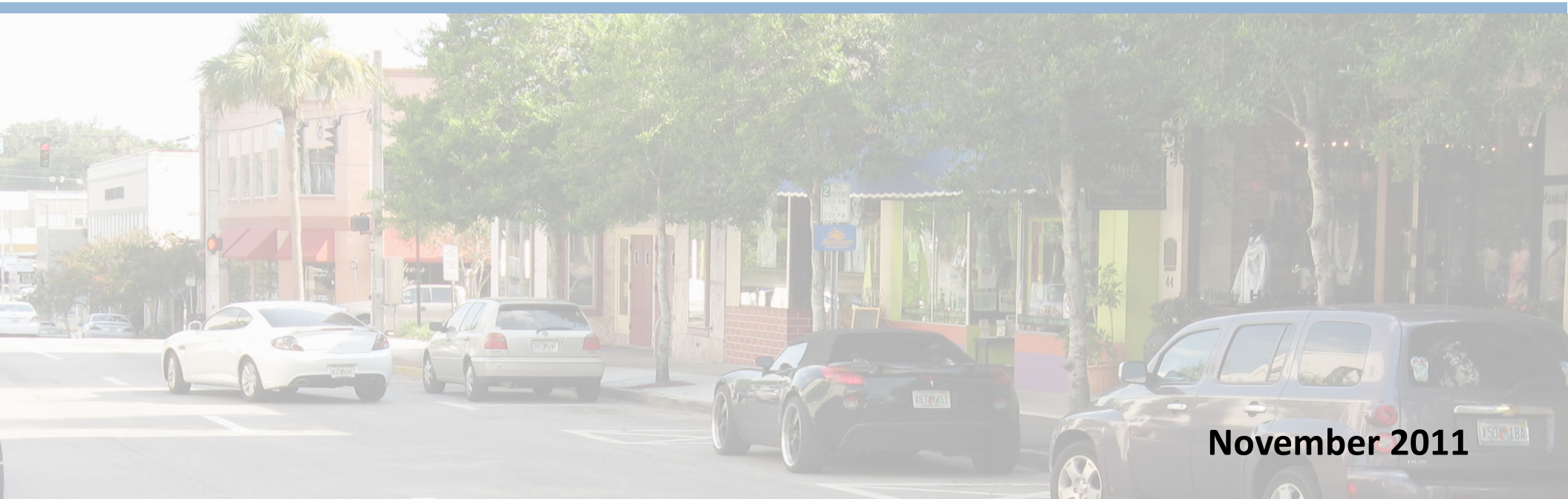
Ocala/Marion TPO | Congestion Management Process

POLICY AND PROCEDURES HANDBOOK



November 2011

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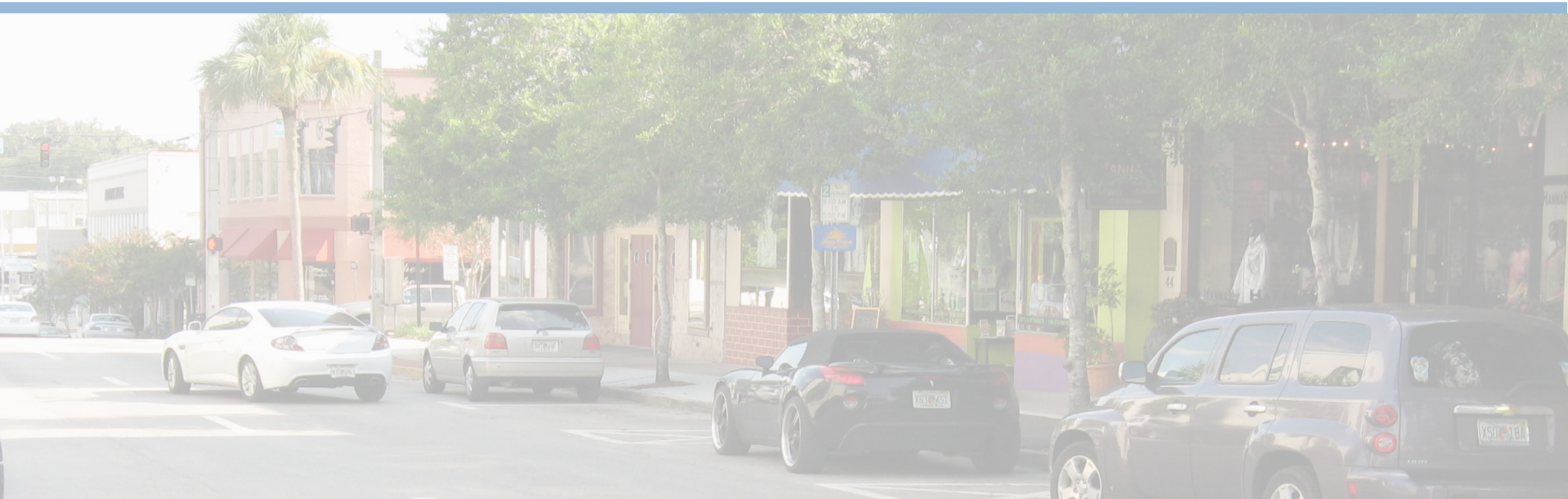
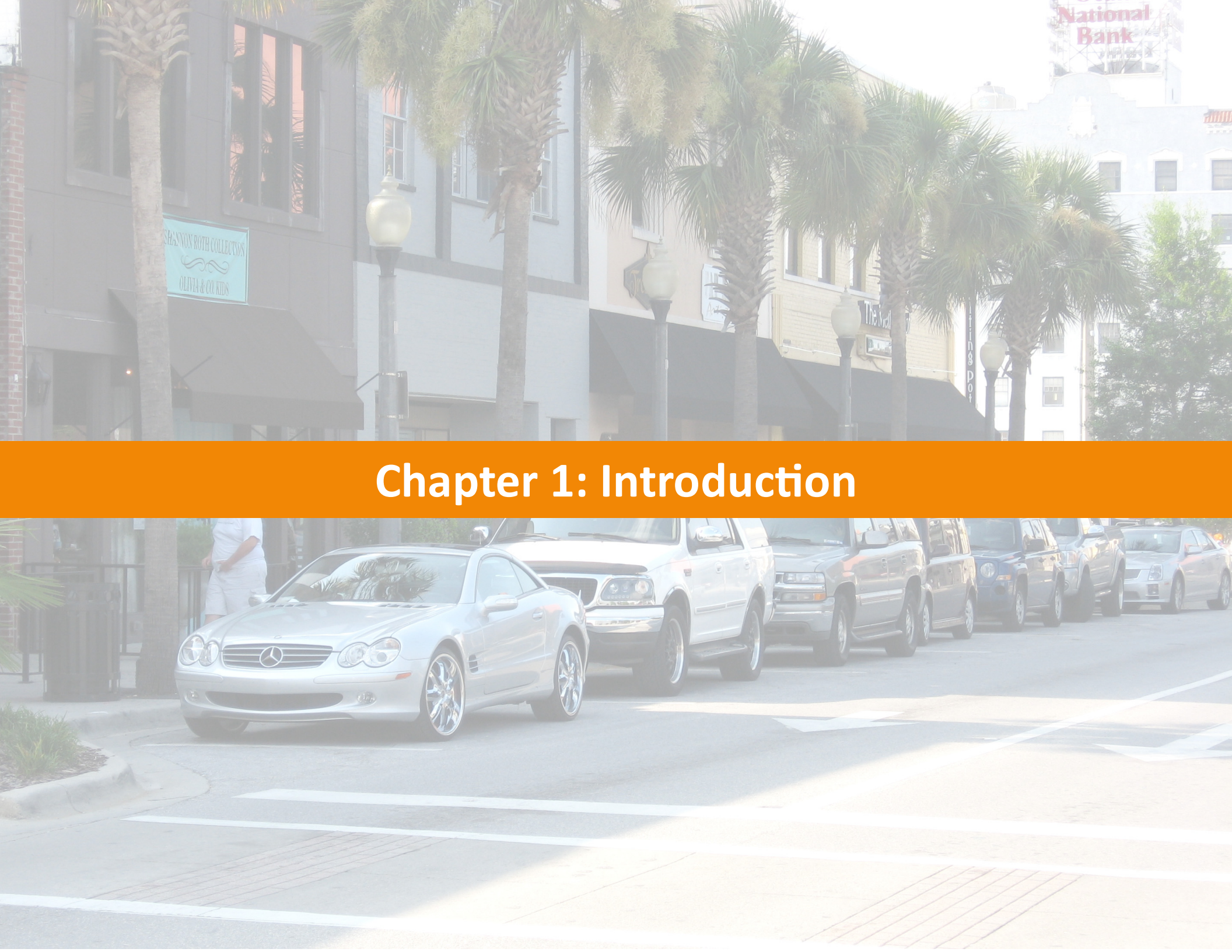


Table of Contents

Maps

Figures

Tables



Chapter 1: Introduction

Chapter 1: Introduction

Introduction to the Congestion Management Process

The Congestion Management Process (CMP) is a management system and process conducted by Metropolitan Planning Organizations (MPOs/TPOs) such as the Ocala/Marion TPO to improve traffic operations and safety through the use of either strategies that reduce travel demand or the implementation of operational improvements. As a TPO, the Ocala/Marion TPO is required by the federal government to implement a CMP as part of its routine planning efforts. The public benefits from having a functional CMP in place since it often can improve travel conditions through the use of low cost improvements or strategies that can be implemented in a relatively short timeframe (within 5-10 years) compared to more traditional capacity improvements such as adding additional travel lanes, which can take over 10 years to implement and cost significantly more. Projects identified through the CMP process also may be added to future updates of the Long Range Transportation Plan should they require a longer timeframe to implement.

The Federal Highway Administration (FHWA) defines a CMP as "a systematic approach collaboratively developed and implemented throughout a metropolitan region, that provides for the safe and effective management and operation of new and existing transportation facilities through the use of demand reduction and operational management strategies."

The CMP is required to be developed and implemented as an essential part of the metropolitan planning process, which establishes the requirement for the Ocala/Marion TPO to implement a CMP.

The CMP has evolved from what was previously known as the Congestion Management System (CMS). Key highlights of the Marion County CMP include:

- Completion of a technical process undertaken each year to identify projects that are needed to reduce congestion and that are prioritized for funding in the County's Capital Improvement element.
- Routine meetings by the TPO's Technical Advisory Committee (TAC)/ CMP Task Force.

In this handbook and procedures document, the Ocala/Marion TPO will outline policies and procedures for the Congestion Management Process.

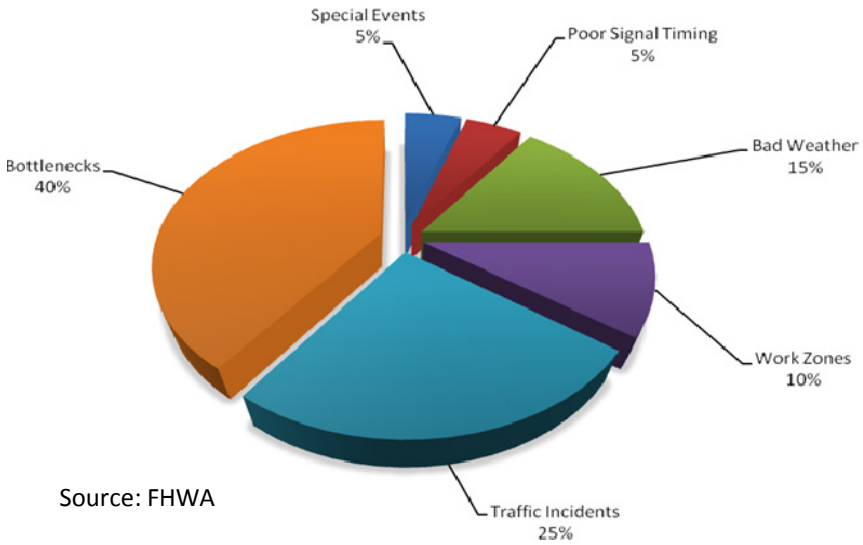
Causes of Congestion

The process of congestion management begins by understanding the causes of the problem. **Figure 1-1** shows the results of a national study presented by FHWA on the sources of congestion. Six major causes of congestion are identified:

- **Bottlenecks**—points where the roadway narrows or regular traffic demands (typically at traffic signals) cause traffic to back up; these are the largest source of congestion and typically cause a roadway to operate below its adopted level of service standards.
- **Traffic incidents**—crashes, stalled vehicles, debris on the road; these incidents cause about one quarter of congestion problems. The focus of the Marion County CMP will be reducing crashes that can cause congestion and expediting incident response to clear incidents where Intelligent Transportation Systems (ITS) surveillance is in place.
- **Work zones**—for new road building and maintenance activities such as filling potholes; caused by necessary activities, but the amount of congestion caused by these actions can be reduced by a variety of strategies.
- **Bad weather**—cannot be controlled, but travelers can be notified of the potential for increased congestion and signal systems can adapt to improve safety.
- **Poor traffic signal timing**—the faulty operation of traffic signals or green/red lights where the time allocation for a road does not match the volume on that road; poor signal timings are a source of congestion on major and minor streets.
- **Special events**—cause "spikes" in traffic volumes and changes in traffic patterns; these irregularities either cause delay on days, times, or locations where there usually is none or add to regular congestion problems.

As shown in **Figure 1-1**, bottlenecks are the largest cause of congestion nationally, followed by traffic incidents and bad weather. Bad weather cannot be controlled, but policies and improvements can be implemented to control traffic incidents and bottlenecks. These national data are widely used in CMP updates due to the lack of comprehensive local studies on the causes of congestion. The data suggest that local causes are likely to be similar, with bottlenecks and traffic incidents typically being the top two causes of congestion.

Figure 1-1
Causes of Congestion



Source: FHWA

Federal Requirements

The initial federal requirements for congestion management were introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and were continued under the successor law, the Transportation Equity Act for the 21st Century (TEA-21). The requirements guiding congestion management further evolved under the most recent federal transportation act, the Safe Accountable Flexible Efficient Transportation Equity Act–A Legacy for Users (SAFETEA-LU), passed into law in August 2005.

One of the significant changes included in SAFETEA-LU was the updated requirement for a "congestion management process" in TMAs, as opposed to a "congestion management system." According to FHWA, the change in name is intended to be a substantive change in perspective and practice to address congestion management through a process that provides for effective management and operations, an enhanced linkage to the planning process based on cooperatively developed travel demand reduction and operational management strategies as well as capacity increases.

Aside from the change in name, the CMP requirements are not expected to change substantially from the CMS requirements. The federal requirements for a CMP are summarized below.

CMP in Transportation Management Areas (Section 450.320) - Statewide Transportation Planning; Metropolitan Transportation Planning; Final Rule

a. The transportation planning process in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system.
   - Cooperatively developed and implemented
   - Travel reduction strategies
   - Operational management strategies

b. The CMP should result in multimodal system performance measures and strategies.
   - Acceptable levels of service may vary from area to area
   - Consider strategies that:
     I. Manage demand
     II. Reduce single occupant vehicle travel
     III. Improve transportation system management and operations
   - Where general purpose lanes are determined to be appropriate, must give explicit consideration to features that facilitate future demand management strategies.

c. The CMP shall be developed, established, and implemented in coordination with Transportation Systems Management (TSM) and operations activities. The CMP shall include:
   - Methods to monitor and evaluate the performance of the multimodal transportation system
     I. Identify the causes of congestion
     II. Identify and evaluate alternative strategies
     III. Provide information supporting the implementation of actions
   - Definitions of congestion management objectives and appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of strategies. Performance measures should be tailored to the specific needs of an area.

- Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion. To the extent possible, this program should be coordinated with existing sources.

Identification and evaluation of the anticipated performance and expected benefits of congestion management strategies that will contribute to the more effective use and improved safety of the existing and future transportation system. Examples of strategies to consider include:

I. Demand management measures, including growth management and congestion pricing
II. Traffic operational improvements
III. Public Transit improvements
IV. Information Technology Services (ITS) technologies
V. Where necessary, additional system capacity

- Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy
- Implementation of a process for periodic assessment of the effectiveness of implemented strategies. Results of this assessment shall be provided to decision makers and the public to provide guidance on the selection of effective strategies for future implementation.

TMA designated nonattainment for ozone or carbon monoxide may not program Federal funds for any project that will result in a significant increase in the carrying capacity of Single Occupant Vehicles (SOVs), with the exception of safety improvements or the elimination of bottlenecks (within the limits of the appropriate projects that can be implemented).

d. In TMAs designated nonattainment for ozone or carbon monoxide, the CMP shall provide an appropriate analysis of reasonable (including multimodal) travel demand reduction and operational management strategies for a corridor in which a project with a significant increase in SOV capacity is proposed to move forward with Federal funds.

e. State laws, rules, and regulations pertaining to congestion management systems or programs may constitute the congestion management process, if FHWA and FTA find that these are consistent with the intent of this process.

CMP Policy and Procedures Handbook Overview

As mentioned previously, the Ocala/Marion TPO is required by the federal government to implement a CMP as part of its routine planning efforts. This handbook outlines the policies and procedures that will ensure that the federal requirements are followed. Specific performance evaluation information on the Marion County network is included in the accompanying Annual State-of-the System Report.

This handbook is outlined to follow the eight-step CMP, based on federal guidelines. The main purpose of this handbook is to (1) evaluate the transportation system and monitor progress, (2) identify congested corridors and select corridors for evaluation, (3) evaluate corridors and potential strategies, and (4) prioritize and program improvements. The report chapters found in this handbook are described in more detail below.

Chapter 1, Introduction – The purpose of the CMP (based on federal requirements), an introduction to the causes of congestion, and an overview of the handbook are provided.

Chapter 2, CMP Overview – The eight-step CMP is described and a general overview of the process is provided as well as the update schedule for the Annual State of the System Report.

Chapter 3, Goals and Objectives – The remainder of the chapters in this handbook discuss specific steps from the eight-step CMP. The Goals and Objectives of the CMP are provided.

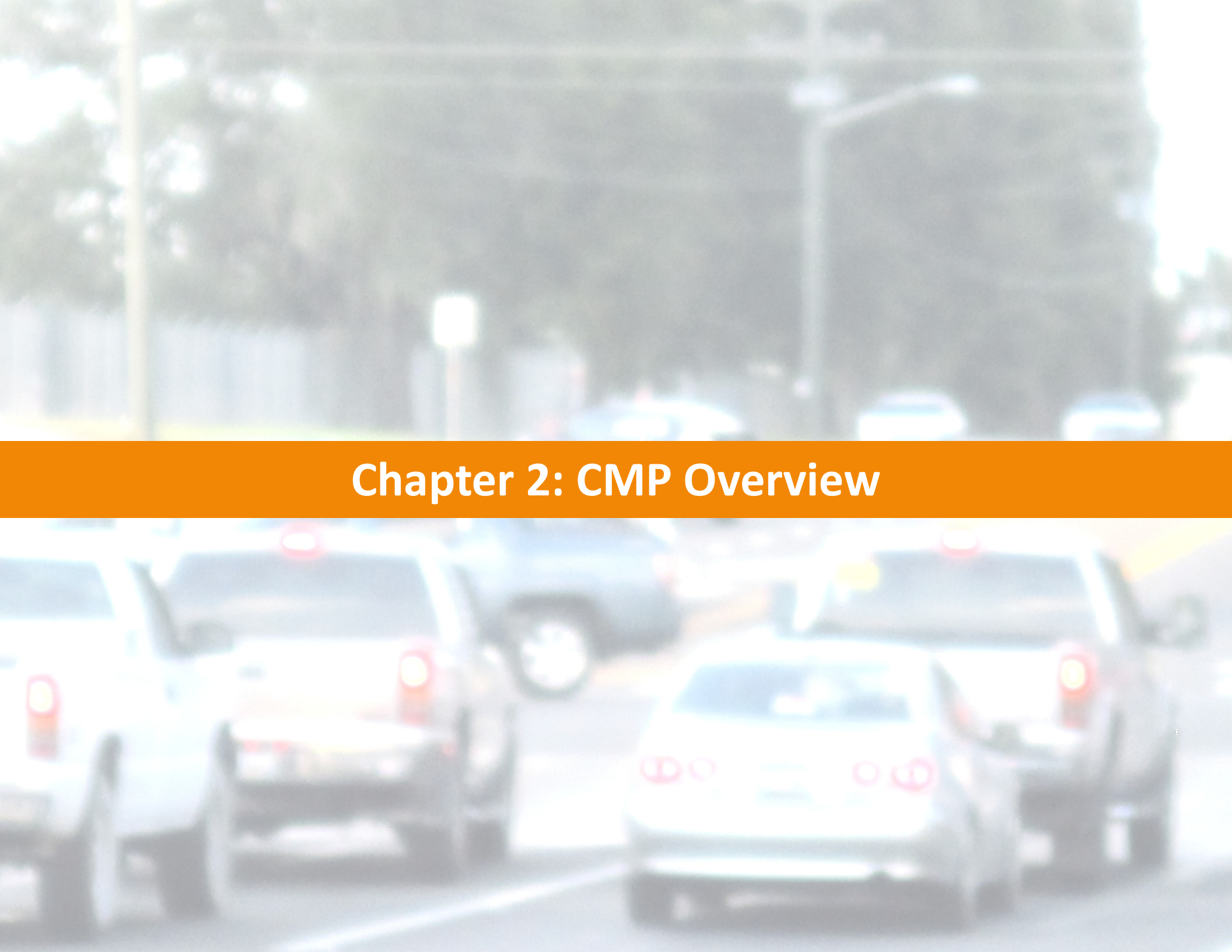
Chapter 4, Network Identification – A description of the area of application and transportation network used for the CMP process is provided.

Chapter 5, Development of Performance Measures – A brief summary is provided of congestion related measures that can be used to monitor the effectiveness of the CMP.

Chapter 6, System Performance Monitoring Plan – This chapter describes how to evaluate and monitor the system, identify congested corridors and select corridors for evaluation, evaluate corridors and potential strategies (described in Chapter 7), and prioritize and program improvements.

Chapter 7, Congested Corridor Selection and CMP Strategies – This chapter describes how congested corridors were identified and strategies that can be used to reduce congestion and different strategies that can be used to improve identified congested corridors.

Chapter 8, Monitor Strategy Effectiveness – This chapter describes monitoring of strategies implemented as well as information that can be found in the Annual State of the System report.



Chapter 2: CMP Overview

Chapter 2: CMP Overview

Overview

Maintenance of a CMP is a requirement for all TPOs under Florida law and for TPOs in TMAs under federal law. Consistent with the guidance from the Final Rule on the CMP for TMAs (Section 450.320), as presented earlier in this report, the intent of the CMP Update is to "address congestion management through a process that provides for safe and effective integrated management and operation of the multi-modal transportation system."

Eight-Step Process

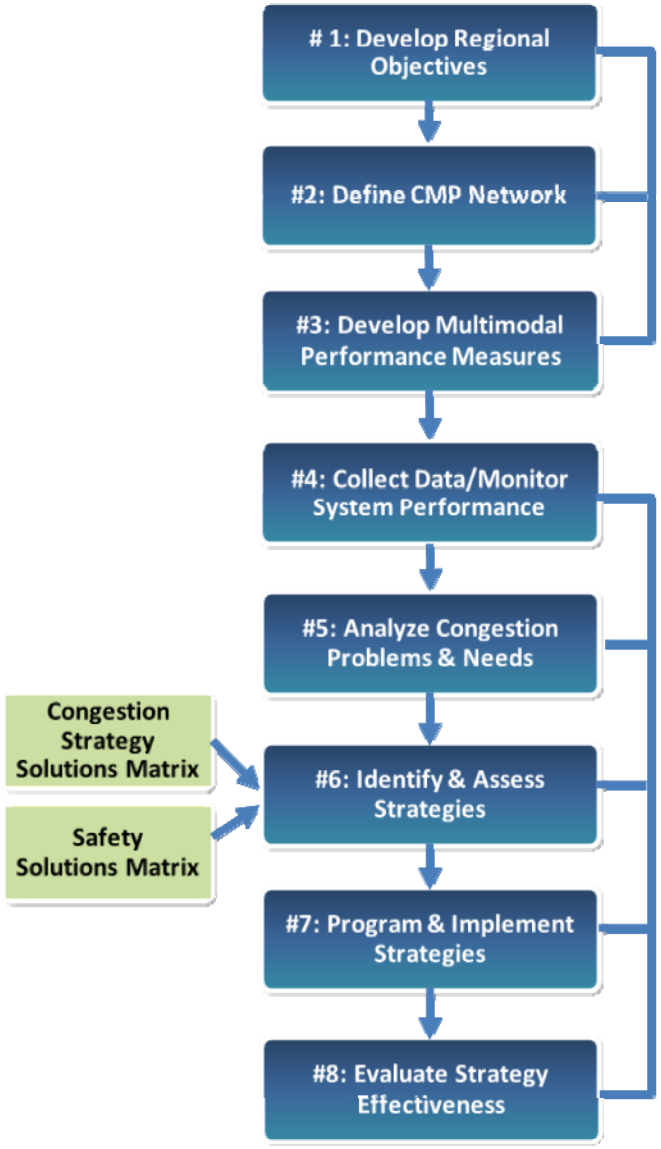
Under the federal guidelines, the CMS was described as a seven-step process; with the addition of a new "first step," the CMS has evolved into an eight-step process, as summarized below.

1. **Develop Congestion Management Objectives –** Objectives should be identified that help to accomplish the congestion management goals.
2. **Identify Area of Application –** The CMP must cover a well-defined application area.
3. **Define System/Network of Interest –** The CMP must define the transportation network that will be evaluated.
4. **Develop Performance Measures –** The CMP must define the measures by which it will monitor and measure congestion.
5. **Institute System Performance Monitoring Plan –** There must be a regularly-scheduled performance monitoring plan for assessing the state of the transportation network and evaluating the status of congestion.
6. **Identify Congestion/Evaluate Strategies –** There must be a toolbox for selecting congestion mitigation strategies and evaluating potential benefits and congested locations.
7. **Implement Selected Strategies/Manage System –** There must be a plan for implementing the CMP as part of the regional transportation planning process.
8. **Monitor Strategy Effectiveness –** The strategies must be regularly monitored to gauge the effectiveness.

Figure 2-1 illustrates the Federal eight-step congestion management process.

Each step of the congestion management process is covered in specific detail throughout the remaining chapters of this handbook. The specific chapters of the report that discuss each step are identified in **Figure 2-1.**

Figure 2-1
Federal Eight-Step CMP



CMP in the Metropolitan Planning Process

The CMP is a working tool that needs to be effectively integrated into the TPO's project prioritization process, Transportation Improvement Plan (TIP), and Long Range Transportation Plan (LRTP). The objectives-driven, performance-based CMP starts with the monitoring and evaluation of current conditions to identify where congestion exists. Based on the identified goals and objectives and the established performance measures of the CMP, this evaluation leads to the identification of potential mitigation strategies, implementation of appropriate strategies, and the development of a monitoring plan.

The outputs of the CMP, such as identified congested corridors/ locations and their recommended mitigation measures, then proceed through the CMP process where they are evaluated and projects or programs are selected for implementation. The projects or programs that are identified for implementation through the CMP are then moved into project development and programmed into the TIP for funding and implementation. The implemented projects are then monitored to evaluate the strategy effectiveness on a systemwide basis. In Marion County, CMP projects typically are funded using boxed funds identified in the LRTP along with other local revenues. This allows the TPO to add annually the most important strategies for implementation and expand funding levels to address local needs.

Public Involvement Process

The purpose of CMP public involvement activities is to provide the public with information on congestion monitoring activities that are in place in Marion County at this time and planned improvements to mitigate congestion. Significant progress has been made in Marion County toward identifying congested corridors and alternative transportation improvement strategies to alleviate congestion and enhance the mobility of persons and goods.

As recent federal regulations warrant involvement of the public during all key stages of transportation projects, it is important to involve the public in all key stages of transportation improvement projects within and beyond the CMP. Otherwise, lack of public support and awareness may adversely impact the success of any potential transportation project. Therefore, the proposed CMP improvement projects/strategies will be presented to the citizens of Marion County at various public involvement activities.

The TPO's TAC/CMP Task Force serves as the advisory group for the CMP update and includes the following jurisdictions/agencies:

- Marion County
- City of Belleview, City of Dunnellon and City of Ocala
- Other stakeholders as the need merits, such as CSX Railroad, goods movement representatives, etc. Typically, these additional members would serve on an *ad hoc* basis to address specific issues.

The Technical Advisory Committee (TAC)/ CMP Task Force convenes for the TPO on CMP related matters. This ensures that CMP issues are addressed routinely as an ongoing activity of the TPO. A key contribution of the Marion County TAC/CMP Task Force is to identify, track, and evaluate potential congestion- or safety-related issues on the roadway network.

CMP Actions/Recommendations

A list of recommendations and actions is presented to enhance the CMP and become more efficient in the overall TPO planning process. The actions/recommendations presented below will be reviewed and considered by TPO staff and the Marion County Congestion Management Plan Task Force for implementation as necessary.

- Update the CMP Policy and Procedures Handbook (CMP Steps 1-4) on a four- to five-year cycle consistent with the update cycle of the LRTP. Timing of the completion of CMP updates in advance of finalizing LRTP updates would benefit integration of CMP strategies into the LRTP.
- Develop an Annual State of the System Report to track effectiveness of the implemented strategies, to the extent possible and to evaluate trends and conditions for the multi-modal transportation system in the CMP study area. The annual CMP State of the System Report will include steps 5 through 8 of the CMP process:
  - Step 5: Performance Monitoring
  - Step 6: Identify Congestion and Evaluate Strategies
  - Step 7: Implement Selected Strategies
  - Step 8: Monitor Strategy Effectiveness (combined with Step 5)
- Enhance coordination with agencies participating in the CMP by framing desirable strategy types and defining roles in implementation. This is essential, as most congestion and mobility strategies are formulated and implemented by other agencies.
- Projects from the CMP process may identify projects for inclusion in the LRTP either through the four-year update cycle or through plan amendments.
- Identify and implement data collection recommendations on collecting key congestion data as well as closing any data gaps identified in this CMP.
- Perform outreach and education efforts to inform interested parties and stakeholders. These may include:
  - Maintain a CMP page on the TPO website.
  - Develop a brochure and/or newsletter on the CMP and its benefits.
- Continue monitoring changes to federal CMP regulations and modify/update CMP to reflect new requirements.

The general schedule for the development of the annual CMP State-of- the-System-Report is provided below (refer to **Figure 6-1).**

January to May

- Update roadway inventory data to support LOS analysis.
- Calculate Non-Highway Systemwide Performance Monitoring (Public Transportation, Bicycle, Pedestrian, TDM, etc.).
- Produce growth rates on county roadways using county traffic counts and perform initial LOS analysis (existing conditions +1 year and existing + 5 years).*
- Produce preliminary growth rates on state roadways using older state traffic counts and perform initial LOS analysis (existing conditions and existing +5 years).*

May

- Hold TAC/CMP Task Force meeting to review and identify potential
  operational issues that would not be identified through the technical screening process.
- Coordinate with goods movement stakeholders and providers to identify related needs (may occur earlier).

May to June

- Receive FDOT traffic counts.
- Produce updated growth rates on state roadways using state traffic counts and perform initial LOS analysis (existing conditions and existing + 5 years).
- Screen corridors (existing conditions and existing + 5 years).
- Select corridors for evaluation.

July

- Report to TAC/CMP Task Force and CAC results of corridor screening and selection.
- Report to TAC/CMP Task Force and CAC results from Non-Highway Systemwide Performance Monitoring (Public Transportation, Bicycle, Pedestrian, TDM, etc.).

July to August

- Identify strategies to be considered on selected corridors.
- Evaluate strategies where appropriate and make improvement or program recommendations for implementation.
- Report to the TAC/CMP Task Force and CAC recommended strategies for implementation.

September to October

- Finalize technical recommendations on strategy implementation.
- Program improvement recommendations in CIE and identify other priority projects or programs for TIP.
- Finalize performance monitoring summary.
- Obtain endorsement from TAC/CMP Task Force and CAC on programmed projects in CIE and priorities for TIP.
- Adopt CMP Project Priority List through Public Hearing of TPO Board.

October to November

- Finalize CMP Annual State-of-the-State Report.

*Note: Since FDOT state roadway traffic counts for the prior typically are released in May or June of the following year, it is necessary to use preliminary state traffic count data that are a year older for the preliminary analysis. Once the FDOT state roadway traffic count data are provided, growth rates and their associated traffic volumes are used to update the LOS analysis.

Chapter 3: Goals and Objectives

Chapter 3: Goals and Objectives

Introduction

A series of CMP goals and objectives was developed to guide the process of monitoring congestion and improving the mobility of persons and goods in Marion County. These were compiled based on CMP goals and objectives used by other communities in Florida and other states that also would be appropriate for Marion County.

The goals and objectives are presented below. They will be used as a tool for selecting strategies and performance measures for strategy monitoring and evaluation and are consistent with the goals and objectives of the TPO's 2035 LRTP, which was updated and adopted in 2009.

CMP Goals and Objectives

GOAL #1: Reduce vehicle miles of travel per capita.

Objective 1.1 Encourage land use development that reduces the distances between trips.

Objective 1.2 Reduce auto travel demand on congested corridors to reduce congested travel.

GOAL #2: Increase the viability and usage of non-automobile modes of travel.

Objective 2.1 Increase the availability of pedestrian facilities to form a more complete network.

Objective 2.2 Increase the availability of bicycle facilities to form a more complete network.

GOAL #3: Improve and increase transit as a viable transportation option.

Objective 3.1 Add transit service to congested corridors without such service and increase the span of service and frequency of fixed route transit service where it exists to increase transit as a viable mode of travel.

Objective 3.2 Establish park-n-ride facilities and carpool lots to facilitate shifts to different modes of travel.

Objective 3.3 Locate transit stops with transit supportive land uses and amenities to encourage use.

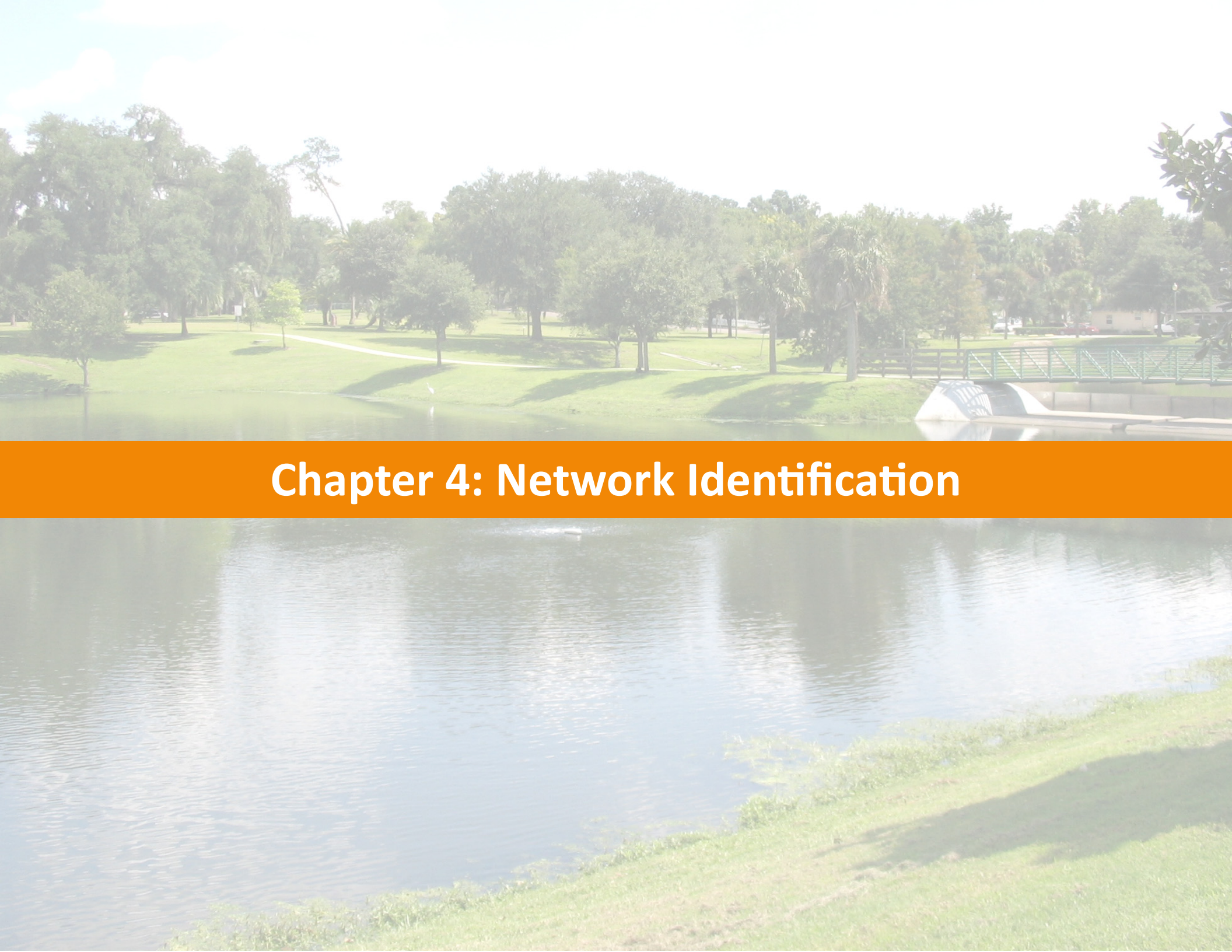
GOAL #4: Improve roadway operations to reduce congestion.

Objective 4.1 Implement strategies that enhance the existing transportation system to relieve congestion, improve safety, and improve mobility of persons and goods.

Objective 4.2 Apply a high priority to projects that provide a rapid reduction in congestion that eliminate or delay the need for more costly roadway expansion.

Objective 4.3 Reduce crashes to reduce non-reoccurring congestion.

Objective 4.4 Improve the mobility of people and goods by using advanced technology strategies including Intelligent Transportation Systems (ITS) to increase system efficiency.



Chapter 4: Network Identification

Chapter 4: Network Identification

Introduction

This chapter of the CMP component presents an overview of the geographic area of application and the transportation network for the Marion County CMP.

Area of Application

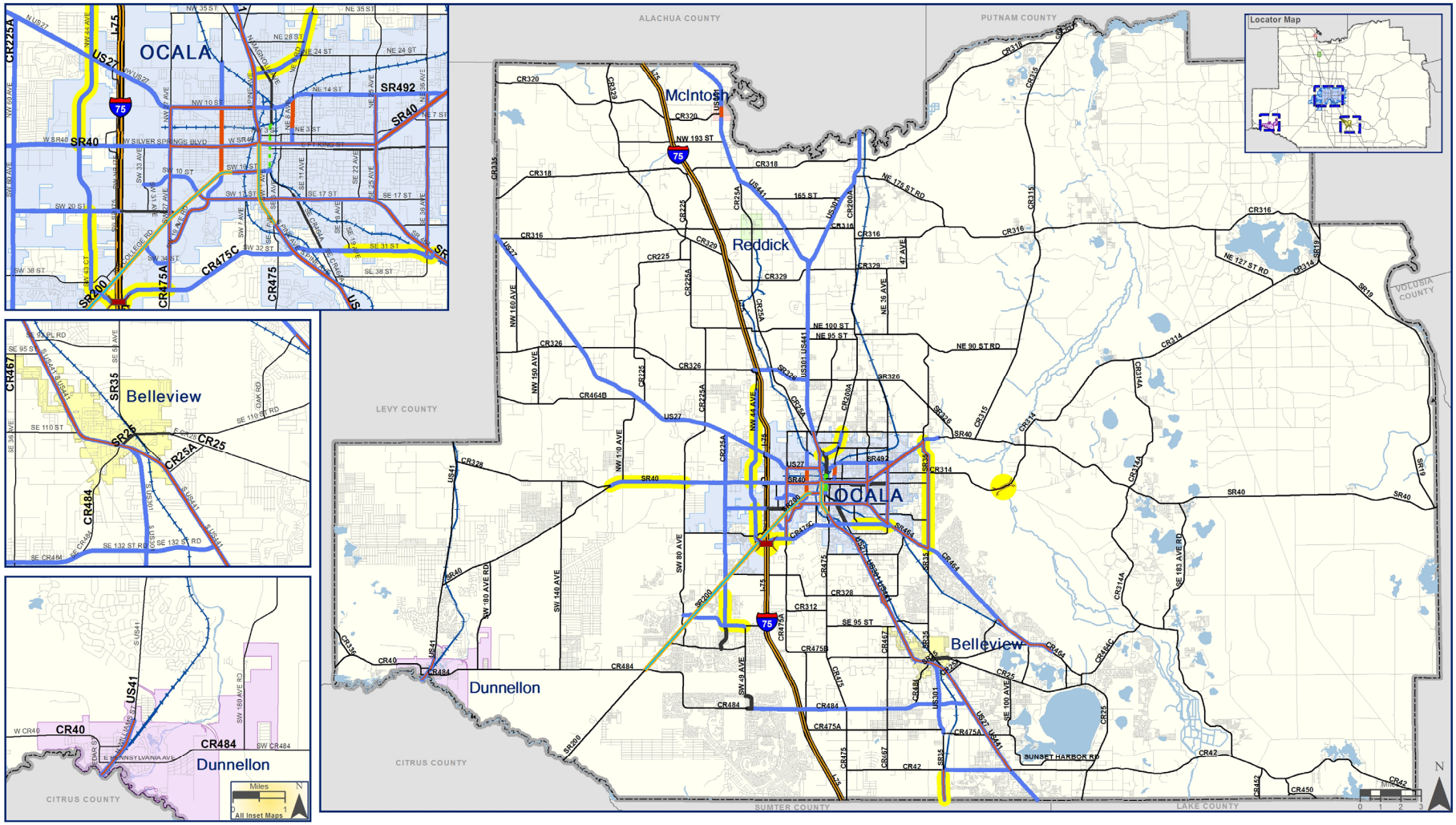
The CMP area of application includes the transportation system that needs to be evaluated and monitored and where congestion management policies and procedures need to be applied. The geographic area of application for this CMP Update consists of Marion County in its entirety.

Transportation Network

Consistent with federal guidelines, the Ocala/Marion TPO CMP covers a multimodal transportation network. In addition to evaluating congestion on the roadway network, the Marion County CMP Update evaluates transit, bicycle/pedestrian/trail, and freight movement networks within its designated area of application. The CMP roadway network is described below.

Roadway Network

The Ocala/Marion TPO CMP roadway network includes all functionally classified roadways included in the adopted LRTP and/or the existing plus committed (E+C) five-year road network (typically, the existing condition plus five years). For example, **Map 4-1** illustrates the existing plus committed roadway network at the time that this handbook was developed and includes roadways through 2015. This represents the study area and network for the Ocala/Marion TPO CMP. Chapter 7 provides further information on congested corridors and strategies.



Map 4-1: Area of Application and Road Network (2015 Network)

Chapter 5: Development of Performance Measures

Chapter 5: Development of Performance Measures

Introduction

Performance measures are used as tools to measure and monitor the effectiveness of the transportation system in the CMP. They assist in identifying and tracking as areas progress in monitoring congestion. However, these measures are dependent upon the transportation network and the availability of data. They typically are used to measure the extent and severity of congestion and for the evaluation of the effectiveness of the implemented strategies.

As identified by FHWA, a set of good performance measures:

- includes quantifiable data that are simple to present and interpret and have professional credibility,
- describes existing conditions and can be used to identify problems and to predict changes,
- can be calculated easily and with existing field data, uses techniques available for estimating the measure, and achieves consistent results, and
- applies to multiple modes and is meaningful at varying scales and settings.

Performance Measures

The performance measures for the Marion County CMP were selected to address the existing conditions for Marion County's multi-modal transportation network. The measures also are in compliance with the federal direction of using measures that covers multi-modal network. The measures are organized into five major categories: roadway, public transit, bicycle/pedestrian/multi-use trail facility, TDM, and goods movement.

These performance measures were identified based on numerous monitoring activities currently conducted and/or planned by various local and state agencies for Marion County. Detailed descriptions of each of these measures, together with an explanation of how the required data are or will be collected, are presented below.

Roadway Performance Measures

- Percent of VMT and Roadway Miles below adopted Level of Service Standard
- V/C Ratio
- V/MSV Ratio

Public Transit Performance Measures

- Percent of Congested Roadway Centerline Miles with Transit Service
- Passenger Trips per Revenue Hour
- Average Peak Service Frequency
- On-Time Performance
- Annual Ridership

Bicycle/Pedestrian/Trail Facility Performance Measures

- Percent of Congested Roadway Centerline Miles with Bicycle and/or Sidewalk Facilities
- Miles of Multi-Use Trails

Safety Performance Measures

- Number of Crashes by Safety Emphasis Area (At Intersection, Vulnerable Users, Lane Departure, Aggressive Driving)

TDM Performance Measures

- Number of Registered Carpools or Vanpools

Goods Movement Performance Measures

- Vehicle Miles Traveled (VMT) Below LOS Standard on Designated Truck Routes
- Number of Crashes Involving Heavy Vehicles

Roadway Performance Measures

Percent of Vehicle Miles of Travel (VMT) and Roadway Miles Below the Adopted Level of Service (LOS) Standard

These measures summarize the proportion of vehicle miles of travel and roadway miles below the adopted level of service standard to help quantify the level of congestion within the county.

Data Collection/Availability *– Marion County collects traffic volume and capacity data and performs LOS analysis on an annual basis for various planning purposes. The County publishes the data into Geographic Information System (GIS) shape files, spreadsheets, and reports once the data are finalized.*

***V/C* Ratio and V/MSV Ratio**

The volume-to-capacity (V/C) ratio is used as the major tool in measuring roadway conditions and is a measure of the amount of traffic on a given roadway in relation to the amount of traffic the roadway was designed to handle. The volume to maximum service volume (V/MSV) is used to measure the amount of traffic on a roadway in relation to the adopted acceptable amount of traffic the roadway should handle.

Data Collection/Availability *– As mentioned above, Marion County collects traffic volume and capacity data and performs LOS analysis on an annual basis for various planning purposes. The County publishes the data into Geographic Information System (GIS) shape files, spreadsheets, and reports once the data are finalized.*

Public Transit Performance Measures

Percent of Congested Roadway Centerline Miles with Transit Service

This measure summarizes the proportion of congested roadway centerline miles with regularly scheduled transit service (fixed-route local bus service).

Data Collection/Availability *– Marion County maintains databases of various transit service and operational data including route networks. These data typically are available in a GIS or spreadsheet format and used regularly for service planning purposes.*

Passenger Trips per Revenue Hour

This measure summarizes the system wide number of passengers boarding a transit vehicle during one revenue service hour in Marion County.

Data Collection/Availability *– Marion County regularly collects these data, which are reported in various day-to-day operations reports and annual reports such as the National Transit Database (NTD).*

Average Service Frequency

The average service frequency for all fixed-route transit services bus routes operated on the CMP roadway network is measured. This measure identifies average frequencies by transit system, along with the region-wide average.

Data Collection/Availability *– These data are collected continuously as part of day-to-day activities and as annual reports.*

On-Time Performance

Ocala/Marion TPO conducts Transit Capacity and Quality Service Evaluations, which, in part, summarizes the on-time performance data for the system. FDOT's *Transit Capacity and Quality of Service Manual* (TCQSM) defines on-time performance for a transit bus as being on-time or up to five minutes after the scheduled arrival time.

Data Collection/Availability *– These data have been collected by the Ocala/Marion TPO as part of the Transit Capacity and Quality Service Evaluation, which is prepared and provided to FDOT every four to five years. On–time performance is one of the six measures evaluated in Transit Quality Level of Service (TQLOS) evaluations. This evaluation, however, no longer is required by FDOT but is encouraged. It is assumed that Marion County will continue to perform this evaluation or will perform a different service evaluation, which will result in transit on-time performance data.*

Annual Ridership

Annual ridership summarizes the total number of unlinked passenger trips from all transit routes that operate in the CMP application area in Marion County. Passengers are counted each time they board vehicles, no matter how many vehicles they use to travel from their origin to their destination.

Data Collection/Availability *- The ridership data are considered one of the key performance indicators for any transit system and are collected regularly. Marion County ridership data are maintained and summarized in various transit and related documents.*

Bicycle/Pedestrian/Trail Facility Performance Measures

Percent of Congested CMP Roadway Centerline Miles with Bicycle Facilities

This measure identifies the proportion of congested CMP centerline miles where some type of bicycle facility exists, as defined by the respective planning agencies. Some communities consider paved shoulders and wide curb lanes to be bicycle facilities, with the exception of interstates and toll facilities.

Data Collection/Availability – *These data are collected and maintained regularly by Marion County and summarized in various local plans.*

Percent of Congested CMP Roadway Centerline Miles with Sidewalk Facilities

The proportion of congested CMP roadway network centerline miles on which a sidewalk is available is measured.

Data Collection/Availability – *These data are collected together with the bicycle facility data in Marion County and summarized in various plans.*

Miles of Multi-Use Trails

This measure summarizes the total number of miles of multi-use trail facilities in Marion County. Multi-use trail facilities usually are off-street facilities designated for the exclusive use of non-motorized travel. They may be used by pedestrians, cyclists, wheelchair users, joggers, and other non-motorized users.

Data Collection/Availability – *These data are collected and maintained with bicycle and sidewalk facility data in Marion County.*

Safety Performance Measures

Number of Crashes by Safety Emphasis Area **(At Intersection, Vulnerable Users, Lane Departure, Aggressive Driving)**

Crashes at intersections and roadway segments are used as an indicator of congestion. Considered a measure of non-recurring congestion, this measure uses data that are widely available through the many local and state agencies that track them on an ongoing basis throughout the CMP application area.

Data Collection/Availability *– Crash data in Marion County are collected through various law enforcement agencies including the Florida Highway Patrol, Marion County Sheriff's Department, and the police departments of major cities in Marion County.*

TDM Performance Measures

Number of Registered Carpools or Vanpools

This measure in the Marion CMP summarizes the annual number of registered carpools and vanpools in CMP application area. A carpool is defined as a group of two or more people who commute to work or other destinations together in a private vehicle, while a vanpool is typically a prearranged group of 5 to 15 people who share their commute to work.

Data Collection/Availability *– Currently, Tampa Bay Area Regional Transportation Authority (TBARTA), through a contracted operator, provides vanpool/carpool services in Marion County and neighboring areas. TBARTA maintains data on registered carpool/vanpool users to determine which carpools and vanpools are available them.*

Goods Movement Performance Measures

Vehicle Miles Traveled (VMT) Below LOS Standard on Designated Truck Routes

This measures the total vehicle miles of travel below the adopted LOS standard in Marion County on designated truck routes. The VMT for a roadway segment is calculated by multiplying the AADT of that segment by the length of the segment in miles.

Data Collection/Availability – *VMT performance data are updated annually by the TPO.*

Number of Crashes involving Heavy Vehicles

The number of crashes involving heavy vehicles is considered to be a measure of non-recurring congestion that is often more significant when it involves heavy vehicles. This measure uses data that are widely available through the many local and state agencies that track them on an ongoing basis throughout the CMP application area.

Data Collection/Availability – Marion County, through an TPO initiative, has a comprehensive traffic crash database that aids in summarizing roadway traffic crash data. The system specifically provides crash information that is used for the congestion management process.

RELATIONSHIP OF PERFORMANCE MEASURES TO THE GOALS AND OBJECTIVES

As part of the CMP process, the performance measures have been related to the goals and objectives discussed earlier in the report.

Table 5-1 illustrates an example of the relationship between the performance measures identified above and the Goals and Objectives for the Congestion Management Process.

Table 5-1

Relationship of Goals and Objectives to Performance Measures

Goals & Objectives	Performance Measures															
	Roadway			Public Transit					Bike/Ped Trail			Safety	TDM	Goods Movement	
	Vehicle Miles of Travel	Vehicle Miles of Travel Below the Adopted LOS Standard	V/C Ratio	Percent of Congested Roadway Centerline Miles with Transit Service	Passenger Trips per Revenue Hour	Average Service Frequency	Annual Ridership on Fixed Route Transit	Annual Ridership on Dial A Ride	Percent of Congested Roadway Centerline Miles with Bicycle Facilities	Percent of Congested Roadway Centerline Miles with Sidewalk Facilities	Miles of Multi-Use Trails	Number of Crashes by Safety Empasis Area (at intersection, vulnerable users, lane departure and aggressive driving	Number of Registered Carpools or Vanpools	Truck Vehicle Miles (VMT) Traveled Below LOS Standard	Number of Crashes Involving Heavy Vehicles
Goal 1: Reduce vehicle miles of travel per capita															
Objective 1.1: Encourage land use development that reduces the distances between trips.	●	●	●	●	●	●	●	●	●	●	●	✚		●	✚
Objective 1.2: Reduce auto travel demand on congested corridors to reduce congested travel	●	●	●	●	●	●	●	●				✚	P	●	✚
Goal 2: Increase the viability and usage of non-automobile modes of travel															
Objective 2.1: Increase the availability of pedestrian facilities to form a more complete network	●	●	●			●	●			●	●	✚			
Objective 2.2: Increase the availability of bicycle facilities to form a more complete network	●	●	●			●	●		●	●	●	✚			
Goal 3: Improve and increase transit as a viable transportation alternative															
Objective 3.1: Add transit service to congested corridors without such service and increase the span of service and frequency of fixed route transit service where it exists to increase transit as a viable mode of travel	●	●	●	●	●	●	●	●							
Objective 3.2: Establish park-n-ride facilities and carpool lots to facilitate shifts to different modes of travel	●	●	●	●	●	●	●						P		
Objective 3.3: Locate transit stops with transit supportive land uses and amenities to encourage use	●	●	●	●	●	●	●	●							
Goal 4: Improve roadway operations to reduce congestion															
Objective 4.1: Implement strategies that enhance the existing transportation system to relieve congestion, improve safety, and improve mobility of persons and goods	●	●	●				●		●	●	●	✚	P	●	✚
Objective 4.2: Apply a high priority to projects that provide a rapid reduction in congestion that eliminate or delay the need for more costly roadway expansion	●	●	●									✚	P	●	✚
Objective 4.3: Reduce crashes to reduce non-reoccuring congestion												✚			✚
Objective 4.4: Improve the mobility of people and goods by using advanced technology strategies including Intelligent Transportation Systems (ITS) to increase system efficiency	●	●	●									✚		●	✚

TDM: Travel Demand Management

Chapter 6: System Performance Monitoring Plan

Chapter 6: System Performance Monitoring Plan

Overview of Monitoring Plan

FHWA identifies congestion monitoring as just one of the several aspects of transportation system performance that leads to more effective investment decisions for transportation improvements. Safety, physical condition, environmental quality, economic development, quality of life, and customer satisfaction are among the aspects of performance that also require monitoring.

The Final Rule on Metropolitan Transportation Planning identifies the requirement for "a coordinated program for data collection and system performance monitoring to assess the extent of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions." In addition, it also indicates that "to the extent possible, this data collection program should be coordinated with existing data sources and coordinated with operations managers in the metropolitan area."

As a result, the goal of the Marion County CMP system monitoring plan, as presented in **Table 6-1** on the following page, is to develop an ongoing system of monitoring and reporting that relies primarily on data already collected or planned to be collected in the county. The components of the monitoring plan include roadways, public transit, bicycle/pedestrian/trail, TDM, and goods movement where:

- Roadways are monitored through annual LOS analysis using traffic counts and other related data constantly collected throughout the region.
- Crashes are monitored to help measure non-recurring congestion.
- Transit performance is monitored continuously through various operating and capital plans.
- Bicycle/pedestrian/trail data are monitored and updated in various city and county databases.
- Significant goods movement corridors are evaluated to address mobility needs of the goods movement providers.

The Ocala/Marion TPO CMP will make use of an Annual State of the System Report to document the performance of the transportation system as described in more detail in Chapter 8 of this report.

The Ocala/Marion TPO, as part of the system monitoring plan, will update the State of the System Report annually. Each year, the TPO will develop a preliminary congestion map early in the year and a final congestion map towards the end of the year. The process is summarized below.

- Between January and June, preliminary existing and five-year networks will be developed using the most recent County counts and the latest available FDOT counts, which will be behind the County counts. These networks will be used to create a preliminary congestion map.
- Between July and November, final existing and five-year networks will be developed once the latest FDOT counts have been received These networks will be used to create a final congestion map.

Table 6-1

System Performance Monitoring Plan

Performance Measure	Monitoring Activity	Responsible Agency	Frequency of Evaluation	Current Status	Geographic Area Covered
Level of Service	Level of Service Analysis	Ocala/Marion TPO/Cities/ FDOT	Annually	Ongoing	Marion County
Crash Frequency	Crash Data Analysis	Marion County Public Works	Annually	Ongoing	Marion County
Passenger Trips per Revenue Hour, Average Service Frequency, Annual Ridership	NTD Report/Transit Development Plan	Marion County TPO/THE BUS	Monthly/ Annually	Ongoing	Marion County
Transit On-time Performance	Transit Quality of Service Evaluation	Marion County TPO/THE BUS	Annually	Ongoing	Marion County
Miles of Bicycle, Pedestrian, and Trail Facilities	Bicycle/Pedestrian/Trail Plans and Databases	Marion County TPO	Annually	Ongoing	Marion County
Number of Registered Carpools or Vanpools	Annual Reports and Interim Summaries by TBARTA.	TBARTA	Monthly/ Annually	Ongoing	Marion County
Truck VMT	Roadway Databases and LRTP	FDOT	Annually	Ongoing	Marion County

Chapter 7: Congested Corridor Selection and CMP Strategies

Chapter 7: Congested Corridor Selection and CMP Strategies

Implementation

This section summarizes the implementation and management of the CMP strategies. This includes the process for selecting corridors and projects for implementation in the future as well as an implementation schedule, implementation responsibilities, costs, and possible funding sources for each strategy currently proposed for implementation.

Congested Corridor Selection and Project Selection Process

The purpose of the CMP is to identify actual projects. The CMP process involves selecting congested corridors that will undergo detailed evaluation for identifying potential projects/programs that can be potentially implemented on the corridors. The process follows three phases (an overview illustration is provided in **Figure 7-1**):

Congested Corridor Network Identification (Phase 1)

Annual monitoring efforts are used to review the level of service on the roadway network to identify recurring congestion. Roadways that are congested today or forecasted to be congested in five years are considered for review through the CMP screening process. Corridors are identified as being "not congested," "approaching congestion or minimally congested," or "extremely congested," as summarized below (additional detail is provided in **Appendix A**).

- **Not Congested (currently or in five years without improvements) –** Corridors that are not anticipated to operate below their adopted level of service standards in either the existing conditions or after committed improvements in the five-year program are implemented.

- **Approaching Congestion or Minimally Congested –** Corridors that are approaching congestion or are minimally congested based on one of the following two criteria (projects on these corridors may have the greatest impact):
  - Corridors that are not congested but have segments that have an LOS of D but meet the adopted LOS standard.
  - Corridors that are not congested by have segments that have and LOS of D and do NOT meet the adopted LOS standard.

- **Extremely Congested -** Roadways in the Existing + Committed (E+C) five-year network that have forecast volumes that are projected to cause the facility's LOS to be F.

Crash data management systems also are used to identify corridors or intersections with a high frequency of crashes that result in non-recurring congestion. Safety improvements not only reduce the potential harm to persons in our communities but also can reduce congestion.

Generally, non-congested corridors do not need to be addressed by the CMP; however, the other two categories typically will require one or more congestion-relieving strategies (project, mobility improving program, etc.). Extremely congested corridors typically will require either capacity improvements or a shift to other mobility strategies that rely significantly on public transportation or reductions in travel demand. In some cases, extremely congested corridors may respond favorably to the implementation of operational improvements; these would be considered on a case-by-case basis where appropriate. The corridors approaching congested or minimally congested typically represent the corridors that will be most responsive to CMP improvement strategies.

After the congested network and corridors have been identified, two to three corridors are selected for detailed analysis and project identification and implementation. The TAC/CMP Task Force reviews the
selection of corridors. Once corridors are selected and evaluated, they will not be reevaluated for three to five years. Corridors typically are selected based on the following:

1. If they are not in the 5-year work program or identified as projects in the 10-year plan and the corridors are forecasted to operate below their adopted level of service standard.
2. The two or three corridors that would receive the greatest mobility or operational benefit from the CMP process.
3. Roadways identified as Long Term Concurrency Roadways using mobility strategies that would be strengthened through the implementation of mobility improvements.

CMP and Safety Strategy Screening (Phase 2)

Once congested corridors are selected for review, they are screened to identify mitigation strategies appropriate to reduce congestion or improve safety to reduce crashes. The CMP Strategy Matrix (found in **Appendix B**) is used to address recurring congestion, and the Safety Mitigation Strategy Matrix (found in **Appendix C**) is used to address nonrecurring congestion. The matrix includes strategies in five tiers as identified in the Marion County CMP Strategy Toolbox. The CMP Strategy Matrix typically is used in a workshop setting to quickly review a corridor, and the Safety Mitigation Strategy Matrix is applied based on a review of crash data.

Once the roadways are categorized based on the three previous criteria (Approaching Congestion, Minimally Congested, and Extremely Congested), they are further grouped into two different types of corridors:

- **Transit Corridors -** These include corridors that are identified as Transit Corridors in either the Comprehensive Plan or the adopted LRTP. These corridors represent locations where Marion County or the TPO has identified that public transportation is a key factor in addressing mobility needs in

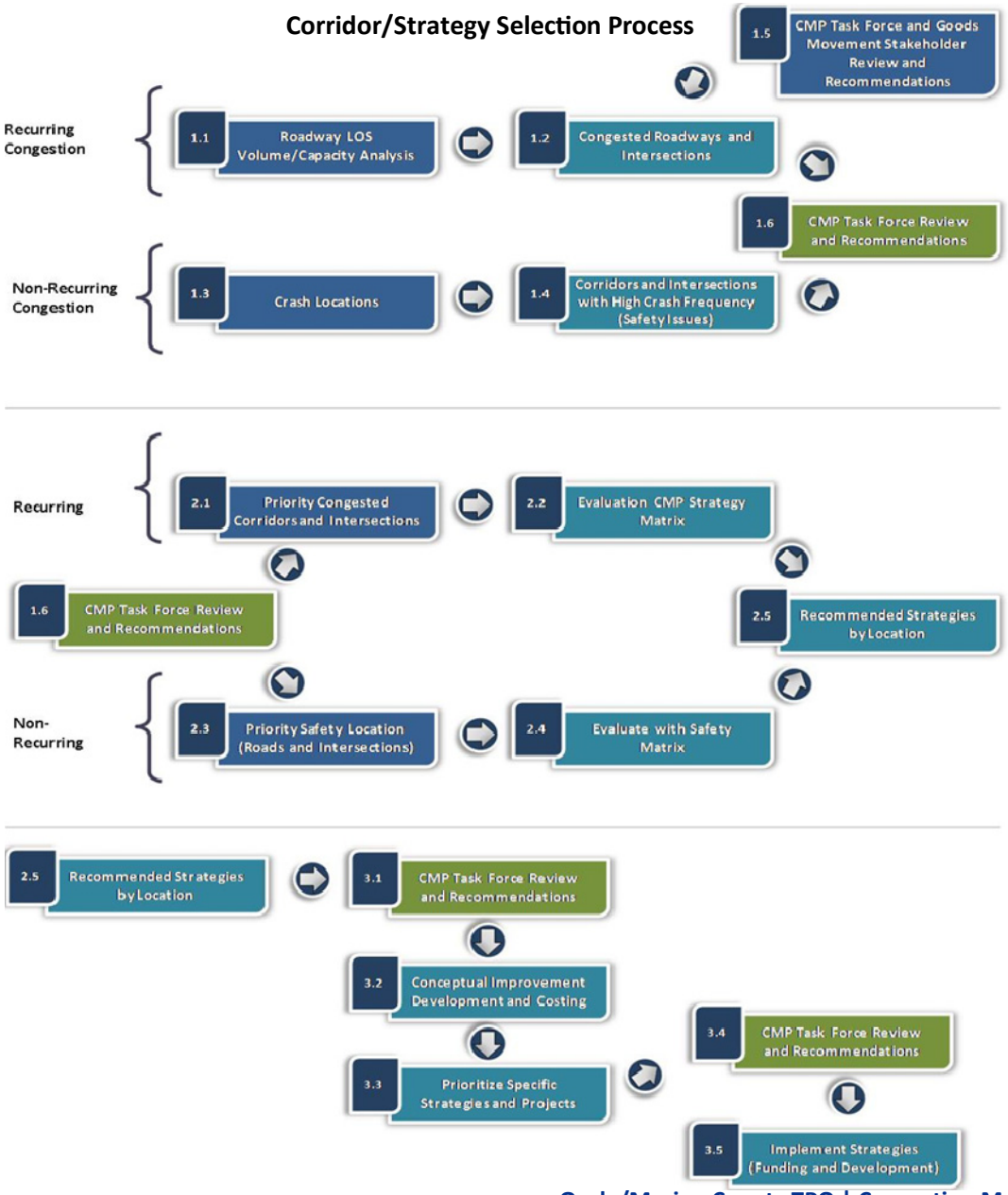
- **Non-Transit Corridors (Non-Designated Corridors) -** These include all other major roadways included in the existing plus committed five year (E+C) five year road network.

Project and Identification and Implementation (Phase 3)

The congestion or safety mitigation strategies that are identified as having the greatest potential benefit are then evaluated in greater detail based on committee or technical recommendations. During this phase, additional analysis of potential projects is undertaken to identify the specific improvement, implementation issues, and costs. "Programs" such as demand-reducing programs or policy changes are evaluated to identify recommended action items. Recommendations then are made for the projects or programs to be implemented. This may result in a near-immediate refocusing of existing resources, such as existing rideshare programs or local maintenance crews where possible, programming improvements in the local agency capital improvement programs, or using boxed funds controlled by the TPO, and finally may be identified as candidate projects for implementation in future LRTPs.

Figure 7-1

Corridor/Strategy Selection Process



Congestion Management Strategies

This section of the CMP Update identifies and evaluates the strategies intended for mitigating existing and future congestion in the Marion County roadway network. A Toolbox of Strategies is presented to help policy makers and planners effectively use these congestion reduction strategies. For TPOs with more than 200,000 people within their planning areas, SAFETEA-LU requires that the TPO "shall address congestion management … through the use of travel demand reduction and operational management strategies." In addition, the Final Rule on Statewide and Metropolitan Transportation Planning published on February 14, 2007, states that "development of a congestion management process should result in multimodal system performance measures and strategies that can be reflected in the metropolitan transportation plan and the Transportation Improvement Program (TIP)."

A full range of potential strategies has been identified for the Ocala/ Marion TPO in its multimodal CMP network. These strategies can be grouped into the following broad categories as presented in **Figure 7-2**.

Figure 7-3 summarizes the demand and operational management strategies included in the Marion County CMP toolbox of strategies, which is presented later in detail. A full range of demand and operational management strategies are identified in these tables for Marion County to assist in its efforts to mitigating existing and future congestion.

Figure 7-2
Congestion Management Strategies

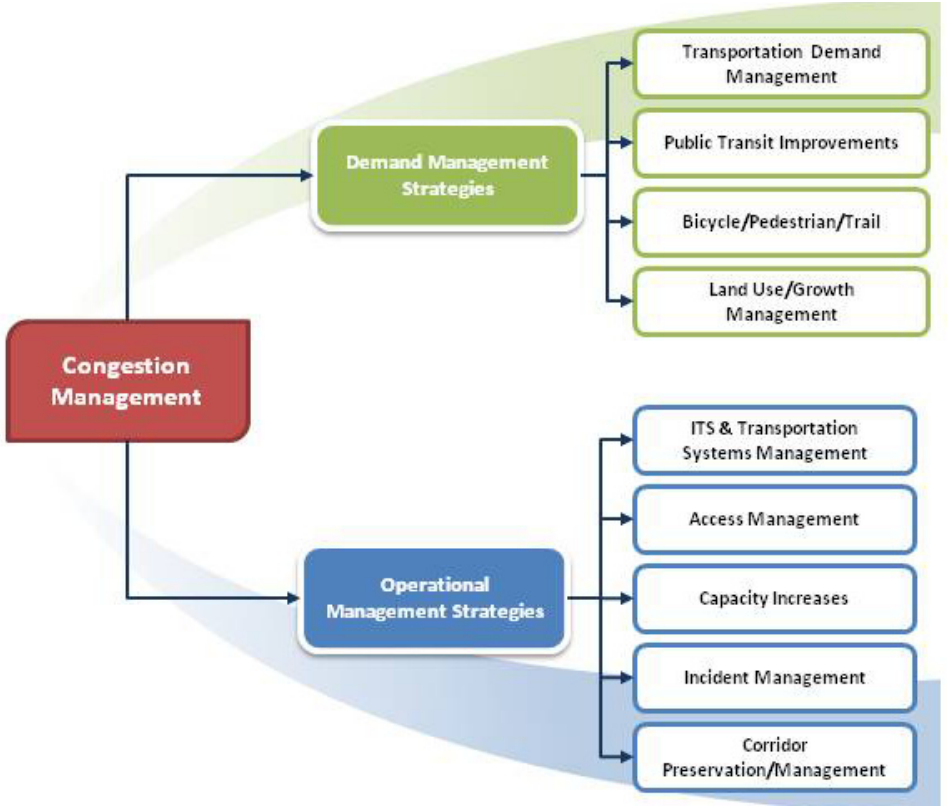
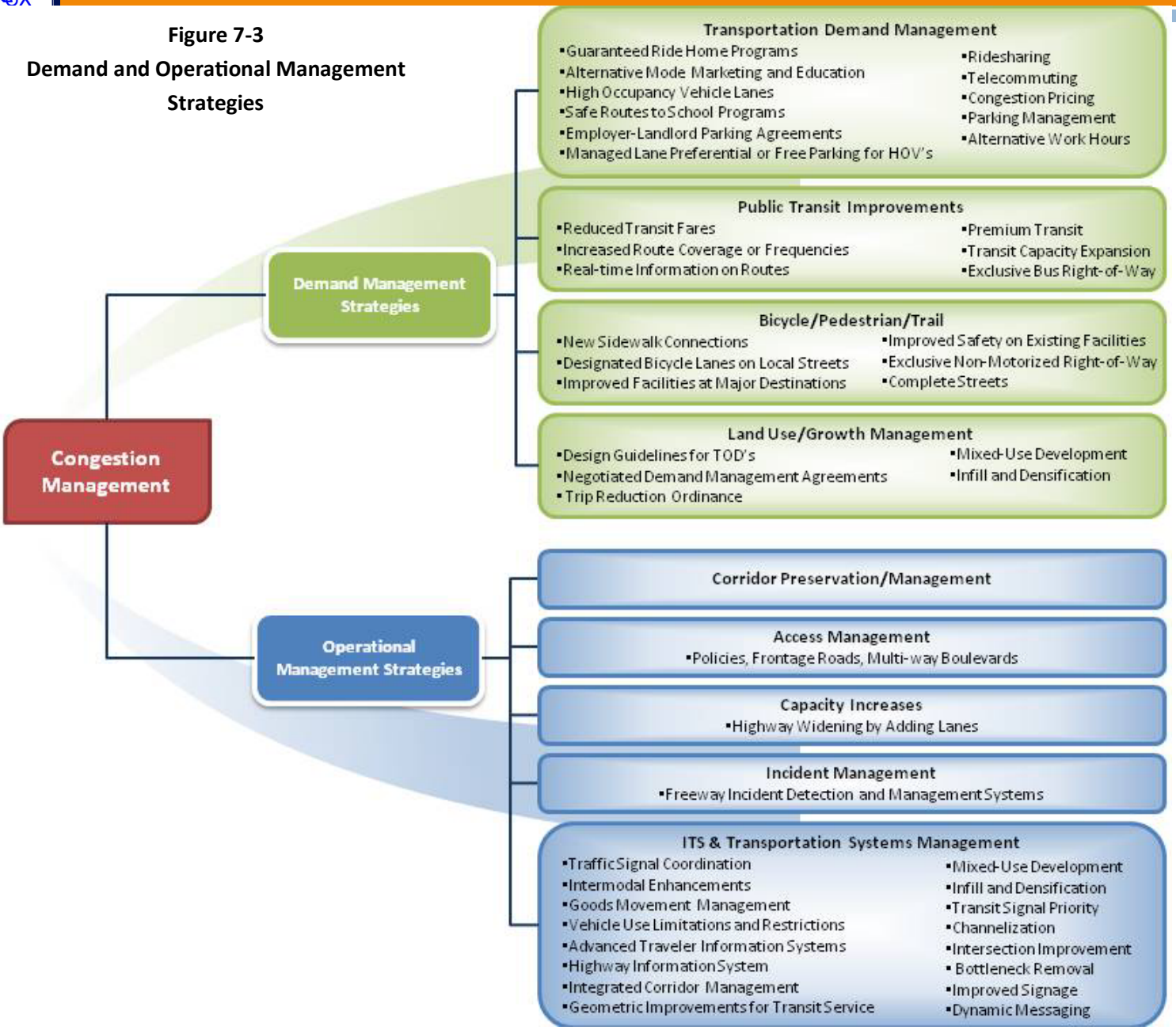


Figure 7-3
Demand and Operational Management Strategies

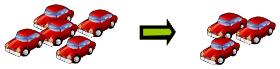


Toolbox of Strategies

The CMP uses a strategy toolbox with multiple tiers of strategies to support the congestion strategy or strategies for congested corridors. Following an approach used by other TPOs and promoted by FHWA, the toolbox of congestion mitigation strategies is arranged so that the measures at the top take precedence over those at the bottom. The toolbox is presented below.

The "top-down" approach promotes the growing sentiment in today's transportation planning arena and follows FHWA's clear direction to consider all available solutions before recommending additional road-way capacity. The Marion County CMP toolbox of strategies is presented in detail in the remainder of this section.

Marion County CMP Toolbox of Strategies



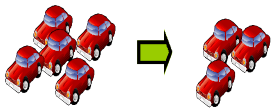
Tier 1: ***Strategies to Reduce Person Trips or Vehicle Miles Traveled***

Tier 2: ***Strategies to Shift Automobile Trips to Other Modes***

Tier 3: ***Strategies to Shift Trips from SOV to HOV Auto/Van***

Tier 4: ***Strategies to Improve Roadway Operations***

Tier 5: ***Strategies to Add Capacity***



Tier 1: Strategies to Reduce Person Trips

Transportation Demand Management Strategies

These strategies are used to reduce the use of single occupant motor vehicles, as the overall objective of TDM is to reduce the miles traveled by automobile. The following TDM strategies, not in any particular order, are available for consideration in the toolbox to potentially reduce travel in the peak hours. Strategies include:

- ***Congestion Pricing:*** Congestion pricing can be implemented statically or dynamically. Static congestion pricing requires that tolls are higher during traditional peak periods. Dynamic congestion pricing allows toll rates to vary depending upon actual traffic conditions. The more congested the road, the higher the cost to travel on the road. Dynamic congestion pricing works best when coupled with real-time information on the availability of other routes.
- ***Alternative Work Hours:*** There are three main variations: staggered hours, flex-time, and compressed work weeks. Staggered hours require employees in different work groups to start at different times to spread out their arrival/departure times. Flex-time allows employees to arrive and leave outside of the traditional commute period. Compressed work weeks involve reducing the number of days per week worked while increasing the number of hours worked per day.
- ***Telecommuting:*** Telecommuting policies allow employees to work at home or a regional telecommute center instead of going into the office, all the time or only one or more days per week.
- ***Guaranteed Ride Home Programs:*** These programs provide a safety net to those people who carpool or use transit to work so that they can get to their destination if unexpected work demands or an emergency arises.
- ***Alternative Mode Marketing and Education:*** Providing education on alternative modes of transportation can be an effective way of increasing demand for alternative modes. This strategy can include mapping Websites that compute directions and travel times for multiple modes of travel.
- ***Safe Routes to Schools Program:*** This federally-funded program provides 100 percent funding to communities to invest in pedestrian and bicycle infrastructure surrounding schools.
- ***Preferential or Free Parking for HOVs:*** This program provides an incentive for employees to carpool with preferred of free-of-charge parking for HOVs.

Land Use/Growth Management Strategies

The strategies in this category include policies and regulations that would decrease the total number of auto trips and trip lengths while promoting transit and non-motorized transportation options. These strategies include the following.

- ***Negotiated Demand Management Agreements:*** As a condition of development approval, local governments require the private sector to contribute to traffic mitigation agreements. The agreements typically set a traffic reduction goal (often expressed as a minimum level of ridesharing participation or a stipulated reduction in the number of automobile trips).
- ***Trip Reduction Ordinance:*** These ordinances use a locality's regulatory authority to limit trip generation from a development. They spread the burden of reducing trip generation among existing and future developments better than Negotiated Demand Management Agreements.
- ***Infill Developments:*** This strategy takes advantage of infrastructure that already exists, rather than building new infrastructure on the fringes of the urban area.
- ***Transit Oriented Developments:*** This strategy clusters housing units and/or businesses near transit stations in walkable communities. By providing convenient access to alternative modes, auto dependence can be reduced.
- ***Design Guidelines for Pedestrian-Oriented Development:*** Maximum block lengths, building setback restrictions, and streetscape enhancements are examples of design guidelines that can be codified in zoning ordinances to encourage pedestrian activity.
- ***Mixed-Use Development:*** This strategy allows many trips to be made without automobiles. People can walk to restaurants and services rather than use their vehicles.

Tier 2: Strategies to Shift Automobile Trips to Other Modes

Public Transit Strategies

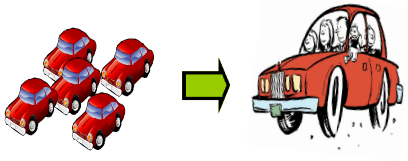
Two types of strategies, capital improvements and operating improvements, are used to enhance the attractiveness of public transit services to shift auto trips to transit. Transit capital improvements generally modernize the transit systems and improve their efficiency; operating improvements make transit more accessible and attractive. The following strategies are included in the toolbox for consideration.

- ***Transit Capacity Expansion:*** This strategy adds new vehicles to expand transit services.
- ***Increasing Bus Route Coverage or Frequencies:*** This strategy provides better accessibility to transit to a greater share of the population. Increasing frequency makes transit more attractive to use.
- ***Implementing Premium Transit:*** Premium transit such as Bus Rapid Transit (BRT) best serves dense urban centers where travelers can walk to their destinations. Premium transit from suburban areas can sometimes be enhanced by providing park-and-ride lots.
- ***Providing Real-Time Information on Transit Routes*:** Providing real-time information on bus progress either at bus stops, terminals, and/or personal wireless devices makes bus travel more attractive.
- ***Reducing Transit Fares:*** This relatively easy-to-implement strategy encourages additional transit use, to the extent that high fares are a real barrier to transit. However, due to the direct financial impact on the transit system operating budgets, reductions in selected fare categories may be a more feasible strategy to implement.
- ***Provide Exclusive Bus Right-Of-Way:*** Exclusive right-of-way includes bus ways, bus-only lanes, and bus bypass ramps. This strategy is applied to freeways and major highways that have routes with high ridership.

Non-Motorized Transportation Strategies

Non-motorized strategies include bicycle, pedestrian, and trail facility improvements that encourage non-motorized modes of transportation instead of single-occupant vehicle trips. The following strategies are included.

- ***New Sidewalk Connections:*** Increasing sidewalk connectivity encourages pedestrian traffic for short trips.
- ***Designated Bicycle Lanes on Local Streets:*** Enhancing the visibility of bicycle facilities increases the perception of safety. In many cases, bicycle lanes can be added to existing road-ways through restriping.
- ***Improved Bicycle Facilities at Transit Stations and Other Trip Destinations:*** Bicycle racks and bicycle lockers at transit stations and other trip destinations increase security. Additional amenities such as locker rooms with showers at workplaces provide further incentives for using bicycles.
- ***Improved Safety of Existing Bicycle and Pedestrian Facilities:*** Maintaining lighting, signage, striping, traffic control devices, and pavement quality and installing curb cuts, curb extensions, median refuges, and raised crosswalks can increase bicycle and pedestrian safety.
- ***Exclusive Non-Motorized ROW:*** Abandoned rail rights-of-way and existing parkland can be used for medium- to long-distance bicycle trails, improving safety and reducing travel times.
- ***Complete Streets:*** Routinely designing and operating the entire right-of-way can enable safe access for all users including pedestrians, bicyclists, motorists, and transit. Elements that may be found on a complete street include sidewalks, bike lanes (or wide paved shoulders), special bus lanes, comfortable and accessible transit stops, frequent crossing opportunities, median islands, accessible pedestrian signals, curb extensions, and more.



Tier 3: Strategies to Shift Trips from SOV to HOV Auto/Van

Transportation Demand Management Strategies

The following TDM strategies are recommended to encourage HOV use.

- ***Ridesharing (Carpools & Vanpools*):** In ridesharing programs, participants are matched with potential candidates for sharing rides. This typically is arranged/encouraged through employers or transportation management agencies that provide ride-matching services. These programs are more effective if combined with HOV lanes, parking management, guaranteed ride home policies, and employer-based incentive programs.
- ***High Occupancy Vehicle Lanes:*** This increases corridor capacity while, at the same time, providing an incentive for single-occupant drivers to shift to ridesharing. These lanes are most effective as part of a comprehensive effort to encourage HOVs, including publicity, outreach, park-and-ride lots, rideshare matching services, and employer incentives.
- ***Park-and-Ride Lots:*** These lots can be used in conjunction with HOV lanes and/or express bus services. They are particularly helpful when coupled with other commute alternatives such as carpool/vanpool programs, transit, and/or HOV lanes.
- ***Employer-Landlord Parking Agreements:*** Employers can negotiate leases so that they pay for parking spaces used only by employees. In turn, employers can pass along parking savings by purchasing transit passes or reimbursing non-driving employees with the cash equivalent of a parking space.
- ***Parking Management:*** This strategy reduces the instance of free parking to encourage other modes of transportation. Options include reducing the minimum number of parking spaces required per development, increasing the share of parking spaces for HOVs, introducing or raising parking fees, providing cash-out options for employees not using subsidized parking spaces, and expanding parking at transit stations or park-and-ride lots.
- ***Managed Lanes:*** FHWA defines managed lanes as highway facilities or a set of lanes in which operational strategies are implemented and managed (in real time) in response to changing conditions. Examples of managed lanes may include high-occupancy toll (HOT) lanes with tolls that vary based on demand, exclusive bus-only lanes, HOV and clean air and/or energy-efficient vehicle lanes, and HOV lanes that could be changed into HOT lanes in response to changing levels of traffic and roadway conditions.

Tier 4: Strategies to Improve Roadway Operations

Intelligent transportation Systems (ITS) Strategies

The strategies in ITS use new and emerging technologies to mitigate congestion while improving safety and environmental impacts. Typically, these systems are made up of many components, including sensors, electronic signs, cameras, controls, and communication technologies. ITS strategies are sets of components working together to provide information and allow greater control of the operation of the transportation system. The following strategies are included in the toolbox.

- ***Dynamic Messaging:*** Dynamic messaging uses changeable message signs to warn motorists of downstream queues; it provides travel time estimates, alternate route information, and information on special events, weather, or accidents.

- ***Advanced Traveler Information Systems (ATIS):*** ATIS provide an extensive amount of data to travelers, such as real-time speed estimates on the Web or over wireless devices and transit vehicle schedule progress. It also provides information on alternative route options.

- ***Integrated Corridor Management (ICM):*** This strategy, built on an ITS platform, provides for the coordination of the individual network operations between parallel facilities creating an interconnected system. A coordinated effort between networks along a corridor can effectively manage the total capacity in a way that will result in reduced congestion.

- ***Transit Signal Priority (TSP):*** This strategy uses technology located onboard transit vehicles or at signalized intersections to temporarily extend green time, allowing the transit vehicle to proceed without stopping at a red light.

Transportation Systems Management Strategies

Transportation Systems Management (TSM) strategies identify operational improvements to enhance the capacity of the existing system. These strategies typically are used together with ITS technologies to better manage and operate existing transportation facilities. The following strategies are included in the toolbox.

- ***Traffic Signal Coordination:*** Signals can be pre-timed and isolated, pre-timed and synchronized, actuated by events (such as the arrival of a vehicle, pedestrian, bus or emergency vehicle), set to adopt one of several pre-defined phasing plans based on current traffic conditions, or set to calculate an optimal phasing plan based on current conditions.
- ***Channelization:*** This strategy is used to optimize the flow of traffic for making left or right turns usually using concrete islands or pavement markings.
- ***Intersection Improvements:*** Intersections can be widened and lanes restriped to increase intersection capacity and safety. This may include auxiliary turn lanes (right or left) and widened shoulders.
- ***Bottleneck Removal:*** This strategy removes or corrects short, isolated, and temporary lane reductions, substandard design elements, and other physical limitations that form a capacity constraint that results in a traffic bottleneck.
- ***Vehicle Use Limitations and Restrictions:*** This strategy includes all-day or selected time-of-day restrictions of vehicles, typically trucks, to increase roadway capacity.
- ***Improved Signage:*** Improving or removing signage to clearly communicate location and direction information can improve traffic flow.
- ***Geometric Improvements for Transit:*** This strategy includes providing for transit stop locations that do not affect the flow of traffic, improve sight lines, and improve merging and diverging of buses and cars.
- ***Intermodal Enhancements:*** Coordinating modes makes movement from one mode to the other easier. These enhancements typically include schedule modification to reduce layover time or increase the opportunity for transfers, creation of multi-modal facilities, informational kiosks, and improved amenities at transfer locations.
- ***Goods Movement Management:*** This strategy restricts delivery or pickup of goods in certain areas to reduce congestion.

Incident Management Strategies

- ***Freeway Incident Detection and Management Systems:*** This strategy addresses primarily non-recurring congestion, typically includes video monitoring and dispatch systems, and may also include roving service patrol vehicles.

Access Management Strategies

- ***Access Management Policies:*** This strategy includes adoption of policies to regulate driveways and limit curb cuts and/or policies that require continuity of sidewalk, bicycle, and trail networks.

Corridor Preservation/Management Strategies

- ***Corridor Preservation:*** This strategy includes implementing, where applicable, land acquisition techniques such as full title purchases of future rights-of-way and purchase of easements to plan proactively in anticipation of future roadway capacity demands.

- ***Corridor Management:*** This strategy is applicable primarily in moderate- to high-density areas and includes strategies to manage corridor rights-of-way. The strategies range from land-use regulations to landowner agreements such as subdivision reservations, which are mandatory dedications of portions of subdivided lots that lie in the future right-of-way.

Tier 5: Strategies to Add Capacity

Strategies to add capacity are the most costly and least desirable strategies and should be considered last resort methods for reducing congestion. As the strategy of cities trying to "build" themselves out of congestion has not provided the intended results, capacity-adding strategies should be applied after determining the demand and operational management strategies identified earlier are not feasible solutions. The key strategy is to increase the capacity of congested roadways through additional general purpose travel lanes.

- ***Increase the capacity of congested roadways through additional general purpose travel lanes.***

CMP Safety Mitigation Matrix

The Marion CMP process also includes a "CMP Safety Mitigation Matrix" for use in streamlining the identification of potential safety issues identified in the identification of congested corridors by making use of crash data produced by the County's Crash Data Management System (CDMS). This system produces maps and reports by crash type or cause which can be used to identify safety issues on the major roadway network for both congested and non-congested roadways. Reducing the number of crashes that occur on major roadways can reduce nonrecurring congestion. While the delay incurred resulting from crashes cannot be determined easily, it is a significant contribution of delay on major roadways. To support the integration of crash reduction as a means to reduce non-reoccurring congestion, a CMP Safety Mitigation Matrix was developed.

The CMP Safety Migration Matrix is provided in **Figure 7-4**. This Matrix is similar to the CMP Strategy Matrix in that it should be used to screen and identify potential strategies that would reduce congestion caused by specific crash types. The Matrix identifies the most common crash types and the typical strategies that could be implemented to improve safety and reduce these crashes. Special consideration also is given to relating these crashes to the four Safety Emphasis Areas identified in the State of Florida Strategic Highway Safety Plan. In most cases, additional detailed study will be required to identify the specific safety strategy or strategies to be implemented for a specific location.

Figure 7-4: CMP Safety Strategies Matrix

Safety Mitigation Matrix

Corridor_____ From_____ To_____ Analyst_____ Date_____

Related Crash Types	Countermeasure Type	SHSP Aggressive Driving	SHSP At Intersection	SHSP Lane Departure	SHSP Vulnerable User	Frequency of Crash Type in Corridor (Circle One)	Common Mitigation	Recommended Follow-up
Angle and left turn crashes occurring at stopped controlled intersections.	Engineering	●	●	●	●	N/A, LOW, MED, HIGH	Provide advance warning sign on approach to intersection. Double up on traffic control signs. Provide warning flashers. Evaluate for possible signalization.	
Angle and left turn crashes occurring away from signalized intersections or divided highways.		●	●		●	N/A, LOW, MED, HIGH	Channelize to prohibit a specific movement. Close median to prohibit all movements.	
Left turn crashes occurring at signalized intersections		●	●		●	N/A, LOW, MED, HIGH	Install of protected left turn phasing at signalized intersections. Consider protected only left turn phasing.	
Rear end and angle crashes at signalized intersections along east west corridors.			●			N/A, LOW, MED, HIGH	Install back plates or high visibility back plates on signalized intersections to increase signal head conspicuity (particularly along east-west corridors).	
Rear end crashes with injuries.		●	●			N/A, LOW, MED, HIGH	Provide advance signal warning sign at signalized intersections. Provide advance street name signs. Increase speed enforcement. Evaluate pavement friction.	
Crashes that occur during nighttime hours.		●	●		●	N/A, LOW, MED, HIGH	Provide street lighting to increase road visibility at nighttime.	
Crashes that occur during slippery or wet conditions.		●	●	●	●	N/A, LOW, MED, HIGH	Improve pavement friction through resurfacing or high-friction overlays.	
Crashes that involve a heavy truck vehicle type.			●			N/A, LOW, MED, HIGH	Provide adequate clearance for heavy truck's reduced stopping distance at signals or provide dilemma zone detection at signals. Provide passing lanes, and acceleration / deceleration lanes. Increase turn radius.	
Crashes that involve a u-turning vehicle.		●	●			N/A, LOW, MED, HIGH	Prohibit U-turns at signalized intersection where there are conflicts with channelized right turns. Prohibit U-turns along corridors where sight distance is inadequate or there are conflicts.	
Crashes that involve left turning vehicles.			●	●	●	N/A, LOW, MED, HIGH	Provide turn lanes, increase left turn storage, provide positive offset.	
Crashes that involve right turning vehicles.			●	●	●	N/A, LOW, MED, HIGH	Provide turn lanes, prohibit right turn on red, provide receiving lane for channelized right turn.	
Crashes that occur at intersections that involve parked cars.			●		●	N/A, LOW, MED, HIGH	Prohibit parking near major intersections to increase driver/pedestrian visibility.	
Crashes that involve pedestrians.			●		●	N/A, LOW, MED, HIGH	Provide countdown heads for signalized intersections, refuge islands for unsignalized crossings, sidewalks along roadways, consolidate driveways to decrease vehicle/pedestrian conflict points.	
Crashes that involve bicyclists.			●		●	N/A, LOW, MED, HIGH	Provide countdown heads for signalized intersections, refuge islands for unsignalized crossings, bike lanes along roadways, consolidate driveways to decrease vehicle/bicyclist conflict points.	
Crashes that involve motorcycles.			●	●	●	N/A, LOW, MED, HIGH	Evaluate pavement friction. Evaluate shoulders to ensure proper drainage. Increase speed enforcement	
Crashes that occur at driveways away from signalized intersections.		●		●	●	N/A, LOW, MED, HIGH	Consolidate driveways to decrease vehicular conflict points. Provide raised medians.	
Crashes that involve vehicles leaving the roadway and include single vehicle collisions with fixed objects.		●		●		N/A, LOW, MED, HIGH	Provide guardrail. Provide delineation along the curve and inverted profile pavement markings (or RPMs). Provide advance warning sign on approach to turns, particularly along rural roadways.	
Crashes that occurred along a curved section of roadway.		●		●	●	N/A, LOW, MED, HIGH	Provide advance warning sign on approach to turns, particularly along rural roadways. Enhance signage. Provide solar flashing beacons on signs.	
Crashes where drugs and/or alcohol was involved.	Enforcement	●	●	●		N/A, LOW, MED, HIGH	Increase DUI enforcement.	
Crashes that cite disregard of traffic control as a contributing cause.		●	●	●	●	N/A, LOW, MED, HIGH	Increase red light running enforcement.	
Crashes that involve a speeding vehicle (cited by officer)		●	●	●	●	N/A, LOW, MED, HIGH	Increase speed enforcement. Install post mounted speed feedback signs.	

Chapter 8: Monitoring Strategy Effectiveness

Chapter 8: Monitoring and Strategy Effectiveness

Introduction

The FHWA guidelines call for CMPs to include provisions to monitor the performance of strategies implemented to address congestion. Regulations require "a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures." This step of the process helps determine whether operational or policy adjustments are needed to make the current strategies work better and provides information about how various strategies work in order to implement future approaches within the CMP study area.

Data collection and performance monitoring are ongoing with the various periodic assessments of roadway, transit, bicycle/pedestrian/trail, freight network performance in Marion County. However, this CMP also identifies the need for a process that supports an annual tracking of the effectiveness of the implemented congestion mitigation strategies and the multi-modal transportation system as a whole. This annual process is described in detail below.

Annual State of the System Report

As a key tool in the Marion County CMP, an Annual State of the System Report will be developed in the interim years until the next CMP update. This report will track the effectiveness of the implemented strategies, to the extent possible with the available project level data, and conditions of the multi-modal transportation system as a whole. The same set of quantifiable performance measures established for the Marion County CMP as described in Chapter 6 of this report will be used to measure system performance at corridor and system levels. The measures that will be used in the Annual State of the System Report on Marion County CMP include:

- **Roadway Performance Measures,** including roadway traffic volume to capacity and crashes.
- **Public Transit Performance Measures,** including passenger trips per revenue hour, average peak service frequency, on-time performance, and annual ridership .
- **Bicycle/Pedestrian/Trail Facility Performance Measures,** including percent of congested CMP roadway centerline miles with bicycle facilities, percent of congested CMP roadway centerline miles with sidewalk facilities, and miles of multi-use trails.
- **TDM Performance Measures,** including the number of registered carpools or vanpools in the CMP study area.
- **Goods Movement Performance Measures,** including the total truck vehicle miles traveled (VMT) in the study area.

The commitment and schedule for preparing an Annual State of the System Report will be determined by the Marion County TAC/CMP Task Force.

Appendix A: Congested Corridors Selection Methodology

Appendix A

Congested Corridors & Hot Spots

Various criteria that primarily use traffic volume and capacity are used to select and categorize the congested corridors in Marion County. The methodology using these criteria to select congested corridors within the CMP application area is presented below. Thereafter, criteria used to identify congestion hot spots, i.e. intersections with recurring or non-recurring congestion, are also summarized.

Selection Methodology

This methodology summarizes the steps used to identify the congested roadways for the Marion County CMP. As indicated earlier, the CMP road network includes all existing and committed roadway segments as identified by the 2035 LRTP.

The selection methodology consists of two main steps. First, five criteria are used to categorize the roadways into three sub-categories. The sub-categories and corresponding criteria are presented below.

Not Congested (currently or in five years without improvements) - The corridors in this category are selected based on applying the following criteria at road segment level:

Not Congested Corridors = ***2010 or 2015 Segments with Facility LOS*** < ***LOS D***

Approaching Congestion or Minimally Congested – The corridors that are approaching congestion are analyzed at two levels. The criteria in each level of analysis are summarized below.

- ***Approaching Congestion*** **-** This includes corridors with segments that meet the following criteria, which are currently congested or congested in five years without improvements.

Corridors Approaching Congestion = 2010 or 2015 Segments with Facility LOS = LOS D or LOS E AND Does NOT meet LOS Standard

OR

Corridors Approaching Congestion = 2010 or 2015 Segments with Facility LOS = LOS D or LOS E AND MEETS LOS Standard

- ***Extremely Congested*** **-** This category includes roadways in the 2014 E+C network that meets the following criteria are considered severely congested.

Extremely Congested Corridors = 2010 or 2015 Segments with Facility LOS = LOS F

Once the roadways are categorized based on these criteria, they are further categorized into two broad types, including:

- **Transit Corridors -** These include Multi-Modal Transportation Districts (MMTD) corridors (corridors that are located in MMTDs) or Key Transit Corridors (corridors with 60-minute or less frequency transit service)

- **Non-Transit Corridors -** These include all other major roadways included in the 2014 existing plus committed (E+C) road network (as defined in the 2035 LRTP).

In addition to the congested roadways selected using the criteria presented above, high crash locations identified in crash data analysis reports and Mobility Management Systems Task Force recommendations of congested intersections are used to identify the congestion "Hot Spots."

Appendix B: CMP Strategy Solutions Matrix

Appendix 7B

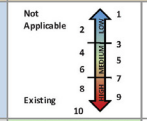
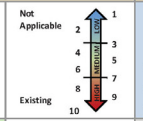
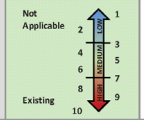
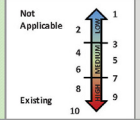
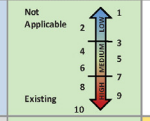
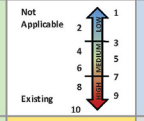
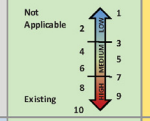
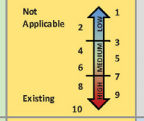
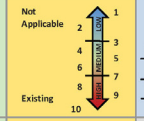
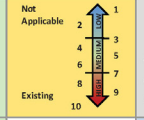
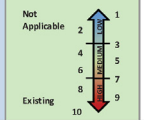
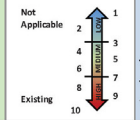
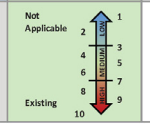
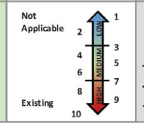
High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Corridor: Reviewer: Date:

Tier	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 1: Strategies to Reduce Person Trips or Vehicle Miles Traveled	1.01	***Congestion Pricing:*** *Congestion pricing can be implemented statically or dynamically. Static congestion pricing requires that tolls are higher during traditional peak periods. Dynamic congestion pricing allows toll rates to vary depending upon actual traffic conditions. The more congested the road, the higher the cost to travel on the road. Dynamic congestion pricing works best when coupled with real-time information on the availability of other routes.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Long Term
	1.02	***Alternative Work Hours:*** *There are three main variations: staggered hours, flex-time, and compressed work weeks. Staggered hours require employees in different work groups to start at different times to spread out their arrival/departure times. Flex-time allows employees to arrive and leave outside of the traditional commute period. Compressed work weeks involve reducing the number of days per week worked while increasing the number of hours worked per day.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.03	***Telecommuting:*** *Telecommuting policies allow employees to work at home or a regional telecommute center instead of going into the office, all the time or only one or more days per week.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.04	***Emergency Ride Home Programs:*** *These programs provide a safety net to those people who carpool or use transit to work so that they can get to their destination if unexpected work demands or an emergency arises.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.05	***Alternative Mode Marketing and Education:*** *Providing education on alternative modes of transportation can be an effective way of increasing demand for alternative modes. This strategy can include mapping websites that compute directions and travel times for multiple modes of travel.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.06	***Safe Routes to Schools Program:*** *This federally-funded program provides 100 percent funding to communities to invest in pedestrian and bicycle infrastructure surrounding schools.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.07	***Preferential for Free Parking for HOVs:*** *This program provides an incentive for employees to carpool with preferred of free-of-charge parking for HOVs.*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.08	***Negotiated Demand Management Agreements:*** *As a condition of development approval, local governments require the private sector to contribute to traffic mitigation agreements. The agreements typically set a traffic reduction goal (often expressed as a minimum level of ridesharing participation or a stipulated reduction in the number of automobile trips).*	Not Applicable / Existing	Not Applicable / Existing	☐ Yes ☐ No Comments:	✓		Short term/Long Term

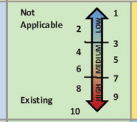
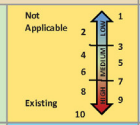
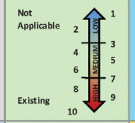
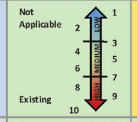
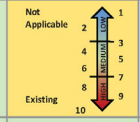
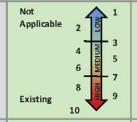
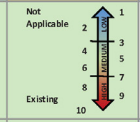
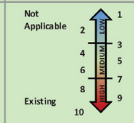
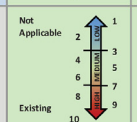
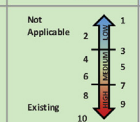
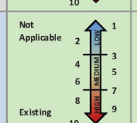
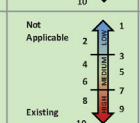
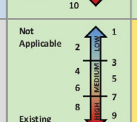
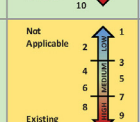
Appendix 7B

High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Tier	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 1: Strategies to Reduce Person Trips or Vehicle Miles Traveled	1.09	***Trip Reduction Ordinance:*** *These ordinances use a locality's regulatory authority to limit trip generation from a development. They spread the burden of reducing trip generation among existing and future developments better than Negotiated Demand Management Agreements.*			☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.10	***Infill developments:*** *This strategy takes advantage of infrastructure that already exists, rather than building new infrastructure on the fringes of the urban area.*			☐ Yes ☐ No Comments:	✓		Short term
	1.11	***Design Guidelines for Pedestrian-Oriented Development:*** *Maximum block lengths, building setback restrictions, and streetscape enhancements are examples of design guidelines that can be codified in zoning ordinances to encourage pedestrian activity.*			☐ Yes ☐ No Comments:	✓		Short term/Long Term
	1.12	***Mixed-Use Development:*** *This strategy allows many trips to be made without automobiles. People can walk to restaurants and services rather than use their vehicles.*			☐ Yes ☐ No Comments:	✓		Short term/Long Term
Tier 2: Strategies to Shift Automobile Trips to Other Modes	2.01	***Transit Capacity Expansion:*** *This strategy adds new vehicles to expand transit services.*			☐ Yes ☐ No Comments:		✓	Short term/Long Term
	2.02	***Increasing Bus Route Coverage or Frequencies:*** *This strategy provides better accessibility to transit to a greater share of the population. Increasing frequency makes transit more attractive to use.*			☐ Yes ☐ No Comments:		✓	Short term/Long Term
	2.03	***Implementing Premium Transit:*** *Premium transit such as Bus Rapid Transit (BRT) best serves dense urban centers where travelers can walk to their destinations. Premium transit from suburban areas can sometimes be enhanced by providing park-and-ride lots.*			☐ Yes ☐ No Comments:		✓	Long Term
	2.04	***Providing Real-Time Information on Transit Routes:*** *Providing real-time information on bus progress either at bus stops, terminals, and/or personal wireless devices makes bus travel more attractive.*			☐ Yes ☐ No Comments:		✓	Short term/Long Term

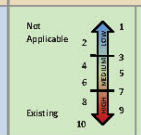
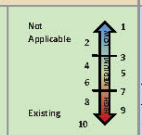
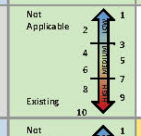
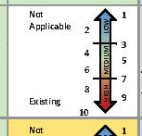
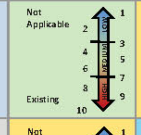
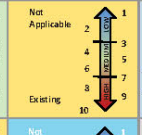
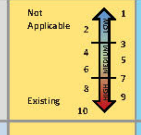
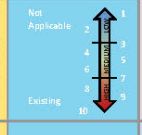
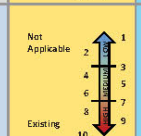
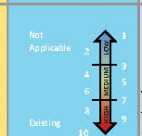
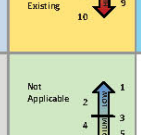
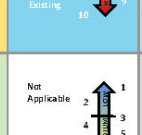
Appendix 7B

High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Level	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 2: Strategies to Shift Automobile Trips to Other Modes	2.05	***Reducing Transit Fares:*** *This relatively easy-to-implement strategy encourages additional transit use, to the extent that high fares are a real barrier to transit. However, due to the direct financial impact on the transit system operating budgets, reductions in selected fare categories may be a more feasible strategy to implement.*			☐ Yes ☐ No Comments:	✓		Short Term
	2.06	***Provide Exclusive Bus Right-Of-Way:*** *Exclusive right-of-way includes bus ways, bus-only lanes, and bus bypass ramps. This strategy is applied to freeways and major highways that have routes with high ridership.*			☐ Yes ☐ No Comments:	✓		Long Term
	2.07	***New Sidewalk Connections:*** *Increasing sidewalk connectivity encourages pedestrian traffic for short trips.*			☐ Yes ☐ No Comments:	✓		Short Term/Long Term
	2.08	***Designated Bicycle Lanes on Facilities or Routes:*** *Enhancing the visibility of bicycle facilities increases the perception of safety. In many cases, bicycle lanes can be added to existing roadways through restriping.*			☐ Yes ☐ No Comments:	✓		Short Term/Long Term
	2.09	***Improved Bicycle Facilities at Transit Stations and Other Trip Destinations:*** *Bicycle racks and bicycle lockers at transit stations and other trip destinations increase security. Additional amenities such as locker rooms with showers at workplaces provide further incentives for using bicycles.*			☐ Yes ☐ No Comments:	✓		Short Term
	2.10	***Improved Safety of Existing Bicycle and Pedestrian Facilities:*** *Maintaining lighting, signage, striping, traffic control devices, and pavement quality and installing curb cuts, curb extensions, median refuges, and raised crosswalks can increase bicycle and pedestrian safety.*			☐ Yes ☐ No Comments:	✓		Short Term
	2.11	***Exclusive Non-Motorized ROW:*** *Abandoned rail rights-of-way and existing parkland can be used for medium- to long-distance bicycle trails, improving safety and reducing travel times.*			☐ Yes ☐ No Comments:	✓		Long Term
	2.12	***Intermodal Enhancements:*** *Coordinating modes makes movement from one mode to the other easier. These enhancements typically includes schedule modification to reduce layover time or increase the opportunity for transfers, creation of multi-modal facilities, informational kiosks, and improved amenities at transfer locations.*			☐ Yes ☐ No Comments:	✓		Short Term/Long Term

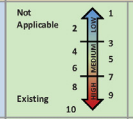
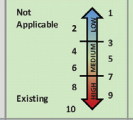
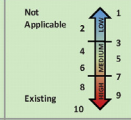
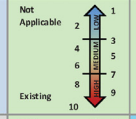
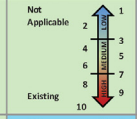
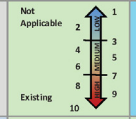
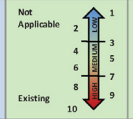
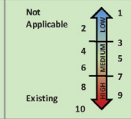
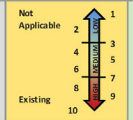
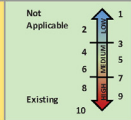
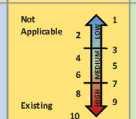
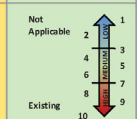
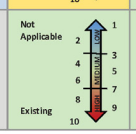
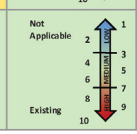
Appendix 7B

High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Level	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 3: Strategies to Increase Vehicle Occupancy	3.01	***Ridesharing (Carpools & Vanpools):*** *In ridesharing programs, participants are matched with potential candidates for sharing rides. This is typically arranged/encouraged through employers or transportation management agencies, which provide ride-matching services. These programs are more effective if combined with HOV lanes, parking management, guaranteed ride home policies, and employer-based incentive programs.*			☐ Yes ☐ No Comments:	✓		Long term
	3.02	***High Occupancy Vehicle Lanes:*** *This increases corridor capacity while at the same time providing an incentive for single-occupant drivers to shift to ridesharing. These lanes are most effective as part of a comprehensive effort to encourage HOVs, including publicity, outreach, park-and-ride lots, rideshare matching services, and employer incentives.*			☐ Yes ☐ No Comments:	✓		Short Term/ Long Term
	3.03	***Park-and-Ride Lots:*** *These lots can be used in conjunction with HOV lanes and/or express bus services. They are particularly helpful when coupled with other commute alternatives such as carpool/vanpool programs, transit, and/or HOV lanes.*			☐ Yes ☐ No Comments:	✓		Short Term/ Long Term
	3.04	***Employer-Landlord Parking Agreements:*** *Employers can negotiate leases so that they pay only for parking spaces used by employees. In turn, employers can pass along parking savings by purchasing transit passes or reimbursing non-driving employees with the cash equivalent of a parking space.*			☐ Yes ☐ No Comments:	✓		Short Term/ Long Term
	3.05	***Parking Management:*** *This strategy reduces the instance of free parking to encourage other modes of transportation. Options include reducing the minimum number of parking spaces required per development, increasing the share of parking spaces for HOVs, introducing or raising parking fees, providing cash-out options for employees not using subsidized parking spaces, and expanding parking at transit stations or park-and-ride lots.*			☐ Yes ☐ No Comments:	✓		Short Term/ Long Term
	3.06	***Managed Lanes:*** *The Federal Highway Administration (FHWA) defines managed lanes as highway facilities or a set of lanes in which operational strategies are implemented and managed (in real time) in response to changing conditions. Examples of managed lanes may include the following: high-occupancy toll (HOT) lanes with tolls that vary based on demand; exclusive bus-only lanes; HOV and clean air and/or energy-efficient vehicle lanes; and HOV lanes that could be changed into HOT lanes in response to changing levels of traffic and roadway conditions.*			☐ Yes ☐ No Comments:	✓		Long Term

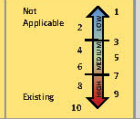
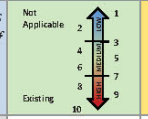
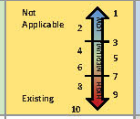
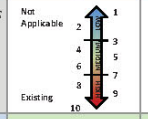
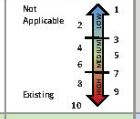
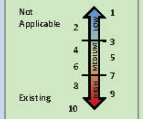
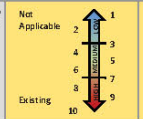
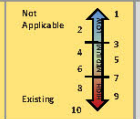
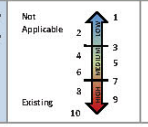
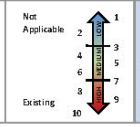
Appendix 7B

High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Level	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 4: Strategies to Improve Roadway Operations	4.01	***Dynamic Messaging:*** *Dynamic messaging uses changeable message signs to warn motorists of downstream queues; it provides travel time estimates, alternate route information, and information on special events, weather, or accidents.*			☐ Yes ☐ No Comments:		✓	Short Term/ Long Term
	4.02	***Advanced Traveler Information Systems (ATIS):*** *ATIS provide an extensive amount of data to travelers, such as real-time speed estimates on the web or over wireless devices and transit vehicle schedule progress. It also provides information on alternative route options.*			☐ Yes ☐ No Comments:		✓	Short Term/ Long Term
	4.03	***Integrated Corridor Management (ICM):*** *This strategy, built on an ITS platform, provides for the coordination of the individual network operations between parallel facilities creating an interconnected system. A coordinated effort between networks along a corridor can effectively manage the total capacity in a way that will result in reduced congestion.*			☐ Yes ☐ No Comments:		✓	Short Term/ Long Term
	4.04	***Transit Signal Priority (TSP):*** *This strategy uses technology located onboard transit vehicles or at signalized intersections to temporarily extend green time, allowing the transit vehicle to proceed without stopping at a red light.*			☐ Yes ☐ No Comments:		✓	Short Term
	4.05	***Traffic Signal Coordination:*** *Signals can be pre-timed and isolated, pre-timed and synchronized, actuated by events (such as the arrival of a vehicle, pedestrian, bus or emergency vehicle), set to adopt one of several pre-defined phasing plans based on current traffic conditions, or set to calculate an optimal phasing plan based on current conditions.*			☐ Yes ☐ No Comments:		✓	Short Term
	4.06	***Channelization:*** *This strategy is used to optimize the flow of traffic for making left or right turns usually using concrete islands or pavement markings.*			☐ Yes ☐ No Comments:		✓	Short Term/ Long Term
	4.07	***Intersection Improvements:*** *Intersections can be widened and lanes restriped to increase intersection capacity and safety. This may include auxiliary turn lanes (right or left) and widened shoulders.*			☐ Yes ☐ No Comments:		✓	Short Term/ Long Term
	4.08	***Bottleneck Removal:*** *This strategy removes or corrects short, isolated, and temporary lane reductions, substandard design elements, and other physical limitations that form a capacity constraint that results in a traffic bottleneck.*			☐ Yes ☐ No Comments:		✓	Short Term/ Long Term

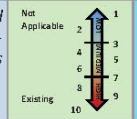
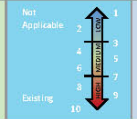
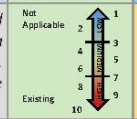
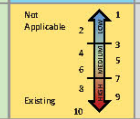
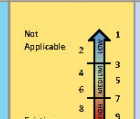
Appendix 7B

High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Level	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 4: Strategies to Improve Roadway Operations	4.09	***Vehicle Use Limitations and Restrictions:*** *This strategy includes all-day or selected time-of-day restrictions of vehicles, typically trucks, to increase roadway capacity.*			☐ Yes ☐ No Comments:		✓	Long Term
	4.10	***Improved Signage:*** *Improving or removing signage to clearly communicate location and direction information can improve traffic flow.*			☐ Yes ☐ No Comments:		✓	Short Term
	4.11	***Geometric Improvements for Transit:*** *This strategy includes providing for transit stop locations that do not affect the flow of traffic, improve sight lines, and improve merging and diverging of buses and cars.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term
	4.12	***Goods Movement Management:*** *This strategy restricts delivery or pickup of goods in certain areas to reduce congestion.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term
	4.13	***Freeway Incident Detection and Management Systems:*** *This strategy addresses primarily non-recurring congestion, typically includes video monitoring and dispatch systems, and may also include roving service patrol vehicles.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term
	4.14	***Access Management Policies:*** *This strategy includes adoption of policies to regulate driveways and limit curb cuts and/or policies that require continuity of sidewalk, bicycle, and trail networks.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term
	4.15	***Corridor Preservation:*** *This strategy includes implementing, where applicable, land acquisition techniques such as full title purchases of future rights-of-way and purchase of easements to plan proactively in anticipation of future roadway capacity demands.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term

Appendix 7B

High Potential Effectiveness
Moderate Potential Effectiveness
Low Potential Effectiveness
Corridor Dependent

Level	Strategy #	Congestion Mitigation Strategy*	Level of Potential Development: Transit Corridor	Level of Potential Development: Non-Transit Corridor	Recommendations/Comments	Demand Improvements	Operational Improvements	Short Term/ Long Term
Tier 4: Strategies to Improve Roadway Operations	4.16	***Corridor Management:*** *This strategy is applicable primarily in moderate- to high-density areas and includes strategies to manage corridor rights-of-way. The strategies range from land-use regulations to landowner agreements such as subdivision reservations, which are mandatory dedications of portions of subdivided lots that lie in the future right-of-way.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term
	4.17	***Complete Streets:*** *Routinely design and operate the entire right of way to enable safe access for all users including pedestrians, bicyclists, motorists, and transit Element that may be found on a complete street include sidewalks, bike lanes (or wide paved shoulders), special bus lanes, comfortable and accessible transit stops, frequent crossing opportunities, median islands, accessible pedestrian signals, curb extensions, and more.*			☐ Yes ☐ No Comments:		✓	Short Term/Long Term
Tier 5: Strategies to Add Capacity	5.01	***Add General Purpose Travel Lanes:*** *Increase the capacity of congested roadways through additional general purpose travel lanes.*			☐ Yes ☐ No Comments:		✓	Long Term

Appendix C: CMP Safety Solutions Matrix

Appendix 7C

Safety Mitigation Matrix

Corridor_____ From_____ To_____ Analyst_____ Date_____

Related Crash Types	Countermeasure Type	SHSP Aggressive Driving	SHSP At Intersection	SHSP Lane Departure	SHSP Vulnerable User	Frequency of Crash Type in Corridor (Circle One)	Common Mitigation	Recommended Follow-up
Angle and left turn crashes occurring at stopped controlled intersections.	Engineering	●	●	●	●	N/A, LOW, MED, HIGH	Provide advance warning sign on approach to intersection. Double up on traffic control signs. Provide warning flashers. Evaluate for possible signalization.	
Angle and left turn crashes occurring away from signalized intersections or divided highways.		●	●		●	N/A, LOW, MED, HIGH	Channelize to prohibit a specific movement. Close median to prohibit all movements.	
Left turn crashes occurring at signalized intersections		●	●		●	N/A, LOW, MED, HIGH	Install of protected left turn phasing at signalized intersections. Consider protected only left turn phasing.	
Rear end and angle crashes at signalized intersections along east west corridors.			●			N/A, LOW, MED, HIGH	Install back plates or high visibility back plates on signalized intersections to increase signal head conspicuity (particularly along east-west corridors).	
Rear end crashes with injuries.		●	●			N/A, LOW, MED, HIGH	Provide advance signal warning sign at signalized intersections. Provide advance street name signs. Increase speed enforcement. Evaluate pavement friction.	
Crashes that occur during nighttime hours.		●	●		●	N/A, LOW, MED, HIGH	Provide street lighting to increase road visibility at nighttime.	
Crashes that occur during slippery or wet conditions.		●	●	●	●	N/A, LOW, MED, HIGH	Improve pavement friction through resurfacing or high-friction overlays.	
Crashes that involve a heavy truck vehicle type.			●			N/A, LOW, MED, HIGH	Provide adequate clearance for heavy truck's reduced stopping distance at signals or provide dilemma zone detection at signals. Provide passing lanes, and acceleration / deceleration lanes. Increase turn radius.	
Crashes that involve a u-turning vehicle.		●	●			N/A, LOW, MED, HIGH	Prohibit U-turns at signalized intersection where there are conflicts with channelized right turns. Prohibit U-turns along corridors where sight distance is inadequate or there are conflicts.	
Crashes that involve left turning vehicles.			●	●	●	N/A, LOW, MED, HIGH	Provide turn lanes, increase left turn storage, provide positive offset.	
Crashes that involve right turning vehicles.			●	●	●	N/A, LOW, MED, HIGH	Provide turn lanes, prohibit right turn on red, provide receiving lane for channelized right turn.	
Crashes that occur at intersections that involve parked cars.			●		●	N/A, LOW, MED, HIGH	Prohibit parking near major intersections to increase driver/pedestrian visibility.	
Crashes that involve pedestrians.			●		●	N/A, LOW, MED, HIGH	Provide countdown heads for signalized intersections, refuge islands for unsignalized crossings, sidewalks along roadways, consolidate driveways to decrease vehicle/pedestrian conflict points.	
Crashes that involve bicyclists.			●		●	N/A, LOW, MED, HIGH	Provide countdown heads for signalized intersections, refuge islands for unsignalized crossings, bike lanes along roadways, consolidate driveways to decrease vehicle/bicyclist conflict points.	
Crashes that involve motorcycles.			●	●	●	N/A, LOW, MED, HIGH	Evaluate pavement friction. Evaluate shoulders to ensure proper drainage. Increase speed enforcement	
Crashes that occur at driveways away from signalized intersections.		●		●	●	N/A, LOW, MED, HIGH	Consolidate driveways to decrease vehicular conflict points. Provide raised medians.	
Crashes that involve vehicles leaving the roadway and include single vehicle collisions with fixed objects.		●		●		N/A, LOW, MED, HIGH	Provide guardrail. Provide delineation along the curve and inverted profile pavement markings (or RPMs). Provide advance warning sign on approach to turns, particularly along rural roadways.	
Crashes that occurred along a curved section of roadway.		●		●	●	N/A, LOW, MED, HIGH	Provide advance warning sign on approach to turns, particularly along rural roadways. Enhance signage. Provide solar flashing beacons on signs.	
Crashes where drugs and/or alcohol was involved.	Enforcement	●	●	●		N/A, LOW, MED, HIGH	Increase DUI enforcement.	
Crashes that cite disregard of traffic control as a contributing cause.		●	●	●	●	N/A, LOW, MED, HIGH	Increase red light running enforcement.	
Crashes that involve a speeding vehicle (cited by officer)		●	●	●	●	N/A, LOW, MED, HIGH	Increase speed enforcement. Install post mounted speed feedback signs.	

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