PRELIMINARY DRAFT

Amendment to VISION 2050:

A Regional Land Use and Transportation Plan for Southeastern Wisconsin

ESTABLISHING TARGETS FOR THE TRANSIT ASSET MANAGEMENT, NATIONAL HIGHWAY SYSTEM CONDITION AND PERFORMANCE, FREIGHT PERFORMANCE, AND CONGESTION MITIGATION AND AIR QUALITY IMPROVEMENT FEDERAL PERFORMANCE MEASURES

INTRODUCTION

The Moving Ahead for Progress in the 21st Century Act (MAP-21), enacted in 2012, created a national performance management framework that established uniform performance measures and target setting to, in part, establish a consistent nationwide process for monitoring the effectiveness of Federal transportation investments. This framework was continued in the Fixing America's Surface Transportation Act (FAST Act) enacted in 2015. As part of implementing the national performance management framework established by MAP-21 and the FAST Act, the Federal Transit Administration (FTA) developed regulations for transit operators and metropolitan planning organizations (MPOs), like the Commission, to annually establish targets for performance measures related to transit asset management (TAM). Similarly, the Federal Highway Administration (FHWA) developed regulations requiring States and MPOs to establish targets every four years for performance measures related to the National Highway System (NHS) condition and performance, freight performance on the Interstate system, and Congestion Mitigation and Air-Quality Improvement (CMAQ). Table 1 shows the specific performance measures under these categories.

The performance targets established for the Region are required to be incorporated into VISION 2050—the year 2050 regional land use and transportation plan completed in 2016. Subsequent updates to VISION 2050 (every four years as part of interim plan updates and every 10 years as part of major updates) will also include a monitoring of the achievement of the targets. In addition, the regional transportation improvement program (TIP) is required to include a description of how the projects programmed in the TIP promote the achievement of the performance targets. While the Commission is required to establish TAM,

Table 1
Transit Asset Management, National Highway System, Freight, and Congestion Mitigation and Air-Quality Transportation Performance Measures Developed by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA)

Performance Measure Areas	Performance Measures
FHWA National Highway Performance Program (NHPP)	
Condition of Pavements on the Interstate System	Percentage of Pavement of the Interstate System in Good Condition Percentage of Pavement of the Interstate System in Poor Condition
Condition of Pavements on the National Highway System (NHS) Excluding the Interstate	Percentage of Pavement of the Non-Interstate NHS in Good Condition Percentage of Pavement of the Non-Interstate NHS in Poor condition
Condition of Bridges on the NHS	Percentage of NHS Bridges Classified as in Good Condition Percentage of NHS Bridges Classified as in Poor Condition
Performance of the Interstate System	Percentage of the Person-Miles Traveled on the Interstate that are Reliable
Performance of the NHS Excluding the Interstate	Percentage of the Person-Miles Traveled on the Non-interstate NHS that are Reliable
FHWA National Highway Freight Program (NHFP)	
Freight Movement on the Interstate System	Freight Reliability Index
FHWA Congestion Mitigation and Air-Quality Improvement Program (CMAQ)	
On-Road Source Emissions	Estimate of Emission Reductions for Projects Funded by CMAQ
Traffic Congestion	Peak Hour Excessive Delay (PHED) Per Capita Percentage of Non-Single Occupancy Vehicles
FTA Section 53 Funding (including Sections 5307, 5310, 5311, 5337, and 5339)	
Transit Asset Management	Percentage of Revenue Vehicles At or Exceeding the Useful Life Benchmark (ULB) Percentage of Vehicles and Equipment At or Exceeding the ULB Percentage of Facilities Exceeding the Transit Economic Requirements Model (TERM) Scale Percentage of Track Segments Having Performance Restrictions

Source: Federal Highway Administration, Federal Transit Administration, and SEWRPC

NHS, freight, and CMAQ targets and plan and program for achievement of those targets, there are no consequences—unlike for the State[1]—should those targets not be met.

In January 2017, the Milwaukee County Transit System (MCTS), the largest transit operator in the Region, established targets for the TAM performance measures. Similarly, in May 2018, the Wisconsin Department of Transportation (WisDOT) established statewide targets for the NHS, freight, and CMAQ the five safety performance targets, in coordination with the State's metropolitan planning organizations (MPOs), including the Commission. Per the regulations, the targets for the two congestion-related CMAQ performance measures were jointly established by WisDOT and the Commission for the Milwaukee urbanized area.[2]

Based on the regulations, the Commission is required to establish one-year targets for the TAM performance measures and four-year targets for the NHS, freight, and CMAQ performance measures for the Region's metropolitan planning area (MPA), as shown on Map 1. Except for the two congestion-related CMAQ performance measures, the Commission can either choose to accept the targets established by the State (and plan and program to achieve the State targets) or establish its own targets (and plan and program to achieve the areawide targets), with the Commission being permitted to choose to accept WisDOT's targets for some of the measures and establish its own targets for the remaining measures[3].

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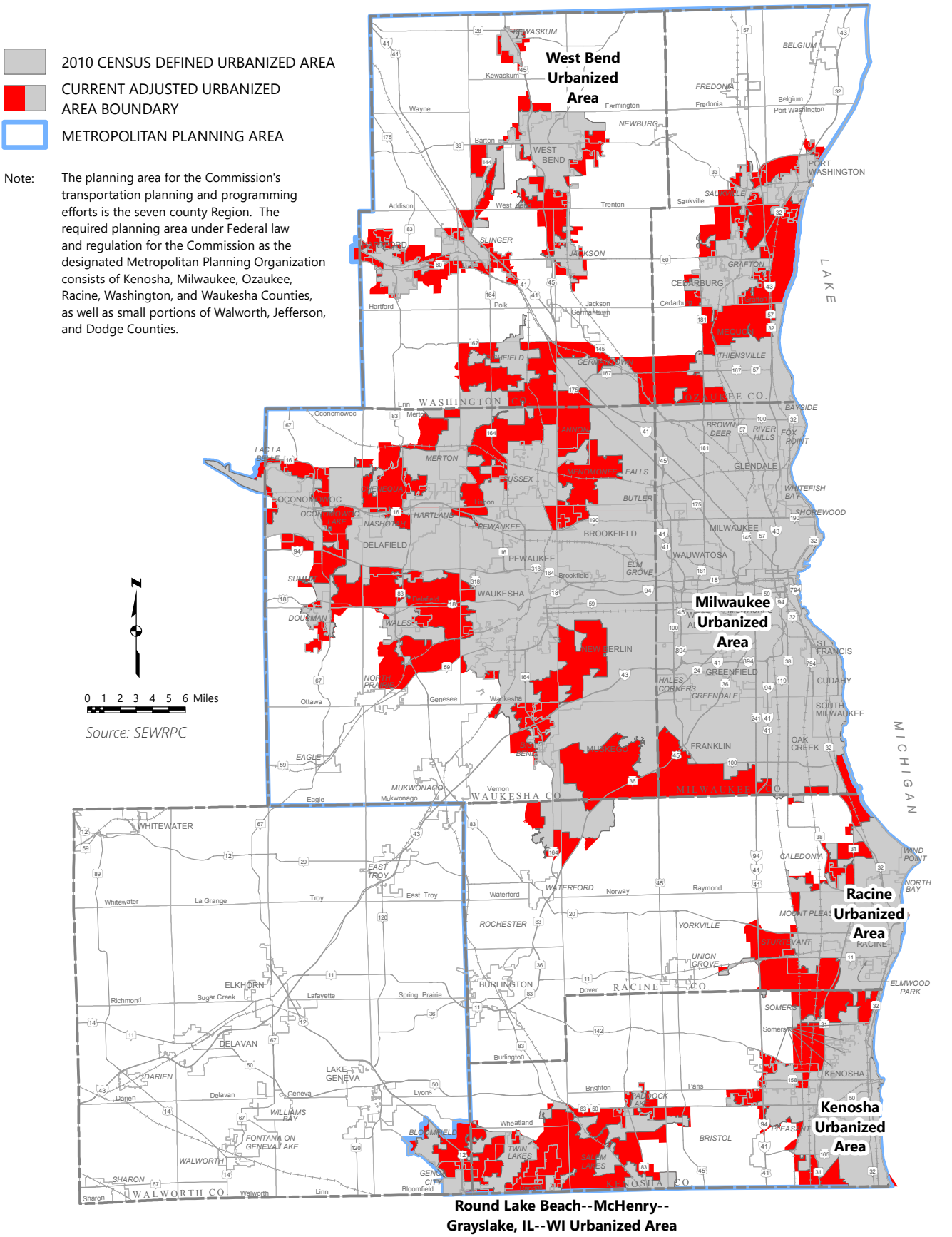
[1] Should it be determined by FHWA that significant progress—meeting target and/or exceeding baseline year data—was not achieved for any of the statewide NHS and freight performance targets, WisDOT would be required to include in their next performance report (completed biannually) a description of actions WisDOT will take to achieve such targets. Additionally, there are minimum performance requirements for the pavement condition of the statewide Interstate system—5 percent in poor condition—and for the statewide condition of bridges on the NHS—10 percent in poor condition. Not meeting these minimum requirements would affect the flexibility the State has in utilizing certain Federal funds by requiring a portion of those funds be utilized to meet the minimum requirement. There are currently no consequences for the State for not meeting the CMAQ targets and for the transit operators for not meeting the TAM targets.

[2] Per the Federal regulations, targets for the two congestion-related performance measures—the peak hourly excessive delay and the non-single occupancy vehicle performance measures—are to be calculated only for urbanized areas having a population over one million that contain within its boundary all or a portion of a non-attainment or maintenance area for the National Ambient Air-Quality Standard. For such urbanized areas, the State and the relevant MPOs are to jointly establish the same targets for these two performance measures. In Wisconsin, the congestion-related targets need to be established only for the Milwaukee urbanized area jointly by WisDOT and the Commission.

[3] This was included in the regulation to recognize that some MPOs may not have the resources to establish their own targets for the performance measures.

Map 1
The Southeastern Wisconsin Region and Census Defined and Adjusted Urbanized Area Boundaries: 2010



To allow the effective monitoring of specific plan recommendations related to the targets, separate areawide short-term targets for the TAM, NHS, freight, and CMAQ performance measures were established for the Region, rather than accepting the State's targets. In order to meet deadlines established in Federal regulations, the Commission set initial targets for performance measures related to TAM, NHS, freight, and CMAQ. The initial targets established for TAM were set in coordination with the transit operators of the Region. The initial targets for the NHS, freight, and CMAQ performance measures were based on the targets established by the State.

The remainder of this memorandum documents the process followed by the Commission in establishing targets for the TAM, NHS, freight, and CMAQ performance measures and amending VISION 2050 to incorporate the establishing and monitoring of these targets.

PROCESS FOR ESTABLISHING TARGETS

In integrating the target setting process into the VISION 2050 plan, regional long-term targets for the TAM, NHS, freight, and CMAQ performance measures to the year 2050 were established. As part of developing the year 2050 targets for each of the TAM, NHS, freight, and CMAQ performance measures, baseline data for each measure was collected or developed for the entire Region, plus those portions of Jefferson and Dodge Counties within the MPA. The methodologies used by transit operators and WisDOT to establish their targets was reviewed, along with historical trends and applicable recommendations of VISION 2050 and other State and regional plans. Based on these reviews, the Commission staff developed preliminary recommended year 2050 targets for inclusion in VISION 2050 for each of the TAM, NHS, freight, and CMAQ performance measures by either applying the transit operator or WisDOT methodology, or modifying the methodology based on historical trends and relevant recommendations identified in VISION 2050.

The preliminary year 2050 targets were reviewed and considered by the Commission's Advisory Committees on Regional Transportation Planning for incorporation into VISION 2050 as a plan amendment. The public had an opportunity to review and provide comment on the targets during a 30-day public comment period. The preliminary targets, along with any comments received and addressed by Commission staff, were reviewed and considered by the Commission in establishing final targets for inclusion in VISION 2050.

Following the inclusion of the targets in VISION 2050, monitoring of achievement of the TAM, NHS, freight, and CMAQ targets is to be completed annually as part of the Commission's Annual Report, every four years as part of the interim regional plan update, and every 10 years as part of the major regional plan update. The regional long-term targets will be reviewed and potentially updated as part of the interim and major regional plan updates. The establishment of the short-term targets for the MPA, as required by the planning regulations, will be based on the long-term regional targets.

The following sections summarize the methodologies utilized in the establishment of the targets. For the establishment of targets, the performance measures for NHS condition (pavement and bridge) and performance (reliability) were grouped separately. In addition, based on their similarities in data and methodology, the NHS reliability-related measure and the freight measure were grouped together.

TRANSIT ASSET MANAGEMENT TARGETS

Transit operators have long monitored the condition of their assets, and developed funding strategies to maintain those assets. As part of the national performance management framework, FTA developed regulations for the monitoring of the condition of transit assets nationwide. Transit operators are also required to establish targets for guiding investment to keep their assets in a state of good repair.[4] In addition, the Commission is required to work with area transit operators in establishing areawide performance targets for the MPA.

The TAM performance measures are calculated based on the data that transit operators annually submit to FTA on their assets and system operation for inclusion in the National Transit Database (NTD). The methodology for this calculation is shown on Figure 1.

Transit Operator and Initial MPO targets

Table 2 shows the one-year TAM targets established by MCTS in December 2017 for their assets. When the Commission established initial TAM targets for the MPA in June 2017, it relied heavily on the TAM targets established by MCTS due to MCTS representing about 94 percent of the replacement value of the Region's transit fleet. However, in establishing the initial targets, the Commission consulted with all of the transit

[4] The FTA TAM regulations defines a state of good repair as the condition in which a capital asset is able to operate at a full level of performance.

Figure 1
Methodology for Calculating the Transit Asset Management Performance Measures

The following is the methodology developed by FTA for calculating the following four TAM performance measures:

- Percent of revenue vehicles that have either met or exceeded their useful life benchmarks (ULB)
- Percent of vehicles and equipment that have either met or exceeded their ULB
- Percent of segments that have performance restrictions
- Percent of facilities exceeding the Transit Economic Requirements Model (TERM) scale

1. As part of the national performance management framework, transit operators are required to conduct an inventory of their transit assets as outlined in the following table:

Transit Asset Category	Asset Class	Applicable Assets
Rolling Stock	All revenue vehicles used in the provision of public transit	Only revenue vehicles with direct capital responsibility
Equipment	All non-revenue service vehicles and equipment over $50,000 used in the provision of public transit, except third-party equipment assets	Only non-revenue service vehicles with direct capital responsibility
Infrastructure	All guideway infrastructure used in the provision of public transit	Only fixed rail guideway with direct capital responsibility
Facilities	All passenger stations and all exclusive-use maintenance facilities used in the provision of public transit, excluding bus shelters	Maintenance and administrative facilities with direct capital responsibility. Passenger stations (buildings) and parking facilities with direct capital responsibility.

2. Calculate each performance measure, based on the number of assets under each transit asset category that are not in state-of-good repair. For rolling stock and non-revenue service vehicles, the state-of-good repair is identified based on the useful life benchmarks (ULB) from FTA's *Transit Database Asset Inventory Module*. The identification of the state-of-good repair for infrastructure and facilities is based on FTA's Transit Economic Requirements Model (TERM) scale, as provided in the *TAM Facility Performance Measure Reporting Guidebook: Condition Assessment Calculation*.

Table 2
Year 2018 Transit Asset Management Targets Established by the Milwaukee County Transit System

Asset			Performance Measure	Target
Category	Class	Examples		
Rolling Stock	Buses	40 foot buses	Percent of revenue vehicles that have either met or exceeded their useful life benchmark	< 30
Equipment	Non-revenue service vehicles and equipment over $50,000	Route Supervisor Vehicles, Maintenance Trucks, Pool Vehicles, DPF Cleaning System, Bus Wash Systems, Fare Collection systems, Vehicle Lifts, etc.	Percent of vehicles and equipment that have either met or exceeded their useful life benchmark	< 30
Facilities	Support	Administration Building, Fleet Maintenance, Kinnickinnic Station/Garage, Fond Du Lac Station/Garage, Fiebrantz Station/Garage, 60th and Vliet Rest Stop, Teutonia and Atkinson Rest Stop	Percent of facilities within an asset class, rated below 3 on condition reporting system	< 15
	Parking	Park-Ride Lots with Direct Capital Responsibility		0
Infrastructure	Fixed Guideway	N/A	N/A	

Source: Milwaukee County Transit System and SEWRPC

operators within the Region on their concurrence on basing the areawide targets on the MCTS targets and in establishing targets for types of transit assets not owned by MCTS, such as fixed-guideway vehicles.

Baseline Data

Transit operators are required to report asset inventory, condition, and performance information to the National Transit Database (NTD) beginning in 2019 for reporting year 2018. The 2017 NTD includes the number and age of the transit rolling stock, which is summarized in Table 3. Baseline performance of transit equipment, facilities, and infrastructure ae addressed in Transit Asset Management (TAM) plans. The TAM planning process is a new requirement, with the first set of TAM plans completed in October 2018. Transit operators and the Commission will work to track the transit asset data for the Region, and refine TAM targets as part of the continued performance monitoring and reporting process developed by FTA.

Evaluation of Historical Trends

Figure 2 shows the average vehicle age for the transit systems in the Region from 2011 to 2017. While not fully representing the TAM performance measures, the average vehicle age data shows that the condition of the transit fleet remained somewhat stable over the seven-year time period. However, most revenue vehicles, with the exception of vans, have experienced an increase in average age since 2016.

Review of Relevant Plans

VISION 2050 contains many recommendations related to expanding and improving transit in the Region. In addition, short-range (five-year) transit development plans developed for each of the Region's public transit systems contain detailed recommendations for the transit services of each operator. In addition, as part of the National performance management framework, each transit operator in the Region is required to develop asset management plans that provide a condition report of the infrastructure and for establishing performance targets to provide a basis for investment prioritization.

VISION 2050

VISION 2050 recommends a substantial improvement and expansion of transit service in Southeastern Wisconsin over the next 30 years (Recommendations 2.1 through 2.4). This includes significant improvement and expansion of public transit in Southeastern Wisconsin, including four commuter rail lines, eight rapid transit lines, and significantly expanded local bus, express bus, commuter bus, and shared-ride taxi services. As part of keeping the existing system, and the recommended expansion and improvement, a viable service

Table 3
Condition of Transit Vehicle Assets of Transit Operators in Southeastern Wisconsin: 2017

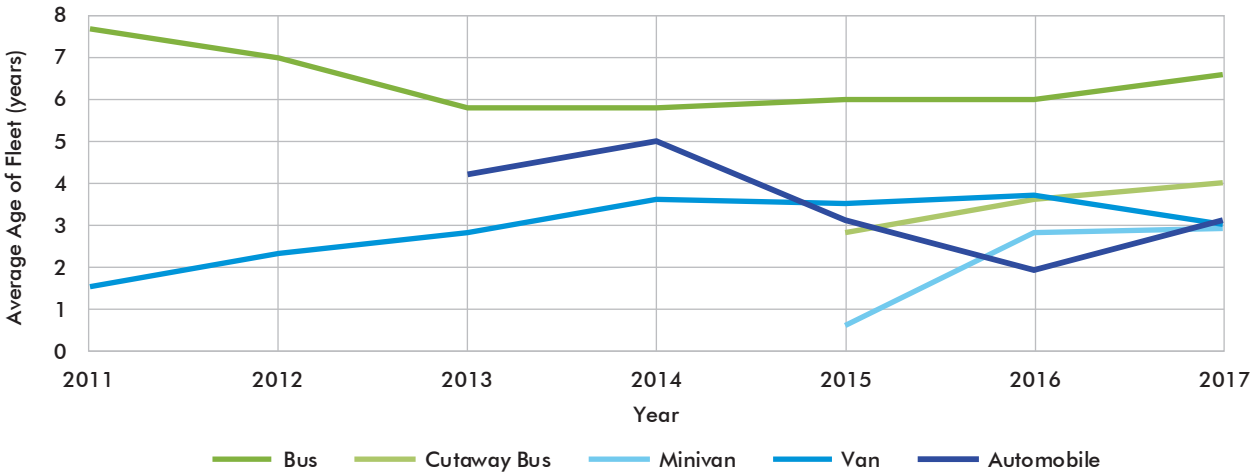
Asset Category/Class	Count	Past Age ULB	
		Number[a]	Percent
Bus	533	115	21.6
Cutaway Bus	53	7	13.2
Minivan	22	2	9.1
Van	6	4	66.7
Automobile	8	1	12.5
Vintage Trolley	7	7	100.0
Revenue Vehicles Summary	629	136	21.6

Note: This assessment utilized the Useful Life Benchmarks (ULB) identified in FTA Circular 5010.iE, March 21, 2017, revised July 16, 2018.

[a] *The Useful Life Benchmarks represent the following: buses = 12 years; cutaways = 4 years; minivans, vans, and automobiles = 4 years; vintage trolleys = 25 years.*

Source: National Transit Database and SEWRPC

Figure 2
Revenue Vehicle Weighted Average Age – Transit Operators in Southeastern Wisconsin



Source: National Transit Database and SEWRPC

to the residents of the Region, the condition of the transit assets in the Region are recommended to be kept in a state of good repair. More detail on these recommendations can be found in Chapter 1 of Volume III of the VISION 2050 report.

As part of the development of VISION 2050, it was determined that without additional transit funding being made available at the Federal and State levels, transit service would be expected to decline—as it has in recent years—by the year 2050. Based on this, a Fiscally-Constrained Transportation Plan (FCTP) was developed for the Region, which included only included the portions of the recommended transit expansion and improvement that would be expected to be completed by the year 2050 with existing and reasonably expected funds. Similarly, it is expected that, based on the existing and reasonably expected funding levels assumed under the FCTP, that transit operators will be required to maintain vehicles and other assets beyond their useful life. More detail on the FCTP can be found in Chapter 2 of Volume III of the VISION 2050 report, and in the document prepared for the Second Amendment to VISION 2050.

Transit Development Plans

The Commission has prepared, on behalf of many of the transit operators in the Region, short-range transit development plans (TDPs). These plans contain detailed recommendations for the transit services of each operator. The TDPs also make recommendations for the short-term capital needs for the transit operators for maintaining their existing assets.

Transit Asset Management Plans

As required by Federal regulations, TAM plans were developed in September 2018 for all of the transit operators in the Region. The TAM plans included a reporting on the current condition of the existing assets of the transit operators and included performance targets for guiding short-term investment decisions. In Southeastern Wisconsin, separate TAM plans were developed for the two Tier I transit operators[5]—MCTS and Kenosha Area Transit. With respect to the Tier II operators, a group TAM plan was prepared by the Commission for eight transit operators—Hartford City Taxi System, Ozaukee County Transit System, RYDE (City of Racine Transit System), Washington County Transit System, City of Waukesha Metro Transit,

[5] A Tier I Transit Provider operates rail or has greater than 100 vehicles across all fixed route modes, or greater than 100 vehicles in one non-fixed route mode. A Tier II Transit Provider is a subrecipient of 5311 funds, or an American Indian Tribe, or operates less than or equal to 100 vehicles across all fixed route modes, or less than or equal to 100 vehicles in one non-fixed route mode.

Waukesha County Transit System, and City of West Bend Taxi Service. In addition, Western Kenosha County Transit was included in the group plan prepared by the Commission. The remaining Tier II transit operators (Walworth County and City of Whitewater) opted into the statewide Group TAM Plan prepared by the WisDOT.

Preliminary TAM Targets

Establishing year 2050 targets based on the short-range targets established by the Commission for the year 2018 would acknowledge that a portion of the Region's rolling stock and transit facilities will operate beyond their useful life and below optimal conditions. In recent years, transit operators in the Region are, and have been, making maximum use of all available FTA funds in order to maintain a state of good repair. Such funds, until recently, have been below historical levels—making it difficult to maintain the desired replacement of buses every 12 years. Other recent funding challenges include State transit funding decreasing or not keeping pace with inflation, the limited ability to replace Federal and State funds with local property taxes due to tax levy caps, and restrictions on other local government revenue sources established by the State. However, given the VISION 2050 recommendations for the over doubling of transit service by the year 2050 and the associated substantial investment in transit assets that would occur if that doubling is achieved, the Commission staff preliminarily recommends that the year 2050 targets for the Region for the revenue vehicle-related measure be 10 percent or fewer vehicles beyond their minimum useful life. Similarly, it is recommended that the year 2050 target for the non-revenue vehicle-related measure be 20 percent or fewer vehicles beyond their minimum useful life. Achieving these targets would result in a vehicle being replaced on average one year before exceeding its Federally-defined maximum useful life. In addition, the Commission staff preliminarily recommends that the year 2050 target for the remaining measures be zero percent based on the assumption that investment levels needed to implement the VISION 2050 recommendations would be sufficient to achieve these targets. Table 4 shows the preliminary recommended year 2050 targets for each of TAM performance measures. It is further recommended, unless additional Federal and State funding become available for transit capital projects, that future short-term targets (beyond 2018) for the rolling stock-related measure be based on the year 2018 targets, as shown on Table 4.

Final TAM Targets

[This section will be completed following approval of final year 2050 regional TAM targets by the Advisory Committee and the Commission]

Table 4
Preliminary Recommended Year 2050 Transit Asset Management Targets for Southeastern Wisconsin[a]

Asset Class	Asset Examples	Performance Measure	Preliminary Recommended Year 2050 Target	Year 2018 Target
Rolling Stock				
Buses, Other Passenger Vehicles, and Railcars	Bus, Cutaway, Van, Minivan, and Streetcars	Percent of revenue vehicles that have either met or exceeded their useful life benchmark	< 10	< 30[a]
Equipment				
Non-revenue service vehicles and equipment over $50,000	Route Supervisor Vehicles, Maintenance Trucks, Pool Vehicles, DPF Cleaning System, Bus Wash Systems, Fare Collection systems, Vehicle Lifts	Percent of vehicles and equipment that have either met or exceeded their useful life benchmark	< 30	< 30
Facilities				
Support	Maintenance and Administrative Facilities	Percent of facilities within an asset class, rated below 3 on condition reporting system	< 15	< 15
Passenger	Rail Terminals, Bus Transfer Stations	Percent of facilities within an asset class, rated below 3 on condition reporting system	0	0
Parking	Park-and-Ride Lots with Direct Capital Responsibility	Percent of facilities within an asset class, rated below 3 on condition reporting system	0	0
Infrastructure				
Fixed Guideway	Track Segments, Exclusive Bus Rights-of-Way, Catenary Segments, and Bridges	Percent of segments that have performance restrictions	0	0

[a] It is proposed that future short-term targets (beyond 2018) for this performance measure be based on the year 2018 target until additional Federal and State funding become available for transit capital projects.

Source: SEWRPC

PAVEMENT CONDITION

The Commission has long tracked the pavement condition of the arterial streets and highways within the Region. The condition of pavement has been historically collected based on the separate measuring systems utilized for the State trunk highway system and for the roadways under county and local jurisdiction.[6] However, in order to develop uniform methodology for tracking the condition of the NHS nationwide, FHWA developed four performance measures to monitor pavement condition: percentage of the Interstate system in good condition, percentage of the Interstate system in poor condition, percentage of the non-Interstate NHS in good condition, and percentage of the non-Interstate NHS in poor condition. The methodology for calculating each of the four pavement condition performance measures is provided in Figure 3. The data utilized to develop the performance measures are based on data submitted annually by WisDOT to FHWA through its Highway Performance Monitoring System (HPMS). Based on the methodology developed by FHWA, a rating of Good, Fair, or Poor is determined based on the criteria established for various types of pavement. Then, the performance measures are calculated by dividing the lane miles of Good or Poor pavement by the total lane miles of evaluated pavement for both the Interstate System and the non-Interstate NHS.

State and Initial MPO Targets

Table 5 shows the two- and four-year targets established by WisDOT in May 2018 for the four pavement-related performance measures. From information provided by WisDOT to FHWA, the targets were established by projecting historical trends into the future. Per Federal regulations, the Commission was required to establish four-year targets for the four pavement-related performance measures for the MPA by November 2018. As such, the Commission established initial targets for these performance measures utilizing the same four-year targets as established by WisDOT.

[6] The Commission has utilized the International Roughness Index (IRI) and the Pavement Surface and Evaluation Rating (PASER) system to monitor the condition of the arterials under State and county/local jurisdiction, respectively. IRI is estimated utilizing special equipment to physically measure pavement condition along the roadway, and PASER is a rating system that employs visual inspection techniques to assess the pavement condition.

Figure 3
Methodology for Calculating the National Pavement Performance Measures for the Interstate System and the Non-Interstate National Highway System (NHS)

The following is the methodology developed by FHWA for calculating the four pavement-related performance measures:

- Percent of Lane-Miles of Interstate Highway System with Good Pavement Condition
- Percent of Lane-Miles of Interstate Highway System with Poor pavement Condition
- Percent of Lane-Miles of Non-Interstate NHS with Good Pavement Condition
- Percent of Lane-Miles of Non-Interstate NHS with Poor Pavement Condition

1. The following four criteria from data submitted by the State to the Highway Performance Management System (HPMS) are utilized for asphalt and concrete pavement, as follows:

Pavement Type	International Roughness Index (IRI)	Percent Cracking	Average Rutting	Average Faulting
Asphaltic Pavement (AP)	X	X	X	
Jointed Concrete Pavement (JCP)	X	X		X
Continuous Reinforced Concrete Pavement (CRCP)	X	X		

2. For every segment of the Interstate system or the non-Interstate NHS having pavement condition data in the HPMS, identify the Good and Poor condition for each of the relevant criteria based on the following thresholds:

Measure Criteria	Good	Fair	Poor
IRI	<95	95-170	>170
Percent Cracking	<5	AP: 5-20 JCP: 5-15 CRCP: 5-10	AP: >20 JCP: >15 CRCP: >10
Average Rutting (Inches)	<0.20	0.20-0.40	>0.40
Average Faulting (Inches)	<0.10	0.10-0.15	>0.15

3. Determine the overall Good or Poor pavement condition for every segment of Interstate system or the non-Interstate NHS, based on the following:

Good	AP and JCP: All Three Criteria Good CRCP: Both Criteria Good
Poor	AP and JCP: Two Criteria Poor CRCP: Both Criteria Poor
Fair	All Other Conditions

4. Calculate the respective performance measure by the following formula:

$$\frac{Percent\ of\ Interstate\ or\ Non-Interstate\ NHS\ Having\ Good\ or\ Poor\ Pavement}{} = \frac{Lane\text{-}Miles\ of\ Good\ or\ Poor\ Pavement}{Total\ Lane\ Miles}$$

Table 5
Statewide National Highway System (NHS) Pavement Condition Targets Established by the Wisconsin Department of Transportation

Performance Measure	2-Year Target (2019)	4-Year Target (2021)
Interstate NHS Pavement Condition		
Percentage of Lane-Miles in Good Condition	N/A	≥ 45
Percentage of Lane-Miles in Bad Condition	N/A	≤ 5
Non-Interstate NHS Pavement Condition		
Percentage of Lane-Miles in Good Condition	≥ 20	≥ 20
Percentage of Lane-Miles in Bad Condition	≤ 12	≤ 12

Source: WisDOT and SEWRPC

Regional Baseline Data

Map 2 shows the pavement condition of each segment of highway for the NHS. Table 6 shows the total lane-miles and percentage of NHS roadways in Southeastern Wisconsin that have a condition of good, fair, and poor.

Evaluation of Historical Trends

Figure 4 shows the percentage of lane-miles of pavement considered Good or Poor based only on IRI for both the Interstate system and the Non-Interstate NHS between 2005 and 2016. While not incorporating all of the pavement condition criteria, this shows that there has been a slight improvement in pavement condition for both systems over the 11-year time period.

Review of Relevant Plans

VISION 2050 contains recommendations related to maintaining pavement condition throughout the Region. In addition, as part of the national performance management framework, WisDOT is currently preparing a statewide asset management plan (AMP) for the pavement and bridges of the roadways on the NHS.

VISION 2050

VISION 2050 recommends that the condition of all 3,600 miles of the roadways that are part of the Region's existing arterial street and highway system be preserved to maintain their ability to effectively carry higher levels of people and goods. Specifically, VISION 2050 recommends maintaining or increasing the current proportion of pavement that is in "good" condition, and maintaining or reducing the current proportion of pavement in "poor" condition, during the life of the plan. The specific recommendation of VISION 2050 that addresses pavement condition is Recommendation 6.1. More detail on this recommendation can be found in Chapter 1 of Volume III of the VISION 2050 report.

State Asset Management Plans

As part of Federal regulations, WisDOT is required to develop and implement an asset management plan for the pavement and bridges of the roadways on the NHS within the State. WisDOT has not yet finalized the State asset management plan, which is expected to be completed by June 2019. Following the completion of the asset management plan by WisDOT, any recommendations that relate to pavement

Map 2
Pavement Condition of the National Highway System in Southeastern Wisconsin: 2017

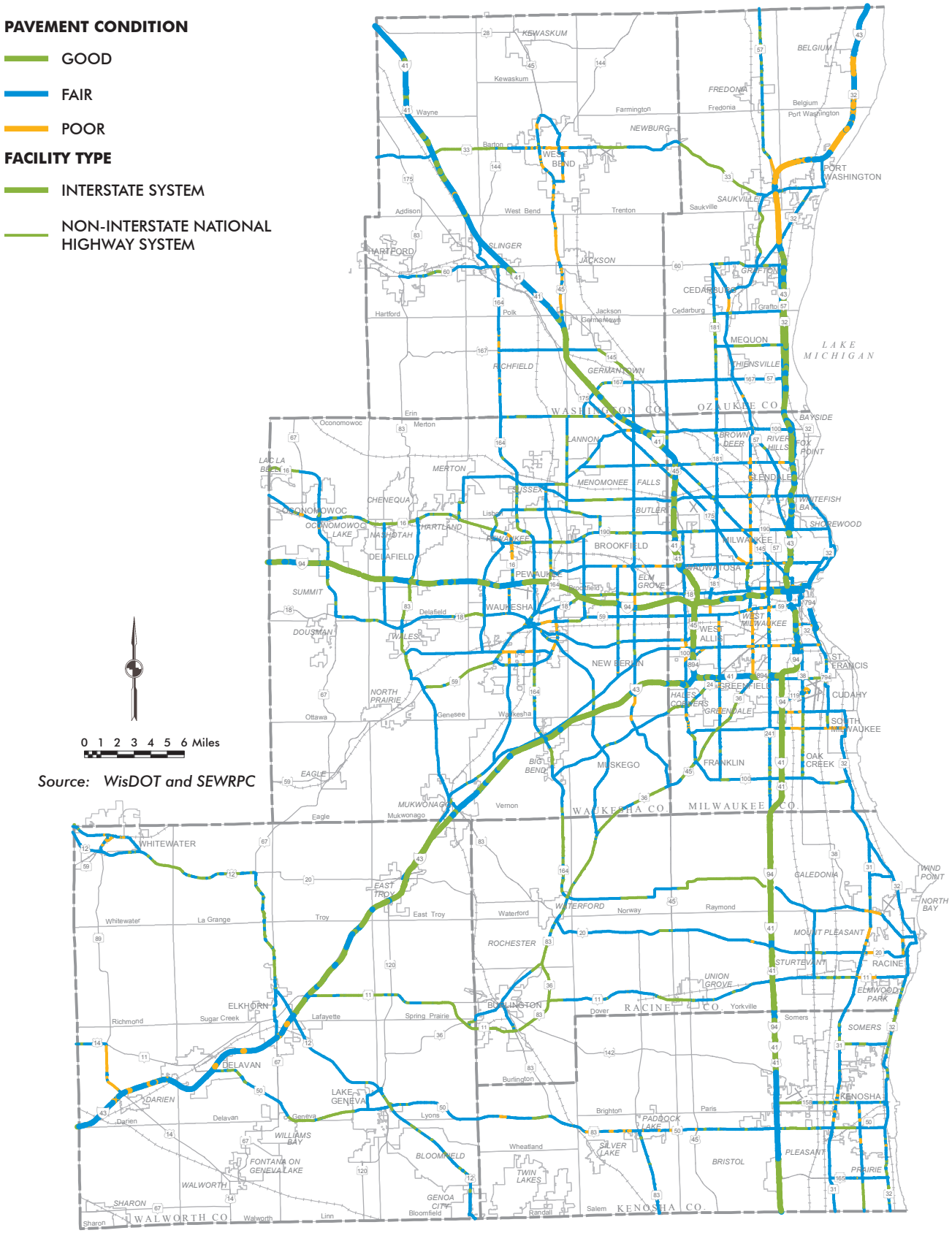


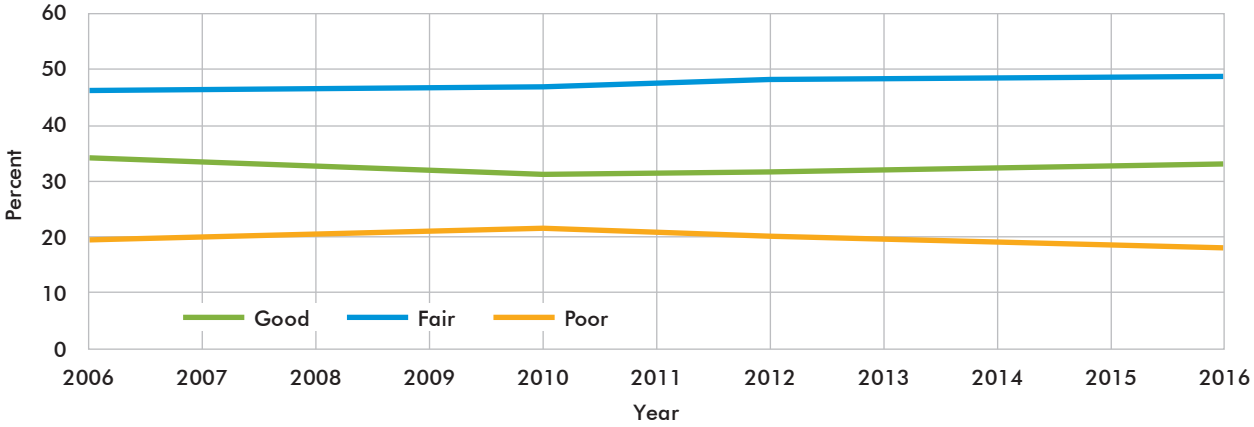
Table 6
Condition of Pavement on the Interstate System and Non-Interstate National Highway System: Base Year 2017

Interstate System		
Rating	**Lane-Miles**	**Percent of Lane-Miles**
Good	604	59.0
Fair	373	36.4
Poor	47	4.6
Total	1,024	100.0

Non-Interstate National Highway System		
Rating	**Lane-Miles**	**Percent of Lane-Miles**
Good	627	18.9
Fair	2,477	74.5
Poor	220	6.6
Total	3,324	100.0

Source: WisDOT and SEWRPC

Figure 4
Condition of State Trunk Highway Based on International Roughness Index: 2006-2016



Source: WisDOT and SEWRPC

condition would be considered when the pavement-related targets are reviewed as part of the review and update of VISION 2050 in 2020.

Preliminary Pavement Condition Targets

Utilizing the State's targets for the regional pavement-related performance measures would represent a decrease in condition for three of the four measures. Such declines would not be consistent with the recommendations of VISION 2050 to maintain or improve the pavement condition of the arterial roadways in Southeastern Wisconsin. Thus, Commission staff deemed it appropriate to establish different targets for the Region. Establishing targets would ideally be done with detailed information on where each segment of roadway is in its life cycle and an asset management model that would allow the evaluation of the effect on pavement condition of different pavement management programs. However, such a model has not yet been developed for the NHS in the Region. Thus, for establishing the targets for the pavement performance measures, it is preliminarily recommended that between 2017 (the base year of the data) and the design year 2050 the amount of existing lane-miles in Good condition increase by 10 percent and the amount of lane-miles in Poor condition decrease by 10 percent. Table 7 shows the preliminary recommended year 2050 pavement targets for the Interstate system and the non-Interstate NHS in the Region. Table 8 shows the resulting year 2021 targets for the MPA and Region. It is further preliminarily recommended that the Commission staff work with WisDOT and county/local governments having NHS under their jurisdiction to assemble detailed historical information on each segment of roadway and to develop an asset management model.

Final Pavement Condition Targets

[This section will be completed following approval of final year 2050 regional NHS pavement targets by the Advisory Committee and the Commission]

BRIDGE CONDITION

The Commission has long tracked the condition of the bridges located on the arterial streets and highways within the Region. Historically, the condition of bridges has been rated based on utilizing the bridge sufficiency rating[7] of the bridges. However, as part of National performance framework, FHWA developed two performance measures to monitor bridge condition: percentage of NHS bridges in good condition and

[7] Sufficiency ratings are a score of 0 to 100 based on four factors: structural adequacy and safety, serviceability and functional obsolescence, essentiality for public use, and special reductions.

Table 7
Preliminary Recommended Regional Year 2050 Targets for National Highway System (NHS) Pavement Performance Measures

Performance Measure	Year 2017 Regional Baseline Data	Preliminary Recommended Year 2050 Regional Target
Interstate NHS Pavement Condition		
Percentage of Lane-Miles in Good Condition	59.0	≥ 64.9
Percentage of Lane-Miles in Bad Condition	4.6	≤ 4.1
Non-Interstate NHS Pavement Condition		
Percentage of Lane-Miles in Good Condition	18.9	≥ 20.8
Percentage of Lane-Miles in Bad Condition	6.6	≤ 5.9

Source: WisDOT and SEWRPC

Table 8
Resulting Year 2021 Targets for National Highway System (NHS) Pavement Performance Measures For the Metropolitan Planning Area and Seven-County Region Based on the Preliminary Recommended Year 2050 Regional Targets

	Metropolitan Planning Area		Seven-County Region	
Performance Measure	Year 2017 Baseline Data	Resulting Year 2021 Target	Year 2017 Baseline Data	Resulting Year 2021 Target
Interstate NHS Pavement Condition				
Percentage of Lane-Miles in Good Condition	61.1	≥ 61.8	59.0	≥ 59.7
Percentage of Lane-Miles in Bad Condition	4.4	≤ 4.3	4.6	≤ 4.5
Non-Interstate NHS Pavement Condition				
Percentage of Lane-Miles in Good Condition	17.6	≥ 17.8	18.9	≥ 19.1
Percentage of Lane-Miles in Bad Condition	6.8	≤ 6.7	6.6	≤ 6.5

Source: WisDOT and SEWRPC

percentage of NHS bridges in poor condition. The methodology for calculating the two bridge condition performance measures is provided in Figure 5. Based on this methodology, a rating of Good, Fair, or Poor is determined based on the criteria established for bridges and culverts. Then, the performance measures are calculated by dividing the total deck area of Good or Poor bridges by the total deck area of evaluated pavement for both the Interstate system and the non-Interstate NHS.

State and Initial MPO targets

Table 9 shows the two- and four-year targets for the two bridge-related performance measures—two for both the Interstate system and the non-Interstate NHS—that were established by WisDOT in May 2018. Per Federal regulations, the Commission was required to establish by November 2018 four-year targets for the two bridge-related performance measures for the MPA. As such, the Commission established initial targets for these performance measures utilizing the same four-year targets as established by WisDOT.

Regional Baseline Data

Map 3 shows the condition of each bridge on the NHS in Southeastern Wisconsin. Table 10 shows the total bridge area and percentage of arterial bridges in Southeastern Wisconsin that have a condition of Good, Fair, or Poor.

Evaluation of Historical Trends

Figure 6 shows the percentage of deck area of bridges considered Good or Poor for the NHS between 2005 and 2017. Over the time period, there has been a slight improvement in bridge condition of the NHS.

Review of Relevant Plans

VISION 2050 contains recommendations related to maintaining condition of bridges throughout the Region. In addition, as part of the national performance management framework, WisDOT is currently preparing a statewide asset management plan (AMP) for the pavement and bridges of the roadways on the NHS.

VISION 2050

VISION 2050 recommends that the condition of all 3,600 miles of the roadways, including bridges, that are part of the Region's existing arterial street and highway system be preserved to maintain their ability to effectively carry higher levels of people and goods. Specifically, VISION 2050 recommends maintaining or

Figure 5
Methodology for Calculating the National Bridge Performance Measures for the National Highway System (NHS)

The following is the methodology developed by FHWA for calculating the two bridge-related performance measures:

- Percent of Deck Area of NHS Bridges in Good Condition
- Percent of Deck Area of NHS Bridges in Poor Condition

1. Identify the Good and Poor condition for each of the relevant criteria based on the following thresholds for the ratings as reported to the National Bridge Inventory:

Measure Criteria	Good	Fair	Poor
Deck	≥7	5 or 6	≤4
Superstructure	≥7	5 or 6	≤4
Substation	≥7	5 or 6	≤4
Culvert	≥7	5 or 6	≤4

2. Calculate overall bridge condition based on the lowest condition of the three criteria for bridges—Deck, Superstructure, and Substation—and the Culvert criteria for culverts.

3. Calculate the respective performance measure by the following formula:

$$\begin{matrix} Percent\ of\ NHS\ Bridges \\ Having\ Good\ or\ Poor\ Pavement \end{matrix} = \frac{Deck\ Area\ \ of\ Good\ or\ Poor\ Pavement}{Total\ Deck\ Area}$$

Table 9
Statewide National Highway System (NHS) Bridge Condition Targets Established by the Wisconsin Department of Transportation

Performance Measure	2-Year Target (2019)	4-Year Target (2021)
Percentage of NHS Bridge Deck Area in Good Condition	≥ 50	≥ 50
Percentage of NHS Bridge Deck Area in Bad Condition	≤ 3	≤ 3

Source: WisDOT and SEWRPC

Map 3
Bridge Condition of the National Highways System in Southeastern Wisconsin: 2017

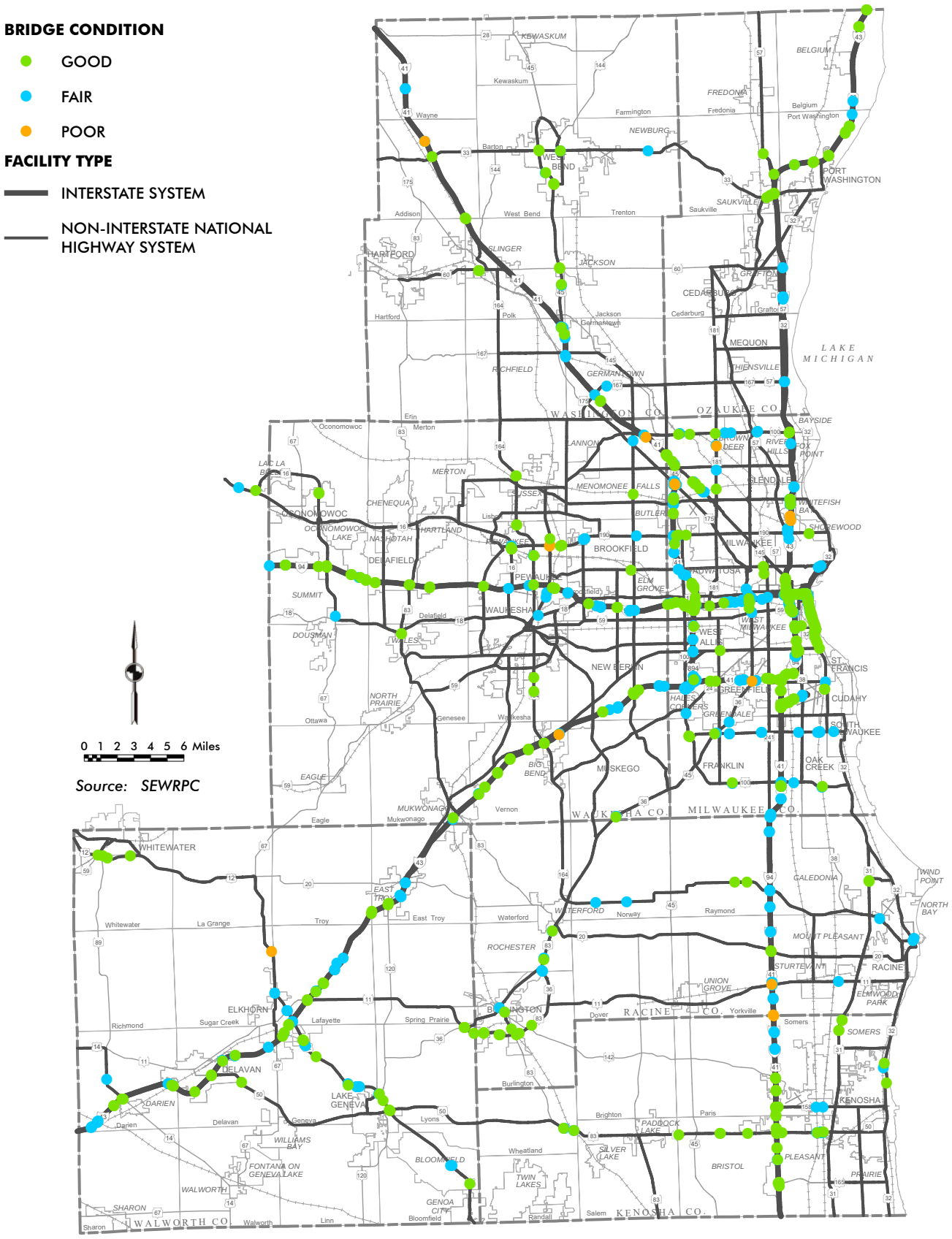
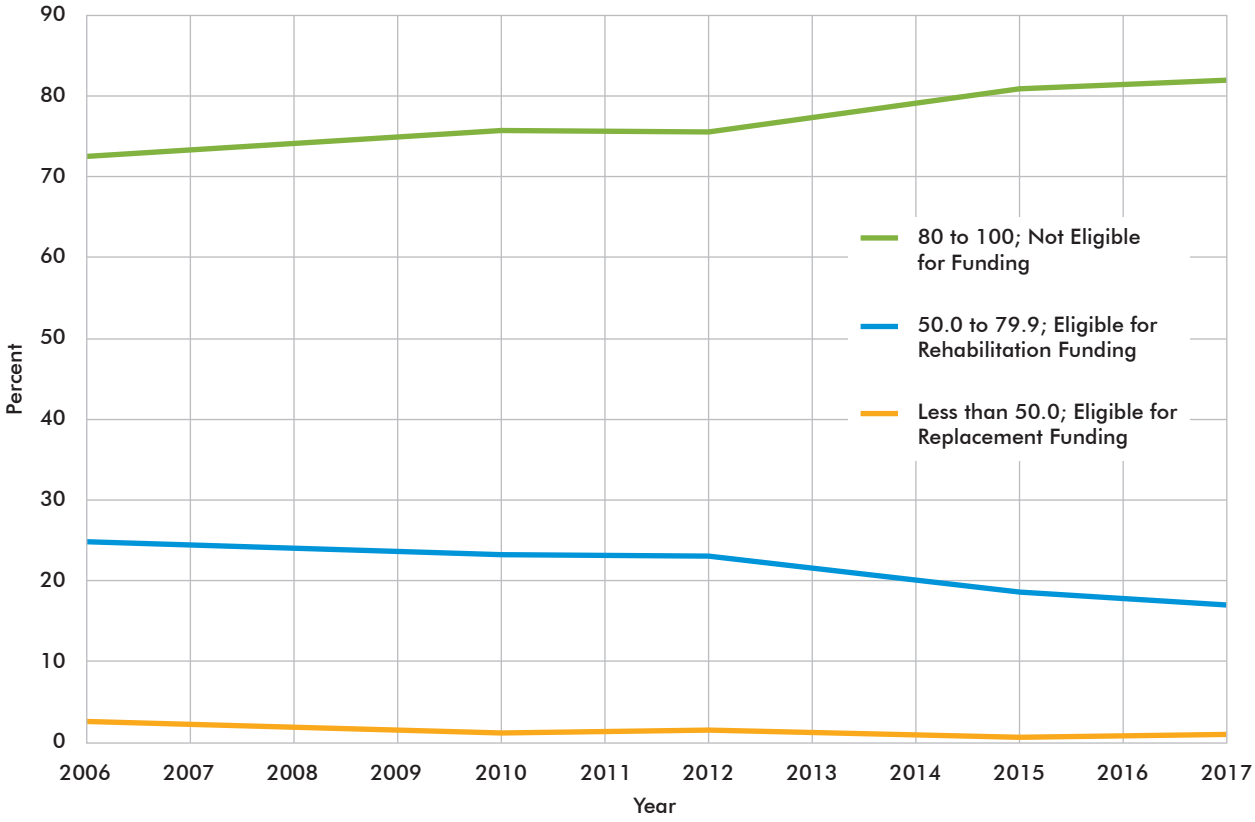


Table 10
Condition of Bridges on the National Highway System: Base Year 2017

Rating	Number of Bridges	Total Deck Area (square feet)	Percent of Total Deck Area
Good	422	607,406	58.0
Fair	334	426,379	40.7
Poor	15	13,468	1.3
Total	771	1,047,257	100.0

Source: WisDOT and SEWRPC

Figure 6
Condition of Bridges Based on Sufficiency Rating on the State Trunk Highway Network: 2006-2017



Source: WisDOT and SEWRPC

increasing the current proportion of bridges that are in "good" condition, and maintaining or reducing the current proportion of pavement in "poor" condition, during the life of the plan. The specific recommendation of VISION 2050 that addresses bridge condition is Recommendation 6.1. More detail on this recommendation can be found in Chapter 1 of Volume III of the VISION 2050 report.

State Asset Management Plans

As part of Federal regulations, WisDOT is required to develop and implement an asset management plan for the pavement and bridges of the roadways on the NHS within the State. WisDOT has not yet finalized the State asset management plan, which is expected to be completed by June 2019. Following the completion of the asset management plan by WisDOT, any recommendations that relate to pavement condition would be considered when the pavement-related targets are reviewed as part of the review and update of VISION 2050 in 2020.

Preliminary Bridge Condition Targets

Utilizing the State's targets for the regional bridge-related performance measures would represent a decrease in condition for these measures. Such declines would not be consistent with the recommendations of VISION 2050 to maintain or improve the bridge condition of the arterial roadways in Southeastern Wisconsin. Thus, Commission staff deemed it appropriate to establish different targets for the Region. Establishing targets would ideally be done with detailed information on where each bridge is in its life cycle and an asset management model that would allow the evaluation of the effect on bridge condition by different pavement management programs. However, such a model has not yet been developed for the NHS in the Region. Thus, for establishing the targets for the bridge performance measures, it is preliminarily recommended that between 2017 (the base year of the data) and the design year 2050 the amount of existing bridge deck in Good condition increase by 10 percent and the amount of deck area in Poor condition decrease by 10 percent. Table 11 shows the preliminary recommended year 2050 bridge targets for the NHS in the Region. Table 12 shows the resulting year 2021 targets for the MPA and Region. It is further preliminarily recommended that the Commission staff work with WisDOT and county/local governments having NHS under their jurisdiction to assemble detailed historical information on each bridge and to develop an asset management model.

Table 11
Preliminary Recommended Regional Year 2050 Targets for National Highway System (NHS) Bridge Performance Measures

Performance Measure	Year 2017 Regional Baseline Data	Preliminary Recommended Year 2050 Regional Target
Percentage of NHS Bridge Deck Area in Good Condition	58.0	≥ 63.8
Percentage of NHS Bridge Deck Area in Bad Condition	1.3	≤ 1.2

Source: WisDOT and SEWRPC

Table 12
Resulting Year 2021 Targets for National Highway System (NHS) Bridge Performance Measures for the Metropolitan Planning Area and Seven-County Region Based on the Preliminary Recommended Year 2050 Regional Targets

	Metropolitan Planning Area		Seven-County Region	
Performance Measure	Year 2017 Baseline Data	Resulting Year 2021 Target	Year 2017 Baseline Data	Resulting Year 2021 Target
Percentage of NHS Bridge Deck Area in Good Condition	58.3	≥ 59.0	58.0	≥ 58.7
Percentage of NHS Bridge Deck Area in Bad Condition	1.3	≤ 1.3	1.3	≤ 1.3

Source: WisDOT and SEWRPC

Final Bridge Condition Targets

[This section will be completed following approval of final year 2050 regional bridge condition targets by the Advisory Committee and the Commission]

SYSTEM RELIABILITY

Transportation system reliability reflects the degree to which travelers are able to reach their destinations on time. Travelers using a less reliable transportation system would be more likely to experience unexpected delays than travelers using a more reliable transportation system. The additional delays associated with a less reliable transportation system would result in negative impacts, such as increased total travel time delay for personal vehicles and public transit, increased vehicle emissions, increased energy use, and increased freight shipping travel time and costs.

Improving the ability of travelers to reach their destinations on time depends on a variety of factors, including: reducing total congestion[8] on the arterial street and highway system, which would allow the system to better accommodate natural day-to-day fluctuations in traffic volumes; reducing the frequency of events, such as vehicular crashes on arterial streets and highways, which can cause non-recurring congestion;[9] improving alternative routes and modes (such as arterial streets and highways, transit service, bicycle facilities, and pedestrian facilities) that can provide an opportunity for travelers to avoid congestion; and expanding transportation options (such as commuter rail, light rail, and bus rapid transit) that are less impacted by inclement weather and crashes.

Transportation system reliability can be measured by the level of variation in travel times that occur day-to-day. Reliability is typically measured by comparing the highest travel time experienced[10] on a daily basis or during a particular time of day (such as during peak travel times) on a roadway to the median or average travel time. Reliability can be measured by taking the difference of the two travel times (representing the additional time that should be added to the trip to arrive on time) or as a ratio of the two travel times.

[8] Congestion on arterial streets and highways occurring on an average weekday results from traffic volumes exceeding roadway design capacity, usually during weekday peak traffic hours.

[9] Non-recurring congestion is congestion that can occur from time to time due to crashes, roadway construction, inclement weather, or special events.

[10] Typically, the 80th or 95th percentile highest travel time.

As part of the national performance management framework, FHWA developed three reliability-based performance measures: 1) percent of the Interstate system that is reliable, 2) percent of the non-Interstate NHS that is reliable, and 3) freight reliability ratio. Figures 7 and 8 show the methodology that is to be utilized to calculate the three performance measures. The travel time data that are to be used to calculate these performance measures come from a data set provided by FHWA, called the National Performance Management Research Data Set (NPMRDS). These data are based on probe data that are collected from a third-party and geo-referenced to segments of the NHS. For the year 2017, NPMRDS data are available for nearly the entire Interstate System in Southeastern Wisconsin. However, NPMRDS data are not yet available for all of the non-Interstate NHS data are available for about 80 percent of the non-Interstate NHS. As this data are updated annually, it is expected that the quality and quantity of NPMRDS data will increase.

State and Initial MPO Targets

Table 13 shows the two- and four-year targets for the three reliability-related measures established by WisDOT in May 2018. These targets were established by WisDOT by assuming that the percent change that occurred month-to-month within the base year would continue for the following four years. Per Federal regulations, the Commission was required to establish four-year targets for these performance measures for the MPA by November 2018. As such, the Commission established initial targets for the NHS reliability performance measures based on applying the relative change between the statewide baseline conditions and the statewide targets to the baseline data for the MPA. For the freight reliability index, the initial target established for the MPA was the same as the target established by WisDOT.

Regional Baseline Data

Map 4 shows the segments of the NHS that are reliable and unreliable in the Region under the NHS reliability measures, and Map 5 shows the freight reliability index for each segment of the Interstate system in the Region. Table 14 shows the Regional baseline performance for the three performance measures.

Evaluation of Historical Trends

Figures 9 and 10 show the performance of the three reliability-based performance measures for the MPA over a three- to six-year period. Due to the limited number of years of available consistent travel time data for both the Interstate system and the non-Interstate NHS in the Region, the trends of the three measures could not be discerned. However, some conclusions can be drawn from the available data about 2017. The percent of the person-miles of travel on the Interstate system within the MPA that were reliable in 2017—

Figure 7
Methodology for Calculating the Travel Time Reliability Performance Measures for the Intestate System and the Non-Intestate National Highway System (NHS)

The following is the methodology developed by FHWA for calculating the two NHS reliability performance measures:

- Percent of Person-Miles on Interstate System that is Reliable
- Percent of Person-Miles on Non-Interstate NHS that is Reliable

1. Utilizing travel time data from the National Performance Management Research Data Set (NPMRDS), calculate the 80th percentile and the 50th percentile highest travel time for every segment of the Interstate system or the Non-Interstate NHS for each of the following four time periods from January 1st through December 31st of a given year:

    a. 6 a.m. – 10 a.m. (Monday through Friday)
    b. 10 a.m. – 4 p.m. (Monday through Friday)
    c. 4 p.m. – 8 p.m. (Monday through Friday)
    d. 6 a.m. – 8 p.m. (Saturday and Sunday)

2. Calculate the level of travel time reliability (LOTTR) for every reporting segment of Interstate system or Non-Interstate NHS for by the following formula:

$$Segment\ Level\ of\ Travel\ Time\ Reliability = \frac{80th\ Percentile\ Travel Time\ of\ Segment}{50th\ Percentile\ Travel Time\ of\ Segment}$$

3. Identify as reliable any reporting segment of the Interstate system or the Non-Interstate NHS that has an LOTTR of below a threshold of 1.50 for all four time periods.

4. Calculate for each reporting segment of the Interstate system or Non-Interstate NHS the annual person-miles of travel (APMT) based on the Annual Average Daily Traffic (AADT) volumes provided by the State for the national Highway Performance Monitoring System (HPMS) by the following formula:

$$Segment\ APMT = Segment\ Length\ \times AADT\ \times Directional\ Factor\ \times Occupancy\ Factor$$

    With the directional factor based on data provided to the HPMS and the occupancy factor provided by the State or MPO.

5. Calculate each of the performance measures by the following formula:

$$Percent\ of\ System\ APMT\ that\ is\ Reliable\ = 100 \times \frac{Total\ APMT\ of\ Reliable\ Segments}{Total\ System\ APMT}$$

Figure 8
Methodology for Calculating the Freight Travel Time
Reliability Performance Measure for the Intestate System

The following is the methodology developed by FHWA for calculating the Freight reliability performance measure—the Freight reliability ratio.

1. Utilizing travel time data from the National Performance Management Research Data Set (NPMRDS), calculate the 95th percentile and the 50th percentile highest truck travel time for every reporting segment of the Interstate system for each of the following five time periods from January 1st through December 31st of a given year:

    a. 6 a.m. – 10 a.m. (Monday through Friday)
    b. 10 a.m. – 4 p.m. (Monday through Friday)
    c. 4 p.m. – 8 p.m. (Monday through Friday)
    d. 6 a.m. – 8 p.m. (Saturday and Sunday)
    e. 8 p.m. – 6 a.m. (Monday through Sunday)

2. Compute the reporting segment truck travel time reliability (TTTR) for each of the five time periods by the following formula:

$$TTTR = \frac{95th\ Percentile\ Travel\ Time\ of\ Reporting\ Segment}{50th\ Percentile\ Travel\ Time\ of\ Reporting\ Segment}$$

3. Identify for each reporting segment the maximum TTTR of all of the five time periods.

4. Calculate each of the performance measures for the reporting segments by the following formula:

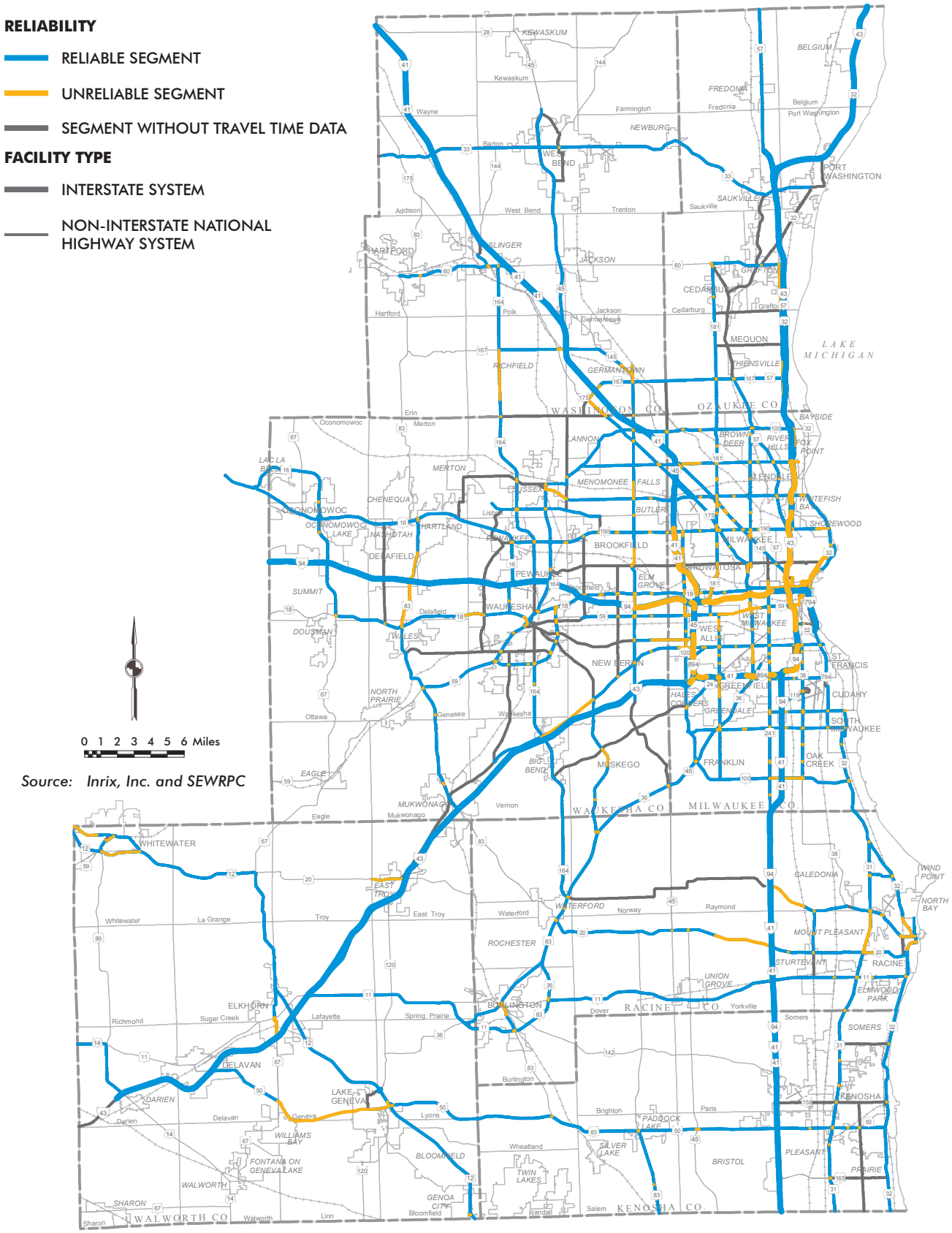
$$Freight\ Reliability\ Ratio = \frac{\sum(Segment\ Length \times Segment\ maxTTTR)}{Total\ System\ Length}$$

Table 13
Statewide Targets for National Highway System and Freight Reliability Performance Measures Established by the Wisconsin Department of Transportation

Performance Measure	Baseline Data (2017)	2-Year Target (2019)	4-Year Target (2021)
Travel Time Reliability			
Percent of Person-Miles Traveled on the Interstate NHS that are Reliable	97.9	≥ 94.0	≥ 90.0
Percent of Person-Miles Traveled on the Non-Interstate NHS that are Reliable	93.9	N/A	≥ 86.0
Freight Reliability			
Track Travel Time Reliability Index	1.16	≤ 1.40	≤ 1.60

Source: Inrix, Inc., WisDOT, and SEWRPC

Map 4
Interstate System and Non-Interstate National Highway System Reliability in Southeastern Wisconsin: 2017



Map 5
Freight Reliability Index for the Interstate System in Southeastern Wisconsin: 2017

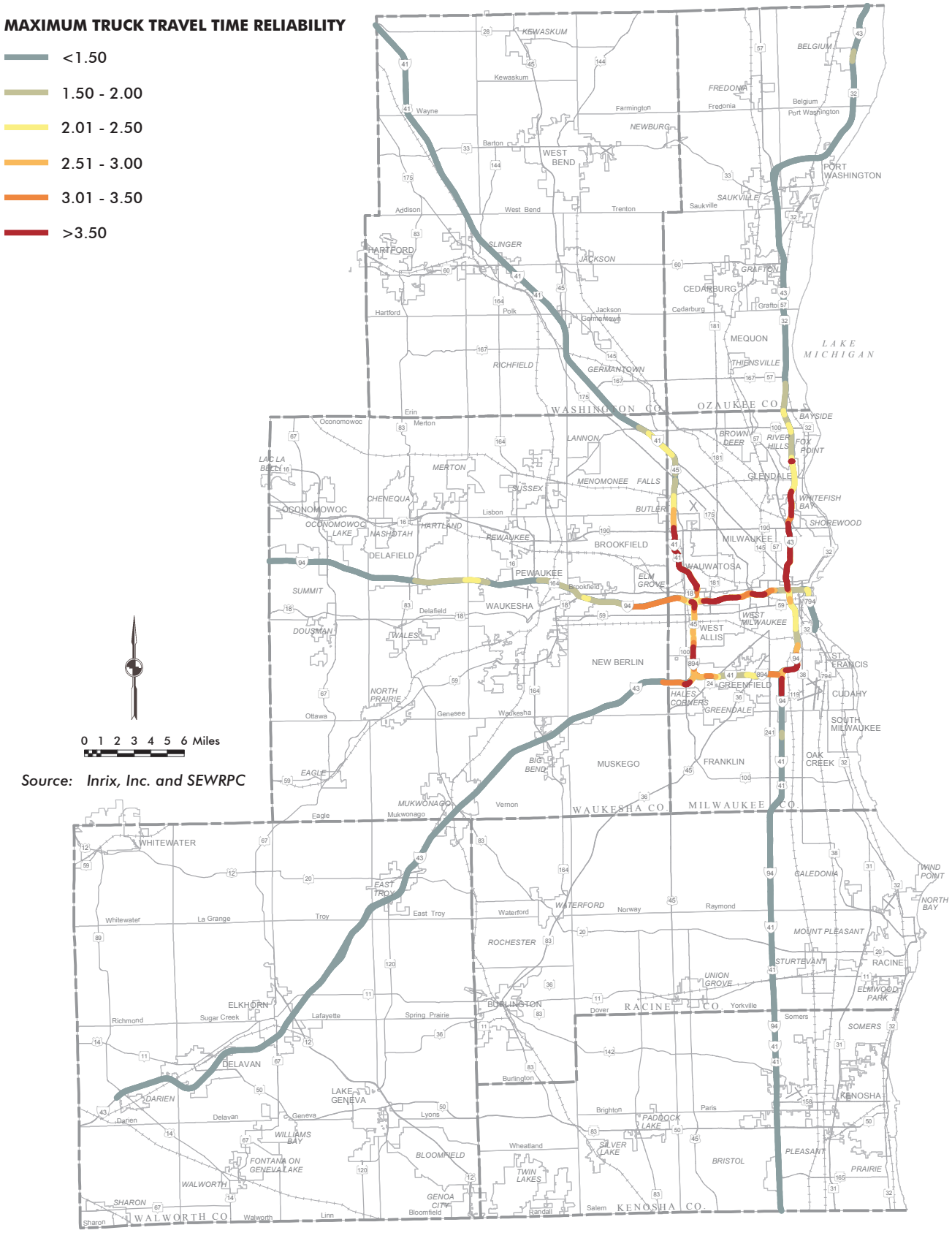
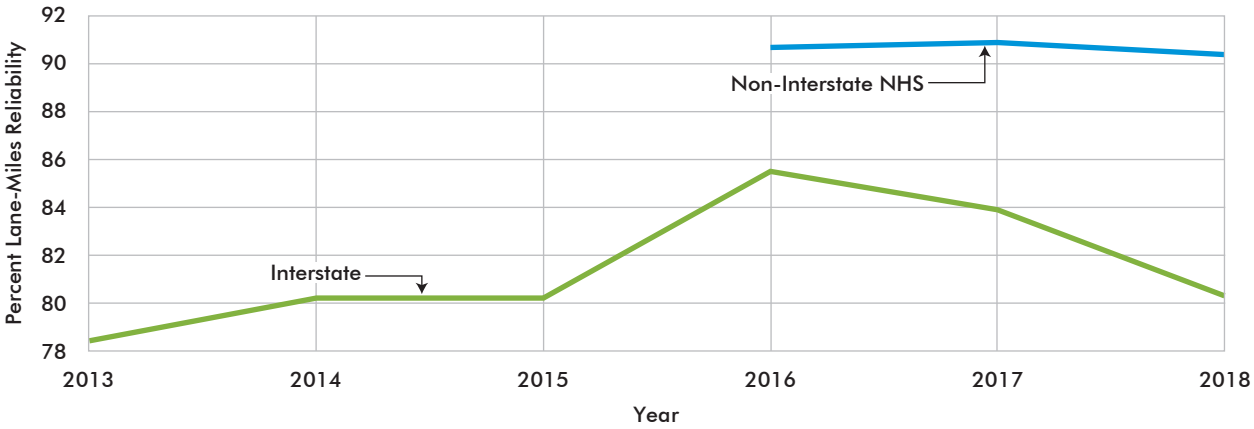


Table 14
National Highway System and Freight Reliability in Southeastern Wisconsin: 2017

Performance Measure	Baseline Data (2017)
Travel Time Reliability	
Percent of Person-Miles Traveled on the Interstate NHS that are Reliable	83.9
Percent of Person-Miles Traveled on the Non-Interstate NHS that are Reliable	90.9
Freight Reliability	
Freight Reliability Index	1.54

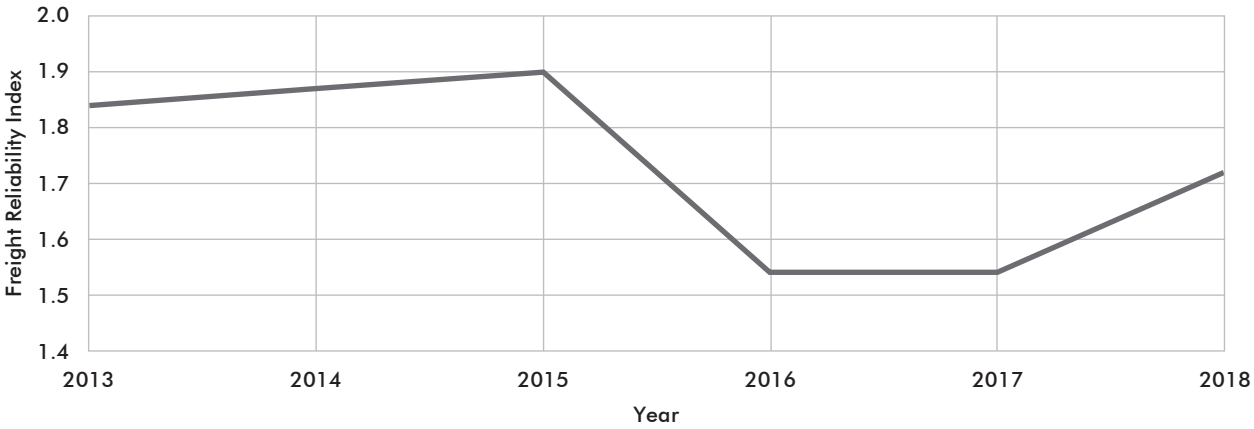
Source: Inrix, Inc., WisDOT, and SEWRPC

Figure 9
Percent of Lane-Miles of the Interstate System and Non-Interstate National Highway Systems (NHS) that are Reliable Within the Metropolitan Planning Area: 2013-2018



Source: Inrix, Inc. and SEWRPC

Figure 10
Freight Reliability Index for the Southeastern Wisconsin Metropolitan Planning Area: 2013-2018



Source: Inrix, Inc. and SEWRPC

83.9—is above both the six-year average of 81.4 percent and the 2018 level of 80.3 percent. With respect to the percent of person-miles of travel on the non-Interstate NHS within the MPA that were reliable, the 2017 level of 90.9 percent is slightly above the three-year average of 90.7 percent and the 2018 level of 90.4. With respect to the freight reliability ratio within the MPA, the 2017 level of 1.54 is well below the six-year average of 1.73 and the 2018 level of 1.72. The Interstate reliability and the freight reliability ratio in 2017 could have been affected by the Zoo Interchange project, as the core interchange was still under significant construction that year—affecting the use and capacity of the Interstate system in the vicinity of the interchange.

Review of Relevant Plans

VISION 2050 contains many recommendations that would contribute to improving transportation system reliability by increasing system capacity across modes, reducing delay (both recurring and non-recurring), and improving safety. In addition, the State Freight Plan was developed to address freight travel on the state trunk highway network, including recommendations to address system bottlenecks to reduce travel delay.

VISION 2050

VISION 2050 contains recommendations related to expanding public transit service and bicycle accommodations, implementing transportation system management (TSM) and transportation demand management measures, improving safety, and increasing arterial highway capacity. National research has found that such recommendations can contribute to system reliability. The following paragraphs summarize these VISION 2050 recommendations. More detail on each of the recommendations can be found in Chapter 1 of Volume III of the VISION 2050 report.

With respect to public transit, VISION 2050 recommends more than doubling transit service in the Region through implementation of four commuter rail lines and eight rapid transit lines, and significantly expanding local bus, express bus, commuter bus, and shared-ride taxi services (Recommendations 2.1 through 2.5). With respect to bicycle and pedestrian accommodations, VISION 2050 recommends that on-street bicycle accommodations be provided on the entire 3,400-mile (nonfreeway) arterial street and highway system (including about 400 miles of enhanced bicycle accommodations), completion of a 709-miles of off-street bicycle path network, and expanding bike share program implementation (Recommendations 3.1 through

3.4). VISION 2050 also includes recommendations for the location, design, and construction of pedestrian facilities (Recommendation 3.5).

VISION 2050 recommends the implementation of transportation system management (TSM) measures relating to freeway traffic management, surface arterial street and highway traffic management, and major activity center parking management and guidance. With respect to freeway traffic management, VISION 2050 recommends measures to improve freeway operation—both during average weekday peak traffic periods and during major and minor incidents—through monitoring of freeway operating conditions and control of traffic traveling on and entering the freeway (Recommendations 4.1 through 4.3). The surface arterial street and highway traffic management measures recommended in VISION 2050 include advisory information, traffic signal coordination, intersection traffic engineering improvements, curb-lane parking restrictions, and access management (Recommendations 4.4 through 4.8). VISION 2050 also recommends that demand-responsive pricing for parking be considered for future implementation in major activity centers to improve parking availability and reduce congestion (Recommendations 4.9 through 4.11).

VISION 2050 recommends travel demand management (TDM) measures or strategies that are intended to reduce personal and vehicular travel or to shift such travel to alternative times and routes, allowing for more efficient use of the existing capacity of the transportation system. Such TDM measures include high-occupancy vehicle (HOV) preferential treatment, park-ride lots, pricing personal vehicle travel, TDM promotion, and detailed site specific neighborhood and major activity center land use plans (Recommendations 5.1 through 5.5). In addition, there are a number of transit recommendations in VISION 2050 that fall under this category, including providing information to promote transit use (Recommendation 2.10), implementing a universal fare system and free transfers between transit systems (Recommendation 2.11), and promoting and expanding transit pricing programs (Recommendation 2.13). To be effective, these measures should be technically and politically feasible; integrated with public transit, bicycle and pedestrian, and arterial street and highway improvements; and combined into coherent packages so that a variety of measures are implemented.

VISION 2050 recommends approximately 268.4 route-miles be widened to provide additional through traffic lanes (representing about 7 percent of the total VISION 2050 arterial street and highway system mileage), including 88.9 miles of existing freeways, and providing 74.6 route-miles of new arterial facilities (representing about 2 percent of the total year 2050 arterial street mileage) (Recommendation 6.3). These

highway improvements are recommended to address the residual congestion that may not be alleviated by recommended land use, systems management, demand management, bicycle and pedestrian, and public transit measures. In addition, many of the recommended new arterial facilities are recommended because they would provide a grid of arterial streets and highways at the appropriate spacing as the planned urban areas of the Region develop to the year 2050. In addition, VISION 2050 recommends a number of measures to reduce the frequency of crashes on the arterial street and highway system (Recommendation 6.5).

State Freight Plan

The Wisconsin State Freight Plan (SFP), prepared and adopted by the WisDOT in 2018, describes and provides recommendations for improving the State's multimodal freight transportation system. Specifically, the SFP summarizes the impact of the freight transportation system on Wisconsin's economy; describes the historical, current, and forecast future condition and performance of the system; provides recommended policies, strategies, and specific transportation projects aimed at improving the system; and assesses the environmental impacts associated with implementing the SFP's recommendations. Consistent with Federal freight planning requirements, development of the SFP included an analysis and inventory of freight bottlenecks, including bottlenecks on Wisconsin's state trunk highway system. The SFP includes recommended freight-specific highway policies that would help address bottlenecks on the state trunk highway system, including using performance measures to prioritize highway investment needs. The SFP also provides a list of priority freight projects programmed to be implemented using National Highway Freight Program (NHFP) funds from Federal fiscal years 2018 through 2020, which would help address identified bottlenecks.

Preliminary Reliability-Related Targets

Establishing regional targets based on WisDOT's targets for the reliability measures would result in targets representing a decline in overall system reliability greater than the historical average experienced in recent years. In the Region, most of the segments of the Interstate system and the non-Interstate NHS are currently reliable. Most of the unreliable portions of the NHS include those portions of the Interstate system in Milwaukee County that experience excessive congestion. While not all segments of the Interstate system that experience excessive congestion are unreliable, most of the unreliable portions of the Interstate system also experience excessive congestion during parts of the day. The Commission, through its travel demand model, has some certainty on how the recommendations in VISION 2050 would affect segment-by-segment congestion in the system. However, while many of the recommendations have been shown through

National research to contribute to improving system reliability, the Commission staff has not yet studied how the relevant recommendations would specifically affect long-term system reliability in the Region.

It is preliminarily recommended that the year 2050 regional reliability targets be based on a modest 5 percent improvement over the short-term average. Table 15 shows the preliminarily recommended year 2050 targets for the three reliability-based targets. At least initially, it is also preliminarily recommended that the short-term targets for the MPA and Region be the same target. For the two NHS performance measures, this would result in an improvement over the year 2017 levels. With respect to the freight measure, the preliminary target would result in a decline from 2017 levels. However, this may be reasonable given how much lower the 2017 level was compared to the short-term average. In addition, it is preliminarily recommended that, as more years of NPMRDS data become available, the Commission staff study the effect certain measures have on system reliability within the Region for consideration when these targets are reviewed and improved.

Final Reliability-Related Target

[This section will be completed following approval of final year 2050 regional reliability-related targets by the Advisory Committee and the Commission]

CONGESTION MITIGATION AND AIR QUALITY

The Congestion Mitigation and Air Quality Improvement (CMAQ) Program was created by the Intermodal Surface Transportation Efficiency Act (ISTEA), enacted in 1991, with a primary goal of directing Federal funding towards transportation programs and projects that help improve air quality and reduce traffic congestion in areas designated by the U.S. Environmental Protection Agency (EPA) as nonattainment or in maintenance of the National Ambient Air Quality Standards (NAAQS). CMAQ projects generally fall into one of three categories: 1) projects that reduce the number of vehicle trips and/or vehicle-miles traveled (VMT), 2) projects that reduce emissions by improving traffic congestion, and 3) projects that reduce emissions through improved vehicle and fuel technologies. Currently, projects in counties that have historically been included in designated nonattainment or maintenance areas are eligible for funding. Thus, as all seven counties in Southeastern Wisconsin are currently, or have historically been, in nonattainment of either the ozone or $PM_{2.5}$ standards, projects located in any of these counties are eligible for funding.

Table 15
Preliminary Recommended Year 2050 Regional Targets for National Highway System and Freight Reliability Performance Measures and Resulting Year 2021 Targets

Performance Measure	Year 2017 Baseline Data	Preliminary Recommended Year 2050 Target [a]	Resulting Year 2021 Targets[a]
Travel Time Reliability			
Percent of Person-Miles Traveled on the Interstate NHS that are Reliable	83.9	≥ 85.5	≥ 81.9
Percent of Person-Miles Traveled on the Non-Interstate NHS that are Reliable	90.9	≥ 95.2	≥ 91.2
Freight Reliability			
Freight Reliability Index	1.54	≤ 1.64	≤ 1.72

[a] Initially, the Regional and MPA targets will be the same.

Source: Inrix, Inc., WisDOT, and SEWRPC

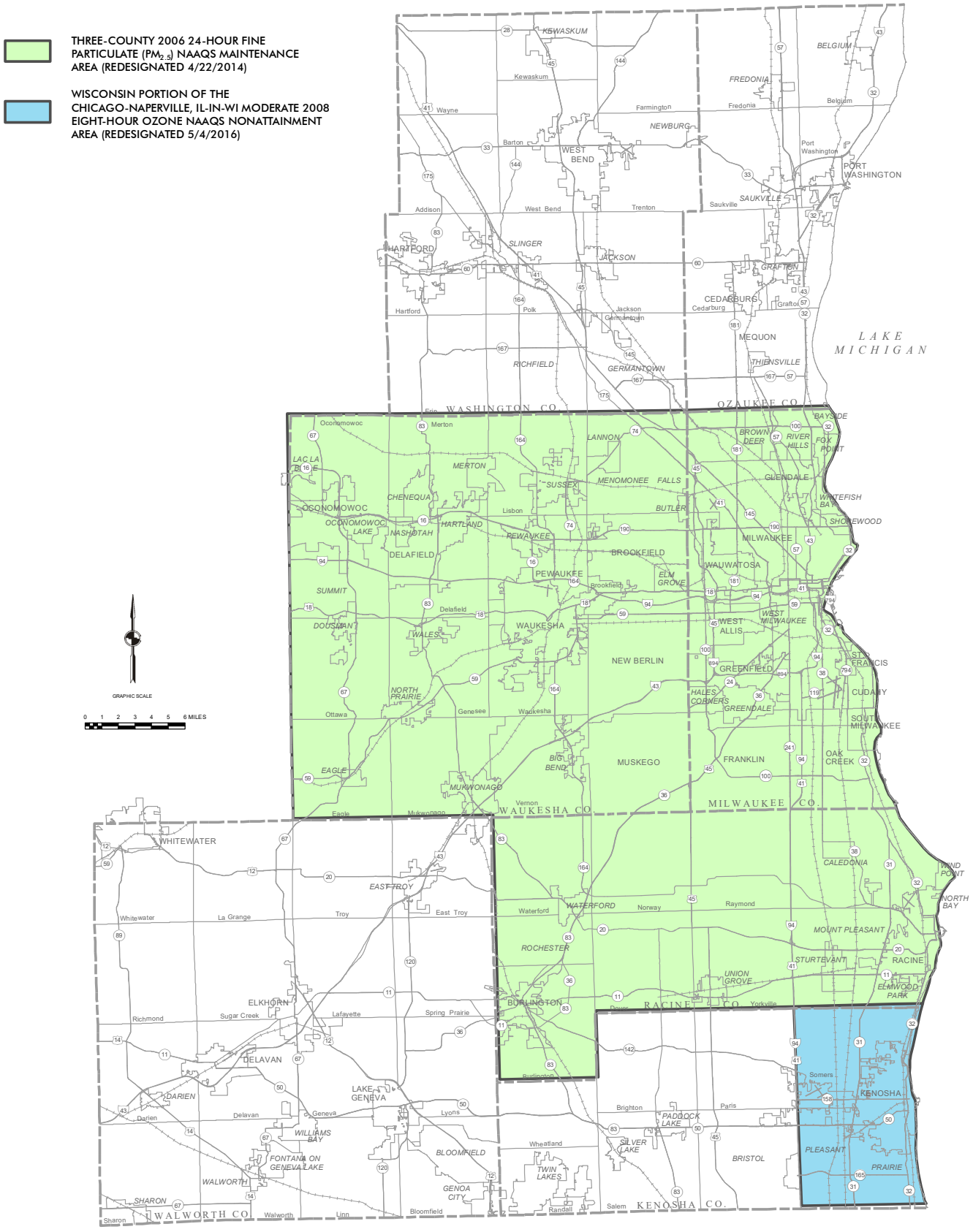
With respect to the National performance management framework, FHWA developed three CMAQ-related performance measures: 1) annual peak hour excessive delay per capita (PHED) measure, 2) the percent of Travel occurring via non-single occupancy vehicle (non-SOV) measure, and 3) the on-road mobile source (i.e., vehicle) emissions measure. Per the regulations, applicability of these measures is dependent upon whether the geographic areas subject to the performance measures contained a non-attainment area or maintenance area under the 2008 ozone standard and the 2016 fine particulate standards on October 1, 2017. For the two capacity-related measures (the PHED and non-SOV measures), the geographic area is only for large urbanized areas (having a population over 1 million). For the emissions-based measure, the geographic area is the MPA. As shown on Map 6, both the Milwaukee urbanized area and the Southeastern Wisconsin MPA contain 2008 ozone or 2016 fine particulate nonattainment and maintenance areas. Thus, targets for all three CMAQ-related performance measures are required to be established for Southeastern Wisconsin—PHED and Non-SOV targets for the Milwaukee urbanized area and emission reduction targets for the Southeastern Wisconsin MPA.

Per the regulations, WisDOT and the Commission are required to jointly establish identical targets for the two congestion-related performance measures. With respect to the emission reduction-related measure, WisDOT establishes a target for the State and the Commission establishes a target for the MPA.

In addition, as the Milwaukee urbanized area has a population over 1 million and includes at least one nonattainment or maintenance area designated by the EPA,[11] the Commission, as the MPO for the Milwaukee urbanized area, is required per Federal regulations to biennially develop a CMAQ Performance Plan to support the implementation of the CMAQ performance measures. The CMAQ Performance Plan for the Milwaukee urbanized area was completed in September 2018, and was submitted to WisDOT for inclusion in its biennial performance report to FHWA. The CMAQ Performance Plan documents the development of CMAQ performance measure targets for the Milwaukee urbanized area, describes how the

[11] The Clean Air Act (CAA) identifies six common air pollutants—ground-level ozone, particulate matter, carbon monoxide, lead, sulfur dioxide, and nitrogen dioxide—that are commonly found in the United States, and the EPA has developed a set of National Ambient Air Quality Standards (NAAQS) that establish the permissible levels for each of the six air pollutants. The EPA designates a geographic area to be a "nonattainment area" if the monitored air quality in that area does not meet the NAAQS. States with designated nonattainment areas must develop a State Implementation Plan (SIP) to improve the air quality in nonattainment areas. Once a nonattainment area meets the NAAQS and other CAA requirements are met, the EPA changes the designation of the area from nonattainment to "maintenance area."

Map 6
NAAQS Nonattainment and Maintenance Areas within the Southeastern Wisconsin Region



Source: SEWRPC

targets will be achieved, and lists the approved CMAQ projects in the Milwaukee urbanized area that would contribute to the achievement of the targets.

The following sections describe the establishing of the targets for the three CMAQ-related performance measures. As the three targets are vastly different in their subject and data needs, they are addressed separately.

CMAQ – PEAK HOURLY EXCESSIVE DELAY

Figure 11 shows how the PHED measure is to be calculated for the Milwaukee urbanized area. WisDOT and the Commission, per the Federal regulations, must jointly calculate baseline data and establish two-year and four-year targets for the PHED measure for the Milwaukee urbanized area every four years. WisDOT, the Commission staff, and the Traffic Operations and Safety (TOPS) Laboratory based at the University of Wisconsin-Madison collaborated on developing the baseline data for the PHED measure.

Baseline data and State-MPO target

The baseline data and the four-year target for the PHED measure are shown in Table 16. WisDOT formally approved the four-year target on May 18, 2018. The Commission approved the targets on November 16, 2018. To develop the four-year target, Commission staff and WisDOT developed a methodology, described in Appendix A, to estimate growth rates between the base year 2017 and future year 2021 (four-year target year) utilizing the Commission's fifth-generation travel demand model to estimate changes in total annual average delay per capita during the AM and PM peak hours as a proxy for PHED per capita. By utilizing the travel demand model, the impact of added roadway capacity and anticipated population growth on the PHED measure could be estimated. The modeled results indicated that projects completed between 2017 and 2021—principally the Zoo Interchange reconstruction project and the resurfacing and restriping of IH 94/IH 894 between the Hale and Zoo Interchanges—would positively impact travel in the Milwaukee urbanized area by reducing PHED by approximately 8 percent. Given the uncertainty in forecasting the future, Commission and WisDOT staffs agreed that half of the modeled reduction (4 percent) in PHED would be applied to the base year PHED per capita to estimate the four-year target PHED per capita. Per Federal regulations, WisDOT and Commission staffs did not establish a two-year target for the PHED measure in the initial round of target setting. However, the two agencies will be required to establish a two-year target during the second CMAQ Performance Plan cycle starting in 2022.

Figure 11
Methodology for Calculating the Annual Hours of Peak Hour Excessive Delay (PHED) per Capita Performance Measure

The following is the methodology developed by FHWA for calculating the Congested Mitigation and Air-Quality Improvement (CMAQ) performance measure related to annual hours of PHED per capita.

1. Determine the excessive delay threshold travel time (EDTTT) for each reporting segment of the National Highway System (NHS) by the following formula:

$$EDTTT\ (in\ seconds) = 3{,}600 \times \frac{Segment\ Length}{\begin{matrix} Higher\ of\ 20\ mph\ or \\ 0.6 \times Speed\ Limit \end{matrix}}$$

2. Utilizing travel time data from the National Performance Management Research Data Set (NPMRDS), to calculate for each NHS reporting segment the travel time segment delay (RSD) for every 15-minute time bin within following time periods:
   a. 6 a.m. – 10 a.m. (Monday through Friday) and
   b. 3 p.m. – 7 p.m. or 4 p.m. – 8 p.m. (Monday through Friday)

$$RSD\ (in\ seconds) = Average\ Travel\ Time\ - EDTTT$$

3. Calculate Excessive Delay (ED) for every 15-minute bin within both time periods with the following formula:

$$ED\ (in\ hours) = \begin{cases} \dfrac{RSD}{3{,}600}\ when\ RSD\ \geq 0 \\ or \\ 0\ when\ RSD < 0 \end{cases}$$

4. Calculate the Average Vehicle Occupancy (AVO) for each segment with the following formula:

$$AVO_{total} = (Percent\ Cars \times\ AVO_{cars}) + (Percent\ Buses \times AVO_{buses}) + (Percent\ Trucks +\ AVO_{trucks})$$

   Where the percentage for each vehicle can be provided by the State/MPO or by bus, truck, and car traffic volume data provided for the HPMS, and the AVO for each vehicle type can be provided by the State and/or MPO.

5. Calculate the Total Excessive Delay (TED) for each NHS report segment to the nearest hundredth for the entire year by the following formula:

$$Segment\ TED\ (in\ person-hours) = \sum \left(AVO \times ED \times \frac{hourly\ volume}{4} \right)$$

   Where the hourly volume is estimated by the State and/or MPO for all days and for all reporting segments where ED is measured.

(continued on next page)

Figure 11 (continued)

6. Calculate the performance measure by the following formula:

$$Annual\ Hours\ of\ PHED\ per\ Capita = \frac{AVO_{total} \times \sum Segment\ TED}{Total\ Population}$$

Where the Total Population is the total population in the urbanized area from the most recent annual population published by the U.S. Census.

Table 16
Peak Hourly Excessive Delay Targets Established for the Milwaukee Urbanized Area in Southeastern Wisconsin by the Wisconsin Department of Transportation and the Commission

Performance Measure	Year 2017 Baseline Data	Year 2019 Target	Year 2021 Target
Annual Hours of Peak Hour Excessive Delay (PHED) per Capita	8.96	N/A[a]	≤ 8.60

[a] The Commission and WisDOT are not required to establish two-year targets as part of the initial target setting for this performance measure.

Source: Inrix, Inc., University of Wisconsin – Madison Transportation Operations and Safety Laboratory, WisDOT and SEWRPC

Review of Relevant Plans

VISION 2050 contains many recommendations that would contribute to reducing delay of the transportation system. In addition, the CMAQ Performance Plan prepared for the Milwaukee urbanized includes projects programmed for CMAQ funding that would contribute to improving system delay.

VISION 2050

As the PHED measure is affected by delay in the system, similar to the three reliability-based measures, implementation of the recommendations of VISION 2050 described in the system reliability section of this document would also contribute to improving this performance measure. The relevant VISION 2050 recommendations include expanding public transit service (Recommendations 2.1 through 2.5) and bicycle accommodations (Recommendations 3.1 through 3.5); implementing TSM measures (Recommendations 4.1 through 4.11) and TDM measures (Recommendations 2.11 through 2.13, and 5.1 through 5.4), improving safety (Recommendation 6.5), and increasing arterial highway capacity (Recommendation 6.3). These highway improvements are recommended to address the residual congestion that may not be alleviated by recommended land use, systems management, demand management, bicycle and pedestrian, and public transit measures. More detail on these recommendations can be found in Chapter 1 of Volume III of the VISION 2050 report.

CMAQ Performance Plan

The types of CMAQ projects that are included in the CMAQ Performance Plan includes projects, with the exception of increasing arterial capacity, that are consistent with the VISION 2050 recommendations that would contribute to improving system delay. In particular, the CMAQ Performance Plan includes transit improvement and expansion projects, bicycle/pedestrian projects, and signal coordination projects.

Preliminary PHED Targets

As the Commission is required to jointly establish the PHED target with WisDOT, it is preliminarily recommended that the year 2021 PHED target for the Milwaukee urbanized area continue to match the target established with WisDOT, and that the year 2050 target be based on the methodology developed by the Commission staff. The year 2050 target, and the methodology for establishing the target, will guide Commission staff as they collaborate with WisDOT on future short-term targets for the urbanized area. Table 17 shows the preliminary recommended year 2050 PHED target for the Milwaukee urbanized area, along with the 2021 PHED target established jointly with WisDOT.

Table 17
Preliminary Recommended Year 2050 Peak Hourly Excessive Delay Targets for the Milwaukee Urbanized Area in Southeastern Wisconsin

Performance Measure	Year 2017 Baseline Data	Year 2021 Target	Preliminary Recommended Year 2050 Target
Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita	8.96	≤ 8.60[a]	≤ 7.84

[a] Per regulations, this target was established jointly by the Wisconsin Department of Transportation and the Commission.

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Source: Inrix, Inc., University of Wisconsin – Madison Transportation Operations and Safety Laboratory, WisDOT and SEWRPC

Final PHED Targets

[This section will be completed following approval the year 2050 regional PHED target by the Advisory Committee and the Commission]

CMAQ – NON-SINGLE OCCUPANCY VEHICLE TRAVEL

Figure 12 shows how the non-SOV measure is to be calculated for the Milwaukee urbanized area. Federal regulations require the Commission and WisDOT to use the same travel time data set for calculating the Non-SOV measure, and the two agencies are required to establish and report unified non-SOV baseline and two-year and four-year target values for the Milwaukee urbanized area. As shown in Figure 13, there are three sources of data that are permitted to be utilized for this measure. Based on data being readily available, WisDOT and Commission staffs calculated the non-SOV measure using the five-year estimate for "Commuting to Work" totaled by mode from the U.S. Census Bureau's American Community Survey (ACS) dataset for the Milwaukee urbanized area.

Baseline Data and State-MPO target

The baseline data and the two-year and four-year Non-SOV targets for the Milwaukee urbanized area are shown in Table 18. To establish the these targets for the Non-SOV measure, the WisDOT and Commission staffs considered three alternative methodologies, as described in Appendix B, to estimate future years 2019 (two-year) and 2021 (four-year) targets—one based on the historical non-SOV travel trend, one based on the VISION 2050 modeled non-SOV travel, and one based on the fiscally constrained transportation plan (FCTP) modeled non-SOV travel. The three methodologies and potential targets were presented and discussed at a meeting between WisDOT and Commission staffs on March 15, 2018. At this meeting, there was a discussion that the historical trend may have captured declines in non-SOV travel attendant to the Milwaukee urbanized area coming out of a recession, while both of the modeled alternatives showed some modest improvement in the non-SOV proportion. Of the two modeled methodologies, the FCTP model was generally accepted by both staffs as the most reasonable, in the short-term, given current fiscal conditions. Additionally, both staffs concurred that the historical declines in non-SOV travel are not likely to continue at the rate captured by the ACS. To mitigate the more aggressive historical decline, it was agreed that an averaging of the potential targets based on historical trends and the FCTP model would be used to set the two-year and four-year targets for non-SOV travel.

Figure 12
Methodology for Calculating the Non-Single Occupancy Vehicle (Non-SOV) Performance Measure

FHWA provided three methodologies that can be utilized to calculate the Congestion Mitigation and Air-Quality Improvement (CMAQ) performance measure related to percent of Non-SOV travel in an urbanized area. The following describe the three methodologies:

1. Utilize SOV travel data that is available from the U.S. Census American Community Survey to calculate the performance measures with the following formula:

$$Percent\ of\ Non-SOV\ Travel = 100\ percent - percent\ of\ SOV\ Travel$$

2. Utilize the percent of non-SOV travel, as calculated using data derived from a local survey that was conducted within the last two years.

3. Calculate the percent of non-SOV travel based on system monitoring data of the actual use of the transportation system. Sample or continuous measurements may be utilized to count the number of travelers using different modes of transportation. The results of the measurements would need to be factored to represent the travel on the entire transportation system and be representative of annual travel. Additionally, the percent of non-SOV travel would need to be updated at least every two years.

Table 18
Non-Single Occupancy Vehicle Targets Established for the Milwaukee Urbanized Area in Southeastern Wisconsin by the Wisconsin Department of Transportation and the Commission

Performance Measure	Year 2017 Baseline Data	2-Year Target (2019)	4-Year Target (2021)
Percent of Non-SOV Travel	20.3[a]	≥ 20.2	≥ 20.1

[a] Data from 2016

Source: U.S. Census American Community Survey, WisDOT, and SEWRPC

Review of Relevant Plans

VISION 2050 contains many recommendations that would promote and encourage alternative modes of travel to travelling via automobile. In addition, the CMAQ Performance Plan prepared for the Milwaukee urbanized includes projects programmed for CMAQ funding that would contribute to improving non-SOV travel.

VISION 2050

VISION 2050 contains many recommendations that would provide an alternative to SOV travel. These include the recommendations to expand public transit service (Recommendations 2.1 through 2.5) and make transit more accessible to travelers through transit-friendly roadway design, enhanced stops, stations, and park-ride facilities; accommodating bicycles on transit vehicles; implementing programs to improve access to suburban employment centers; providing information to promote transit use; implementing a universal fare system and free transfers between systems; considering implementation of proof-of-payment services on heavily-used services to minimize stop times; promoting and expanding transit pricing programs; and expand "guaranteed ride home" programs (Recommendations 2.6 through 2.14). In addition, VISION 2050 recommends the expansion of bicycle accommodations on arterial streets and highways, of the off-street bicycle network, and bike-share programs (Recommendations 3.1 through 3.4). VISION 2050 also has recommendations related to providing pedestrian accommodations (Recommendation 3.5). More detail on these recommendations can be found in Chapter 1 of Volume III of the VISION 2050 report.

CMAQ Performance Plan

The CMAQ Performance Plan lists many CMAQ projects in the Milwaukee urbanized area that would contribute to the achievement of the targets. In particular, there are a number of CMAQ projects involving the expansion of transit service and bicycle/pedestrian facilities that are intended to provide an alternative to SOV travel.

Preliminary Non-SOV Targets

As the Commission is required to jointly establish the non-SOV target with WisDOT, it is preliminarily recommended that the years 2019 and 2021 non-SOV targets for the Milwaukee urbanized area continue to match the target established with WisDOT, and that the year 2050 be based on the methodology developed by the Commission staff. The year 2050 target, and the methodology for establishing the target, will guide Commission staff as they collaborate with WisDOT on future short-term targets for the urbanized

area. Table 19 shows the preliminary recommended year 2050 non-SOV targets for the Milwaukee urbanized area, along with the years 2019 and 2021 non-SOV targets established jointly with WisDOT.

Final Non-SOV Targets

[This section will be completed following approval the year 2050 regional non-SOV targets by the Advisory Committee and the Commission]

CMAQ – EMISSION REDUCTIONS

The methodology for calculating the emission reduction measure is shown on Figure 13. Unlike the two congestion-related CMAQ measures, this measure is to be calculated separately by the State for a statewide target and the Commission for the Region's MPA. The data to be utilized for this measure are the emission reduction estimates for projects implemented for CMAQ funding, as entered by WisDOT into the CMAQ Public Access System. Thus, this measure is the only performance measure established by FHWA that is linked entirely to the implementation of projects funded by a particular funding source.

State and Initial MPO targets

The two-year and four-year emission reduction targets for the State are shown in Table 20 While not required by Federal regulations, WisDOT and the Commission jointly developed the targets for the State. In developing the targets, WisDOT and Commission staffs considered the estimated emission reductions attributable to CMAQ-funded projects that were previously implemented and CMAQ projects that would be implemented within the next two to four years. In November 2018, the Commission established two-year and four-year emissions reduction targets based on the share of CMAQ projects expected to be implemented within the MPA.

Baseline Data

The baseline data for the emission reduction measure for the Region is shown in Table 21. For this measure, the baseline data consists of the emission reductions estimated for all of the projects implemented with CMAQ funding over the four-year time period of 2014 through 2017.

Review of Relevant Plans

VISION 2050 contains many recommendations that would contribute to reducing emission levels attributed to the transportation system. In addition, the CMAQ Performance Plan prepared for the Milwaukee

Table 19
Preliminary Recommended Year 2050 Non-Single Occupancy Vehicle Performance Targets for the Milwaukee Urbanized Area in Southeastern Wisconsin

Performance Measure	Year 2017 Baseline Data	Year 2019 Target	Year 2021 Target	Preliminary Recommended Year 2050 Target
Percent of Non-SOV Travel	20.3[a]	≥ 20.2[b]	≥ 20.1[b]	≥ 21.2

[a] Data from 2016

[b] *Per regulations, this target was established jointly by the Wisconsin Department of Transportation and the Commission.*

Source: U.S. Census American Community Survey, WisDOT, and SEWRPC

Figure 13
Methodology for Calculating the Total Emission Reductions Performance Measures

The following describes the methodology that FHWA developed for calculating the Congestion Mitigation and Air-Quality Improvement (CMAQ) performance measures related to total emission reductions. The performance measures are calculated for each criteria pollutant that a portion of the State or metropolitan planning area is in non-attainment or maintenance for. In southeastern Wisconsin, the three criteria pollutant that an emission reduction measure is to be calculated is particulate matter$_{2.5}$ ($PM_{2.5}$), Volatile Organic Compound (VOC), and Nitrogen Oxide (NO_x).

1. Calculate the performance measures for each relevant criteria pollutant by totaling over a two- or four-year period the total estimated emission reduction estimated to have occurred from projects previously implemented with CMAQ funding (for baseline data and monitoring progress) or estimated to occur through implementation of CMAQ projects.

Table 20
Statewide Emission Reduction Targets Established by the Wisconsin Department of Transportation

Performance Measure	2018 – 2019 Target	2018 – 2022 Target
Reduction in VOC (kg/day)	≥ 12.154	≥ 30.123
Reduction in NOx (kg/day)	≥ 90.354	≥ 150.388
Reduction in $PM_{2.5}$ (kg/day)	≥ 9.043	≥13.820

Source: WisDOT and SEWRPC

Table 21
Estimated Reduction in Emissions from Projects Implemented With Congestion Mitigation and Air-Quality Program Funding In Southeastern Wisconsin: 2014-2017

Performance Measure	2014-2017 Baseline Data
Reduction in VOC (kg/day)	41.268
Reduction in NOx (kg/day)	109.545
Reduction in $PM_{2.5}$ (kg/day)	3.291

Source: WisDOT and SEWRPC

urbanized includes projects programmed for CMAQ funding that would contribute to reducing transportation emission levels.

VISION 2050

VISION 2050 contains many recommendations that align with the types of projects that are eligible for CMAQ funding. The relevant VISION 2050 recommendations include expanding public transit service and bicycle accommodations, and implementing TSM (such as signal coordination and intersection improvements) and TDM measures. More detail on these recommendations can be found in Chapter 1 of Volume III of the VISION 2050 report.

CMAQ Performance Plan

As per the regulations, the CMAQ Performance Plan lists the approved CMAQ projects in the Milwaukee urbanized area, along with their estimated emission reductions, that would contribute to the achievement of the emission reduction target over the next four years.

Preliminary Emission Reduction Targets

As the emission reduction measure is calculated entirely from estimates of the emission reductions attributable to projects implemented with CMAQ funding, it is preliminarily recommended that the years 2019 and 2021 emission reduction targets previously established by the Commission be the Region targets, and that year 2050 targets for this measure not be established. Additionally, the target for the MPA and the Region will be considered the same. Table 22 shows the preliminary recommended emission reduction targets for the Region.

Final Emission Reduction Targets

[This section will be completed following approval the years 2019 and 2021 emission reduction targets by the Advisory Committee and the Commission]

* * *

Table 22
Preliminary Recommended Emission Reduction Targets for Southeastern Wisconsin

Performance Measure	2014-2017 Baseline Data	2018 – 2019 Target	2018 – 2022 Target
Reduction in VOC (kg/day)	41.268	≥ 10.860	≥ 27.032
Reduction in NOx (kg/day)	109.545	≥ 83.316	≥ 137.350
Reduction in $PM_{2.5}$ (kg/day)	3.291	≥ 7.797	≥12.096

Source: WisDOT and SEWRPC

Appendix A

PHED Growth Factor Methodology

The PM3 performance measure relating to the annual hours of peak hour excessive delay (PHED) per capita requires the establishment of a four-year target. As the PHED per capita measure is new (and historical data is unavailable to establish a trend), a process for establishing short-range future year targets is necessary. To develop the potential targets, the Southeastern Wisconsin Regional Planning Commission has worked with the Wisconsin Department of Transportation (WisDOT) to develop a proposed methodology to estimate growth rates between the base year (year 2017) and future year 2021 (four-year target) utilizing a travel demand model to estimate changes in total annual average delay per capita during the AM and PM peak hours as a proxy for PHED per capita. By utilizing a travel demand model, the impact construction work zones and new roadway capacity may potentially have on PHED within the Milwaukee urbanized area (MUA), as well as, anticipated population growth can be accounted for. The process to develop the PHED growth factors is as follows:

1. Synthetic 30-minute trip tables derived from the Commission's fifth generation travel demand models are assigned sequentially using the Commission's time-of-day assignment procedure. This procedure is described in more detail in the PHED Hourly Volume Calculation Methodology document.

2. Congested travel times are calculated in 30-minute increments on every link in the Commission's highway network using a series of volume-delay functions based on the unadjusted highway assignments. The form of the functions is as follows:

$$Time_{congested} = Time_{freeflow} \times \left[1 + \alpha \left(\frac{Volume}{Capacity_{LOS\ E}}\right)^{\beta}\right]$$

   Where α and β vary based on whether the facility is a surface arterial or freeway and the freeflow speed of the facility. The set of α and β values are provided in the table below:

Facility Type	Freeflow Speed (MPH)	α	β
Surface Arterial	Greater than 45	0.34	4.0
	35 to 45	0.38	5.0
	30 to 35	0.96	5.0
	Less than 30	1.11	5.0
Freeway	Greater than 65	0.32	7.0
	60 to 65	0.25	9.0
	55 to 60	0.18	8.5
	Less than 55	0.10	10.0

3. Link-level delay is calculated by subtracting the freeflow travel time from the period congested travel time to estimate the average delay in minutes experienced by vehicles traversing a link during a 30 minute period. The average period delay is then multiplied by the mechanically adjusted highway assignment attendant to a period to determine the total period vehicle minutes of delay. The peak hour vehicle delay is then calculated for each link by summing the vehicle delay for the 30-minute periods representing the two peak periods (6 AM to 10 AM and 3 PM to 7 PM) used in the PHED calculation. Currently average vehicle occupancy is not accounted for since it is assumed that vehicle occupancy will not change between the base year and 4-year target year.

4. Total average weekday vehicle delay is calculated for the MUA by summing the peak hour minutes of delay for the highway network for the surface arterial and freeway links within the Milwaukee urbanized area.

5. Calculate delay per capita in hours by dividing the total MUA delay in minutes by 60 and by the modeled MUA total population.

6. Annualize the average weekday delay per capita by applying the annualization factor of 341.12.

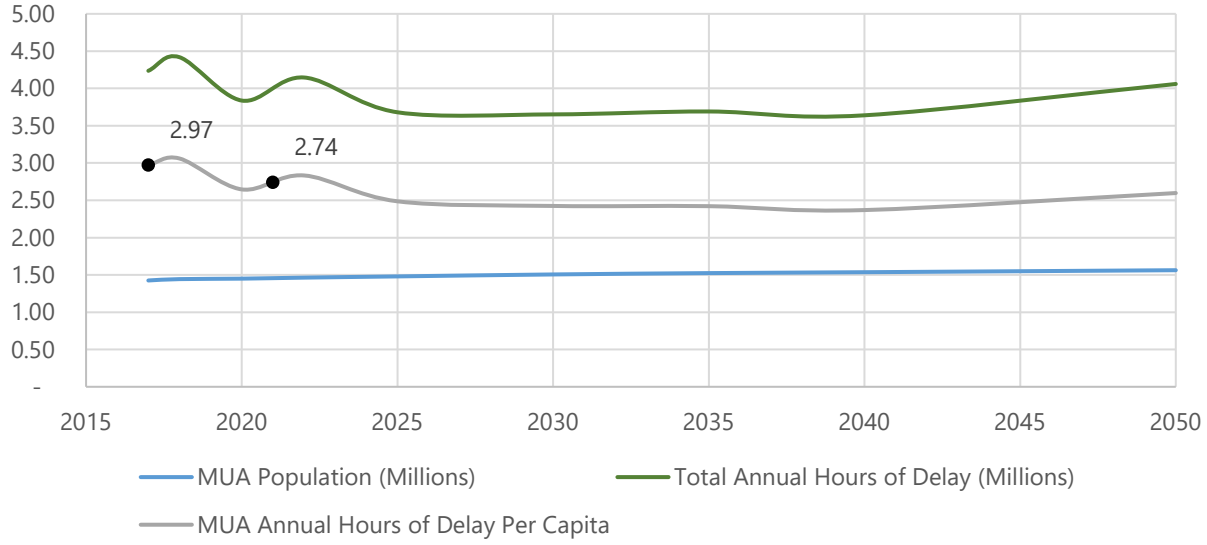
This process is run for the current year and any year of interest. Figure 1 shows the forecast population, delay, and estimated delay per capita from multiple model runs in roughly 5 year increments through the design year of VISION 2050 under the fiscally constrained plan. The reductions in delay in the earlier years are related to the anticipated implementation of surface arterial and freeway capacity improvements on the most congested segments of the arterial street and highway system. In the later years these improvements begin to get more congested and later improvements do not have as significant an impact on delay because they are on segments largely outside the most densely developed areas of the Region.

Using the information in Figure 1, a ratio of 0.922 is derived by dividing the total delay per capita of 2.74 hours in 2021 by the total delay per capita of 2.97 hours in 2017. This ratio is then applied to the PHED per capita calculated with the 2017 NPMRDS data to estimate the target PHED per capita value for the year 2021.

Recommendation

As previously described, the modeled results indicated that the projects expected to be completed by the year 2021 (four-year target), namely the Zoo Interchange reconstruction project and the resurfacing and restriping of IH 894 between the Hale and Zoo Interchanges, would positively impact travel in the Milwaukee urbanized area by reducing the PHED by approximately eight percent. At a meeting between WisDOT and Commission staffs, on March 15, 2018, both staffs concurred that a downward trend in PHED was reasonable. Given the uncertainty in forecasting the future, both staffs concurred that half of the modeled reduction (4 percent) in PHED would be applied to the base year PHED per capita value to estimate the four-year target PHED per capita.

Figure 1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4.50
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3.00
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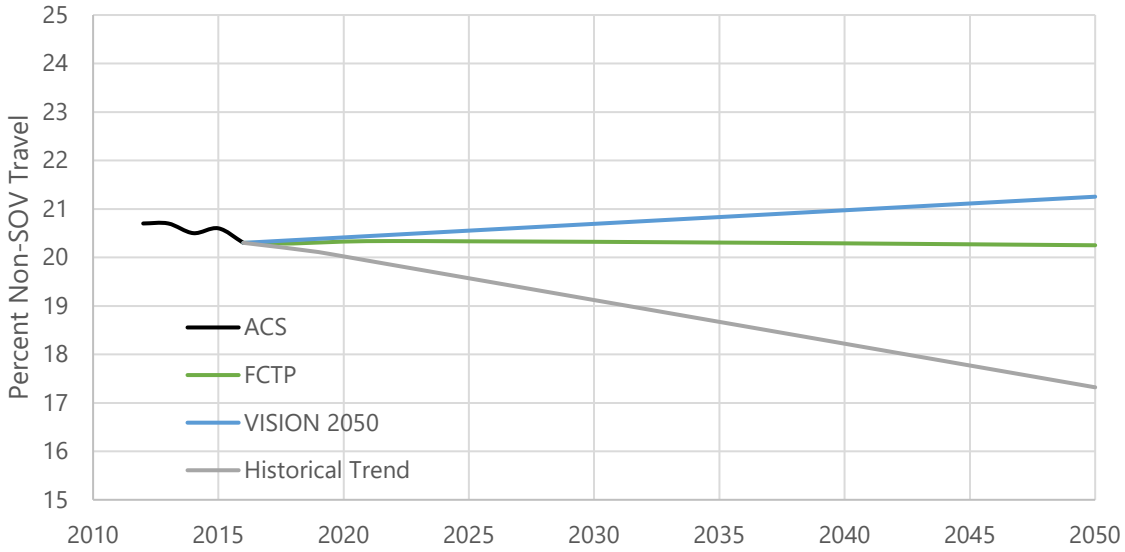
1.50
1.00
0.50
-
2.97
2.74
2015
2020
2025
2030
2035
2040
2045
2050
MUA Population (Millions)
Total Annual Hours of Delay (Millions)
MUA Annual Hours of Delay Per Capita

Appendix B

Non-SOV Target Setting Methodology

The PM3 performance measure relating to the percent of Non-SOV travel requires the establishment of two-year and four-year targets. To establish targets there needs to be a process for establishing a trend between the current year and short-range future years for which the targets are being set. To develop the potential targets, the Southeastern Wisconsin Regional Planning Commission has worked with the Wisconsin Department of Transportation (WisDOT) to develop three potential methodologies to estimate future years 2019 (two-year) and 2021 (four-year) targets based on the historical trend, the fiscally constrained transportation plan, and VISION 2050. The non-SOV forecasts through the year 2050 from each of the three methods are shown below.



Historical Trend

The historical trend methodology utilizes a projection of the last five US Census American Community Survey five-year datasets—2008 through 2012 (20.7%), 2009 through 2013 (20.7%), 2010 through 2014 (20.5%), 2011 through 2015 (20.6%), and 2012 through 2016 (20.3%)—to estimate potential two-year, four-year, and year 2050 targets. Commission staff used a linear projection which yielded an approximately 3 percentage point reduction in percent non-SOV travel by the year 2050.

Fiscally Constrained Transportation Plan

The second set of potential targets were calculated by factoring the current year 2016 non-SOV percentage by the change in percent non-SOV travel estimated by the Commission's fifth generation travel demand model under the fiscally constrained transportation plan (FCTP). The fiscally constrained transportation plan only includes those projects that can be completed

within funding reasonably expected to be available through the year 2050. The staging of the projects under the FCTP is consistent with the staging of projects used to develop the most recent conformity demonstration. Under the FCTP, the percentage of non-SOV travel is expected to decline 0.05 percentage points by the year 2050.

VISION 2050

The third set of potential non-SOV targets were calculated by factoring the current year 2016 non-SOV percentage by the change in percent non-SOV travel estimated by the Commission's fifth generation travel demand model under VISION 2050. Under VISION 2050, the percentage of non-SOV travel is expected to increase 0.95 percentage points by the year 2050.

Potential Targets

The potential two- and four-year non-SOV targets under consideration resulting from the three potential forecasting methods are shown below:

Method	Two-Year (2019) Target	Four-Year (2021) Target
Historical Trend	20.11	19.93
FCTP	20.31	20.34
VISION 2050	20.36	20.41

Recommendation

The three proposed target setting methodologies and potential targets were presented and discussed at a meeting between WisDOT and Commission staffs, on March 15, 2018. At this meeting, there was discussion that the historical trend may have captured declines in non-SOV travel attendant to the Milwaukee urbanized area coming out of a recession, while both of the modeled alternatives show some modest improvement in the non-SOV proportion. Of the two modeled methodologies, the FCTP was generally accepted by both staffs as the most reasonable in the short-term, given current fiscal conditions. Additionally, both staffs concurred that the historical declines in non-SOV travel are not likely to continue at the rate captured by the ACS. To mitigate the more aggressive historical decline, it was agreed that an averaging of the FCTP and historically based targets would be used to set the two- and four-year targets for non-SOV travel. The resulting targets from this averaging are 20.2 (two-year) and 20.1 (four-year).