

GVMC

Congestion Management Process

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**Prepared by the Grand Valley Metro Council
Grand Rapids, Michigan**

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Introduction

Purpose

The Congestion Management Process (CMP) is intended to be a systematic way of monitoring, measuring and diagnosing the causes of current and future congestion on a region's multi-modal transportation systems; evaluating and recommending alternative strategies to manage or mitigate current and future regional congestion; and monitoring and evaluating the performance of strategies implemented to manage or mitigate congestion.

Background

Federal transportation legislation requires Metropolitan Planning Organizations to develop and implement Congestion Management Systems (CMP) as part of the metropolitan transportation planning process (23 CFR 500).

In Transportation Management Areas that are in non-attainment of ozone or carbon monoxide (CO) standards, Federal funds may not be expended for any new project that will significantly increase the carrying capacity for single-occupant vehicles (SOV's) unless the project results from a CMP. For the Grand Rapids area, a significant increase in carrying capacity for SOV's is defined as a project that adds one or more through-travel lanes for one half mile or more on a roadway classified as a Collector or higher on the Federal functional class map for the area.

In the early 1990's MPO staff developed a CMP to meet the federal regulations and serve the transportation planning needs of the urban area. The CMP includes an ongoing method to provide information on the performance of the transportation system and on alternative strategies to alleviate congestion and enhance mobility. The CMP emphasizes effective management of existing facilities through use of travel demand and operational management strategies. In cases where these methods are deemed ineffective to resolve the congestion issue of a corridor, capacity enhancing projects will be selected as the preferred alternative.

Grand Valley Metro Council (GVMC) as the designated Metropolitan Planning Organization (MPO) for the Grand Rapids urban area serves as the central focus for a wide variety of transportation planning activities that encompass all modes of transportation. GVMC coordinates and provides technical support to many regional planning studies. GVMC is also an important source of transportation data used in various traffic engineering studies and roadway design projects undertaken by its member jurisdictions and private consultant organizations. Consequently, GVMC needs accurate and objective data in order to maintain both the validity and the credibility of the decisions that may be based on these studies.

The GVMC Congestion Management System consists of 8 major components. These components include:

- CMP Network Definition
- System Monitoring/Data Collection

- Performance Measures
- Congestion Management Strategies
- System Evaluation
- Integration into MPO planning process
- Regionally Significant Projects not in CMP
- Review and Update

The CMP Process

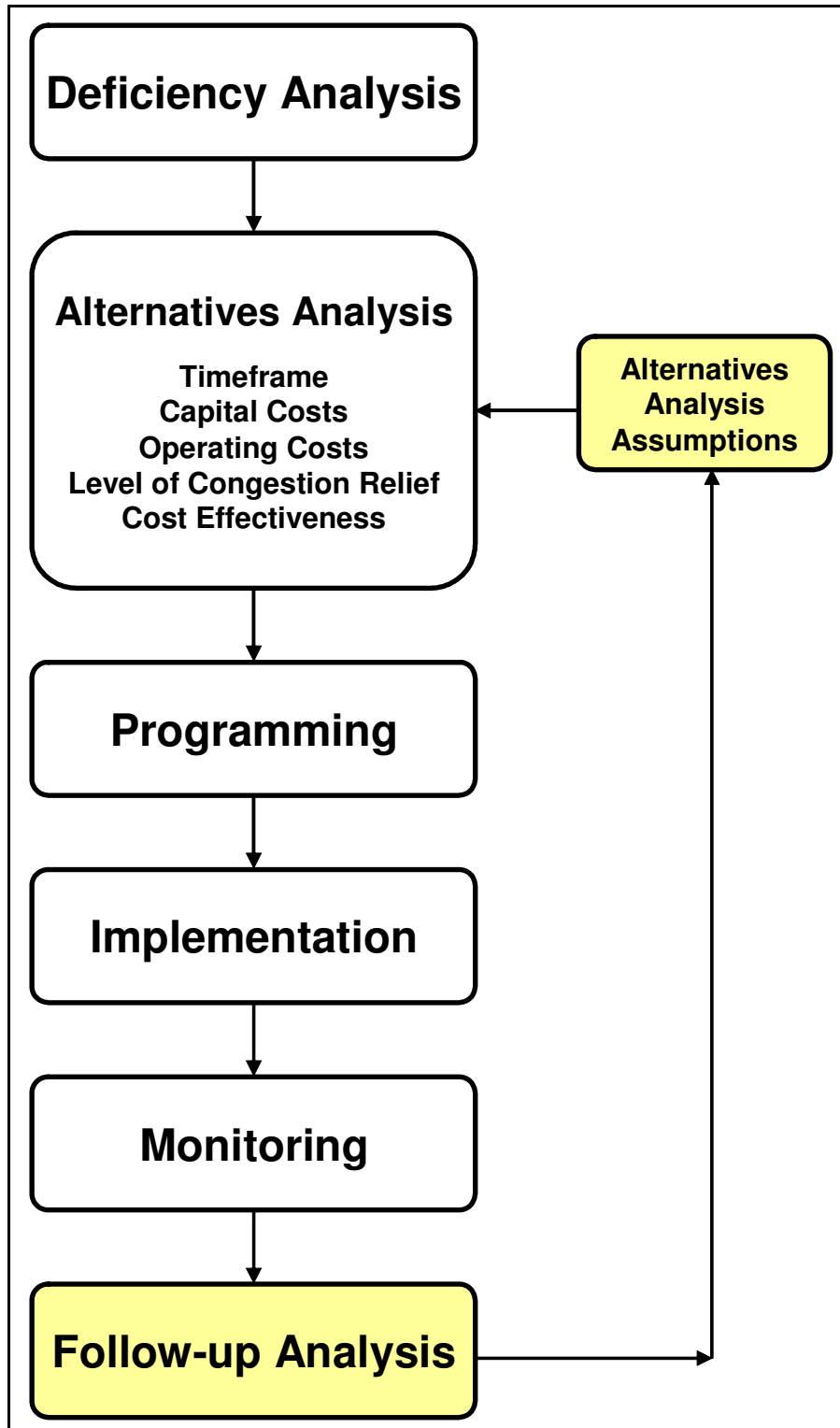
GVMC will employ a traditional approach to implementing its CMP. Data will be gathered that will allow for sophisticated computer and manual analysis. A change from the previous CMP plans includes the inclusion of Non-Recurring congestion along with the more traditional Recurring Congestion. Non-Recurring congestion is experienced when an unplanned incident occurs on or near a transportation facility. These incidents can include the following:

- Traffic Accidents
- Road Construction
- Weather
- Roadside Distractions
- Other Planned Events

GVMC will utilize Intelligent Transportation Systems (ITS) technologies to address this type of congestion. Incident recognition and response will be greatly improved when ITS is fully implemented in the region. As part of the region wide ITS deployment, all major freeways will be instrumented with a speed/congestion monitoring system that will quickly detect nonrecurring incidents on the areas highly traveled roadways. This effort is being supplemented with the expansion of the areas Dynamic Message Signs (DMS). Traveler notification and the general dispersion of traffic information will give the traveling public information when they are making their transportation options.

As for recurring congestion, there have been some improvements made in several areas. Traffic data acquisition, reporting and follow-up analysis will be upgraded or improved with this effort. A list of deficient transportation facilities will be identified using the much more comprehensive data collection process. After deficiencies are identified, an in depth alternatives analysis will be completed using the alternatives listed in Appendix A. Issues such as time frame, capital costs, operating costs, level of congestion relief, and overall benefit to cost will be identified. After all of the analysis is complete, this information is then used to select the optimal group of projects that maximizes the expenditure of federal funds. After the projects have been implemented, a period of monitoring is introduced that observes how the improvement effected overall congestion on the corridor and how the group of projects changed transportation efficiency regionally. The last step in the process is follow-up analysis. This involves checking to make sure that the assumptions used for the initial analysis still hold true. When assumptions are found to be inaccurate, GVMC will make the appropriate adjustment.

The following flow chart depicts the CMP process:



CMP Network

For the purposes of data collection and system monitoring, many MPOs identify a subset of the regional street and highway network as their “CMP Network”. GVMC made the decision many years ago to include the entire functionally classified street system in the CMP. The justification for including all roadway facilities in the system is simple. The area was and continues to grow at such a rapid rate that a low volume collector today could become a high volume arterial serving major residential and commercial areas in a short period of time. In some cases, roadways that are not currently functionally classified have also been included in the CMP due to the potential these facilities exhibit. Currently, the CMP for the Grand Rapids Metropolitan Area includes in excess of 1,350 center lane miles. The GVMC CMP network is shown below in Figure 1. In addition, Table 1 shows the roadway function classification and corresponding number.

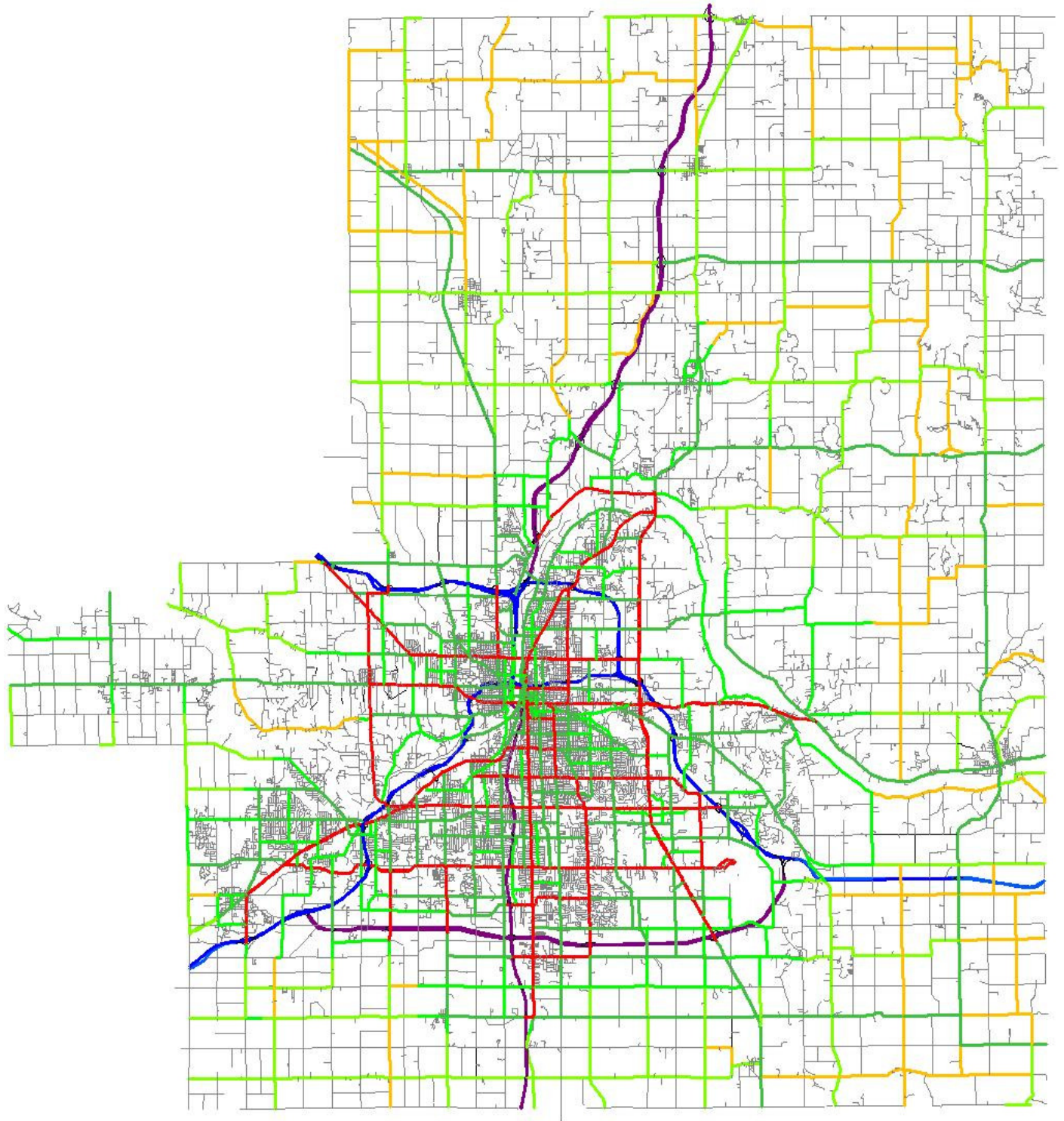
Number	Function Classification
1 – Purple	Rural Interstate
2 – Blue	Rural Freeway
6 – Dk Grn	Rural Minor Arterial
7 – Lt Grn	Rural Major Collector
8 – Orange	Rural Minor Collector
11 – Blue	Urban Interstate
12 – Purple	Urban Freeway
14 – Red	Urban Principal Arterial
16 Dk Grn	Urban Minor Arterial
17 Lt Grn	Urban Collector

System Monitoring and Data Collection

The GVMC CMP currently incorporates a vast amount of data collection and system monitoring activities into the CMP Network. These activities include:

- Collection and analysis of observed traffic volumes from state and local agencies. Traffic counts will be collected in 15 minute increments where possible to allow for maximum analysis flexibility ;
- Maintenance of a system wide database that includes at a minimum 24 hour counts. This database will encompass 100% of the CMP network. Counts used for the CMP will be no older than 4 years.
- Maintenance of historical traffic volume data.
- Incorporation of all CMP data into GVMC Regional Infrastructure Management System (RIMS). RIMS is a GIS based data management system.

Figure 1 GVMC CMP Map



Performance Measures and Congestion Identification

In the past the only performance measure used by GVMC was Level of Service (LOS) based upon observed and projected Volume to Capacity (V/C) ratios. As its name implies, the volume-to-capacity ratio is simply the demand for travel on a roadway divided by the capacity of the roadway. Observed daily traffic volumes and characteristics of the CMP transportation roadway segments assembled by GVMC are used to calculate the volume-to-capacity ratio. Level of service grades corresponding to volume-to-capacity ratios are shown in Table 1. In order to attain GVMC's goal of level of service D, a roadway would have to have a volume-to-capacity ratio of 1.0 or less. The map on page 4 depicts congested corridors and identified intersections where recurring congestion has been observed.

Table 1. Roadway Volume-to-Capacity Ratios and Corresponding Level of Service

<u>V/C ratio</u>	<u>LOS</u>
Less than 0.75	LOS A up to C
0.76 to 1.00	LOS D
1.01 to 1.24	LOS E
1.25 or above	LOS F

GVMC established a level of service goal of "D" (a volume to capacity ratio of 1.00 or less) for regionally significant roadway facilities as part of its Long-Range Transportation Plan (LRP) process.

An enhanced traffic data collection program implemented in early 2005 allows for a more robust approach to performance measures. The revised performance measures include the following:

- Congestion Based:
 - + Peak period V/C ratio on link
 - + Peak period travel time on link
 - + Peak Period intersection delay or LOS
 - + % of regional system deficient during peak periods
- Accessibility Based:
 - + % of population within 15 minutes of selected activities (retail, hospitals, elementary schools) using all modes
 - + % of population within 1/4 mile walking distance to selected activities (retail, hospitals, elementary schools)

Figure 2 and 3 identify congested segments in the GVMC CMP network in 2005 and in 2035 if no mitigated strategies are taken to improve it.

Congestion Management Strategies

The GVMC CMP provides information about a wide range of congestion management strategies applicable to the Grand Rapids area. Using a CMP “cafeteria plan”, the MPO committees can select the appropriate solution for recurring congested locations.

The intent of the CMP “cafeteria plan” is to provide a reference for the development of alternative strategies for consideration in Major Investment Studies (MIS) and Corridor Studies, which may be conducted within the context of the Grand Rapids metropolitan transportation planning process.

GVMC CMP strategies include:

- A. Highway Projects;
- B. Transit Projects;
- C. Intelligent Transportation System (ITS) and Transportation System Management (TSM) Strategies;
- D. Transportation Demand Management (TDM) Strategies;
- E. Land Development Strategies
- F. Bicycle and Pedestrian Projects; and
- G. Access Management Strategies;

A. Highway Projects

The Long Range Transportation Plan for the area presents the potential highway infrastructure projects that may be applicable for the Grand Rapids area. The regional travel model and RIMS are the primary analysis tools to assess the transportation impacts.

B. Transit Projects

Transit services and infrastructure projects have traditionally been implemented in regions to provide an alternative to automobile travel potentially reducing peak-period congestion and improving mobility and accessibility for commuters. The 2020 Mobile Metro Plan presents the transit projects that may be applicable for the area. These projects tend to reduce system wide VMT in relatively small increments but do improve corridor and system wide accessibility, improve roadway travel times, and decrease congestion on the roadway system.

C. Intelligent Transportation System (ITS) and Transportation System Management (TSM)

Intelligent Transportation System (ITS) and Transportation System Management (TSM) strategies have traditionally focused on improving the operation of the transportation system without major capital investment and cost. While ITS strategies may be costly compared to more traditional TSM strategies, their relative congestion reduction impacts can be significant. Appendix A presents the ITS and TSM strategies that may be applicable for the Grand Rapids area. The strategies identified in Appendix A can build upon current ITS initiatives in the region such as the traffic signal coordination program

D. TDM Measures

Transportation demand management (TDM) strategies are used to reduce travel during

the peak, commute period. They are also used to help the area meet air quality conformity standards, and are intended to provide ways to provide congestion relief/mobility improvements without high cost infrastructure projects. Appendix A presents the TDM strategies that may be applicable for the region. These strategies can potentially build upon current initiatives being implemented in the region such as the local ride share program, funded through the MPO.

E. Land Development Strategies

Land development strategies have been used in some areas to manage transportation demand on the system, and to help agencies meet air quality conformity standards. Land development strategies can include limits on the amount and location of development until certain service standards are met, or policies that encourage development patterns better served by public transportation and non-motorized modes. The Grand Valley Metro Council Blueprint strives to work with local jurisdictions to plan for land development strategies that strike an appropriate balance between land use and transportation.

F. Bicycle and Pedestrian Projects

Non-motorized modes of transportation, such as biking and walking, are often overlooked as alternatives for alleviating congestion. Investments in these modes can increase safety and mobility in a cost-efficient manner, while providing a zero-emission alternative to motorized modes. The strategies listed can be implemented in the area with relatively little cost, but tend to have local rather than system wide impacts. The effectiveness of an investment in non-motorized travel depends heavily on coordination with local land use policies and connections with other modes, such as transit, for longer distance travel. Safety and aesthetics should also be emphasized in the design of bicycle and pedestrian facilities in order to increase their attractiveness.

G. Access Management

Access management is a broad concept that can include everything from curb cut restrictions on local arterials to minimum interchange spacing on freeways. Restricting turning movements on local arterials can reduce accidents and prevent turning vehicles from impeding traffic flow. Similarly, eliminating merge points and weaving sections at freeway interchanges increases the capacity of the facility. The access management strategies listed in Appendix A are applicable to the area, and can be used in either the modification or original design of a facility.

System Evaluation

The implementation of CMP strategies are tracked through the development of the TIP. Evaluation of implemented CMP strategies are conducted as “before and after” studies for individual projects, through modeling exercises or through spot reviews of the benefits and costs of project types, as appropriate. At a minimum the network for the regional travel demand forecasting model will be updated every four years, in advance of each long range plan update, to reflect implemented CMP strategies involving highway or increased transit capacity into the existing network.

Integration into MPO planning process

The GVMC CMP is only one component of the overall metropolitan planning process. It is integrated with the Long Range Transportation Plan (LRP), Transportation Improvement Program (TIP) and MIS and Corridor Studies through its data and analysis functions. These relationships are summarized below.

Relationship to the LRP

The GVMC CMP is related to the development of the regional Long-Range Transportation Plan in three ways:

- The CMP provides system performance information which may be used by GVMC staff to identify corridors or segments for detailed analysis in Corridor or Major Investment Studies, as recommended by the LRP; and
- The CMP Cafeteria Plan provides alternative congestion management strategies for consideration in MIS and Corridor Studies, which ultimately provide recommendations for preferred strategies to be incorporated into the LRP.
- The CMP provides system performance information for local jurisdictions who sponsor improvement projects. This information may influence their recommended projects for corporation in the LRP;

Relationship to the TIP

The GVMC CMP is related to the development of the regional Transportation Improvement Program in three ways:

- The CMP provides system performance information for project sponsors, which may influence their recommended projects for incorporation in the TIP;
- The CMP provides system performance information for use by GVMC in evaluating projects nominated for inclusion in the TIP; and
- The CMP provides information about alternative congestion management strategies considered for SOV capacity projects to be advanced using federal funds.

Relationship to Major Investment Studies (MIS) and Other Special Studies

The GVMC CMP is related to the development of MIS and Corridor Studies in two ways:

- The CMP provides system performance information which may be used by GVMC to identify corridors or segments for detailed analysis in Corridor or Major Investment Studies; and
- The CMP Cafeteria Plan provides alternative congestion management strategies for consideration in MIS and Corridor Studies. When traffic congestion is referenced in the Purpose and Need statement for an MIS, the MIS should consider the congestion management strategies included in the GVMC CMP Cafeteria Plan as a starting point for the development of alternative strategies. This does not preclude the MIS from considering other strategies that may not be in the CMP Cafeteria Plan, nor does it require that the MIS select a strategy from the CMP Cafeteria Plan as the preferred alternative.

Relationship to the Regional Intelligent Transportation Systems (ITS) Architecture

All ITS strategies implemented from the CMP Cafeteria Plan will be consistent with the Regional ITS Architecture. GVMC will ensure that both the Regional ITS Architecture and the CMP Cafeteria Plan are reviewed for consistency and reconciled as necessary when either is updated.

Regionally Significant Projects not in CMP

Occasionally, regionally significant projects on facilities not included on the CMP network are considered for implementation. Due to the fact that all federal aid urban facilities in the study area are included in the GVMC CMP, only new facilities would fall into the category of regionally significant facilities not in the CMP. In these cases CMP cafeteria options are followed as described below:

- An analysis of alternatives, including TDM and TSM, is conducted in the context of a Major Investment Study, Corridor Study or development of a NEPA Environmental Document to develop the preferred strategy for the project;
- The development of alternatives for the MIS, Corridor Study or NEPA Document includes a review of the strategies catalogued in the GVMC CMP cafeteria plan;
- The documentation of the study describes how the CMP cafeteria plan strategies were addressed in the development of the preferred strategy.

Review and Update

All elements of the GVMC CMP are reviewed and updated periodically to reflect changes to the region's transportation goals and objectives and transportation systems.

At a minimum:

- The CMP Network is updated every four years, in advance of each update to the Long-Range Transportation Plan;
- CMP Network performance is analyzed every four years by GVMC, in advance of each update to the Plan;
- The regional travel demand forecasting model network is updated every four years, in advance of each Plan update;
- Observed traffic volumes are incorporated into the CMP database and RIMS as they are made available to GVMC;
- Policies and procedures governing the CMP are reviewed and revised as necessary to address changes to regional transportation goals and/or federal rules and requirements.

Appendix A
Cafeteria Plan Alternatives

Potential Highway Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: Increasing Number of Lanes without Highway Widening

Uses “excess” width in the highway cross section used for breakdown lanes or median

Increased Capacity

Alternative: Geometric Design Improvements

This includes widening to provide shoulders, additional turn lanes at intersections, auxiliary lanes to improve merging and diverging.

Increase mobility

Reduce congestion by improved, sight lines improving bottlenecks

Increase traffic flow and improve safety

Alternative: HOV Lanes

This increases corridor capacity while at the same time provides an incentive for single-occupant drivers to shift to ridesharing. These lanes are most effective as part of a comprehensive effort to encourage HOVs, including publicity, outreach, park-and-ride lots, and ride share matching services.

Reduce Regional Trips

Increase Vehicle Occupancy

Improve Travel Time

Increase transit use efficiency

Reduce Regional VMT

Alternative: Highway Widening by Adding Lanes

Traditional Method for relieving congestion

Increased capacity, reduced congestion in the short term. Long term effects depend on local conditions

Potential Transit Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: Implementing Park-and-Ride Lots

These can be used in conjunction with HOV lanes and/or express bus services. They are particularly helpful for encouraging HOV use for longer distance commute trips.

Reduce regional VMT

Increase mobility and transit efficiency

Alternative: Increasing Bus Route Coverage or frequencies

This provides better accessibility to transit to a greater share of the population. Increasing frequency makes transit more attractive to use.

Increase transit ridership

Decrease travel time

Reduce daily VMT

Potential ITS/TSM Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: Ramp Metering

This allows freeways to operate at their optimal flow rates, thereby speeding travel and reducing collisions.

Decreased travel time

Alternative: Highway Information Systems

These systems provide travelers with real-time information that can be used to make trip and route choice decisions.

Reduced travel times and delay

Peak period travel shift

Alternative: Advanced Traveler Information Systems

This provides an extensive amount of data to travelers, such as real time speed estimates on the web or over wireless devices, and transit vehicle schedule progress.

Reduced travel times and delay

Peak period travel shift

Alternative: Traffic Signal Coordination

This improves traffic flow and reduces emissions by minimizing stops on arterial streets.

Improve travel time

Reduce number of stops

Alternative: Freeway Incident Detection and Management Systems

This is an effective way to alleviate nonrecurring congestion. Systems typically include video monitoring, dispatch systems, and sometimes roving service patrol vehicles.

Reduce accident delay

Reduce travel time

Potential TDM Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: Alternative Work Hours

This allows workers to arrive and leave work outside of the traditional commute period. It can be on a scheduled basis or a true flextime.

Reduce peak period VMT

Improve travel time for participants

Alternative: Telecommuting

This involves employees to work at home or regional tele-commute center instead of going into the office. They might do this all the time, or only one or more days per week.

Reduce VMT

Reduce SOV trips

Alternative: Mixed-Use Development

This allows many trips to be made without automobiles. People can walk to restaurants and services rather than use their vehicles.

Increase walk trips

Decreased SOV trips

Decrease in VMT & VHT

Alternative: Ridesharing

This is typically arranged/encouraged through employers or transportation management agencies (TMA), which provides ride-matching services.

Reduce work related VMT

Reduce SOV trips

Potential Land Development Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: Transit-Oriented Development

This clusters housing units and/or businesses near transit stations in walkable communities

Decrease SOV share

Increased transit usage

Decreased vehicle trips/VMT

Alternative: Infill and Densification

This takes advantage of infrastructure that already exists, rather than building new infrastructure on the fringes of the urban area.

Decrease SOV

Increased transit

Decreased VMT per dwelling

Potential Non-motorized Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: New Sidewalks and Designated Bicycle Lanes on Local Streets.

Enhancing the visibility of bicycle and Increased mobility and access pedestrian facilities increases the perception of safety. In many cases, bike lanes can be added to existing roadways

Increased mobility and access

Increased non-motorized mode share

Reduced incidents

Alternative: Improved Bicycle Facilities at Transit Stations and Other Destinations

Bicycle racks and bike lockers at transit stations and other trip destinations increase security. Additional amenities such as locker rooms with showers at workplaces provide further incentives for using bicycles.

Increased bicycle mode share

Reduced congestion at major trip generators

Alternative: Improved Safety of Existing Bicycle and Pedestrian Facilities.

Maintaining lighting, signage, striping, traffic control devices, and pavement quality, and installing curb cuts, curb extensions, median refuges, and raised crosswalks can increase bicycle and pedestrian safety.

Increased non-motorized mode share

Reduced incidents

Alternative: Exclusive Non-Motorized Rights-of-Way.

Abandoned rail rights-of-way and existing parkland can be used for medium- to long distance bike trails, improving safety and reducing travel times.

Increased mobility

Reduced congestion on nearby roads

Potential Access Management Strategies in the GVMC CMP Cafeteria Plan

Strategies/Projects

Congestion and Mobility Benefits

Alternative: Left Turn Restrictions; Curb Cut and Driveway Restrictions

Turning vehicles can impede traffic flow and are more likely to be involved in crashes.

Increased capacity/efficiency

Improved mobility/travel time

Alternative: Turn lanes and New or Relocate Driveways and Exit Ramps

In some situations, increasing or modifying access to a property can be more beneficial than reducing access

Increase capacity/efficiency

Improved mobility/safety

Improved travel times

Appendix B

2005 Congested Roadways by Jurisdiction

Political Jurisdiction	Road	Function Class	Congested Length (mile)
Ada Township	Grand River Drive	Urban Collector	2.98
	Knapp Street	Urban Minor Arterial	0.83
	M-21 (Fulton Street)	Urban Principal Arterial	4.5
	Carl Drive	Urban Collector	0.34
	Ada Drive	Urban Minor Arterial	0.38
	Thornapple River Drive	Urban Minor Arterial	1.14
	Buttrick Ave	Urban Minor Arterial	0.03
			10.2
Algoma Township	10 Mile Road	Rural Major Collector	1.65
	14 Mile Road	Rural Minor Collector	0.63
	Northland Drive	Rural Major Collector	0.31
	Division St	Urban Minor Arterial	0.23
		2.82	
Allendale Township	M-45 (Lake Michigan Drive)	Urban Principal Arterial	7.51
	68 th Ave	Urban Minor Arterial	2.26
	48 th Ave	Rural Major Collector	2.02
		11.79	
Alpine Township	4 Mile Road	Urban Minor Arterial	0.12
	Alpine Ave	Urban Minor Arterial	1.27
		1.39	
Byron Township	68 th Ave	Urban Principal Arterial	0.49
		0.49	
Caledonia Township	68 th St	Urban Collector	0.51
	84 th St	Rural Minor Arterial	2.08
	M-37 (Broadmoor Ave)	Urban Principal Arterial	2.89
	M-37 (Cherry Valley Ave)	Rural Minor Arterial	2.32
		7.8	
Cannon Township	Belding Road	Urban Minor Arterial	2.57
			2.57
Cascade Township	Thornapple River Drive	Urban Minor Arterial	2.25
	M-37 (Broadmoor Ave)	Urban Principal Arterial	0.41
	28 th St	Urban Principal Arterial	2.19
	Burton St	Urban Minor Arterial	0.5
	Cascade Rd	Urban Minor Arterial	0.44
	30 th St	Not Classified-Modeled	0.62
		6.41	

2005 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
City of East Grand Rapids	Breton Rd	Urban Minor Arterial	0.96
	Lake Drive	Urban Minor Arterial	1.13
	Plymouth Ave	Urban Collector	0.85
			2.94
City of Grandville	28 th St	Urban Principal Arterial	1.28
	I-196 EB	Urban Interstate	1.47
	I-196 WB	Urban Interstate	2.25
	Chicago Drive	Urban Principal Arterial	1.71
	Wilson Ave	Urban Minor Arterial	0.51
	Rivertown Parkway	Urban Principal Arterial	2.18
	44 th St	Urban Principal Arterial	1.17
	Ivanrest Ave	Not Classified-Modeled	0.2
			10.77
City of Grand Rapids	Alpine Ave	Urban Principal Arterial	1.15
	Ann St	Urban Minor Arterial	0.65
	Covell Ave	Urban Minor Arterial	0.5
	Leonard St	Urban Principal Arterial	3.91
	Walker Ave	Urban Minor Arterial	1.34
	Burton St	Urban Principal Arterial	5.9
	Clyde Park Ave	Urban Minor Arterial	0.41
	6 th St	Urban Collector	0.36
	US 131 (SB)	Urban Interstate	3.54
	US 131 (NB)	Urban Interstate	4.28
	Plainfield Ave	Urban Principal Arterial	2.11
	College Ave	Urban Minor Arterial	1.5
	Fuller Ave	Urban Principal Arterial	4.45
	Fulton St	Urban Principal Arterial	4.95
	North Park St	Urban Minor Arterial	0.05
	I-96 (EB)	Urban Interstate	1.19
	I-96 (WB)	Urban Interstate	2.44
	M-44 (East Beltline)	Urban Principal Arterial	3.47
	M-45 (Lake Michigan Drive)	Urban Principal Arterial	2.12
	Alger St	Urban Minor Arterial	1.15
Bridge St	Urban Minor Arterial	0.41	
M-11 (28 th St)	Urban Principal Arterial	4.22	
Division Ave	Urban Principal Arterial	4.32	

2005 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
City of Grand Rapids	I-196 (WB)	Urban Interstate	6.62
	I-196(EB)	Urban Interstate	3.83
	Eastern Ave	Urban Principal Arterial	3.46
	Kalamazoo Ave	Urban Principal Arterial	3.36
	Madison Ave	Urban Minor Arterial	0.96
	Newberry St	Urban Collector	0.16
	Monroe Ave	Urban Minor Arterial	1.1
	Breton Rd	Urban Minor Arterial	1.0
	Plymouth Ave	Urban Minor Arterial	0.98
	Lake Drive	Urban Minor Arterial	1.33
	Franklin St	Urban Minor Arterial	0.54
	Wealthy St	Urban Principal Arterial	0.8
	Michigan St	Urban Principal Arterial	0.79
	Stocking Ave	Urban Minor Arterial	0.4
	Market Ave	Urban Minor Arterial	1.81
	7 th St	Urban Minor Arterial	0.06
	Jefferson Ave	Urban Minor Arterial	0.13
	Grandville Ave	Urban Principal Arterial	1.63
	Oaks St	Not Classified-Modeled	0.21
	Ionia Ave	Urban Minor Arterial	0.16
	Lane Ave	Not Classified-Modeled	0.08
	Lexington Ave	Urban Minor Arterial	0.32
	Hall St	Urban Principal Arterial	0.55
	Ottawa Ave	Urban Minor Arterial	0.2
	Taylor Ave	Urban Principal Arterial	0.03
	Richmond St	Urban Minor Arterial	0.27
	32 nd St	Urban Minor Arterial	0.65
	44 th St	Urban Principal Arterial	0.39
	East Paris Ave	Urban Minor Arterial	0.89
	Knapp St	Urban Minor Arterial	0.31
			87.54
City of Hudsonville	Balsam Drive	Urban Minor Arterial	0.37
	32 nd Ave	Urban Principal Arterial	0.4
			0.77
City of Kentwood	M-37 (Broadmoor Ave)	Urban Principal Arterial	4.0
	28 th St	Urban Principal Arterial	1.74
	32 nd St	Urban Minor Arterial	1.27
	44 th St	Urban Principal Arterial	3.96

2005 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
City of Kentwood	52 nd St	Urban Principal Arterial	1.0
	Patterson Ave	Urban Principal Arterial	3.18
	East Paris Ave	Urban Minor Arterial	0.98
	Kalamazoo Ave	Urban Principal Arterial	2.0
			18.13
City of Walker	Wilson Ave	Urban Principal Arterial	6.58
	Fruit Ridge Ave	Urban Principal Arterial	0.28
	US 131 (SB)	Urban Interstate	1.04
	US 131 (NB)	Urban Interstate	2.14
	M-45(Lake Michigan Drive)	Urban Principal Arterial	1.56
	3 Mile Road	Urban Minor Arterial	0.16
	Walker Ave	Urban Minor Arterial	0.17
	Alpine Ave	Urban Minor Arterial	1.2
	North Park St	Urban Minor Arterial	0.31
	I-96 (EB)	Urban Interstate	0.16
			13.6
City of Wyoming	28 th St	Urban Principal Arterial	3.53
	44 th St	Urban Principal Arterial	3.49
	52 nd St	Urban Minor Arterial	0.32
	54 th St	Urban Principal Arterial	1.14
	Wilson Ave	Urban Principal Arterial	1.58
	Byron Center Ave	Urban Minor Arterial	0.75
	Burlingame Ave	Not Classified-Modeled	0.38
	Rivertown Parkway	Urban Principal Arterial	0.34
	US131 (NB)	Urban Freeway	1.38
	US 131 (SB)	Urban Freeway	0.69
	Burton St	Urban Principal Arterial	0.51
	I-196 (EB)	Urban Interstate	1.59
	Division Ave	Urban Principal Arterial	0.29
			15.99
Gaines Township	84 th St	Rural Minor Arterial	0.98
			0.98
Grand Rapids Township	M-44 (East Beltline)	Urban Principal Arterial	4.1
	M-21 (Fulton St)	Urban Principal Arterial	0.37
	I-96 (WB)	Urban Interstate	1.8
	I-96 (EB)	Urban Interstate	1.72
	Cascade Rd	Urban Minor Arterial	1.33
	Woodward Lane	Not Classified-Modeled	0.3
	Robinson Rd	Urban Collector	0.04
	East Paris Ave	Urban Minor Arterial	0.48

2005 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
Georgetown Township	Chicago Drive	Urban Principal Arterial	5.6
	Baldwin St	Urban Minor Arterial	0.53
	Port Sheldon St	Urban Minor Arterial	1.99
	Bauer Road	Rural Major Collector	1.51
	8 th Ave	Urban Minor Arterial	0.83
	28 th Ave	Urban Minor Arterial	1.55
	48 th Ave	Rural Major Collector	1.53
	Kenowa Ave	Urban Minor Arterial	0.56
	Tyler St	Urban Minor Arterial	0.25
	Main St	Urban Minor Arterial	0.28
	Cottonwood Drive	Urban Minor Arterial	0.66
	44 th St	Urban Principal Arterial	1.6
Grattan Township	Belding Road	Rural Minor Arterial	2.99
			2.99
Jamestown Township	32 nd Ave	Rural Major Collector	2.46
	8 th Ave	Urban Minor Arterial	0.09
			2.55
Lowell Township	Fulton St	Rural Minor Arterial	2.9
	Alden Nash Ave	Rural Minor Arterial	3.56
	Segwun Ave	Rural Minor Arterial	0.38
	Hudson St	Rural Minor Arterial	0.63
	Main St	Rural Minor Arterial	1.03
			8.5
Oakfield Township	14 Mile Road	Rural Minor Arterial	2.9
			2.9
Plainfield Township	M-44 (Northland Drive)	Urban Principal Arterial	2.14
	M-44 (East Beltline)	Urban Principal Arterial	3.9
	Wolverine Blvd	Urban Minor Arterial	2.56
	West River Drive	Urban Principal Arterial	1.85
	US 131 (NB)	Urban Freeway	6.21
	Division Ave	Urban Collector	0.24
	North Park St	Urban Minor Arterial	0.17
	Plainfield Ave	Urban Principal Arterial	1.04
	Post Drive	Urban Minor Arterial	0.49
		18.6	
Sparta Township	M-37	Rural Minor Arterial	4.5
			4.5
Total			261.16

Appendix C

2030 Congested Roadways by Township

Political Jurisdiction	Road	Function Class	Congested Length (mile)
Ada Township	Grand River Drive	Urban Collector	4.59
	Knapp Street	Urban Minor Arterial	1.04
	M-21 (Fulton Street)	Urban Principal Arterial	6.17
	Carl Drive	Urban Collector	0.34
	Ada Drive	Urban Minor Arterial	2.27
	Thornapple River Drive	Urban Minor Arterial	1.14
	Buttrick Ave	Urban Minor Arterial	0.45
	Spaulding Ave	Urban Minor Arterial	1.48
	Pettis Ave	Urban Minor Arterial	2.0
	Vergennes	Urban Collector	2.16
			21.64
Algoma Township	10 Mile Road	Rural Major Collector	1.33
	14 Mile Road	Rural Minor Collector	0.76
	Northland Drive	Rural Major Collector	0.31
			2.4
Allendale Township	M-45 (Lake Michigan Drive)	Urban Principal Arterial	7.51
	48 th Ave	Rural Major Collector	0.53
			8.04
Alpine Township	4 Mile Road	Urban Minor Arterial	0.97
	6 Mile Road	Rural Major Collector	0.34
	10 Mile Road	Rural Major Collector	0.25
	Alpine Ave	Urban Minor Arterial	4.36
	Fruit Ridge Ave	Rural Major Collector	6.11
	M-37	Rural Minor Artrial	0.25
			12.28
Byron Township	68 th St	Urban Principal Arterial	0.67
	84 th St	Urban Collector	2.45
	100 th St	Rural Major Collector	0.88
	Burlingame Ave	Not Classified-Modeled	0.47
	Ivanrest Ave	Not Classified-Modeled	0.14
	Byron Center Ave	Urban Minor Arterial	0.27
	Clyde Park Ave	Urban Collector	0.69
			5.57
Caledonia Township	68 th St	Urban Collector	2.83
	84 th St	Rural Minor Arterial	3.11
	M-37 (Broadmoor Ave)	Urban Principal Arterial	2.92

	M-37 (Cherry Valley Ave)	Rural Minor Arterial	2.75
	Kraft Ave	Not Classified-Modeled	1.6
	Whitneyville Road	Rural Major Collector	0.25

2030 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
Cannon Township	Belding Road	Urban Minor Arterial	2.57
	Pettis Ave	Rural Major Collector	2.0
	Cannonsburg Rd	Rural Major Collector	1.22
	Myers Lake Ave	Urban Collector	0.99
			20.24
Cascade Township	Thornapple River Drive	Urban Minor Arterial	2.25
	M-37 (Broadmoor Ave)	Urban Principal Arterial	0.42
	28 th St	Urban Principal Arterial	2.52
	Burton St	Urban Minor Arterial	0.5
	Cascade Rd	Urban Minor Arterial	0.53
	30 th St	Not Classified-Modeled	0.62
	Spaulding Ave	Urban Minor Arterial	1.39
	Kraft Ave	Urban Minor Arterial	0.55
	Whitneyville Ave	Urban Collector	1.04
	Buttrick Ave	Urban Collector	0.28
		10.1	
City of East Grand Rapids	Breton Rd	Urban Minor Arterial	0.96
	Lake Drive	Urban Minor Arterial	1.13
	Plymouth Ave	Urban Collector	0.96
			3.05
City of Grandville	28 th St	Urban Principal Arterial	1.46
	I-196 EB	Urban Interstate	2.23
	I-196 WB	Urban Interstate	2.1
	Chicago Drive	Urban Principal Arterial	2.07
	Wilson Ave	Urban Minor Arterial	2.74
	Rivertown Parkway	Urban Principal Arterial	2.18
	44 th St	Urban Principal Arterial	1.16
	Ivanrest Ave	Not Classified-Modeled	0.47
		14.41	
City of Grand Rapids	Alpine Ave	Urban Principal Arterial	1.55
	Ann St	Urban Minor Arterial	0.79
	Covell Ave	Urban Minor Arterial	1.43
	Leonard St	Urban Principal Arterial	5.2
	Walker Ave	Urban Minor Arterial	2.15
	Burton St	Urban Principal Arterial	5.9
	Clyde Park Ave	Urban Minor Arterial	0.44

	6 th St	Urban Collector	0.60
	US 131 (SB)	Urban Interstate	4.8
	US 131 (NB)	Urban Interstate	4.04

2030 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
City of Grand Rapids	Plainfield Ave	Urban Principal Arterial	3.21
	College Ave	Urban Minor Arterial	1.67
	Fuller Ave	Urban Principal Arterial	5.83
	Fulton St	Urban Principal Arterial	5.22
	North Park St	Urban Minor Arterial	0.38
	I-96 (EB)	Urban Interstate	3.68
	I-96 (WB)	Urban Interstate	3.74
	M-44 (East Beltline)	Urban Principal Arterial	6.52
	M-45 (Lake Michigan Drive)	Urban Principal Arterial	3.24
	Alger St	Urban Minor Arterial	0.72
	Bridge St	Urban Minor Arterial	1.56
	M-11 (28 th St)	Urban Principal Arterial	4.19
	Division Ave	Urban Principal Arterial	4.31
	I-196 (WB)	Urban Interstate	5.05
	I-196(EB)	Urban Interstate	3.7
	Eastern Ave	Urban Principal Arterial	3.66
	Kalamazoo Ave	Urban Principal Arterial	3.6
	Madison Ave	Urban Minor Arterial	2.09
	Newberry St	Urban Collector	0.16
	Monroe Ave	Urban Minor Arterial	2.13
	Breton Rd	Urban Minor Arterial	1.0
	Plymouth Ave	Urban Minor Arterial	1.25
	Lake Drive	Urban Minor Arterial	1.46
	Franklin St	Urban Minor Arterial	1.04
	Wealthy St	Urban Principal Arterial	1.29
	Michigan St	Urban Principal Arterial	1.67
	Stocking Ave	Urban Minor Arterial	0.58
	Market Ave	Urban Minor Arterial	2.09
	7 th St	Urban Minor Arterial	0.06
	Jefferson Ave	Urban Minor Arterial	0.13
	Grandville Ave	Urban Principal Arterial	1.62
	Oaks St	Not Classified-Modeled	0.15
	Ionia Ave	Urban Minor Arterial	0.67
Lane Ave	Not Classified-Modeled	0.06	
Lexington Ave	Urban Minor Arterial	0.32	
Hall St	Urban Principal Arterial	0.57	
Ottawa Ave	Urban Minor Arterial	0.2	

	Taylor Ave	Urban Principal Arterial	0.03
	Richmond St	Urban Minor Arterial	0.76
	32 nd St	Urban Minor Arterial	0.68

2030 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
City of Grand Rapids	44 th St	Urban Principal Arterial	0.39
	East Paris Ave	Urban Minor Arterial	1.00
	3 Mile Road	Urban Minor Arterial	0.52
	Adam St	Urban Minor Arterial	0.02
	Buchanan Ave	Urban Minor Arterial	0.51
	Century Ave	Not Classified-Modeled	0.06
	Diamond Ave	Not Classified-Modeled	0.24
	Eastern Ave	Urban Principal Arterial	3.66
	Lafayette Ave	Urban Collector	0.1
	Leffingwell Ave	Not Classified-Modeled	0.5
	Lyon St	Urban Minor Arterial	0.05
	Maryland Ave	Not Classified-Modeled	0.81
	Oakleigh Road	Urban Minor Arterial	0.11
	Pearl St	Urban Minor Arterial	0.14
	Scribner Ave	Urban Collector	0.12
Seward Ave	Urban Collector	0.29	
Turner Ave	Urban Collector	0.42	
			116.13
City of Hudsonville	Balsam Drive	Urban Minor Arterial	0.22
	32 nd Ave	Urban Principal Arterial	0.4
			0.62
City of Kentwood	M-37 (Broadmoor Ave)	Urban Principal Arterial	6.02
	28 th St	Urban Principal Arterial	1.73
	32 nd St	Urban Minor Arterial	2.23
	44 th St	Urban Principal Arterial	4.34
	52 nd St	Urban Principal Arterial	2.01
	Patterson Ave	Urban Principal Arterial	3.54
	East Paris Ave	Urban Minor Arterial	1.59
	Kalamazoo Ave	Urban Principal Arterial	2.01
	M-44(East Beltline Ave)	Urban Principal Arterial	0.48
	Paris Ave	Urban Minor Arterial	1.01
	Shaffer Ave	Urban Minor Arterial	0.22
			25.18
City of Walker	Wilson Ave	Urban Principal Arterial	7.08
	Fruit Ridge Ave	Urban Principal Arterial	1.00
	US 131 (SB)	Urban Interstate	1.66

	US 131 (NB)	Urban Interstate	2.14
	M-45(Lake Michigan Drive)	Urban Principal Arterial	1.89
	3 Mile Road	Urban Minor Arterial	1.13

2030 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
City of Walker	Alpine Ave	Urban Minor Arterial	2.00
	North Park St	Urban Minor Arterial	0.31
	I-96 (EB)	Urban Interstate	2.56
	I-96 (WB)	Urban Interstate	0.30
	Bristol Ave	Urban Collector	0.99
	Butterworth St	Urban Collector	2.96
	Leonard St	Urban Collector	0.61
	Maynard Ave	Urban Collector	0.81
	O Brien Road	Urban Minor Arterial	0.49
City of Wyoming	28 th St	Urban Principal Arterial	3.47
	44 th St	Urban Principal Arterial	3.5
	52 nd St	Urban Minor Arterial	1.31
	54 th St	Urban Principal Arterial	1.01
	Byron Center Ave	Urban Minor Arterial	1.7
	Burlingame Ave	Not Classified-Modeled	0.50
	Rivertown Parkway	Urban Principal Arterial	0.38
	US131 (NB)	Urban Freeway	3.08
	US 131 (SB)	Urban Freeway	1.46
	Burton St	Urban Principal Arterial	0.84
	I-196 (EB)	Urban Interstate	1.59
	Division Ave	Urban Principal Arterial	0.52
	Chicago Drive	Urban Principal Arterial	2.31
	Clyde Park Ave	Urban Minor Arterial	0.52
	Eastern Ave	Urban Minor Arterial	0.29
	Gezon Parkway	Urban Minor Arterial	0.42
			22.9
Gaines Township	84 th St	Rural Minor Arterial	4.01
	Kalamazoo Ave	Urban Principal Ave	0.71
	Eastern Ave	Urban Minor Arterial	0.38
	100 th St	Rural Major Collector	0.09
			5.19
Grand Rapids Township	M-44 (East Beltline)	Urban Principal Arterial	8.21
	M-21 (Fulton St)	Urban Principal Arterial	1.54
	I-96 (WB)	Urban Interstate	4.11
	I-96 (EB)	Urban Interstate	4.01
	Cascade Rd	Urban Minor Arterial	2.95

	Woodward Lane	Not Classified-Modeled	0.30
	Robinson Rd	Urban Collector	0.13
	East Paris Ave	Urban Minor Arterial	0.48

2030 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
Grand Rapids Township	Ada Drive	Urban Minor Arterial	0.25
	Knapp St	Urban Minor Arterial	1.93
	Leffingwell Ave	Not Classified-Modeled	0.49
			24.4
Georgetown Township	Chicago Drive	Urban Principal Arterial	5.33
	Baldwin St	Urban Minor Arterial	2.09
	Port Sheldon St	Urban Minor Arterial	1.51
	Bauer Road	Rural Major Collector	2.53
	8 th Ave	Urban Minor Arterial	1.75
	Kenowa Ave	Urban Minor Arterial	0.78
	Tyler St	Urban Minor Arterial	0.25
	Main St	Urban Minor Arterial	0.23
	Cottonwood Drive	Urban Minor Arterial	0.65
	44 th St	Urban Principal Arterial	2.25
	36 th Ave	Not Classified-Modeled	0.48
	Fillmore St	Rural Major Collector	1.87
Grattan Township	Belding Road	Rural Minor Arterial	2.99
			2.99
Jamestown Township	32 nd Ave	Rural Major Collector	3.47
	8 th Ave	Urban Minor Arterial	0.09
			3.56
Lowell Township	Fulton St	Rural Minor Arterial	2.9
	Alden Nash Ave	Rural Minor Arterial	4.08
	Segwun Ave	Rural Minor Arterial	0.38
			7.36
Oakfield Township	14 Mile Road	Rural Minor Arterial	6.15
			6.15
Plainfield Township	M-44 (Northland Drive)	Urban Principal Arterial	0.58
	M-44 (East Beltline)	Urban Principal Arterial	3.9
	Wolverine Blvd	Urban Minor Arterial	2.69
	West River Drive	Urban Principal Arterial	3.15
	US 131 (NB)	Urban Freeway	6.8
	Division Ave	Urban Collector	0.24

	North Park St	Urban Minor Arterial	0.17
	Plainfield Ave	Urban Principal Arterial	1.34
	Post Drive	Urban Minor Arterial	0.77

2030 Congested Roadways by Township (Continue)

Political Jurisdiction	Road	Function Class	Congested Length (mile)
Plainfield Township	Belmont Ave	Urban Minor Arterial	0.5
	Cannonsburg Ave	Urban Collector	1.51
	Grand River Drive	Urban Collector	2.62
	Northland Drive	Urban Minor Arterial	1.76
	Pine Island Drive	Urban Collector	0.74
	Samrick Ave	Not Classified-Modeled	0.64
	US 131 (SB)	Urban Freeway	1.24
			28.65
Sparta Township	M-37	Rural Minor Arterial	5.08
	10 Mile Road	Rural Major Collector	1.11
			6.19
Total			392.7