Chapter 3:

Our Transportation System Today

Our Transportation System Today

The following sections describe the existing conditions of the greater Madison region transportation system. To view the region's progress towards achieving the adopted targets of the federally required transportation performance measures please see Appendix B.

Roadways

Streets and highways form the foundation of the transportation system. Aside from limited-access freeways, roadways must be designed to accommodate safe, convenient travel by buses, bicyclists, and pedestrians, as well as motorists. In addition to travel, streets play a role in public life and the way we experience cities. As the National Association of City Transportation Officials (NACTO) notes, they are the lifeblood of our communities and the foundation of our urban economies. With streets making up 80% of all public space in cities, they have the potential to foster economic activity, serve as an attractive front yard space for residents, and provide a safe place for all people, including those moving on foot, by bike or via transit.

There are over 2,900 miles of public roadways in the MPO Planning Area and 380 bridges. Roads are critical to virtually all freight moving to and from locations in Dane County. In 2019, 98% of Dane County's freight tonnage and 90% of its freight value moved exclusively by truck. The remainder, which moves by other modes for part of its trip, needs to travel by truck on the first or last legs of its journey. Countywide in 2019, the roadway system carried an estimated 14.4 million vehicle miles of travel each day. Roadways also have both direct and indirect impacts on the natural environment that must be considered in planning efforts and facility design.

Streets and highways provide connectivity to jobs, homes, shops, parks, and other opportunities. The physical design characteristics of each roadway play a significant role in its safety, operational performance, and ability to accommodate different transportation modes. As an infrastructure asset, the roadway system requires maintenance to remain in acceptable condition.

The Madison area has a uniquely constrained roadway system due to the natural geography of the area, with the City of Madison's downtown sitting on an isthmus. The City of Madison, founded in 1848, is a master planned community built on a tight grid of streets around what we now know as the Capitol Square. High-volume arterial streets radiate from the square and connect to a number of State and Interstate Highways, including the Beltline (U.S. Highways (USH) 12, 14, 18, and 151), Stoughton Road (USH 51), and I-39/90/94. Unlike many urban areas, downtown Madison is located off the freeway and expressway network. This has greatly contributed to the livability of the downtown, but also made traffic circulation more challenging, increasing the importance of travel demand management and operational strategies for mitigating congestion. Many suburban communities surrounding Madison were founded in the late 1800s, and contain a similarly dense street grid in their historic cores.

Roadway development patterns changed across the United States after World War II. America built most of its early highway and freeway infrastructure during this time, leading to the rise of suburbanization. Terms like roadway hierarchy became part of the planning lexicon, and curvilinear streets and cul-de-sacs became the norm for new neighborhood design. The Madison area was no exception to national trends. The construction of the Beltline Highway facilitated growth in areas further from the urban core, including the suburbs. Conceived and approved in 1944, the Beltline opened as a 2-lane highway in 1949.

In the 1950s, intersections with the Beltline were steadily converted into interchanges and portions of the road widened to four lanes. In the 1970s, portions of the roadway were expanded to six lanes. In 2022, WisDOT will complete work on the Flex Lane project on the Beltline, which will allow peak-period use of the Beltline Highway's interior shoulders, thereby providing an extra travel lane in each direction.

The COVID-19 pandemic has changed driving behavior. Prior to the pandemic, travel

demand during the AM and PM peak periods was significantly higher than midday travel. With the increase in telework, those peaks have flattened somewhat, especially the AM peak with traffic now distributed more evenly throughout the day. The reduced peak traffic volumes as a result of increased teleworking could help to reduce the need for capacity expansion in the future.

ROADWAY FUNCTIONAL CLASSIFICATION SYSTEM

The Federal-Aid Highway Act of 1973, as amended, requires the use of a functional highway classification to update and modify the Federal-aid highway system. Functional classification defines the role the roadway plays (mobility, connectivity, accessibility) in serving motor vehicle travel needs through the regional roadway network. Functional classification carries with it some expectations about roadway design, including its speed, capacity and relationship to existing and future land use development. However, the land use context for roadways and the priority and needs for transit, bicyclists, and pedestrians must also be considered in designing roadways and their operations.

The Federal Functional Classification system divides roadways into two groups – urban and rural – based upon whether or not the roadway is located within the urban area boundary of a metropolitan area. The system classifies roadways into the following main categories:

- **Principal Arterials**, which include the Interstate, other access restricted freeways and expressways, and other high traffic volume roadways serving the longest trips and the major regional centers and facilities;
- **Minor Arterials**, which connect and augment the principal arterials, serve moderate distance trips and community land uses;
- **Collectors**, which connect neighborhoods to the arterials, serving more of an access function and shorter trips connecting to neighborhood facilities; and
- **Local Roads**, which serve primarily an access function for homes and businesses.

Federal legislation uses functional classification in determining eligibility for funding under the Federal-aid program. All roadways classified as a rural major or urban collector or higher are eligible for federal funding.

The MPO coordinates with WisDOT to assign functional classifications to roadways in the urban area, while WisDOT assigns functional classes to roadways in the rural area. Roadways are classified according to average daily traffic (ADT) volume, population of the area, land uses served, spacing criteria, and supplemental criteria (e.g., whether bus or truck route and traffic control). In addition, rural-urban interface is considered, which ensures the connectivity of routes from rural areas into urban areas.

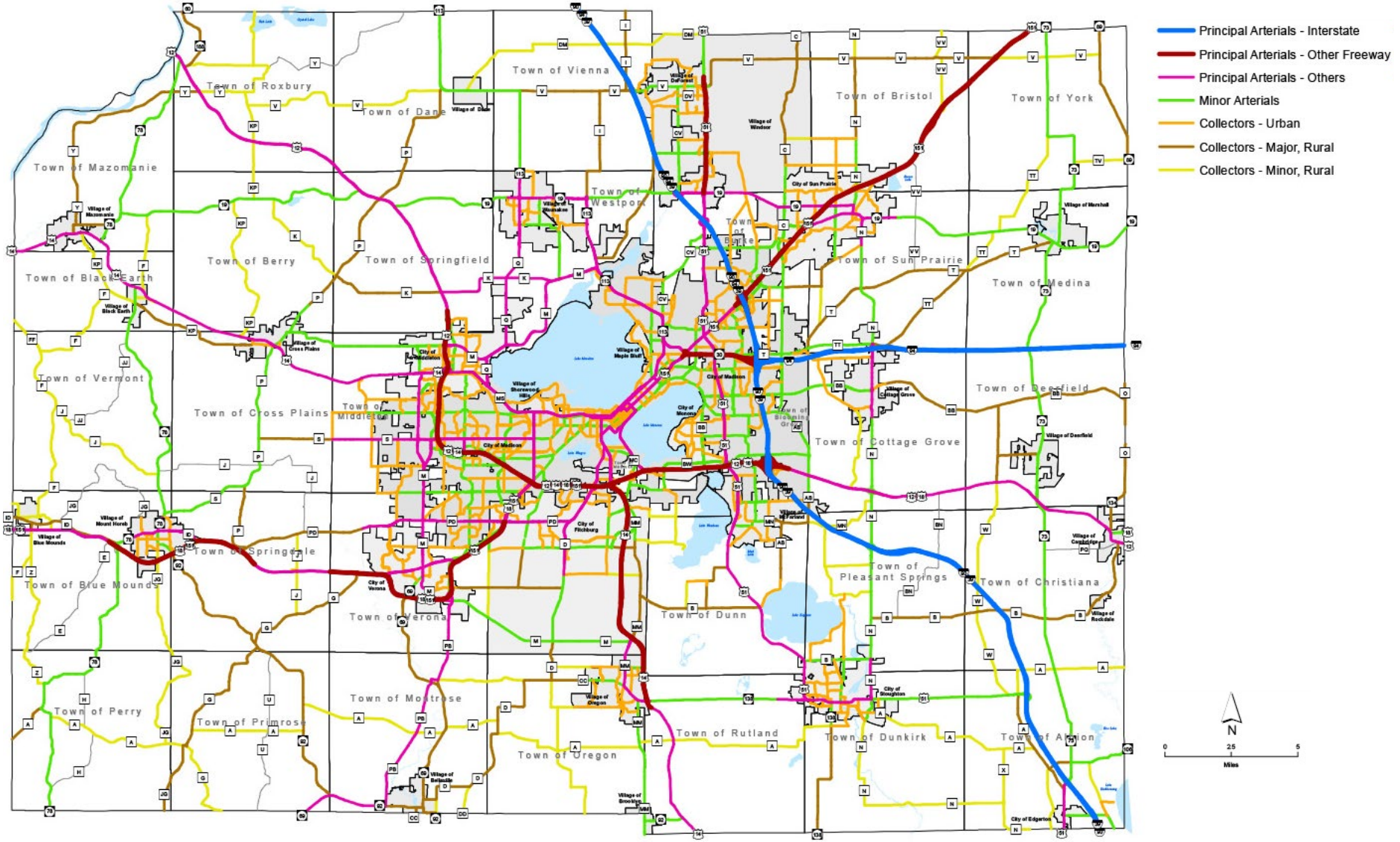
Map 3-a shows the functionally classified roadway system in Dane County as approved in 2015. The map is updated every ten years.

STREET TYPOLOGY

The functional classification system only addresses how roadways are being used by motor vehicle traffic. Street typology goes beyond that to look at land use and community context and considers multi-modal travel. In 2021, the City of Madison hired a consultant to assist the city in developing a process and tools to assist in designing new and reconstructed streets that balance all competing street uses consistent

Roadway Functional Classification System (2020)

Dane County, Wisconsin



Map 3-a 2020 Roadway Functional Classification System (2020)

with its Complete Green Streets policy. The policy is based on putting people first, supporting community, fostering sustainability, and achieving equity. A draft street typology was developed, which classifies streets by the land use context, target speeds, and equity issues and relates those to functional class. The project also includes identifying a modal (transit, bike, auto) priority network as a tool for balancing needs when (re) designing streets. For more information, see the project website at this link: https://www.cityofmadison.com/transportation/initiatives/complete-green-streets.

NATIONAL HIGHWAY SYSTEM

The National Highway System consists of roadways important to the nation's economy, defense, and mobility. The NHS was developed by the Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs).

The National Highway System (NHS) includes the following subsystems of roadways:

- **Interstate**
- **Other Principal Arterials**
- **Strategic Highway Network (STRAHNET)**, which includes highways important to the United States' strategic defense, providing access, continuity and emergency capabilities for defense purposes.
- **Intermodal Connectors**, which provide access between major intermodal facilities and the other subsystems making up the NHS.

The MPO Planning Area contains a total of 158 NHS Interstate Highway lane miles, 463 non-Interstate NHS US/State highway lane miles, and 88 local road NHS lane miles. The National Highway System is shown in Map 3-b.

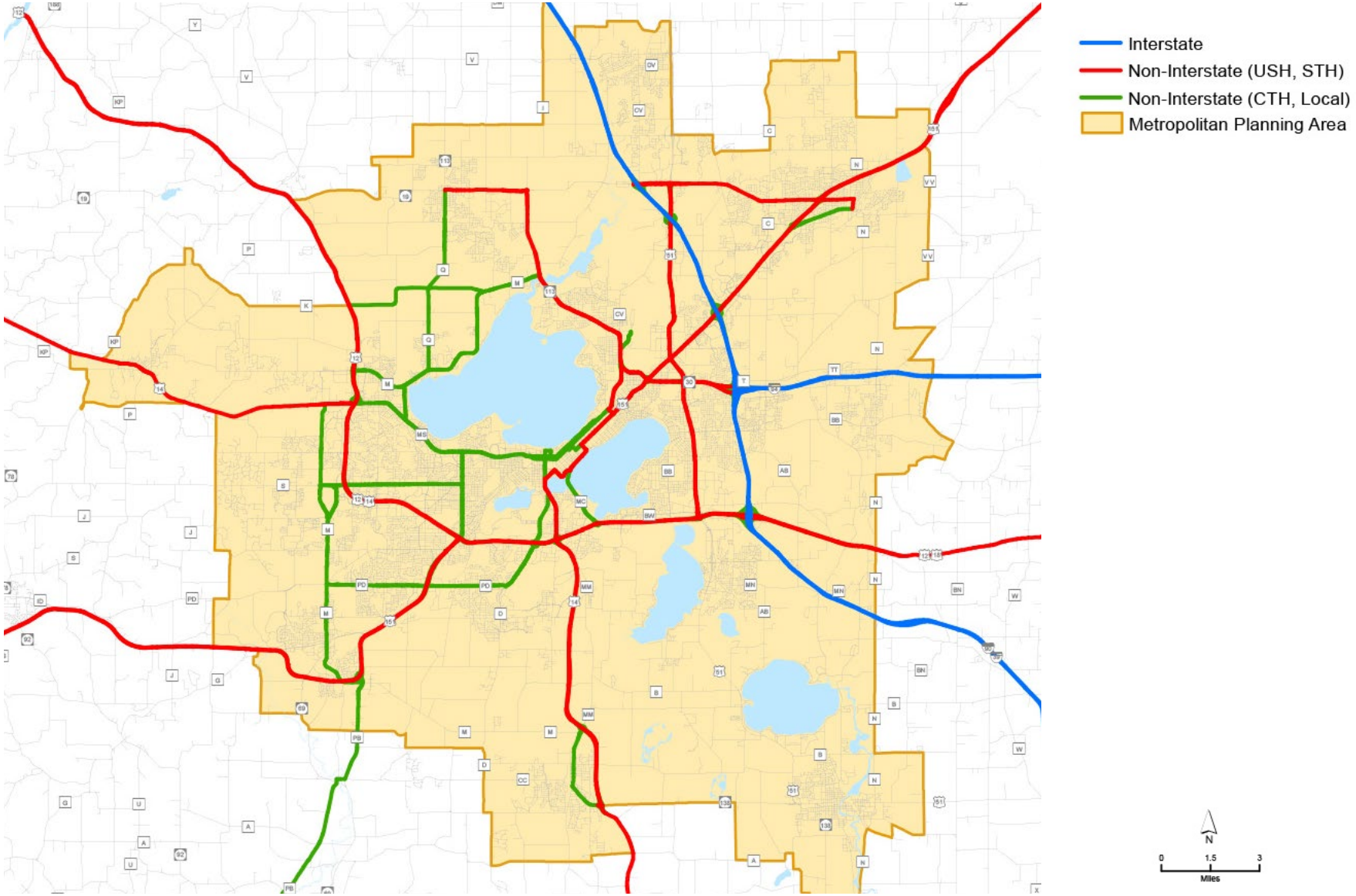
ROADWAY JURISDICTION

Roadway jurisdiction indicates which agency or community owns the road and is responsible for construction, maintenance, and operations. Roadway jurisdiction of the regional roadway network, including all arterials and collectors, is generally categorized in the following systems:

- **State Highway System:** The state highway system consists of all highways under the jurisdiction of the Wisconsin Department of Transportation (WisDOT), including Interstate highways, U.S. Highways, and all other state highways, referred to as State Trunk Highways. 36% of the regional roadway system centerline miles are under WisDOT jurisdiction.
- **Connecting Highway System:** Connecting highways are technically local roads that run through developed portions of cities and villages and connect to and are signed as state highways. The state maintains responsibility for their reconstruction, when needed, but ongoing maintenance is the responsibility of the municipality. Municipalities receive connecting highway aids to offset this maintenance cost. 1% of the regional roadway network are connecting highways, including East Washington Ave., Northport Dr. and Packers Ave., and S. Park Street.
- **County Trunk Highway System:** The county trunk highway system contains public roads under the jurisdiction of and maintained by Dane County. 29% of the regional roadway system centerline miles are under Dane County jurisdiction. That percentage has been decreasing as segments of county highways in cities and villages have been transferred to the

National Highway System 2020

Madison Metropolitan Area



Map 3-b National Highway System 2020

municipality following reconstruction per agreement with the county.

- **Municipal Street System:** The municipal street system includes public roads and streets within the limits of municipalities, except those on the federal, state, and county systems and connecting highways. 34% of the regional roadway system centerline miles are under the jurisdiction of local municipalities.

In some instances, an entity with roadway jurisdiction may enter into an agreement to have another agency perform maintenance, manage operations, or provide snow removal services; however, the agency with jurisdiction over the roadway is ultimately responsible for ensuring the maintenance is performed in a satisfactory manner. For example, Dane County performs all snow removal on the Beltline and Interstate per contract with the state, which are both under WisDOT jurisdiction.

PAVEMENT CONDITION

The useful life of a roadway can be extended, and costs can be minimized, by implementing appropriate preservation treatments throughout the pavement's lifecycle. Selecting the right pavement preservation treatments requires understanding current pavement conditions and where the roadway is in its lifecycle. There are three primary measures used to evaluate pavements in Wisconsin: the Pavement Surface Evaluation and Rating (PASER) system, the Pavement Condition Index (PCI), and the federal measure, required under the federal surface transportation program.

PASER Ratings and Corresponding Treatments

Quality	Rating	Treatment for Pavement	Treatment for Concrete
Excellent	9-10	No maintenance required	No maintenance required
Good	7-8	Crack sealing and minor patching	Routine maintenance
Fair	5-6	Preservation treatments (non-structural)	Surface repairs, partial-depth patching
Poor	3-4	Structural renewal (overlay)	Extensive slab or joint rehabilitation
Very Poor	1-2	Reconstruction	Reconstruction

Figure 3-a PASER Ratings and Corresponding Treatments

The Pavement Surface Evaluation and Rating (PASER) system is used to assist local communities in evaluating the condition of municipal roadways. The PASER rating system was developed by researchers at the University of Wisconsin-Madison to be a quick, comparable way to evaluate surface conditions of pavement. The system rates pavements along a scale from 1-10 and prescribes treatment options accordingly, as shown in Figure 3-a.

For state roadways, WisDOT uses the more sophisticated Pavement Condition Index (PCI) to evaluate pavement condition. PCI was developed by the United States Army Corps of Engineers, and uses a visual survey to measure the distress of pavement. This widely utilized method of pavement condition measurement factors in twenty different pavement distress types (e.g., different cracking types, rutting, potholes, etc.).

In addition to these pavement distress types, PCI rates distress in jointed concrete pavements. The system rates pavements

along a scale of 0-100 in which 0 is the worst possible roadway condition and 100 is a new roadway. For simplicity, this scale has been converted to the PASER scale where used in the RTP. Map 3-c details pavement condition in the MPO planning area.

Generally, roadways with a pavement condition of "fair" or worse are nearing the end of their repairable life. Lower volume roads routinely fall into this category, while high-volume, regional mobility corridors rarely do. In 2019/2020, pavement condition in the MPO Planning area varied by facility type:

- 100% of the Interstate highway system was in good to excellent condition
- 87% of the US highway system was in good to excellent condition
- 90% of the state highway system was in good to excellent condition
- 58% of county and municipal arterial and collector roads were in good to excellent condition.

Some of the regional roadways in the poorest condition in 2019 include:

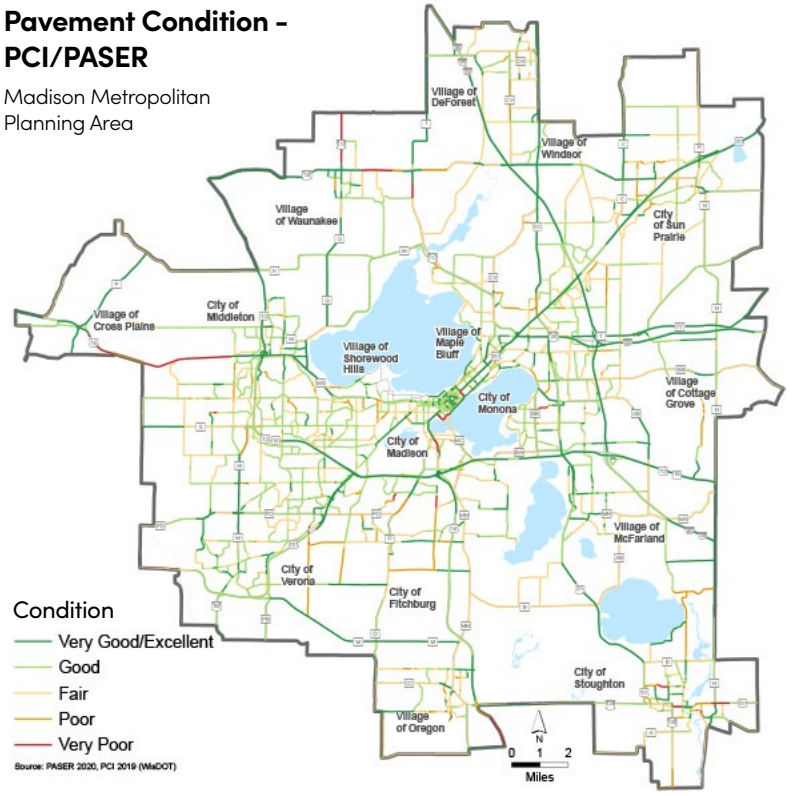
- State Trunk Highway (STH) 113 from Kennedy Road to the STH 19 (very poor to fair) – *Pavement replacement scheduled for 2023*
- STH 113 north of STH 19 (very poor to fair) – *Pavement replacement scheduled for 2024*
- US Highway (USH) 14 from the Beltline to Cross Plains (very poor to poor) – *Mill and overlay completed in 2020*
- S. Blair Street/USH 151 (very poor) – *Concrete repair and overlay scheduled for 2022*
- S. Park/USH 151 (South of Olin Ave.) (fair to very poor) – *Concrete repair and overlay scheduled for 2022*

The federal pavement condition performance measures, required under the surface transportation bill, are based on four metrics: roughness, cracking, rutting, and faulting. These metrics are combined to yield a condition rating that forms the basis of the performance measure. States and MPOs are required to report the percentage of Interstate and non-Interstate NHS roadway lane miles in good and poor condition.

These performance measures were codified several years ago but, until recently, full data has been available only for roughness, measured using the International Roughness Index (IRI). Transportation planners and engineers in the Madison area found the use of IRI alone to be a less useful measure than PASER/PCI.

Pavement Condition - PCI/PASER

Madison Metropolitan Planning Area



Map 3-c Pavement Condition - PCI/PASER

An analysis of pavement condition in the Madison area is also included in Chapter 5.

BRIDGE CONDITION

The Federal Highway Administration (FHWA) compiles the National Bridge Inventory (NBI), a database with information about every bridge in the US. The federally required bridge condition performance measures—percentage of NHS bridges in good and poor condition—are based on deck, superstructure, substructure, and culvert condition ratings in

the NBI. A bridge's condition is determined by its lowest rated element. If the lowest rating is at least 7, the bridge is classified as good; if it is 3 or below, the bridge is classified as poor. Bridges with their lowest rating between 4 and 6, are classified as fair. The federal performance measure is calculated based on bridge deck area, rather than the number of bridges in each category.

By deck area, 49% of bridges in the metropolitan area are in good condition and 1% are in poor condition. The condition of NHS and non-NHS bridges is shown in Figure 3-b. Map 3-d shows the location and condition of both NHS and non-NHS bridges in the area.

A total of 17 bridges in the metropolitan area were rated as being in poor condition following inspections in late 2019, including the following:

- Century Ave./CTH M at Pheasant Branch Creek – *Bridge replacement scheduled for 2022 pending federal grant*
- STH 30 (WB) at Fair Oaks Ave – *Deck overlay scheduled for 2023*
- US 14 at STH 138
- CTH N at Little Door Creek
- Hoepker Rd. at I-39/90/94
- CTH KP at Black Earth Creek – *Bridge replacement scheduled for 2023*
- Windsor Rd at the Yahara River – *Bridge replacement scheduled for 2022*
- CTH T at Koshkonong Creek
- STH 19 at the Yahara River – *Bridge replacement completed 2020*
- CTH MN at Door Creek
- CTH BB at Koshkonong Creek
- Femrite Dr at Door Creek

TRAFFIC VOLUMES

Between 2010 and 2019, vehicle miles of travel (VMT) increased about 8.5% or an average of a little less than 1% annually, as shown in Figure 3-c. The increase is largely due to population and employment growth.

VMT decreased 15% in 2020, due to the COVID-19 pandemic. VMT has largely, but not completely rebounded since then based on data collected by the MPO, but with continued high levels of teleworking trips are more spread out during the day with more made from home rather than as part of the work trip.

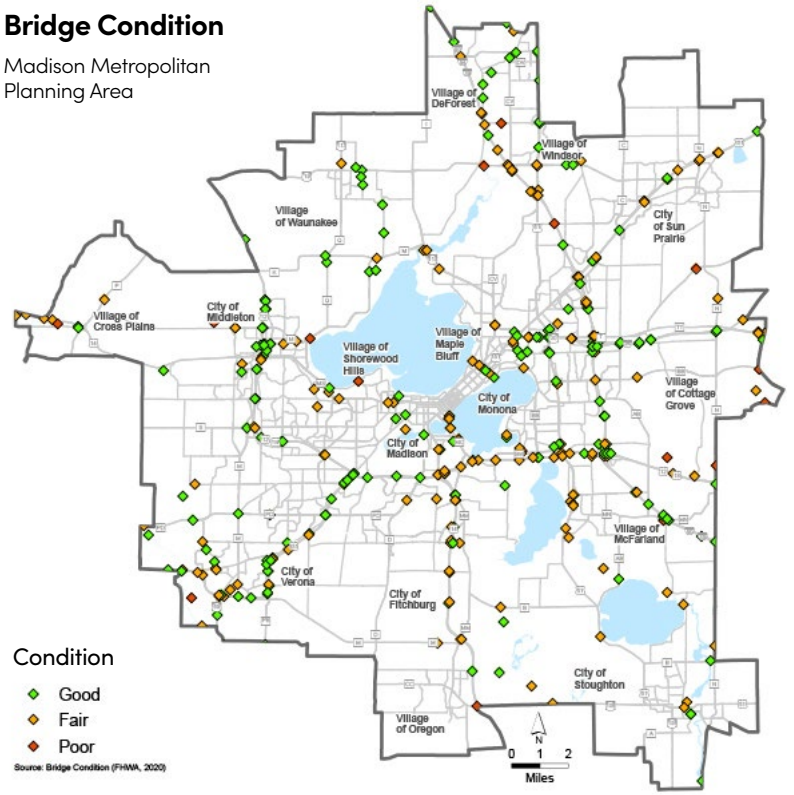
The most significant traffic growth over the past 30 years has occurred on the Beltline between Verona Road and I-39/90 and on I-39/90 between the Beltline and USH

Bridge Condition

Condition	NHS Bridges		Non-NHS Bridges		Combined	
	#	Percent*	#	Percent*	#	Percent*
Good	112	44%	69	61%	181	50%
Fair	97	55%	85	36%	182	49%
Poor	3	1%	14	3%	17	1%

*by deck area

Figure 3-b Bridge Condition



Map 3-d Bridge Condition

Dane County VMT Trends

Year	VMT	% Change
2010	13,258,276	-
2011	13,116,507	-1.1%
2012	13,724,431	4.6%
2013	13,290,950	-3.2%
2014	13,481,513	1.4%
2015	13,637,621	1.2%
2016	14,048,312	3.0%
2017	14,208,516	1.1%
2018	14,406,214	1.4%
2019	14,391,678	-0.1%
2020	12,219,456	-15.1%

Source: WisDOT

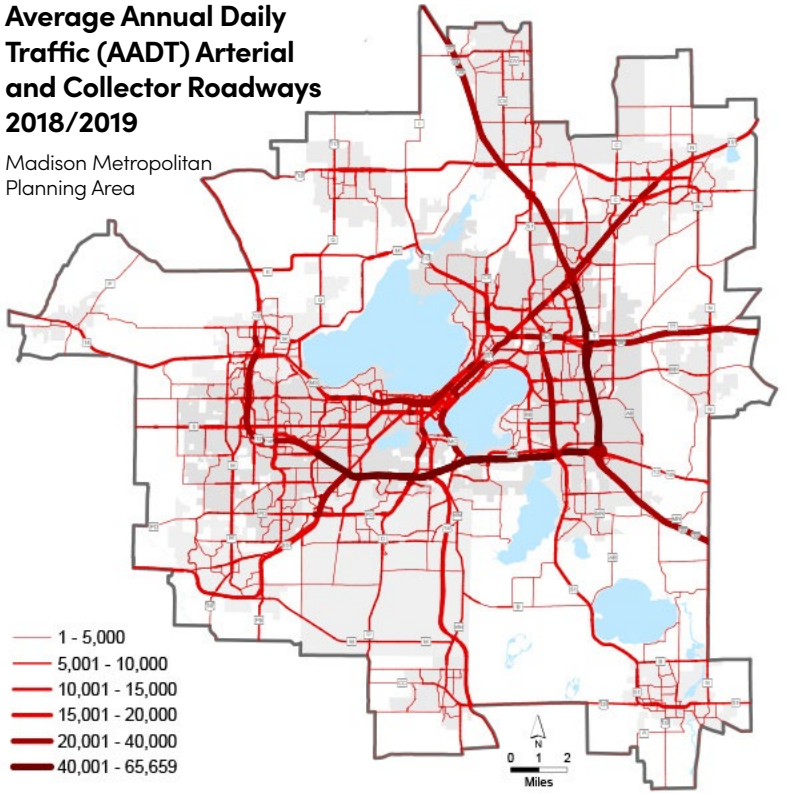
Figure 3-c Dane County VMT Trends

151. The Beltline is the only centrally located roadway that directly connects the west and east sides of the metropolitan area. According to data collected for the Beltline Study, over one-half of vehicles exit the Beltline within four interchanges. WisDOT's Flex Lane project will address the demand by providing additional capacity on the Beltline during peak use periods, for those vehicles traveling more than 1-2 exits.

Map 3-e shows 2019 traffic volumes on the arterial roadway system.

ROADWAY CONGESTION

Congestion is caused when the demand for a transportation facility approaches or exceeds its capacity. Congestion leads to slower travel speeds, vehicle queuing at intersections and interchanges, and can also impact safety, particularly rear end crashes. Recurring congestion is common during the morning and afternoon rush hour periods on heavily traveled regional roadways. This type of congestion is generally predictable, understood, and accepted by motorists. However, non-recurring congestion caused by construction, crashes, bad weather, and other incidents generates unexpected delays and unanticipated variability in trip travel times. Complicating things, one source of non-recurring congestion can trigger or exacerbate the impact of another. For example, a snow storm may lead to a crash, or a special event near a construction zone may cause extreme delay. Research has shown that these non-recurring causes contribute to nearly half of all congestion. This type of unpredictable congestion is also more frustrating than recurring congestion—causing commuters to be late for work, buses to run late, and freight to miss delivery windows. The MPO maintains a congestion management process (CMP) located in Appendix F which monitors congestion in the region and prioritizes congestion mitigation strategies.



Map 3-e Average Annual Daily Traffic (AADT) Arterial and Collector Roadways 2018/2019

Roadway congestion is common during the morning (7-9 AM) and evening (4-6 PM) peak hour periods on heavily traveled regional roadways, particularly on radial arterials leading to the downtown/campus area and in Beltline and CTH M/K corridors due to our geography, which funnels traffic onto a small number of corridors.

Map 3-f shows generalized traffic congestion on the arterial roadway system using planning level daily traffic volume capacities

in the regional travel model developed by WisDOT using the Highway Capacity Manual.

While congestion has traditionally been measured in terms of the capacity of a roadway, travel time reliability is a more direct measure of how congestion affects roadway users. Travel time reliability measures the variability in travel times that can occur from one day to the next. For most commuters, congestion is understood, anticipated, and planned for, however drivers generally need to budget extra time to allow for unanticipated variability or delays caused by incidents such as weather conditions, work zones, crashes, or special events. Reliability is reported as the travel time index, which is the ratio of travel time in peak periods compared to travel times during normal conditions. A travel time index value of 1.25 indicates that a trip that would typically take 20 minutes would take 25 minutes in heavy traffic conditions (20 minutes x 1.25 =25 minutes). An index value of 1.5 or less is considered reliable. Map 3-g shows the morning (7-9 AM) and Map 3-h shows evening (4-6 PM) travel time reliability for major area roadways.

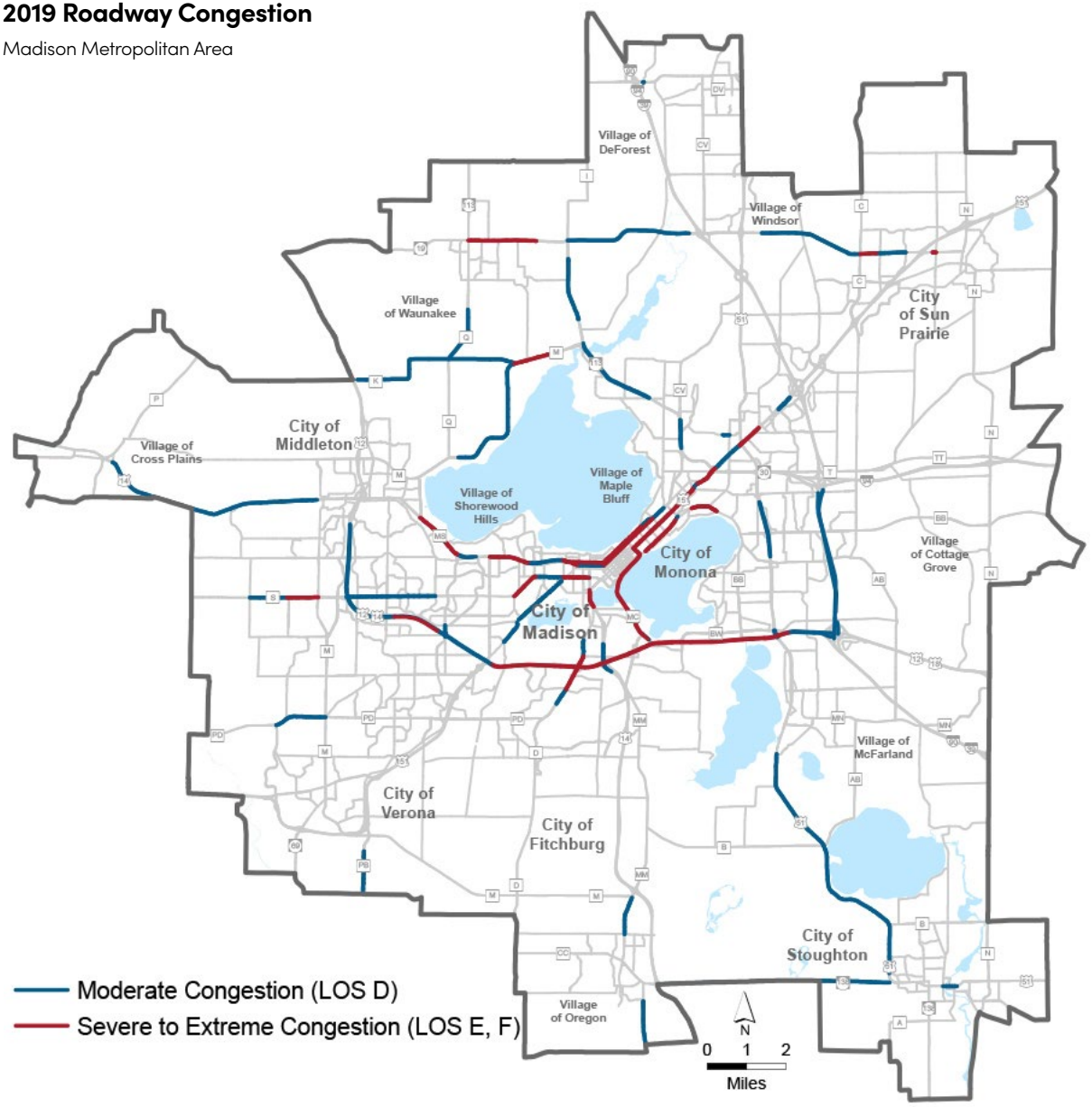
SAFETY

The safety of all roadway users is a top priority. Between 2016 and 2020, Dane County experienced an average of 9,265 crashes per year[1]; during this time period there were 164 total crash fatalities and 1,009

[1] Crash data from Wisconsin Traffic Operations and Safety (TOPS) Laboratory. Wisconsin MV4000 and DT4000 crash data, excluding crashes with deer.

2019 Roadway Congestion

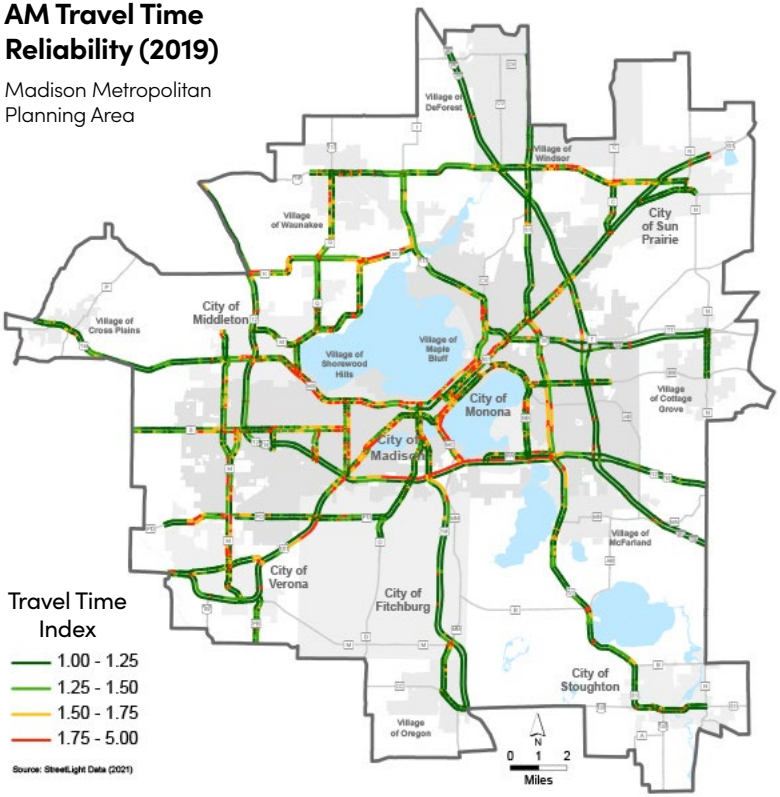
Madison Metropolitan Area



Map 3-f 2019 Roadway Congestion

AM Travel Time Reliability (2019)

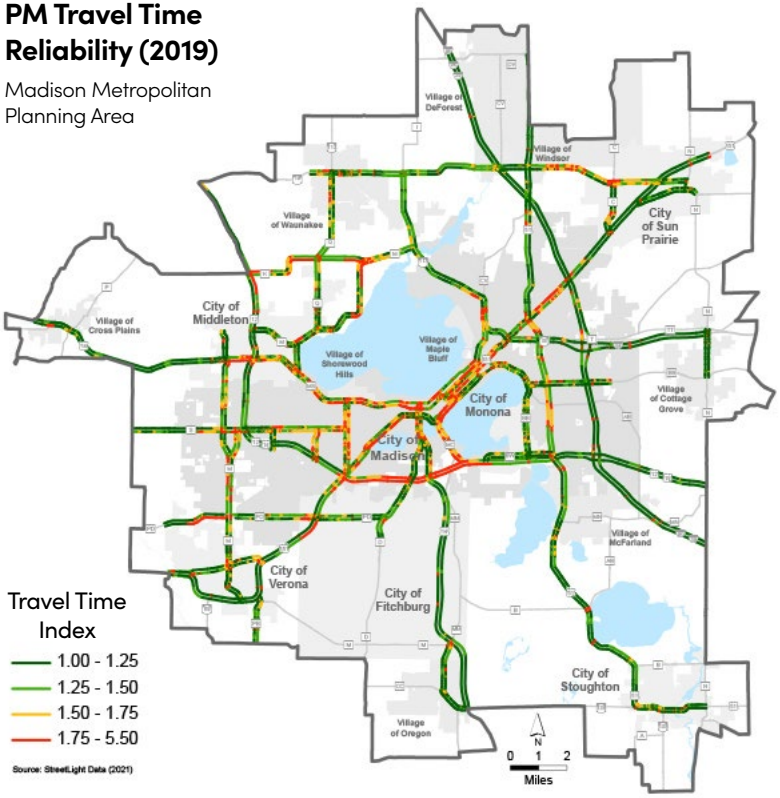
Madison Metropolitan Planning Area



Map 3-g AM Travel Time Reliability (2019)

PM Travel Time Reliability (2019)

Madison Metropolitan Planning Area



Map 3-h PM Travel Time Reliability (2019)

Dane County Motor Vehicle Fatalities

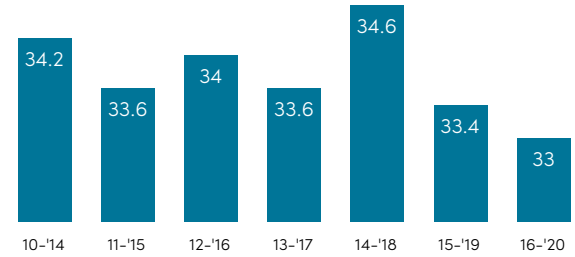


Figure 3-d Dane County Motor Vehicle Fatalities

Dane County Crash Fatalities 2010-2021

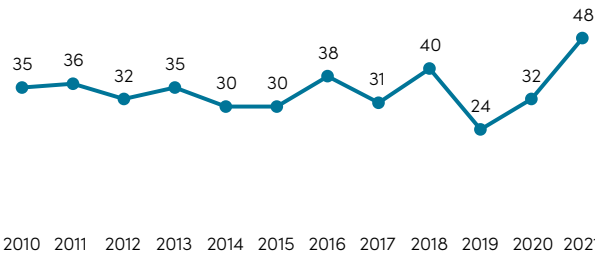


Figure 3-e Dane County Crash Fatalities 2010-2021

serious injuries. 75% of crashes resulted in property damage only. Traffic fatalities had been generally decreasing over the years as shown by the 5-year rolling averages in Figure 3-d, however as seen in Figure 3-e, 2021 was the deadliest year on Dane County roads in recent history, despite a significant drop in vehicle traffic and overall crashes as a result of the pandemic. Serious injuries as a result of a traffic crash have continued to rise in recent years, as shown in Figure 3-f. Vulnerable roadway users -

Dane County Motor Vehicle Serious Injuries

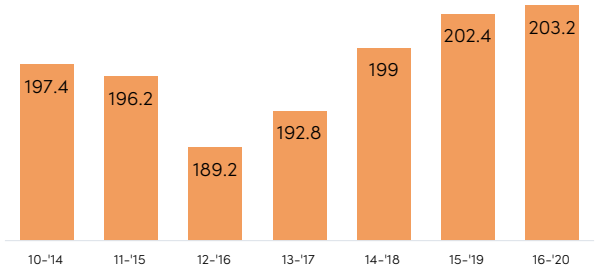


Figure 3-f Dane County Motor Vehicle Serious Injuries

Dane County Non-Motorized Fatalities and Serious Injuries

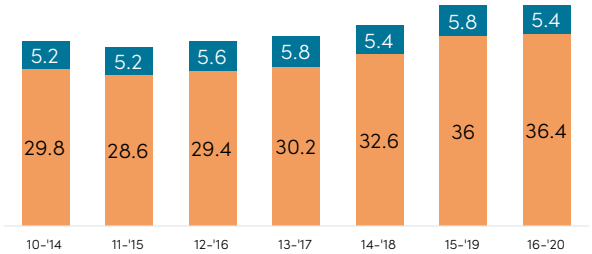


Figure 3-g Dane County Non-Motorized Fatalities and Serious Injuries

bicyclists and pedestrians - continue to make up a disproportionate share of roadway fatalities and serious injuries, shown in Figure 3-g. Over the past five years, the most common contributing factors to crash fatalities include: not wearing a seatbelt (36% of fatal crashes), speeding (29% of fatal crashes), and drug and/or alcohol impairment (25% of fatal crashes).

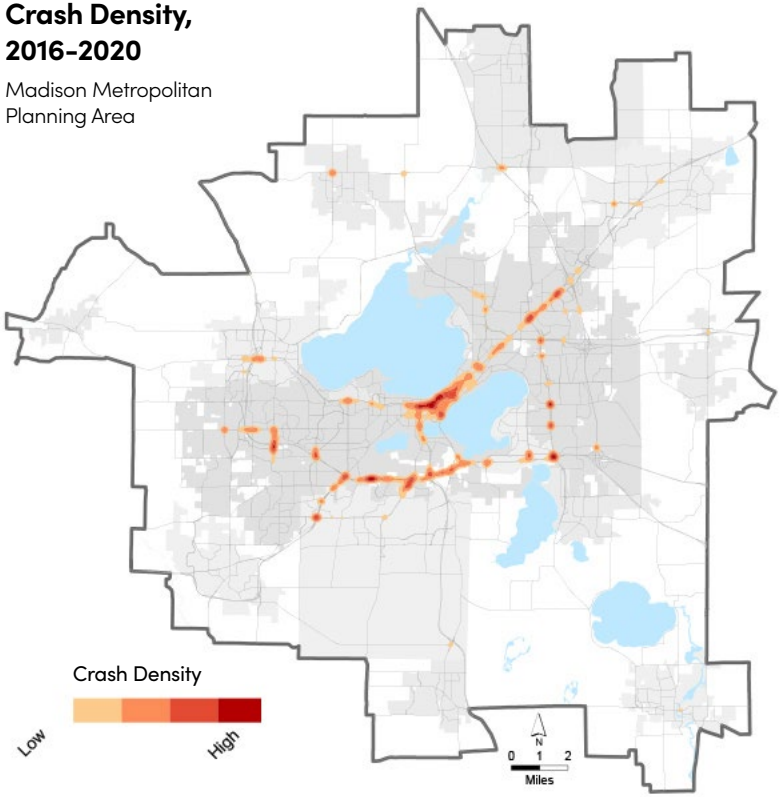
Map 3-i shows the "hotspot" density of crashes from 2016-2020. As expected, the highest volume arterials, as well as the isthmus area, have the highest density of total crashes.

The University of Wisconsin-Madison (UW) Traffic Operations & Safety (TOPS) Lab completed an intersection network safety network screening analysis for the MPO. The analysis ranked all arterial and collector intersections in the planning area by the total number of crashes, crash rate, and crash severity using crash data from 2017-2020. A map of the top 100 ranked intersections by crash frequency is shown in Map 3-j. The top 10 intersections ranked by severity include:

- East Washington Ave and Stoughton Rd
- Stoughton Rd and Broadway
- East Washington Ave and Zeier Rd
- Stoughton Rd and Buckeye Rd
- Stoughton Rd and Pflaum Rd
- Monona Dr and Broadway
- East Washington Ave and First St
- Gammon Rd and Watts Rd
- John Nolen Dr and Rimrock Rd
- Packers Ave and International Ln

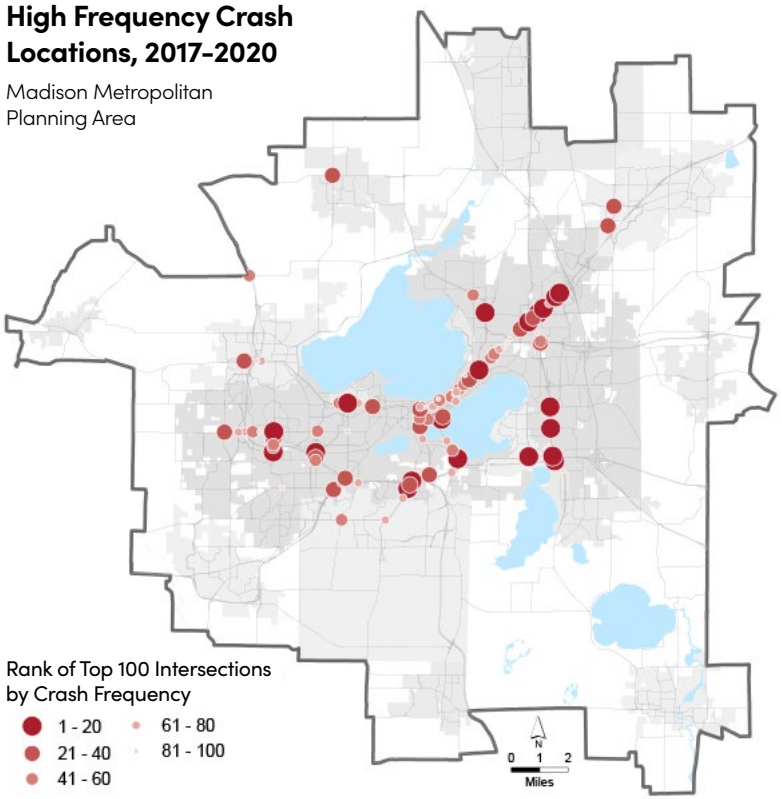
Crash Density, 2016-2020

Madison Metropolitan Planning Area



Map 3-i Crash Density, 2016-2020

The City of Madison adopted a Vision Zero policy in 2020. Vision Zero is a data driven strategy intended to eliminate traffic deaths and severe injuries on city streets. The City of Madison Vision Zero initiative strives to improve pedestrian and bike safety for all users throughout the city and improve the identified high injury intersections, all in an effort to prevent avoidable fatal crashes. A key Vision Zero strategy is reducing speed limits, and as part of their Vision Zero initiative, the City lowered speed limits on segments



Map 3-j High Frequency Crash Locations, 2017-2020

of East Washington Ave, Cottage Grove Rd, Whitney Way, Mineral Point Rd, Gammon Rd, McKenna Blvd, and Milwaukee St. Madison is rolling out a "20 is Plenty" program focused on reducing speed limits on residential streets. The City of Sun Prairie also adopted a Vision Zero policy in 2021, establishing a pedestrian safety task force and reducing the speed limit on Main Street.

The MPO is an active member of the Dane County Traffic Safety Commission (TSC). The TSC meets quarterly to review traffic crash data in order to enhance the level of safety on all public roadways in Dane County for all roadway users. The TSC is comprised of representatives including planners and engineers, law enforcement, medical professionals and other interested community participants to foster a coordinated effort to address the "4 E's" of road safety: Education, Enforcement, Engineering, and Emergency Care. The MPO assists with compiling crash statistics and facilitating the crash incidence review. The MPO is currently assisting with a project to develop recommendations for how the TSC reviews and acts on crash trends and to develop a coordinated 4 E program to address identified problem safety issues.

INTELLIGENT TRANSPORTATION SYSTEM (ITS) AND TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)

An Intelligent Transportation System (ITS) is a collection of technologies or systems (e.g., advanced sensors, computers, communications systems, etc.) that enable multiple agencies to work together to collectively manage a transportation network. ITS can be applied to the region's transportation infrastructure of highways, streets, bridges and to a growing number of vehicles, including cars, buses and trucks. ITS elements can also assist in the safe movement of bicycles and pedestrians and can improve transportation providers' (e.g., governments, transit agencies, emergency responders) ability to offer services to the public. ITS technologies can help:

- Collect and transmit information on traffic conditions. This information can be used in real-time to notify users so they can adjust their plans and by operators to better manage the transportation network. Historical information can be used to monitor how conditions change over time and to implement fixes and tweaks so that strategies can be set in place prior to when impacts are expected.
- Decrease congestion by reducing the number of traffic incidents, clearing them more quickly when they occur, and rerouting traffic flow around them to decrease emergency response times and to improve quality of life of those users that would otherwise be impacted by incidents.
- Improve the efficiency of transit, maintenance, and emergency response agencies.

Examples of ITS infrastructure include:

- Adaptive traffic signals
- Connected signals and vehicles – something being pilot tested in the Park Street corridor

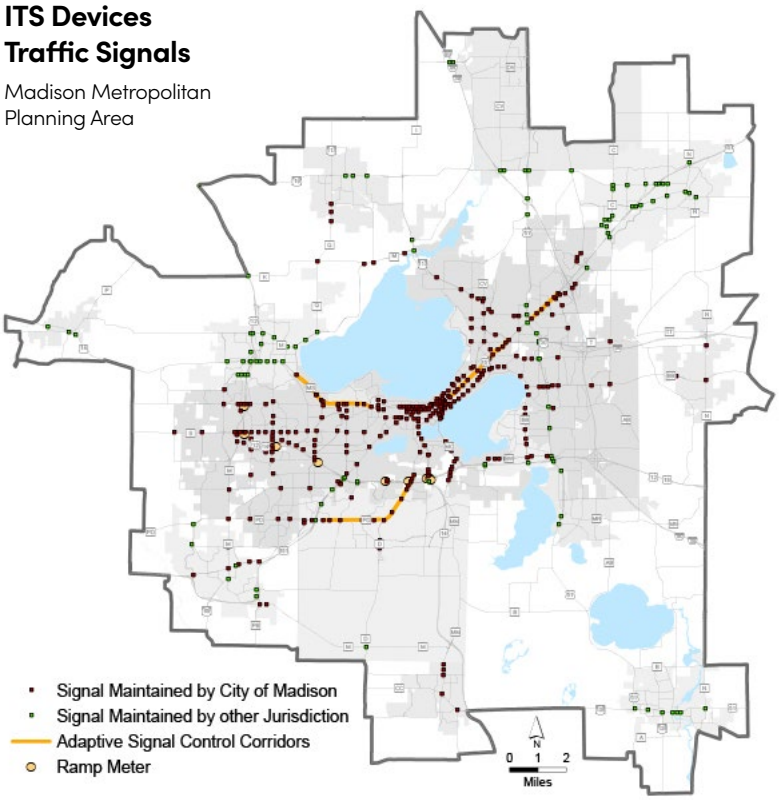
- Ramp metering
- Transit signal priority
- Travel information systems, including dynamic messaging signs
- Road weather information systems
- Traffic cameras to allow monitoring of traffic conditions
- Bluetooth sensors
- Automatic traffic recorders

Map 3-k shows traffic signals, including adaptive signal corridors, and ramp meters. Map 3-l shows traffic cameras and real-time message signs.

Madison's Transportation Systems Management and Operations (TSMO) Program combines' robust communication networks with innovative software applications to manage traffic operation using physical and virtual user interfaces. These tools allow for remote monitoring and response to traffic conditions in real time. Traffic engineers are able to apply state-of-the-art tools and technologies to reduce congestion and delay, enhance safety and improve the overall utility of Madison's transportation network to support cost-effective economic growth in the region in a more sustainable manner.
The City of Madison's Traffic Engineering team recently received international distinction and the *2021 Transportation Systems Management & Operations Council Organization Award* by the Institute of Transportation Engineers (ITE). The specific award Madison received seeks to recognize organizations that demonstrate the successful use of Intelligent Transportation System (ITS) technologies to improve the efficiency of surface transportation facilities with significant societal mobility.

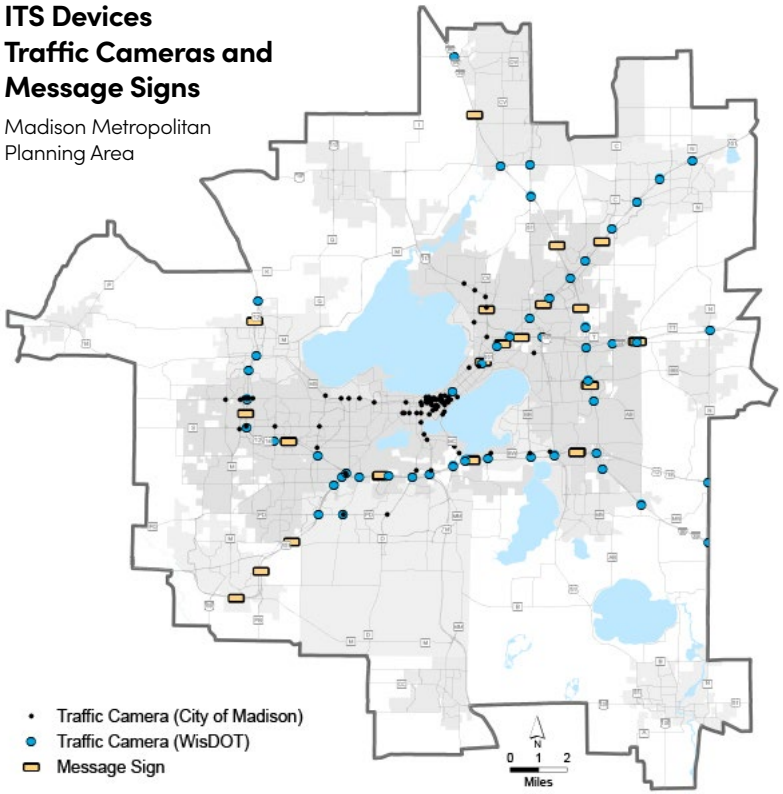
Key components that comprise the City of Madison's Transportation Systems Management and Operations (TSMO) Program include:

- Low-cost Physical and Virtual Traffic Management Center - an area located in the city's downtown Traffic Engineering office, featuring a video wall and management tools for engineers and operators to remotely monitor traffic and make changes to devices in the field.
- Fiber Network Communication - city-owned infrastructure by which information transmits to devices and facilities around the City.
- Traffic Condition Monitoring - visual verification of operations and traffic incidents provided by online congestion mapping and strategically placed traffic cameras throughout the city's transportation network.



Map 3-k ITS Devices Traffic Signals

- Advanced Traffic Signal Management Software - an application that allows engineers the ability to respond and adapt traffic signals to changing conditions.
- Asset Management - the coordination of staffing resources and information related to traffic engineering infrastructure around the City.
- Traveler Information - a Waze-based application that allows city staff to share real-time incident information with road users.



Map 3-I ITS Devices Traffic Cameras and Message Signs

Recently, the program played a critical role in response to changing travel demands resulting from COVID-19. The program includes many Intelligent Transportation System (ITS) components and promotes a culture of effectively managing and operating the transportation system instead of constantly expanding the infrastructure. Not only does this program provide solutions to today's issues such as COVID-19 response, it also positions Madison to be better able to adapt to growth and technological challenges in the future.

ELECTRIC VEHICLES AND ALTERNATIVE FUEL CORRIDORS

Electric vehicle (EV) and other alternative fuel vehicle (AFV) use is growing rapidly across Wisconsin and the country. Alternative fuels include hydrogen, propane, and natural gas. These vehicles rely on charging and fueling station infrastructure that match their vehicle type to travel successfully.

Electric charging is the most common alternative fuel option. Approximately 80% of electric vehicle charging is done at home, and workplace charging options are expanding, however acceptable levels of public charging station infrastructure is important to reduce range anxiety. There are three levels of electric charging:

- Level 1 charging is the most basic, using a standard electrical outlet. This can be used for home charging, and requires the greatest amount of charging time to fully recharge, up to 1-2 days depending upon battery size.
- Level 2 charging uses a 220-240 volt outlet. It can take up to 8 hours to fully recharge a using level 2 charging.
- Level 3 charging is also called fast- or supercharging. Level 3 can fully recharge an EV battery in around an hour depending upon battery size.

There are 100 public EV chargers in the Madison area, 16 of which are high power or supercharging stations, shown in Map 3-m.

Federal Highway Administration (FHWA) Alternative Fuel Corridor Designation Program

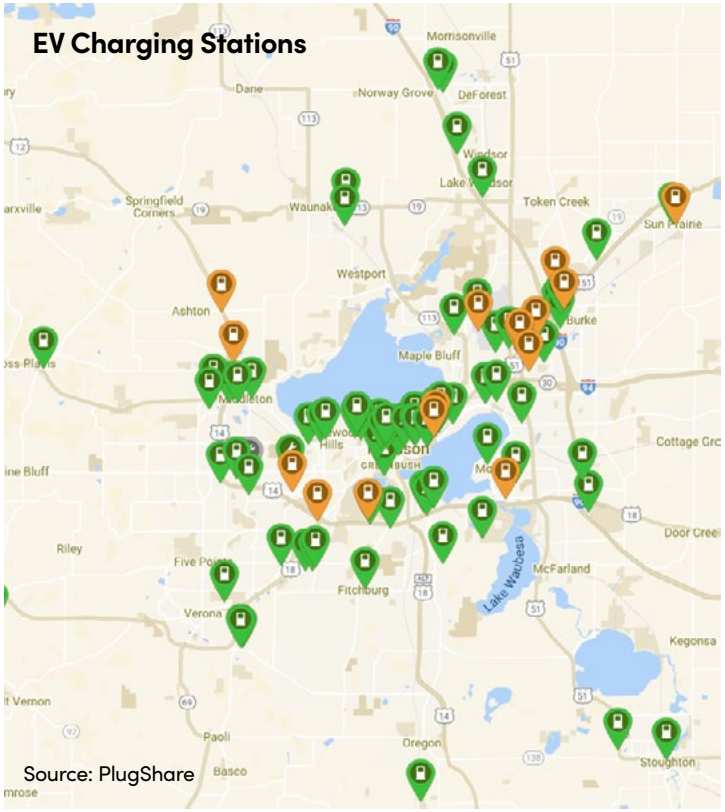
The Alternative Fuel Corridor (AFC) Designation Program was established by Section 1413 of the FAST Act to create a national network of alternative fueling and charging infrastructure along National Highway System (NHS) corridors. Current designations of Alternative Fuel Corridors (AFC) cover over 145,222 miles of the NHS.

There are two designation types available for a given corridor:

1. "Corridor-Ready": Route has enough facilities to warrant signage indicating locations of alternative fueling stations
2. "Corridor-Pending": Route does not yet have enough facilities to warrant signage. FHWA coordinates with state and local entities to bring corridor-pending routes up to corridor-ready.

Designation status is based on a maximum distance between fuel stations of the same type along the corridor:

- EV charging: EV charging facilities at 50-mile intervals along designated EV corridors. I-94, and portions of I-39/90 from Edgerton to US 51 north of Madison, and US 151 from the Beltline to STH 19 in Sun Prairie are designated as corridor-ready EV corridors.
- Propane: Propane fueling facilities at 150-mile intervals along designated propane corridors. I-39/90 and I-94 are designated propane fuel corridor-ready.
- Natural gas: Compressed natural gas (CNG) and liquefied natural gas (LNG) facilities at 150-mile intervals and at 200-mile intervals respectively, along designated corridors. The entirety of US 151, 1-39/90, and 1-94 is designated at CNG corridor-ready routes. There are no LNG corridor-ready routes in the region.



Map 3-m EV Charging Stations

Public Transit

TRANSIT SERVICE PROVIDERS

Metro Transit, operated by the City of Madison, provides the majority of public transportation service in the Madison metropolitan area. The agency contracts with the cities of Middleton, Fitchburg, Sun Prairie, and Verona, as well as the University of Wisconsin and other entities to provide service outside the City of Madison. Metro operates a fleet of about 215 fixed-route buses, as well as contractor-provided point-to-point paratransit service for qualifying people with disabilities.

As shown in Figure 3-h, ridership on Metro Transit increased rapidly following the City of Madison's acquisition of the Madison Bus Company in 1970, spurred by spiking oil prices in the 1970s, peaking in 1979. Throughout the 1980s ridership declined before beginning a period of moderate growth in the 1990s that accelerated in 2000s, reaching a high of 15.2 million in 2014. Ridership then began a decline, exacerbated by the COVID-19 pandemic—which reduced annual ridership to less than 37% of pre-pandemic levels in 2020. The causes and implications of the pre-COVID decline are unclear but may be linked to lower gasoline prices and the rise of ride-hailing services such as Lyft and Uber. The increase in remote work that followed safer-at-home orders responding to the COVID-19 pandemic is likely to have a long-term impact on ridership, as many employers are expected to continue to allow part-time and in some cases full-time remote work in the post-COVID future. Even so, April 2021 saw year-over-year increases in ridership from April 2020—the first month with a year-over-year increase since the pandemic began in March 2020.

In addition to Metro Transit, the City of Monona operates Monona Express, a fixed-route commuter service during the morning and afternoon peak periods, and Monona Lift, designed primarily to provide transportation for seniors and people with disabilities during mid-day hours. Monona Express operates in a counter-clockwise loop around Lake Monona in the morning and a clockwise loop in the evening. Service is only provided to passengers travelling within Monona or between Monona and Madison.

Annual Fixed Route Ridership 1970-2020

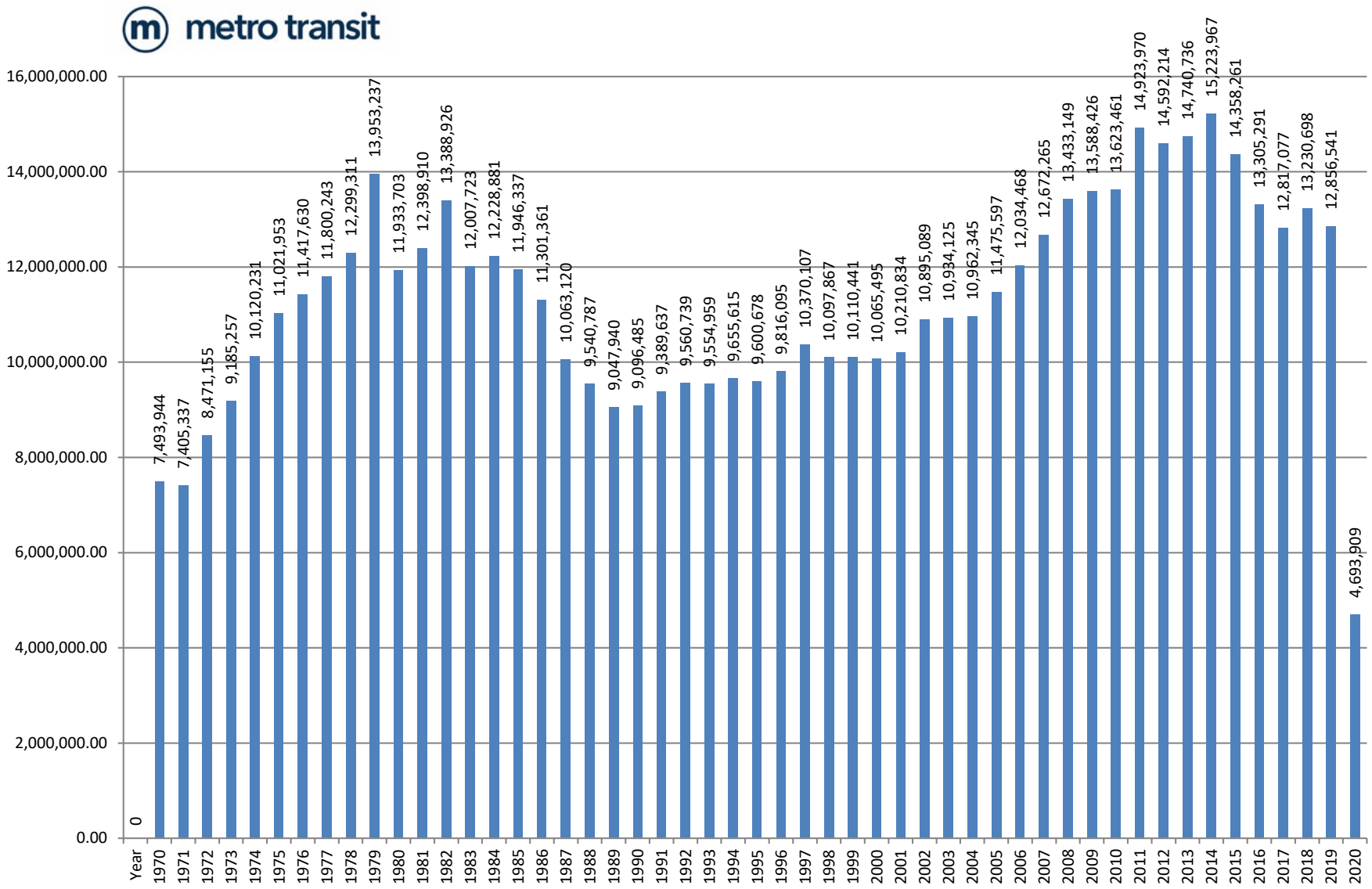


Figure 3-h Annual Fixed Route Ridership 1970-2020

Map 3-n shows the transit route system and service area.

While other communities lack local fixed route transit service, Sun Prairie and Stoughton offer publicly subsidized shared-ride taxi service, primarily for intra-city trips. In addition, Sun Prairie is working with Metro and the MPO to design potential local service routes, which would provide transfer opportunities to the local Sun Prairie BRT extension.

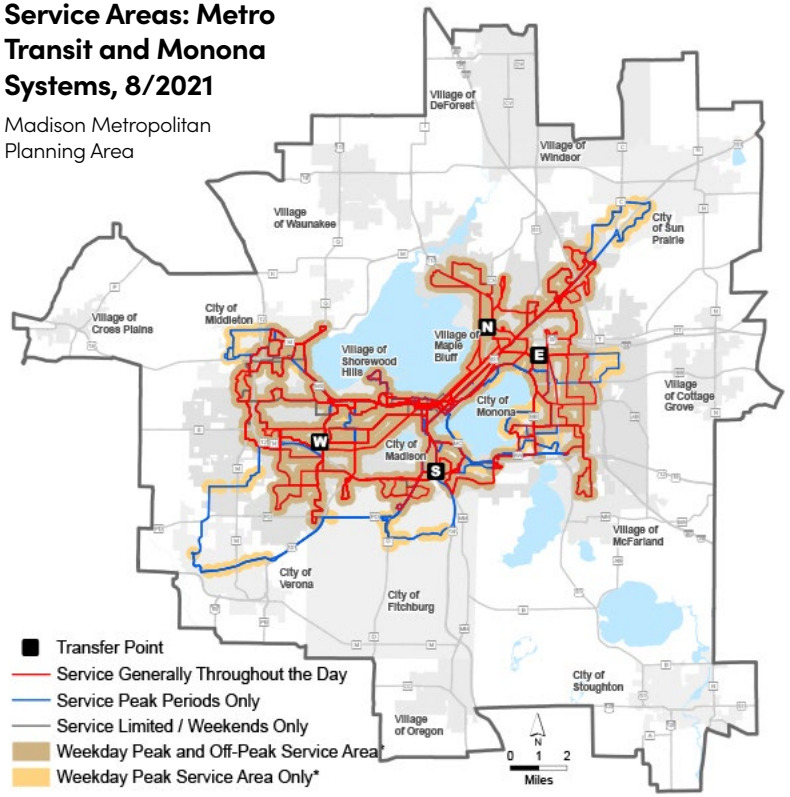
SERVICE LEVELS

Metro Transit operates 47 mainline fixed routes[2] and several supplemental school day routes serving Madison's public middle and high schools. Service is currently designed around four transfer points with most routes operating every 30 minutes during weekday peak periods and every 30 to 60 minutes off peak if service is offered during those times. Timed transfers at the transfer points allow for connections throughout Metro's service area. Many routes overlap in central Madison to provide service in some corridors every 15 minutes or better. While the transfer point system theoretically provides the opportunity for riders to travel throughout the Metro service area, it often requires out-of-direction travel and can result in travel times in excess of 1.5-2 hours for common one-way trips between peripheral areas.

Metro Transit's service (2022) is concentrated in the morning and afternoon peak periods with about 125 buses in operation during those times. Fleet utilization drops to about 75 buses during the middle of the day on weekdays and 35 on weekends. The added service during peak periods consists of increased frequency on all-day routes, commuter routes that provide faster and more direct service, and supplemental school day routes targeting middle school and high school students. Metro began to phase out provision of contracted middle school student transportation for MMSD in 2019, with that service scheduled to end with the 2021-2022 school year.

Service Areas: Metro Transit and Monona Systems, 8/2021

Madison Metropolitan Planning Area



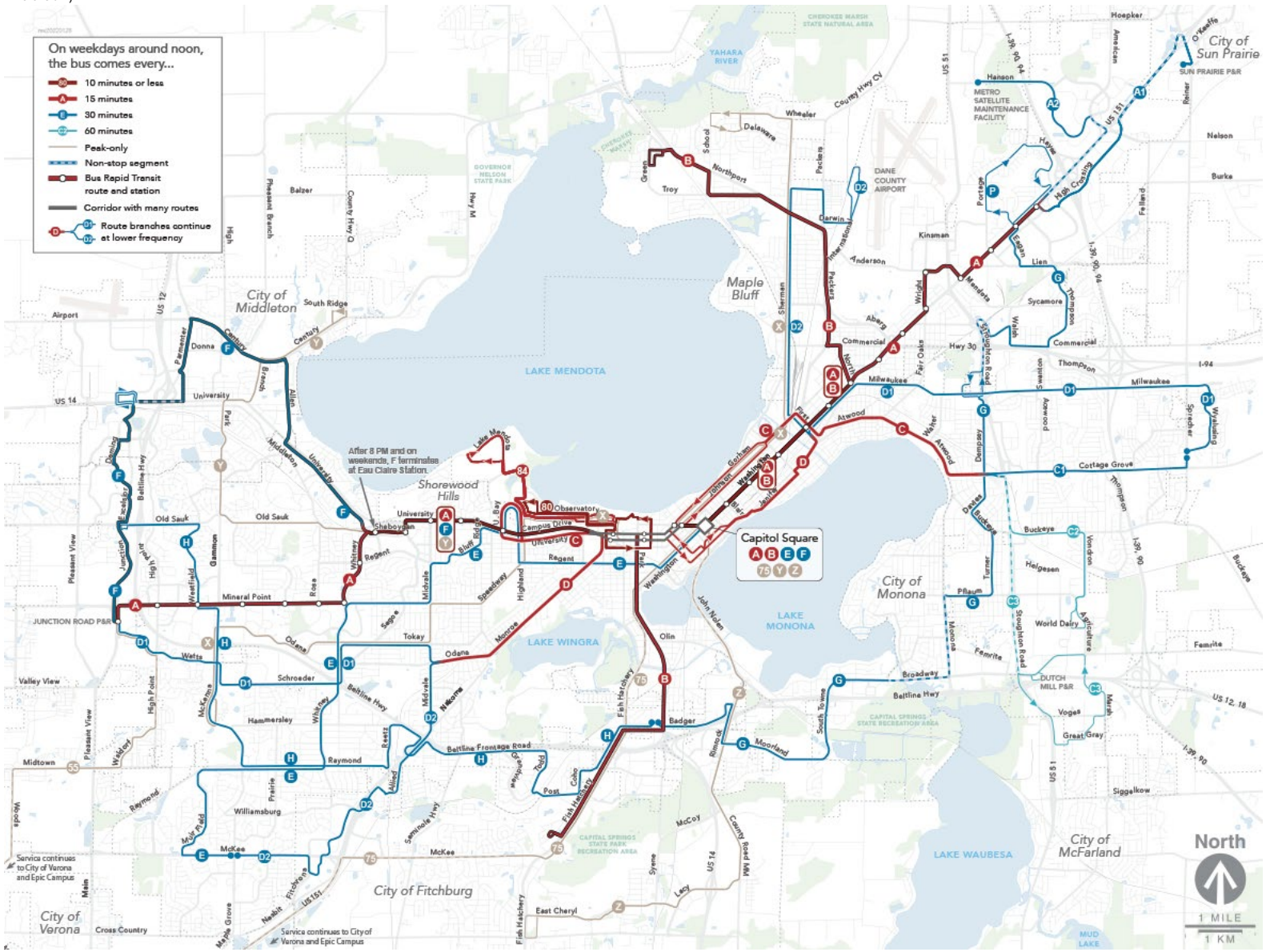
Map 3-n Service Areas: Metro Transit and Monona Systems, 8/2021

Metro is currently working with Jarret Walker + Associates on a study intended to entirely redesign its transit network to integrate with BRT and to align with current service goals. Implementation of new service patterns is expected to begin in summer 2023. Service on the future BRT routes will be provided by conventional buses until BRT service begins in 2024. Map 3-o shows service frequencies during the mid-day period under the draft network plan. Service levels would be consistent throughout the service day, until 8 PM on weekdays or all day on weekends, when service frequency would drop. In Map 3-o, service frequencies are indicated by the color of the line showing each route, with frequencies of 15 minutes or less in red, 30-minute headway routes in blue, 60-minute routes in light blue, and peak-only routes in tan. Route designations (e.g. A, B, C, D1, D2, 75) are for planning purposes only.

[2] November 2021; pre-pandemic, Metro operated as many as 62 mainline fixed routes.

Draft Network Plan

Madison, WI



Map 3-o Draft Network Plan

BUS OPERATIONS

Metro Transit dispatches its fleet of about 220 buses from a single bus storage and operations facility on East Washington Avenue at Ingersoll Street. The facility was renovated in 1981 with the intent of housing a fleet of about 160 buses and is currently operating beyond capacity. A multi-phase facility improvement plan began in 2019, with phase 3A scheduled to be completed in August 2022. Metro is currently planning and designing the remodel of a new satellite facility on Hanson Road, which will accommodate 96 to 104 60-foot articulated buses, as well as providing bus fueling and maintenance lanes, driver spaces, and administrative offices. This facility will support the Bus Rapid Transit and other fixed-route operations.

Metro Transit's fixed-route fleet consists almost entirely of standard-length 40-foot diesel transit buses, about 10% of which are hybrid diesel-electric. Metro took delivery of three electric buses in 2021 that will enter service in 2022. Metro Transit, in coordination with the MPO, conducted a *Bus Size Study* in 2014 reviewing the fleet make-up. The study concluded that although the uniform fleet cost-effectively serves the area, the overcrowding problems encountered on several routes could be solved with larger 60-foot long articulated buses. Further, a few buses could be replaced with shorter 30-foot buses, although the small number of 30-foot buses combined with similar operating costs would not result in large cost savings. Metro will use new articulated 60-foot buses for the East-West BRT system, as well as the North-South BRT, Middleton, Sun Prairie, and American Center local service extensions.

FUNDING

Funding for public transportation in the Madison area is derived primarily from four sources – fares, local investments (primarily from property taxes), federal grants, and state operating grants. As Metro Transit is a City of Madison utility, some service, particularly service provided outside the city limits, is funded through partner agreements where other municipalities or institutions cover the local share. Figures 3-i and 3-j show Metro Transit's Operating and Capital budget funding summaries for 2020.

Metro Transit's funding and governance structure as a city-owned utility is fairly uncommon. A Regional Transit Authority, which would raise revenue in the transit service area, has been explored but is not currently allowed by state law. Enabling legislation was granted in 2009 and rescinded in 2010.

SPECIALIZED TRANSIT

The majority of specialized transportation open to the public is supported by Metro Transit and Dane County. A variety of private organizations and service providers help bring the service to the public.

Metro Transit provides its paratransit service in accordance with the Americans with Disability Act. The paratransit network shadows the all-day fixed-route bus system, excluding peak-period commute-oriented service. Paratransit service is provided on a demand-responsive, advance-reservation basis for people who are unable to use Metro's regular fixed-route service. Metro contracts with private providers for paratransit service. Metro contracted 113,301 paratransit trips in 2019.

Metro Transit 2020 Operating Funding Summary

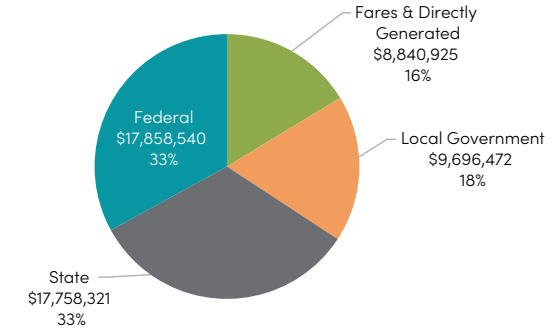


Figure 3-i Metro Transit 2020 Operating Funding Summary

Metro Transit 2020 Capital Funding Summary

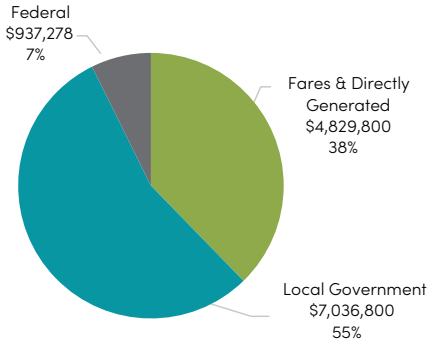
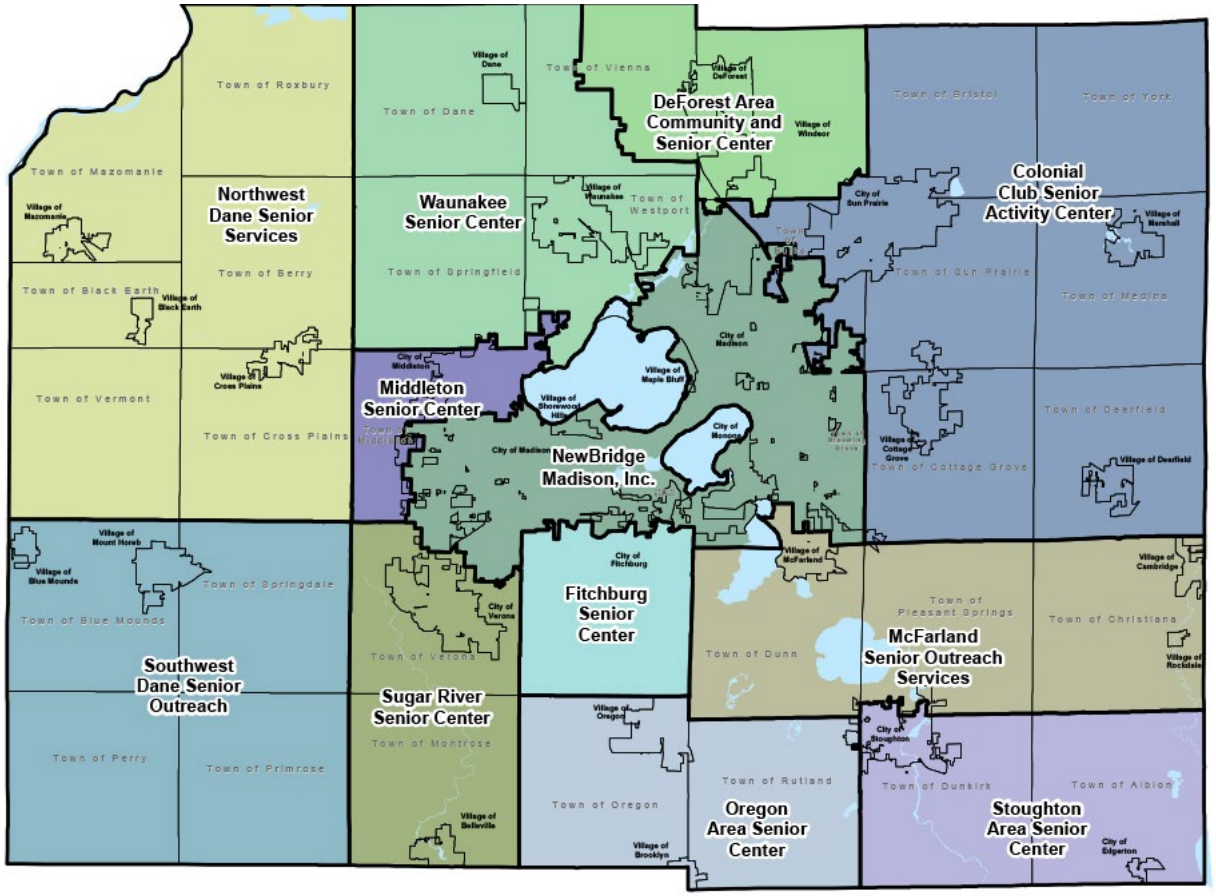


Figure 3-j Metro Transit 2020 Capital Funding Summary

2021 Dane County Senior Focal Points



Map 3-p 2019 Dane County Senior Focal Points

The Adult Community Services Division of the Dane County Department of Human Services (DCDHS) administers wheelchair-accessible routed group ride and demand-responsive services for seniors and people with physical or developmental disabilities. The service is provided entirely through contracts with private service providers. DCDHS operates a one-call center to help coordinate these services as well as external resources and to help riders easily connect with the appropriate service.

The group ride services are divided into Group Access Service in urban neighborhoods and Rural Senior Group Transportation Program outside of the Madison/Middleton area. The services provide regularly scheduled weekday routed group trips for seniors (age 60 and older) and people with disabilities who live in their own homes in Dane County. The service is neighborhood-based, connecting residential areas to nearby nutrition sites, grocery/general shopping areas, and other destinations. During the COVID-19 pandemic, group access services transitioned to meal and grocery delivery services in order to provide vital nutrition access for eligible participants.

Map 3-p shows the group ride services focal points around which the service is organized.

The public shared-ride taxi systems in Sun Prairie and Stoughton offer accessible service that is generally door-to-door. Several private taxi companies operate in the Madison area; however, only Union Cab offers wheelchair-accessible service. The Dane County Accessible Taxi Service (DACTS) was formed as a non-profit in 2021; beginning in 2022, this entity will provide accessible taxi vehicles to Union Cab for prioritized dispatch services for eligible riders.

Other specialized transportation services fill various needs. The Retired Senior Volunteer Driver Escort Program (RSVP) provides individual door-through-door rides to medical trips for adults aged 60 and over

and for people with disabilities with volunteer drivers in their own vehicles. The Veterans Helping Veterans program provides veterans of all ages and their family members with rides to needed appointments and services. Private Non-Emergency Medical Transportation (NEMT) providers offer rides throughout Dane County and beyond; many NEMT providers operate on a shared-ride model to improve operational efficiency. YW Transit[3] provides four primary services county-wide:

- Contracted Community Rides: Rides to community agency programs for individuals isolated by poverty, age, disability, and language barriers.
- JobRide: Rides for low-income people going to/from work.
- Sexual Assault Prevention: Rides at night for potential victims of sexual assault and those in domestic violence situations.
- Specialized Transportation: Rides for seniors and people with disabilities to access their communities and needed services.

Specialized Transportation is discussed in more detail in the *2019-2023 Coordinated Public Transit – Human Services Transportation Plan for Dane County*.[4]

[3] YWCA transportation program

[4] https://www.greatermadisonmpo.org/planning/documents/2019_CoordinatedPlan_FinalForWeb.pdf

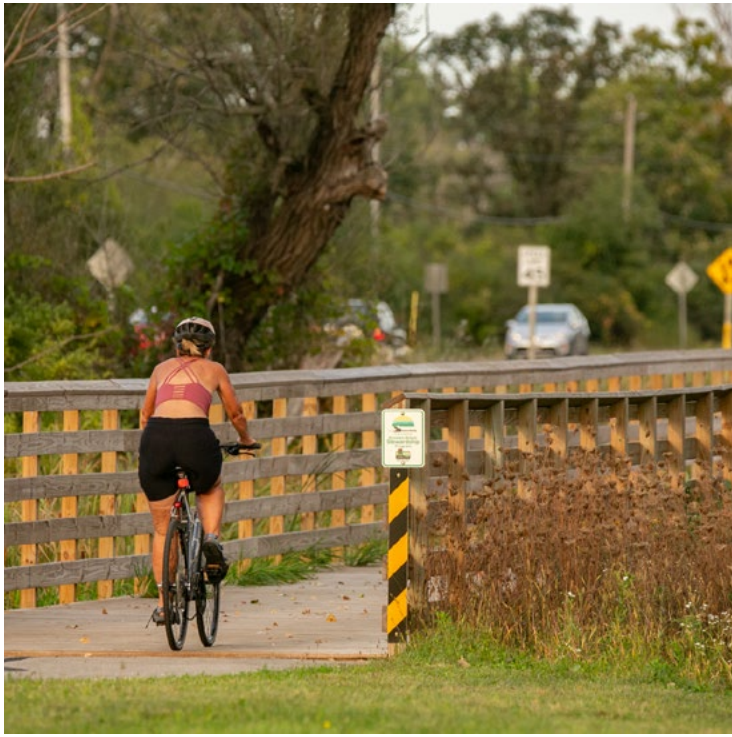
Bicycles

EXISTING BIKEWAY SYSTEM

The Madison metropolitan area is served by an interconnected bikeway network consisting of off-street shared-use paths, on-street bike lanes, and local street networks. Bikeway construction began in earnest in the 1990s and most roadway projects now feature provisions for pedestrians and bicyclists. Several rail and other corridors have been utilized to build high quality shared-use paths.

The *2015 Bicycle Transportation Plan* organized components of the bikeway system into a regional network of primary and secondary bicycle routes consisting of on-street and off-street segments. This network helps planners visualize the bikeway network as it is used by cyclists, identify gaps, and prioritize improvements. The Bicycle Transportation Plan identified regional bicycle infrastructure needs and outlined recommended path segments to improve regional connectivity. Updates were made to the planned regional network as part of the last Regional Transportation Plan (RTP) adopted in 2017 and are being made as part of this RTP update.

Most communities in Dane County also engage in bikeway planning. The Cities of Fitchburg, Middleton, Monona, and Verona have bicycle and pedestrian plans while the City of Madison has adopted the regional bicycle transportation plan. The City of Sun Prairie's 2019 Comprehensive Plan calls for adoption of an Active Transportation Plan.[5] Many neighborhood and comprehensive plans also plan for bicycle infrastructure. The City of Madison also plans for bicycle infrastructure as part of neighborhood development plans.



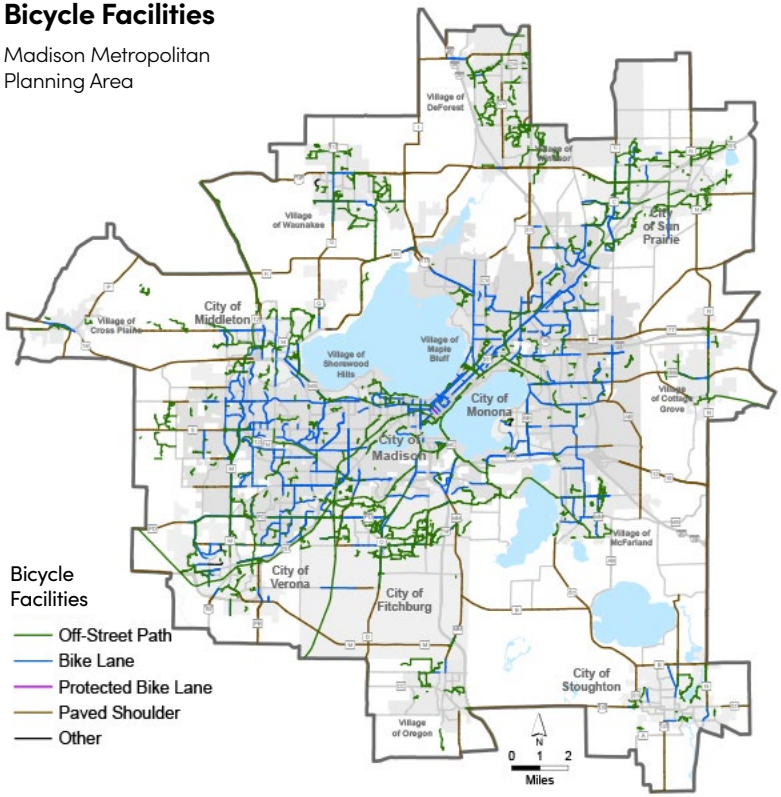
BICYCLE FACILITIES

Bicycle facilities include off-street facilities, most commonly shared-use paths, and on-street facilities, such as bike lanes and paved shoulders.

[5] P 8-8

Bicycle Facilities

Madison Metropolitan Planning Area



Map 3-q Bicycle Facilities

Shared-use paths are the most comfortable bicycle facilities because they eliminate the need for a bicyclist to interact with traffic outside of street crossings. Shared-use paths are typically built along railroad corridors, street and highway corridors, through parks, and in other locations where land can be secured. However, they often do not provide direct access to homes and businesses.

Bike lanes are used on arterial and collector streets to separate bicyclists from traffic. They may be separated from traffic with a buffer space or vertical element like a curb or row of parked cars. Contra-flow bike lanes are used on one-way streets to allow two-way bicycle traffic.

Paved shoulders wide enough for bicycle use (ideally 5 feet or more) are used in rural areas where vehicle and bicycle traffic is relatively low. They operate similarly to bike lanes but also provide other benefits, including reducing several crash types, improving roadway drainage, and serving as an emergency stopping space for motor vehicles.

New bicycle facilities are generally added during street reconstruction projects, if possible. Bicycle facilities are chosen based on many factors, including the projected usage, safest design, cost, and available space. Map 3-q shows existing bicycle facilities.

SAFETY

In the 2018 *Dane County Bicycle and Pedestrian Crash Study*, the MPO identified common features of crashes in which bicyclists and pedestrians were struck by motor vehicles in order to guide safety improvement efforts, measure the change in bicycle safety since the City of Madison's 1992 bicycle crash study, and set a benchmark for future safety performance measurement in the Madison metropolitan area and Dane County.

During the study period, 2011-2015, there were 798 documented motor vehicle crashes involving bicyclists, 6 (1%) of which were fatal and 58 (7%) of which were classified as "incapacitating." The most severe injuries were highly correlated with high traffic speeds, with 5 of 6 (83%) fatal crashes occurring on roads with speed limits of at least 35 mph, despite these roads accounting for only 20% of reported bicycle crashes.

In developed areas, the vast majority of crashes took place at intersections; in rural areas, most took place at non-intersection locations. The most common crash type, accounting for 22% of all crashes, involved left-turning motorists colliding with oncoming bicyclists at intersections.

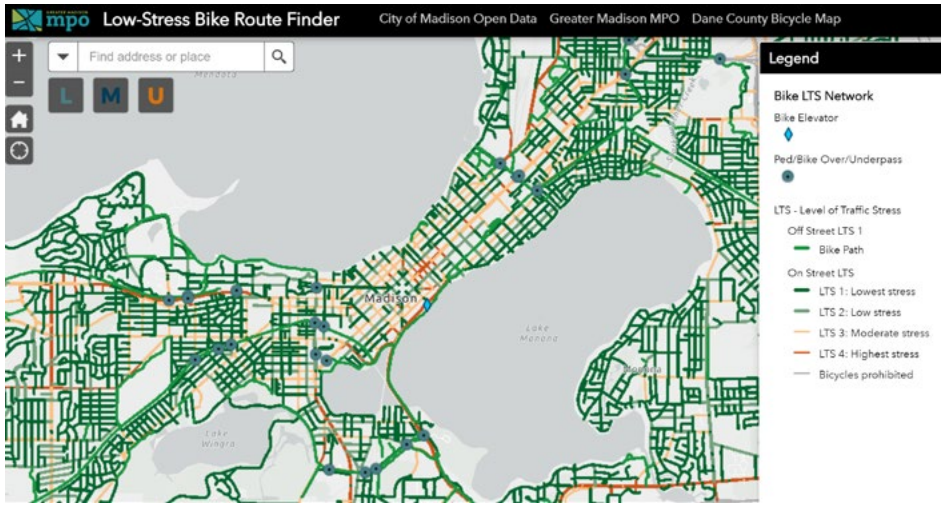
One of the most interesting findings of the study was the importance of travel direction to crash risk. While bicyclists normally travel in the same direction as adjacent motor vehicles, on sidewalks and roadside shared-use paths they may travel in either direction. The number of crashes involving bicyclists on these facilities traveling against traffic is more than 3.5 times those involving bicyclists traveling with traffic. This disparity does not appear in pedestrian crashes and suggests that bicyclists' higher speeds may put them at particular risk when traveling against traffic.

Bicycling in the City of Madison appears to have gotten substantially safer in recent decades. During the 1987-1990 period, the City had an annual bike crash rate of 101.7 per 100,000 population, in the 2011-2015 period, the rate was 51.4 crashes per 100,000 population despite a higher rate of bicycle commuting. One likely factor driving this improvement was the dramatic expansion of on- and off-street bicycle facilities during the intervening years.

LEVEL OF TRAFFIC STRESS (LTS)

As bicycling has grown in importance as a means of day-to-day transportation, the MPO has adopted new planning tools to better understand and improve conditions for bicyclists in the Madison area, beyond bicycle-specific infrastructure such as shared-use paths and bike lanes. In 2018, the MPO began using Bicycle Level of Traffic Stress (LTS) to evaluate the traffic-related stress experienced by bicyclists based on roadway design, traffic volumes, traffic speeds, and other factors. LTS is an objective, data-driven way to rate the bike-friendliness of roads on an easily understandable four-level scale. The low-stress bicycle network is all of the routes, including streets and off-street paths, on which an average adult person would be expected to feel comfortable riding a bicycle, and consists of all routes rated as LTS 1 or 2. LTS 1 is a route that would be comfortable for people of all ages and abilities.

LTS analysis is a particularly valuable planning tool because it reveals the full network within which bicyclists operate. High-visibility bike infrastructure projects represent an important but relatively small portion of the bike network. Connected low-volume streets form its foundation. In some cases, continuous low-volume streets that are used by higher volumes of bicyclists and for longer journeys may incorporate bicycle priority features such as traffic calming, bike signals and other treatments to reduce delay at intersections, wayfinding signage, and markings such as green pavement and sharrows. These streets may be signed as "bike boulevards" indicating the priority for bicyclists along the route.



The LTS network is regularly updated and available for public viewing online as the Low-Stress Bike Route Finder. The Low-Stress Bike Route Finder assists persons in finding a route to their destination based on the preferences for stress level. For more information on LTS methodology and uses, see the MPO's report, *Defining the Madison Area Low-Stress Bicycle Network and Using it to Build a Better Regional Network*.

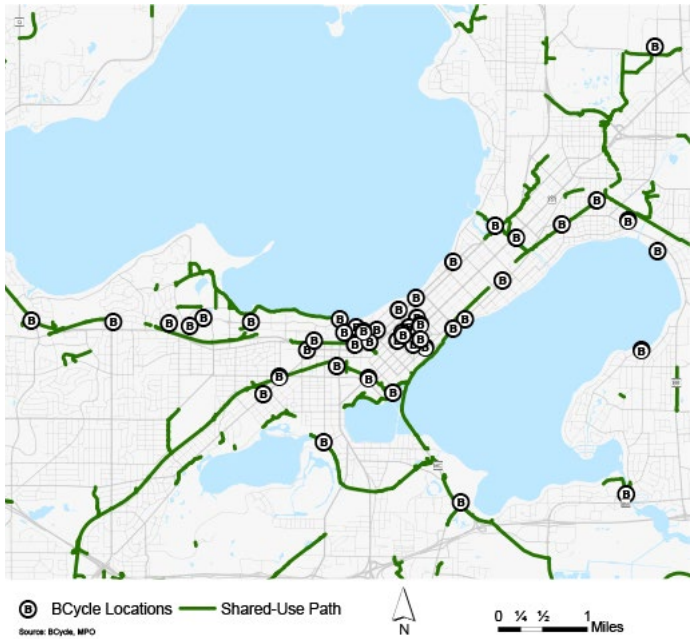
BIKE SHARE

Madison is served by a popular and successful bike-share system operated by BCycle. The system currently operates 334 e-bikes and 52 docking stations, as shown in Map 3-r. Stations are densely clustered in central Madison but extend west to Midvale Boulevard, south to Inland Way in Monona (new in 2021), east to Olbrich Park, and north to Madison College's Truax Campus.

In 2019 BCycle transitioned its entire fleet to e-bikes and offered free annual passes to UW-Madison students, leading to a massive surge in ridership, as shown in Figure 3-k. While ridership in 2020 declined, it was still more than 80% higher than 2018 levels, and the average trip length grew to 4.3 miles as users took more recreational rides. In 2021 ridership continued to increase over both 2019 and 2020 levels, and the addition of new stations - including two in the City of Monona

BCycle Stations

Madison Metropolitan Planning Area



Map 3-r BCycle Stations

BCycle Ridership and Average Trip Length

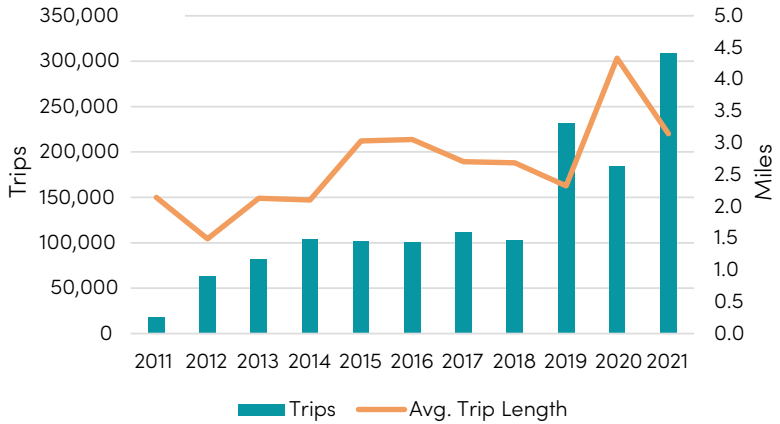


Figure 3-k BCycle Ridership and Average Trip Length

- increased the system's service area. The first week of September 2021 set a new record of 14,800 B-Cycle trips in a week – the highest usage in BCycle history in any community. In 2021, the system had 309,059 trips, an increase of 67% over 2020 and 34% over the previous record year of 2019.

A BCycle - Madison Public Library Foundation partnership began to offer BCycle fobs that can be checked out by anyone with a library card on September 20, 2021, improving equity and system accessibility for low-income and unbanked persons.[6] The program provides two access fobs and helmets at each of the nine Madison Public Library locations.

EDUCATION AND ENCOURAGEMENT PROGRAMS

Education and encouragement programs help people of all ages, backgrounds, and abilities make use of bicycling infrastructure. These programs help people learn to use the roads and paths safely, as well as assist those who are new to bicycling to start riding. Programs also help ensure that motorists understand their responsibilities in ensuring that the Madison area is a safe place to bike. In addition to local and neighborhood-specific education events, Madison School & Community Recreation offers a Learn 2 Ride program, and the Wisconsin Bike Federation resumed operation of the Dane County Safe Routes to School (SRTS) program in 2021, when the organization hired staff based in Madison again after an absence of several years. The SRTS program is a partnership with the Capitol Area Regional Planning Commission, which has designated the Wisconsin Bike Federation as the organization responsible for this activity within their planning area. The City of Madison has a full-time Pedestrian and Bicycle Safety Coordinator funded through the MPO, and offers programs to teach children how to bicycle safely and provides resources including "Learn to Ride" web sites in English and Spanish. The Pedestrian and Bicycle Safety Coordinator undertakes direct education, oversees volunteers, and collaborates and partners with the Dane County SRTS program, area non-profits, and the Healthy Kids Collaborative – Dane County to hold bicycle education events in community and neighborhood centers, schools, parks, and other venues. The Madison Metropolitan School District adopted a Safe Routes to School Master Plan in 2013. The City of Middleton publishes a Bicycle Guide that includes basic safety and rules of the road information.

[6] https://www.madisonpubliclibrary.org/bcycle

MAPS AND WAYFINDING

The Cities of Madison, Fitchburg, Middleton, Monona, Sun Prairie, and other communities publish local bike maps; additional small-area or route-specific maps, such as those for the Monona Lake Loop and the Bombay Bicycle Club Ride Maps, are published by area organizations and agencies. The MPO, in partnership with Dane County, publishes the Dane County Bicycle Map in print and online, which provides information on the bicycle suitability of rural roads and the location of paths and other facilities. The 2020 Dane County Bicycle Map includes both English and Spanish text, making it the first bilingual county-wide bike map in Wisconsin. The MPO also publishes and maintains a variety of online resources including the Low Traffic Stress (LTS) Bike Route Finder, Story Maps of area trails, and a complete listing of area bike maps. Finally, the Wisconsin Department of Transportation produces bicycle maps for all counties in Wisconsin.

Historically, shared-use paths and bike routes were named and signed by their controlling jurisdictions. The Dane County Bicycle Wayfinding Manual establishes standards for marking bicycle routes consistently across jurisdictions, making it easier and more convenient for cyclists to navigate the system. Unfortunately, area communities have been slow to adopt or implement this manual, so consistent wayfinding is not yet available for cross-jurisdictional area routes. In 2019, the MPO updated the project screening criteria for the STBG – Transportation Alternatives (TA) funding program to include appropriate wayfinding as a project requirement.

BICYCLE USE

Bicycle usage has increased dramatically in the last few decades. The U.S. Census provides reliable commute-to-work bicycle counts that show that about 3.6% of commuters in the Madison Urban Area bike to work, but the number rises to 4.5% in the City of Madison and exceeds 10% in some central Madison Census Tracts.[7] The increases are largely associated with improved bicycle infrastructure, changing attitudes about transportation and the environment, and parking limitations and cost in central Madison.

Estimating bicycle use for non-commute trips is more difficult. To gather information about travel in the region as a part of the update and improvements to the regional travel forecast model, the MPO conducted a household travel survey in 2016-17, concurrent with the National Household Travel Survey (NHTS). The MPO's survey was designed to largely duplicate the NHTS to increase the sample size in the MPO area, and generate more data about travel behaviors associated with biking and transit, less common modes of travel.

The survey results revealed that just under 4% of all trips in the MPO area were made by bike.[8] People living in central Madison made about 10% of their trips by bike compared to people in suburban communities who made just 2% of their trips by bike. 28% of all bike trips were between home and work; home-based trips for social/recreational purposes and trips between non-home locations each accounted for another 21%. The average bike trip was 1.8 miles in length—shorter for people living in the central Madison area, and longer for those living in other parts of the City of Madison and in the suburban communities. While the average distance people biked

[7] ACS 2019 5-year, Means of Transportation to Work.

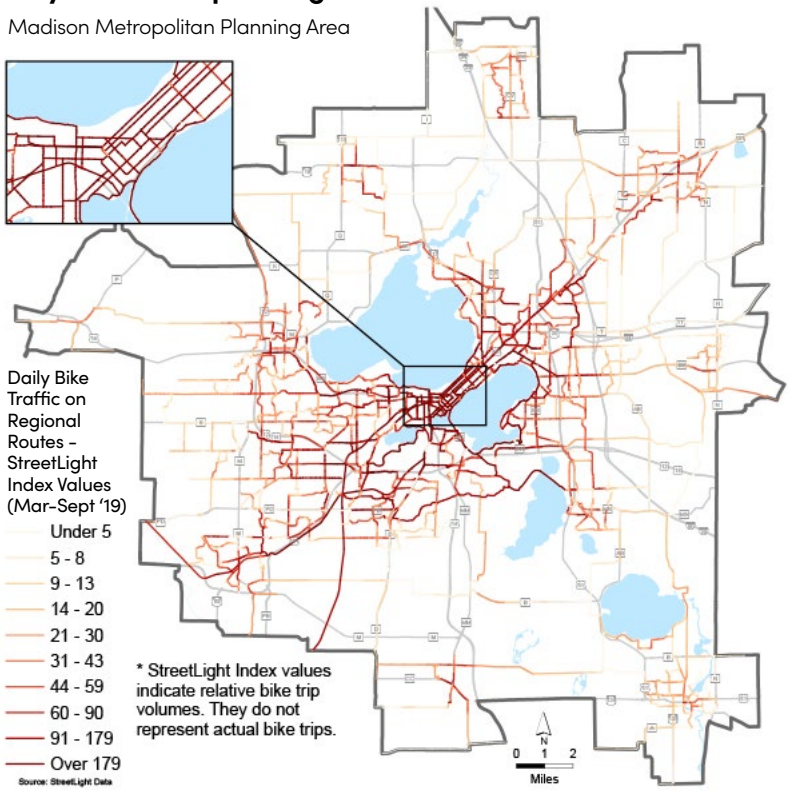
[8] All travel survey data referenced is for weekday trips made entirely within Dane County.

from home to work was nearly 3 miles, the average distance of all other bike trip types ranged from 1.0 to 1.7 miles. These relatively short trip distances highlight the impact of land use on bike travel—people are unlikely to bike to destinations beyond a few miles from their homes.

The City of Madison has a number of continuous bicycle-counting devices at various locations spread throughout the city. These show high usage particularly near the UW and on the Southwest Path and Capital City Path. Two Eco-Totem counters log data for reporting and analysis, as well as displaying the daily bicycle count.

The MPO also uses "big data" for insight into bike travel in the region. The MPO contracts with StreetLight Data for access to aggregated travel information based on signals sent to and from smart phones for location-based services—mapping, social media, and other applications that track users' whereabouts. While this is a valuable data source, the StreetLight platform does not report the estimated actual number of bicycle riders, instead using an "index" that ranks traffic proportionally within the analysis. In attempting to correlate StreetLight Index data with ridership recorded by automatic counters, MPO staff discovered inconsistencies and reporting errors in the automatic counter data that made a direct comparison impossible. MPO and City of Madison staff continue to work to resolve these issues in order to generate more useful bike traffic estimates. MPO staff also coordinate with other area agencies that conduct bicycle and pedestrian counts, including Dane County Parks, UW-Madison, and other communities to compile ridership data from throughout the region.

Bicycle Ridership on Regional Routes



Map 3-s Bicycle Ridership on Regional Routes

While we cannot currently calibrate data from StreetLight with data from bike counters installed in the area, it can still provide a sense of bicycling activity throughout the region. Map 3-s shows the estimated average daily relative volume of bicycle traffic on regional bike routes in the MPO area. The StreetLight Index values shown represent the bicycle traffic on each segment relative to traffic on other segments; they do not represent the estimated average of actual

bicycle trips. Bicycle activity is clearly concentrated in central Madison and on a number of routes radiating out from the central area. Elevated levels of bike traffic are also apparent in each of the smaller communities, most likely due to short in-town trips, such as those to or from schools.

There are some locations where MPO staff believes that the StreetLight Index values shown on the map may be incorrect. Small low-traffic gaps on otherwise higher-traffic corridors are most likely due to errors linking bike trips to the correct route. In addition, StreetLight Index values on routes adjacent to large surface parking lots, such as near East Towne Mall, may be too high due to slow-moving cars in parking lots being incorrectly identified as bikes by StreetLight's algorithm.

RECOGNITION AND AWARDS

In 2015, six Madison-area communities submitted the first-ever regionally-coordinated applications for Bicycle Friendly Community (BFC) certification through the League of American Bicyclists. Seven area communities again submitted coordinated applications in the fall of 2019, with two more community applications delayed until spring 2020. The awards earned by these applications[9] attest to the Madison area's status as one of the United States' best metropolitan areas to be a bicyclist.

As shown in Figure 3-I, People for Bikes, a national advocacy organization, ranks the City of Madison as the second-best place to ride a bike in North America, with an overall score that is only marginally less than that of top-ranking San Luis Obispo, CA.[10]

Pedestrians

EXISTING PEDESTRIAN SYSTEM

Pedestrian facilities are important for a safe transportation system that accommodates all users, since virtually all trips by any mode begin and end with walking. Sidewalks provide a separate facility so that people walking and using mobility devices do not need to walk in traffic. Sidewalks also provide access to public transit, increasing transportation options for those who may not be able to drive. Sidewalks on both sides of the street reduce the number of times pedestrians must cross the street and be exposed to traffic. The City of Madison and other communities have programs that routinely retrofit sidewalks and crosswalks with curb ramps in street corridors that do not have them and repair sidewalks that are broken, heaved, or do not meet modern standards.

Top 10 Places to Ride a Bike

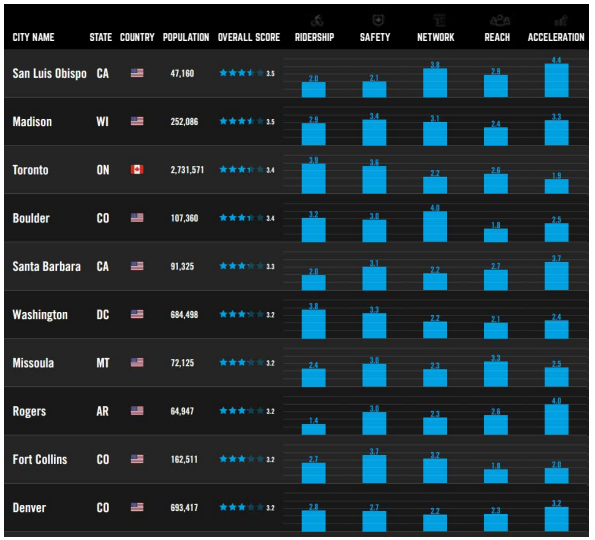


Figure 3-I Top 10 Places to Ride a Bike

All urban streets benefit from sidewalks. They create a healthier community as research has shown people will walk for recreational or other purposes if a facility is provided. Sidewalks, however, are most crucial on urban arterial and collector streets, which have higher traffic speeds and volumes and also serve most destinations like shops, schools, and employment areas. Sidewalks on these streets provide the most safety benefits and also can increase the number of transportation trips made by walking. In addition, shared-use paths are used by pedestrians as an alternative to walking along streets or because they provide shorter paths to destinations.

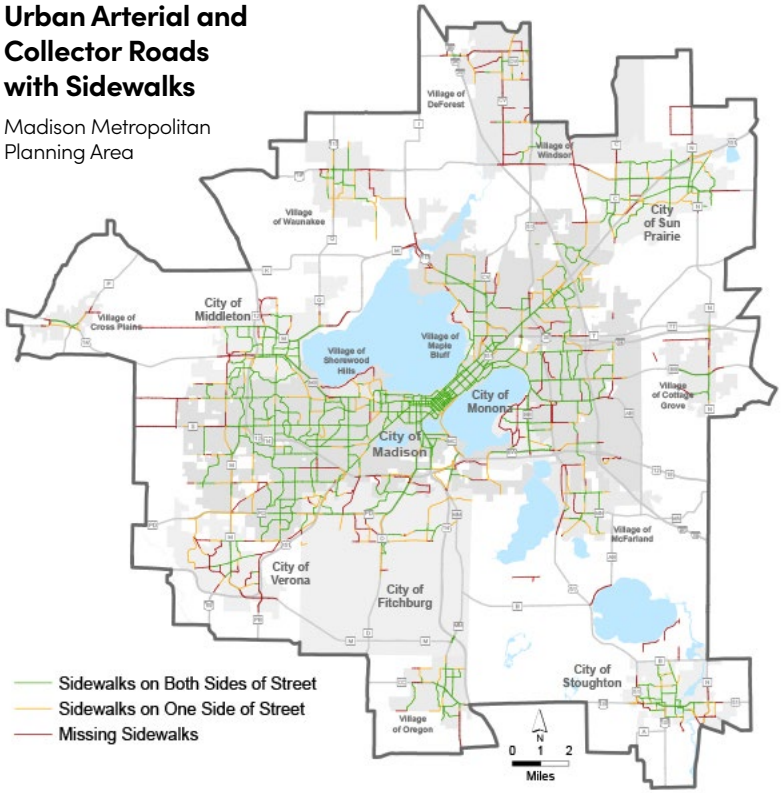
Intersections represent a special barrier for pedestrians not only because they

[9] UW – Madison - Platinum Bicycle Friendly University; City of Madison - Platinum BFC; City of Fitchburg - Silver BFC; City of Middleton, City of Monona, City of Sun Prairie, City of Verona, and Dane County (2016) - Bronze BFCs; Village of Oregon – Honorable Mention.

[10] https://cityratings.peopleforbikes.org/all-cities-ratings/ (as of April 28, 2021)

Urban Arterial and Collector Roads with Sidewalks

Madison Metropolitan Planning Area



Map 3-t Urban Arterial and Collector Roads with Sidewalks

must cross traffic to continue, but also because traffic is frequently turning and drivers may be focusing on several things at once. Motor vehicle traffic is required to yield to pedestrians at most unsignalized intersections, but compliance is limited.

SIDEWALK COVERAGE

The MPO maintains a countywide sidewalk database in order to track sidewalk coverage. The database contains information on whether each public road has a sidewalk or shared-use path on both sides, one side, or no sidewalk at all. It further tracks whether streets are primarily urban or rural (sidewalks are not normally installed on rural roads) and whether or not sidewalk is expected due to development along the street and in the area and other factors. Sidewalks are not expected along freeways, ramps, alleys, or in parking lots.

In the metropolitan planning area, about 50% of urban streets have sidewalks on both sides, with an additional 15% having sidewalks on one side. Sidewalk coverage in the City of Madison is substantially greater, with 88% of streets equipped with sidewalks on at least one side. Among urban arterial and collector roads in the area, shown on Map 3-t, 54% have sidewalks on both sides and an additional 23% have sidewalks on one side.

THE CHALLENGES AND TRADE-OFFS WITH RETROFITTING SIDEWALKS IN DEVELOPED AREAS

Although sidewalks are normally included in new construction in most jurisdictions, installing sidewalks along streets in established neighborhoods is often met with local opposition. Residents may be concerned

about several issues, including assessments for sidewalk installation, the need to clear snow and ice in the winter, and the loss of yard area and landscaping.

While policies regarding snow and ice clearance are similar across communities in the Madison metropolitan area, policies regarding funding for sidewalk installations in existing neighborhoods vary widely. Some require property owners to pay the entire cost, others fund the entire cost publicly, and some split the cost of new sidewalk construction 50/50 with adjacent owners.

City of Madison residents are charged a special assessment for 100% of the cost of

sidewalk installation and 50% of the cost for repair. Beginning in 2015, the city has offered a program to reduce the burden of these assessments on low-income residents.

The MPO published *Pedestrian and Bicycle Facility Requirements, Policies, and Street Standards* in 2021, which details the current assessment policies of area communities and discusses the equity ramifications of sidewalk funding policies.

INTERSECTION TREATMENTS

A variety of intersection treatments are used in the U.S. as well as in the Madison area to make intersections safer for pedestrians.

- **Marked crosswalks** – Legal crosswalks can be either marked or unmarked. Well-marked crosswalks are easier for drivers and pedestrians to see.
- **Rectangular Rapid Flashing Beacons (RRFB)** – Yellow LED lights may be installed with signs at crosswalks at non-signalized intersections to alert drivers of pedestrian(s) crossing the street. The beacons are activated by a pedestrian pressing a button. Vehicles should stop, and may proceed when the crosswalk is clear.
- **Pedestrian hybrid beacons / High-intensity Activated crossWalK beacon (HAWK)** – Special traffic beacons at an intersection that does not warrant full signalization. Solid red lights require vehicles to come to a complete stop; a flashing light cycle indicates that drivers may proceed with caution if no pedestrians are present. The beacons are activated when a pedestrian presses a button.
- **Median refuge islands** – Refuges can shorten distance needed to cross an intersection and allow a pedestrian to make a multi-stage crossing. Refuges should be wide enough to safely accommodate several pedestrians, or expected bicycle and pedestrian traffic as appropriate. Especially on higher-speed roadways, refuges should include bollards or other physical barriers between traffic and people waiting on the refuge.
- **Curb extensions** – Intersection treatments designed to shorten the effective crossing distance for pedestrians. These are appropriate on blocks with on-street parking, but may interfere with bus and bike lanes.
- **Wayfinding signage** – In dense commercial areas like downtowns and campuses, wayfinding tools like maps can be valuable for people who are unfamiliar with the area. Signage indicating routes and distances to destinations are appropriate at intersections of major pedestrian routes in both rural and urban settings.

STREET NETWORK CONNECTIVITY

Besides high quality pedestrian facilities, pedestrians need a dense network of streets. Since people only walk at a speed of a few miles per hour, any out-of-direction travel is an impediment to walking. Downtown grid systems with short blocks and dense street networks common in cities developed prior to the advent of automobiles or even public transit are ideal for walking.

Intersection density is one indicator of pedestrian network connectivity. Generally, a higher number of intersections is correlated with shorter blocks and easier navigation. Linear barriers, such as water features, freeways, and railroads also present impediments to walking.

The MPO's *Pedestrian and Bicycle Facility Requirements, Policies, and Street Standards* report includes block size requirements established by area communities, as well as national best practices and recommendations on block size. Notably, nearly all area communities require minimum block sizes (400-600 feet) that are nearly equal to the maximum block size recommendations established by the Institute of Transportation Engineers (less than 400 feet desired, 660 feet maximum). Reducing or even eliminating minimum block sizes and adopting smaller maximum block size limits would result in the development of more walkable neighborhoods.

While central Madison's dense street network and small blocks make it well suited to travel by foot, limited-access highways, as well as some rail lines and major roadways, present challenges for connecting neighborhoods on Madison's periphery, as shown in Map 3-u. In many locations, new or improved pedestrian connections across these barriers are needed.

Deficient pedestrian barrier crossings may be improved by adding pedestrian facilities or safety improvements, and by linking barrier crossings with the existing pedestrian network.

BICYCLE AND PEDESTRIAN CRASH STUDY

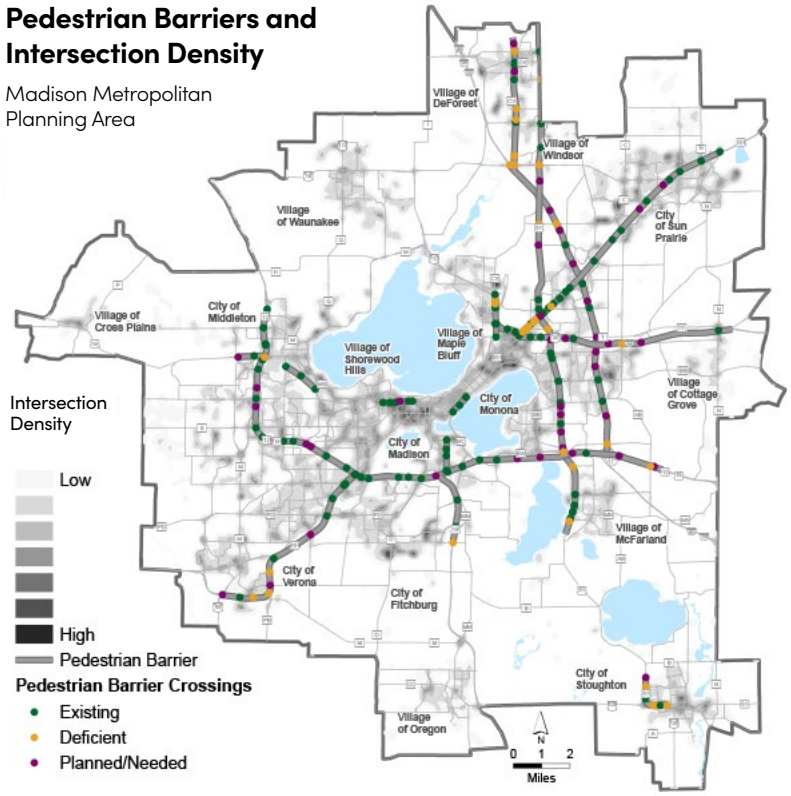
In the 2018 *Dane County Bicycle and Pedestrian Crash Study*, the MPO identified common features of crashes in which pedestrians were struck by motor vehicles and set a benchmark for future safety performance measurement in the Madison metropolitan area and Dane County.

During the study period of 2011-2015, there were 552 documented motor vehicle crashes involving pedestrians, 23 (4%) of which were fatal and 79 (14.3%) were classified as "incapacitating." The rate of fatalities and incapacitating injuries resulting from these crashes is far higher than from motor vehicle crashes involving bicyclists. Speed was highly correlated with injury severity, with 14 of 23 crashes (61%) occurring on roads with speed limits of at least 35 mph, despite these roads accounting for less than 20% of reported pedestrian crashes. While the majority of crashes were in central Madison, fatal crashes were more widely distributed. Most crashes occurred at an intersection, and in about 60 percent of cases the pedestrian was in a legal crosswalk.

Drivers received citations in 49% of these crashes, pedestrians were cited in about 10%, and 1% of crashes resulted in citations for both drivers and pedestrians. In 40% of the crashes, no citations were issued.

Pedestrian Barriers and Intersection Density

Madison Metropolitan Planning Area



Map 3-u Pedestrian Barriers and Intersection Density. Pedestrian barriers are railroad tracks and major roadways that significantly inhibit pedestrian travel. Barrier crossings are paths, crosswalks, or roads that enable pedestrian access. Deficient crossings lack adequate safety features or pedestrian facilities, or do not provide sufficient connectivity.

Transportation Demand Management and Ridesharing

TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) is generally defined as a set of strategies to reduce roadway congestion, vehicle miles traveled, and demand for single-occupancy vehicle (SOV) use by redistributing demand to alternative travel modes, times, and routes. TDM is implemented through land use policies that support compact, mixed-use development; transportation policies that support safe, connected, multimodal systems; financial incentives such as discounted transit passes and priced parking that influence demand; and public and private sector programs that use education and encouragement to promote behavior change.

TDM programs that are administered by public and nonprofit entities and applied beyond a single workplace, such as at a district, municipal, or regional scale, have traditionally focused on commuter-based incentives and activities that promote carpooling, vanpooling, public transit and telework, as well as employer-based incentives and marketing aimed at reducing drive-alone commute trips. Today, these programs also promote active transportation such as bicycling and walking, and support

transportation behavior change for trips beyond the commute.

While TDM involves all modes of non-SOV transportation, this section focuses on ridesharing services, shared mobility options, and incentive and encouragement programs in the Madison region. See other sections in this chapter for more on walking, bicycling, and public transit.

RIDESHARING AND SHARED MOBILITY SERVICES

There are multiple programs and services that support ridesharing and shared mobility in the Madison area. Both of these transportation types contribute to reducing single-occupancy vehicle trips and personal vehicle ownership, leading to fewer vehicle miles traveled and less demand for roadway and parking infrastructure.

RoundTrip Program

The MPO administers the RoundTrip rideshare program in partnership with the Wisconsin Department of Transportation's RIDESHARE etc. program. RIDESHARE etc. serves commuters statewide and RoundTrip serves commuters in Dane County. Prior to 2021, both programs shared the RIDESHARE etc. name and website; in August 2021, the MPO launched RoundTrip as a unique brand with a dedicated website serving employers and individuals in Dane County.

The RoundTrip program mission is to connect individuals, businesses and organizations

in the Madison region with convenient alternatives to driving alone. The purpose is to reduce vehicle miles traveled and congestion, and improve regional quality of life, by connecting commuters and employers with non-SOV travel options and incentives. The RoundTrip website, www.RoundTripGreaterMadison.org, shares a statewide ride-matching platform with RIDESHARE etc. that allows commuters to search for carpool partners, state vanpool routes, Metro Transit routes, bike buddies, and park-n-rides based on their preferences. The site also provides employer resources; digital sign-up and voucher delivery for the Emergency Ride Home (ERH) program; and a clearinghouse of links to transportation services in Dane County.

On average, hundreds of commuters in Dane County register with RoundTrip annually to search for commute matches and participate in the ERH program. The number of annual registrations fluctuates based on changing incentives, gas prices, and exceptional circumstances such as the COVID-19 pandemic. In 2021, 244 new commuters registered and there were 2,819 participants in Dane County. Of these, 1,116 were active for matching and 1,483 were registered for ERH. Also in 2021, 871 matches were attempted by participants looking for a carpool, vanpool, bike buddy, transit route, or park and ride, and 565 of these received at least one match. Ridesharing arrangements that form outside of the RoundTrip program are not captured in these statistics. According to 2019 Census American Community Survey 5-year data, approximately 7.3% of workers 16 years and over in Dane County commute by car- or vanpool.

State Vanpool Program

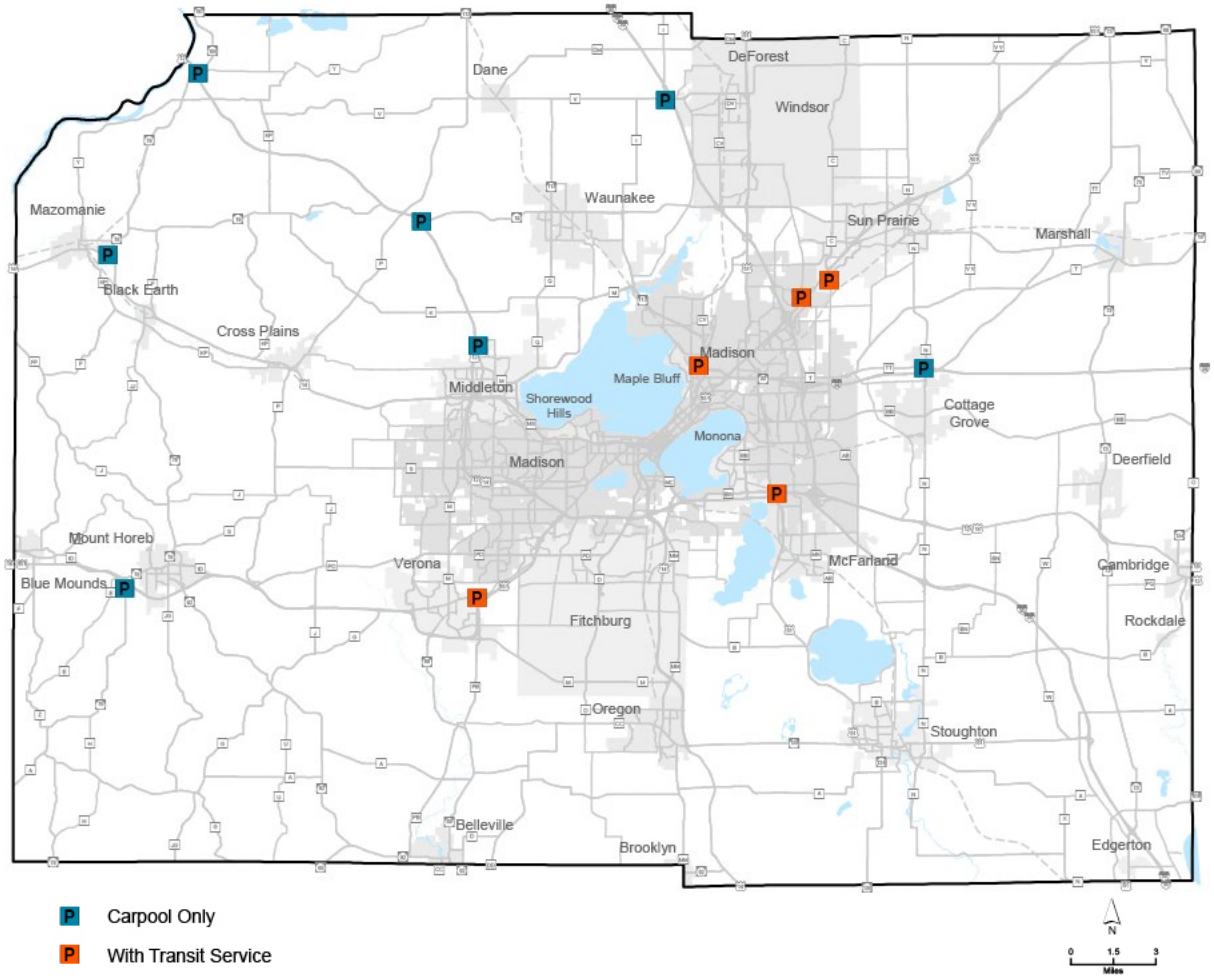
The Wisconsin Department of Administration (WisDOA) operates the only publicly operated commuter vanpool program in Dane County. The program primarily serves commuters traveling to downtown Madison and the UW campus from communities outside

of Madison. The vanpools are groups of 8-15 commuters traveling in vans owned and insured by the program and driven by participants. Participants share costs and pay a bi-weekly fare that covers gas, insurance, and maintenance. Non-state employees may participate, however there must be at least one state employee assigned to each van.

Prior to the start of the coronavirus pandemic in March 2020, the program operated fifty routes with just over 500 riders. At the end of 2021, the majority of these routes were paused due to low or no ridership, and the program was operating nine routes with seventy-four riders. Paused routes remain available for matching in RoundTrip and will be resumed with sufficient interest.

Existing Park and Ride Lots

Dane County, Wisconsin



Map 3-v Existing Park and Ride Lots

Park and Ride Lots

There are twelve formal park and ride lots in Dane County, five of which are served by Metro Transit (see Map 3-v). Nine are operated by WisDOT; one is jointly operated by WisDOT in partnership with the Wisconsin DNR and Dane County; two are operated by Metro Transit; and one is operated by the City of Sun Prairie. With the planned implementation of bus rapid transit (BRT) and the related transit network redesign in Madison in 2023-2024, the existing North Transfer Point park and ride is proposed to be removed, and a new lot is anticipated on the west end of the BRT line.

There are also many informal park-and-ride locations distributed throughout the region, concentrated along major Metro Transit corridors. These include locations such as neighborhood streets and commercial parking lots.

YW Transit JobRide Program

In addition to other public transit options including fixed route, specialized transit, and shared ride taxis, the JobRide program operated by YW Transit provides rides

for low-income commuters to areas that are inaccessible during non-peak public transportation hours, including nights, weekends, and holidays. For more information on other public transit services in the Madison area, including additional services provided by YW Transit, see the Public Transit section in the chapter.

Car Share

Car sharing allows people to access shared cars at a variety of locations for short periods of time. Car sharing makes it easier for people to get by with fewer cars or go car-free, helping members save money while retaining access to a car when they need one.

Car sharing also provides members with the flexibility to access different types of vehicles depending on need. In Madison, car sharing is provided by ZipCar, with 25 locations and 43 vehicles throughout the UW-Madison campus and downtown Madison.

Bike Share

Bike share allows users to check out a bicycle at any station in the network, ride to their destination, and park at the closest station. Bike share supports TDM by making it easier for people to make short trips by bicycle, and increasing accessibility by providing an alternative to bicycle ownership.

The City of Madison partners with Trek Bicycles to make bike share available through the Madison BCycle program. Madison BCycle launched in 2011 and recently became the first system in the country to convert entirely to e-bikes. BCycle stations were originally concentrated on the UW campus and in downtown Madison, and have since expanded beyond these areas, including to the first two stations outside of Madison in 2021.

Madison BCycle offers a Corporate Program that allows businesses to subsidize annual memberships for employees and purchase discounted day passes for guests. UW-Madison and Madison College students and staff, and staff of UW Extension and UW Health, are all eligible for discounted annual passes. In 2021, BCycle launched a free Community Pass Program to increase

accessibility for low-income and unbanked individuals. For more information on the Madison-area BCycle system, see the Bicycle section in this chapter.

INCENTIVE & ENCOURAGEMENT PROGRAMS

Successful TDM relies on a mix of incentive and encouragement programs to raise public awareness and increase the use of alternatives to driving alone. Incentive programs with a financial component are particularly effective at promoting behavior change. Several existing programs are implemented by public entities for the Madison area as a whole, while others are implemented by private employers for their employees.

Emergency Ride Home Program

The Emergency Ride Home (ERH) program is funded by the Dane County Highway Department and administered by the MPO through RoundTrip. It supports commuters who work in Dane County by providing up

to six taxi vouchers per year, for use in an emergency when participants are at work without a personal vehicle. The vouchers are good for up to $75 per ride in order cover rides to anywhere in Dane County. The current annual budget is $2,000.

At the end of 2021, the ERH program had 1,483 registered participants and had averaged 52 rides per year since 2017. As part of the RoundTrip website launch in August 2021, the MPO introduced digital ERH sign up and voucher requests, which replaced the original manual process with paper vouchers, and made ERH easier to access and less costly to administer.

Metro Transit Commute Card & Discounted Pass Programs

Metro Transit offers multiple discounted pass programs to encourage commuting by public transit. These include the unlimited ride Commute Card program for area employers; discounted 31-day and 10-ride cards; and unlimited ride pass programs with local institutions.

The Commute Card program is open to employers of any size and offers unlimited ride annual passes at a discounted rate, capped at $65.00 per month. Employers can choose to pay the entire cost; share the cost with employees; or allow employees pay for their own rides with pre-tax dollars. Prior to the coronavirus pandemic in 2020, the Commute Card program had 122 employer participants of a variety of sizes. Participation dipped to 79 businesses in late 2021, due in part to business shutdowns and increased telework during the pandemic.

In addition to the Commute Card, Metro Transit operates unlimited ride pass programs for the City of Madison, Dane County, Edgewood College, Madison College, UW-Madison, and Meriter and St. Mary's hospitals. These employers subsidize all or most of the cost for their riders.

RoundTrip Program Marketing

The MPO collaborates with Metro Transit, UW-Madison Transportation Services, and Dane County to run a jointly-funded annual advertising campaign. The campaign raises awareness of the RoundTrip program and local transportation options through a variety of media.

The MPO also conducts outreach to employers and organizations through RoundTrip and publishes a quarterly e-newsletter for employer contacts. In 2021, the MPO used insights from the pandemic to produce a TeleWORKS Toolkit for employers to

encourage telework as a strategy to reduce drive-alone commutes, and partnered with Sustain Dane and the Dane County Office of Energy and Climate Change to conduct additional engagement on this topic.

Bicycling Promotion

Many efforts in the Madison area focus on bicycle promotion and the presence of local advocacy groups is expanding throughout the region. Many communities participate in the Wisconsin Bike Federation's Bike Week, which is held annually in June and expands upon National Bike to Work Day held in May. In Madison, Bike Week is led by Madison Bikes.

In 2021, the Madison Bicycle Center (MBC) opened in downtown Madison through a partnership between the city and local non-profit Madison Freewheel Bike Co. The MBC provides state-of-the-art support for commuter bicycling and offers used bikes for sale; repair services; day passes and

memberships with access to secure storage; showers; a bike wash station; and more.

When funding is available, the MPO sponsors bicycle challenges on the Love to Ride platform, which specializes in applying behavior change strategies to promoting bicycling for transportation worldwide. These month-long challenges encourage riders of all levels to bike more often using tailored messaging, social engagement, teams, and prizes. Following each challenge, Love to Ride provides detailed metrics that can be used to inform future challenges and initiatives. Love to Ride Madison challenges have been held in 2015, 2016, 2020, and 2021.

Safe Routes to School

The Safe Routes to School (SRTS) movement encourages parents and children to walk and bike to school, to increase physical activity and reduce the safety issues associated with driving. A coordinated county-wide SRTS program began in 2017, supported with Federal Transportation Alternatives Program funding awarded by the MPO. Originally led by Healthy Kids Collaborative (UW Health), the program is currently administered by the Bicycle Federation of Wisconsin.

UW-Madison Commuter Solutions Program

As the largest employer in Dane County and largest landowner in central Madison, the commute habits of UW employees have a significant impact on the transportation system. The UW Department of Transportation Services operates a comprehensive Commuter Solutions program for faculty, staff, and students that supports alternatives to driving alone in the following ways:

- **Best Workplace for Commuters, 2022:** This designation recognizes UW-Madison's efforts to promote environmentally friendly commuting by encouraging multi-modal transportation and alternatives to reduce stress and traffic congestion.
- **Personalized Route Planning:** Individual outreach and an online form that allows faculty, staff and students to request route planning information customized to their schedule, location and interests.
- **Transit:** Free campus bus service and deeply subsidized Metro Transit passes for most UW-Madison faculty and staff and UW Health employees. Students are eligible for free passes funded via student segregated fees.
- **Carpooling:** Six complimentary daily parking passes per year and access to an Emergency Ride Home program for registered carpool members.
- **Emergency Ride Home:** Up to three ERH vouchers every six months for employees who choose an alternative to driving alone to campus.
- **Park and Rides:** Low-cost permits at two university lots, with shuttle service to locations throughout campus.
- **Flex Parking:** Occasional parking for commuter who typically use alternate modes. Flex Parking represents about 10% of available permits and regularly has a waitlist.
- **Bicycling:** The UW-Madison is a Platinum level Bicycle Friendly University. There are over 15,000 bicycle parking stalls on campus, including secure bike lockers and cages. UW will have thirteen BCycle stations installed by summer of 2022. The UW Bicycle Resource Center offers free use of tools, and classes for students and employees.

Inter-Regional Travel

INTER-CITY BUS SERVICE

A handful of private inter-city bus companies provide regularly-scheduled bus service open to the public between Madison and major destinations like Milwaukee, Chicago, and Minneapolis/St Paul as well as other cities and points in the region. Prior to the COVID-19 pandemic, Badger Bus provided eight round trips per day to Milwaukee with stops in Johnson Creek and Waukesha; these services have been suspended, with Badger Bus currently only offering the seasonal campus trips described below. Van Galder (Coach USA) provides 12 round trips daily to Chicago with stops in Janesville, Beloit, and Rockford. Megabus (Coach USA) and Greyhound both provide one daily express round trip between Chicago and Minneapolis/St Paul with a stop in Madison; prior to the COVID pandemic both operators offered multiple daily trips on these routes. FlixBus, a relative newcomer to the U.S. intercity bus market,[11] offers service to Minneapolis and Chicago five days a week.

Lower-volume routes connect smaller cities. Lamers provides daily service on routes between Madison and Dubuque, Green Bay, Appleton, Milwaukee, and Wisconsin Rapids. Jefferson Lines serves Madison and La Crosse on its Milwaukee to Minneapolis route. Operation of these services is partially supported by Wisconsin state intercity bus grants, and federal Section 5311 funding supports capital purchases for Jefferson and Lamers Bus Lines. Seasonal limited service between Madison and Whitewater, Eau Claire, and La Crosse/Minneapolis operated by Badger Bus is designed around college and university student weekend travel with two trips each on Friday and Sunday.

Map 3-w shows inter-city bus stop locations in the Madison area.

Ridership data is not generally available from intercity bus companies, and only Jefferson Lines provided requested ridership numbers for this plan update. Jefferson Lines reports approximately 3,800 total annual 2019 combined boardings and alightings in Madison, with the most popular trips being those between Madison and La Crosse, the Twin Cities, Rochester, Winona, and connections to interlined bus networks in locations outside of Wisconsin.

Jefferson operates approximately 1 in 20 inter-city buses that serve Madison. If their buses are, on average, at the same percentage of capacity as other lines they are carrying approximately 5% of the total inter-city ridership. This means that total inter-city annual ridership would appear to be in the neighborhood of 76,000 trips, or 208 trips daily. Given that these trips are bound for or arriving from nearly every direction, it is unlikely that inter-city buses currently have any impact on congestion through reducing private automobile traffic. Ridership would need to increase by one if not two orders of magnitude in order for these services to have a noticeable impact traffic congestion on any particular roadway or corridor.

Investment in high-quality facilities for inter-city bus travelers could help boost ridership, so it is conceivable that congestion could be impacted by these services by 2050 - particularly in specific corridors or areas like the UW campus where so many trips begin or end. Ironically, inter-city buses and related pick-up/drop-off traffic appear to cause congestion at the current UW Lake Street stop location; this problem should be at least partly ameliorated by the planned Lake St. inter-city bus terminal.

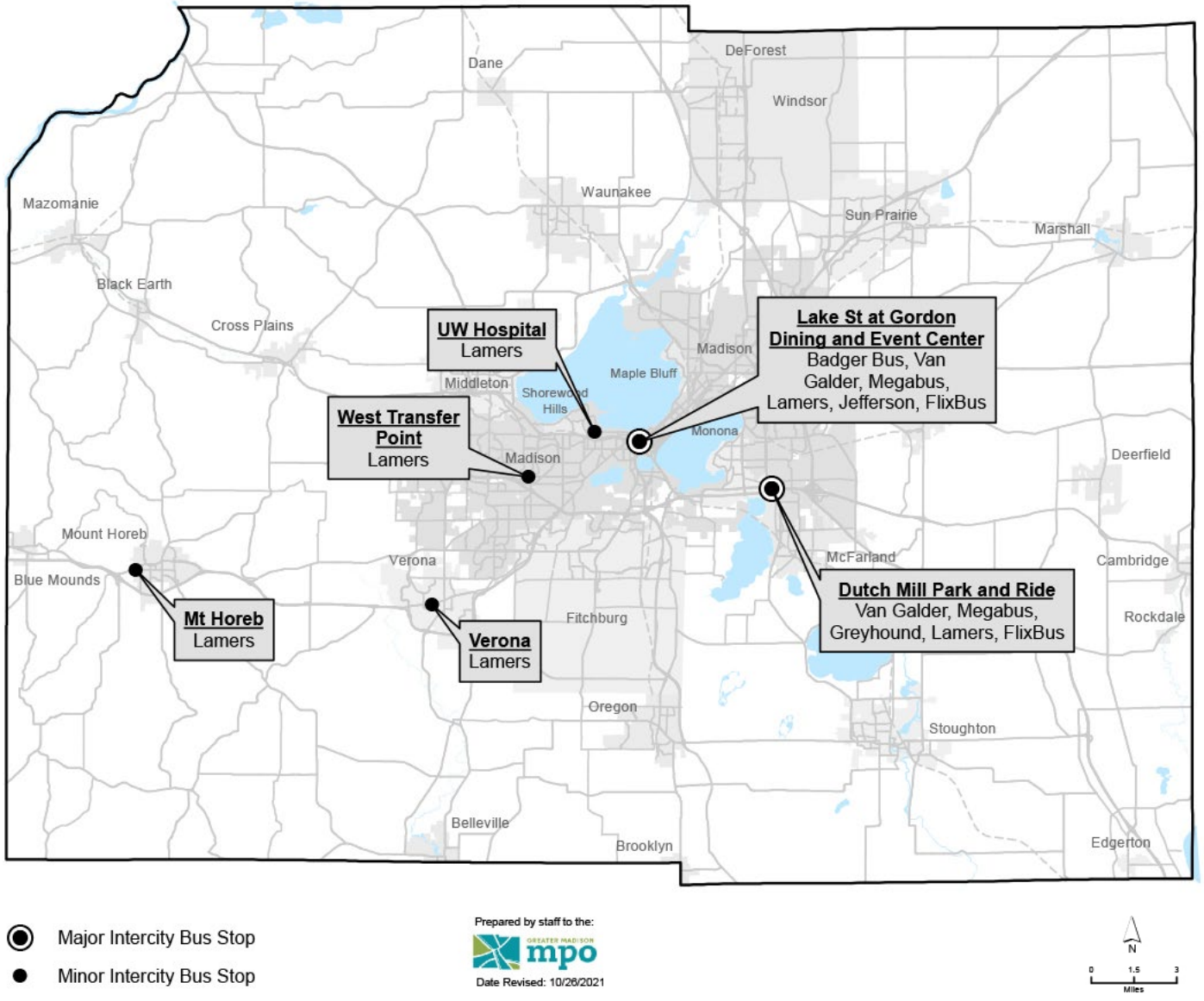
[11] Founded in Germany in 2013, initiated Madison service in 2021, and acquired Greyhound in October 2021.

Based on the shortest trip distance to any of those destinations from Madison (La Crosse, at 142 miles), the 3,800 annual trips made to or from Madison on Jefferson Lines alone prevent the release of over 500,000 lbs. of CO2 annually, compared to making those trips in single occupant vehicles.[12] Given that the majority of destinations served by Jefferson Lines are farther from Madison than La Crosse is, the actual reduction in CO2 emissions resulting through use of inter-city bus service is much higher than this conservative estimate. Although the larger bus companies did not provide ridership numbers for this plan, Jefferson Lines operates approximately one in 20 inter-city buses serving Madison, and most destinations served by inter-city buses are further from Madison than La Crosse is. Accordingly, a rough and highly conservative estimate of CO2 emissions reductions from the use of inter-city buses is that at least 10,000,000 lbs. (over 4,500 metric tons) of

[12] Stanford University Commute Cost & Carbon Emissions Calculator https://transportation-forms.stanford.edu/cost/

Intercity Bus Stops

Dane County, WIsconsin



Map 3-w Intercity Bus Stops

additional CO2 would be released annually if all those trips were made by SOV.

Assuming that the 3,800 annual riders of Jefferson Lines are 1/20th, or 5% of all inter-city passengers, 76,000 one-way trips are made into or out of Madison annually on inter-city buses. Once again basing overall estimates on the conservative trip length of 142 miles, and given that approximately 6.8 gallons of fuel would be burned by the average vehicle while making that trip[13], over 500,000 gallons of gasoline are saved annually through inter-city bus ridership in the Madison area.

The combined direct (gas, parking, & tolls) and indirect (insurance, maintenance, etc.) cost of operating a private vehicle for the 142-mile trip to La Crosse is estimated at $103.19.[14] These costs do not include the cost of the vehicle itself. A one-way ticket for this trip costs between $22 and $31, depending on the bus company and desired day of travel.[15] Assuming that all inter-city bus tickets cost just $22 (the low end of ticket prices to one of the closest possible destinations), the estimated 76,000 passengers of inter-city bus service to and from Madison save over $6 million annually by not making those trips in private automobiles. The public does subsidize some inter-city bus services through the federal Section 5311 Program; for 2022-2026, this annual support amounts to under $1.5 million for area routes.[16]

[13] ibid

[14] Ibid

[15] On-line price search conducted September 10, 2021

[16] Greater Madison MPO 2022-2026 Transportation Improvement Program

Although inter-city bus services do not currently have a measurable impact on traffic congestion on the routes they travel, it is clear that they do have positive impacts on emissions and air quality, as well as reducing fossil-fuel use and traveler costs.[17]

PASSENGER RAIL SERVICE

The nearest passenger rail station with regular public service is the Amtrak station in Columbus, Wisconsin about 26 miles northeast of downtown Madison. This station serves Amtrak's daily long-distance Empire Builder route serving Chicago, Milwaukee, Minneapolis/St. Paul, Seattle, Portland, and other cities with departures three days a week. Access to Empire Builder trains is limited by stop locations – which include Portage and Wisconsin Dells – and schedules of inter-regional bus operators serving La Crosse and Columbus.

Amtrak also coordinates with inter-regional bus companies and sells integrated tickets on their Thruway Bus service. Thruway bus service allows passengers to buy a single ticket that includes travel on Amtrak's rail service and certain connecting bus routes. Amtrak's national network includes a central

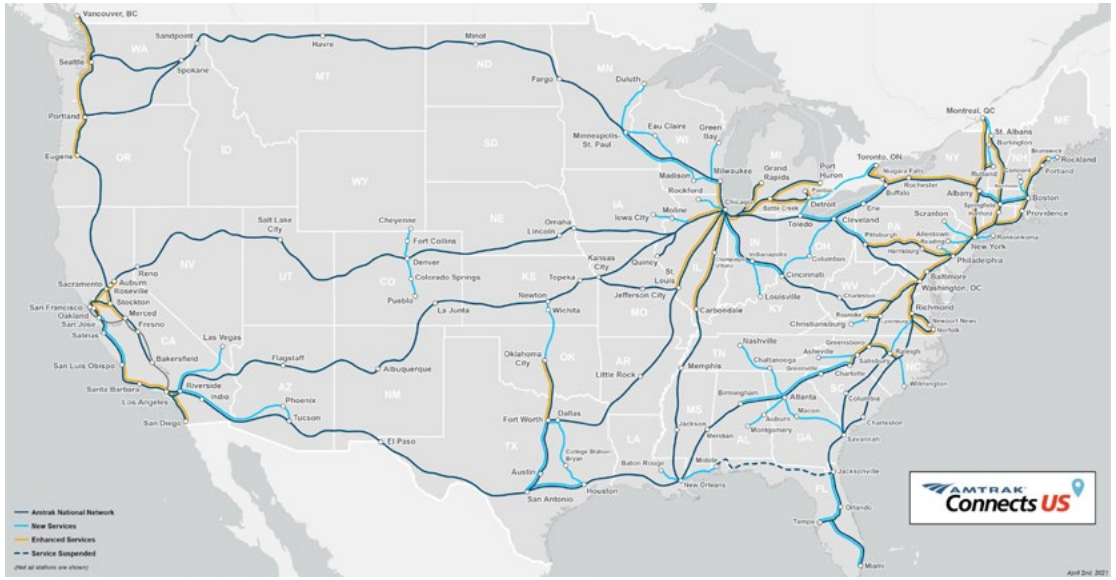
[17] Per 23 CFR 450.324(f)(8), MPOs need to consider "the role that intercity buses may play in reducing congestion, pollution, and energy consumption in a cost-effective manner and strategies and investments that preserve and enhance intercity bus systems, including systems that are privately owned and operated, and including transportation alternatives, as defined in 23 U.S.C. 101(a), and associated transit improvements, as described in 49 U.S.C. 5302(a), as appropriate."

hub in Chicago, which, along with Van Galder's Madison-to-Chicago bus service, allows convenient rail travel to many major destinations around the U.S.

In addition to its long-distance service with trains generally running daily on routes longer than 750 miles, Amtrak offers more frequent service on shorter state-supported lines. The Hiawatha Service between Chicago and Milwaukee is one of Amtrak's more successful state-supported routes with about seven daily round trips and 876,356 passenger boardings in 2019.[18] Due to the Coronavirus

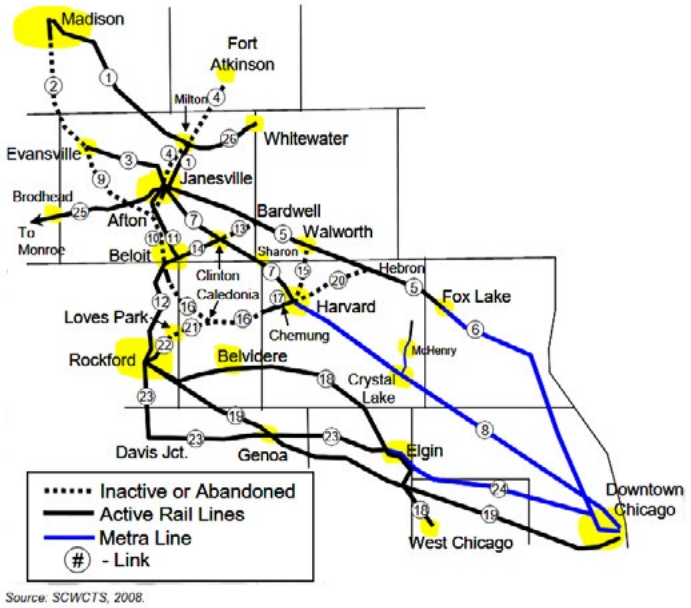
[18] https://wisconsindot.gov/Pages/projects/multimodal/rail-chi-mil/facts.aspx

Amtrak Connects US



Map 3-x Amtrak Connects US

SCWCTS Candidate Rail Corridor Links



Source: SCWCTS, 2008.

Map 3-y SCWCTS Candidate Rail Corridor Links

pandemic, only four northbound and three southbound trips are currently offered on a daily basis. Planned improvements to the Hiawatha Service include improving frequency to ten round trips per day and increasing train speeds to up to 90 miles per hour. In the 2000s, the Wisconsin Department of Transportation led an effort to extend the Hiawatha Service line to Madison with improved tracks and a station near the Monona Terrace. The project was cancelled in 2010. WisDOT is currently engaged in the Wisconsin Rail Plan 2050 planning process, scheduled to be completed by summer 2022.[19]

The Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), signed into law in November 2021 includes $66 billion for rail nation-wide, and Amtrak's Connects US plan (see Map 3-x) proposes new service connecting Madison directly to Milwaukee and Minneapolis/St. Paul. Funding for planning a station location was included in the City of Madison's 2022 Capital Budget.

The Stateline Area Transportation Study (SLATS), the MPO for the Beloit metro area, conducted a Passenger Rail Study[20] in 2021 that advanced two Study Alignments for further study: Rockford-Beloit-Janesville-Milton-Madison, labeled as Rockford-Madison (E); and, Harvard-Janesville-Milton-Madison, labeled as Harvard-Madison (E) in map 3-z

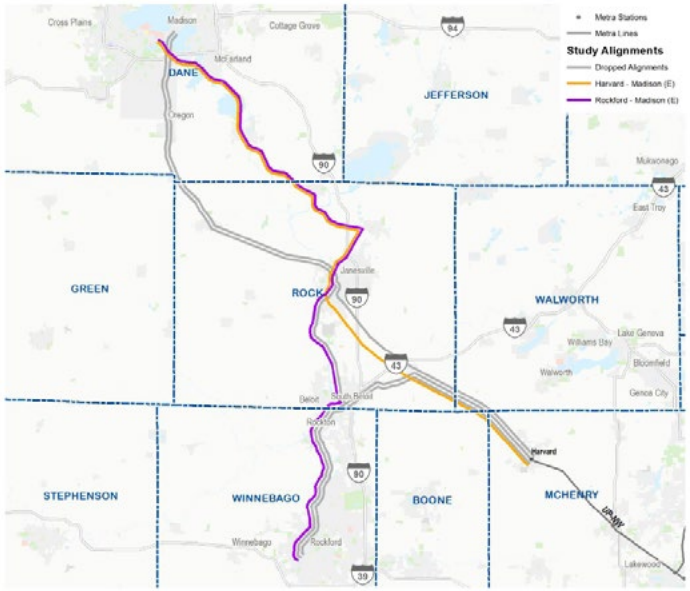
The Midwest Regional Rail Plan (MWRRP),[21] released in October 2021, recommends that the Chicago to Twin Cities Core Express route serve Madison directly. Notably, the MWRRP states that "Milwaukee and Madison were determined to be significant markets critical to the operational viability of a Core Express corridor between Chicago and Minneapolis-

[19] https://wisconsindot.gov/Pages/projects/multimodal/railplan/default.aspx

[20] http://gouda.beloitwi.gov/weblink/0/edoc/74275/SLATS%20Passenger%20Rail%20Study_FINAL%20REPORT_Feb%202021.pdf

[21] https://railroads.dot.gov/sites/fra.dot.gov/files/2021-10/Final%20Report-MWRRP%20with%20Appendices%20PDFa.pdf

Study Alignments to Advance



Map 3-z Study Alignments to Advance

St. Paul and should be included on any mainline route alignment."[22] The MWRRP recommends that the Minneapolis-St. Paul – Chicago "Core Express" service be routed via Milwaukee and Madison, and notes that there are no outstanding issues with this configuration.[23] The MWRRP Fig. 26, a concept of the recommended routing, is reproduced in this plan as Figure 3-m.

INTER-CITY BUS TERMINAL

Inter-city buses stop in a variety of places in Madison but most serve a stop on North Lake Street on the UW campus. Greyhound is an exception, only serving the Dutch Mill park-and-ride on Madison's southeast side. Inter-city bus passengers currently do not have a terminal to use with direct access to bathrooms, information, or climate control. The lack of an inter-city transit terminal is not consistent with the level of inter-city bus service in Madison. The need for a new terminal has been felt since Badger Bus closed their terminal on Bedford Street in 2009.

Various sites for an inter-city terminal have been investigated, including a rail terminal near the Monona Terrace, a parcel on Bedford Street, and a terminal integrated into the reconstructed Lake Street parking garage. The City of Madison began the RFP process for a new public parking structure, intercity bus terminal, first floor retail, and housing on the Lake Street site (Figure 3-n) in late 2020, but due to budget constraints related to the pandemic the project was postponed until 2021. Seven proposals were received for the project, with selection of the preferred proposal anticipated in 2022 and construction beginning in the first half of 2025.[24] Project goals include providing a high quality facility that serves all the inter-city bus lines with information, ticket sales, and other amenities in a location with convenient pedestrian access to the UW, Capitol Square, and Metro Transit bus service.

MWRRP Recommended Routing

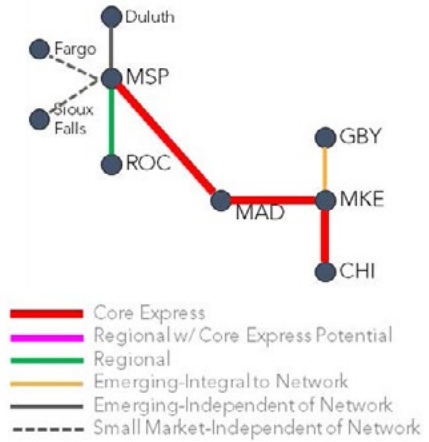


Figure 3-m MWRRP Recommended Routing

AIRPORT ACCESS

Metro Transit provides public transit service to the Dane County Regional Airport with Route 20, operating every 30 minutes between the North Transfer Point and East Towne Mall. Transfers at either terminal allow passengers to travel to central Madison, the UW, and other destinations in the Metro Transit service area. A trip between the Capitol Square and the airport, a five-mile trip, is currently scheduled to take 35-47 minutes, including a nine- to twelve-minute wait at the North Transfer Point.

Direct limited-stop service between central Madison and the Dane County Airport has been investigated intermittently. The region's

[22] p 48

[23] Table 9

[24] https://www.cityofmadison.com/dpced/economicdevelopment/state-street-campus-garage-mixed-use-project/3643/

Lake Street Ramp Location

Figure 3-n Lake Street Ramp Location

ability to introduce the service is limited by several factors. First, transit ridership from the airport is approximately 15 passengers per day (2019). Although it is unclear what the demand potential would be with faster, simpler service, it is unlikely that an express fixed-route service designed specifically around service to the airport could be operated with sufficient frequency to draw enough ridership and be a cost-effective use of funds. Second, the service would be duplicative of parallel service in the corridor, such as existing routes 20, 2, and 4, and the planned North/South BRT service.

The planned Bus Rapid Transit system includes service on Packers without direct service to the airport. Although BRT service to the airport would provide a fast, high quality trip between the airport and central Madison without a transfer, the current ridership at the airport does not justify the provision of premium transit service to this destination. Furthermore, providing BRT service to the airport would necessitate eliminating or reducing BRT service to identified Environmental Justice areas and other residential areas along Northport Drive; to date in the process, Network Redesign team members, the public, and the City of Madison Transportation Planning & Policy Board (TPPB) have preferred providing this service to the Northport Drive area over to the airport. The draft Metro Transit Network Redesign Plan does calls for 30-minute direct bus service to the airport using Sherman Avenue.

Although bike lanes and off-street routes provide numerous approach routes to the airport, bicycle access to and from the Dane County Regional Airport is discouraged by several gaps in the off-street network and a lack of wayfinding signage indicating where bicyclists should go at key decision points. The road accessing the airport, International Lane, is rated as Level of Traffic Stress (LTS) 3, as is the road approaching from the east, Anderson Street. Accessing the airport from any other direction requires crossing, if not traveling on, Packers Avenue (LTS 4). Closing these gaps in the low-stress network would vastly improve bicycle access to and from the airport, facilitating the use of non-motorized transportation modes for travelers and employees. Bicycle connections to the airport and related improvements are the subject of the Dane County Regional Airport Bike Plan, a detail of which is shown in Figure 3-o.[25]

DCRA Bike Plan Detail

Figure 3-o DCRA Bike Plan Detail

[25] Dane County Regional Airport Bike Plan (Jollay, Cotter, and Aley), 2016; see also https://youtu.be/-LoNzvrEtxA?t=323

Freight Transportation

FREIGHT MOVEMENT

The region's economic prosperity depends on the efficient movement of freight. Freight transportation is a key factor in the efficiency, productivity, and profitability of most businesses, and is critical to economic growth.

In recent years, a shift towards online shopping from traditional brick-and-motor stores has had a major impact on the way freight moves in the community. It has fundamentally changed the last stage of freight movement, aka the "last mile," for consumer goods. In the past, the last mile would be a delivery to a retail store. Today, many of these shipments terminate at private residences. While this has led to more delivery truck traffic in residential neighborhoods, the full impact of online shopping on traffic congestion and emissions is unclear—depending on the efficiency of truck deliveries, whether deliveries replace personal vehicle trips, and other factors.

Between 2014 and 2019, the total tonnage of freight shipments in Dane County increased by about 8.5%.[26] In 2014, a total of 23.7 million tons of freight were moved in Dane County, 98% of which was carried by truck. In 2019, 25.6 million tons of freight were moved in the county, 95% of which was carried by truck. The slight decline in the share of freight carried by truck, is a result of a dramatic uptick in the quantity of rail freight, which more than doubled over the five-year period to 1.1 million tons in 2019. In terms of weight, the quantity of freight moved by air and other modes (pipelines) accounted for roughly 0.1% of all freight moved in 2014 and 2019.

The value of freight shipments in the county increased by 4% during this period, from $24.1 to $25.1 billion. Trucks are the dominant mode by value, carrying 90% of the county's total freight value in 2019, while air cargo accounted for 8.5%, and rail carried less than 2%. The value of air freight increased by 28% between 2014 and 2019, from $1.6 to $2.1 billion. The value of rail freight also grew during this period, increasing by nearly 48%, but its total value remains below $450 million. The high value and low weight of air shipments is due to air cargo being largely restricted to the most high-value time-sensitive goods. Rail tends to carry the lowest value, least time-sensitive shipments.

Outbound shipments account for just under 40% of the total, in terms of both weight and value, with inbound shipments accounting for slightly more than 50%, see Figures 3-p and 3-q. The imbalance between outbound and inbound

Dane County Freight Tonnage 2019

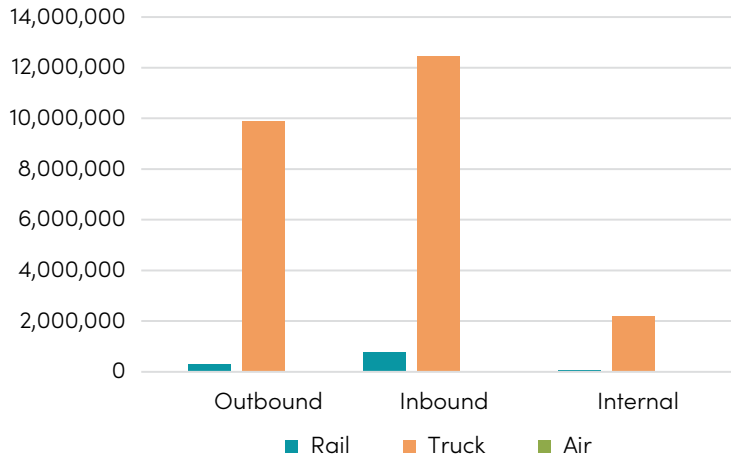


Figure 3-p Dane County Freight Tonnage 2019

Dane County Freight Value 2019

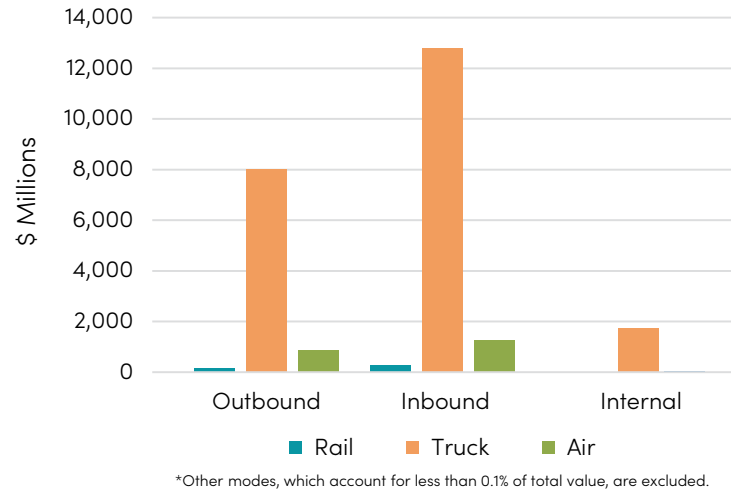


Figure 3-q Dane County Freight Value 2019

[26] Excludes through traffic.

Top Out-of-State Origins for Dane County Freight by Weight 2019

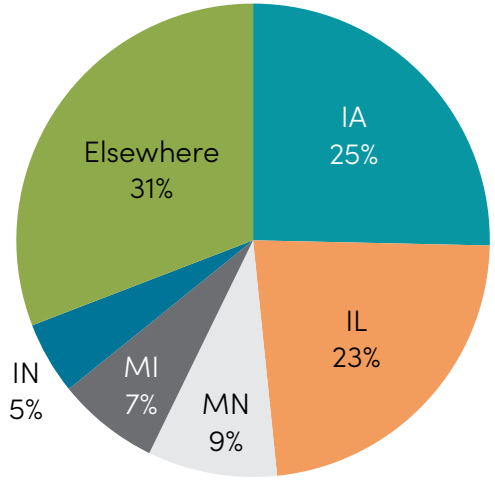


Figure 3-r Top Out-of-State Origins for Dane County Freight by Weight 2019

Top Out-of-State Destinations for Dane County Freight by Weight 2019

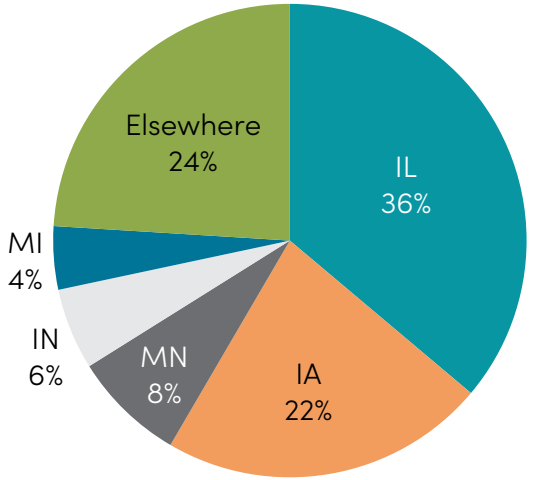


Figure 3-s Top Out-of-State Destinations for Dane County Freight by Weight 2019

Top Outbound Commodities 2019

Commodity	Tons	Commodity	Value
Grain	1,570,977	Drugs	$887,970,068
Petroleum Refining Products	1,172,291	Petroleum Refining Products	$778,870,068
Broken Stone or Riprap	984,502	Truck Trailers	$743,974,633
Misc Waste or Scrap	901,171	Warehouse & Distribution Center	$675,849,556
Gravel or Sand	893,498	Misc Plastic Products	$403,255,734
Dairy Farm Products	688,848	Meat Products	$264,185,598
Warehouse & Distribution Center	548,205	Dairy Farm Products	$256,251,418
Prepared or Canned Feed	408,141	Bread or Other Bakery Products	$232,072,452
Ready-mix Concrete, Wet	371,150	Misc Waste or Scrap	$226,605,827
Cut Stone or Stone Products	257,099	Misc Agricultural Chemicals	$193,669,535
Other Commodities	2,397,212	Other Commodities	$4,379,022,789

Figure 3-t Top Outbound Commodities 2019

freight volumes is likely due to the Madison area's economic base, which is tilted towards healthcare, education, government, and technology, industries that employ many consumers but that are not reliant on the export of goods from the area.

By tonnage, Dane County's trade is almost evenly split between locations inside and outside the State of Wisconsin. 46% of Dane County's inbound freight comes from out of state, with 54% coming from in-state locations. 52% of Dane County's outbound freight is bound for out-of-state destinations, while 48% goes to other counties in Wisconsin. The top out-of-state origins and destinations of Dane County freight shipments, by weight, are detailed in Figures 3-r and 3-s.

TOP COMMODITIES

Dane County's top outbound commodities in 2019, as determined by weight and value, are shown in Figure 3-t. Four of the top ten commodities by weight are also among the top ten commodities by value. Many of the other commodities in the list, however, represent commodities that are extremely high or low values by weight. For example, the total weight of drugs, which represented nearly 10% of total outbound commodity value in 2019, was just 26,070 tons—just 0.3% of total outbound tonnage. Similarly, broken stone or rip rap, which accounts for 12% of outbound tonnage, represents just 0.1% of total outbound value.

Some of the top outbound commodities by weight and value are also among the top ten inbound commodities, as shown in Figure

Top Inbound Commodities 2019

Commodity	Tons	Commodity	Value
Broken Stone or Riprap	2,539,449	Warehouse & Distribution Center	$1,366,172,762
Gravel or Sand	2,143,039	Motor Vehicles	$839,495,531
Warehouse & Distribution Center	1,108,150	Drugs	$611,652,313
Grain	571,499	Motor Vehicle Parts or Accessories	$479,566,932
Ready-mix Concrete, Wet	540,013	Misc Plastic Products	$381,645,185
Petroleum Refining Products	507,625	Petroleum Refining Products	$341,862,708
Concrete Products	382,365	Instruments, Photo Equipment, Optical Eq.	$334,050,127
Distilled or Blended Liquors	283,219	Electrical Equipment	$259,841,709
Misc Field Crops	274,320	Livestock	$246,394,029
Asphalt Paving Blocks or Mix	237,936	Misc Manufacturing Products	$242,000,078
Other Commodities	4,645,125	Other Commodities	$9,180,037,390

Figure 3-u Top Inbound Commodities 2019

Top Internal Commodities 2019

Commodity	Tons	Commodity	Value
Petroleum Refining Products	663,630	Petroleum Refining Products	$445,083,568
Ready-mix Concrete, Wet	360,375	Drugs	$236,682,248
Broken Stone or Riprap	325,164	Truck Trailers	$87,300,798
Gravel or Sand	291,320	Warehouse & Distribution Center	$69,706,367
Cut Stone or Stone Products	90,709	Bread or Other Bakery Prod	$46,780,167
Warehouse & Distribution Center	56,541	Misc Plastic Products	$42,366,652
Liquefied Gases, Coal or Petroleum	38,749	Household Cooking Equipment	$38,638,339
Concrete Products	33,895	Engrg, Lab or Scientific Equipment	$38,509,396
Potassium or Sodium Compound	31,500	Misc Electrical Industrial Equipment	$37,094,419
Fertilizers	31,088	Lighting Fixtures	$34,140,357
Other Commodities	302,552	Other Commodities	$3,600,534

Figure 3-v Top Internal Commodities 2019

3-u. These include products in the warehouse and distribution center commodity group (consumer goods) and those in the petroleum refining products group (gasoline, etc.).

As shown in Figure 3-v, freight shipments beginning and ending entirely within Dane County are dominated by petroleum refining products, the top commodity by both weight and value.

FREIGHT FACILITIES

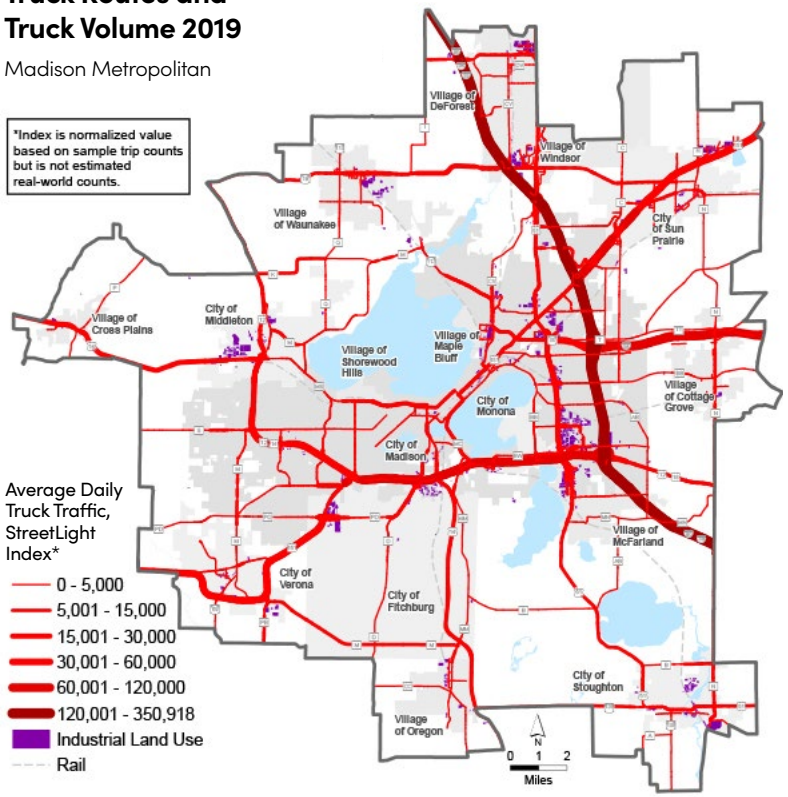
Trucking

The vast majority of Dane County's freight is carried by trucks traveling on designated truck routes. Official designation as a truck route is important because trucks must normally use the shortest path between designated truck routes and their destinations. Dane County's primary long distance truck routes include the Interstate and US highways that pass through the county, including I-39/90/94, the Beltline, and US Highways 51 and 151. These routes connect the metropolitan area to surrounding cities such as La Crosse, Eau Claire, Wausau, the Twin Cities, the Fox Valley Cities, Janesville, Dubuque, Rockford, Milwaukee, and Chicago.

Local truck routes range from major local arterials, such as University Avenue, to segments of local streets serving small clusters of businesses. These routes are integral for moving freight around the region as well as to and from their local destinations. Local routes are defined by Dane County and local municipalities.

Truck Routes and Truck Volume 2019

Madison Metropolitan



Map 3-aa Truck Routes and Truck Volume 2019

The metropolitan area is home to numerous trucking companies, most of which cluster near industrial areas and truck routes. Many truck companies are located along the US Highway 51 corridor due to the corridor's relatively easy access to the interstate system.

Dane County's industrial areas and truck routes, including the relative share of truck traffic on each, is detailed in Map 3-aa. Truck traffic volume is shown as StreetLight Index. StreetLight Index volume estimates are not estimates of actual daily truck traffic; they describe the relative levels of truck traffic only. So, for example a road with an index value of 10,000 is estimated to carry twice as many trucks each day, on average, as a road with an index value of 5,000.

While congestion in the Madison area is modest compared to many other large urban areas, it does impact some key freight routes. Travel time reliability is a particular challenge on the Beltline, between USH 51 and Verona Rd (USH 18/151), and USH 51, between East Washington Avenue and the Beltline, during morning and afternoon peak periods. See the Roadways section for more information on congestion and travel time reliability.

Rail

The Wisconsin and Southern Railroad (WSOR), a regional railroad, is the principal operator on all of the rail lines in the area except for a portion of rail line that runs from Madison north to DeForest that is owned by Canadian Pacific. WSOR connects Dane County with locations throughout southern Wisconsin and into northeastern Illinois, operating on over 750 miles of track.

Air

The Dane County Regional Airport (MSN) on the north side of Madison provides air cargo service to the region. Four dedicated cargo airlines currently serve the airport. Passenger airlines also regularly carry freight in addition to passengers and their luggage.

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