bridge collapsed in Minneapolis. Although this was a rare instance, the importance of proper maintenance was demonstrated.

Equitability

Not only does operations and maintenance provide for an effective and efficient transportation system, it also provides for an equitable system. Transportation infrastructure must comply with federal and state mandates, such as the Americans with Disabilities Act (ADA). ADA compliance requires additional resources to build new, or retrofit existing, transportation facilities to allow for disabled individuals to effectively use the transportation system. Some features include:

- Crosswalk ramps.
- Audible pedestrian signals.
- Pedestrian islands.
- Wheelchair lifts on transit vehicle.

ADA Compliant Curb Cut

For cities that are not fully ADA compliant, an implementation plan is required to schedule necessary ADA enhancements or identify an annual budget item for ADA retrofit projects. The implementation plan is required to comply with the letter and spirit of the Americans with Disabilities Act of 1990 and Section 504 of the

Rehabilitation Act of 1973. All new projects with federal funding must include ADA accommodations.

What Is System Management?

Work Zone Signs

System management goes beyond operations and maintenance and seeks to optimize the performance of existing infrastructure. System management involves a wide range of techniques to maximize the ability of the existing transportation facilities to meet user demands. Some of these techniques include:

- Traffic incident management.
- Travel information services.
- Roadway weather information.
- Automatic vehicle location.
- Traffic signal coordination.
- Work zone management.
- Electronic payment/toll collection.
- Emergency response and homeland security.
- Freight management.
- Transportation demand management.
- Transit fleet management and dispatch.
- Congestion management.

Many of these techniques are discussed later in this section.

What is congestion?

Traffic congestion occurs when the demand to use a road exceeds the roadway's capacity. Congestion typically results in reduced travel speeds and increased travel time.

What Is Congestion Management?

Every day the WAMPO region is prone to **congestion** due to crashes, weather, construction, insufficient road capacity, and special events. Congestion causes additional expenses for travelers in the form of gasoline use and travel time. In addition, air quality can be affected as stop and go traffic tends to generate higher emissions.

What is the Congestion Management Process (CMP)?

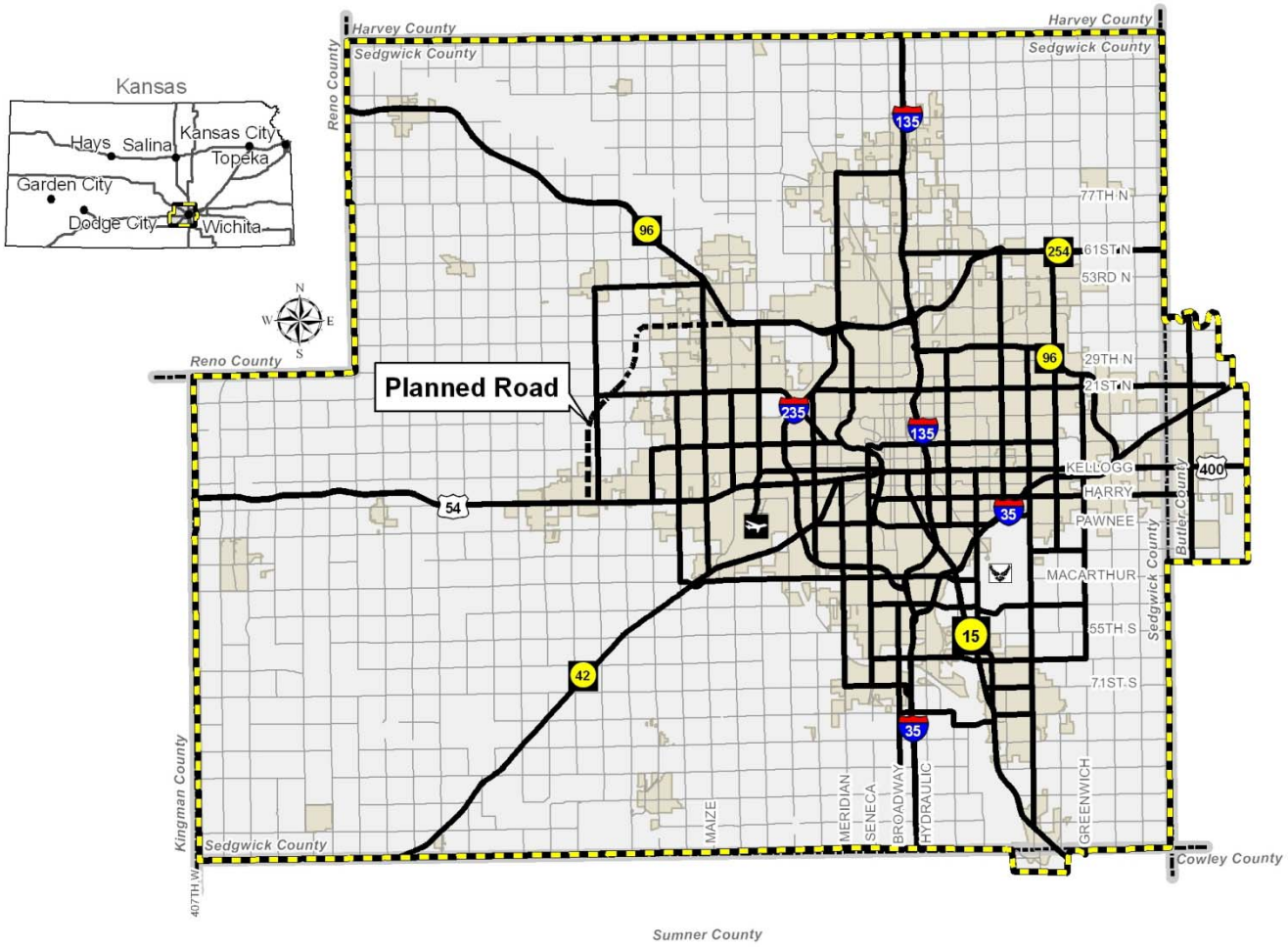
A planning tool that identifies congested areas and provides several techniques to relieve congestion at key locations.

Congestion management focuses on decreasing congestion without adding lanes on roadways. Congestion management includes many techniques, such as increasing transit ridership and coordinating signal timing. Other techniques are included in the WAMPO **Congestion Management Process (CMP)**. The CMP is a document intended to address congestion in the region. It identifies congested areas and provides a toolbox of potential

techniques for reducing congestion. The CMP is periodically updated to incorporate new data and track congestion trends.

The CMP identifies roadways that have national and/or regional importance to economic vitality, mobility, and livability. These roadways make up the CMP Network. This Network consists of over 460 miles of roads from the Regional Highway System and the Regional Arterial System. The CMP Network includes interstates, highways, and other regionally important roads that are heavily used. **Exhibit 6.8.2** shows the CMP Network. The CMP Network will likely change as WAMPO works with local agencies to update the CMP. The CMP is available on the WAMPO website.

Exhibit 6.8.2: CMP Network (2008)



How Is Congestion Measured?

There are several performance measures that provide information about the levels of congestion across the region. These performance measures include volume to capacity (V/C) ratio, crash location mapping, and transit on-time performance. The CMP uses these measures to identify congested areas.

What is volume to capacity (V/C) ratio?

The amount of traffic on a road (volume) compared to the amount of traffic the road is designed to carry (capacity) during a certain time period.

Volume to Capacity (V/C) Ratio

Volume to capacity (V/C) ratio describes the number of vehicles on a roadway (volume) compared to the number of vehicles the road is designed to carry (capacity). The CMP uses V/C ratios to evaluate recurring congestion throughout the region. Recurring congestion is the congestion motorists routinely encounter on most weekdays, usually during peak travel periods and in the same location. This congestion is typically caused by too many vehicles on the road, poorly timed signals, vehicles stopped at rail crossings, or other issues.

Congestion at I-235 Exit

There is also non-recurring congestion. Non-recurring congestion is not routinely encountered and is usually due to a vehicle crash, debris on the road, weather, construction work zones, a disabled vehicle, or a special event.

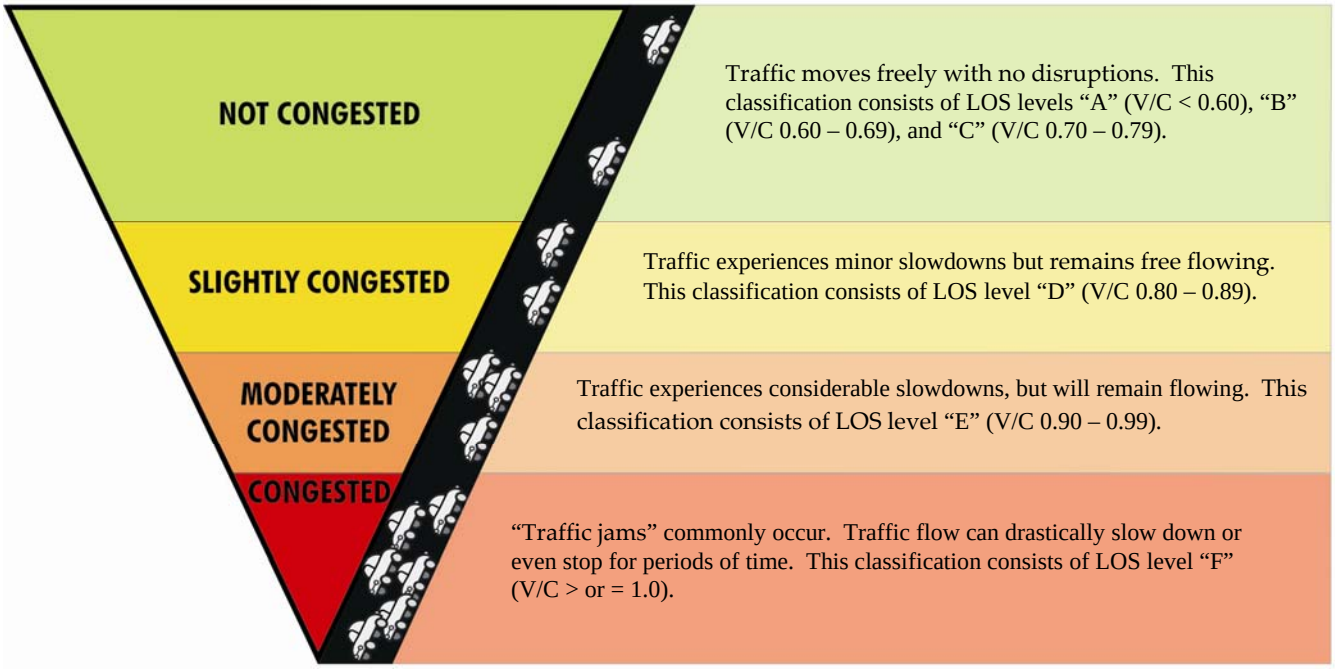
The V/C ratio directly corresponds to a **level of service (LOS)**. LOS is a measure to estimate the quality of service on the regional roadways by associating the V/C ratio to a letter grade. LOS uses an "A through F" scale. The various LOS classifications are shown in **Exhibit 6.8.3**. LOS A is not necessarily desirable as it may indicate a road is over-built for the number of vehicles that use it.

What is level of service (LOS)?

A measure that estimates the quality of service on roads by converting the volume to capacity ratio to a letter grade from A to F (see **Exhibit 6.8.3**).

To determine V/C ratios, WAMPO needs local communities to collect updated local traffic counts. Since travel patterns change over time, frequent and regular collection of traffic counts is important to determining LOS and congestion. Local communities play a vital role in providing this information.

Exhibit 6.8.3: Level of Service (LOS) Classifications



Crash Location Mapping

The CMP includes crash location maps that identify the areas most prone to crashes in the WAMPO region. These high crash locations are areas where non-recurring congestion is likely to occur. The maps indentify where there is a concentration of crashes.

Transit On-Time Performance

The CMP also uses data from Wichita Transit about how often their buses are on-time. The percent of transit vehicles arriving on-time can be an indicator of congestion on the roadway network. Each transit route has an anticipated travel time to complete. When the transit route continually takes longer to complete, the bus is likely experiencing some congestion along the route.

Wichita Transit Center

How Severe Is the Congestion in the Region?

WAMPO is one of the least congested urban areas with a population near 500,000. However, congestion does occur in the region. There are specific roads that experience congestion. The majority of congestion occurs in the AM (6-10 AM) and PM (4-8 PM) peak hours when people are commuting to and from work. Many of the areas that are currently seeing recurring congestion are crossings over

Congestion on Zoo Boulevard

the Wichita-Valley Center Flood Control Project (Big Ditch) and portions of US-54/400 (Kellogg) west of I-135. More information about the specific locations of recurring congestion can be found in the WAMPO CMP.

Although specific locations of non-recurring congestion are hard to identify, some locations do have a higher likelihood for non-recurring congestion to occur due to crashes. More information about high crash locations can be found in the WAMPO CMP.

Overall, the WAMPO region has lower congestion than areas of similar size, with average commute times to work of less than 20 minutes. But will this trend continue into the future? According to the Texas Transportation Institute, congestion is growing at a relatively slow rate, as shown in **Exhibit 6.8.4**. However, as the region continues to grow, the likelihood of increasing congestion is a real possibility. How the region deals with congestion is up to many agencies, such as citizens, developers, cities, counties, the State, and WAMPO.

Exhibit 6.8.4 Wichita Delay and Congestion Compared to Other, Similar Urban Areas

Urban Area	2007 Delay per Traveler	2007 Total Delay	1982 to 2007 Delay per Traveler Growth	1982 to 2007 Total Delay Growth
Wichita, KS	Low	Low	Slower	Slower
Brownsville, TX	Low	Low	Slower	Slower
Boulder, CO	Low	Low	Slower	Slower
Spokane, WA	Low	Low	Slower	Slower
Laredo, TX	Average	Low	Average	Slower
Salem, OR	Average	Low	Average	Slower
Little Rock, AR	Average	Average	Faster	Faster
Columbia, SC	Average	High	Faster	Faster
Knoxville, TN	High	High	Average	Faster
Pensacola, FL	High	High	Faster	Faster
Charleston, SC	High	High	Faster	Faster
Cape Coral, FL	High	High	Faster	Faster
Source: Texas Transportation Institute, 2007 Urban Mobility Study	High - Much higher congestion; Average – Average congestion; Low - Much lower congestion		Faster - Much faster congestion growth; Average - Average congestion growth; Slower - Slower congestion growth	

How Does the CMP Address Congestion?

The WAMPO CMP includes a toolbox that identifies strategies to reduce congestion and improve regional air quality. The combination of these strategies, along with the identified areas of congestion, will provide decision makers with options to reduce congestion.

There are a variety of congestion reduction strategies in the toolbox which focus on **transportation system management (TSM)** techniques. TSM solutions are a broad range of relatively inexpensive, operational improvements that can reduce traffic congestion.

There are three categories of TSM solutions; travel demand management (TDM), public transportation enhancements, and traffic operation improvements. These TSM solutions encompass a wide range of congestion reduction options. The CMP provides more details on TSM solutions.

What is transportation system management (TSM)?

A broad range of lower cost improvements that reduce traffic congestion without adding new roads.

The CMP also includes the "add capacity" approach, adding lanes to relieve congestion. Adding capacity is generally more costly than TSM solutions and tends to be a short-term solution. Adding lanes typically encourages additional automobile travel by making it easier to get around. TSM solutions are often lower cost and more sustainable.

What is travel demand management (TDM)?

Strategies to discourage single occupant vehicle travel and encourage more efficient modes of travel such as carpooling or public transit.

Travel Demand Management

Travel demand management (TDM) falls under the TSM category. TDM strategies work to improve the roadway performance by discouraging single occupant vehicle travel. They encourage more efficient means of travel, such as carpooling or public transit. TDM strategies also include using local regulations as a way to reduce congestion. Zoning or employer flextime options are some local regulations that are part of TDM strategies. TDM strategies are often quick to implement and are typically cost effective solutions to address congestion.

Transit Electronic Fare Collection would allow faster passenger loading by swiping a pre-paid transit card.

Public Transportation Enhancements

Public transportation projects work to reduce traffic congestion by decreasing the number of personal vehicles used. It is anticipated that Wichita Transit will implement a variety of public transportation enhancements that will improve public transit operations. These projects include automatic vehicle location, automated stop announcement, **electronic fare collection**, and an automated passenger count system.

What are automatic vehicle locator (AVL) systems?

Computer based vehicle tracking systems to monitor bus location and transit stop arrival times.

Automatic vehicle locator (AVL) is a computer-based vehicle tracking system. For transit, the AVL allows for real time positioning of each vehicle, which is then relayed to a control center. In addition to monitoring bus delays, it can be used to notify passengers when buses are expected to arrive. This will let individuals know if the bus will be on time. This information can be displayed on boards and kiosks at the transit center or bus stops, or on a website.

Traffic Operations Improvements

Traffic operations improvements can reduce traffic congestion by maximizing safe and efficient traffic movement. The traffic operations improvement strategies include:

- Traffic signal coordination.
- Deployment of intelligent transportation systems (ITS) technologies.
- Efficient intersection design.
- Construction of auxiliary lanes.
- Traffic calming initiatives.
- Access management strategies.

The following paragraphs further explain each of these traffic operations improvements, which can overlap and be coordinated to provide an even more efficient transportation system.

Signal Coordination on Murdock Street

Traffic Signal Coordination

Coordinated traffic signals are able to communicate electronically with one another to provide a more continuous traffic flow by reducing the number of red light stops along a corridor. Signal coordination is generally used along heavily traveled corridors with closely spaced traffic signals. A coordinated traffic signal system can be programmed for different times of the day, detour routing, and emergency vehicle **preemption**. Some communities in the region are initiating this strategy by upgrading traffic signal equipment that allows signal coordination on the heaviest traveled routes.

What is preemption?

It allows emergency vehicles to change traffic lights. This allows the vehicle to proceed through the intersection more quickly and under safer conditions. The emergency vehicle can extend a green light while approaching or change a red light to green.

Intelligent Transportation Systems

Another operational improvement is the incorporation of ITS technologies into the transportation system. These include message boards that display information about incidents, weather, and many other technologies. ITS supports coordination between emergency responders to provide more efficient responses to crashes. ITS includes traffic signal coordination and automatic vehicle location. ITS is discussed in more detail later in this section.

Driveways and Dedicated Left Turn Lane

Efficient Intersection Design

Improvements to intersection designs are cost effective treatments that can reduce congestion by maximizing traffic flow. Typical improvements include:

- Dedicated turn lanes.
- Better signage and pavement markings.
- Enhanced traffic channelization.
- Signal coordination.

Construction of Auxiliary Lanes

An auxiliary lane is an extra continuous lane on a freeway that connects an interchange on-ramp to the off-ramp of the next interchange. Auxiliary lanes reduce conflicts when vehicles merge on and off the freeway by providing longer distances to enter or exit the flow of traffic. This leads to less slowing and braking of traffic on the freeway, leading to less congestion. Short on-ramps do not allow vehicles enough space to accelerate to the speed of freeway traffic.

Traffic Calming Example: Raised Pedestrian Crossing

Traffic Calming Initiatives

Traffic calming initiatives are strategies that slow down or reduce local traffic with the intent to improve pedestrian safety, reduce congestion, and enhance the overall livability for area residents. Some common strategies include lane narrowing, allowing on street parking, traffic circles, speed humps, and raised pedestrian crossings.

Roundabout

Access Management Strategies

Access management regulates the location and number of access points, driveways, and median openings along the roadway. Access management strategies may include dedicated left turn lanes, shared driveway access, right in/right out driveway access, raised center medians, and interconnected parking areas.

These strategies improve traffic flow and can potentially reduce the number of vehicle conflict points. Conflict points are areas where a traveler may cross, merge, or leave a lane of travel. These conflict points typically have a higher potential for accidents. Access management strategies reduce the number of conflict points by restricting some of the possible vehicle movements.

One measure being implemented around the world to reduce the number of conflict points is the use of roundabouts. A roundabout reduces the number of vehicle-vehicle and vehicle-pedestrian conflict points and the speed of vehicles at intersections. Besides the potential safety benefits, roundabouts reduce fuel wasted while idling, potentially improving air quality.

Drivers may be unfamiliar with roundabouts initially; however, surveys show that public opinion improves as drivers gain more experience with roundabouts. Educational efforts may be needed if and when more roundabouts are implemented.

What Are Intelligent Transportation Systems?

As mentioned earlier, ITS takes advantage of new and existing technologies to better manage the transportation system. ITS applications include, but are not limited to:

- Traveler advisory systems for advanced notice of bad weather, detours, travel times, construction zones, crashes, and other incidents.
- Better traffic signal systems, freeway incident detection, and management systems.
- Electronic transit schedule information (stop announcements, fare collection, and passenger counting) and GPS tracking of bus movements and locations.
- Weigh-in-motion, electronic truck clearance at vehicle inspection stations.
- Electronic toll payment or transit fare payment for faster service.
- Emergency vehicle fleet tracking and navigation assistance.
- In-vehicle technologies such as on-board computers or collision avoidance sensor technologies.
- Traffic safety data collection.
- **Advance traveler information systems (ATIS)**.

These efforts are multimodal including highways, railroads, and transit. ITS works to provide a smooth flow of traffic, minimize congestion, and improve safety.

Dynamic Message Board

What is an Advanced Traveler Information System (ATIS)?

A system for providing real time travel information to users before they start their trip. Travel information is typically provided via website or email alerts.

What Is a Regional ITS Architecture?

The Wichita Area Regional ITS Architecture, which is maintained by WAMPO, provides a blueprint of how the transportation systems in the region will be interconnected through information sharing. The Regional ITS Architecture inventories existing and future ITS needs. Periodically, the Regional ITS Architecture needs to be revised to ensure an ITS system that is consistent and compatible with the Kansas and national ITS standards.

ITS technologies support the goals of the MTP 2035 by enhancing the coordination among multiple participating agencies as well as collecting and disseminating information during an emergency. More information about the Regional ITS Architecture can be found on the WAMPO website.

What is a management system?

A process for monitoring and evaluating infrastructure conditions. It identifies cost effective solutions to maintain an adequate level of service and determine long-term maintenance funding requirements.

What Are Management Systems?

Management systems are effective ways to monitor the condition of roads or bridges and provide the following:

- A process for evaluating existing conditions.
- Cost effective solutions to maintain an adequate level of service.
- Long-term maintenance funding requirements.

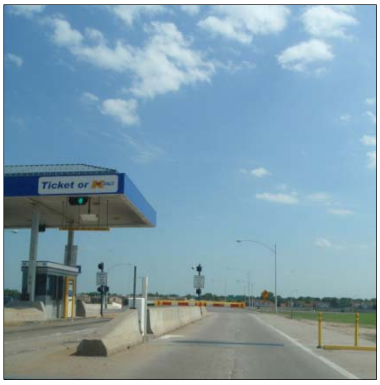
Maintenance on Freeway Ramps

A pavement or bridge management system is a planning tool that is used to determine the existing conditions and potentially model future conditions. This type of system usually contains a series of decision points used to determine how and when to repair infrastructure. Procedures for scheduling maintenance and rehabilitation to maximize benefits and minimize costs are typically included.

Management systems can be as simple as visual inspections or as complex as using special software and databases to model future conditions and identify priority projects.

Who Plays a Role in Operations, Maintenance, and Systems Management?

WAMPO has a role in planning and monitoring regional operations and maintenance and assisting with transportation investment management. The transportation system is operated and maintained by several entities including the Kansas Turnpike Authority, KDOT, counties, cities, and transit operators. WAMPO's planning process for operations and maintenance includes:



Kansas Turnpike Authority Toll Plaza

- Identifying projects for the MTP 2035.
- Programming projects in the Transportation Improvement Program (TIP).
- Maintaining the Regional ITS Architecture.
- Developing and maintaining a Congestion Management Process (CMP).

WAMPO is the funding conduit between the local jurisdictions and federal transportation funding programs. The MTP 2035 has identified funding that is available for operations and maintenance activities. More information about the MTP 2035 operations and maintenance resources can be found in **Chapter 8: Financial Plan**.

WAMPO's planning process for system management includes:

- Monitoring congestion indicators such as level of service and travel time trends through the CMP.
- Identification of regional transportation needs based on system monitoring.
- Coordinating the deployment of ITS elements.
- Encouraging the implementation of travel demand measures.


Construction on Broadway

What Are the Recommended Next Steps?

Local agencies and KDOT should invest in the maintenance of their roads, bridges, and vehicles to extend the useful life of investments. As identified in this section, congestion is a major concern due to the potential future negative impacts, such as decreased air quality and increased costs. The region should look to develop an access management plan

Traffic on US-54/400 (Kellogg)

as well as regularly update traffic counts. These two items will provide information that will assist future planning efforts.

WAMPO will update the CMP to incorporate new data and strategies. WAMPO will continue to monitor congestion and recommend mitigation strategies.

WAMPO has an established Regional ITS Architecture that is consistent with the Kansas Statewide ITS Architecture and meets national standards. The Regional ITS Architecture will be updated periodically, as needed, to reflect changes in future elements, additions of new elements, and remain consistent with national and Kansas ITS standards.

The MTP includes projects and a financial plan that are intended to be consistent with the ideas and strategies identified in this section. Participation from, and between, partner transportation agencies is required to continue the focus on operations, maintenance, and systems management.