Introduction & Methdology

The *CMP Atlas*, a companion document to the recently released *A Profile in Congestion: The 30 Most Congested Corridor in the Albuquerque Metropolitan Area*, provides a range of detailed transportation and congestion data for each segment of the 30 corridors that comprise the congested corridor network in MRCOG's Congestion Management Process (CMP). While the *Profile* document indicates the corridors and locations with the greatest congestion, the *CMP Atlas* identifies the source of that congestion by indicating whether the corridor experiences high traffic volumes, low speeds, or high numbers of traffic incidents (measured in crash rates).

The *Atlas* is available for local governments to use in local plans and studies, and as a project development tool for assessing the locations with the most urgent needs. Data contained in the *CMP Atlas* will also be used for evaluation in the Project Prioritization Process.

The *CMP Atlas* features the following data for each corridor:

- Corridor Profile
- Access Characteristics
- Volume (current and historical)
- Travel Time & Delay
- Speed Differential
- Volume-to-Capacity Ratio
- Crash Rates

Ranking Congestion

Congestion is a relative term, compared to some standard which may vary from place to place. The MRCOG Congestion Management Process uses three criteria to quantify congestion: 1) **Volume-to-capacity (V/C) ratio**; 2) **Speed differential**; and 3) **Crash rates**. These criteria combine recurring sources of congestion (V/C ratios and speed differential), which reflect average or predictable conditions, and non-recurring factors (crash rates), which are sources of congestion that occur on an irregular basis. CMP uses these criteria to evaluate individual segments and rank entire corridors in the CMP congested network. Each segment or link of a corridor can generate points depending on the observed roadway conditions. The scores for each link are aggregated at the corridor level to determine an overall score for the corridor which can then be compared to the other facilities in the CMP congested network. Rankings are updated annually as new data is collected.

1. V/C Ratio

Volume-to-capacity (V/C) ratio compares the observed traffic volume along a roadway against the capacity, or the number of vehicles that a roadway segment is intended to carry. V/C is measured for each peak period and each direction. The closer V/C ratio is to 1.0 the greater the level of congestion is considered to be. A V/C ratio of greater than 1.0 is considered to be "over

capacity." V/C ratios above certain thresholds generate points for a roadway segment. The V/C ranking in the Corridor Profile table compares the number of "V/C points" a corridor generates compared to other corridors in the CMP network. Traffic counts for the highest-volume 60-minute span within each peak period are used to determine AM and PM V/C ratios. Volume data is collected as part of MRCOG Traffic Counts program.

2. Speed Differential

Speed differential measures the relationship between the posted speed limit, or intended speed, along a roadway segment and the observed speed of vehicles. The greater the percentage difference between actual and intended speed, the greater the level of delay and congestion. Speed differentials above certain levels generate points generate points for each roadway segment. The speed differential ranking in the Corridor Profile table compares the number of overall "speed points" a corridor generates compared to other corridors in the CMP network. Speed data are collected annually through the CMP Travel Time program which uses a "probe" vehicle collection method to collect data across the peak period. An average velocity of all runs is taken to develop a link speed value for each direction and for each peak period.

3. Crash Rates

Crash rates are incorporated into CMP by comparing the frequency of incidents at intersections along a corridor compared to the regional average crash rate. The likelihood of an incident reflects safety concerns and crash-induced congestion. Crash rates generate points if they exceed certain thresholds. Crash data is collected as part of MRCOG's Safety Analysis program.

AMPA Crash Rate = 1.23026 crashes per 1 million vehicles.

Segment Scoring

The scores for each link are used to generate the maps in each CMP *Atlas* profile. The level of congestion should be considered on a regional level and reflects conditions across the peak period.

Point Generation by Segment

Points per Segment	V/C Ratio	Speed Differential	Crash Rate (vs. AMPA Average)
3	> 1.0	> 35%	> 3x
2	0.85 - 1.0	25 - 35%	2x - 3x
1	0.7 - 0.85	15 - 25%	1x - 2x
0	< 0.7	< 15%	< 1x

Profile Components

Functional Classification is a system of categorizing roadways based on their use and general characteristics. The system is based on the premise that roadways are part of a network and the functional classification describes the role a particular roadway plays in the larger system.

The urban ***principal arterial*** system should carry the majority of trips entering and leaving the urban area, as well as significant intra-area travel, such as between central business districts and outlying residential areas or travel between major inner-city communities. The urban principal arterial system should serve the major centers of activity of a metropolitan area, the highest traffic volume corridors, and facilitate the longest trips.

The urban ***minor arterial*** street system should interconnect with and augment the urban principal arterial system and provide service to trips of moderate length. This system also distributes travel to geographic areas smaller than those identified with the higher system and place more emphasis on land access.

Collectors provide access to the arterial system and circulation within residential neighborhoods, commercial areas, and industrial area. Collectors typically distribute trips from the arterial to the final destination and collect traffic from local streets in residential neighborhoods and channel it into the arterial system.

Source: FHWA Functional Classification Guidelines

Lane Capacity per Hour by Functional Class

Functional Class	Per Lane Capacity
Principal Arterial	800
Minor Arterial	750
Collector	675

Total Capacity is based on the functional classification of the roadway facility.[1] It refers to the maximum number of vehicles that a roadway segment is intended to carry per hour. Total capacity refers to the carrying capacity in *both* directions. The *directional capacity* is generally half of the total capacity, unless there are an uneven number of lanes in each travel direction. The V/C ratio for a segment is based on the volume for an hour-long period compared to the directional capacity.

[1] Assuming Level of Service D.

Access Control

A number of facilities in the AMPA have been designated as limited access roadways in order to ensure the adequate flow of traffic along the roadway itself and move vehicles as efficiently as possible. Access control is an important strategy in managing congestion; any segments subject to access limitations along CMP corridors are noted.

The CMP *Atlas* contains an inventory of various access characteristics for each segment of the congested corridor network:

- Frequency of signalized intersections
- Driveways
- Intersections
- Right-turn facilities
- On-Street parking
- Center-turn facilities

Types of center-turn facilities

- *Continuous*: also known as a suicide lane – locations with a striped median turn lane facilitating turning movements in both directions.
- *Median turn bay*: a protect turn facility, usually with some form of raised median to allows turns from one direction of travel.
- *Median cut*: a gap or break in a raised median that allows a low volume of left-hand turn.

Continuous Center Turn Lane

Median Cut

Median Turn Bay

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) refers to the use of technology to manage roadways and improve the efficiency of the overall transportation network. The ITS Subcommittee, facilitated by MRCOG, also develops profiles to highlight the types of deployment present along each corridor and identifies ITS-related needs and potential improvements. Proper ITS analysis is beyond the scope of the CMP Corridor Profiles. However, it is important to recognize the role of ITS in congestion management. The Corridor Profiles contain two pieces of data: 1) whether or not the corridor is incorporated in the regional ITS architecture and designated as an ITS corridor; 2) if there is currently ITS-related technology deployed along the corridor. Both pieces indicate the potential role that ITS can play in management of the corridor. The ITS profile should be consulted for more details on the locations and scope of deployment (available on

the ITS page in the Transportation section of the MRCOG website). The Corridor Profile table does contain a number of designations and acronyms that refer to the types of ITS deployment currently found along the corridor.

- *F/PF:* Fiber/Partial Fiber – A form of telemetry along a corridor connecting signals to facilitate the progression of traffic.
- *CCTV:* Closed Circuit Television – A tool for monitoring and reporting conditions along a roadway. CCTV allows for real-time observation of traffic patterns and delay.
- *DMS:* Dynamic Message Sign – A tool for posting real-time messages on traffic conditions to commuters.
- *VDS:* Vehicle Detector Station – A tool for monitoring and reporting conditions along a roadway. VDS can detect real-time congestion and allows for collection of various forms of roadway data.
- *Transit:* Signal prioritization to enhance vehicle speed and efficiency through traffic signals or traveler information devices on-board or at transit stations.
- *WiFi:* A form of telemetry along a corridor connecting signals to facilitate the progression of traffic.

Transit Characteristics

The profile table indicates the type of service, including the major transit facilities, present along the corridor. The "Transit Characteristics" section of the profile page describes the level of transit service along or near the corridor in greater detail and classifies transit service into three types:

- *Rapid Ride:* Express service that stops approximately every mile. ABQ Ride Rapid Ride service utilizes articulated buses with greater passenger capacity than standard buses.
- *Local:* Routes that operate all-day and typically stop every few blocks.
- *Commuter:* Routes that operates only during the peak periods.

Study Areas and Demographic Trends

An area surrounding each corridor was identified for the purposes of demographic analysis. This provides a simple snapshot of the employment and population totals – key generators of congestion – along the extent of the corridor. The study area is comprised of Data Analysis Subzones that are adjacent to the CMP corridor or within a ½-mile buffer. Additional zones were added as appropriate if the corridor in question is part of an obvious commuter-shed and therefore the clear choice for nearby residents/commuters to access most destinations. Large area, low-population zones from the periphery of corridors were eliminated to ensure study areas of manageable sizes. Population and employment growth in the study area can shed light on the amount of future traffic that the corridor may be expected to handle. However, the study area does not necessarily incorporate the entire commuter-shed for a corridor. Many corridors function as "through facilities," carrying travelers from points of origin to destinations that are both outside of the study area. River crossings are important examples of these facilities. Therefore the study area is an important indicator of future congestion, but a lack of

projected growth does not guarantee the conditions along the corridor will remain unchanged over time.

Summary Data

Average Speed refers to the range of speeds observed along the corridor during peak periods. At a corridor-wide level, a large range indicates varied conditions across the corridor, while a small range indicates a smoother and more consistent flow of traffic. Occasionally the high speeds are related to uncongested conditions along the periphery of a corridor.

Total Delay is defined as the difference between the amount of time it would take a vehicle to traverse a corridor from one end to the other traveling at the posted speed compared to the actual amount of time it take a vehicle to drive the corridor. Two components of delay are included in the profile: total delay in seconds and rate of delay in seconds per mile. In general, a more severe delay results in higher delay ratio.

Criterion Rankings

In addition to the overall congestion ranking, the scores individual corridors receive in a particular criterion compared to other facilities to create additional rankings based solely on V/C ratios, speed differential, and crash rates. These criterion rankings help determine the general source of congestion along a particular facility. They expose interesting dynamics within a roadway, such as corridors which have high V/C ratios, indicating large amounts of traffic, but low speed differential scores, indicating smooth speeds. In this scenario, it can be surmised that the high volume is managed reasonably well and does not inhibit the general flow of traffic. Conversely, many corridors demonstrate high speed differentials (i.e. slow speeds and large delays) but low V/C ratios, suggesting that congestion may not be related to the volume of vehicles, but the design and management of the facility (e.g. signal timing issues, insufficient turn lanes, or high levels of access points).

Criterion Rankings

V/C Rank	Corridor	Points	Overall Ranking
1	Alameda Blvd	106.3	1
2	US 550	86.9	5
3	NM 47	71.3	7
4	Montaño Rd	68.7	2
5	Paradise Blvd	68.0	6

Speed Rank	Corridor	Points	Overall Ranking
1	Alameda Blvd	91.1	1
2	Gibson Blvd	64.0	19
3	Paseo del Norte	62.8	3
4	Central Ave	60.8	20
5	Bridge/Cesar Chavez	58.5	4

Safety Rank	Corridor	Points	Overall Ranking
1	Montgomery Blvd	31.9	10
2	Coors Blvd	29.0	8
3	Paseo del Norte	25.3	3
4	Jefferson St	25.0	9
5	Bridge/Cesar Chavez	24.4	4

Daily Volume (AWDT)

Average Weekday Daily Volume (AWDT) is an important reflection of the overall level of use of a roadway and the number of individuals that use a facility on a given weekday. AWDT along the segments of a CMP corridor are presented in the Corridor Profile, while a historical inventory of volume by segment is included in the *Atlas* to allow for comparison over time. Many segments experienced a decline in volumes between 2008 and 2010 due to economic considerations and the resulting decrease in vehicular travel. Nevertheless, large increases in volume can be found over the last ten years along many CMP corridors, particularly those west

of the Rio Grande. By contrast, many corridors east of the river have experienced decreases in volume over the last 15 years. Most corridors have large ranges in volume with lower traffic levels on the periphery and high totals closer to activity centers or major intersections and Interstate access points. High volume locations frequently experience high levels of delay or congestion; however, the correlation is not perfect. For congestion scoring purposes, only peak hour volume is considered.

Delay Analysis

Delay data demonstrates the travel time penalty associated with the congestion along a particular segment or a section of a corridor.

Delay analysis in the CMP *Atlas* consists of four tables:

- PM Peak Period Travel Time: how long it takes to drive from one intersection mid-point to another.
- PM Peak Delay (seconds): the sum of the difference between the actual travel time and the time it would take to travel the same distance at the posted speed limits. This table highlights the locations with the greatest *magnitude* of delay.
- Distance: the length in miles between intersections.
- PM Peak Delay (seconds/mile): delay in seconds normalized by distance to provide some insight into where the greatest *rate of delay* occurs.

When considering delay data is important to consider both the magnitude of delay and the rate of delay. Total delay and rate of delay are a function of distance or the length of the segment and can shed light on the severity of delay, but are most effective when analyzed collectively. For example, the magnitude, or total time delay, indicates whether or not the delay has a meaningful impact on the users. However, over a long segment the magnitude of delay may appear to be quite large when it is in fact occurring at a small rate. A small rate of delay may not merit much consideration, even if it cumulatively results in a high magnitude of delay. Conversely, locations with high rates of delay may indicate the locations where congestion is most severe, or may simply indicate the delay occurs over a short segment resulting in a *low* magnitude of delay and may not merit specific efforts or investment. In general, priority should be given to segments that generate high rates of delay and high magnitude of delay.