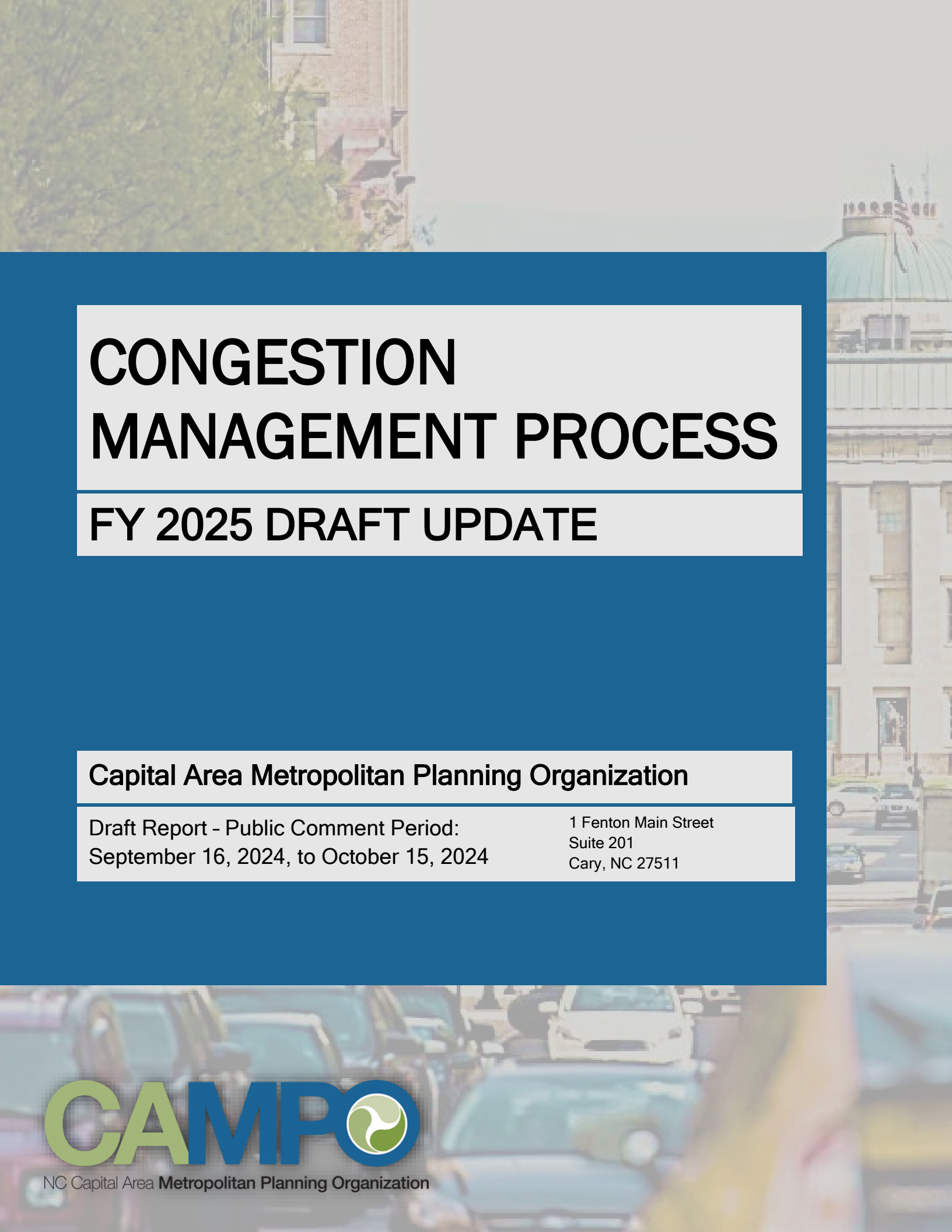


CONGESTION MANAGEMENT PROCESS

FY 2025 DRAFT UPDATE

Capital Area Metropolitan Planning Organization

1 Fenton Main Street
Suite 201
Cary, NC 27511

Draft Report – Public Comment Period:
September 16, 2024, to October 15, 2024

CAMPO
NC Capital Area Metropolitan Planning Organization

Table of Contents

Introduction

1.0 What is congestion and how does it impact our region?

Transportation congestion occurs in a particular time and place when there are more people wanting to use a transportation facility than it can handle at one time, resulting in slower travel speeds and a decline in service quality. If use of the transportation network was evenly distributed throughout either the time of day, class of facility, or transportation mode, then congestion would not exist. Within the CAMPO planning region, this is most experienced by private vehicles on our streets and highways, but it can also affect bike lanes, sidewalks, public transportation, and even airports.

While it is important to develop performance measures to track the impact of congestion, and develop strategies to mitigate and manage those impacts, we must keep in mind that congestion does not always create a negative impact. Congestion is, by its nature an indicator of a strong economy and a vibrant and dynamic community. Furthermore, an increase in congestion can slow traffic, positively impacting the safety of bicyclists and pedestrians. Congestion can also incentivize community adaptation resulting in increased infill development, the development of location efficient land uses, and a shift in transportation mode away from the single occupancy vehicle (SOV).

According to the Urban Mobility Report, produced by the Texas A&M Transportation Institute ("the institute"), the amount of annual delay per commuter has nearly doubled in 30 years from 20 hours annually in 1992 to 37 hours in 2022 (with 40 hours of commuter delay in pre-pandemic 2019) within the Raleigh Urbanized Area (UZA). Transportation congestion for our travelers using the roadway network exists in part, because over the last thirty years our state's construction of lane miles has not kept pace with the increase in population, number of drivers, number of vehicles, and annual vehicle miles traveled. Put simply, supply has not kept up with demand. This relationship is best communicated in Figure 1[1],[2] as seen below:

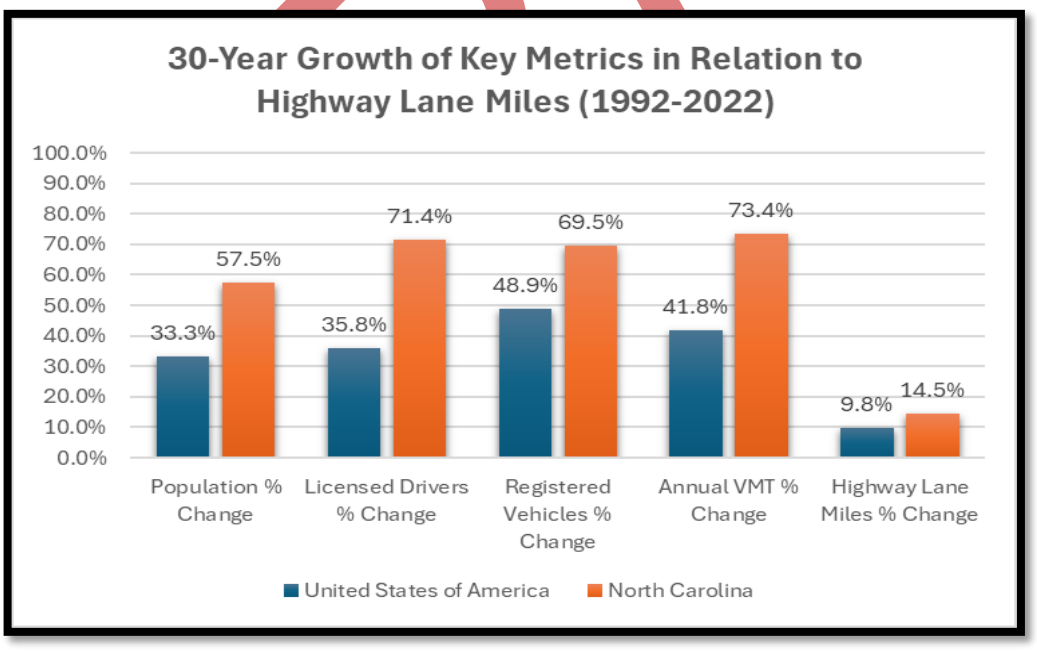


Figure 1: 30-Year Growth of Key Metrics in Relation to Highway Lane Mile (1992-2022)

The disproportional population explosion in the Raleigh UZA played a major role in North Carolina's population growth over the last 30 years (57.5% growth). The

[1] Annual Vehicle Miles Traveled (VMT) and Highway Lane Miles based upon lane miles for all functional classes except "local" (Rural - Interstate, Other Principal Arterial, Minor Arterial, Major Collector, Minor Collector; Urban - Interstate, Other Freeways & Expressways, Other Principal Arterial, Minor Arterial, Collector)

[2] Population Data provided by the 1990 and 2020 decennial US Census (US Census Bureau). Licensed Drivers, Registered Vehicles, Annual VMT, & Highway Lane Miles provided by the USDOT FHWA's Policy and Government Affairs Office of Highway Policy Information

population of Wake County in 1990 was 423,380. The population of CAMPO in 2020 was 1,357,017, which constitutes a percent change for the CAMPO planning region of at least 220.6%. As seen in Figure 1, there is a direct positive correlation between population growth and annual VMT growth. Therefore, attempting to program funds with the goal of highway lane miles for the CAMPO planning region keeping pace with the growth of annual vehicle miles traveled (VMT) was and continues to be financially and pragmatically unrealistic. Furthermore, an increase to lane miles would result, through induced demand, in an increase of VMT, and would perpetuate a continuous need to increase lane miles as VMT increased.

1.1 What is a Congestion Management Process (CMP)?

CAMPO, through various planning efforts, developed data-driven and achievable CMP objectives to mitigate and adapt to the effects of congestion in our region. These CMP objectives help to organize various multi-modal CMP performance measures and a series of recommended demand management, traffic operations, public transportation, and network capacity CMP strategies. Development of these objectives, performance measures and strategies are part of the federally mandated CMP, a process for Metropolitan Planning Organizations (MPO) designated as Transportation Management Areas[3] (TMA).

This policy started as part of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and evolved into the Congestion Management Process (CMP)[4], as part of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The CMP, adopted by the MPO's Transportation Advisory Committee (referred to by CAMPO, and for the remainder of this report as the Executive Board), is a systematic approach to managing congestion across modes. The CMP provides a current and reliable reporting transportation system to assess feasible congestion management strategies that meet local and regional needs. According to the Code of Federal Regulations (23 CFR §450.322),

> "Consideration should be given to strategies that manage demand, reduce single occupant vehicle (SOV) travel, improve transportation system management and operations, and improve efficient service integration within and across modes, including highway, transit, passenger and freight rail operations, and non-motorized transport."

In section "e" of 23 CFR §450.322, the CMP gives specific instructions for those MPO's designated as a "non-attainment area for ozone or carbon monoxide pursuant to the Clean Air Act". While CAMPO is qualified as under attainment, it performs its planning tasks under this guidance to maintain staff expertise, capacity, and a commitment to environmental transparency. CAMPO's Executive Board adopted the previous update to the CMP in June of 2010. Since then, CAMPO has achieved the requirements laid out for the CMP in the aggregate of its many and varied multi-modal planning efforts. Notable examples include CAMPO's most recent MTP, Connect 2050; the Wake County Transit Plan Update (2021); the Commuter Corridor Study (2019); and the Triangle Region ITS Strategic Deployment Plan Update (2020)[5]. This CMP update looks to present the work done in these numerous plans and studies through the lens of the CMP. The development of this CMP update will function to then inform future planning efforts, notably CAMPO's Transportation Improvement Program (TIP) and the 2055 MTP

[3] USDOT's website states, "An urbanized area with a population over 200,000, as defined by the Bureau of the Census and designated by the Secretary of the U.S. Department of Transportation (DOT), is called a Transportation Management Area (TMA). As described in 49 U.S.C. 5303(k), and in recognition of the greater complexity of transportation issues in large urban areas, an MPO in a TMA has a stronger voice in setting priorities for implementing projects listed in the transportation improvement program and are responsible for additional planning products. The planning processes in MPOs in TMAs also must be certified by the Secretary of DOT as being in compliance with federal requirements."

[4] The Code of Federal Regulations that dictates the governance of the Federal Highway Administration (FHWA) mandates the creation and maintenance of a Congestion Management Process through 23 CFR §450.322.

[5] Other relevant planning efforts can be found in CAMPO's Program and Studies - Interactive Map (https://camponc.maps.arcgis.com/apps/instant/portfolio/index.html?appid=482d454352b14bfdaa23b89539de1f11)

(Destination 2055).

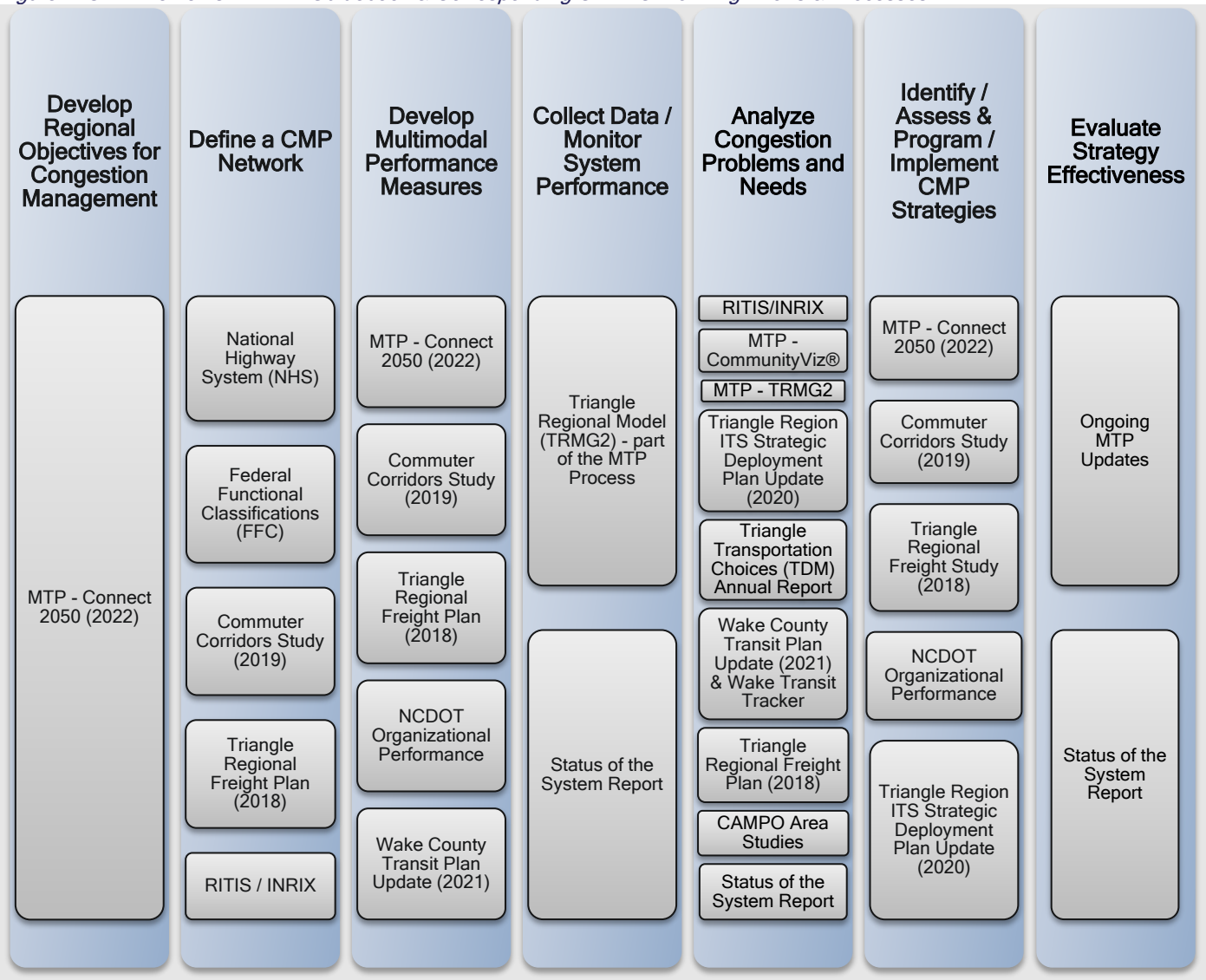
1.2 What are the elements of the Congestion Management Process?

The CMP is an iterative report with future iterations based upon future MTP development cycles. During this planning exercise, the CMP undergoes a comprehensive review to improve efficiency, incorporate new data sources, and refine strategies. While not a prescriptive process in the relevant CFR, the sections recommended by the Federal Highway Administration (FHWA) are as follows:

1. Develop Regional Objectives for Congestion Management
2. Define a CMP Network
3. Develop Multimodal Performance Measures
4. Collect Data / Monitor System Performance
5. Analyze Congestion Problems and Needs
6. Identify and Assess CMP Strategies
7. Program and Implement CMP Strategies
8. Evaluate Strategy Effectiveness

CAMPO's comprehensive planning effort covers these eight required CMP elements. Figure 2 makes a formal connection between the CMP elements and their corresponding CAMPO planning process steps. The remainder of this report will give a detailed account of this planning work through the lens of the eight CMP elements and recommended iterative improvements to the process for future updates.

Figure 2: CMP Elements - FHWA Guidebook & Corresponding CAMPO Planning Efforts & Processes



CMP Objectives

2.0 Develop Regional CMP Objectives

When developing CAMPO's CMP objectives, consideration was given to the CFR that requires, as described in the introduction, the development of a CMP that considers among other elements "strategies manage demand, reduce SOV travel [...]", etc.

Given these recommendations by FHWA, when compiling appropriate CMP objectives, the goals, objectives, performance measures, and strategies were considered from a series of CAMPO's most recent plans and studies. These plans and studies included Connect 2050, the Commuter Corridor Study, the Wake County Transit Plan Update, the Triangle Regional Freight Plan, and the Triangle Regional ITS Strategic Deployment Plan Update. Once compiled, a synthesis resulted in the following holistic objectives:

- Objective 1: Improve Travel Time Reliability and Efficiency
- Objective 2: Enhance Public Transit Services and Infrastructure
- Objective 3: Enhance Safety and Operational Performance
- Objective 4: Promote the Development of a Sustainable, Health-Oriented, and Multimodal Transportation Network
- Objective 5: Enhance Traveler Information and Demand Management

CMP Network

3.0 How was the CMP Network Determined?

The CAMPO CMP Network was determined by combining corridors of significance that have either been deemed significant by FHWA or studied and deemed significant by the CAMPO Executive Board. Corridors from FHWA's National Highway System (NHS) and the Federal Functional Classification's (FFC) first three classifications (Interstate; Principal Arterial – Other Freeways and Expressways; Principal Arterial – Other) are combined with the region's most congested (those within the 95th percentile) bottlenecks, as determined by analyzing INRIX data from the Regional Integrated Transportation Information System (RITIS), to form CAMPO's CMP network. Furthermore, the significance of these specific corridors is further bolstered by results of CAMPO's Commuter Corridor Study (2019), and the Triangle Regional Freight Plan (2018) as seen in Figure 4.

The routes featured in the NHS, being federally recognized and used as the primary network for determining federally required performance measures can be incorporated into the CMP network without further scrutiny. Likewise, the FFC System of North Carolina is an FHWA required process managed by the NCDOT's Transportation Planning Division (TPD).

When analyzing the INRIX data from RITIS, data from the entirety of 2022 was extracted to (1) mirror the data featured in the document's introduction, and (2) attempt to minimize any impact on the data from the COVID-19 pandemic. We considered the corridors that fell into the 95th percentile of "total delay"[6] so that those corridors with truly significant impact to the traveler would be featured, even if they did not feature in the NHS or FFC. By listing whether (and by how much) the bottleneck corridors feature in the greater CMP network, CAMPO staff and stakeholders can begin to understand how much of the most significant corridors in CAMPOs planning area are impacted by the most significant bottlenecks.

The CAMPO Commuter Corridor Study (2019) and the Triangle Regional Freight Plan (2018) both include relevant information for the development of CAMPO's CMP. The Commuter Corridor Study explored, using performance indicators such as travel time and buffer indices, the severity and underlying causes of traffic congestion along the region's major commuter corridors. The study then posited the impact on congestion of six different land-use development scenarios and developed transportation planning recommendations to manage the growing congestion based on a mirrored cost-benefit analysis for each scenario. Figure 4 shows that a vast majority of the NHS, FFC, and significant bottlenecked routes were recently studied in the Commuter Corridor Study. The implication, being that CAMPO's CMP is significantly supported by the work and results laid out in the Commuter Corridor Study.

In 2018, CAMPO partnered with several regional funding and planning organizations to complete the Triangle Regional Freight Plan. This plan considered a wide range of variables when developing its "Strategic Freight Corridors" map including current and modeled freight volume, corresponding environmental justice data, truck related crashes, and even relative access to Raleigh-Durham

[6]The RITIS definition of "Total Delay" is "Base impact weighted by the difference between free-flow travel time and observed travel time multiplied by the average daily volume (AADT), adjusted by a day-of-the-week factor. This metric should be used to rank and compare the estimated total delay from all vehicles within the bottleneck."

International Airport. While all this information is relevant to the CMP, in developing the CMP network, CAMPO staff referred specifically to the AM Peak, Mid-day, and PM Peak Hour Buffer Time Index for Trucks.

Below, please refer to Figure 3 and 4, which display graphically and in tabular form respectively, the compilation of these data sources from the NHS, FFC, RITIS, the Commuter Corridor Study (2019), and the Triangle Regional Freight Study (2018). This CMP network as displayed allows CAMPO to gather data, track performance measures and develop management strategies in a way that optimizes our partnerships with local, state, and federal stakeholders.

3.1 CMP Network Map and Table

Figure 3: Figure 3.0: CMP Network Map

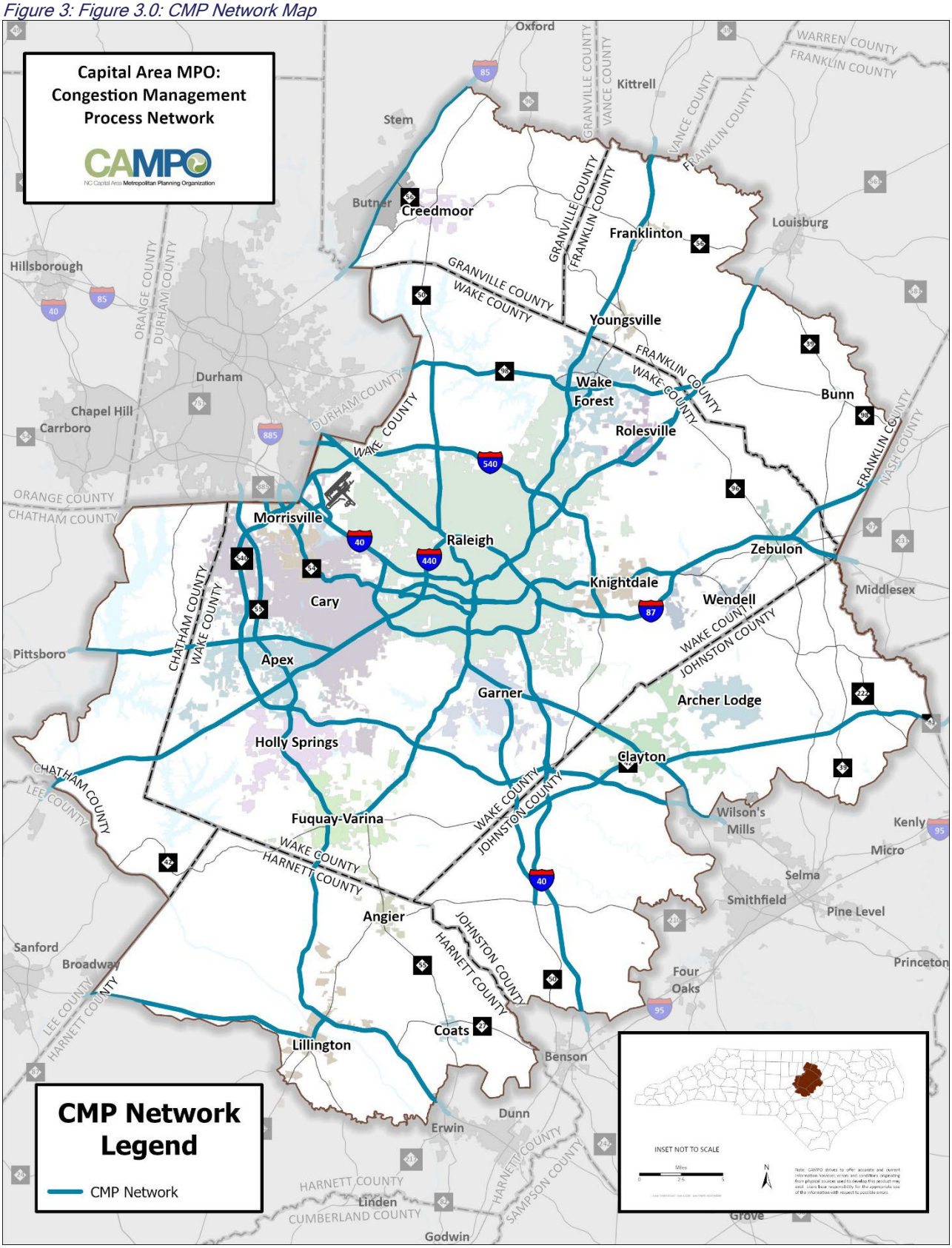


Figure 4: CMP Network Table

Route	Segment	NHS	FFC[7]	INRIX (95th Percentile)	Commuter Corridor Study	Triangle Freight Plan
I-40	Durham County Boundary (CAMPO Boundary) to Woodall Dairy Road (CAMPO Boundary)	Yes	Yes	Yes	Yes	Yes[8]
I-85	Tar River (CAMPO Boundary) to Falls Lake (CAMPO Boundary)	Yes	Yes	No	No	No
I-87	I-440 to US 64	Yes	Yes	Yes[9]	Yes	No
I-440	US 1 to I-40	Yes	Yes	Yes	Yes	Yes
I-540	I-87 to I-40	Yes	Yes	Yes	Yes	Yes[10]
US 1	Tar River (CAMPO Boundary) to I-440; I-440 to Deep River (CAMPO Boundary)	Yes	Yes	Yes[11]	Yes	Yes[12]
US 1 Alt	US 1 to NC 98	No	No	Yes	Yes	No
US 64	Bryantown Road (CAMPO Boundary) to I-440; US 1 to Big Woods Road (CAMPO Boundary)	Yes[13]	Yes	Yes[14]	Yes	Yes[15]
US 64 Bus	I-440 to I-87	No	Yes	No	Yes	Yes[16]
US 70	Durham County Boundary (CAMPO Boundary) to I-40 (Auburn, NC); I-40 to Little Poplar Creek (CAMPO Boundary)	Yes	Yes	Yes[17]	Yes	Yes[18]
US 70 Bus	I-40 to US 70	No	Yes	No	Yes	Yes
US 264	US 64 to Moccasin Creek (CAMPO Boundary	Yes	Yes	No	No	No
US 401	Cedar Creek (CAMPO Boundary) to US 421 (Lillington, NC)	Yes	Yes	No	Yes	Yes
US 421	Lee County Boundary (CAMPO Boundary) to US 401; US 401 to Juniper Creek (CAMPO Boundary)	Yes	Yes	No	No	Yes[19]

[7] The CAMPO CMP's network employs the top three Federal Functional Classifications (FFC): Interstate; Principal Arterial – Other Freeways and Expressways; Principal Arterial - Other
[8] Durham County Boundary to NC 42
[9] I-87: I-540 to US 64
[10] I-540: US 1 to I-40
[11] US 1: US 1 Alt (Youngsville/Wake Forest) to US 401; I-40 to NC 540
[12] US 1: NC 56 to I-440; I-40 to NC 55
[13] US 64: Bryantown Road (CAMPO Boundary) to I-87; US 1 to Big Woods Road (CAMPO Boundary)
[14] US 64: Bryantown Road (CAMPO Boundary) to Lizard Lick Road; US 1 to NC 55
[15] US 64: I-87 to I-440; US 1 to Big Woods Road (CAMPO Boundary)
[16] US 64 Bus: I-440 to Old Knight Road
[17] US 70: I-440 to Lynn Road
[18] Durham County Boundary (CAMPO Boundary) to I-40 (Auburn, NC)
[19] US 421: US 401 to NC 27

NC 42	NC 50 to Hawley Road (CAMPO Boundary)[20]	No	No	Yes	No	Yes
NC 50	US 70 (Raleigh, NC) to NC98	Yes	No	Yes[21]	Yes	Yes
NC 50	US 70 (Garner, NC) to NC 210	No	No	Yes	Yes	Yes[22]
NC 54	Durham County Border (CAMPO Boundary) to I-440	Yes	Yes[23]	No	Yes	Yes
NC 55	Durham County Border (CAMPO Boundary) to US 401	Yes	Yes	Yes[24]	Yes[25]	Yes
NC 98	Durham County Boundary (CAMPO Boundary) to US 401	Yes	Yes	No	Yes	No
NC 540	I-40 to I-40	Yes	Yes	No	Yes[27]	Yes[28]
NC 885	Durham County Border (CAMPO Boundary) to NC 540	Yes	Yes	No	No	No
SR-2911 New Bern Avenue	South Person Street to I-440	Yes	Yes	No	No	No
SR-1012 Western Blvd	Hillsborough Street to US 70	No	Yes	No	No	No
SR-3015 Airport Blvd	NC 54 to I-40 to SR-1002 (Aviation Pkwy)	Yes	No	No	No	Yes
SR-3097 (Aviation Pkwy)	SR-3015 (Airport Blvd) / SR-1002 (Aviation Pkwy) to I-540	Yes	Yes	No	No	No
SR-1002 Aviation Pkwy	I-40 to SR-3015 (Airport Blvd)	No	Yes	No	No	Yes
SR-3067 (T W Alexander Drive)	Durham County Boundary (CAMPO Boundary) to US 70	Yes	Yes	No	No	Yes
SR 1728 (Wade Avenue)	I-40 to US 70	Yes	Yes	No	Yes[29]	Yes
Hillsborough Street/West Edenton Street	I-440 to North Dawson Street	Yes	No	Yes[30]	No	No
West Edenton	North Dawson Street to New Bern Avenue	Yes	Yes	No	No	No

[20] NC 42 from NC 50 to Buffalo Road is featured in the 95th Percentile of Bottlenecks in the INRIX data as well as the Triangle Regional Freight Plan. NC 42 from Buffalo Road, east to Hawley Road (CAMPO Boundary) was included in the CMP Network for the sake of network continuity.

[21] NC50: I-540 to NC 98

[22] NC50: US 70 to NC 42

[23] NC 54: Durham County Boundary (CAMPO Boundary) to Hillsborough Street

[24] NC 55: Jenks Road to South Salem Street; US 1 to NC 540

[25] NC 55: Durham County Boundary (CAMPO Boundary) to US 401; US 401 to Clayhole Road (CAMPO Boundary)

[26] NC 98 has a mix of methodological reasons for being included in the CMP Network based upon which specific segment of NC 98. From the Durham County boundary (CAMPO boundary) to Old Falls of Neuse Road, the facility is part of the NHS, but not part of the highest three FFC classifications. For the small segment from Old Falls of Neuse Road to US 1 the facility is applicable to both criteria. From US 1 to Jones Dairy Road the facility is part of the highest three FFC. Lastly, from Jones Dairy Road to US 401 the facility segment was included by CAMPO staff in the CMP Network for the sake of network continuity.

[27] NC 540: I-40 to NC 55

[28] NC 540: US 1 to NC 55

[29] Wade Avenue: I-40 to I-440

[30] Hillsborough Street: Oberlin Road to Faircloth Street

Street / East Edenton Street						
W Morgan Street	Hillsborough Street to North Dawson Street	Yes	No	No	No	No
West Morgan Street / East Morgan Street	North Dawson Street to South Person Street	Yes	Yes	No	No	No

CMP Performance Measures

4.0 How CAMPO developed its Multimodal CMP Performance Measures

The CMP Network is comprised, primarily of facilities within the National Highway System and the top three federal functional classes. This preference towards facilities within federal systems allows for greater ease when collecting and analyzing data to be measured against the CMP's 39 performance measures. The CMP's performance measures were derived from the following multi-modal plans and studies adopted by either the CAMPO Executive Board or the NCDOT Board of Transportation: Connect 2050; the Commuter Corridor Study (2019); the Triangle Regional Freight Plan (2018); NCDOT's performance measures for "Highway Reliability"; and the current Wake County Transit Plan (2021). The performance measures due to their multi-modal nature have been grouped in sections 4.1 through 4.5 by their respective primary multi-modal CMP objective.

While the CMP performance measures support the CMP objectives laid out in section 3, the CMP performance measures also support the MTP objectives to "Manage Congestion and System Reliability". Those objectives are:

1. Allow people and goods to move with minimal congestion and time delay, and with greater predictability.
2. Promote Travel Demand Management (TDM), such as carpooling, vanpooling and park-and-ride.
3. Enhance Intelligent Transportation Systems (ITS), such as ramp metering, dynamic signal phasing and vehicle detection systems.

In section 4.6, the CMP will show, represented in a Ven diagram, the ratio of CMP performance measures that support the above MTP objectives.

4.1 CMP Performance Measures that support CMP Objective 1 – Improve Travel Time Reliability and Efficiency

CMP Performance Measures with Targets or Trends	Origin of Performance Measure
Increase % of planned investment in existing roadways (versus new location)	Connect 2050 MTP (CAMPO 2022, Pg 21)
Interstate Level of Travel Time Reliability (LOTTR): 75% or Higher	Connect 2050 MTP (CAMPO 2022, Pg 21)
Non-Interstate National Highway System (NHS) LOTTR – 70%	Connect 2050 MTP (CAMPO 2022, Pg 21)
Interstate Truck Travel Time Reliability Index (TTI) – 1.7 or lower	Connect 2050 MTP (CAMPO 2022, Pg 22)

Monitor the results of freeway ramp metering projects	Commuter Corridors Study (CAMPO 2019, Pg 174)
Pavement conditions on key highway and arterial freight routes, e.g., International Roughness Index (IRI)	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Bridge and Tunnel conditions ratings	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Lane miles of streets with unacceptable pavement condition ratings by NCDOT	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Transportation Improvement Program (TIP) expenditures in MPO for roadway maintenance	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Increasing the percentage of acceptable travel time reliability on North Carolina Roadways in CAMPO planning area (Wake, Franklin, Granville, Harnett, & Johnston Counties) by reducing the time it takes to clear a major crash from a North Carolina highway to under 90 minutes.	NCDOT Organizational Performance

4.2 CMP Performance Measures that support CMP Objective 2 – Enhance Public Transit Services and Infrastructure

CMP Performance Measures with Targets or Trends	Origin of Performance Measure
Increase % of jobs within 1/4 mile of frequent bus transit service (15min) or 1/2 mile of fixed guideway stations (BRT/CRT)	Connect 2050 MTP (CAMPO 2022, Pg 21)
Increase % of work and non-work trips by transit that take less than 40 minutes by MPO, low-income, minority and zero-car households	Connect 2050 MTP (CAMPO 2022, Pg 21)
Increase % of transit and bicycle/pedestrian mode shares in "travel choice neighborhoods": areas accessible to light rail, bus rapid transit, commuter rail and frequent bus service (½ mile to stations, ¼ mile to frequent bus service)	Connect 2050 MTP (CAMPO 2022, Pg 21)
Increase total transit boardings per capita	Connect 2050 MTP (CAMPO 2022, Pg 21)
Increase to 23%, by 2030, the population of Wake County living within ¾ of a mile from the frequent transit network	Wake County Transit Plan (2021-2030)
Increase to 43%, by 2030, the jobs in Wake County situated within ¾ of a mile from the frequent transit network	Wake County Transit Plan (2021-2030)
Increase, by 2030, the frequent service network from 17 miles to 99 miles	Wake County Transit Plan (2021-2030)
Increase to 55%, by 2030, the population of Wake County living within ¾ of a mile from the all-day transit network	Wake County Transit Plan (2021-2030)
Increase to 81%, by 2030, the jobs in Wake County situated within ¾ of a mile from the all-day network	Wake County Transit Plan (2021-2030)

4.3 CMP Performance Measures that support CMP Objective 3 – Enhance Safety and Operational Performance

CMP Performance Measures with Targets or Trends	Origin of Performance Measure
Reduce Total fatalities rate (per 100 million vehicle miles traveled)	Connect 2050 MTP (CAMPO 2022, Pg 22)
Reduce Total serious injuries rate (per 100 million)	Connect 2050 MTP (CAMPO 2022, Pg 22)
Multimodal freight connectivity and redundancy. Projects can be evaluated for providing access on freight routes from/to locations with significant freight activities (e.g., businesses, warehouses, etc.,	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)

and clusters of these) both in terms of highway access as well as access to rail lines, terminals, ports and airports.	
Location of major generators near Interstate highways, four-lane highways, or intermodal terminal.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Number of truck-involved crashes, serious injury, and fatalities per million vehicle miles traveled (VMT).	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pag 66)
Rate of truck-involved crashes, serious injury, and fatalities per million VMT.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Location of truck-involved crashes, serious injury, and fatalities per million VMT	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Rate and number of crash incidents at rail grade crossings.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Average emergency response time for truck involved traffic incidents in minutes.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)
Use of ITS and innovative technologies to improve safety.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOT 2018, Pg 66)

4.4 CMP Performance Measures that support CMP Objective 4 – Promote the Development of a Sustainable, Health-Oriented, and Multimodal Transportation Network

CMP Performance Measures with Targets or Trends	Origin of Performance Measure
Increase MPO total programming per capita on bicycle and pedestrian facilities	Connect 2050 MTP (CAMPO 2022, Pg 21)
Increase % of jurisdictions with ordinance requirements for sidewalk construction or in-lieu fees	Connect 2050 MTP (CAMPO 2022, Pg 21)
Reduce % of work and non-work trips by auto that take less than 30 minutes by MPO, low-income, minority and zero-car households	Connect 2050 MTP (CAMPO 2022, Pg 21)
Reduce Vehicle miles of travel (VMT) per capita and total	Connect 2050 MTP (CAMPO 2022, Pg 21)
Reduce % of peak-hour travelers driving alone	Connect 2050 MTP (CAMPO 2022, Pg 21)
Reduce Emissions total and per capita from on-road mobile sources (ozone, carbon monoxide, particulate matter, greenhouse gases)	Connect 2050 MTP (CAMPO 2022, Pg 22)
Reduce Energy consumption total and per capita from transportation sources	Connect 2050 MTP (CAMPO 2022, Pg 22)
Use of ITS and innovative technologies to reduce emissions.	Triangle Regional Freight Plan (CAMPO / DCHC / NCDOTD 2018, Pg 66)

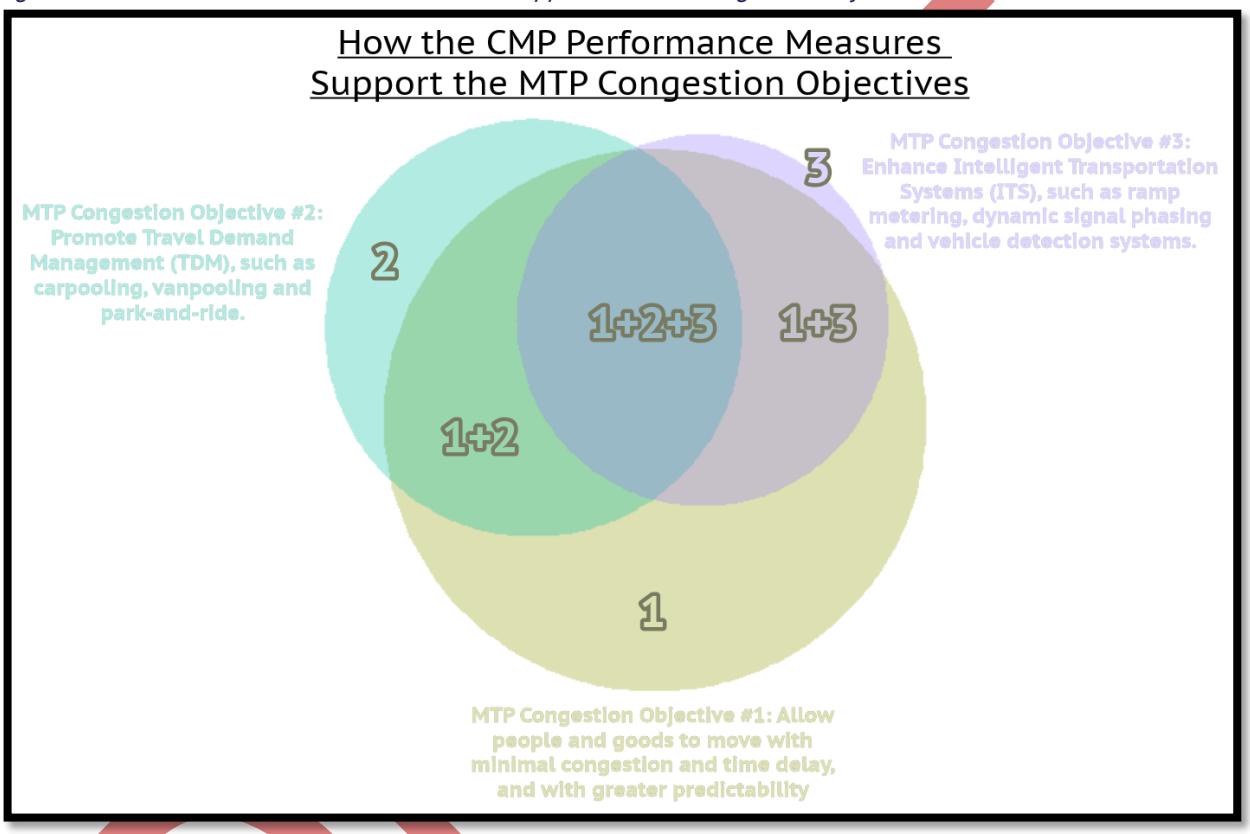
4.5 CMP Performance Measures that support CMP Objective 5 – Enhance Traveler Information and Demand Management

CMP Performance Measures with Targets or Trends	Origin of Performance Measure
Increase Total individuals provided TDM program and activity support	Connect 2050 MTP (CAMPO 2022, Pg 21)
Increase Amount of Intelligent Transportation Solutions (ITS) investments	Connect 2050 MTP (CAMPO 2022, Pg 22)

4.6 CMP Performance Measures that support the MTP objectives to Manage Congestion and System Reliability

The CMP performance measures both support the CMP objectives and the MTP objectives meant to manage congestion and system reliability. Shown in Figure 5, of the total 39 CMP performance measures, 31, 16, and 10 support the goals of MTP Congestion Objectives one, two, & three respectively. Some of those performance measures support a single MTP objective, while some support two of or all three MTP objectives. That relationship is also shown in Figure 5.

Figure 5: How the CMP Performance Measures Support the MTP Congestion Objectives



CMP Collect Data - Monitor System Performance

5.0: How CAMPO Collects CMP Data and Monitors its System Performance

While the CMP Network may emphasize roadway facilities, the CMP, by the nature of its objectives, performance measures, and strategies is a multi-modal process. Therefore, the data collected to regularly monitor system performance is also multi-modal. Monitoring current transportation system performance including roadway and bicycle/pedestrian use, CAMPO collects data from RITIS, NCDOT, and outputs from TRMG2[31]. Data on safety, asset condition, and level of travel time reliability is collected annually by NCDOT as part of the MAP-21 federal requirements. CAMPO collects and analyzes fixed route and paratransit service performance data through the Wake County Transit Program (see www.waketransittracker.com). Likewise, CAMPO collects transit asset management data through its processes put in place as part of the MAP-21 requirements. Central Pines Regional Council (CPRC) collects and synthesizes the regions TDM efforts by publishing the Triangle Transportation Choices annual impact report. Lastly, CAMPO collects data to track the impact of Transportation Systems Management and Operations (TSMO)/Intelligent Transportation Systems (ITS) by (1) collaboratively planning TSMO/ITS regional systems in the Triangle Region ITS Working Group (coordinated by CPRC), (2) planning of specific TSMO/ITS projects as part of the MTP development process, and (3) the development of those TSMO/ITS projects in CAMPO's Transportation Improvement Program (TIP).

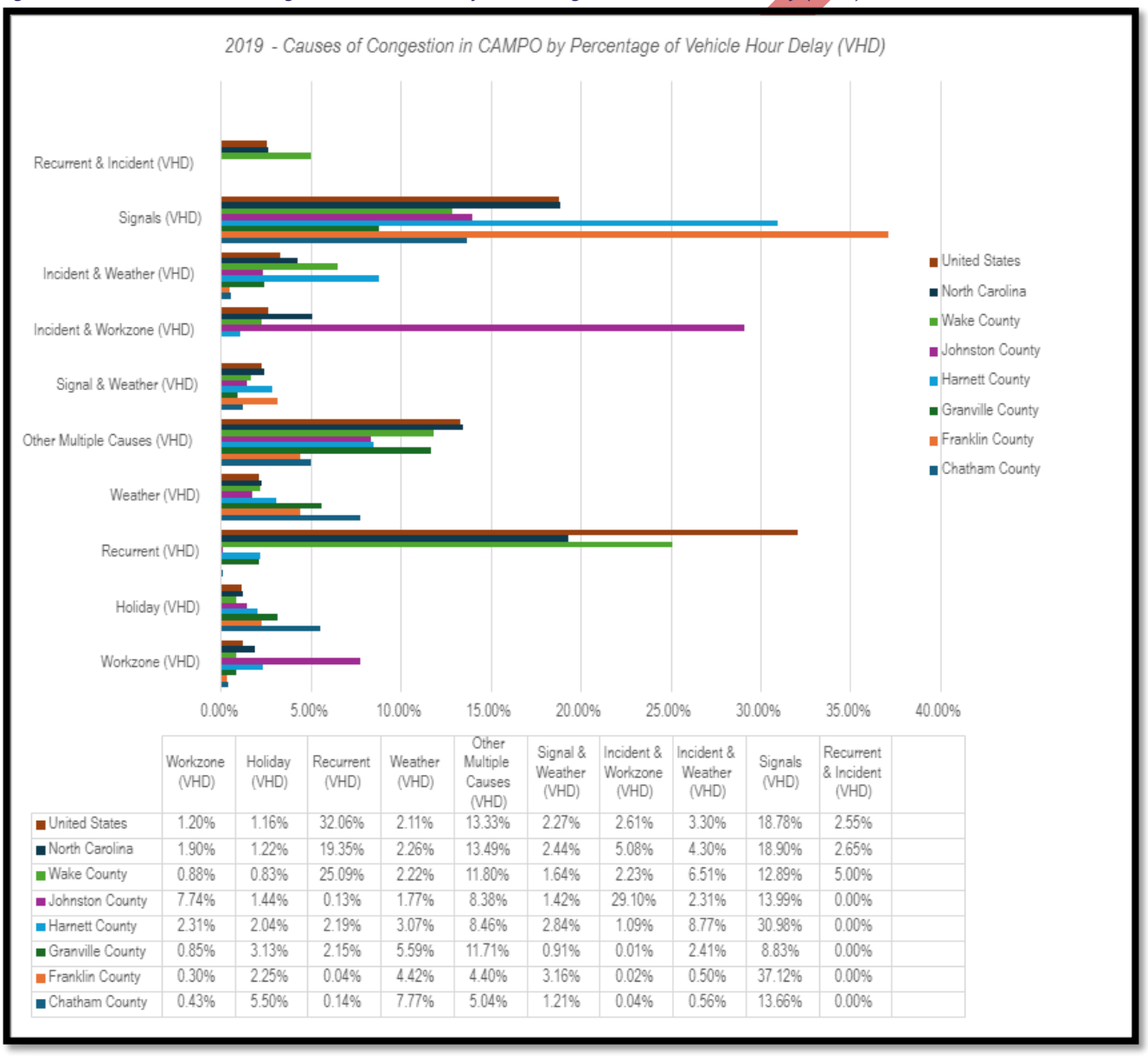
[31] A full description of where the data inputs for the Triangle Regional Travel Demand Model (TRMG2) can be found at this GitHub website: https://github.com/Triangle-Modeling-and-Analytics/TRMG2/wiki.

CMP Analyze Congestion Problems and Needs

6.0 CAMPO's Root Causes of Congestion

In CAMPO's planning area, there are several root causes of congestion. These causes of congestion can be categorized into increased demand (ex: holiday), reduced capacity (ex: work zone), and patterns of predictability in traffic flow (ex: recurrent). Using tools like RITIS, and the data extracted from it, CAMPO planners can analyze congestion impacts and needs. An example of this analysis is shown in Figure 6.0: 2019 - Causes of Congestion in CAMPO by Percentage of Vehicle Hour Delay (VHD).

Figure 6: 2019 - Causes of Congestion in CAMPO by Percentage of Vehicle Hour Delay (VHD)



	Workzone (VHD)	Holiday (VHD)	Recurrent (VHD)	Weather (VHD)	Other Multiple Causes (VHD)	Signal & Weather (VHD)	Incident & Workzone (VHD)	Incident & Weather (VHD)	Signals (VHD)	Recurrent & Incident (VHD)
United States	1.20%	1.16%	32.06%	2.11%	13.33%	2.27%	2.61%	3.30%	18.78%	2.55%
North Carolina	1.90%	1.22%	19.35%	2.26%	13.49%	2.44%	5.08%	4.30%	18.90%	2.65%
Wake County	0.88%	0.83%	25.09%	2.22%	11.80%	1.64%	2.23%	6.51%	12.89%	5.00%
Johnston County	7.74%	1.44%	0.13%	1.77%	8.38%	1.42%	29.10%	2.31%	13.99%	0.00%
Harnett County	2.31%	2.04%	2.19%	3.07%	8.46%	2.84%	1.09%	8.77%	30.98%	0.00%
Granville County	0.85%	3.13%	2.15%	5.59%	11.71%	0.91%	0.01%	2.41%	8.83%	0.00%
Franklin County	0.30%	2.25%	0.04%	4.42%	4.40%	3.16%	0.02%	0.50%	37.12%	0.00%
Chatham County	0.43%	5.50%	0.14%	7.77%	5.04%	1.21%	0.04%	0.56%	13.66%	0.00%

Multiple narratives around congestion in the CAMPO planning area can be extrapolated from the data in Figure 6. For example: (1) there may exist low hanging fruit for reducing congestion in Harnett and Franklin counties by studying the intersections managed by the signal system; (2) a disproportionate percentage of Johnston County's congestion is caused by traffic incidents occurring in work zones; and (3) studying how to alleviate bottlenecking in Wake County could help to alleviate congestion as roughly

25% of the county's congestion is considered "recurrent". This is only one of many examples of how CAMPO staff analyze the impacts and needs related to multimodal congestion.

6.1 How CAMPO Analyzes Congestion Problems and Needs

CAMPO analyzes congestion and the resulting impacts and needs primarily by taking a continuing and iterative approach. Sometimes our rapidly growing region requires we take a snapshot of current conditions so we can project scenarios into the future, as in the case of the Commuter Corridor Study. However, even these snapshots are developed to create a grander image, incorporating them into the larger continual and iterative processes - in that case, the Connect 2050 MTP. The upcoming 2055 MTP (Destination 2055) is CAMPO's latest example of iterative congestion planning and management. This planning document will be developed by combining transportation modeling and planning efforts to optimize our transportation network's capacity given the current and future land uses that surround and employ it.

The interrelated modelling processes that create the basis for Destination 2055 quantitative analysis are the CommunityViz® growth allocation model and the region's new Triangle Regional Travel Demand Model Generation Two (TRMG2). CommunityViz®, employing a series of 40 land use place types designated on a parcel-by-parcel basis by the local municipal partners, gives CAMPO staff the ability to create population and economic growth scenarios for the horizon year of a given MTP. These growth scenarios are then used as data inputs in TRMG2, when creating ways to optimize improvements to the multi-modal transportation network.

In addition to the CommunityViz® scenarios, TRMG2 calculates congested travel times as one of many data outputs. These outputs help tell the multi-modal story of congestion cost and travel time delay. The model is even able to output how equitably congestion is distributed throughout the TRMG2 model region using CAMPOs Communities of Concern.

The planning efforts that go into developing the MTP are, like the modeling, complex, vast and varied. The analysis of multi-modal congestion data through these planning efforts includes the development of an ITS roadmap, the first deliverable of the Triangle Region ITS Strategic Deployment Plan Update; the implementation and reporting on the TDM program by CPRC; and the progress of the Wake County Transit Plan as shown on the program's development dashboard (www.waketransittracker.com). This analysis builds upon the multi-modal congestion planning work in the Wake County Transit Plan, the Triangle Regional Freight Plan, CAMPO's numerous area studies, and the Triangle Region ITS Strategic Deployment Plan Update.

While all the above modeling and planning work is crucial to analyzing the vast amounts of data collected that relate to the role congestion plays in our region, none of these models or planning documents focus solely on congestion. That is why, as part of the development this, CAMPO's updated Congestion Management Process, staff will be resurrecting the regularly updated Status of the System Report. This report, which may or may not keep that moniker, will address in one place, all the crucial data analysis related to multi-modal congestion. This could include tackling how congestion impacts our region from the interrelated lenses of economic development, public health, and social equity.

CMP Strategies

7.0 How to Identify and Assess CMP Strategies at CAMPO

The planning and development of appropriate multi-modal facility improvements within the CMP network occur as part of the regular and iterative MTP development cycle. The MTP and the plans and studies that feed into it often include strategies for managing multi-modal congestion according to set planning objectives and performance measures. These strategies tend to include recommendations on how to address transportation system development, transportation system management, and transportation demand management. These congestion management strategies tend to include recommendations related to TSMO/ITS, TDM, transit, active transportation, and targeted roadway capacity improvements.

All 49 strategies identified for CAMPO's CMP were derived from the following CAMPO and NCDOT adopted studies, plans, and policies:

- Connect 2050 Metropolitan Transportation Plan (2022)
- Commuter Corridors Study (2019)
- Triangle Regional Freight Plan (2018)
- NCDOT's Organizational Performance Scorecard (2024)
- Triangle Region ITS Strategic Deployment Plan Update (2020)

To assess the validity and pertinence of the selected strategies for congestion management, the CMP relies upon the MTP's use of population growth modeling powered by TRMG2 and a series of thoughtful land use development scenarios through the MTP's extensive collaborative process with its local jurisdictions, powered by CommunityViz®. For those strategies derived from the Commuter Corridor Study, a benefit cost analysis (BCA) was completed to assist in resource and strategy prioritization. These approaches for strategy assessment tend to be most relevant with regards to the delivery of fixed route and high-capacity public transit, active transportation, and roadway development congestion strategies.

As it relates to assessing the impact of TSMO/ITS strategies, planning work has already taken place to assess the strengths and weaknesses of the regional signal systems through studies like the Western Wake Signal Integration Study. This study prepares for the development of a local signal system for those Wake County municipalities found along the NC 55 corridor. A similar study is being considered for development, to explore an integrated municipal signal system in the eastern portion of Wake County.

Assessing the impact of strategies in transportation demand management require assessing the behavior of the community. Predictive modeling as part of the TRMG2 can assist with this, but most of this work takes place in the form of annual and bi-annual transit ridership satisfaction surveys and commuter surveys administered by GoTriangle/GoRaleigh and CPRC respectively.

Lastly, as with the CMP performance measures, the CMP strategies both support the CMP objectives and the MTP objectives to manage congestion and system reliability[32]. The relationship between the CMP strategies and MTP objectives is described in detail in section 7.6.

[32] listed in section 4.0

7.1 CMP Strategies that support CMP Objective 1 – Improve Travel Time Reliability and Efficiency

CMP Strategies	Origin of Strategies
Reduce Daily minutes of delay per capita	Connect 2050 MTP (CAMPO 2022, Page 21)
Selectively enhance highway & arterial capacities of the commuter corridors	Commuter Corridors Study (CAMPO 2019, Pg 173)
Build managed lanes along I-40 and I-540	Commuter Corridors Study (CAMPO 2019, Page 173)
Increase network connectivity by adding connector roadways	Commuter Corridors Study (CAMPO 2019, Page 173)
Upgrade the freeway merge/diverge areas with auxiliary lanes to address operational and safety issues	Commuter Corridors Study (CAMPO 2019, Page 173)
Continue to implement electronic tolls along future NC 540 corridor segments	Commuter Corridors Study (CAMPO 2019, Page 174)
Implement dynamic congestion pricing on the most congested commuter corridors such as the I-40 through the RTP area; and Expand congestion pricing on future NC 540 corridor segments	Commuter Corridors Study (CAMPO 2019, Page 175)
Relieve congestion on heavily traveled truck routes, including through the encouragement of expanded rail transportation.	Triangle Regional Freight Plan (CAMPO / DCHC / NCDOTD 2018, Page 62)
Plan and preserve industrial land uses for job creation and efficient service to markets and population.	Triangle Regional Freight Plan (CAMPO / DCHC / NCDOTD 2018, Page 62)
Establish and designate truck routes consistent with federal, state and local regulations, and incorporate flexibility in routes to reduce the risk from disruption.	Triangle Regional Freight Plan (CAMPO / DCHC / NCDOTD 2018, Page 62)
Ensure maximum regional mobility through improvements to and maintenance of the road and highway network.	Triangle Regional Freight Plan (CAMPO / DCHC / NCDOTD 2018, Page 62)
Provide safe, reliable, efficient and well-maintained goods movement facilities.	Triangle Regional Freight Plan (CAMPO / DCHC / NCDOTD 2018, Page 62)
Improve Reliability & Connectivity of Transportation System by increasing the percentage of acceptable travel time reliability on North Carolina Roadways	NCDOT Organizational Performance[33]

7.2 CMP Strategies that support CMP Objective 2 – Enhance Public Transit Services and Infrastructure

CMP Strategies	Origin of Strategies
Increase per capita transit service hours	Connect 2050 MTP (CAMPO 2022, Pg 21)
Accommodate buses along the commuter corridors with enhanced bus stops	Commuter Corridors Study (CAMPO 2019, Pg 173)
Add premium transit such as Bus Rapid Transit (BRT) and Light Rail Transit (LRT) to connect downtown Raleigh and the Research Triangle Park (RTP) with the rest of the region	Commuter Corridors Study (CAMPO 2019, Pg 179)
Improve transit connections and park-and-ride lots to reduce wait time and eliminate safety issues	Commuter Corridors Study (CAMPO 2019, Pg 173)
Add micro-transit services to provide first-mile/last-mile services in the suburbs	Commuter Corridors Study (CAMPO 2019, Pg 173)

[33] https://www.ncdot.gov/about-us/our-mission/Performance/Pages/highway-reliability.aspx

Expand deployment of the AVL technology for better managing the bus services	Commuter Corridors Study (CAMPO 2019, Pg 174)
Collaborate with GoRaleigh, GoTriangle, and GoCary to develop smart mobility hubs and transit stops and stations that are safe, comfortable, and convenient	Commuter Corridors Study (CAMPO 2019, Pg 175)

7.3 CMP Strategies that support CMP Objective 3 – Enhance Safety and Operational Performance

CMP Strategies	Origin of Strategies
Reduce economic losses due to transportation crashes and incidents.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Ensure the alignment of land use planning and the siting of freight producing and staging facilities for compatibility and safe, productive function.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Improve mobility and access to intermodal operations and facilities.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Reduce fatality, injury, and crash/incident rates on all modes.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Improve the ability to identify high accident locations and evaluate their impacts in TIP project prioritization.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Partner with Law Enforcement and Emergency Response agencies to provide support and reduce delay during traffic incident management events.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Upgrade the interchanges where there are recurrent congestion or safety issues	Commuter Corridors Study (CAMPO 2019, Pg 173)
Provide railroad grade separations, whenever feasible	Commuter Corridors Study (CAMPO 2019, Pg 173)
Continue to prepare hot-spot studies and target small-scale intersection improvements in high growth suburban areas	Commuter Corridors Study (CAMPO 2019, Pg 174)
Continue to modernize the local traffic signal systems for better signal timing coordination and pedestrian safety	Commuter Corridors Study (CAMPO 2019, Pg 173)
Continue to invest in deploying new technologies for work zone traffic management	Commuter Corridors Study (CAMPO 2019, Pg 174)

7.4 CMP Strategies that support CMP Objective 4 – Promote the Development of a Sustainable, Health-Oriented, and Multimodal Transportation Network

CMP Strategies	Origin of Strategies
Promote the adoption of efficient freight vehicles and technologies offering safer, environmentally cleaner performance.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Plan and design our community centers for the timely and fuel-efficient supply of goods necessary for living and working.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Reduce environmental and community impacts from goods movement operations to create healthy communities and a clean environment and improve quality of life for those communities most impacted by goods movement.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)

Ensure a productive operating environment for freight transportation in the region.	Triangle Regional Freight Plan (CAMPO/DCHC/NCDOTD 2018, Pg 62)
Partner with large employers and educational institutions in the region to define incentives on transit fares	Commuter Corridors Study (CAMPO 2019, Pg 174)
Partner with large employers and educational institutions in the region to incentivize alternate workdays, alternate work hours, and telecommuting	Commuter Corridors Study (CAMPO 2019, Pg 175)
Work with local jurisdictions in implementing smart growth land use policies to reduce reliance on SOV travel	Commuter Corridors Study (CAMPO 2019, Pg 175)
Work with local jurisdictions to promote Transit-Oriented Developments (TODs), affordable housing near transit, and smart mobility hubs	Commuter Corridors Study (CAMPO 2019, Pg 175)
Develop parking incentives for shared ride, shared mobility services, and off-peak travel hours	Commuter Corridors Study (CAMPO 2019, Pg 175)

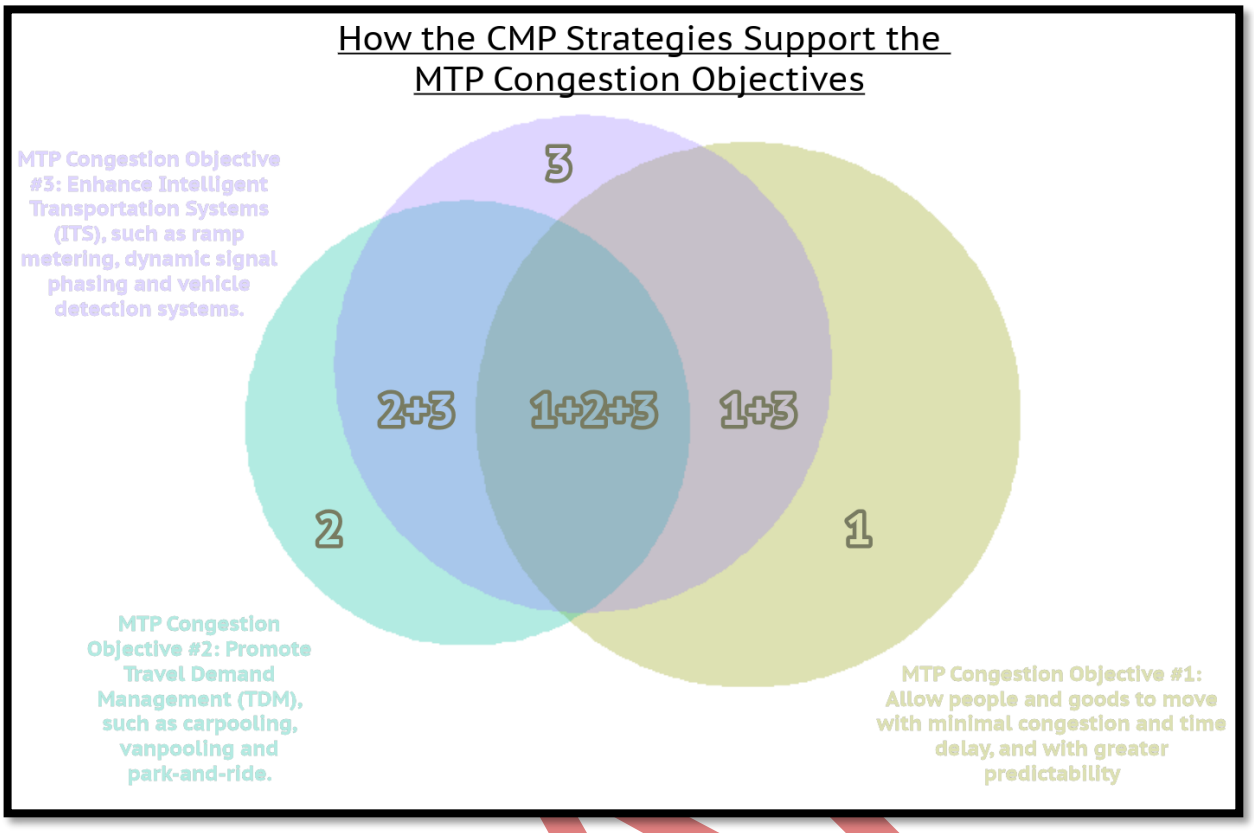
7.5 CMP Strategies that support CMP Objective 5 – Enhance Traveler Information and Demand Management

CMP Strategies	Origin of Strategies
Implement parking management strategies in downtown and high activity areas to balance parking cost vs. convenience	Commuter Corridors Study (CAMPO 2019, Pg 174)
Continue to partner with other states and the private sector for a more integrated traveler information system	Commuter Corridors Study (CAMPO 2019, Pg 174)
Establish and develop partnerships for ITS operations, communication and information dissemination	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)
Improve incident management and response, Freeway Management, Arterial Management, Integrated Corridor Management (ICM)	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)
Prioritize deployments to improve safety and provide accurate real time information	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)
Expand Integrated Corridor Management (ICM) Program-Interoperability between State and Local, Arterial Management, Freeway Management	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)
Improve system communications for interconnectivity and data sharing	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)
Implement an Asset Management Program	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)
Evaluate and execute cost effective solutions	Triangle Region ITS Strategic Deployment Plan Update (CAMPO 2020, Pg ES-8)

7.6 CMP Strategies that support the MTP objectives to Manage Congestion and System Reliability

The CMP strategies both support the CMP objectives and the MTP objectives meant to manage congestion and system reliability. Shown in Figure 7 below, of the total 49 CMP strategies, 33, 18, and 19 support the goals of MTP congestion objectives one, two, & three respectively. Some of those strategies support a single MTP objective, while some support two of or all three MTP objectives. That relationship is shown in Figure 7.

Figure 7: How the CMP Strategies Support the MTP Congestion Objectives



7.7 How to Program and Implement CMP Strategies at CAMPO

Programming and implementation of congestion strategies takes place as part of the Metropolitan Transportation Plan development process. Projects that make their way into the MTP then, and only then, have a chance to be further developed and submitted for scoring into North Carolina's Strategic Transportation Prioritization (SPOT) process as determined by the State Transportation Investment (STI) law. SPOT, which scores projects in a cascading fashion, prioritizing projects base on tiers (statewide, regional, and division needs).

While active transportation and fixed route transit congestion strategies are eligible for submission in SPOT, they are usually only considered under Division needs and are rarely funded through SPOT. This prioritization process is best for those cost effective, high impact, and regionally or even statewide focused congestion strategies. These can include large scale TSMO/ITS projects on major interstates, high-capacity public transportation projects, or even strategic capacity improvements with regional significance. Occasionally, congestion strategies such as TMSO projects can be integrated within larger roadway or transit projects, such as interstate modernizations or bus rapid transit expansion. Once a strategy is scored successfully through SPOT, it is funded, and eventually implemented through the state's transportation improvement program (STIP).

Smaller division needs and locally scaled projects tend not to find programming and implementation through the state's SPOT process. However, CAMPO has a multijurisdictional "one call for all" to implement congestion planning strategies. In addition, CAMPO also administers its Locally Administered Projects Program (LAPP), which has the capacity to fund roadway, active transportation, and smaller public transportation congestion management strategies. Lastly, for more medium sized public

transportation strategies within Wake County, CAMPO annually develops the Wake Transit Work Plan, which directs over 100 million in funding towards projects that can have an impact on congestion.

Evaluate Strategy Effectiveness

8.0 Evaluating Strategy Effectiveness

The institute, in their annual Urban Mobility Report, calculated that users of the Raleigh, NC urbanized area transportation network experienced a total of ~22.5M hours of delay in 2022 (this is slightly below the pre-pandemic totals in 2019 of 26.2M). While the institute determined that the Raleigh urbanized area represented the lowest number of hours of delay amongst its population peers (urbanized areas between one and three million people), this congestion still cost the region $575 million in lost productivity and fuel.

As CAMPO staff work to understand the economic and human impact of congestion in our planning region by evaluating the effectiveness of congestion management strategy implementation, we can ask new questions as part of the MTP development process and the reinvigorated Status of the System Report. These two processes are the most appropriate in evaluating the effectiveness of congestion management strategies.

Future questions about strategy effectiveness may consider the economic impact of congestion on our region's most productive industries; understanding the impact of congestion as a social determinant of health for our region; and even considering through tools available to CAMPO within TRMG2, whether congestion is equitably or inequitably distributed throughout the planning region.