Congestion Management Process

Prepared for:

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LIST OF ACRONYMS

ACS	American Community Survey
CFR	Code of Federal Regulations
CMP	Congestion Management Process
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
ISTEA	Intermodal Surface Transportation Efficiency Act
LOTTR	Level of Travel Time Reliability
LRTP	Long Range Transportation Plan
MPO	Metropolitan Planning Organization
NDOT	Nebraska Department of Transportation
NHS	National Highway System
NPMRDS	National Performance Management Research Data Set
PHED	Peak Hour Excessive Delay
SOV	Single Occupancy Vehicle
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TTTR	Truck Travel Time Reliability
v/c	Volume per Capacity
VMT	Vehicle Miles Traveled

I. CMP INTRODUCTION

A. Overview

Federal Requirements

Federal requirements state that metropolitan areas with more than 200,000 people, known as Transportation Management Areas (TMAs), must maintain a Congestion Management Process (CMP) and use it to make informed transportation planning decisions. These requirements were introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 as a "*Congestion Management System*" and are continued under the successive transportation authorization laws, including the current law, Fixing America's Surface Transportation (FAST) Act. FAST Act refers to a "*Congestion Management Process,*" reflecting the goal of the law to utilize a process that is an integral component of metropolitan transportation planning.

The Federal Highway Administration (FHWA) guidance[1] refers to a CMP as a "systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs." The purpose of the CMP is to define congested corridors in the region, develop strategies to mitigate the congestion, and provide a way to monitor the effectiveness of the strategies. The CMP is also intended to use performance measures to direct funding toward projects and strategies that are most effective for addressing congestion. The CMP is intended to augment and be folded into the overall metropolitan transportation planning process in Lincoln and Lancaster County.

FHWA suggests that 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 travel.

The FHWA regulations in 23 CFR Part 450 Sec. 322 specify that an effective CMP should include:

- Methods to monitor and evaluate the performance of the multimodal transportation system, identify the causes of reoccurring and non-recurring congestion, identify and evaluate alternative strategies, provide information supporting the implementation of actions, and evaluate the efficiency and effectiveness of implemented actions;
- Definition of objectives and performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods;
- Establishment of a program for data collection and system performance monitoring to define the extent and causes of congestion, to contribute in determining the causes of congestion, and to evaluate the efficiency and effectiveness of implemented actions;
- Identification and evaluation of the anticipated performance and benefits of both traditional and non-traditional congestion management strategies;
- Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies); and

[1] FHWA Congestion Management Process: A Guidebook, April 2011

- Implementation of a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures.

History of Lincoln MPO's CMP

The City of Lincoln is the federally recognized Metropolitan Planning Organization (MPO) for the Lincoln Metropolitan Area, supporting Lincoln and Lancaster County to carry out transportation planning and decision-making within the TMA. The MPO provides a forum for cooperative decision-making among responsible state and local officials, public and private transit operators, and the general public. The MPO coordinates the planning activities of all transportation-related agencies and adopts long range plans to guide transportation investment decisions. Plans and programs consider all transportation modes and support community development and social goals.

The 2000 Census identified the Lincoln Urban Area as having a population of 226,582 and accordingly, the Secretary of Transportation designated the Lincoln MPO as a TMA. This classification qualifies the Lincoln MPO for specific shares of federal transportation funds, but also establishes additional administrative and planning requirements in the transportation planning process. These additional planning activities relate primarily to the development of a Congestion Management Process (CMP), project selection, public involvement and the MPO certification process.

The inaugural CMP for the Lincoln MPO was approved in 2009, and it was created to satisfy the essential requirements of the ISTEA regulations. The 2040 LRTP update included development of goals and objectives for the multimodal transportation network as well as performance measures appropriate for evaluating progress. Data required to assess the performance measures were used to produce the Lincoln MPO 2019 Annual Performance Report. Multiple performance measures address measures of congestion. Future updates of the LRTP provide the Lincoln MPO with the opportunity to update objectives and performance measures that address congestion management.

B. Congestion Management Process: The 8-Steps

The Lincoln MPO views congestion management in the context of the overall transportation planning process and as a tool to ensure that existing and new transportation infrastructure is effectively managed and maintained. The CMP is implemented as a feedback process to inform and understand congestion within the TMA and the appropriate strategies to address it. The 8-Steps of the CMP include:

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

Effective implementation of the CMP may improve the operational efficiency and reliability of Lincoln's transportation system. It provides guidance for effectively allocating finite resources toward improvements that minimize travel-time delays, improve air quality and conserve energy. These improvements are important to the region's environment, economy, and quality of life. They directly benefit automobile and transit vehicle users as well as truck and freight operators, pedestrians and bicyclists. The continued development and coordination of this process is an important element of the Lincoln transportation planning process. It is used as a guide to develop project recommendations for the Transportation Improvement Program (TIP) and to provide policies for the congestion management element of the Long Range Transportation Plan.

C. CMP Structure

The Lincoln MPO's CMP is intended to be a systematic and regionally accepted approach for managing congestion that provides accurate and relevant information on transportation system performance and assesses alternative strategies for congestion management that meet state, regional, and local needs. These strategies can then be developed into policies and/or programmed as projects into the LRTP and TIP. A description of congestion trends and the impacts of congestion is presented to give context for the problems the CMP will address. With this perspective, the CMP is organized into two sections that capture the 8-Step process. The first section addresses how the CMP evaluates congestion. Steps 1-5 are independent steps that work to generate relatable measures of congestion. The second section addresses how the CMP will address congestion. Steps 6-8 identify strategies that may best address congestion and how those strategies will be evaluated going forward.

D. Trends

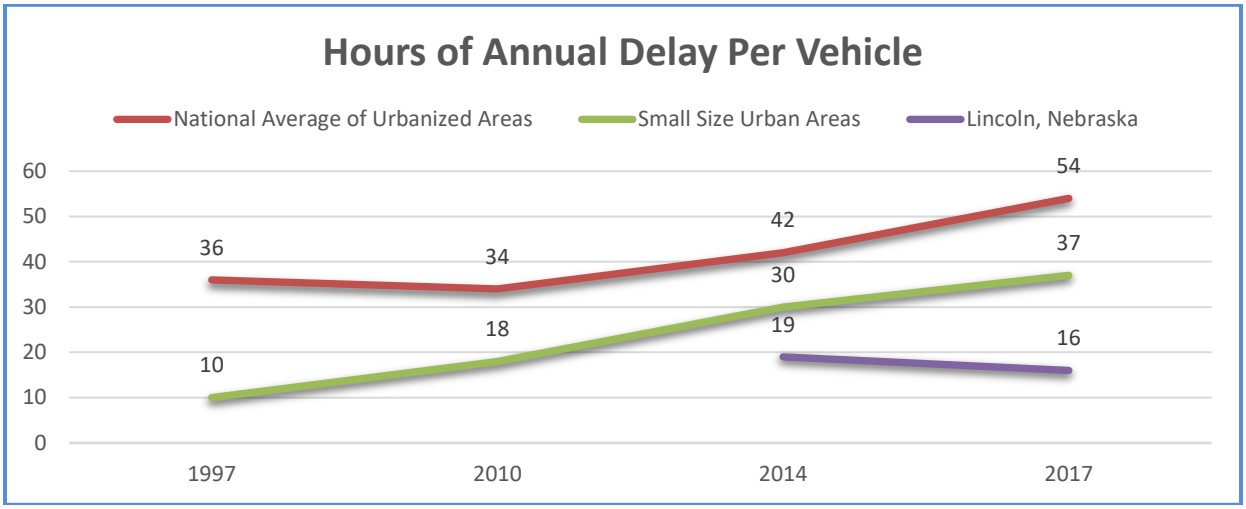
National Trends in Congestion

A primary reference for national statistics and analysis on the current state of roadway congestion comes from the Texas Transportation Institute (TTI). The 2019 Urban Mobility Report gives a detailed description of congestion conditions in all of America's 494 urban areas ranging from smaller cities with populations greater than 50,000 to large urbanized regions with populations of over three million people.

Based on national data compiled by the TTI, roadway congestion increased steadily from the 1980s through 2006 before receding with the December 2007 recession. TTI calculations showed that by 2017, nationwide National Highway System (NHS) congestion within urban areas had generally returned to historic growth pattern. The 10-years of economic growth brought traffic congestion to the highest measured levels in most U.S. cities.

Growing congestion results in lost time and wasted fuel which affects quality of life, the economy and the environment. According to the TTI, congestion in 2017 caused Americans to travel an additional 8.8 billion hours and purchase an extra 3.3 billion gallons of fuel. The number of annual hours expended per vehicle due to congestion is shown in **Figure 1**. The reported values are documented in the Urban Mobility Scorecards which includes the Lincoln Urban Area starting in 2016 reporting on 2014 data.

Figure 1 - Hours of Annual Delay Per Vehicle Comparison[2]



For the years reported, trends for the Lincoln area are much less than national averages and urban areas of similar size. The total number of extra hours spent in traffic due to congestion helps to compare relative congestion. The lower number of annual hours of delay per vehicle in Lincoln from 2014 to 2017 is noticeable because of the upward national trend. During 2014, the impact of construction projects along portions of Interstate 80 and maintenance along Nebraska Highway 6 in Lincoln likely elevated the number of hours of congestion. Without those non-recurring events, annual hours of delay per vehicle in 2014 would have been lower and the upward trend would likely have occurred for Lincoln as well.

Nebraska Trends in Congestion

Within Nebraska, the small and larger size urban areas demonstrate less traffic congestion relative to national levels. Even so, published public sentiment about congestion indicates Nebraska roadway users value reducing congestion further. The public survey conducted in 2011 as part of the Statewide Long Range Transportation Plan documented 62/52/42% (Omaha/Lincoln/Statewide) of roadway users prioritize projects and programs that would address congestion. The Statewide Long Range Transportation Plan is currently being updated and may demonstrate a shift in priority for addressing congestion, but available funding is expected to limit the scope of what can be accomplished. In 2017, the Nebraska Department of Transportation (NDOT)[3] estimated a $6 billion dollar shortfall in level of funding needed over 20 years to maintain and improve the statewide transportation system.

A key factor that influences travel demand is population. Nationally, Nebraska ranked 37th in population with 1,929,268 residents in 2018. As Nebraska's population grows, that growth is unevenly distributed throughout the state. According to the University of Nebraska – Omaha, Center for Public Affairs Research[4], statewide population growth averaged 4.4% from 2010-2016, with only seven of 93 counties experiencing growth greater than 5%. In urban counties of Douglas, Sarpy, Lancaster, Dakota and Hall where MPOs are located, land development continues to build out quicker from urban centers. The

[2] Texas A&M Transportation Institute Urban Mobility Scorecards; 1997, 2012, 2016 and 2019
[3] Omaha World Herald, December 14, 2017
[4] David Drozd, March 21, 2017

effect of this expansion influences transportation needs that have been historically met by the single-occupant automobile trip.

Based on American Community Survey data from 2018, 81.9% of all trips to work in Nebraska were made using SOVs. This measure indicates Lincoln has a lower percentage of SOV trips than some small urban areas such as Jackson, MS with 84.5% SOV, but a higher percentage than others like Madison, WI at 64.2% SOV. The percentage of individuals in the Lincoln urban area who drove to work alone (81.0%) is lower than the state average, but higher than the national average. Lincoln's mode-share is contrasted against Nebraska and National benchmarks in **Table 1**.

Table 1 - Estimated Mode-Split of Lincoln Relative to Nebraska and National Estimates

Commuting to Work 2018[5]	Lincoln, NE	Nebraska	National
Drove alone (SOV)	81.0%	81.9%	76.4%
Carpooled	9.1%	9.0%	9.1%
Public transportation (excluding taxicab)	1.4%	0.7%	5.0%
Walked	3.3%	2.7%	2.7%
Bicycled	1.3%	0.4%	0.6%
Other	0.6%	0.8%	1.2%
Worked at Home	3.3%	4.4%	4.9%
Mean Travel Time to Work	18.7 minutes	18.6 minutes	26.6 minutes

The dominance of individuals driving alone to work continues a long-standing pattern of increasing automobile use extending back to 1960 when the American Community Survey first began collecting data on commuting travel modes. Increasing numbers of SOVs adds to the number of Vehicle Miles Traveled (VMT) and can incrementally increase the time of travel to work as congestion worsens. According to the NDOT[6], the total Average Daily VMT on the all roadways in the state grew from 52.5 million and 57.5 million between 2009 and 2019. In 2018, the mean time for an individual to commute to work was 18.6 minutes in Nebraska, similar to Lincoln, while the national mean was 26.6 minutes. This information reflects all travel modes to work, not just SOVs.

E. Impacts

The effects of roadway congestion can measurably influence lost time, lost income, and reduced safety. In some cases, these effects can be quantified in terms of production costs, such as the costs associated with wasted fuel. Quality of life can also be affected by roadway congestion but is more difficult to quantify in monetary terms. A small sample of the adverse effects of roadway congestion is listed below:

- **Wasted fuel** – Each year, millions of gallons of fuel are wasted as a result of roadway congestion. This represents billions of dollars in losses to both commercial and private interests. The costs associated with wasted fuel are typically passed on to the consumer.
- **Diminished quality of life** – Every minute wasted in congestion reduces the available time for family, friends, errands, hobbies, exercise, and other life pursuits. In addition, evidence has

[5] American Community Survey – 2018 5-Year Average Table S0801
[6] Source reference – State of Nebraska Automatic Traffic Recorder Data (NDOT)

suggested that increases in commuter times can negatively affect involvement in community affairs.

- **Lost economic productivity** – As traffic congestion grows, material storage and delivery systems can be easily disrupted, raising transportation and manufacturing costs while reducing productivity. The costs associated with lost productivity are often passed on to the consumer.
- **Reduced safety** – Frustrated drivers can exhibit higher risk and aggressive driving behaviors, increasing the potential for crashes. Highway interchanges that require weaving maneuvers on congested roadways also pose significant safety hazards.
- **Slowed emergency response** – Delays caused by roadway congestion can severely impact response times in emergency situations and add additional safety risk to both roadway users and emergency responders.
- **Degraded air quality** – In general, vehicles emit far more pollutants that contribute to ground-level ozone and smog during stop-and-go traffic than under free flow conditions. Greenhouse gas emissions also increase as a result of roadway congestion.
- **Decreased system reliability** – Reliability of the transportation system begins to decrease as roadway congestion grows to absorb longer periods of time and more stretches of highway. Additional buffer time must be committed in order to arrive at a destination on-time, reducing market access and competitiveness.
- **Increased spending on infrastructure** – When local, state, and federal governments must allocate an increasing amount of resources to simply keep pace with growing roadway demand, fewer funds are available for transportation initiatives and other government services.

Many of these effects can be minimized using congestion mitigation strategies. Strategies discussed in Section III include both physical and operational improvements to the regional transportation network.

II. CMP EVALUATION (STEPS 1-5)

A. Step 1: Develop Regional Objectives for Congestion Management

Congestion management objectives are derived from the vision and goals articulated in the current Long Range Transportation Plan. The vision and goals in these documents enable the CMP to articulate efforts that minimize congestion and improve system reliability in the movement of people, goods, and services.

2040 LRTP Goals

Maintenance	A well-maintained transportation system.
Mobility and System Reliability	An efficient, reliable, and well-connected transportation system for moving people and freight.
Livability and Travel Choice	A multimodal system that provides travel options to support a more compact, livable urban environment.
Safety and Security	A safe and secure transportation system.
Economic Vitality	A transportation system that supports economic vitality for residents and businesses.
Environmental Sustainability	A transportation system that enhances the natural, cultural and built environment.
Funding and Cost Effectiveness	Collaboration in funding transportation projects that maximizes user benefits.

CMP Objectives

With these LRTP goals in mind, the Lincoln MPO has established two objectives that address the multifaceted challenges of measuring congestion, communicating how it is managed, and enabling data driven decisions. These two objectives broadly support the comprehensive nature of all goals in the LRTP.

The first objective of the CMP is to manage the efficient performance of the multimodal transportation network.

Efficiency is desirable because it represents management of resources that avoids wasting energy, money and time. The multimodal transportation network requires the wise investment of resources to achieve the objective of efficient movement of people, goods and services. Users view an efficient transportation network as one that enables them to move from place to place with minimal delay. Therefore, planners and engineers configure the transportation network to accommodate movement with reasonable levels of recurring delay during peak periods. An efficient system is neither under-designed nor over-designed. This objective for infrastructure prioritization, design, construction and operation helps stretch limited funding and keep up with the maintenance costs of aging infrastructure. Efficient performance minimizes lost time and the costs of travel as well as the negative environmental impacts to air quality caused by excessive idling.

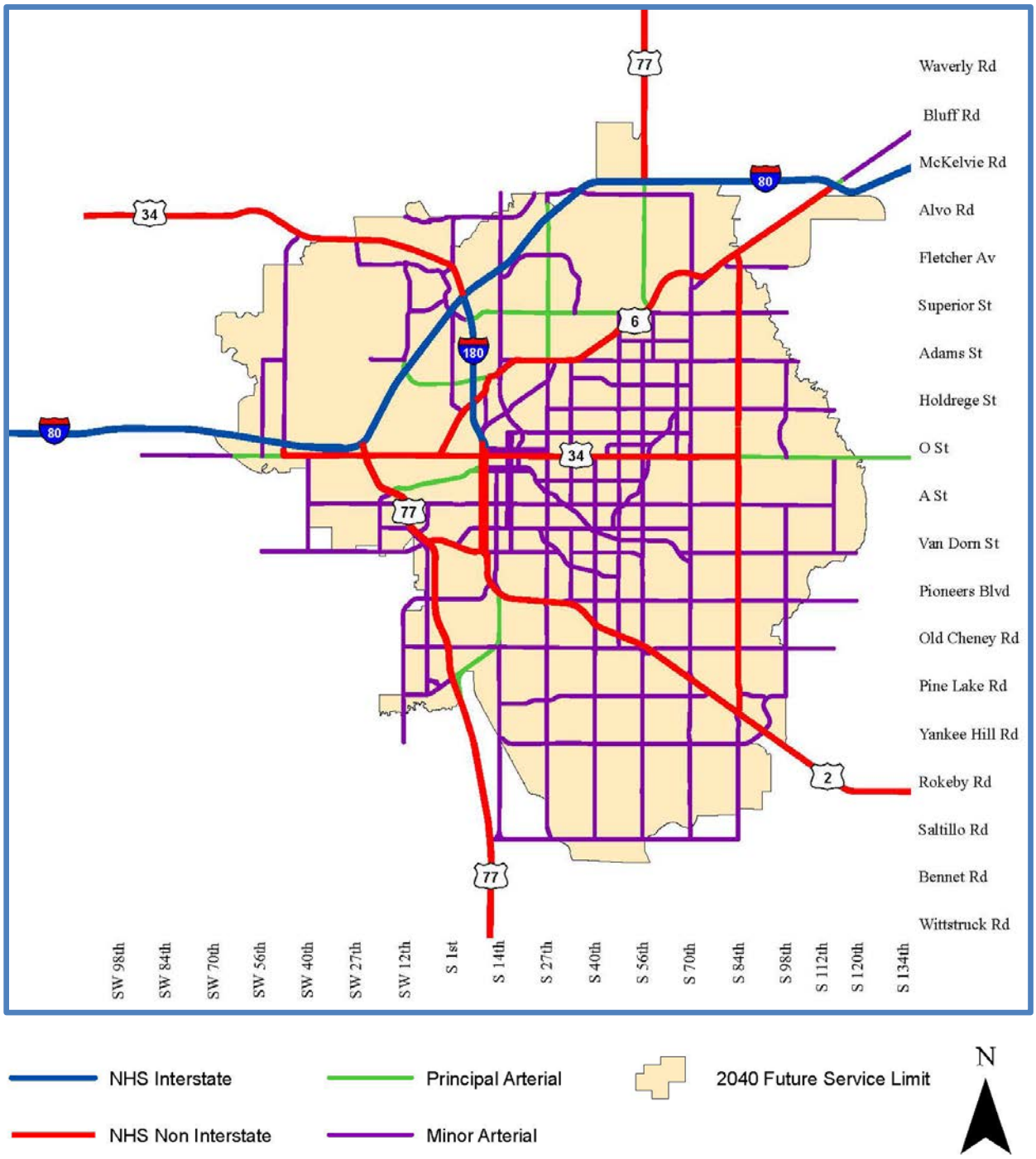
The second objective of the CMP is to manage the reliable performance of the multimodal transportation network.

Reliability is desirable because it represents dependability, offering reasonable expectation of travel time for people, goods and services. The multimodal transportation network must be managed on a day to day basis to limit instances and duration of non-recurring delay to achieve the objective of reliable movement of people, goods and services. Users consider a reliable transportation network to be predictable, even if that predictability includes recurring delay. Some conditions that create non-recurring delay (like events) may be anticipated and managed accordingly, but unpredictable conditions (like accidents) also occur and require strategies that resolve the delay as quickly as possible. Even though the network is managed to be efficient as possible, different strategies are needed to deliver reliable performance. This objective for infrastructure management helps connect people, goods and services to their destination with limited variation day-to-day. Reliable performance will minimize unplanned travel delay and infrastructure maintenance associated with traffic management along the travelled way.

B. Step 2: Define CMP Network

The CMP is applied within a specific geographic area for specific surface transportation facilities that comprise the CMP network. The MPO designates transportation facilities that represent the CMP network and that are evaluated against CMP objectives. The Lincoln MPO designates the CMP network within the City of Lincoln Future Service Limit, the area anticipated to urbanize over the next 20 years. The CMP network includes interstate and non-interstate portions of the NHS, major arterial streets and a small number of major collector streets that are perceived as arterial by roadway users. Transit routes are also considered part of the CMP network. Sidewalks and trails within the application area are to be strategically managed but are not analyzed for congestion management objectives. **Figure 2** illustrates the Lincoln MPO's CMP Network.

Figure 2 - CMP Network of the Lincoln MPO



C. Step 3: Develop Multimodal Performance Measures

The CMP utilizes performance measures that aid in characterizing CMP objectives and the congestion challenges facing the region. The Lincoln MPO measures progress toward CMP objectives using three groups of metrics summarized in this Step. The first group of performance measures are federally mandated and the Lincoln MPO coordinates performance targets for them with NDOT. The second group of performance measures are listed in the current LRTP and provide additional context to local congestion by providing performance targets that support CMP objectives. The final group of performance measures are established specifically for the CMP. The three groups are described below.

Mandated Performance Measures

The performance measures listed in **Table 2** are required by federal regulations for assessing the Interstate and Non-Interstate portions of the NHS within the MPO. The performance measures utilize national data sets that are established in federal regulations to be applied equally by all MPOs.

Table 2 – Mandated Performance Measures

Mandated Measures:	Description:
Interstate (*490.507(a)(1)*) and Non-Interstate (*490.507(a)(2)*) Level of Travel Time Reliability (LOTTR)	Level of Travel Time Reliability (LOTTR) is defined as the ratio of the longer travel times (80th percentile) to a "normal" travel time (50th percentile), using data from FHWA's National Performance Management Research Data Set (NPMRDS) or equivalent. Data are collected in 15-minute segments during all time periods between 6 a.m. and 8 p.m. local time. The measures are the percent of person-miles traveled on the relevant portion of the NHS that are reliable. Person-miles take into account the users of the NHS. Data to reflect the users can include bus, auto, and truck occupancy levels.
Truck Travel Time Reliability (TTTR) Index (*490.607*)	Freight movement is assessed by the TTTR Index. Reporting is divided into five periods: morning peak (6-10 a.m.), midday (10 a.m.-4 p.m.) and afternoon peak (4-8 p.m.) Mondays through Fridays; weekends (6 a.m.-8 p.m.); and overnights for all days (8 p.m.-6 a.m.). The TTTR ratio is generated by dividing the 95th percentile time by the normal time (50th percentile) for each segment. The TTTR Index is then generated by multiplying each segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.

Table 2 Continued on Next Page

Annual Hours of Peak Hour Excessive Delay per Capita (*490.707(a)*)	Traffic congestion is measured by the annual hours of peak hour excessive delay (PHED) per capita on the NHS. The threshold for excessive delay is based on the travel time at 20 miles per hour or 60% of the posted speed limit travel time, whichever is greater, and is measured in 15-minute intervals during peak travel hours. The total excessive delay metric is then weighted by vehicle volumes and occupancy. *The Lincoln MPO is required to begin reporting this measure for 2022.*
Percent Non-SOV Travel (*490.707(b)*)	Single Occupancy Vehicle (SOV) use and alternative mode share is measured using American Community Survey (ACS) Commuting (Journey to Work) data from the U.S. Census Bureau. NDOT and the Lincoln MPO may use localized survey or volume/usage counts for each mode to determine the percent non-SOV travel. *The Lincoln MPO is required to begin reporting this measure for 2022.*

LRTP Performance Measures Relevant to Congestion Management

The Lincoln MPO has also established a range of performance measures which are documented in the LRTP. These performance measures reflect the local nature of Lincoln MPO goals and objectives for the multimodal transportation network. A range of congestion conditions and management approaches are quantified through the periodic assessments of these performance measures. As the LRTP is updated, the Lincoln MPO may revise these performance measures. Therefore, the current LRTP may be referenced for the complete list of LRTP performance measures relevant to congestion management.

Additional Measures Related to Congestion Management

Two additional performance measures listed in **Table 1** have been selected to support evaluation of the CMP. These measures are not currently included within the LRTP but improve the ability to evaluate congestion and support project prioritization and selection related to the TIP. The ongoing use and frequency of evaluation for these measures will be considered during the next LRTP update.

Table 3 Presented on Next Page

Table 3 – Additional Measures Related to Congestion Management

Mobility and System Reliability Measure:	For the Purpose of:	Which Addresses Congestion by:	Limitations include:
Non-NHS Congestion Factor (Location Based Data)	Evaluating efficiency of CMP network.	Indicating the statistical severity of measured travel times experienced during peak periods along CMP network segments compared to free flow speeds.	• Segment lengths are defined by a corridor trip instead of individual intersections or bottleneck locations where congestion is typically experienced. • Segment lengths not standardized allowing longer segments to influence travel time more than shorter segments. • Segments are not representative of VMT • Location based service data is largely illustrative, not definitive, and requires validation by other measures before applying CMP strategies
Safety and Security Measure:	**For the Purpose of:**	**Which Addresses Congestion by:**	**Limitations include:**
Annual crashes per mile on CMP Network (Ratio) (NDOT/City)	Evaluating reliability of CMP network.	Using crash density as a surrogate to measure crashes per CMP segment mile. This measure is not evaluated to provide safety analysis. It indicates the relative likelihood of experiencing non-recurring delay on each CMP segment caused by a crash.	• Crashes are only one of many potential traffic incidents. • Data limited to reportable crashes only, excluding non-reportable and near miss incidents that may also influence non-recurring congestion. • Normalized crash statistics are not representative of traffic safety or efforts to reduce the risk of crashes. • Value does not reflect a duration that congestion is created as result of annual crashes per segment mile.

D. Step 4: Collect Data / Monitor System Performance

The Lincoln MPO has identified three groups of performance measures that require data collection to support system monitoring and decision making. The mandated performance measure data is presented as defined by NDOT and adopted by the Lincoln MPO. LRTP performance measure data types, frequency, sources and results are described in the annual performance report. The additional

performance measures recommended for the CMP are presented as analyzed by the Lincoln MPO in completing this CMP update.

Mandated Performance Measure Data

The performance measures listed in **Table 4** are directly influenced by NDOT based on National criteria. The measures were proposed in 2018 and adopted by the Lincoln MPO in 2019.

Table 4 – Mandated Performance Measure Data

	NDOT System Target	Lincoln Performance[7]
Interstate Level of Travel Time Reliability (LOTTR) Percent	98.9%	100%
Non-Interstate Level of Travel Time Reliability (LOTTR) Percent	92.6%	92.0%
Truck Travel Time Reliability (TTTR) Index	1.10	1.10
Annual Hours of NHS Peak Hour Excessive Delay per Capita	TBD for 2022	TBD for 2022
Percent NHS Non-SOV Travel	TBD for 2022	TBD for 2022

LRTP Performance Measure Data

Data collected for LRTP performance measures and summaries of recent trends are compiled annually by the Lincoln MPO. Information about the performance measures and annual metrics can be reviewed in the most recent LRTP annual report.

Additional Measure Data Recommended for Congestion Management

The CMP identified two additional performance measures used to assess the efficiency and reliability of the multimodal transportation network. Although various measures could be used, these measures provide an appropriate level of analysis for the Lincoln MPO to assess causes of congestion and evaluate strategies to address severe congestion experienced within the CMP network.

Congestion Factor of Other CMP Network Roadways

To help identify CMP network locations where travelers experience the most severe recurring congestion, the Lincoln MPO evaluated Location Based Data (LBD) to calculate a Congestion Factor for a select number of CMP segments. A Congestion Factor is a measure that reflects an increased travel time caused by the difference in average speed compared to free flow travel speed. To illustrate the impact of Congestion Factor on travel time, a hypothetical study segment with a 10-minute travel time under free flow conditions that exhibits an average travel time of 13.3 minutes during an analysis period would have a Congestion Factor value of 0.33. Other free flow travel times can be used to calculate a Congestion Factor.

[7] NDOT published 2017 NPMRDS Data in, Nebraska PM3 Performance Measures and Target Setting, Measuring Statewide Performance and Setting Targets

Segments were generated to represent travel corridors for the analysis rather than studying individual blocks where congestion is commonly experienced. This scale for segment analysis best represents a user's overall trip and leaves more traditional analysis to further study within segments where severe congestion is represented. The Lincoln MPO assessed the travel time LBD for morning commute (7:00 am to 9:00 am) and afternoon commute (4:00 pm to 6:00pm) periods. Other analysis periods can be used to study congestion.

LBD can provide some insight to the Lincoln MPO when evaluating recurring congestion. Because LBD are largely dependent upon the mobile location of a user's mobile devise, they can give a measured duration of time between entering and exiting a defined network segment. The Lincoln MPO studied LBD for this CMP to evaluate travel times during 2019 along defined CMP network segments.

As was described in **Table 3**, some important limitations exist when interpreting LBD. As a result, drawing conclusions from Congestion Factors should not be made independent from other LRTP performance measures. For example, volume to capacity (v/c) ratio compares the number of vehicles to the capacity of a designated intersection. This is another common method of measuring congestion and is already included as a LRTP performance measure. The v/c ratio also inherently measures the number of vehicles that are affected at intersections. A Congestion Factor does not measure the number of vehicles affected. The Lincoln MPO anticipates LBD service availability will continue to grow and improvements to analysis methods may eliminate some limitations to using results for CMP updates.

Crashes per CMP Network Segment Mile

To identify segments where travelers are most likely to experience non-recurring congestion, the Lincoln MPO used State of Nebraska crash data available from 2018 to calculate crash ratios for each CMP segment. This ratio represents the average number of annual crashes per CMP segment mile. Crash ratios are different from commonly reported crash rates which describe the number of crashes in a given period as compared to traffic volume. A crash ratio simply seeks to characterize the potential for a given segment to experience non-recurring delay. Crash rates are a safety analysis measure that is not part of this CMP.

A crash ratio value of 45.0 indicates the segment averaged 45 reportable crashes per mile of that segment over the measured year. A traveler could anticipate half the probability of experiencing non-recurring delay on that segment when compared to a segment with a crash ratio of 90. A Geographic Information System buffer was used to analyze each segment's measured length. Changes to the lengths of a segment could have an impact on calculated crash ratios. The 25 segments with the highest measured crash ratio are listed in **Table 5**.

Table 5 Presented on Next Page

Table 5 - Highest Density Crashes by CMP Segment in 2018

Rank	Segment Name	From	To	Length (mi)	Crash Ratio
1	9th Street	K Street	Q Street	0.48	136.38
2	10th Street	K Street	Q Street	0.48	122.30
3	O Street	9th Street	25th Street	1.22	104.03
4	L Street	9th Street	17th Street	0.63	90.18
5	O Street	25th Street	84th Street	4.13	81.84
6	17th Street	K Street	Q Street	0.49	81.65
7	11th Street	L Street	P Street	0.23	79.24
8	14th Street	L Street	P Street	0.23	78.59
9	13th Street	L Street	P Street	0.23	69.96
10	27th Street	O Street	Highway 6	1.96	66.83
11	K Street	9th Street	17th Street	0.63	66.68
12	27th Street	Highway 2	O Street	2.93	64.45
13	Antelope Valley Parkway	K Street	Military Road	1.63	61.43
14	A Street	17th Street	27th Street	0.73	61.32
15	Q Street	9th Street	17th Street	0.65	61.27
16	16th Street	K Street	Q Street	0.49	59.00
17	33rd Street	Normal Boulevard	O Street	1.05	51.51
18	48th Street	O Street	Superior Street	2.98	47.29
19	P Street	9th Street	17th Street	0.64	47.15
20	Cornhusker Highway	11th Street	56th Street	3.76	46.06
21	Vine Street	27th Street	70th Street	2.98	45.37
22	14th Street	Highway 6	Fletcher Avenue	1.91	45.37
23	Normal Boulevard	Antelope Valley Parkway	56th Street	3.16	40.76
24	12th Street	L Street	P Street	0.23	39.45
25	P Street	17th Street	27th Street	0.73	38.55
Average of all CMP Network Segments Analyzed					**26.10**

E. Step 5: Analyze Congestion Problems and Needs

The Lincoln MPO takes the information generated in Step 4 to make observations about locations where congestion is occurring. MPO staff along with agency members of the MPO analyze the data to identify congestion problems and needs that may need addressed. This process is completed in coordination with the CMP Subcommittee of the MPO Technical Committee. The CMP Subcommittee represents the transportation agencies that ensure congestion problems are characterized correctly. Once congestion problems and needs have been characterized, future planning efforts identify appropriate strategies for implementation. These agencies work together to address the causes of congestion through a variety of transportation funding strategies. A brief overview of the common causes of congestion experienced within Lincoln's CMP Network is provided below.

Causes of inefficient performance

- **Physical Bottlenecks** – Sections of roadway network including intersections that have reached their operational capacity which is determined by a number of factors including the number and width of lanes and shoulders, merge areas at interchanges, and roadway alignments (grades and curves).
- **Access Management** – Locations of driveway/street spacing, turn lane configurations, or median treatments that introduce traffic flow disruptions.
- **Signal Timing** – Disruption of traffic flow by traffic control devices and railroad grade crossings. Unoptimized signals, which Lincoln LTU continues to reduce on the CMP network, contribute to congestion and travel time variability.

Causes of unreliable performance

- **Traffic Incidents** – Events that disrupt the normal flow of traffic, usually by physical impedance in the travel lanes. Events such as vehicular crashes, breakdowns, and debris in travel lanes are the most common form of incidents. In addition to blocking travel lanes physically, events that occur on the shoulder or roadside can also influence traffic flow by distracting drivers, leading to changes in driver behavior and ultimately degrading the quality of traffic flow. Even incidents off of the roadway (e.g., a fire in a building next to a highway) can be considered traffic incidents if they affect travel in the travel lanes.
- **Weather Conditions** – Environmental conditions can lead to changes in driver behavior that affect traffic flow. Due to reduced visibility, drivers will usually lower their speeds and increase their headways when precipitation, bright sunlight on the horizon, fog, or smoke are present. Wet, snowy, or icy roadway surface conditions will also lead to the same effect even after precipitation has ended.
- **Work Zones** – Construction activities on the roadway that result in physical changes to the highway environment. These changes may include a reduction in the number or width of travel lanes, lane "shifts," lane diversions, reduction, or elimination of shoulders, and even temporary roadway closures. Delays caused by work zones have been cited by travelers as one of the most frustrating conditions they encounter on trips.
- **Special Events** – Demand fluctuations where traffic flow in the vicinity of an event is disproportionately different from "typical" patterns. Special events such as university sporting events, concerts, municipal festivals, organized recreational events and others occasionally cause "surges" in traffic demand or barriers to traffic patterns that overwhelm the system.

III. CMP IMPLEMENTATION (STEPS 6-8)

A variety of strategies may be considered and employed to address congestion in Lincoln. This section describes the strategy evaluation process that the Lincoln MPO intends to follow once adequate data are compiled and congestion problems appropriately characterized. The implementation steps continue a feedback process of planning, implementation and evaluation that leads to prioritizing transportation investments that minimize congestion.

A. Step 6: Identify and Assess Strategies

The CMP can be used for measuring progress toward objectives using a variety of metrics. The Lincoln MPO considers the applicability of each strategy to address congestion of the CMP network. Some strategies that are not applicable in other MPOs may be well suited for the Lincoln MPO. Similarly, the Lincoln MPO must strive to make wise decisions about the investment into strategies with the highest likelihood of reducing congestion. **Tables 6 - 9** present the subjective assessment by the MPO for four groups of strategies and how applicable each strategy is currently considered within the CMP. The CMP Subcommittee members provided valuable input about the applicability of strategies listed below. Strategies with high applicability to address recurring or non-recurring congestions may be prioritized higher as strategies in the LRTP and when updating the TIP.

Reducing Person Trips or Vehicle Miles Traveled

The transportation network within the City of Lincoln benefits from the long-standing land use development pattern that limits sprawl. Public utilities of water and wastewater are developed within stormwater drainage basins and may be extended upon annexation. This strategic initiative reduces Vehicle Miles Traveled (VMT) relative to other urban areas. Additional strategies may help to further reduce person trips or VMT.

Table 6 - Strategies that Reduce Person Trips or Vehicle Miles Traveled

Description	Current Applicability to Lincoln MPO
A.1 Congestion Pricing or Road User Charge	Lower Potential
A.2 Alternative Work Hours	Lower Potential
A.3 Telecommuting	Some Potential
A.4 Emergency Ride Home Program	Lower Potential
A.5 Alternative Mode Marketing and Education	Some Potential
A.6 Safe Routes to Schools	Some Potential
A.7 Preferential for Free Parking for HOVs	Some Potential
A.8 Negotiated Demand Management Agreements	Lower Potential
A.9 Trip Reduction Ordinance	Lower Potential
A.10 Infill Developments	Higher Potential
A.11 Design Guidelines for Pedestrian-Oriented Development	Some Potential
A.12 Mixed-Use Development	Higher Potential

Shifting Automobile Trips or Other Modes:

The City of Lincoln StarTran bus system operates six-days a week and offers a cost-effective alternative to SOV travel to work and other transportation needs. Bus system routes were reconfigured following the 2016 Transit Development Plan. Following significant drops in ridership after 2014, route changes have seen increasing ridership in 2016-2018. The N-Street Cycle Track constructed in 2014 was the City's first protected bike lane and is connected to a growing network of over 130 miles of award-winning[8] bicycle infrastructure throughout the Lincoln MPO. This infrastructure provides travelers with an alternative to SOV travel that can see greater seasonal demand in the late Spring through early Fall. In 2019, the City adopted an inaugural shared mobility ordinance which will bring a pilot project for electric scooters that can provide first and last mile options for some travelers. BikeLNK, Lincoln's docked bike share program, includes 21 stations and 105 bikes as of February 2020. BikeLNK was integrated into Lincoln Transportation and Utilities starting in 2020 and additional expansion is anticipated to continue shifting some automobile trips to bicycles.

Table 7 - Strategies that Shift Automobile Trips or Other Modes:

Description	Current Applicability to Lincoln MPO
B.1 Transit Capacity Expansion	Some Potential
B.2 Increasing Bus Route Coverage or Frequency	Some Potential
B.3 Implementing Regional Premium Transit	Lower Potential
B.4 Transit Route Real-Time Information	Some Potential
B.5 Reduced Transit Fares	Higher Potential
B.6 Exclusive Bus Right-of-Way	Some Potential
B.7 New Sidewalk Connections	Some Potential
B.8 Complete Streets	Higher Potential
B.9 Improved Bicycle Facilities at Transit Development Centers or Trip Destinations	Some Potential
B.10 Improved Safety of Existing Bicycle and Pedestrian Facilities	Higher Potential
B.11 Exclusive Non-Motorized ROW	Some Potential
B.12 Intermodal Enhancements Linked to Micro-Mobility Services	Some Potential

Improve Roadway Operations:

The 2015 Traffic Management Master Plan provided a range of recommendations for evaluation and enhancements to improve roadway operations. A few of the primary system needs included Advanced Traffic Management System (ATMS) hardware and software, Location and functionality of the Public Works Operations Center (PWOC), Vehicle detection, Signal phasing alternatives, Signal optimization program, ITS field devices - CCTV cams for system monitoring, Arterial dynamic message signs (DMS) and other important considerations for optimizing existing roadway infrastructure.

In 2016, the City began the process of optimizing signal timing through a program called, Green Light Lincoln. Phase 1 was estimated to save travelers 8.8 million dollars annually by drivers using 575,000 fewer gallons of gas. The successful program is entering into Phase 4 and continues to provide operation

[8] 2014 American Planning Association – Great Places in America Award for the Great Plains Trails Network

improvements that reduce the cost of vehicle travel and increase reliability of transit services. Additional strategies listed in the Traffic Management Master Plan are also generating a positive impact on congestion that can be influenced by roadway operations.

Table 8 - Strategies that Improve Roadway Operations:

Description	Current Applicability to Lincoln MPO
C.1 Dynamic Messaging	Some Potential
C.2 Advance Traveler Information Systems (ATIS)	Some Potential
C.3 Integrated Corridor Management (ICM)	Some Potential
C.4 Transit Signal Priority (TSIP)	Lower Potential
C.5 Variable Speed Limits	Lower Potential
C.6 Truck Signal Priority	Lower Potential
C.7 Traffic Signal Coordination	Higher Potential
C.8 Channelization	Some Potential
C.9 Bottleneck Removal	Some Potential
C.10 Vehicle Use Limitations and Restrictions	Lower Potential
C.11 Autonomous Vehicle Smart Routing	Some Potential
C.12 Improved Signage	Some Potential
C.13 Geometric Improvements for Transit	Lower Potential
C.14 Goods Movement Management	Some Potential
C.15 Freeway Incident Detection and Management Systems	Lower Potential
C.16 Access Management Policies	Higher Potential
C.17 Corridor Preservation	Some Potential
C.18 Corridor Management	Some Potential

Improve Infrastructure or add Capacity:

The LRTP process considers a range of priorities that are important to stakeholders. Congestion management is an important consideration. The range of priorities are used to help the Lincoln MPO make decisions between projects and strategies. Some strategies consider improving infrastructure or adding capacity to help alleviate congestion. The LRTP documents the need to continue allocating resources to address current and future congestion on the street network at existing intersections. Improvements to existing intersections may reduce bottlenecks and improve safety; both of which address the objectives of the CMP. Roadway projects may minimize future congestion that can be anticipated with additional future growth. The Transit Demand Model maintained by the MPO is used to anticipate the increased demand on the roadway network and helps with the prioritization of projects given funding constraints. Infrastructure and Capacity improvements strategies are part of a comprehensive approach to managing congestion.

Table 9 - Strategies that Improve Infrastructure or add Capacity:

Description	Current Applicability to Lincoln MPO
D.1 Intersection Improvements	Higher Potential
D.2 Interchange Improvements or Additions	Lower Potential
D.3 New Lanes of Travel	Some Potential
D.4 2+1 Center Turn Lane Projects	Higher Potential

B. Step 7: Program and Implement Strategies

Information developed through the CMP is applied to establish priorities in the Transportation Improvement Program (TIP) thereby facilitating the implementation of the CMP, either through formal or informal processes. During the development of the LRTP and TIP, congestion management objectives and performance measures from this document will be referenced in the project prioritization and evaluation processes. Therefore, the information documented in this CMP serves to inform other decision-making processes over the coming years and will be reevaluated when the CMP is updated. The Lincoln MPO staff, Technical Committee and Officials Committee lead and direct the effort to program the CMP strategies for implementation.

C. Step 8: Evaluate Strategy Effectiveness

The central focus of this CMP update is to build upon the MPO's previous CMP by integrating real world data collection and performance measures into the process. Not only must the CMP meet the federal requirements, but the Lincoln MPO has a desire to use the CMP as a regional benchmarking resource to inform transportation investment decisions and to paint a clear picture of the region's transportation needs. This CMP will be integrated into the 2050 LRTP.

The CMP highlights an on-going and iterative process to use strategies that span various timelines and resource demands. The Lincoln MPO works closely with operating agencies to evaluate the effectiveness of congestion reduction strategies implemented in the Lincoln region. There is not a one-size-fits-all approach to congestion management and strategies should remain flexible to address new opportunities and challenges. Future analysts should utilize the performance measures captured within this CMP to determine the effectiveness of the selected strategies. Doing so will lead to identification of areas with congestion or safety issues, development and assessment of potential mitigation strategies, and support of prioritization decisions that lead to investments in congestion and safety improvements.