CONGESTION MANAGEMENT

PROCESS

Lubbock Metropolitan Planning Organization

In Cooperation with:

City of Lubbock
City of Wolfforth
Lubbock County
Texas Department of Transportation
Citibus

Prepared by:

City of Lubbock
Traffic Engineering Department
and
LMPO

Approved by the Transportation Policy Committee on August 17, 2012

CONGESTION MANAGEMENT SYSTEM PROCESS

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OVERVIEW

Traffic congestion is a continuing nationwide problem and a growing concern for local transportation officials. 60 percent of Texans today live in a major metropolitan area. The Lubbock Metropolitan Planning Organization (MPO) has seen an increase in congestion within the Congestion Management System Boundary (CMSB), as depicted in Appendix A. Much of this congestion can be attributed to a rise in the general population, the build up of housing and businesses to the west, south, and southwest areas of the Metropolitan Area, several major highway construction projects, and an increased student population at Texas Tech University. A record 28,200 students enrolled in 2012, an increase in the last 2 years' mark of 25,573. This represented a growth of 10.3 percent. Current forecast are for student enrollment to grow to 40,000 in the coming years. Traffic volume data show an over capacity on many major arterials in Lubbock during peak times.

The Congestion Management System Boundary for the Lubbock Metropolitan Planning Organization is the same as the Metropolitan Area Boundary. See Appendix A.

Within the Lubbock Metropolitan Planning Organization's Congestion Management System Boundary, congestion is defined as those facilities, federally functionally classified as arterial and above, that have a rating of Moderate, Heavy, Severe or Extreme as calculated based upon the criteria in the Delay Calculation Summary shown in Appendix B.

The MPO views congestion management in the context of the overall transportation planning process. The Metropolitan Planning Rule of Statewide Roadway Planning identifies "the need to relieve congestion and prevent congestion from occurring where it does not yet occur." Further, the rule specifies that in the Transportation Management Areas (TMAs), the planning process must include the development of a Congestion Management Process (CMP) that provides for effective management of new and existing transportation facilities through the use of travel demand reduction and operational management strategies.

PURPOSE

The Management and Monitoring System Rule of the Congestion Management System defines congestion as "the level at which transportation system performance is no longer acceptable due to traffic interference." The rule states that in all TMAs, the CMP shall be developed, established and implemented as part of the metropolitan planning process and shall include:

1. Methods to monitor and evaluate the performance of the multimodal transportation system; identify the causes of congestion, identify and evaluate alternative actions, provide information supporting the implementation of actions, and evaluate the efficiency and effectiveness of implemented actions;

2. Definition of parameters for measuring the extent of congestion and for supporting the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since levels of acceptable system performance may vary among local communities, performance measures and service thresholds should be tailored to the specific needs of the area and established cooperatively by the State affected MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area;

3. Establishment of a program for data collection and system performance monitoring to define the extent and duration of congestion, to help determine the causes of congestion, and to evaluate the efficiency and effectiveness of implemented actions. To the extent possible, existing data sources should be used, as well as appropriate application of the real time system performance monitoring capabilities available through the Intelligent Transportation System (ITS) technologies;

4. Identification and evaluation of the anticipated performance and expected benefits of appropriate traditional and nontraditional congestion management strategies that will contribute to the more efficient use of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, should be appropriately considered for each area: Transportation demand management measures, including growth management and congestion pricing; traffic operational improvements; public transportation improvements; ITS technologies; and, where necessary, additional system capacity.

5. Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation; and

6. Implementation of a process for periodic assessment of the efficiency and effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision makers to provide guidance on selection of effective strategies for future implementation**.**

TEXAS METROPOLITAN MOBILITY PLAN

The Texas Metropolitan Mobility Plan will also identify common goals during development to improve traffic flow by using all modes of transportation. A regional plan will be setup tailored to the needs of the CMSB and will address the following common goals:

1. Relieve Congestion. The Texas Department of Transportation (TxDOT) will adopt a Texas congestion index to aid the metropolitan areas in setting goals for congestion reduction. This index will assess the mobility of people and goods in each metropolitan area of Texas. Focusing on surface modes of transportation, the index will be based on the delay time experienced by people and in the delivery of goods. Consultations with TxDOT will develop improvement goals based on that congestion index. This goal setting will require a comprehensive local and regional examination of the impact of potential improvement projects and policy approaches across all transportation modes based on index results.

2. Improved Safety. The regional mobility plan will address safety improvements across all transportation modes.

3. Improved Air Quality. Through established procedures and future refinements, the regional mobility plan will, in conformance with established guidelines, access impact on air quality. This will require comprehensive planning through the metropolitan area across all modes.

4. Improved Quality of Life. The regional mobility process will address the quality-of-life impact of proposed projects and approaches. This quality-of-life assessment, integral to regional plan approval, will serve with the air-quality assessment as a basis for improved methods of project implementation.

5. Improved Opportunities for Economic Development. Reduced congestion and improved mobility are crucial to the economic vitality of the Lubbock Congestion Management System Boundary. Further growth must be well planned and comprehensively integrated with all transportation modes.

CONGESTION MANAGEMENT SYSTEM WORK PROGRAM (CMSWP)

Pursuant to the Management and Monitoring Systems Final Rule issued on December 19, 1996, the MPO has established the Congestion Management Committee (CMC) comprising of all the members of the Technical Advisory Committee plus the MPO staff. The CMC is the committee responsible for preparing and making recommendations to the Transportation Policy Committee (TPC) for implementing the Congested Management System Program. The MPO staff assists the TPC. Collective and individual responsibilities of the members of this committee are listed later in this report.

In September 2003, the MPO designated the Transportation Policy Committee (TPC) as the Regional Planning Board for the Texas Metropolitan Mobility Plan. The critical analysis of thoroughfares in the metropolitan area relative to their level of congestion based on speed ranges and traffic volumes (ADT) per lanes as shown in Appendix B.

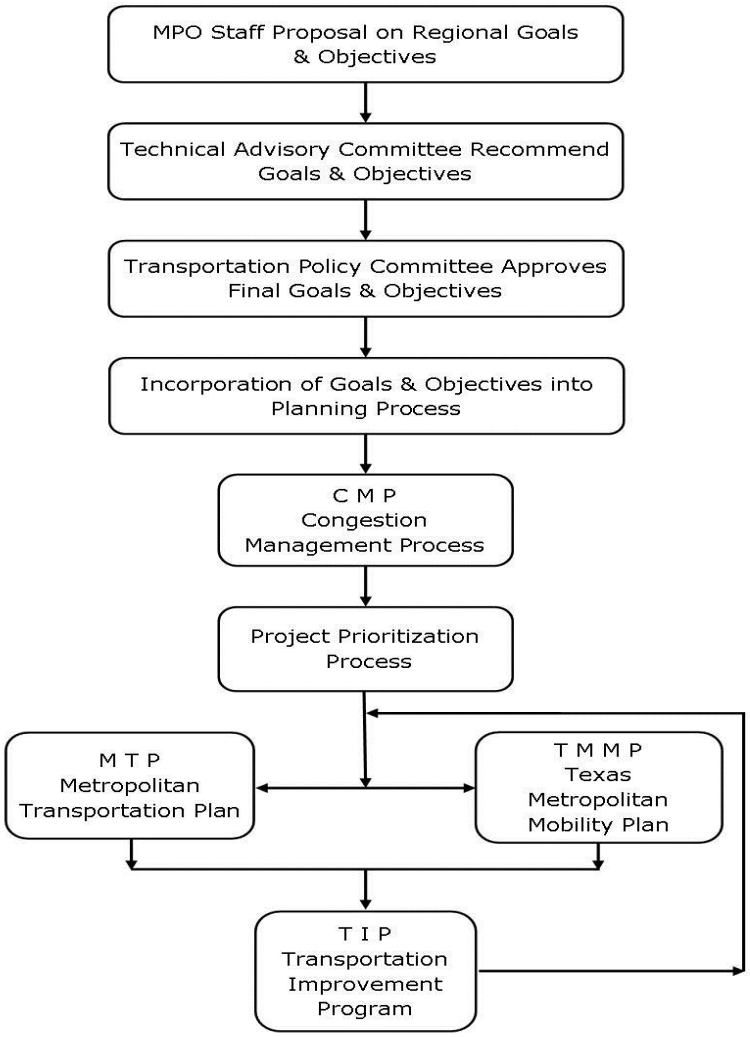
The Lubbock Metropolitan Planning Organization's Congestion Management Committee (CMC) shall monitor the congestion in the Lubbock Congestion Management System Boundary and make necessary recommendations to the Transportation Policy Committee.

The primary means of addressing congestion within the Lubbock Congestion Management System Boundary will be through Transportation System Management (TSM) strategies: Intelligent Transportation System (ITS), Freeway Incident Management, Geometric Design, Traffic Signal Improvements [timing plan improvement (synchronization), interconnected signals, annual traffic signal maintenance], Intersection Improvements, and through Planning Management: Growth Management (site plan review) and Access Management.

CONGESTION MANAGEMENT PLANNING PROCESS

The MPO may not have the luxury of adding capacity to accommodate increased traffic. It is the intention of the MPO to work with the local entities to improve efficiency by adopting the Transportation Demand Management (TDM) and Transportation System Management (TSM) strategies to reduce Single Occupancy Vehicle (SOV) travel, see Appendix C for definitions and strategies. The following chart explains the Congestion Management System (CMS) activities of the MPO and their relationship with the planning process. During each update to the Metropolitan Transportation Plan congestion will be taken into consideration during the project selection process and will be reviewed to insure compliance with SAFETEA-LU as a CMS.

Flow Chart—1 MPO Planning Process



GOALS

The MPO's goals to operate the Congestion Management Process are as follows:

1. To provide the Congestion Management Process Boundary area community with a safe, efficient, environmental friendly, and economical transportation system.

2. To improve mobility of goods and persons by using Intelligent Transportation System (ITS) and other strategies according to local needs.

3. To reduce SOV travel by encouraging the use of other modes including transit, walking, biking, carpooling, and vanpooling.

4. To improve both intermodal and multimodal facilities by maximum utilization of existing resources.

5. To maintain Level of Service (LOS) A, B, C, or D during peak periods, see Appendix D for LOS definitions.

6. To utilize the Texas Metropolitan Mobility Plan process to assist in carrying out the congestion management process.

CONGESTION FACTORS AND CORRECTIVE ACTIONS

SOV Travel (Single Occupancy Vehicles)

SOV is the predominant mode of travel within the CMPB area, which is a major cause of congestion and deteriorating air quality.

Activities: Citibus, along with the City Of Lubbock, encourage the use of public transportation. LMPO and the City of Lubbock revised the metropolitan area bike plan in 2007 to better coordinate existing and future bikeways with roadway improvements. The bike plan may be accessed at www.ci.lubbock.tx.us.

TDM: Ridesharing, carpooling, vanpooling, Non-motorized Travel (bicycle), Public and Private Transit (transit service), Alternative Work Hours Programs (flexible work hour program, compressed workweek), Parking Management, congestion pricing.

TSM: Traffic Signal Improvement, Intersection Improvement, Growth Management, Access Management.

PM: Intelligent Transportation System (ITS), (Advanced Transportation Management System), Freeway Incident Management System

Traffic Signal Synchronization

Unsynchronized signals or poorly synchronized signals contribute to traffic congestion. Drivers experience stops, stop- delays, and longer travel time contributing to increased fuel consumption, congestion, and air pollution.

Activities: New road construction in the City Of Lubbock is expanding rapidly and this includes a new freeway through the City and major arterials. New businesses are relocating to Lubbock and a new mall has been constructed on the west side. Traffic volumes are kept up to date and signal timings are evaluated regularly to address changes in driving routes due to this new construction. Parking restrictions are considered at approaches to new traffic signals and on arterials. A new Advanced Traffic Management System (ATMS) is being implemented in 2012 at the Traffic Management Center (TMC), along with new traffic signal controllers and a fiber optics communications system in the field which will increase the capability and reliability of the computerized traffic system that the City of Lubbock operates.

TDM: Parking Management

TSM: Traffic Signal Improvements, Intersection Improvements, Intelligent Transportation System (ITS), Geometric Design,

Access Management

Closely spaced driveways and their nearness to intersections on arterial streets hamper traffic movement causing congestion and air pollution.

Activities: The City of Lubbock updated the Access Management Policy in April 2011 to better control and evaluate ingress and egress onto private property as new construction replaces older existing construction. Parking restrictions and the Resident Parking Only Program regulate on-street parking. City departments participate in weekly Site Review for new construction and existing alterations of commercial businesses.

TDM: Parking Management

TSM: Geometric Design, Growth Management (subdivision regulations).

PM: Access Management (driveway regulations (building codes/site plan regulations).

Continuous Left Turn Lanes

Consideration should be given to use raised center medians in lieu of continuous turn lanes in areas of heavy traffic concentration, higher travel speeds, and frequent driveway spacing.

Activities: New construction and increased traffic have required that the City look at new ways of relieving congestion. Median construction is considered at newly constructed major intersections and existing congested areas. Raised Pavement Markers (RPMs) and delineator systems are options for existing thoroughfare intersections where congestion is identified.

TDM: Parking Management.

TSM: Geometric Design (raised medians), Traffic Signal Improvement, Intersection Improvements and Access Management.

PM: Access Management.

School Zones on Major Arterials

Arterial street system serves major centers of activity of a metropolitan area. These facilities emphasize mobility rather than land accessibility. Low driving speed limits in school zones on major arterials cause traffic delays and congestion.

Activities: The City is involved with the school districts surrounding Lubbock in an effort to locate new schools away from major arterials and business districts. Bus parking and No Parking areas are implemented for student loading/unloading and traffic flow around schools.

TDM: Parking Management

TSM: Geometric Design, Traffic Signal Improvements, Intersection Improvements, Growth Management

PM: Access Management (designated cross walks).

Intelligent Transportation System (ITS)

The City Of Lubbock is taking a leading role, in partnership with TxDOT, in development and implementation of a Regional ITS and its deployment. ITS gives Lubbock's Traffic Engineers the ability to observe real time traffic and to respond quickly to events.

Activities: Video freeway monitoring, dynamic message signs, freeway management, fiber optics communications and a centralized computer signal system are all part of the ITS technologies being used at the City's Traffic Management Center (TMC).

TDM: N/ A

TSM: Traffic Signal Improvements, ITS (video monitoring dynamic message signs, count station)

PM: N/A

Project Prioritization Process

The Lubbock Metropolitan Planning Organization's Transportation Policy Committee at its December 13, 2011 adopted a Project Selection Criteria (see Appendix E) that is used during the development of the Metropolitan Transportation Plan updates.

CONGESTION MANAGEMENT COMMITTEE

The Congestion Management Committee, comprising the Technical Advisory Committee and the MPO Staff, will meet periodically to evaluate CMS strategies and suggest changes, when needed. The CMC is the committee responsible for preparing and making recommendations to the Transportation Policy Committee for implementation of the Congested Management System Program. The MPO staff assists this committee.

Congestion management requires traffic count data. The city, county, and the Texas Department of Transportation collect this data routinely in their jurisdictions for traffic operation. Data need for CMS does not put any extra burden on any entity of the MPO.

The MPO will coordinate this data collection activity and provide assistance, when needed. Revision of zoning and subdivision regulations would be the responsibility of the planning departments of the cities.

The Congestion Management Committee analyzes the data collected from all the MPO entities to check the transportation system performance. The CMC will then recommend any necessary plan or action to the Transportation Policy Committee (TPC). The TPC decides what action is feasible and which agency is responsible for implementing the action plan to alleviate congestion in the MPO area.

The following are the responsibilities of each entity:

MPO STAFF

LMPO staff, in consultation with the Technical Advisory Committee (TAC), drafts the Metropolitan Transportation Plan (MTP), Transportation Improvement Program (TIP), and CMP with the cooperation of all LMPO entities and presents them to the Transportation Policy Committee and federal and state agencies for approval, if necessary. LMPO staff keeps all the entities in the MPO area informed of any federal or state rules and regulations, provides assistance in conducting surveys/studies related to transportation planning, and sets threshold values to monitor congestion and air quality with the cooperation from entities. LMPO staff assists elected officials and the public in achieving the Lubbock Metropolitan Area's Title VI requirements (environmental justice in minority and low-income populations) in short range improvement programs and long range plans.

CITIES (LUBBOCK & WOLFFORTH)

Provide and share all data and information collected to perform necessary analysis Provide information on land use and zoning laws and regulations or any changes.

LUBBOCK COUNTY

Provide and share all data and information collected to perform necessary analysis. Provide information on land use and zoning laws and regulations or any changes.

STATE (**Texas Department of Transportation**)

Provides and shares all data and information collected to perform necessary analysis. Provides assistance in conducting surveys/studies and data analysis.

TRANSIT (Citibus)

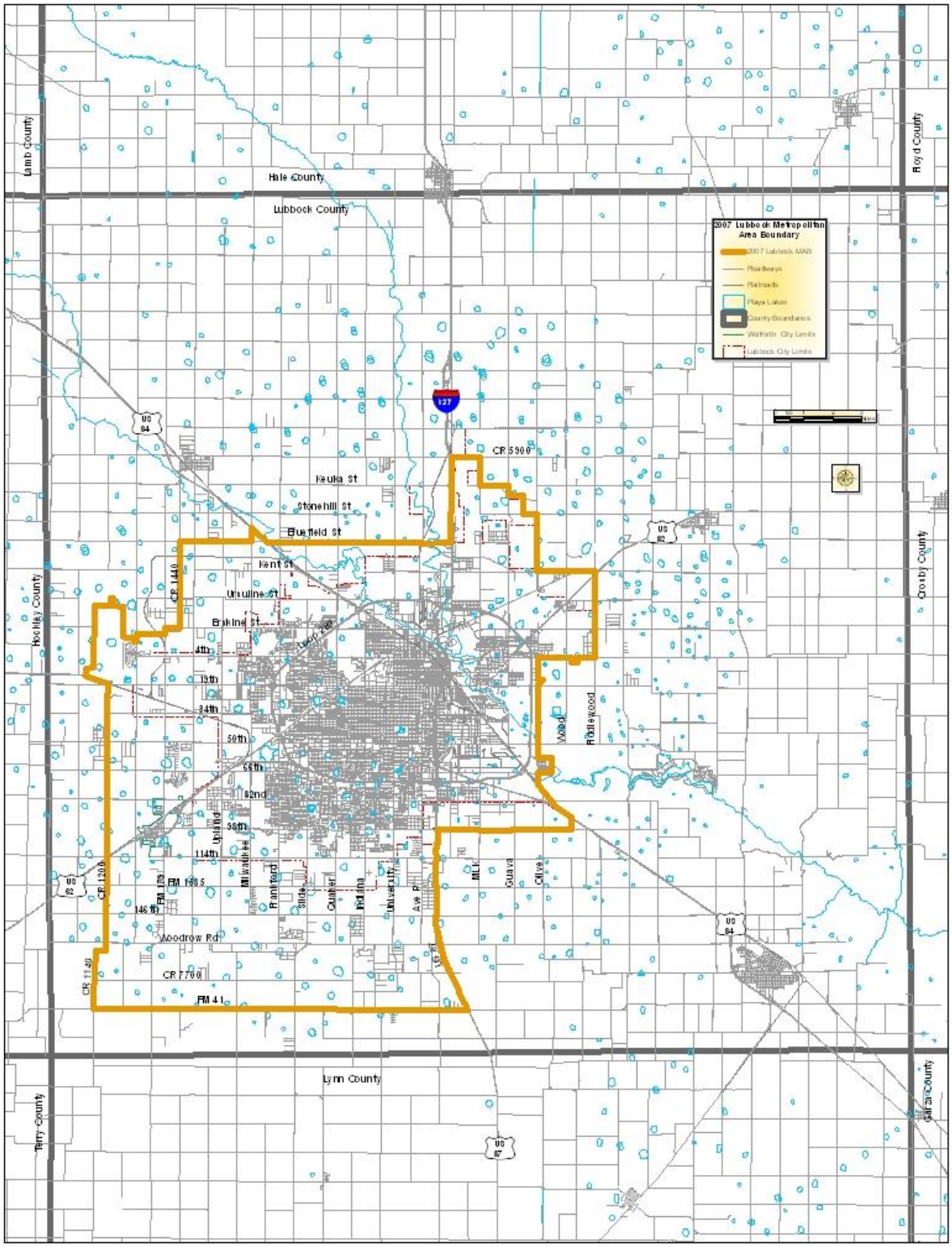
Provides and shares information on route selection and planning. Provides information on incentives offered to increase transit use. Provides and shares data on transit use trends.

FREIGHT FACILITIES

The Government and Business Enterprises Division of TxDOT issued an April, 2007 report titled Trans-Texas Corridor Rural Development Opportunitites: Ports-to-Plains Case Study. The report identified an extension of the Permian Basin Railways line to connect the Lubbock and Midland-Odessa areas. This potential corridor could be eligible for TTC corridor designation with the aim of developing an intermodal facility for export of the local cotton crop and ethanol. Based on the study, a terminal for ethanol export would be needed. The development of freight rail to transport both these products would reduce truck traffic in the Lubbock Metropolitan Area.

APPENDIX A

CONGESTION MANAGEMENT SYSTEM BOUNDARY



APPENDIX B

DELAY CALCULATION SUMMARY*

Congestion Range	Speed Range	Components or System Element	Traffic Level or Condition
Un-congested	60 35 35	Freeways Streets Public Transportation Service	ADT/Lane less than 15,000 ADT/Lane less that 5,500 On-Schedule
Moderate	60 to 55 35 to 28	Freeway Streets	15,000 to 17,500 5,500 to 7,000
Heavy	55 to 48 28 to 27	Freeway Streets	17,500 to 20,000 7,000 to 8,500
Severe	48 to 27 27 to 26	Freeway Streets	20,000 to 25,000 8,500 to 10,000
Extreme	27 to 20 26 to 25	Freeway Streets	Greater than 25,000 Greater than 10,000

Improvement Treatments	Delay Reduction (%)
Ramp metering	0 to 12.4
Traffic-signal coordination	0.5 to 6.1
Incident management	14 to 35
Access management	To be determined
High-occupancy vehicle (HOV) facilities	Include speed and person volume directly
Other treatments	To be determined

* Texas Metropolitan Mobility Plan 2006, p.24

APPENDIX C

DEFINITIONS OF MEASURES OF CONGESTION

These travel characteristics and definitions will help provide information and are suggested for data collection to assess core system performance measured to evaluate congestion.

Average Travel Speed

The average travel speed is computed as the distance traveled divided by the average total time to traverse a given highway segment. It is obtained from a travel time study along the route. The total time includes stopped delays in addition to the actual time of motion. Necessary number of travel time runs depend on the variance in travel time, the acceptable degree of precision, and the level of confidence desired. Therefore, average travel speeds are a poor measure of roadway congestion.

Average Travel Time

The average travel time is defined as the total time to traverse a length of a roadway under prevailing traffic conditions. All stopped delays are included in the average travel time. The average travel time measure can be used to compare the quality of service of various alternate routes from a point of origin to a point of the destination.

Average Travel Rate

This measure is the average time, generally in minutes, required to travel a prescribed distance (one mile or one kilometer) along a route or through a system of routes. An average travel rate is the reciprocal of average travel speed, and is generally reported in minutes per mile (per kilometer). Average travel rates can measure congestion on both a corridor and a sub-area/area wide level.

Total Delay

Total delay or stopped delay is the time that a vehicle is stopped in traffic or at an intersection. Expressed in seconds per vehicle, stopped delay can be measured as the actual "locked wheel" time, or in terms of time less than a very slow speed, such as 5 mph. The Highway Capacity Manual's (HCM) delay equation uses turning movement volumes to capacity ratios to determine stopped delays at intersections. Intersection delay is not a good performance measure for the following two reasons.

1. The inability to forecast turning movements of an intersection, and
2. It is not readily adaptable as a corridor or area wide measure.

However, delay studies are useful for determining the locations, causes and lengths of delays. Total delay information can only be used to locate and measure spot areas of congestion.

Level of Service

The most common measure currently used to define congestion involves Level-of-Service (LOS) values as defined in the 2000 Highway Capacity Manual (HCM).

LOS…A qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience.

Sometimes LOS is a qualitative measure describing operational conditions of a segment or traffic stream, during peak periods. Six different levels are defined (LOS A, B, C, D, E, and F) with LOS A representing the best condition and LOS E and F representing the worst condition. LOS can be defined and measured differently depending upon the roadway facility it is describing. A definition of congestion involving LOS values is common, with many agencies indicating either LOS E or F as congestion. However, because of the various methods of determining LOS, these values are usually not comparable between roadway classifications.

Accident Rates

The number of accidents per million vehicles entering a spot location or the number of accidents per million vehicle-miles over a section of roadway can be used as an indicator of congestion. The nature of accidents, and the way they are recorded, makes it difficult to measure congestion from accident rates alone. At very high traffic volumes when there is a bottleneck of traffic and the inability to change lanes, there may also be a reduction in friction between vehicles and corresponding reduction in accidents. There is also a wide variance in the reporting of accident data by local law enforcement agencies. Two major problems are that not all accidents are reported and that the exact accident location is not identified. Accident rates are applicable as spot, corridor, and area wide measures. Accident rates alone are not a suitable measure of congestion.

CONGESTION MANAGEMENT STRATEGIES

There are several innovative Transportation Demand Management (TDM), Transportation System Management (TSM) and Planning Management (PM) strategies used throughout the USA. Some of these strategies can be adopted based on the local resources and needs.

Transportation Demand Management (TDM)

TDM strategies are designed to maximize the people-moving capability of the transportation system by increasing the number of persons in a vehicle, or by influencing the time of, or need to, travel. To accomplish these types of changes, TDM programs must rely on incentives or disincentives to make these shifts in behavior attraction. The primary purpose of TDM is to reduce the number of vehicles using the road system while providing many mobility options to those who want to travel. The following are some TDM alternatives to a single occupant vehicle:

Carpools and Vanpools

These pools are useful when the transit service is not reaching the sparsely populated area or does not have enough resources to increase the service area.

Public and Private Transit

The use of transit service has been a great help in reducing congestion in most urban areas. Transit, including bus pools and shuttles only, can be utilized when there is a demand and SOV travel and other TDM strategies are not able to provide service to alleviate congestion.

Non-motorized travel

Bicycling and walking are very useful in mixed land use development. These modes reduce congestion and air pollution.

Parking Management

A parking management program is any plan by which a parking space is provided, controlled, regulated, or restricted in any manner. Communities around the United States have adopted parking policies to improve environmental quality, transportation mode shifts, or access preservation.

High Occupancy Vehicle Lanes (HOV)

Designated HOV lanes have a significant role in moving more persons per vehicle and thus decreasing vehicle miles of travel.

Road Pricing

A price on using a highway or roadway facility forces the users to use another mode of transportation or use an alternative route.

New Highways

When necessary, new highways are constructed to relieve congestion by routing traffic from an existing system that is congested and contributing to air pollution.

Alternative Work Hours Programs

Compressed Work Weeks in which employees work a full 40-hour in fewer than the typical five days and Flexible Work Schedule that shifts work start and end times to off-peak hours of the day help relieve congestion.

Financial Incentives

Preferential parking for persons sharing carpools and vanpools, subsidies for transit riders, transportation allowances, preferential access and egress to parking lots, periodic prize drawings for carpool and vanpool members, and guaranteed ride home programs help reduce traffic and congestion.

TRANSPORTATION SYSTEM MANAGEMENT

Transportation System Management (TSM) is the application of construction, operational, and institutional actions to make the most productive and cost-effective use of existing transportation facilities and services. It is through the application of TSM strategies such as operational changes and land use policies that an urban area is able to maintain mobility and safety in the face of growing demand for travel and limitations on system growth.

Intelligent Transportation System (ITS)

ITS technology has been a great help in relieving congestion where other solutions have failed. These intelligent transportation systems include computers, communications, and displays.

Goods Movement Management

It can reduce congestion from city streets in peak hours by regulating pickups and delivery times for freight delivery.

Freeway Incident Management System

Prompt removal of a disabled vehicle from travel lanes improves traffic flow

Geometric Design

Appropriate geometric design helps in reducing congestion and improves safety and freedom of driving. Replacement of continuous left turn lanes with a raised median and adding lanes increases capacity.

Traffic Signal Improvements

Several studies revealed that change in signals' physical equipment and timing optimization has helped intensively in congestion mitigation. Traffic flow could be improved by equipment update, timing plan improvement, interconnected signals, traffic signal removal, or traffic signal maintenance as needed.

Intersection Improvements

An intersection can be improved by installing traffic control devices for the smooth and safe passage of both pedestrians and vehicles. The devices used could be stop signs,

yield signs, traffic signs, turning lanes, traffic islands, channelization, and improved design.

PLANNING MANAGEMENT

These strategies are related to zoning, land-use, and urban design techniques to avoid congestion by integrating land-use planning, site planning, and landscaping with a transportation system.

Growth Management

It is defined as "the use of public policy to regulate the location, geographic pattern, quality and rate of growth of development." Travel demand modeling provides valuable information on traffic generation that could be used to control over the land development and its impact on the surrounding transportation infrastructure. A tool used for growth management is site plan review and requirements in conjunction with required traffic impact analysis for high-density multi-family, commercial, or industrial development.

Access Management

Access management is the art of controlling space and design of driveways, medians and median openings, intersections, traffic signals, and freeway interchanges. Appropriate access control can decrease the number of accidents and congestion. To have a successful access management plan, both transportation planners and land use planners have to work cooperatively. The benefits of the access management are fewer accidents, increased capacity, and shorter travel times.

GLOSSARY

American with Disabilities Act (ADA): A civil right act passed in 1990 defining the rules and regulation for the accessibility of American with Disabilities at all the public and private places

Code of Federal Regulation (CFR): The code of federal regulations is a codification of the general and permanent rules published in the Federal Register by the Executive Departments and agencies of the Federal Government.

Congestion Management System (CMS): A management system or systematic process for identifying traffic congestion, mitigating congestion, and monitoring the effectiveness of congestion mitigation measures.

Congestion Management Committee (CMC): It is the committee consisting of Technical Advisory Committee and MPO Staff that meets periodically to discuss measures to alleviate congestion.

Congestion Management System Work Program (CMSWP): A program developed to identify locations to collect traffic data to analyze congestion.

Highway Capacity Manual (HCM): A manual prepared by the Transportation Research Board containing highway design and planning standards.

High Occupancy Vehicle (HOV): A vehicle with two or more occupants. Freeways and other roads carrying large traffic volumes may have lanes designated for HOV use such as vanpools, carpools, and transit.

Intelligent Transportation System (ITS): A computer/communications technology that provides the motorist with information about road conditions as well as monitors and controls vehicle operation on roadways.

Level of Service (LOS): A traffic flow measuring variable which is used to understand road/highway capacity.

Metropolitan Planning Organization (MPO): A forum for cooperative transportation decision making which is responsible for conducting and coordinating a region's transportation planning process.

Metropolitan Transportation Plan (MTP): A document, which identifies existing and future transportation deficiencies and needs, as well as network improvements needed to meet mobility requirements on a twenty-year time period.

APPENDIX D

LEVEL OF SERVICE (LOS) DEFINITION SUMMARY*

LOS, URBAN STREETS	
LOS – A	LOS A describes primarily free-flow operations at average travel speeds, usually about 90 percent of the free–flow speed (FFS) for the given street class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.
LOS – B	LOS B describes reasonably unimpeded operations at average travel speeds, usually about 70 percent of the FFS for the street class. The ability to maneuver within the traffic stream is only slightly restricted, and control delays at signalized intersections are not significant.
LOS – C	LOS C describes stable operations; however, ability to maneuver and change lanes in mid-block locations may be more restricted than at LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the FFS for the street class.
LOS – D	LOS D borders on a range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors. Average travel speeds are about 40 percent of FFS.
LOS – E	LOS E is characterized by significant delays and average travel speeds of 33 percent or less of the FFS. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.
LOS – F	LOS F is characterized by urban street flow at extremely low speeds, typically one-third to one-fourth of the FFS. Intersection congestion is likely at critical signalized locations, with high delays, high volumes, and extensive queuing.

LOS, FREEWAYS	
LOS – A	LOS A describes free-flow operations. Free-flow speeds (FFS) prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The effects of incidents or point breakdowns are easily absorbed at this level.
LOS – B	LOS B represents reasonably free flow, and free-flow speeds are maintained. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and point breakdowns are still easily absorbed
LOS – C	LOS C provides for flow with speeds at or near the FFS of the freeway. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.

LOS – D	LOS D is the level at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to maneuver within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.
LOS – E	At its highest density value, LOS E describes operation at capacity. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. Vehicles are closely spaced, leaving little room to maneuver within the traffic stream at speeds that still exceed 49 mi/h. Any disruption of the traffic stream, such as vehicles entering from a ramp or a vehicle changing lanes, can establish a disruption wave that propagates throughout the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown with extensive queuing. Maneuverability within the traffic stream is extremely limited, and the level of physical and psychological comfort afforded the driver is poor.
LOS – F	LOS F describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. Breakdowns occur for a number of reasons: • Traffic incidents can cause a temporary reduction in the capacity of a short segment, so that the number of vehicles arriving at the point is greater than the number of vehicles that can move through it. • Points of recurring congestion, such as merge or weaving segments and lane drops, experience very high demand in which the number of vehicles arriving is greater than the number of vehicles discharged-In forecasting situations, the projected peak-hour (or other) flow rate can exceed the estimated capacity of the location. • Note that in all cases, breakdown occurs when the ratio of existing demand to actual capacity or of forecast demand to estimated capacity exceeds 1.00. Operations immediately downstream of such a point, however, are generally at or near capacity, and downstream operations improve (assuming that there are no additional downstream bottlenecks) as discharging vehicles move away from the bottleneck. • LOS F operations within a queue are the result of a breakdown or bottleneck at a downstream point. LOS F is also used to describe conditions at the point of the breakdown or bottleneck and the queue discharge flow that occurs at speeds lower than the lowest speed for LOS E, as well as the operations within the queue that forms upstream. Whenever LOS F conditions exist, they have the potential to extend upstream for significant distances.

* Highway Capacity Manual 2000, p.10-5, p.13-8, 13-10, 13-11

URBAN STREET LOS BY CLASS*

Urban Street Class	I	II	III	IV
Range of free-flow speeds (FFS)	55 to 45mi/h	45 to 35 mi/h	35 to 30 mi/h	35 to 25 mi/h
Typical FFS	50 mi/h	40 mi/h	35 mi/h	30 mi/h
LOS	Average Travel Speed (mi/h)			
A	>42	>35	>30	>25
B	>34-42	>28-35	>24-30	>19-25
C	>27-34	>22-28	>18-24	>13-19
D	>21-27	>17-22	>14-18	>9-13
E	>16-21	>13-17	>10-14	>7-9
F	less than or =16	less than or =13	less than or = 10	less than or = 7

* Highway Capacity Manual 2000, p.15-3

SERVICE VOLUMES FOR BASIC FREEWAY SEGMENTS*

	Number of Lanes	FFS (mi/h)	Service Volumes (veh/h) for LOS				
			A	B	C	D	E
Urban	2	63	1230	2030	2930	3840	4560
	3	65	1900	3110	4500	5850	6930

* Highway Capacity Manual 2000, p.13-13

APPENDIX D

Lubbock Metropolitan Planning Organization 2012—2040 MTP Project Rating Form	11/15/2011

Project Name / Location:

Limits from:

Limits to:

Project ID: **TxDOT:** **MPO:**

Purpose:

Project Length (miles): **Est. Construction Cost:** **Est. Engineering Cost:**

Est. Utility Cost: **Est. ROW Cost:**

Proposed Funding: **%Federal:** **% State:** **%Local:**

Major Adjacent Land Use: **Accident history:**

Congestion Level: **Current:** **V/C Ratio:** **LOS:**

Projected: **V/C Ratio:** **LOS:**

Does the project provide any of the Following benefits: Single item no more than 50 Group total no more than 100	Points: (1-100)
Increases area Safety?	
Improves area Security?	
Provides alternative modes: transit, bicycle access, adds sidewalks	
Increases local economic development opportunities?	
Responds to Congestion Management Process issues	
Does project reduce travel time or trip length	

Does the Project impact air quality?	Points: (1-50)
Does the project increase the value of transportation assets?	Points: (1-50)
Does the project have regional significance?	Points: (1-50)
Does the project meet TxDOT and FHWA/ FTA planning goals?	Points: (1-50)

Project readiness (1-200)

- Funding availability
- Sponsoring agency support
- Right-of-way availability
- Ability to get environmental clearance
- Total Project Cost
- Ready to bid
- Likely to let in the current TIP
- O&M Value
- EJ & Title VI Participation

Operations and Maintenance Impact:

Environmental Justice Impact:

Comments:	Date of review:	Total Points: (500 total)

TAC Adjustment:		TPC Adjustment:	