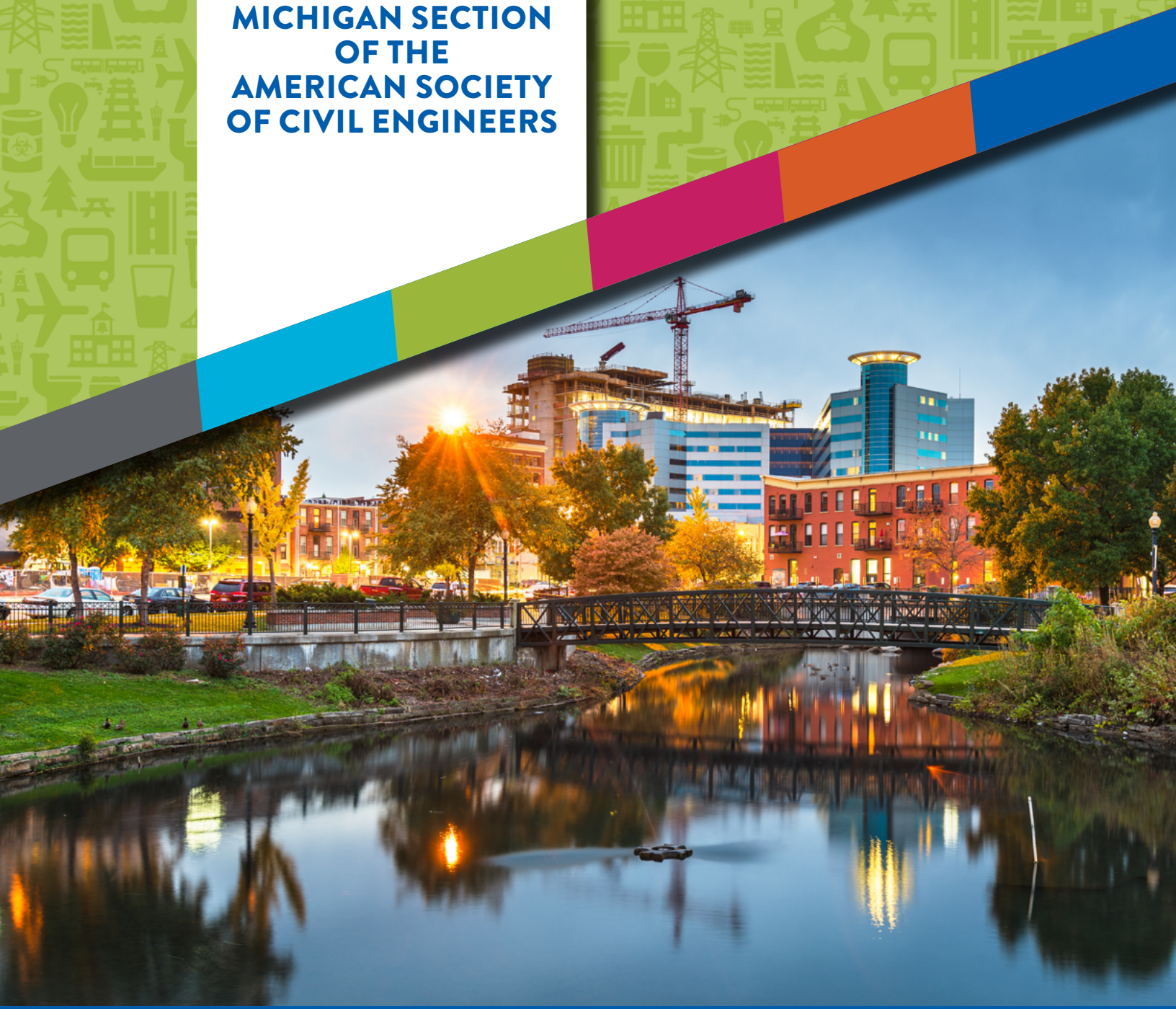
2023

REPORT CARD FOR MICHIGAN'S INFRASTRUCTURE

MICHIGAN SECTION OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS



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Executive Summary

Quality infrastructure is necessary for Michigan's economic success, public health, and social prosperity. Our transportation system allows Michiganders to take essential and recreational trips. Water systems deliver drinking water to homes and offices, collect and treat wastewater from growing communities, and convey stormwater from dangerous flooding. Ports and inland waterways provide routes from farm to market. And the state – home to Edison's private residence, the first in America to utilize electricity – relies heavily on the power grid to charge electronics and keep the lights on.

For too long, Michigan's infrastructure suffered the impacts of chronic underinvestment. Fortunately, progress has been made over the past five years thanks to investments from the state and federal lawmakers. These included $3.5 billion in bond funding from the "Rebuilding Michigan Program" and $4.7 billion from the "Building Michigan Together" plan. Michigan is also set to to receive $11 billion over the next five years from the 2021 Bipartisan Infrastructure Law for much needed projects in the systems assessed by this report card.

To sustain recent improvements to Michigan's infrastructure, close investment gaps, and expand system services, decisionmakers must implement sustainable, dedicated, long-term funding solutions, address workforce challenges, and prioritize resilience and reliability. The 2023 Report Card for Michigan's Infrastructure can help residents, elected officials, and decisionmakers easily understand the state of our infrastructure and how to make strategic decisions to continue the forward progress.

About The Report Card for Michigan's Infrastructure

While you may not think about infrastructure every day, civil engineers do because we've pledged to build it, maintain it, and keep the public safe. As an organization of civil engineers who live and work in Michigan, we want to share what its condition is and what can be done to improve it.

Methodology

The purpose of the Report Card for Michigan's Infrastructure is to inform the public and decision makers of the current condition of our state's infrastructure in a concise and easily accessible format of a school report card. Each of the categories of infrastructure covered in the Report Card is assessed using rigorous grading criteria and recent data to provide a comprehensive assessment of the area's infrastructure. ASCE has used the following criteria to discuss and grade the state of the infrastructure:

CAPACITY

Does the infrastructure's capacity meet current and future demands?

CONDITION

What is the infrastructure's existing and near-future physical condition?

FUNDING

What is the current level of funding from all levels of government for the infrastructure category as compared to the estimated funding need?

FUTURE NEED

What is the cost to improve the infrastructure? Will future funding prospects address the need?

OPERATION AND MAINTENANCE

What is the owners' ability to operate and maintain the infrastructure properly? Is the infrastructure in compliance with government regulations?

PUBLIC SAFETY

To what extent is the public's safety jeopardized by the condition of the infrastructure and what could be the consequences of failure?

RESILIENCE

What is the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents? How able is it to quickly recover and reconstitute critical services with minimum consequences for public safety and health, the economy, and national security?

INNOVATION

What new and innovative techniques, materials, technologies, and delivery methods are being implemented to improve the infrastructure?

GRADING SCALE

EXCEPTIONAL: FIT FOR THE FUTURE

The infrastructure in the system or network is generally in excellent condition, typically new or recently rehabilitated, and meets capacity needs for the future. A few elements show signs of general deterioration that require attention. Facilities meet modern standards for functionality and are resilient to withstand most disasters and severe weather events.

GOOD: ADEQUATE FOR NOW

The infrastructure in the system or network is in good to excellent condition; some elements show signs of general deterioration that require attention. A few elements exhibit significant deficiencies. Safe and reliable with minimal capacity issues and minimal risk.

MEDIOCRE: REQUIRES ATTENTION

The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.

POOR: AT RISK

The infrastructure is in poor to fair condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration. Condition and capacity are of significant concern with strong risk of failure.

FAILING/CRITICAL: UNFIT FOR PURPOSE

The infrastructure in the system is in unacceptable condition with widespread advanced signs of deterioration. Many of the components of the system exhibit signs of imminent failure.

2023 Michigan's Infrastructure Report Card

G.P.A. C-

AVIATION	C	RAIL	C
BRIDGES	D+	ROADS	D
DAMS	C-	SCHOOLS	C-
DRINKING WATER	D+	SOLID WASTE	C+
ENERGY	D	STORMWATER	D
INLAND WATERWAYS	C	TRANSIT	C-
PUBLIC PARKS	C	WASTEWATER	C

Recommendations to Raise the Grade

1. ENHANCE AND EXPAND DEDICATED FUNDING FOR INFRASTRUCTURE AT STATE AND LOCAL LEVELS

In the last five years, the condition of Michigan roads has improved, airports have held steady or sought new capacity, schools have increased facility spending, and water systems have started chiseling away their project queues. These infrastructure systems cannot sustain progress or seriously reduce investment gaps without greater predictable funding.

2. PROACTIVELY ADDRESS WORKFORCE DEVELOPMENT CHALLENGES

The infrastructure workforce makes improvement possible, and most employers are now struggling to hire and retain staff. Government leaders, the private sector, and educational institutions should coordinate efforts so Michigan can maximize the positive benefits of recent federal and state investment.

3. FOCUS PLANNING AND DESIGN ON RESILIENCE AND RELIABILITY

Michigan's energy grid was unreliable in recent storm events and stormwater infrastructure is not sufficient to endure increasingly unpredictable and high-magnitude threats. Decision-makers should advance upgrades to infrastructure systems to help them stay operational during adverse events, using redundancy, updated codes and standards, and other strategies.

Aviation

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EXECUTIVE SUMMARY

Michigan's 234 airports, including 15 primary airports, contribute over $23 billion annually to the state's economy. Scheduled airlines transported more than 42 million passengers to and from Michigan in 2019. The Michigan Department of Transportation maintains the condition and overall safety of aeronautical infrastructure through asset management. The average Pavement Condition Index (PCI) of airports in the state increased slightly from a PCI of 69 out of 100 in 2018 to a PCI of 71 in 2020. While federal funding for Michigan's airport infrastructure has increased slightly over the past four years thanks to the Bipartisan Infrastructure Law and COVID-era relief legislation, state funding is uncertain and limited. The three cents-per-gallon Aviation Fuel Excise Tax has been unchanged since its inception in 1931 and the $6 million revenue from the Airport Parking Tax is increasingly reserved for bond repayment obligations.

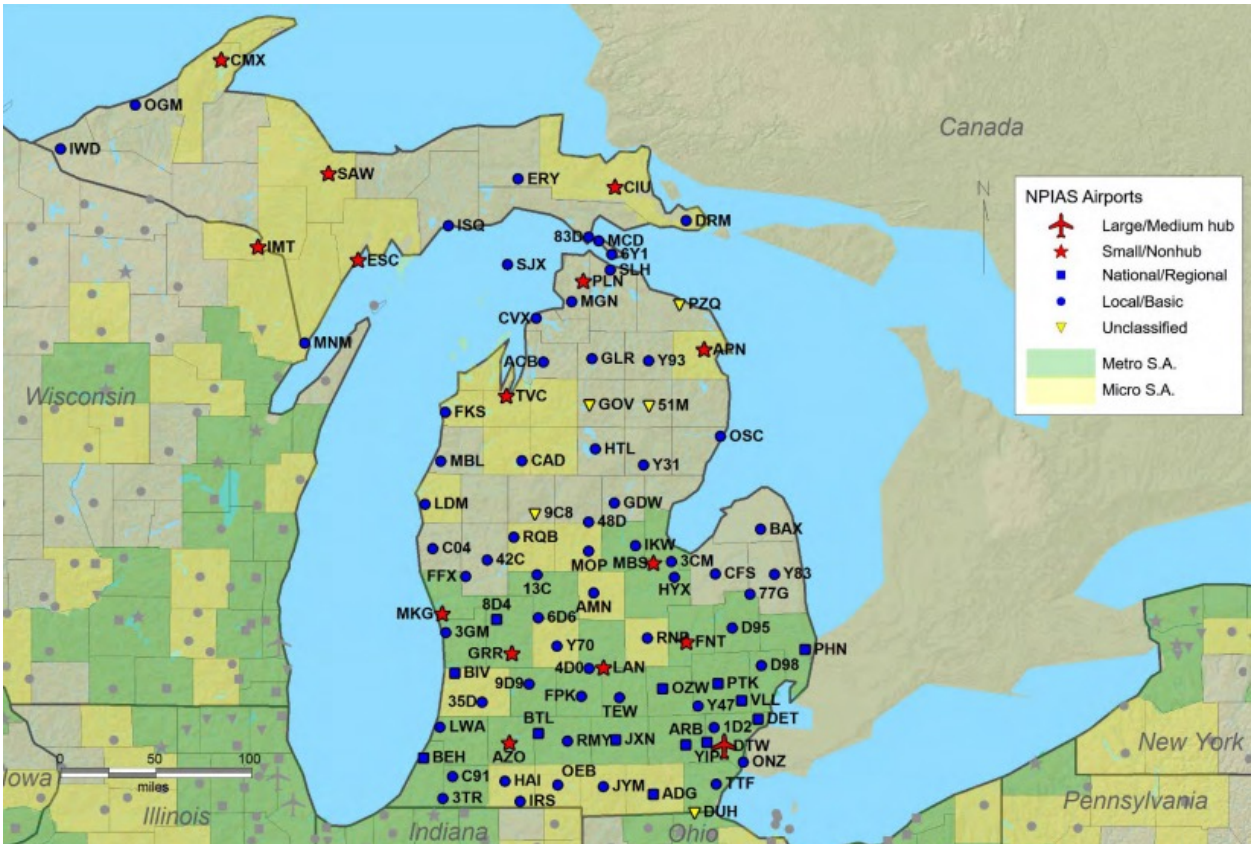
BACKGROUND

Aviation is an integral part of Michigan's transportation system, connecting our residents and products throughout the state with the nation and world. Michigan has a vibrant and diverse aviation community consisting of the airlines, business aviation, and recreational flyers. Every Michigan citizen is impacted by the benefits aviation provides.

The airports of the Michigan aviation network support these activities and are significant assets to the state's economy. Business growth in Michigan relies on a safe and efficient aviation system. With the geographic challenges of Michigan, access to all parts of the state in support of business, tourism, and emergency relief is critical. The economic impact of aviation in Michigan is estimated at more than $23 billion annually.

Michigan has 234 airports across the state, including 15 primary airports, which provide passenger air service. The 15 primary air service airports include one large hub, one small hub, and 13 non-hub airports (Federal Aviation Administration, 2019), plus two Essential Air Service (EAS)/Commercial Service which are not primary airports (Ironwood and Manistee). These airports are geographically well-situated and meet Michigan's air service needs within the service threshold of 60 minutes or less surface travel time. Major investments at the Detroit large hub over the last 5 years have included significant airside (runway and associated taxiway) improvements and expansions. Terminal capacity improvements have been limited over the 5 year period.

FIGURE 1. MAP OF NPIAS AIRPORTS IN MICHIGAN



Source: https://www.faa.gov/sites/faa.gov/files/NPIAS-2023-2027-Appendix-B.pdf

The Michigan Airport System has remained stable both in capacity and condition. The number of airports in the system and services provided are relatively unchanged. The system of airports remains a vital part of Michigan's transportation link to national and global markets.

Cargo Summary - 1.58 billion pounds in 2018 to 1.68 billion pounds in 2021 is 6% increase over 3 years, or 2% per year (with fluctuation year over year).

Rank (21)	Locid	City	Airport Name	2021 Landed Weight (lbs.)	2020 Landed Weight (lbs.)	2019 Landed Weight (lbs.)	2018 Landed Weight (lbs.)
35	DTW	Detroit	Detroit Metro Wayne County	947,101,222	888,306,650	893,741,120	843,725,711
93	LAN	Clinton (Township of)	Capital Region International	253,404,274	236,828,982	230,135,184	202,834,826
95	GRR	Grand Rapids	Gerald R Ford International	245,440,052	255,564,404	244,185,354	229,658,034
115	YIP	Detroit	Willow Run	139,936,118	125,510,053	176,676,378	217,624,487
125	FNT	Flint	Bishop International	89,394,100	87,139,300	86,333,938	85,730,928
135	IWD	Ironwood	Gogebic/Iron County	5,029,000	4,200,100	4,936,000	5,280,200
				1,680,304,766	1,597,549,489	1,636,007,974	1,584,854,186

There are 95 airports in Michigan listed in FAA's National Plan of Integrated Airport Systems (NPIAS) 2021-2025, which lists airports significant to national air transportation and thus eligible to receive Federal grants under the Airport Improvement Program (AIP).

CAPACITY

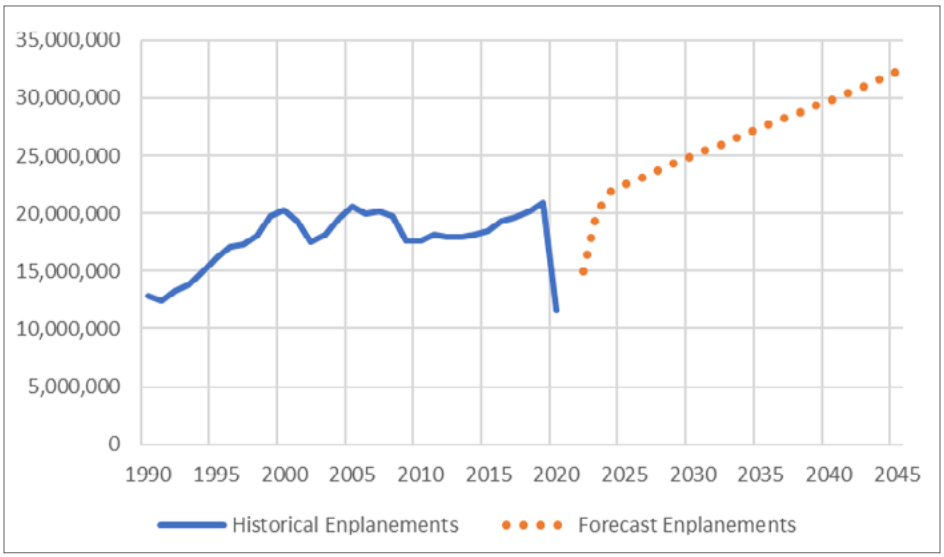
Table 1 lists the airports in Michigan with regularly scheduled air service. Almost all of Michigan's 10 million residents live within a 90-minute drive from one of these airports, and the large population centers are within a 30-minute drive from one of these airports.

TABLE 1. AIRPORTS IN MICHIGAN WITH REGULARLY SCHEDULED AIR SERVICE

Associated City	Airport Name	FAA Identifier
Alpena	Alpena County Regional	APN
Charlevoix	Charlevoix Municipal	CVX
Detroit	Detroit Metropolitan Wayne County	DTW
Escanaba	Delta County	ESC
Flint	Bishop International	FNT
Grand Rapids	Gerald R. Ford International	GRR
Hancock	Houghton County Memorial	CMX
Iron Mountain Kingsford	Ford	IMT
Ironwood	Gogebic-Iron County	IWD
Kalamazoo	Kalamazoo/Battle Creek International	AZO
Lansing	Capital Region International	LAN
Manistee	Manistee County Blacker	MBL
Marquette	Sawyer International	SAW
Muskegon	Muskegon County	MKG
Pellston	Pellston Regional Airport of Emmet County	PLN
Saginaw	MBS International	MBS
Sault Ste. Marie	Chippewa County International	CIU
Traverse City	Cherry Capital	TVC

Commercial passenger enplanements (passenger boardings) peaked in 2019 at 20.9 million before decreasing due to the COVID-19 pandemic. The FAA projects that passenger enplanements will reach pre-pandemic levels by 2024 and continue to increase through 2045.

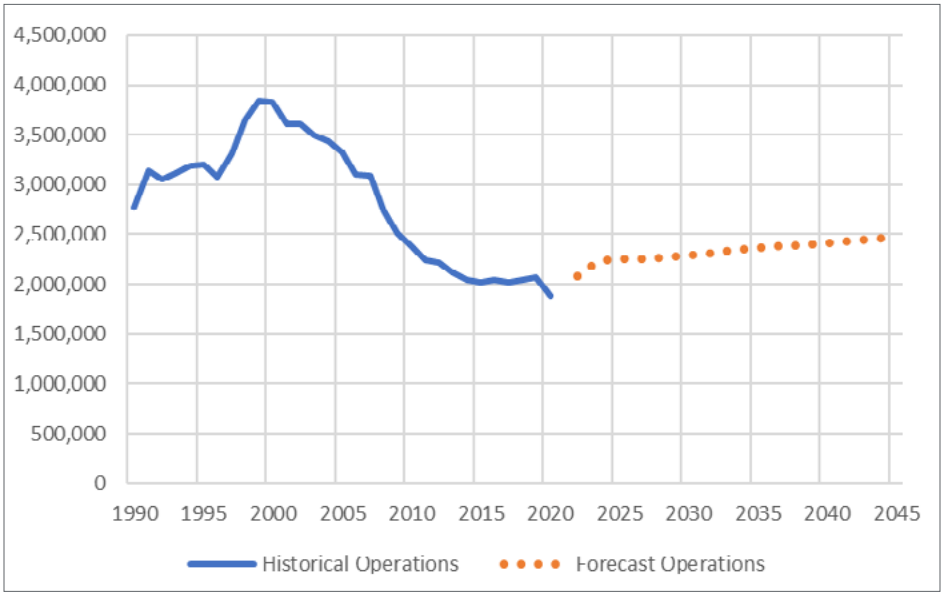
FIGURE 2. COMMERCIAL PASSENGER ENPLANEMENTS, 1990-PRESENT AND FORECASTED



Source: FAA Terminal Area Forecast (Federal Fiscal Year)

Beginning in 2000, the aviation industry saw a significant decrease in aircraft operations, especially in the general aviation sector. Forecasts show stable aircraft operations, with activity modestly but steadily increasing through 2024. Most of the growth is projected in the corporate and commercial aviation sectors.

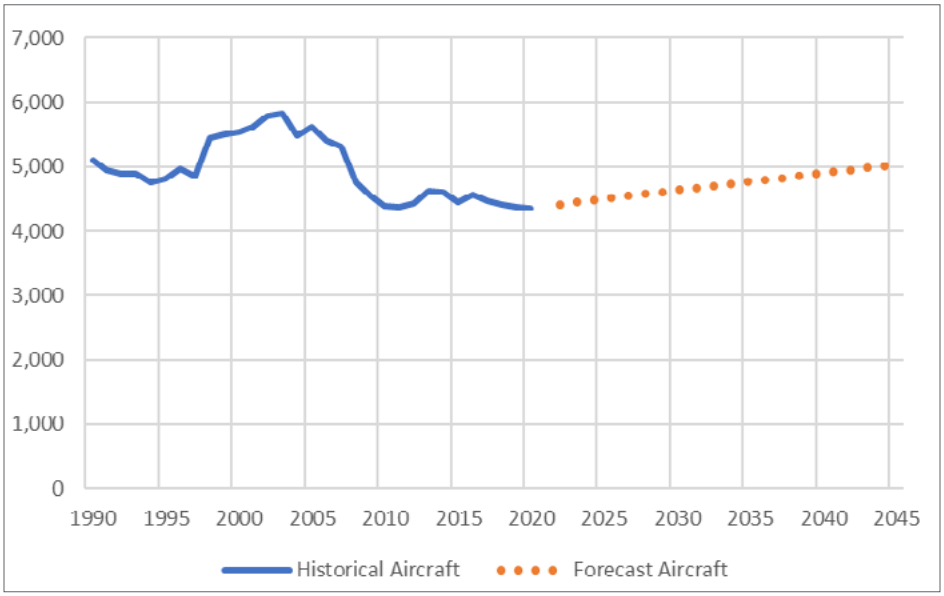
FIGURE 3. AIRCRAFT OPERATIONS IN MICHIGAN, 1990-PRESENT AND FORECASTED



Note: Data for National Plan of Integrated Airport Systems (NPIAS) Airports only
Source: FAA Terminal Area Forecasts (Federal Fiscal Year)

Based aircraft in Michigan saw significant declines beginning around 2003 through 2011, and have been fairly stable since then. The FAA forecasts based aircraft both nationally and in Michigan will be stable with some modest growth through 2045, primarily in the corporate aviation sector.

FIGURE 4. BASED AIRCRAFT IN MICHIGAN, 1990-PRESENT AND FORECASTED



Note: Data for National Plan of Integrated Airport Systems (NPIAS) Airports only
Source: FAA Terminal Area Forecasts (Federal Fiscal Year)

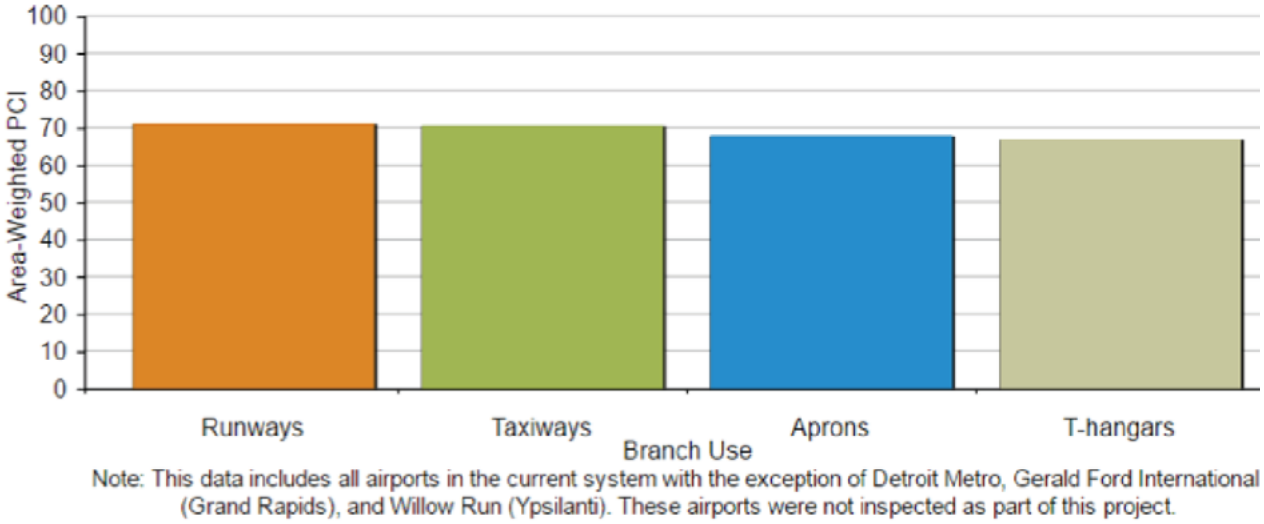
CONDITION

The condition and overall safety of the aeronautical infrastructure has been well monitored and maintained through an asset management concept described in the Michigan Aviation System Plan. This plan provides guidelines for maintenance and future development through a "systems approach." This approach takes into consideration state, national, and local goals for safety and access to pertinent markets in order to provide quality and economical aeronautical access in Michigan.

Through their Statewide Pavement Management System Update, the MDOT Office of Aeronautics evaluated over 166.3 million square feet of airfield pavements from 2019 to 2021, constituting almost all of the airports in Michigan. This evaluation procedure uses the Pavement Condition Index (PCI) to quantify pavement conditions.

1. Airfield pavements include runways (surfaces devoted to the landing and takeoff of aircraft), taxiways (surfaces utilized by aircraft to travel to and from runways), aprons (surfaces dedicated to aircraft parking), and T-hangar taxi lanes (smaller taxiways near and around hangars utilized to access hangars). The average PCI of airports in the state rose slightly from a PCI of 69 in 2018 to a PCI of 71 in 2020.

FIGURE 5. PAVEMENT CONDITION INDEX (PCI) AT AIRPORTS IN MICHIGAN



Source: MDOT Aeronautics Statewide Pavement Management Update, https://mdotnetpublic.state.mi.us/apms/

FUNDING & FUTURE NEED

The bulk of capital funding improvements to the aviation system are provided with federal Airport Improvement Program (AIP) funding through the FAA,which flows through the State of Michigan. Since 2005, this funding has remained flat at or decreased from $3.5 billion nationally. This funding program was most recently reauthorized by Congress under the Federal Aviation Administration Reauthorization Act of 2018, which has been extended through fiscal year 2023. The funding categories and programs have remained unchanged since the 2005 report.

Because airports derive funding from passenger facility charges, there were tremendous financial impacts to airport infrastructure during the COVID-19 global pandemic. Four federal initiatives provided supplemental federal funding for airports in 2020 and 2021, beyond the 2018 FAA Reauthorization. This additional support helps address the backlog of airport investment needs for modernization.

1. The Coronavirus Aid, Relief, and Economic Security Act (CARES, March 27, 2020) included $10 billion in funds as economic relief to eligible U.S. airports
2. The Coronavirus Response and Relief Supplemental Appropriation Act (CRRSAA, December 27, 2020) provided nearly $2 billion in funds as economic relief to eligible U.S. airports
3. The American Rescue Plan Act of 2021 (ARPA, March 11, 2021) included $8 billion in funds to provide economic assistance to U.S. airports
4. Bipartisan Infrastructure Law (BIL, November 11, 2021, also referred to as the Infrastructure Investment and Jobs Act) identified $25 billion to be invested in airport infrastructure over fiscal years 2022 through 2026.
    a. $15 billion to eligible airport infrastructure to increase safety and expand capacity
    b. $5 billion to airport terminals to replace aging infrastructure, increase energy efficiency and accessibility, and more
    c. $5 billion for the FAA to invest in air traffic facilities

The first three legislative items above focused immediate funds on sustaining airport operations through the global pandemic and provided little to no investment in what the FAA has identified as a $45 billion airport infrastructure backlog need and Airports Council International – North America has summarized as a $115 billion infrastructure backlog. BIL begins to address airport infrastructure modernization needs and has the potential to improve the condition of Michigan airports and the associated infrastructure grade in the coming years.

The stability of federal funding for airports remains a concern, as little progress has been made other than near-term funding opportunities. At the state level, fuel tax revenues have been flat while bond repayment obligations have increased, requiring the department to continually re-assess sources and participation levels in all aviation programs. At the federal level, AIP and Passenger Facility Charge (PFC) levels have not increased in decades.

Although the federal Essential Air Service Program (EAS) has been under increased scrutiny for cost and effectiveness, it remains in effect for the foreseeable future. As of December 2021, air service is subsidized under the EAS Program at nine Michigan airports: Alpena County Regional (Alpena), Delta County (Escanaba), Houghton County Memorial (Hancock), Ford Airport (Iron Mountain), Gogebic County (Ironwood), Manistee-Blacker (Manistee), Muskegon County (Muskegon), Pellston Regional (Pellston), and Chippewa County International (Sault Ste. Marie). While no immediate changes are foreseen, continued EAS service is contingent upon federal funds being appropriated to the U.S. Department of Transportation (USDOT) for this program.

State funding for airports continues to fluctuate and is plagued with uncertainty. The three cents-per-gallon Aviation Fuel Excise Tax has been unchanged since its inception in 1931 and revenue from the tax has slowly decreased since 2005. The $6 million revenue to the State Aeronautics Fund (SAF) from the Airport Parking Tax has continued. However, an increasing amount each year is dedicated to bond indebtedness from the 2002 Airport Safety and Protection (ASAP) Program. Forecasts of state revenue to the SAF are beginning to see some positive signs, mainly due to increases in general aviation activity.

Local budget concerns have caused local agencies to examine their level of support for their airports as well. Many have been forced to examine the level of services they can provide within their decreasing budgets. Reduced levels of local funding put more pressure on state funds to match federal aid.

Beginning in 2000, the aviation industry saw a significant decrease in aircraft operations, especially in the general aviation sector.

PUBLIC SAFETY AND RESILIENCE

Airports move people, goods, and services and are critical to Michigan's economy. This movement must occur safely at all times to ensure confidence and reliability in the system. Airports and airlines are responsible for ongoing safety and security upgrades to keep pace with changing mandates and security procedures.

Airport and aircraft operations must also continue during inclement weather and emergencies in all seasons. Many airports in Michigan support first responders such as police, fire, and medical units, and there are a number of military airfields in the state as well. All of these facilities support emergency operations and are critical to the response to natural and man-made disasters.

Recent state activities related to the regulation of per- and polyfluoroalkyl substances (PFAS) compounds have introduced a unique challenge to federally certified and

state licensed commercial service airports required to utilize aqueous film forming foam (AFFF) containing PFAS for fire fighting purposes. Federal requirements have maintained the safety of air travel by continuing to require AFFF containing PFAS, while state and local investments have eliminated discharge of the compound to only emergency situations. The FAA and Department of Defense (DOD) continue to research solutions to address the PFAS compound requirement in AFFF.

In August 2020, Michigan promulgated rules establishing maximum contaminant levels (MCLs) for seven PFAS compounds. These MCLs are the first established to be more aggressive than federal standards and position airports, who are bound by federal regulations, between federal requirements and state regulations. While air travel safety remains intact, the financial resiliency of Michigan airports and the communities that own and operate these airports may be challenged by unfunded cleanup criteria associated with historical impacts.

INNOVATION

Aviation-focused schools, academies, colleges, and university programs are available across the state to ensure that the next generation of high-tech and highly skilled aviation experts are available to compete for jobs in the aviation sector throughout Michigan. These include programs in pilot training, aircraft maintenance, aviation business administration, aeronautical engineering, flight science, and airspace engineering.

Michigan has a rich history of innovation, with the world's first paved airport in 1928 at Ford Airport in Dearborn (now home to Ford Proving Grounds), and the first mass-produced all-metal airliner, the Ford Tri-Motor, first produced in 1925. The same history and spirit of innovation should guide Michigan to consider new funding methods to address the state's aviation system needs.

Despite current funding challenges, Michigan maintains a complete and well-planned aviation system. This came about because of a continuing commitment by the state to maintain an active role in aviation planning and development. This commitment is evidenced by the state's decision to become a "block grant" state, which enables state, not federal, control of airport planning, programming, and development.

In support of continued innovation, the Michigan Aeronautics Commission's Unmanned Aircraft Systems (UAS) Task Force has engaged in opportunities for unmanned aircraft vehicles and associated infrastructure around the state. In related efforts, the Michigan Economic Development Corporation has established Michigan's Office of Future Mobility and Electrification, whose efforts include those related to air mobility. Both state and private investments in the air mobility space have the potential to uniquely situate Michigan to take advantage of research and development and manufacturing resources which have been vital to the historical success of the automobile industry around the state.

Michigan is also well-positioned to participate in evolving space transportation innovation. The state legislature has provided innovative opportunities to Michigan communities by appropriating $2 million to assess the feasibility of developing one or more low-orbit launch sites in the state. Coupling state investment in this sector, companies in Michigan continue to invest and innovate in the space transportation arena.

Aviation

RECOMMENDATIONS TO RAISE THE GRADE

- Add $0.03 tax per gallon of aviation fuel sold to the current $0.03 per gallon to help mitigate the state funding shortfall.
- Eliminate the $0.015 credit on the $0.03 per gallon aviation fuel tax that benefits passenger airlines to significantly increase available funding.
- Increase the state sales tax on aviation parts and supplies by $.01 to help to boost the aeronautic state fund.
- Remove the federally-imposed cap on PFC to allow airports a tool to invest in their own facilities.
- Explore innovative third-party funding such as privatization, public-private partnerships, and other innovative funding mechanisms to help increase the amount of funding available for the state's vital aviation needs.
- Restore and increase funding to the state funded Air Service Development program to attract airlines to Michigan markets.

Aviation

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SOURCES

Michigan Aviation System Plan, 2017: https://www.michigan.gov/mdot/-/media/Project/Websites/MDOT/Travel/Mobility/Aero/Planning-and-Development/MASP/Michigan-Aviation-System-Plan.pdf?rev=5734db635ef54e709b029f844d6866a4&hash=5B67F4C70C25B192B7790570F62D48BA

FAA, 2019: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/previous_years

MDOT Aeronautics Fast Facts, 2017: http://www.michigan.gov/documents/mdot/MDOT_fastfacts02-2011_345554_7.pdf

MDOT Aviation White Paper: http://www.michigan.gov/documents/mdot/Aviation_White_Paper_Final_1_11_16_521132_7.pdf

Policy Plan for Michigan Air Service: https://www.michigan.gov/mdot/-/media/Project/Websites/MDOT/Travel/Mobility/Aero/Michigan-Airports/Air-Service-Program-Guidelines.pdf?rev=cd7ab040514a4ecd883169e1161b0faa&hash=EFF749EA30A632C0FD459B45F6F967D7

MDOT Aeronautics Pavement Management System Update, 2020: https://mdotnetpublic.state.mi.us/apms/

MDOT Long-Range Transportation Plan 2005-2030 Aviation Technical Report

How Aviation Works in Michigan: http://www.michigan.gov/documents/aero/Aviation_in_Michigan_Summary_-_Final_529233_7.pdf

MDOT Aeronautics 2019 Annual Report: https://www.michigan.gov/-/media/Project/Websites/aero/MAC/2019/MAC_Annual_Report_FY2019_FINAL.pdf?rev=5467f07d79e54ee79e3103856a49e162

MDOT Aeronautics Fund Cash Balance: http://www.michigan.gov/documents/aero/MDOT_SAF_Cash_Balance_Updated_White_Paper_Dec.16_550360_7.pdf

Michigan Air Service Program Guidelines, 2016: https://www.michigan.gov/-/media/Project/Websites/aero/Air-Service/Air_Service_Program_Guidelines.pdf?rev=a617eb5126f14cab8b2accefa6e3becd

MEDC, "The Economic Impact of Travel in Michigan" (2016): https://medc.app.box.com/s/0y4ihokfc9mwit5wlfv84lfckhqysdz1

Federal Aviation Administration, National Plan of Integrated Airport Systems: https://www.faa.gov/airports/planning_capacity/npias/current

ARPA Airport Rescue Funds: https://www.faa.gov/airports/airport_rescue_grants#:~:text=Airport%20Rescue%20Grants%20%E2%80%93%20Airports,-Share&text=1319%2C%20Public%20Law%20117%2D2,(COVID%2D19)%20pandemic

Information on the Bipartisan Infrastructure Law: https://www.faa.gov/bil

MPART: https://www.michigan.gov/pfasresponse/drinking-water/mcl

Bridges

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EXECUTIVE SUMMARY

Michigan had 11,314 bridges in 2022, providing crossings over waterways, roads, railroads, and severe topography. Approximately 1,269 (11%) of those bridges are in poor condition, stable from 11% in 2018, but higher than the 7.5% national average. They include heavily traveled structures like I-696's overpass and ramps with I-75. Good condition bridges dropped to 35% of the total in 2022 from 40% in 2018, increasing fair condition bridges to 54% from 50%. An additional $380 million to $510 million is needed annually to repair Michigan's bridges, with long-term savings for higher near-term funding. One-time investments from Lansing have prevented even worse bridge degradation the last few years, and the federal Bipartisan Infrastructure Law has already sent some of the $563 million expected for Michigan bridge work through 2026. Michigan's gas tax, indexed for inflation from January 2022, will further fund improvements, but the bridge backlog remains larger than Michigan's last report card.

CONDITIONS & CAPACITY

Michigan has 11,314 bridges, owned, and maintained by the state, county road commissions, and municipalities. This inventory has grown steadily since the 2018 Michigan report card, when the state had 11,227 spans. However, total deck area on bridges in the state has stayed flat at approximately 6 million square meters.

Safe and well-maintained bridges provide residents access to work, home, vacation areas, medical facilities, and schools; they allow businesses access to suppliers and markets. It is increasingly challenging to maintain and improve bridge conditions due to the struggle of implementing a statewide-unified long-term asset management plan resulting from inadequate funding.

Bridge Condition in Michigan - Counts

Year	Good	%Good	Fair	%Fair	Poor	%Poor	Load_Posted	%Load_Posted	Total
2022	3,848	34.0%	5,583	49.3%	628	5.6%	1,106	9.8%	11,314
2021	3,991	35.4%	5,452	48.3%	624	5.5%	1,088	9.6%	11,284
2020	4,089	36.3%	5,380	47.7%	589	5.2%	1,077	9.6%	11,271
2019	4,193	41.8%	5,252	52.4%	575	5.7%	1,077	10.7%	10,020
2018	4,364	43.5%	5,071	50.6%	585	5.8%	1,082	10.8%	10,022

Bridge Condition in Michigan - Deck Area (Square Meters)

Year	Good	%Good	Fair	%Fair	Poor	%Poor	Load_Posted	%Load_Posted	Total
2022	1,730,263	28.9%	3,924,703	65.6%	325,938	5.4%	398,189	6.7%	5,980,905
2021	1,862,010	31.0%	3,807,157	63.4%	338,693	5.6%	384,384	6.4%	6,007,860
2020	1,941,308	32.0%	3,821,269	62.9%	313,114	5.2%	291,267	4.8%	6,075,691
2019	2,135,752	35.2%	3,609,324	59.5%	316,782	5.2%	284,687	4.7%	6,061,857
2018	2,256,521	37.2%	3,364,850	55.4%	448,185	7.4%	273,281	4.5%	6,069,682

In 2022, 34% of Michigan bridges were in good condition – a drop from 43.5% in 2018. Deck areas in good condition dropped from 37.2% in 2018 to 28.9% in 2022. While fair condition bridges have stayed table on count terms, 65.6% of bridge deck area is now in fair condition, compared to 55.4% in 2018. Poor condition bridges have held between 5% and 6% in the last four years, however they are disproportionate by ownership. 6% of MDOT-owned bridges and 14 percent of locally owned bridges were in poor condition in 2021.

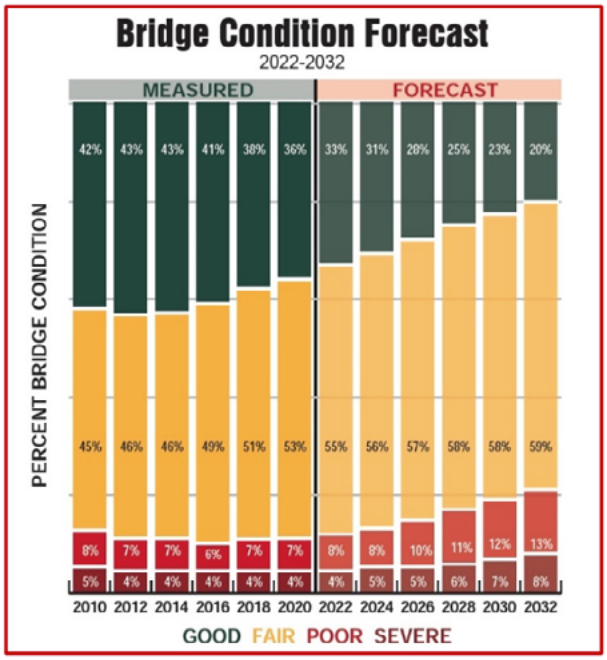
When bridges become degraded limits on vehicle weight and size will be posted, forbidding crossing, thereby impeding the flow of goods and commerce and potentially impacting emergency services. 6.7% of deck area in Michigan had a load posting 2022, compared to 4.5% in 2018.

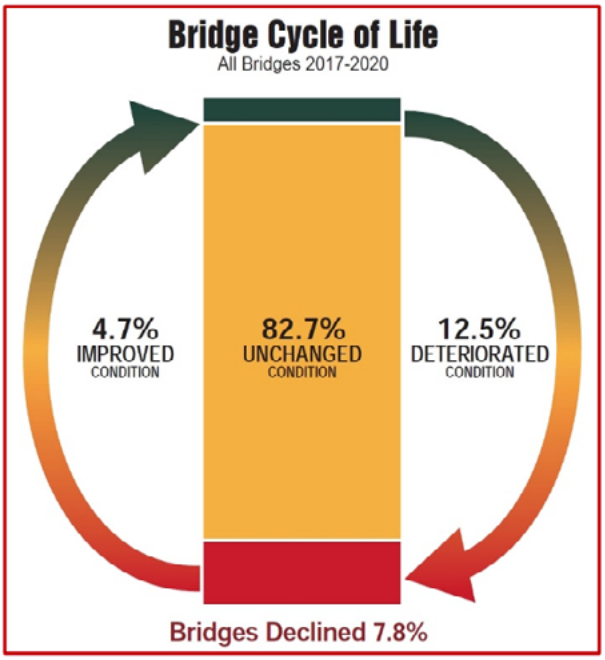
An influx of bridge maintenance work is necessary to reverse the curve in the decline of bridge condition ratings. Michigan residents and business owners are experiencing more travel and emergency response delays with the increase in closed rural bridges. Accelerated bridge construction techniques, such as prefabricated bridge components (i.e., bridge footings, deck slabs, walls, and columns) have helped reduce travel delays during construction of smaller new bridges in the last few years.

The good/fair/poor rating was adopted by the Federal Highway Administration (FHWA) as an update to previous categories of structurally deficient, though bridge status is still tracked on those terms. 11%, or 1,269 of Michigan's bridges are structurally deficient, higher than the national average of 7.5%. That's 8% of the deck area as structurally deficient, or 11th most among the 50 states and Washington, D.C.

Structurally deficient bridges include facilities frequently traveled by Michigan road users, such as I-696's overpass of I-75 and the four ramps built in 1971 which supports over 200,000 daily car trips. I-75's bridge over Fort Street in Wayne County carries 110,000 daily trips and is structurally deficient today after construction in 1967. Two I-94 bridges in Kalamazoo, over Portage Road and the Norfolk Southern rail alignment, carry almost 70,000 daily trips after their constructions in 1956 and 1954 respectively. A trio of I-475 bridges in Genesee County carry more than 63,000 trips each day following 1976 construction. Structurally deficient bridges on surface roads carry multitudes of Michiganders as well, like US-23 over M-36 in Livingston County (Whitmore Lake) – built in 1960 and carries 62,000 daily trips.

Figures below from Michigan's Transportation Asset Management Council show the churn of bridge condition reflects that groups forecast from 2022 forward. Without implementation of a long-term plan and sustained levels of high funding, Michigan's bridges will continue to deteriorate and fail to meet demand. Action beyond Michigan's recent one-time investments and the 2021 Bipartisan Infrastructure Law is required to address long-term funding needs.





FUNDING AND FUTURE NEED

Bridge maintenance and reconstruction is funded through a mix of federal, state, and local dollars. The mix depends on each structure, but local and state matches are required in many cases for projects where the federal government picks up most of the tab. This chapter considers federal-eligible bridges, which include divided highways, non-highway interstate, and major surface arterial roads carrying the most daily vehicle trips.

At the federal level, motor fuel and other truck-related taxes that support the Highway Trust Fund (the major source of federal surface transportation funding) are eroding. Federal motor fuel tax rates have not increased since 1993. Tax revenues per vehicle miles traveled (VMT) are decreasing after counting inflation, while expenditures are increasing after including inflation. In 1994, a passenger car averaged 20.7 miles per gallon (MPG) and drivers paid 3.2 cents in state and federal tax per VMT. In 2018, a passenger car averaged 24.4 MPG and drivers only paid 2.1 cents per VMT. Because of inflation, the purchasing power of the 18.4 cent-per-gallon tax on gasoline has significantly eroded over the past 29 years and is "worth" only about 9 cents today. This trend will likely continue as demand for gasoline decreases with the introduction and adoption of more fuel-efficient and alternative fuel vehicles.

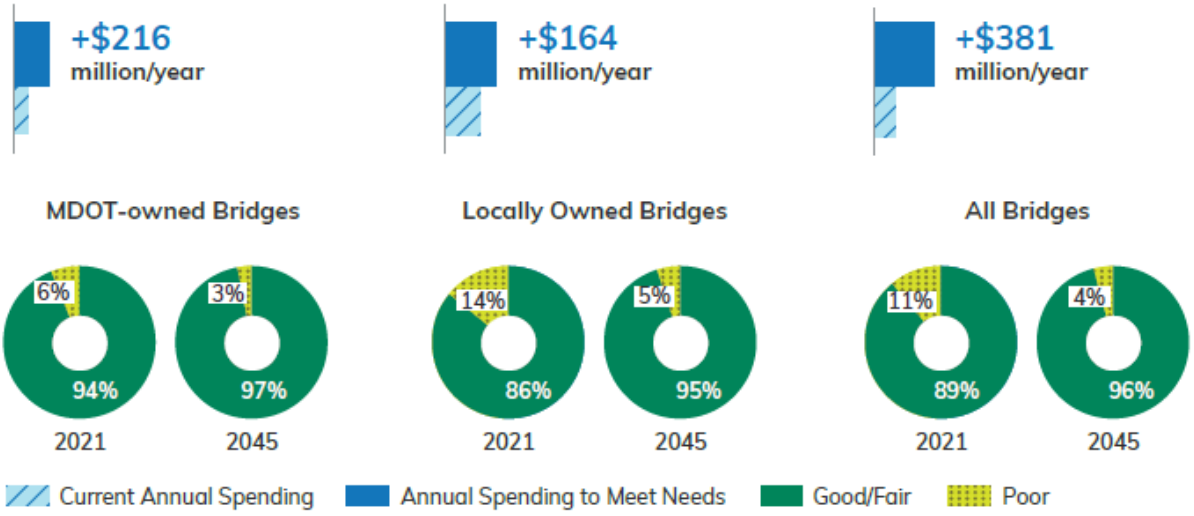
Current mechanisms for state funding utilize vehicle registration fees and motor fuel taxes for the bulk of the state's transportation revenue. However, revenue from motor fuel taxes will decline over time as fuel efficiency increases and hybrid and electric vehicles become a larger percentage of the vehicle fleet. Beginning January 1, 2022, the state fuel tax was annually indexed to the rate of inflation – or 5%, whichever was lower – to help compensate for declines in fuel tax revenues. That rate climbed to 28.4 cents in 2023 from 27.2 last year, ranking 6th highest among the states and District of Columbia.

In 2015, then-Governor Rick Snyder signed into law an infrastructure funding package that relied on a combination of increased fuel tax, registration fees, and income tax redirection to the Michigan Transportation Fund (MTF). The 2015 package, along with regular economic growth, provided roads, bridges, and transit a total of $7.7 billion in additional funding through 2023. More recently, Governor Whitmer's 2020 Rebuilding Michigan plan included $3.5 billion of one-time bond financing, accelerating major highway projects and state trunklines. These investments held Michigan bridges from worse degradation and enabled the construction of hundreds more.

The Infrastructure Investment and Jobs Act (IIJA) of 2021, also called the Bipartisan Infrastructure Law provided a significant investment in Michigan's transportation system, starting in 2022. The IIJA will provide $563 million to Michigan from FY 2022-2026 for bridge replacements, rehabilitations, and preservation programs in Michigan. These formula funds will allow state and local governments to move forward with numerous bridge projects. Even with successful applications to IIJA's additional, competitive grant programs these funds will not be enough to address the decline in bridge condition shown above nor make significant ground on the backlog of bridge work.

Michigan's Mobility2045 long-range transportation plan, published 2021, placed annual bridge spending at $157 million for state-owned structures and $75 million for those locally owned. Raising Michigan bridges to its own performance would cost $216 million more per year for state bridges and $164 million for the local counterparts. That $381 million total annual need sums to $9.5 billion over Michigan's 25-year transportation planning window.

MICHIGAN BRIDGE PRESERVATION, ANNUAL NEEDS (VIA MOBILITY2045)

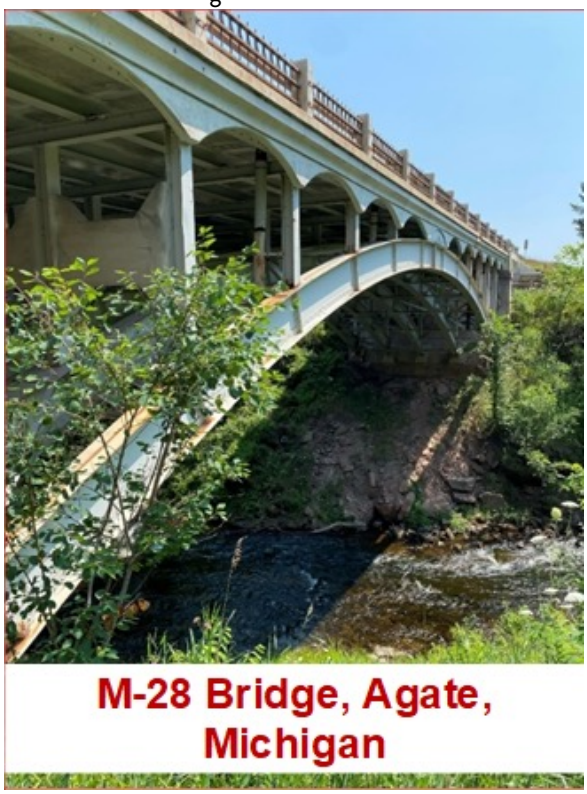


Transportation research non-profit TRIP estimates that the current cost to repair all structurally deficient bridges in Michigan by 2031 is $5.1 billion, or $130 million greater than the annual average the state estimates to reach a similar condition mark by 2045. If only current formula funding were available, that group predicts, 18% Michigan's bridges will be rated structurally deficient by 2031 and their repair cost will balloon to more than $8 billion. Because of inflation, and increasingly severe environmental harms, proactive action will prove more affordable in the long-term.

OPERATIONS AND MAINTENANCE

Today's bridge owners demand solutions that maximize the preservation of the structural and operational characteristics of their bridges to closely match the originally constructed or subsequently modified conditions. Most of the Michigan bridges owners find that the needs for bridge operations and maintenance outweigh the funding available. However, bridge owners and designers are trying combat funding issues by providing innovative and sustainable O&M solutions to existing and the newest bridges in their inventory.

The improved planning and design of these bridges include durable solutions, such as: minimal-impact, non-destructive evaluation methods that are being used more widely; while new technologies such as infrared thermography, ground-penetrating radar, and remotely operated surveillance devices like flying and submersible drones that are being deployed to



M-28 Bridge, Agate, Michigan

assess bridge conditions and to facilitate safer, more efficient engineering decisions. Additionally, engineers are designing "living bridges" where sensors are being embedded into new and existing structures to provide continuous feedback on structural conditions. Likewise, asset management systems can provide precise and current performance information that is vital to cost optimal operation maximizing available funds.

INNOVATION

Michigan bridge engineers are now using materials such as ultra-high-performance concrete, corrosion-resistant reinforcement, high-performance steel, composites, and improved coatings to increase resilience and add durability, higher strengths, and add longer life to bridges. In fact, here in Michigan, our State has been leading the nation in developing design procedures, design tools, various unique special provisions, and construction/fabrication oversight measures with the use of Carbon Fiber Reinforced Polymer (CFRP) materials in bridge projects over the past 12 years. The goal for the use of innovative materials, such as CFRP, is to provide bridge design solutions in Michigan that will extend the bridge service life to more than 100 years, require far less maintenance, and lead to significant cost savings.

Ashmun Street Bridge, Sault Ste. Marie, Michigan

Michigan bridge engineers are now using materials such as ultra-high-performance concrete, corrosion-resistant reinforcement, high-performance steel, composites, and improved coatings to increase resilience and add durability, higher strengths, and add longer life to bridges.

PUBLIC SAFETY

Bridges play a critical role within the highway network and the overall transportation system in Michigan. The highest proportion of bridges were built during the peak interstate construction period from the late 1950s through the early 1970s, but there are many older bridges still in use. As mentioned above, it is not only important for Michigan bridge owners to have a sustainable O&M program, but it is also in the vital interest of the bridge owners to have a strong national bridge inspection program of the bridges in their inventory. Regular and thorough bridge inspections are necessary to maintain safe operations and prevent structural and functional failures. In addition, data on the condition and performance of bridges are necessary for bridge owners to make informed investment decisions as part of an asset management program.

Bridges

RECOMMENDATIONS TO RAISE THE GRADE

A deteriorating and inadequate highway transportation system costs Michigan motorists billions of dollars every year in wasted time and fuel, injuries and fatalities caused by traffic crashes, and wear and tear on their vehicles. Making needed improvements to Michigan's roads and bridges is key to providing a safer, more efficient transportation system that will decrease fatalities, decrease the amount of wasted time and money spent by motorists, and improve the state's economic livelihood. Therefore, we recommend the following to raise the bridge grade:

- Michigan's leaders must recognize the current crisis with declining bridge conditions and provide substantial and sustainable asset management programs to assist Michigan bridge owners toward a road to success.
- Increase funding from all levels of government to continue significant bridge repair, rehabilitation, and replacement.
- Prioritize rehabilitating and preserving bridges in fair condition, as these bridges can often be preserved at a fraction of the cost of replacement if the work is performed in a timely manner. This approach can reduce the number of structurally deficient bridges to below 5%, decrease the maintenance backlog, and address the large number of bridges that have passed or are approaching the end of their design life.
- Develop a balanced approach for our current aging bridge inventory that emphasizes preservation, rehabilitation, and replacement where necessary, while also setting aside funding for critical operation and maintenance. Bridge owners should consider the costs across a bridge's entire lifecycle using life-cycle cost analysis (LCCA) to make smart design decisions and prioritize maintenance and rehabilitation.
- Develop multi-variable prioritization formulas and prioritize investments on bridges that are most critical, such as those that experience the highest daily traffic volume and are located on critical freight corridors or evacuation routes. Ensure state funding mechanisms (motor fuel taxes or other) are sufficient to fund needed investment in bridges.
- Consider long-term funding solutions for transportation infrastructure and potential alternatives to motor fuel taxes, including mileage-based user fees.
- Continue to fund research into the use of innovative technologies, materials, and construction techniques.
- Michigan receives a high volume of freight traffic; there should be a mileage-based user fee installed for freight vehicles or fees for permits corresponding to truck size and weight.

Bridges

DEFINITIONS

NBI Good (G) Condition – A bridge with a condition rating of 7 or greater for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert).

NBI Fair (F) Condition – A bridge with a condition rating of 5 or 6 for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert).

NBI Poor (P) Condition – A bridge with a condition rating of 4 or less for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert).

Structurally Deficient – Bridges that require significant maintenance, rehabilitation, or replacement. These bridges must be inspected at least every year since critical load-carrying elements were found to be in poor condition due to deterioration or damage. A structurally deficient bridge has a condition rating of 4 or less for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert).

SOURCES

Federal Highway (FHWA) Bridge Inventory Data 2018-2022.

Michigan Mobility 2045 Plan, released November 2021.

"Michigan's 2020 Roads & Bridges Annual Report" by Michigan Transportation Asset Management Council, dated April 2021.

MDOT 2022-2026 Five Year Transportation Program – Approved by the State Transportation Commission on November 4, 2021.

American Road and Transportation Builders Association, Bridge Report, accessed April 28, 2023.

Where Are We Going? Michigan's Current and Future Pavement and Bridge Conditions, Safety, and Congestion and Reliability Levels and the Impact on Michigan Households, Based on Investment Levels over the Next Decade; TRIP, published May 2022.

Michigan gas tax increases by 5%, 6th highest gas tax in the U.S., WXYZ-TV, published January 2023.

Broadband

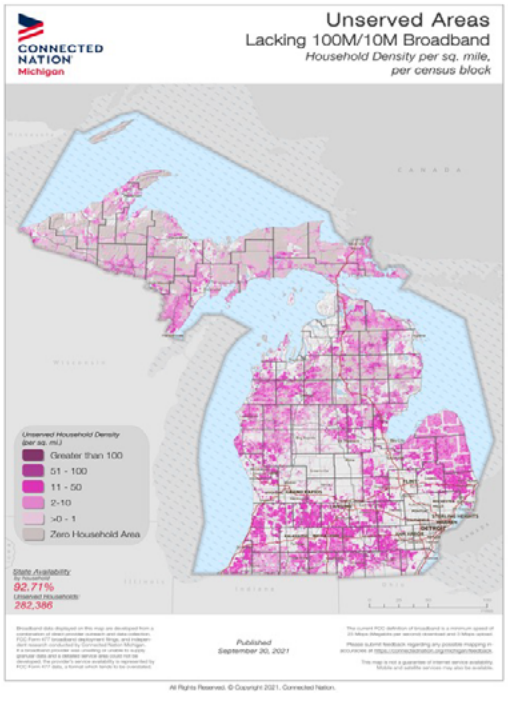
EXECUTIVE SUMMARY

The 2023 ASCE *Report Card on Michigan's Infrastructure* determined there was insufficient information to justify a broadband grade, similarly to the *2021 Report Card on America's Infrastructure*. Civil engineers design, install, and maintain the backbone infrastructure of wireline and wireless broadband. Federal funds are increasingly available to upgrade connectivity, which is essential for public safety, health, and economic opportunity. As of February 2023, over $100 million in appropriations under the 2021 Bipartisan Infrastructure Law were delivered for broadband projects in the Upper Peninsula and northern Lower Peninsula to overcome deployment challenges to rural areas and disadvantaged communities. Public data are sparse on the condition, capacity, operations, and maintenance of infrastructure delivering broadband connections. Decision-makers should pursue more comprehensive reporting requirements from telecommunications companies leveraging public dollars and facilitate creative models of deployment in low-access areas which include digital literacy, such as the Detroit Community Technology Project.

SPOTLIGHT

Broadband, a term for high-speed internet access, is a critical infrastructure with demonstrated value during the Covid pandemic where online learning by all ages, business continuity, communications, and commerce were facilitated. However, as shown in the following September, 2020 graphic, many Michigan rural areas are still not served with high-speed internet access and State's 95.8% availability and 67.5% access are at or less than national averages[1,2] of 95.6% and 70.3% respectively.

The FCC defines advanced telecommuni¬cations capability as a download speed of 25 megabits (MGB) per second or higher, and upload speeds of 3 MGB or higher. In¬ternet can be provided by satellite, digital subscriber line (DSL; telephone line), dedicated cable, microwave, or fiber optic. In-frastructure includes tower-supported an¬tennae/ repeaters (wireless), and fiber optic, telephone, or copper wire (wired) principally in underground circuiting.



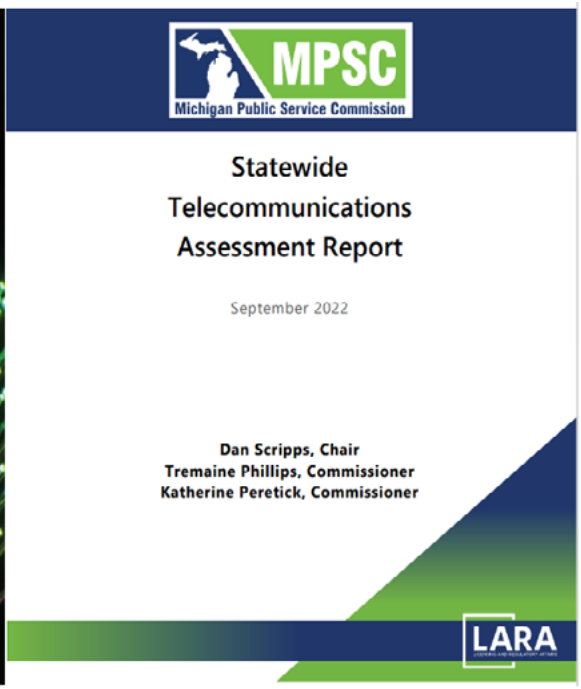
1 Federal Communications Commission (FCC), "14th Broadband Deployment Report", January 19, 2021

2 U.S. Census Bureau, "American Community Survey (ACS) 5-Year Estimates for 2016-2020", March 17, 2022.

Presently, the FCC does not consid¬er wireless connections, e.g., smartphones and tablets, in its assessment of broadband access. However, lower-income residents, younger households[3], and those occupied by racial minority groups are more likely to use wireless data connections on mobile devices as their primary connectivity method. The Pew Research Center found in 2021 that only 57% of Americans of income below $30,000 had wireline broadband at home, and only 59% a home computer, while 76% of them had smartphones – a 27% gap.[4] Only 11% of Americans between $30K and $100K rely on smartphones for internet connectivity and 6% of those earning six-figures. Modern mobile devices allow "hotspot" mode, allowing computers to piggy-back on smartphone data, but those are unreliable, expensive, and power-intensive connections.

In Michigan, the Michigan Public Service Commission (MPSC) provides partial oversight authority on traditional wireline (landline) phone service, although such often crosses over into wireless and internet protocol (IP) services. Unlike MPSC's oversight of investor-owned electric utilities, the Commission does not regulate broadband rates. A patchwork of low-income access programs is offered by private telecom companies, often a result of one-off FCC regulatory actions like merger review. The MPSC regulates certain internet services pursuant to state/federal law, but does have a role in maintaining competitive or affordable rates or requiring spending on infrastructure upkeep and resilience. The Michigan Telecommunications Act specifically excludes some services from MPSC regulation, including cellular service, broadband, and internet services although some aspects of those services are intertwined with the MPSC's regulatory responsibilities (e.g., MPSC does not have authority over satellite television services or streaming video). Thus, the Commission's focus has been on "services" rather than infrastructure condition or access as illustrated in its September, 2022 "Statewide Telecommunications Assessment Report".

Gov. Gretchen Whitmer issued Executive Directive 2021-2 to help bridge the digital divide and established the Michigan High-Speed Internet Office (MIHI), which coordinates all state, federal, philanthropic and private investments made into broadband infrastructure and its utilization. Connected Nation Michigan (Mapping & Analysis | Connect Michigan (connectednation.org)) is a part of MIHI and provides statistics and mapping on broadband access. In February, 2023, updated "Broadband Roadmap" data was issued indicating over 93% of residences now have at least 25 Mbps/3 Mbps download/upload access with unserved rural communities diminishing.



3 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8548978/

4 https://www.pewresearch.org/short-reads/2021/07/16/home-broadband-adoption-computer-ownership-vary-by-race-ethnicity-in-the-u-s/

In 2022, Michigan lawmakers agreed on a $4.8 billion infrastructure spending plan, and on January 19, 2023 a supplemental $238 million has been allocated for further expanding high-speed broadband/internet access and reducing the "digital divide." However, as indicated in a recent forum[5], there are risks that this public funding will not be wisely spent. There are limited public data to ascertain the condition, capacity, operations and maintenance, and future needs of the infrastructure partially subsidized by the public.

Understanding what infrastructure will be required for the next generation (e.g., full 5G deployment, internet of things applications) needs to be part of planning/spending so that obsolescence is avoided. Focus on resilience is also crucial, as telecommunications are exposed to both cybersecurity and physical threats. Both new infrastructure construction and resilience are part of engineering solutions. Expanding and maintaining broad¬band infrastructure typically involves right-of-way issues, "dig once" policies, and the co-location of electric infrastructure with telecommunications backbone. More public data and decision-maker scrutiny is necessary as greater investments fund hardware (receptors, transmitters, receivers, antennae) and require coordination with other infrastructure implements (towers, poles, buildings, and underground conduit.

Broadband infrastructure deployment and upkeep requires improved funding and coordination, but also necessitates more public involvement and outreach on digital literacy. Many communities, like those groups outlined above, do not understand the importance of broadband and/or require empathetic stewardship to utilize new and improved connectivity. Creative stakeholder groups and funding models can close this gap of understanding with greater capacity from public funding. For example, the Detroit Community Technology Project, a 501(c)(3) nonprofit helps deploy new broadband connections, but also focuses on the work that comes after installation. Their Equitable Internet Initiative "supports and develops historically marginalized residents to build and maintain neighborhood-governed internet infrastructure that fosters accessibility, consent, safety, and resilience."[6] According to the Project, "38% of [Detroit] homes have no Internet connection, 63% of low-income homes have no in-home broadband, and 70% of school-age children have no Internet access at home."

In addition to cyber/physical threats, other challenges to tackle include broadband frequency impacts (e.g., 5G threats to aviation/airport communications), aging/safety management of poles/towers/structures and other infrastructure, and broadband rate controls (e.g., MPSC engagement in private broadband rates). The need for public data exchange and democratically accountable oversight will only accelerate. Many other infrastructure sectors are depending on telecommunication capabilities from autonomous vehicles reading road signs, smart grid operations to reduce outages, and water pipes embedded with leak detection sensors, and many others.

5 Mackinac Center for Public Policy, "Issues and Ideas Forum – How to Effectively Expand Internet Access in Michigan", March 22, 2022.

6 https://detroitcommunitytech.org/eii

Broadband

RECOMMENDATIONS TO RAISE THE GRADE

Setting a grade for Michigan's broadband infrastructure and improving its performance requires:

- Careful planning of wireline broadband deployment and much greater public data disclosure from productive partnerships between all levels of public/government and the private sector.
- Updating rigorously verified maps required by the Broadband DATA Act and 2021 Bipartisan Infrastructure Law.
- Co-location and co-building of broadband should be planned with existing new infrastructure with private and public asset ownership. This includes managing below- and above-ground infrastructure, codification of "dig once" policies, and improvement in planning, permitting, and taxing policies and processes.
- Reconsideration of state and local regulations for broadband infrastructure to maximize the value of public investment, close digital literacy gaps from new and existing connections, and ensure affordable access to disadvantaged communities.
- Facilitation of creative broadband deployment strategies and organizations with local-community buy-in and wraparound services for connectivity gaps before and after an operational wireleline connection.
- Enactment and enforcement of codes and standards to ensure that utility poles, other struc¬tures, and affected systems such as aviation telecommunications safely support 5G and future platforms; future telecommunications improvements are inevitable and should be reliable, resilient, and take advantage of existing infrastructure.
- Planning which fosters stakeholder engagement and enables public/private partnerships to align needs and provide guidance to the MIHI.

Broadband

DEFINITIONS

ACCESS and AVAILABILITY – Access refers to the ability of a residence or business to reach a Broadband source, whereas Availability refers to physical presence in a specific geographic region.

BROADBAND – Wired or wireless data streaming technology operating at speeds of at least 25 megabits per second downstream, 3 megabits per second upstream allowing high speed internet access.

4G (MOBILE WIRELESS) – 4G data streaming at approximate speeds between 12 and 36 megabytes per second. This equates to a roughly six-minute download time for a feature-length movie.

5G (MOBILE WIRELESS) – 5G data streaming as supporting up to 300 Mbps or greater. A feature-length movie can be downloaded in as little as 15 seconds. Designed for urban areas.

FIBER OPTIC BROADBAND – Wired technology that converts data-carrying elec¬tric signals to light, which can then be transmitted through glass fibers approxi¬mately the diameter of human hair. According to the FCC, fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps.

WIRELESS BROADBAND – Data streaming (internet connection) to a home or business connects between the customer's location and the service provider's facility. Wireless broadband can be mobile or fixed.

SATELLITE BROADBAND – The FCC defines satellite broadband as another form of wireless broadband, useful for serving remote or sparsely populated areas. Speeds can be slower than DSL and cable modem, but 10 times faster than the download speeds of dial-up internet access. Extreme weather conditions and other externalities can disrupt or slow satellite service, benefitting rural applications.

Dams

C-

EXECUTIVE SUMMARY

Dams in Michigan support flood control, economic development, and recreation. Approximately 75% of the state's 2,600 dams are privately owned, with others owned by municipalities, public utilities, the state, or federal government. Six percent of dams in Michigan have "significant" hazard potential, meaning should they fail, loss of life and economic damage is likely. Of these 149 dams, four are in unsatisfactory condition and five are unrated. Michigan's dam safety program budget was increased after dam failures at Edenville and Sanford in 2020. But new resources are needed to improve the overall condition of dams across the state. The Michigan 21st Century Infrastructure Commission Report cited a need for $225 million over the next 20 years to manage aging dams.

BACKGROUND

Throughout history, Michigan has supported the intensive use of rivers for economic development, recreation, and flood control. Dams can provide many benefits, but if left unmanaged, can pose risks to public safety, local and regional economies, and the environment in the event of failure. Many owners, public and private, do not have the financial capability to repair/maintain dams, or to remove aging or abandoned dams particularly when such are non-revenue generating. Recognition of this imbalance has recently led to grants and state/federal legislative actions for repair/removal. Abandoned and poorly maintained dams may pose significant risks to downstream residents/businesses and Michigan's environment and economy.

Dams in Michigan are regulated by Part 307, Inland Lake Levels, and/or Part 315, Dam Safety, of The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The Dam Safety Program of the Michigan Department of Environment, Great Lakes and Energy (EGLE) maintains an online inventory which lists about 2,600 dams, with about two thirds being older than 50-years.

Many dams were originally constructed to support power or mill operations and some still serve this original purpose. In other cases, dams continue to form impoundments for water supply or recreational purposes, are abandoned, or are in need of repair/removal for risk reduction. Deficient dam condition poses a safety hazard to downstream residents/businesses and risk of environmental degradation and property damage under dam failure.

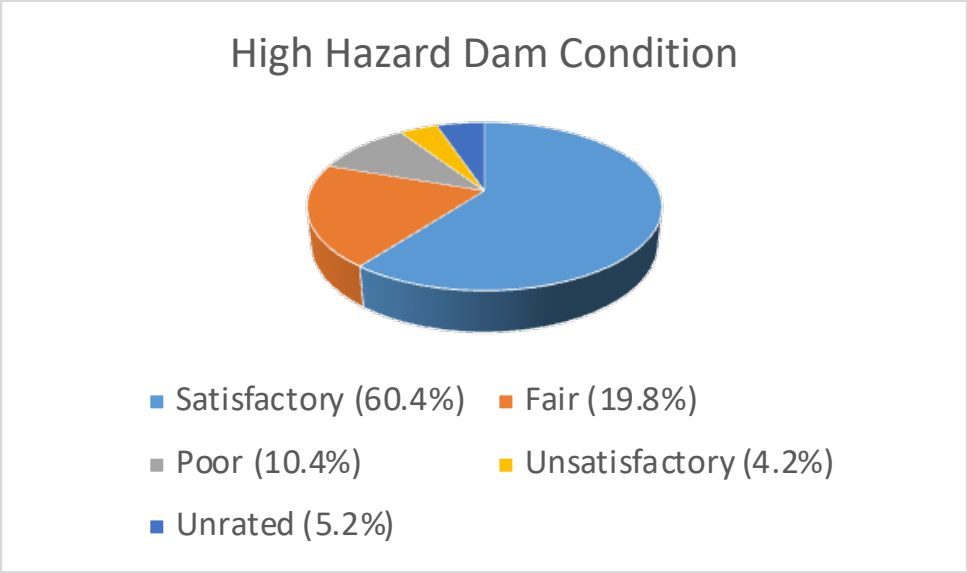
CONDITIONS & CAPACITY

The State-based EGLE Inventory and National Inventory of Dams (NID) maintained by the U.S. Army Corps of Engineers are considered representative of the state's dam infrastructure. Age is a good indicator of overall condition since all infrastructure has a finite service life, although owner oversight with frequent condition survey and maintenance are also important to service life and function. Based on the inventories, 170 of Michigan's 2,600 dams were built prior to 1900.

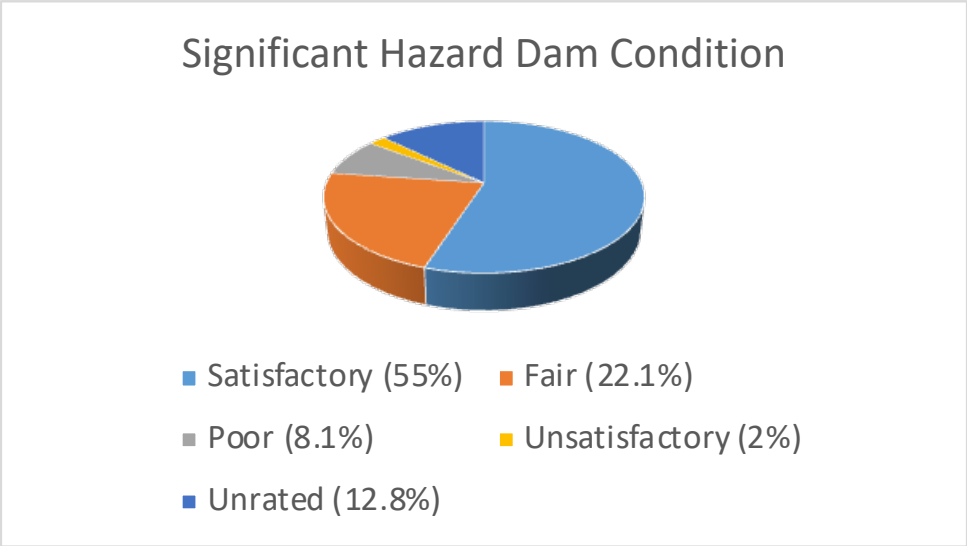
Periodic EGLE inspection of regulated dams under the Dam Safety Program at 3 to 5 year intervals requires the subjective condition assignment of "Satisfactory", "Fair", "Poor", or "Unsatisfactory" (best to worst). The inspection frequency is dependent on hazard classification. FERC-regulated dams must also be inspected with frequency being a function of dam height and reservoir volume.

Hazard potential is not an indication of the dam's condition; however, it indicates the potential risk for loss of life, property damage, and environmental damage in the area downstream of a dam in the event of failure of the dam or appurtenant works. Once inspected, owners must then fund repair or removal if deficiencies or safety hazards exist. Unfortunately, deficiencies often remain uncorrected, sometimes for decades, because their owners do not have adequate resources. The following is a condition summary categorized by hazard level:

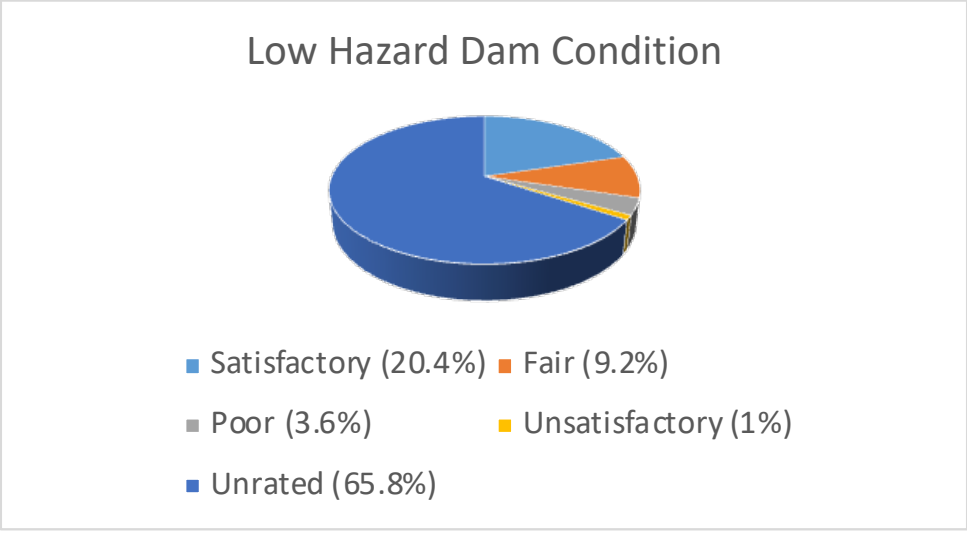
Michigan has 97 "high" hazard potential state-regulated dams (representing about 4% of Michigan's 2,600 dams). A "high" hazard dam is one located in an area where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or class I carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for loss of life. According to condition assessment data contained in the EGLE Dam Inventory there are 58-"satisfactory", 19-"fair", 10-"poor", 4-"unsatisfactory", and 5-"unrated" dams.



Michigan has 149 "significant" hazard potential state-regulated dams (representing about 6% of Michigan's 2,600 dams). A "significant" hazard dam is located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, where environmental degradation may be significant, or where danger to individuals exists. According to condition assessment data contained in the EGLE Dam Inventory there are 82-"satisfactory", 33-"fair", 12-"poor", 3-"unsatisfactory", and 19-"unrated" dams.

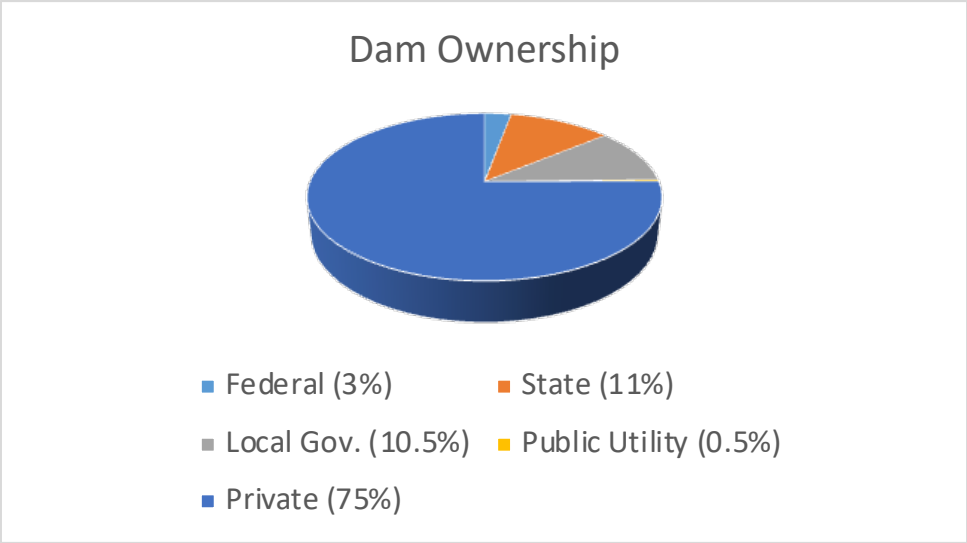


Michigan has 2,295 "low" hazard potential dams or Part 307 lake level control structures (representing about 90% of Michigan's 2,600 dams). A "low" hazard dam is located in an area where failure may cause damage limited to agriculture, uninhabited buildings, structures, or township or county roads, where environmental degradation would be minimal, and where danger to individuals is slight or nonexistent. According to condition assessment data contained in the EGLE Dam Inventory there are 466-"satisfactory", 211-"fair", 83-"poor", 23-"unsatisfactory", and 1,503-"unrated" dams/lake level control structures.



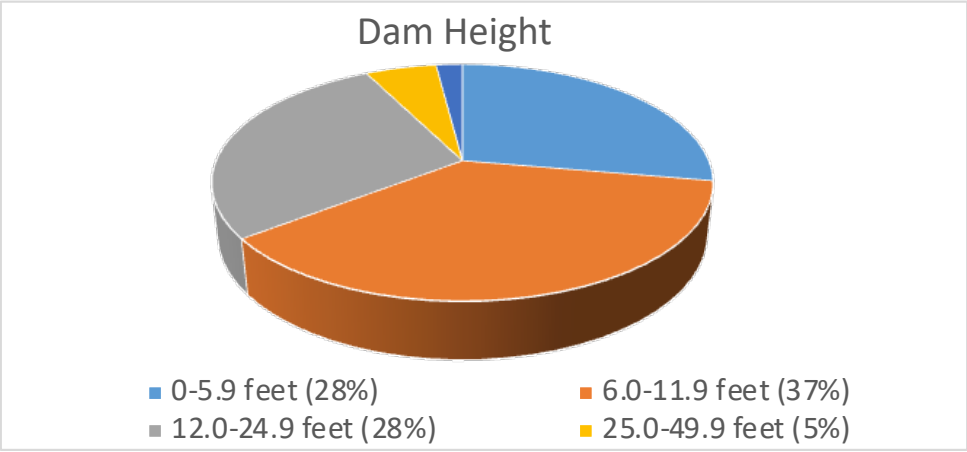
A majority of the structures listed as "low" hazard with unrated condition are lake level control structures or structures that do not meet the criteria of Part 315 to be regulated as a dam in Michigan. Although, these structures are not regulated as dams, due to their impoundment area and structural height, many of them impound lakes that support development and recreation. These dams are aging as well, and their failure would have severe economic impacts to both the local community but the State of Michigan.

The majority of Michigan dams (about 75%) are privately owned. The remainder are owned by local municipalities, state and federal government, and public utility companies.



Additional statistics on Michigan's 2,600+ dams:

- Only 52 new dams were built in the last 25 years (due to diminished needs/benefits)
- There are 245 dams with a "high" or "significant" hazard potential rating
- The tallest dam in Michigan has a height of approximately 170 feet
- 28 percent of dams are 6 feet in height or less
- 92 dams are under FERC jurisdiction because they are equipped with hydropower equipment but only yield about 1.2% of State's electricity because of flat topography
- Since the early 20th century, more than 300 dam failures have been documented.



Current rules/guidelines associated with Part 315 were reviewed by the Dam Safety Task Force (DSTF), formed after the 2020 failure of Edenville/Sanford Dams, and recommended changes were published in 2021. It is anticipated that the frequency of future inspections, monitoring/surveillance scope, capacity, and permitting requirements will all be strengthened to reduce risks. However, the combined rate of dam removals/repairs (about 25 total per year) is not keeping pace with aging nor are dams in an elevated hazard state being quickly addressed.

Awareness of these concerns has prompted EGLE and the Department of Natural Resources (DNR) to revisit benefits versus potential for removal and private owners such as Consumers Energy to complete public meetings regarding the future of its aging hydroelectric dams.

There have been programmatic improvements since the 2018 ASCE Michigan Report Card, but little improvement in the overall condition of dams. Slow but steady rate of removal of dams since the 2018 Report Card has eliminated some high hazard dams and restored biodiversity benefits from water flow. The general condition of Michigan's dams in the EGLE Dam Inventory, remain relatively the same, warranting the same grade as the the 2018 grade of "C-".

Slow but steady rate of removal of dams since the 2018 Report Card has eliminated some high hazard dams and restored biodiversity benefits from water flow.

FUNDING & FUTURE NEED

The choice to either repair or remove a dam is often difficult as there are safety (flood risk), social-cultural (recreational), biological, ecological, and economic factors involved. Dam removal costs are highly variable and dependent on factors such as sediment contaminants and volumes, surrounding infrastructure, wetland-related issues, and more(1). Similarly, the cost to make repairs, to often massive earthen and concrete structures, can similarly be high. Furthermore, the proposed regulatory updates proposed in the DSTF report, will ultimately increase the cost of owning and maintaining a dam.

Lack of funding for addressing Michigan's aging dams in recent decades has led to significant need. Previously, the Michigan 21st Century Infrastructure Commission Report cited a need for $225 million in state funding over the next 20 years to manage aging dams. This funding amount included an initial $10 million to perform field assessments, upgrade the dam database, and procure decision-support tools and training to evaluate repair/removal options. The remaining $215 million was estimated to maintain or in some cases remove dams with elevated risks flagged by the inventory and decision-support tools. The rate at which Michigan's aging dam infrastructure is degrading clearly generated financial demands that far exceed the available funding to repair or remove them.

Funding mechanisms, such as the Michigan Department of Natural Resources Fisheries Habitat Grant, recently announced EGLE Dam Risk Reduction Grant Program, and non-profit grants from the National Fish and Wildlife Foundation are certainly needed and the State's expansion of the Dam Safety unit is expected to reduce risks. However, this funding falls far short of current needs with the first round of applications limited to only only those dams posing high risk to public safety and the environment and the funding requests far out-pacing the available dollars. The anticipated updates to Michigan's dam safety regulations will spur much needed improvements, the in-depth inspections required will certainly identify that exponentially more investments must be made to this critical infrastructure system.

PUBLIC SAFETY & RESILIENCE

To improve public safety and resilience, the risk and consequences of dam failures must be lowered. Since the early 20th century, more than 300 dam failures have been documented in Michigan. The 2020 Edenville/Sanford dam failures near Midland resulted in hundreds of millions of dollars in damage. Concern about dam safety and environmental quality has become more prevalent over the last decade as more aging dams require high-cost repair. One positive for public safety is that approximately 97% of high/significant hazard potential dams have an Emergency Action Plan (EAP), which outlines steps to be taken in the event of impending dam failure. Implementation of measures in an EAP can help reduce the severity of damage and risk of loss of life; the Edenville/Sanford EAP aided in avoiding fatalities and serious injuries.

By their nature, dams have a low level of resilience since dams cannot "recover" once significant degradation or movement is experienced. Multiple layers of redundancy are typically not provided in dam design and construction should a component fail. Therefore, when there is a dam failure, the consequences in terms of downstream damage can be relatively severe. This highlights the importance of proactive maintenance and monitoring of Michigan's dam infrastructure. Innovations in remote sensing technology, such as cameras, inclinometers, or piezometers that provide data through a web connection, can be utilized to allow for relatively rapid data collection in real time for larger more remote dams.

Dams

C-

RECOMMENDATIONS TO RAISE THE GRADE

Some recommendations to improve the outlook for Michigan's dams include:

According to the 2020 Association of State Dam Safety Officials (ASDSO) review of EGLE's Dam Safety Program, such is understaffed and constrained by limited time, resources and budget; Michigan's investments in dam safety have been lacking for decades, which has increased risk to public safety and environment; and owners of high hazard dams should perform detailed evaluations to uncover latent safety defects commonly found in aging structures. The FERC sponsored final report from the Edenville/Sanford dam failure yielded similar findings and lessons to be learned.

The 2021 Dam Safety Task Force final report included 86 recommendations addressing funding, legislation and authority, improving safety, compliance/enforcement, emergency response, Program management, and outreach and awareness. Specific recommendations are as follows:

- Developing a revolving loan program, creating a dedicated dam emergency fund and directing penalties and/or fines back to the emergency fund.
- Legislative and authority recommendations include requiring dams to meet FEAM MDSP recommendations for design floods, provide ability for emergency drawdowns, and requirements for FERC regulated dams to report inventory to the state.
- Safety improvement recommendations include requiring finite term licenses for dams, requiring owners to provide proof of financial responsibility or security, and requiring owners to maintain insurance.
- Compliance and enforcement recommendations include developing a priority list utilizing a risk-based approach and utilizing water-level lowering orders as a compliance tool.
- Emergency Response recommendations include developing a statewide dam EAP, annual review of EAPs and developing a standardized EAP format.
- EGLE needs to assign resources to translate ASDSO and Task Force recommendations into improved Program tools/processes and to provide status updates on its Program website.

Stakeholders, including State and federal regulators, owners and general public, should collaborate to assess aging dam function and need, creating an asset management process for long-term decision-making on repairs, replacement, or removal. This process should address changing demands (e.g., increasing probable maximum flood and controls), land use planning, consequences of failure, and adequacy of investment sources versus need looking forward.

Ensure that all significant/high hazard dams and those with elevated risk of failure have up-to-date emergency action plans (EAPs) and that EAP content has been broadly communicated by owners to affected communities, general public, and first responders.

In addition to any federal funding received, Michigan should increase Dam Safety funding to provide owners with loans and matching grants for repair, replacement, or removal of dams on a risk-prioritized basis.

Dams

SOURCES

American Rivers website: https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/dam-removal-map/

EGLE Dam Safety Unit Dam Inventory (Michigan Dam Inventory | Michigan Dam Inventory | EGLE Maps & Data (arcgis.com)).

2018 ASCE Michigan Infrastructure Report Card.

FERC, Independent Forensic Team (IFT), "Final Report, Investigation of Failures of Edenville and Sanford Dams", May, 2022.

EGLE, Dam Safety Task Force, "Michigan Dam Safety Task Force Report", February 12, 2021.

EGLE, "Dam Risk Reduction Grant Program", November 7, 2022 (https://www.michigan.gov/egle/about/organization/water-resources/dam-safety/program-overview).

Drinking Water

D+

EXECUTIVE SUMMARY

Most of the infrastructure within the State of Michigan's community water supply systems (CWS) are over 50 years old and a significant portion is approaching 100 years of service life. The state has a $860 million to $1.1 billion annual gap in water infrastructure needs compiled from decades of deferred maintenance and lack of knowledge on asset conditions. The Flint water crisis placed a national spotlight on the impacts of deteriorating infrastructure, fragmented decision-making, and severe underinvestment in water infrastructure. Flint is not alone. Many other Michigan CWS need critical infrastructure improvements. Drinking water upgrades have jump-started thanks to regulatory advancements on lead and copper, requirements for asset management planning, and recent influxes of funding for projects including replacement of over 27,000 lead service lines. Long-term, sustainable funding sources are needed to drive continued success

CAPACITY & CONDITION

Approximately 74% of Michigan's population (±10.05 million) obtains their drinking water from the State's 1,381 Community Water Supply systems (CWS) with the balance supplied by Non-Community Water Supply (NCWS) systems or private wells - see Table 1. Of the 1,381 CWSs, 644 are privately-owned and 713 supply a population of less than 500 people.

TABLE 1: MICHIGAN DRINKING WATER SOURCES AND REGULATORY OVERSIGHT

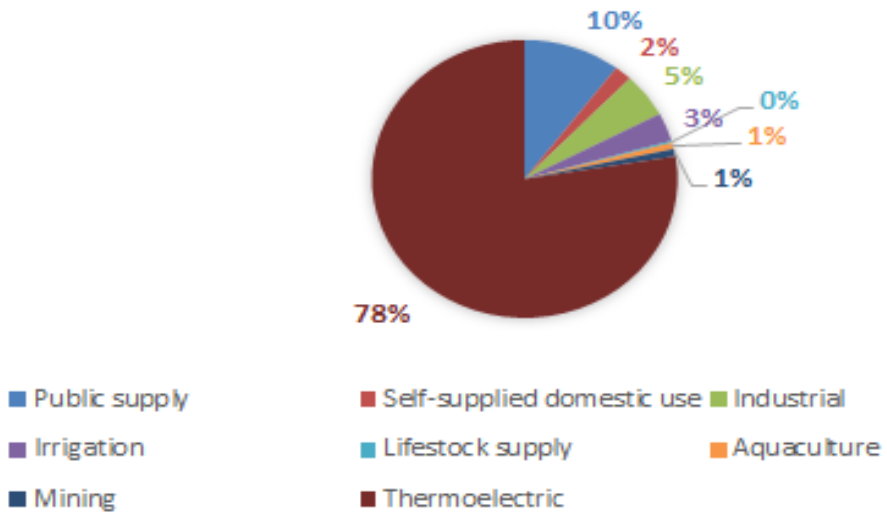
Water Source, System Supply (Owner)	Count	Approx. Population Served	Regulatory Oversight Notes (Note 5)
Aquifer Well (Private/Agricultural Owners)	~ 1.12 million wells	2.3 million	EGLE oversight, Local Health Dept. permitting; minimal water treatment
CWS – Aquifer Source (Note 1 & 2)	1,075 systems	1.82 million	EGLE oversight, review/approval of plans and significant water treatment
CWS – Surface Source (Note 1 & 2)	306 systems	5.63 million	EGLE oversight, review/approval of plans and significant water treatment
Non-transient NCWS (Note 3)	1,305 systems	310,000	Primarily private owners serving a population > 25; EGLE permit control w/ Local Heath Dept. oversight
Transient NCWS (Note 4)	7,796 systems	Over 1 million (per day)	

Notes:

- CWS - year-round residential customers (e.g. municipalities, manufactured housing communities, rural water districts, subdivisions, etc.)
- Municipalities and water authorities own approximately 50% of CWSs with balance owned by the State (e.g., prisons) or private entities (e.g., housing communities, apartment complexes, and universities). Only 65 CWSs equipped with water treatment; over 232 CWSs purchase treated water from other treatment-equipped CWSs.
- NTNCWS – same non-residential customers six months out of the year (e.g. schools, day care facilities, office buildings, manufacturing facilities, etc.)
- TNCWS – different non-residential customers every day (e.g. motels, parks, airports, campgrounds, rest areas, etc.)

The U.S. Geological Survey (USGS)1 reported that system owners in Michigan withdrew nominally 10,053 million gallons of water per day (MGD) split between groundwater (767 MGD) and surface water (9,286 MGD). Approximately 79% of the surface water came from the Great Lakes. Much of the water used by thermoelectric power is for "once through" cooling and after minimal treatment is returned to surface water as "wastewater" versus being consumed. Between 2010 and 2015, public-supply withdrawals in Michigan increased by ~1.2%, while total domestic water use decreased by ~12% (USGS, 2017). The latter includes self-supplied domestic water withdrawals.

FIGURE 1: TYPICAL DAILY WATER USE – MICHIGAN



Regional shifts in Michigan's population rather than population growth have created new pressures on CWSs especially in some urban centers. While state-wide growth remains minimal, at about 2% from 2010 to 2020, significant (6% - 12%) growth has occurred in the Western Michigan counties of Ottawa, Kent, and Allegan, in the Southeast Michigan counties of Washtenaw, Livingston, and Oakland, and in Grand Traverse County.

Additionally, domestic water use has been declining due to prevalence of efficient plumbing fixtures, asset management planning (AMP), advanced metering infrastructure (AMI), escalating water rates, and general public awareness of water conservation. Average residential domestic water use is estimated to range between 50 gallons per capita per day (gpcd) and 90 gpcd, while average non-residential domestic water use is estimated between 50% and 100% of the residential use.

Consistent with the installation history of drinking water supply systems throughout the United States, the majority of the transmission and distribution (T&D) pipelines in Michigan were installed from the late 1800's to the early 1970's. Therefore, a significant portion of the State's T&D pipelines have exceeded their useful life, with a considerable proportion approaching 100 years of service life, especially in the early-settled areas of the State (such as Southeast Michigan, Grand Rapids, Bay City/Saginaw, Flint, Kalamazoo, etc.). Average pipe replacement rates are estimated at less than 1% of total system T&D. Pipelines are difficult to assess, maintain and replace as they are underground and typically located in roadway corridors, close to other utilities and require significant social inconveniences. Reported non-revenue water loss is between 10 and 50 percent, however, most CWSs register on the lower end of that range.

Water treatment plants, pumping stations and storage reservoirs were predominantly built during similar timeframes as system T&D, however, these facilities are more likely to be maintained or replaced because they are accessible, deterioration is apparent and their failure results in more dramatic user impact.

The State of Michigan has required that all CWSs that serves more than 1,000 people submit a Water System Asset Management Program (WAMP) and update it every five (5) years to better inventory system assets, recognize and address system deficiencies and deterioration and identify funding gaps.

Estimating the number of water main breaks and boil water advisories throughout the State is challenging. Some outlets estimate that over 850 water main breaks occur in North America each day. Taking into consideration state size, age of T&D, weather and seasonal fluctuations, it is safe to assume that Michigan contributes an above average proportion of those breaks each day. Assuming a cost of $10,000 per break, the State's aging T&D is costing CWSs $200,000 to $300,000 each day which adds up to over $109.5 million annually. In August of 2022, a break on a 120-inch transmission main placed over 935,000 Metro Detroit residents in 23 communities on a precautionary boil water advisory, showing the criticality of Michigan's T&D pipelines.

OPERATION & MAINTENANCE

Communities throughout Michigan face the challenge of maintaining and updating older infrastructure that was designed and built to meet former, less strict requirements but now must meet emerging, more stringent state and federal drinking water standards. Some CWSs are well managed and well-funded while other CWSs have been underfunded and understaffed, both in management and in operations, for many decades, leading to large, costly capital improvement delays that are difficult to recover. Delaying needed capital improvements increase emergency repair costs and further erode O&M budgets needed to keep functional system components from deteriorating at faster rates.

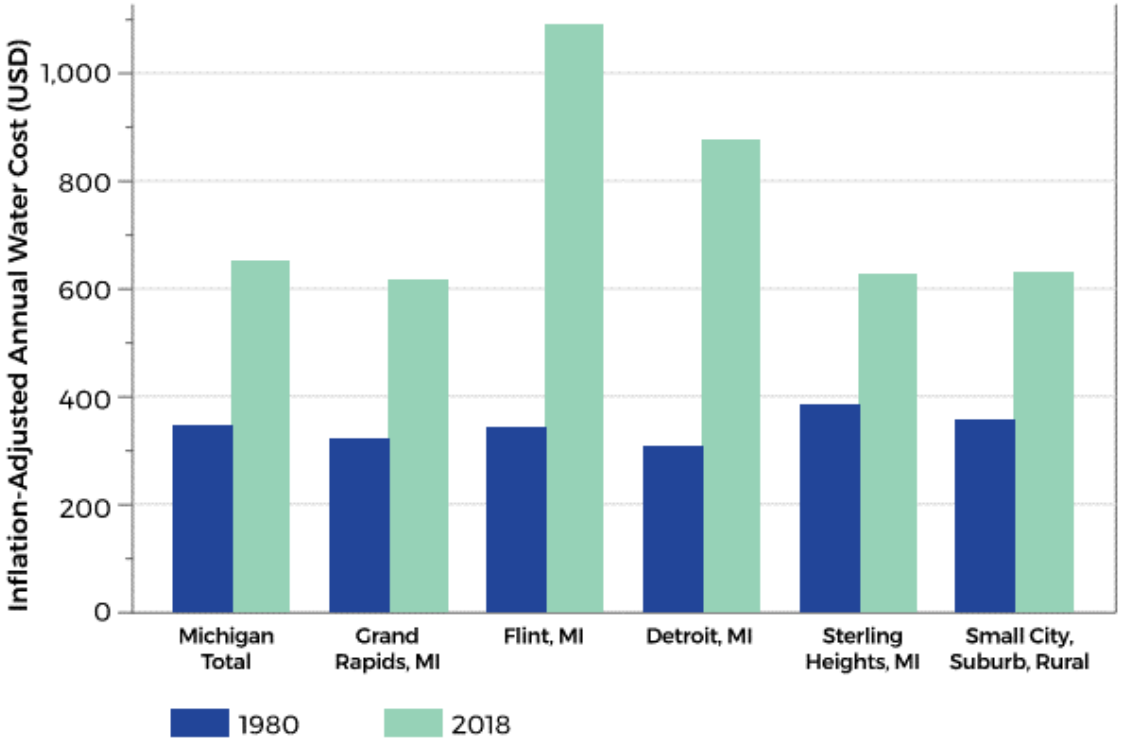
Additionally, many superintendents and operators are retiring, taking with them years of experience and knowledge, and fewer younger professionals are in training to replace them. Another significant issue that affects CWS operations is the availability of equipment and materials and the cost increase for treatment chemicals. Long lead times for materials, result in major operation, maintenance, and replacement issues and operational cost increases cut into the budget for capital expenditures. These supply chain issues mean adequate funding to purchase the products is eroded with the inflation of material and labor costs, forcing some system owners to postpone projects.

FUNDING & FUTURE NEED

Changes in population and water consumption rates directly impact the ability to raise funds for capital infrastructure plans. While population growth and increased consumption can potentially decrease water rates (lower cost per capita), increases in population can also increase operational costs. Alternatively, population declines and decreased demand, lower per capita consumption generally has an upward pressure on rates.

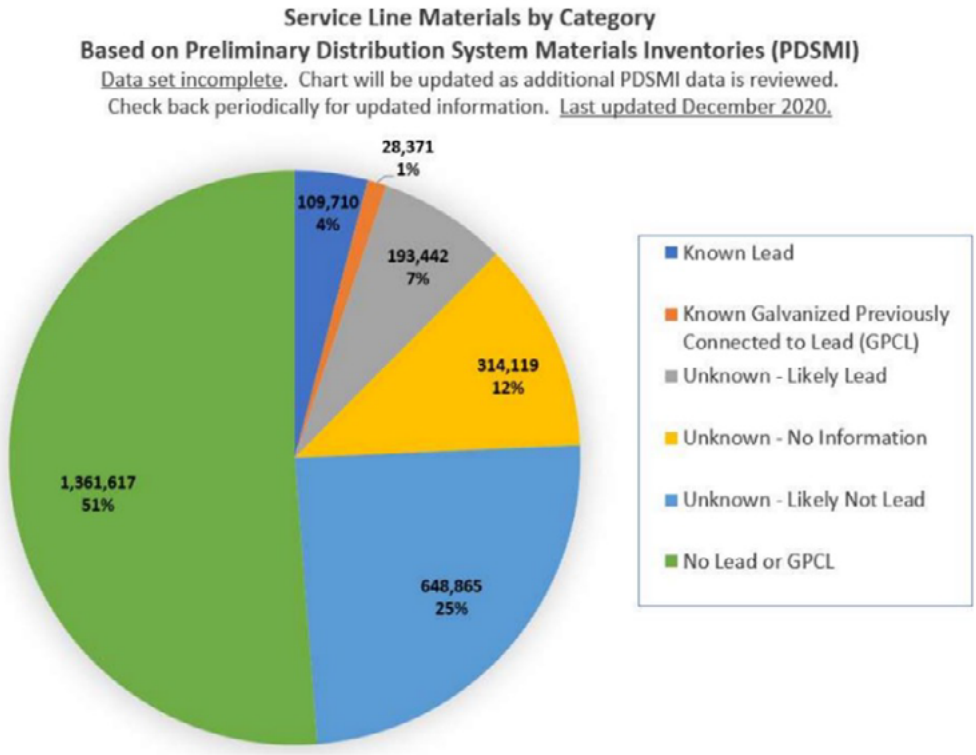
Since federal funding cannot be used for O&M, CWSs generate revenue primarily via water rates, rather than taxes dedicated to the drinking water system. Rates are set based on wholesale water rates (for consecutive systems), O&M expenses, asset depreciation, and capital improvement needs and are typically based equitably on usage. Many utilities across the state have observed a decrease in per capita water usage. Public utilities have made greater efforts to manage system assets and monitor un-billed water use. Modern asset management best practices, improved leak detection technology and advanced metering have allowed utilities to better locate and repair losses in their respective water systems. Decrease in non-revenue water loss generally has a downward pressure on rates.

Average inflation-adjusted water costs have roughly doubled in Michigan since 1980. As the graph below indicates, small cities, suburbs, and rural areas follow that average while large urban areas (e.g., Detroit and Flint) have seen a much sharper rise4. This discrepancy highlights the effects that a lack of investment and resultant increased maintenance have on the cost to provide safe drinking water.



Source: University of Michigan Graham Sustainability Institute

Water systems across the state have continued to increase rates to cover the underfunding and O&M and capital cost increases but system investments continue to fall short. Recent studies2,3 estimate that $1.0 to $1.3 billion is needed annually for investments in drinking water infrastructure, while the average annual investment for Michigan CWSs is estimated at $590 million (all estimates have been adjusted from 2015 dollars to 2022 dollars). These data suggest that Michigan is underinvesting in its drinking water infrastructure by anywhere from $410 million to $710 million, each year. These estimates do not include the projected costs to address emerging contaminants nor the anticipated $1.7 -$2.5 billion to replace lead service lines.



Michigan's MI Clean Water Plan (October, 2020) provided an historic $500 million investment ($207 million towards drinking water) to address infrastructure issues such as LSL Replacements, WSL verification, asset management planning, contamination risk reduction and affordability. This one-time investment was a much-needed boost to infrastructure investment in the state, however, the need for a long-term, sustainable funding source is needed and remains the goal for future investments.

Requests for state and federal funding have increased significantly in recent years, indicating an increase in awareness of needs and increase availability of partial loan forgiveness. In April of 2022 Governor Whitmer signed Public Act 53 of 2022 which provides a $4.7 billion bump to infrastructure funding, $1.9 of which will be administered through the DWSRF Program and includes State ARPA funds (available for FY23 and FY24) and funds from the 2021 Bipartisan Infrastructure Law (aka "IIJA") (available from FY23-FY27). Refer to the below table;

EGLE DWSRF FINAL INTENDED USE PLAN – FISCAL YEAR 2021-2023

Fiscal Year	DWSRF Program Applications	Requested Project Totals	DWSRF Fundable Range	Partial Loan Forgiveness	Funding Deficit
2021	28	$247 million	$275 million	$10.2 million	$0
2022	53	$769 million	$387 million	$28 million	$382 million
2023	69	$982 million	$464 million	$313 million	$518 million
2024 (Projected)	280	$2.0 billion	$590 million	$360 million	???

While EGLE continues to improve information sharing on the condition of public drinking water infrastructure in Michigan, accurate reporting of statewide investment needs for upgrades and replacements remains lacking. Michigan continues to make a significant effort to encourage communities to fund and create AMPs to identify both the area and magnitude of system revenue needs. A central repository for this information would assist in information sharing and awareness.

The MI Clean Water Plan was a good start and Public Act 53 has continued the State's influx of dollars into drinking water infrastructure improvements. However, these "sweeping investments" are one-time influxes and not sustained funding. It's been estimated that for every $1 million spent from the SRF, 16.5 jobs are created but how many of these jobs are held once the project that received SRF monies is complete? Contractors are not willing to invest additional resources to grow their business, buy more equipment and hire more full-time staff until long-term, sustainable funding sources are secured; and that innovative funding mechanism will be a job creator.

PUBLIC SAFETY

The quality of water produced and delivered by Michigan drinking water supplies is high, however, legacy and emerging contaminants continue to require closer attention. With the goal of protecting public health through the reduction of lead and copper levels in drinking water, in June of 2018, Michigan adopted the country's most proactive Lead and Copper Rule (LCR). The revised LCR requires water utilities to inventory all water service lines, notify customers if they have or likely have a lead service line and fully replace all lead service lines within the next 20 years. Michigan also adopted (August 2020) the first of their kind regulations limiting per- and polyfluoroalkyl substances (PFAS) in drinking water, establishing MCLs with implications for monitoring requirements and cleanup criteria.

Supplies monitored by EGLE oversight generated 1,063 SDWA violations in 346 CWSs in Michigan during 2021 (out of 1,381 systems). This is a relatively low number of reported SDWA violations considering the total number of monitoring events and population served; it's fewer than the predicted average number by state in a 2017 report by the NRDC6. In addition, most were monitoring/reporting violations which have no direct risk to public health and a significant number of these were for lead and copper at CWSs and relate to Michigan's more stringent LCR sampling and reporting requirements.

While the NCWS serves a much smaller population than the CWS, the number of chemical violations for NCWS greatly exceeded that for CWSs. In 2021, there were 67 new and continuing chemical MCL violations. Typically, these violations are resolved when the supply owner either pursues better quality water or installs water treatment devices. Monitoring/reporting violations occur with ~20% of NCWS, many related to the Revised Total Coliform Rule. EGLE continues to work with local health departments to improve compliance with the Revised Total Coliform Rule.

RESILIENCE & INNOVATION

In general, due to the relative age and onset of damage due to corrosion and fatigue, existing drinking water infrastructure in the State of Michigan is not resilient. However, the drinking water infrastructure stays effective in large part due to the hard work of the State's water system operators, laborers and contractors that keep these aging CWSs operational and maintain the supply and delivery of safe drinking water to millions of customers throughout the State.

The MI-SDWA requires Type 1 CWSs to submit a Reliability Study every five (5) years that demonstrates the CWS' ability to meet the minimum MI-SDWA requirements for water supply and delivery. In addition, many State CWSs were required to complete the EPA's Risk & Resilience Assessments and update their Emergency Response Plans in accordance with AWIA guidelines.

Lastly, the State's support of responsible asset management planning will forecast CWS needs and goals for drinking water infrastructure improvements to construct efficient, better planned and more resilient water supply systems for future generations.

State regulatory authorities have been cautiously accepting innovative technologies for drinking water infrastructure construction and rehabilitation. The State and CWS Owners should strive to utilize national best practices and innovations such as those that reduce life-cycle costs, trenchless technologies, alternate pipe materials, real-time water quality monitoring and water re-use and collaborate to implement these methods and ideals.

The State has also been encouraging for the regionalization of water systems. Regionalization will stretch the State's budget dollars further and create economies of scale that may provide safer more affordable drinking water. Of the 1,381 CWSs in the State, approximately 1,076 CWSs are consider a small CWS. Based on the data in the table below as collected as part of the DWINSA[4], small systems require more than twice the amount of funding per capita than a medium-sized CWS.

System Size*	Need		Water Systems†		Total Population Served	
	$ Billions	% of Need	Number of Systems	% of Water Systems	Population (millions)‡	% of Population Served§
Large Community Water Systems (serving over 100,000 people)	$174.4	37.6%	644	1.3%	141.7	46.4%
Medium Community Water Systems (serving 3,301 to 100,000 people)	$212.3	45.8%	9,279	18.7%	140.1	45.8%
Small Community Water Systems (serving 3,300 and fewer people)	$76.6	16.5%	39,482	79.9%	23.9	7.8%

Note: Percentages may not add to 100 due to rounding.

Drinking Water

RECOMMENDATIONS TO RAISE THE GRADE

- Develop a long-term, sustainable funding source to assist CWSs with the implementation of and support for their CIP and O&M expenditures.
- Continue to support compliance of new regulations for emerging contaminants and LCR revisions with influx funding.
- Continue to encourage asset management planning by providing education, guidance and additional funding to assist CWSs that have not yet established or would like to improve their AMPs. Ensure AMPs are developed in a manner that enables consistent reporting in a statewide asset management database system and create a central repository to promote information sharing and awareness.
- Update Michigan's Statewide Sanitary Code to improve minimum permitting requirements, increase inspection frequencies, help ensure public education and provide awareness for safely operating private septic systems to protect the aquifer network.
- Develop economic, funding, and regulatory framework for permitting7 that ensures compliance while enabling flexibility of means and methods and encourages innovation to produce and sustain successful projects and achieve public and environmental health goals.

DEFINITIONS

Michigan Department of Environment, Great Lakes and Energy (EGLE) – Michigan's state-wide regulatory agency for water and wastewater systems.

Michigan Safe Drinking Water Act (MI-SDWA) – The Michigan Safe Drinking Water Act, Public Act 399, as amended, (ACT 399) was enacted in 1976 and enables the Michigan Department of Environment, Great Lakes and Energy to maintain direct control over the public drinking water program in the state.

Asset Management Plan (AMP) – a tactical plan for managing an organization's infrastructure and other assets to deliver an agreed standard of service.

America's Water Infrastructure Act (AWIA) – enacted in 2018, AWIA improves drinking water and water quality, deepens infrastructure investments, enhances public health and quality of life, increases jobs, and bolsters the economy.

Infrastructure Funding Gap – the difference between annual infrastructure spending and the estimated required annual investment to maintain a sustainable, reliable water and sewer system.

Drinking Water

SOURCES

United States Geological Survey Circular 1405, "Estimated Use of Water in the United States in 2010," 2014

Great Lake Sustainability Indicators – Drinking Water, "Water and Sewer Infrastructure Funding and Gap," March 2022

Public Sector Consultants, Inc., "Michigan's Water Infrastructure Investment Needs," April 2016

University of Michigan Graham Sustainability Institute, "Water Service Affordability in Michigan: A Statewide Assessment," November 2021

USEPA - Office of Ground Water and Drinking Water - Drinking Water Protection Division, "Drinking Water Infrastructure Needs Survey and Assessment – Seventh Report to Congress," April 2023

NRDC, "Threats on Tap: Widespread Violations Highlight Need for Investment in Water Infrastructure and Protections," 2017

"S. 2848 – 114th Congress: Water Resources Development Act of 2016"

State of Michigan, "21st Century Infrastructure Commission Report," November 2016

Energy

D

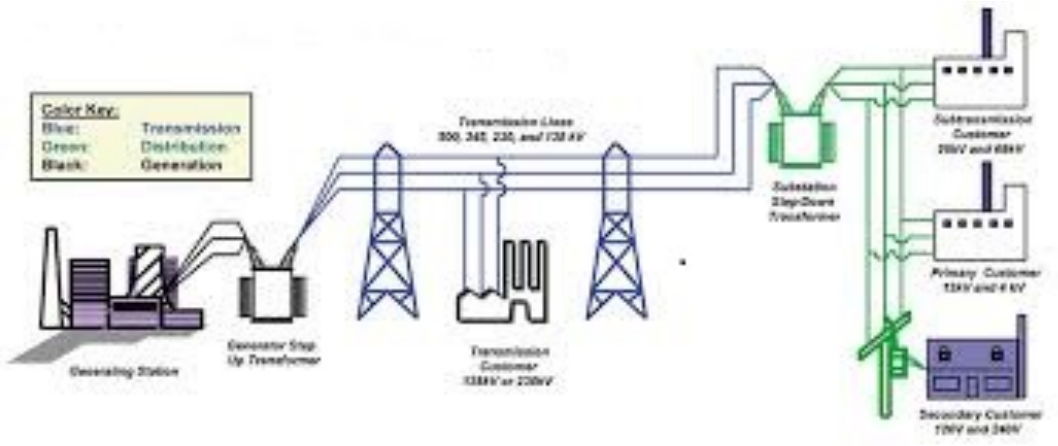
EXECUTIVE SUMMARY

Electricity in Michigan is delivered by 7 investor-owned utilities, 11 cooperative utilities, and 40 municipally owned utilities – the first of which have rates overseen by Michigan's Public Service Commission (MPSC) and serve the most customers. Investor-owned DTE Electric Company distributes power to most of the state's thumb, with fellow private Consumers Energy servicing the rest of the Lower Peninsula. In 2020, utilities in Michigan were 37% higher than the national average in time to restore non-momentary electric interruptions. High outages were reported in 2021 and 2023 with a small 2022 dip, principally due to storms. Michiganders pay $0.18/KWh in residential use, compared to a $0.155/KWh national average, and $0.133/KWh in commercial use versus $0.128/KWh nationally. Adding clean energy sources while maintaining high service reliability is difficult with aging transmission lines and last-mile connections. Infrastructure improvements should focus on resilience and rates should account for life-cycle costs while keeping energy affordable to stakeholders.

BACKGROUND

Michigan's energy infrastructure was constructed in parallel to industry/population center growth. Electricity generation focused on central, "base load" plants with high usage factors to meet local demands of steel mill, automotive, and other industry operations and consumer needs such as lights and appliances (e.g., Detroit area). Transmission and distribution (T&D) circuits were routed overhead from central generation sources to consumers, as urban growth expanded into the Upper and Lower Peninsulas (UP, LP). Figure 1 displays the overall electric power grid (simplified).

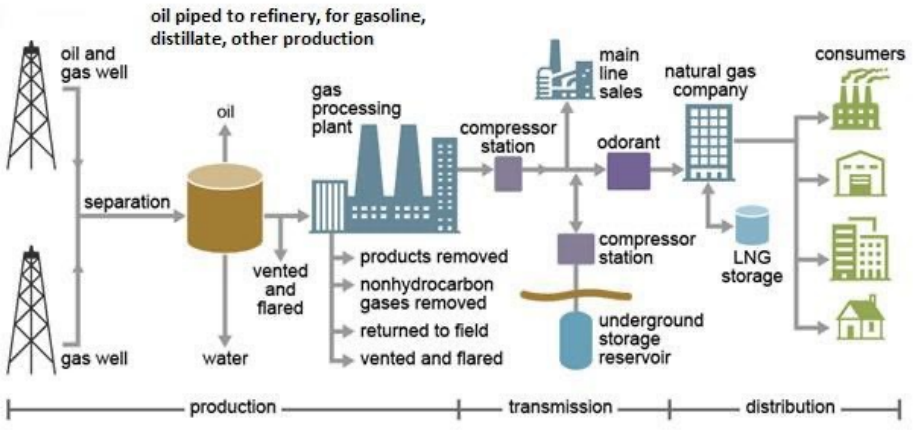
FIGURE 1. ELECTRIC POWER GRID



(Source: U.S. Department of Energy (DOE))

T&D expansion and dispersed generation served to electrify rural areas with current infrastructure owners listed in Table 1. Natural gas, petroleum, liquids, and other energy pipelines were also built by independent pipeline corporations (Table 2) to meet Michigan's growing demands, particularly in the Lower Peninsula (LP) where oil/gas deposits are integrated with external sources and where geological formations supported natural gas/NGL/other storage expansion. Figure 2 provides an overview of petroleum, liquids, and natural gas delivery from sources to stakeholders.

FIGURE 2. PETROLEUM AND NATURAL GAS SUPPLY



(Source: U.S. Energy Information Administration)

Aside from smaller public municipalities/cooperatives, infrastructure ownership is primarily by larger utilities subject to public regulatory oversight and market rules by Midcontinent Independent System Operator (MISO). This construct is unique compared to publicly owned infrastructure in Michigan such as roads and drinking water systems.

TABLE 1. PRIMARY MICHIGAN ELECTRICITY INFRASTRUCTURE OWNERS

Infrastructure	Primary Owners	Statistics/Notes
High Voltage Electricity Transmission	ITC Holdings (LP grid); American Transmission Co (UP grid)	High-voltage power grid; 138,000 kilovolts (kV) and higher via wires and substations
Low Voltage Electricity Distribution and Generation	Alpena Power, Consumers Energy, DTE Electric, Indiana Michigan Power, Upper MI Energy Resources, Upper Peninsula Power, Wisconsin Electric Power (utilities); Wolverine Power (cooperative); others	Wires-based distribution from transmission to consumers. Other owners include cooperatives, municipalities, alternate energy suppliers (AESs). Most self-generate/distribute with MISO markets

TABLE 2. PRIMARY MICHIGAN OIL/GAS INFRASTRUCTURE OWNERS

Infrastructure	Primary Owners	Statistics/Notes
Interstate Energy Pipelines (liquids, gases)	ANR and Great Lakes Gas Transmission (TransCanada), Enbridge, Northern Natural Gas, Panhandle Eastern, Energy Transfer, DT Midstream	High pressure. Over 10,000 pipe-miles (~3,500 miles of liquids, with balance natural gas)
In-State Energy Distribution Pipelines	Consumers Energy, DTE Energy, smaller distribution pipelines to city gates	Low pressure. Over 100,000 gas gathering/ distribution pipeline miles from interstate/ refineries to consumers
Michigan Refineries	(1) petroleum refinery (Marathon Detroit); (14) natural gas/liquids processing plants, various private distributors	Refinery processes 132,000 barrels/day oil into gasoline, distillate, related products. Processing plants purify/odorize/deliver energy products to consumers via distributors
Michigan Gas Storage Fields	ANR, Blue Lake, Bluewater, Consumers Energy, DTE Energy, Southwest, DT Midstream, Multiple smaller owners	1.1 trillion cubic feet storage in geological formations (MI – *largest US volume*); storage balances varying demand

Michigan's electricity infrastructure and delivered costs are greatly affected by wholesale markets operated by MISO. MISO oversees buying generation and selling electricity, as well as maintaining in-state grid stability and reliability. MISO markets and state/federal regulatory oversight both serve to control infrastructure investment and electricity rates. Petroleum/natural gas transport lines into and through Michigan are also subject to state/federal oversight and compliance with safety/security laws addressing operations and new construction.

CAPACITY AND CONDITION
Electricity

Michigan's current mix includes coal-, natural gas-, and oil-fired, light water nuclear power, renewable, and other generation sources. Given its northern climate, Michigan has summer and winter peak demands in the range of nominally 29,000 to 30,000 MW. Per the 2022 American Council for an Energy-Efficient Economy (ACEEE) report, a 1.63% reduction in 2020 demand (% of retail sales) occurred from efficiency, reduced air conditioning loads (cooler weather), and COVID-19 impacts, placing Michigan eighth in US in savings. Increasing renewable supply is being managed relative to demand in MISO markets. Michigan's in-state generation in quickly transitioning to clean energy sources per Table 3:

TABLE 3: MICHIGAN NET ELECTRICITY GENERATION BY SOURCE - NOVEMBER 2021

Generation Source*	Net Generation, thousand MWh	%	Trend/Commentary
Petroleum/Oil-Fired	4	0.04%	Soon-to-retire generation
Natural Gas-Fired	2603	26.6%	Older, except DTE Blue Water (1150 MW)
Coal-Fired	2974	30.4%	Decreasing use (near-term plant retirements)
Nuclear (Cook, Fermi-2, Palisades)	3037	31.0%	19% of capacity (Palisades) retired in 2022
Hydroelectric	119	1.2%	Extremely old hydro dams; limited generation
Non-hydroelectric Renewables (wind, solar, biomass)	1057	10.8%	Major solar growth - intermittent, non-inertial; generation; wind slowed – permitting
TOTAL:	9794	100%	

**Limited electricity imports not included*

https://www.eia.gov/state/?sid=MI#tabs-4
Source: EIA, "Electric Power Monthly"

Michigan's aging fossil fuel-based fleet is slowly converting to other sources backstopped by dispatchable natural gas/nuclear sources, with active focus on decarbonization and ensuring that increasing renewables (reduced inertial generation) do not destabilize the T&D grid.

In-state electricity demand slowed from 2007 to 2020 although 2021 statistics suggest an uptick (MPSC, 2021). Declines were due to milder weather, reduced industrial production, efficiency gains, and COVID-19, with industrial growth leading recent change. Available 2020 statistics show Michigan has a reserve operating margin of 13% over recent peak demand, which is close to U.S. norms. However, such margin is threatened by aging infrastructure, retirements of inertial generation (Table 3), and electrification (e.g., growth in electric vehicle charging). Reliability is highly influenced by generation diversity and T&D condition, capacity, and performance, so MISO itself and private owners play vital roles.

Per EIA's 2021 Annual Report considering 2020 state metrics, Michigan ranked above the national average at 1.3 interruptions per customer per year and notably 37% above average in minutes to restore non-momentary electric interruptions (outside "major event" days). This trend continued in 2021 when elevated forced outages triggered an MPSC technical review but 2023 interruptions have escalated. Regulatory requirements to reduce outages and improve response are expected. Distribution owners are currently exploring undergrounding circuits having highest risk of future outages, expanding tree trimming, and investing in "smart grid" improvements (e.g., sensing/reclosing to reduce outages, voltage reduction) to reduce interruptions.

Petroleum/Natural Gas/Natural Gas Liquids (NGLs)

Michigan's natural gas, NGL, and gasoline/distillate demands for 2020 were estimated to be 914 billion cubic feet and 5.0 billion gallons respectively, by the MPSC Energy Appraisal (2021). Between 2020 and 2021, consumption was lower due to COVID-19 effects but demand is expected to rebound. Michigan's

annual in-state oil and natural gas production today as a percentage of total annual demand are roughly 0.2% and 10% per EIA and Energy Appraisal data, respectively. Michigan has the highest propane consumption for residential use of any of the 50 states. Both gasoline and distillate (diesel) oil use are expected to increase slightly even as prices stay elevated in 2022, although longer-term projections show decreasing demand. Demand will continue to be met via interstate pipelines particularly as in-state oil, gasoline, and natural gas reserves are depleted, with electric vehicles anticipated to reduce future gasoline demand. Michigan's natural gas and NGL storage capacity in the form of underground caverns, salt domes, and empty oil/gas reefs are capable of receiving pressurized natural gas and NGLs from in-state and out-of-state sources and provide a buffer against winter heat demands and price increases. Storage capacity use should continue to be maximized to enhance energy security. With the new NGL terminal in mid-Michigan, petroleum/natural gas/propane supply infrastructure appears adequate to meet future needs, but supplies themselves are a separate concern.

OPERATIONS AND MAINTENANCE (O&M)

O&M on energy infrastructure is conducted by private owners (Tables 1/2) to meet forecasted demand, and market, reliability, and regulatory requirements. O&M spending is minimized to maintain low energy prices to consumers and deliver higher profitability for investors. Michigan's elevated outage occurrence/duration has been caused by weather, falling trees, faulty equipment, or human error, and mitigation is a current focus. A solution to replace the underwater, 60-year old Line 5 petroleum/NGL pipelines from LP to UP has not been implemented, extending operational and environmental risks from failure. Annual owner focus on testing and aging management via replacement of high-risk pipelines are critical to avoid interruptions.

FUNDING AND FUTURE NEEDS

While current capacity exceeds demand, electric generation shifts to reduce carbon emissions and overcoming T&D infrastructure aging/outages are prioritized needs. Alternatives including increased energy efficiency and peak load reduction are needed to balance increasing electrification (e.g., transportation) and the already strained T&D grid. Investments must also focus on lowering energy costs; Michigan's current electric rates are elevated against regional and national averages.

ELECTRIC RATES (¢/kWh)*	Residential Sector	Commercial Sector	Industrial Sector	ALL Sectors
Michigan	17.99	13.25	8.12	13.50
Region (East NC)	15.77	12.08	8.38	12.22
US Total	15.47	12.79	8.30	12.78

**Energy Information Administration, January 2023 data in dollars per kilo-watt hours (¢/kWh)*

PUBLIC SAFETY, RESILIENCE, AND INNOVATION

Michigan's energy infrastructure has generally proven resilient against natural/human stresses since the 2003 regional grid blackout, although aging, climate change and cyber/human threats pose risks. Continued renewal of infrastructure, hardening communications, and innovative smart grid technology use are needed to limit outages and economic impacts. Improving grid-related outage statistics, avoiding pipeline-related failures, and overcoming regulatory/economic/policy barriers are critical to future system performance.

Energy

RECOMMENDATIONS TO RAISE THE GRADE

The Michigan ASCE Section makes the following recommendations on the State's energy infrastructure:

- Stakeholders should continue pursuing reductions in energy demand/consumption/waste while maintaining rates as low as achievable and investing in clean sources to sustain/grow current economy (e.g., updating energy codes; pursuing grants/funds targeting efficiency/conservation).
- Select distributed generation and renewable energy coupled with T&D investment are needed to replace central generation, avoid capacity shortfalls, overcome aging/congestion, and improve resilience. Infrastructure owners must balance MISO market constraints with increasing impact of renewables on grid performance and inverter-based resources (IBRs) so as to avoid negative power quality/outages faced elsewhere.
- A life-cycle driven solution is needed for existing energy infrastructure. Any petroleum or NGL spill poses significant risk to the Great Lakes, inland ecosystems, and public health. Where fossil fuel energy resources are used, resilient infrastructure is needed.
- Undergrounding select distribution, smart grid innovations, tree management, and aging infrastructure replacement to improve reliability metrics should be focal points of near-term investment, given Michigan's elevated outage durations. Use of non-wire alternatives (NWAs) such as electricity storage needs consideration.
- No other major improvements to petroleum/NGL/natural gas infrastructure appear needed; high pressure pipeline test intervals can selectively be reduced from 7 to 5 or fewer years where informed by test results and risk analysis and replacement of aging high-risk pipeline segments in urban areas should continue to occur. Decarbonizing via alternate heating systems (e.g., heat pumps), renewable sources (e.g., landfill/digester methane), and green hydrogen should be explored.
- Greater certainty on ever-changing environmental policies/regulations and decreasing the permitting timeline for new generation/T&D infrastructure are needed.

Energy

DEFINITIONS

Congestion: Flow of electricity or fluid in an energy system that is restricted or constrained below desired levels, either by the physical capacity or operational policies designed to preserve security and reliability.

Distributed generation: Scalable electricity generation located to where such is demanded and connected to distribution (versus "centralized generation" which requires both T&D infrastructure to deliver).

Distribution: Circuits that carry lower voltage electricity (voltage at or near consumption-level) or pipelines that deliver lower pressure refined energy products (e.g., gasoline, odorized natural gas) to stakeholders.

Electricity storage: Systems which capture energy produced via mechanical, electrical, and electrochemical means to enable its stored energy dispatch as electricity at a later time when demanded.

Energy Systems (or Infrastructure): Systems which: (1) generate, transmit, and distribute electric power, and (2) collect, refine and transport energy fuels including solid (e.g., coal, biomass), liquid (e.g., oil, gasoline), and gaseous (e.g., natural gas) fuels, for delivery to stakeholders.

Grid: Interconnected system of T&D circuits and related equipment that deliver high-voltage electricity from power generating plants to "substations", where voltage is lowered to that suitable for distribution to stakeholders. Michigan's grid is part of the U.S. Eastern Interconnection, connected to other eastern U.S.

Natural gas liquids (NGLs): hydrocarbons in the same family of molecules as natural gas/crude oil, composed exclusively of carbon and hydrogen. Ethane, propane, butane, isobutane, and pentane are all NGLs. Nominally 8% of all MI homes utilize propane an energy source.

Power generating plant: Facility that uses a conventional fuel source (e.g., coal, natural gas, oil, uranium), or that captures a renewable energy source, to produce electricity.

Processing plant: Facility which refines, purifies, or extracts energy products from raw fuel stock (e.g., petroleum, natural gas, NGLs) into products usable by stakeholders for power generation, heating, transportation, and other commodity uses).

Renewable energy: Electricity generation using biomass, hydroelectric, geothermal, wind and solar sources as opposed to fossil fuel or nuclear sources.

Testing: Inspection, testing, and analysis techniques used to evaluate the physical condition of an energy system typically without causing damage. Testing includes nondestructive tests (NDT), leakage surveys, remote sensing via instrumentation, and drone inspections.

Transmission: Circuits that carry high voltage electricity from generation to locations where bulk electricity is needed (typically at 138 kV and higher) and pipelines which carry liquids/gases under high pressure from origin (e.g., wells) to processing plants, storage, or high volume end users.

Energy

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SOURCES

American Council for an Energy-Efficient Economy (ACEEE), "State Energy Efficiency Scorecard Results: 2021 Progress Report", February, 2022.

American Gas Foundation, "Building a Resilient Energy Future: How the Gas System Contributes to US Energy System Resilience", January, 2021.

Michigan Public Service Commission (MPSC), "Annual Report on the Implementation of PA 295, 2020 Utility Energy Waste Reduction Programs", February 15, 2022.

MPSC, "Report on the Implementation and Cost-Effectiveness of PA 295 Renewable Energy Standard", February 15, 2022.

MPSC, "Michigan Energy Appraisal, Winter Outlook 2021-2022", November 3, 2021

MPSC, "MI Power Grid, Status Report", September 30, 2021

North American Electric Reliability Corporation (NERC), "2022 State of Reliability: An Assessment of 2021 Bulk Power System Performance", July, 2022.

Midcontinent Independent System Operator (MISO), "LTRP Detailed Business Case Development", Long Range Transmission Planning (LRTP) Workshop, February 25, 2022.

Public Sector Consultants, "Analysis of Propane Supply Alternatives for Michigan", for Michigan Department of Environment, Great Lakes, and Energy (EGLE)/MPSC, March 2020.

U.S. Department of Energy (DOE), "State of Michigan Energy Sector Risk Profile", March, 2021.

U.S. Energy Information Administration (EIA), "Michigan State Energy Profile", updated monthly, accessed February, 2022. Michigan - State Energy Profile Overview - U.S. Energy Information Administration (EIA)

Inland Waterways

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EXECUTIVE SUMMARY

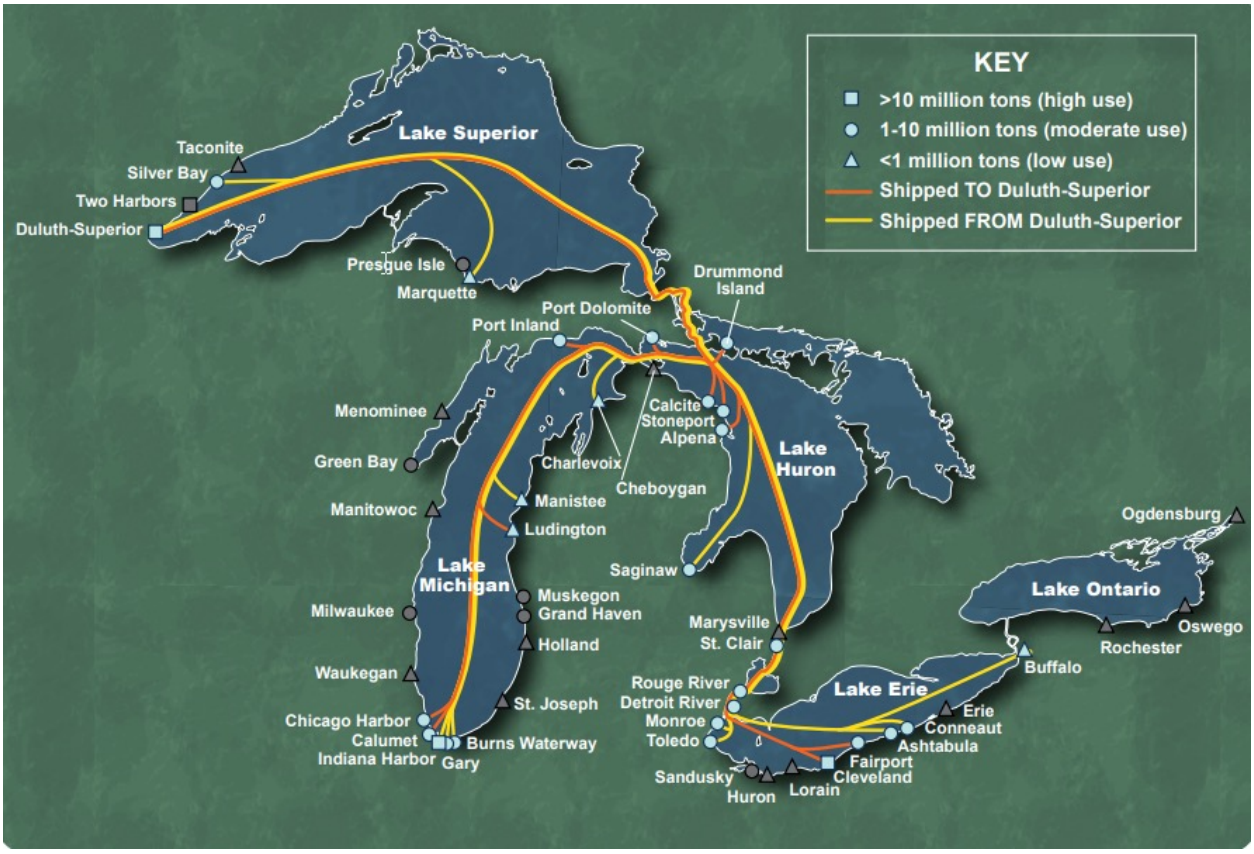
Michigan's inland waterway navigation system includes 50 federal harbors, 14 navigable waterways, the Soo Locks system, and dredged material facilities for material placement. Over 90% of Great Lakes coastal structures are older than 60 years, exceeding the typical 50-year design life and increasing costs to maintain operations. Funding for navigation has steadily increased over the past decade with supplemental funding from the 2021 Bipartisan Infrastructure Law and 2023 Disaster Relief Supplemental Appropriations Act providing $73.1 million for federal navigation projects in Michigan. Construction to improve redundancy at the Soo Locks is underway on a second Poe-sized lock, preventing multi-million-dollar industry losses and nation-wide job destruction for each day of unscheduled closure. High water across all the Great Lakes has challenged Michigan's navigation system recently, coupled with increased high wave activity, contributing to significant shoreline erosion and accelerated deterioration of aging navigation structures.

BACKGROUND

The Great Lakes Navigation System (GLNS) is a complex deepwater navigation system stretching 2,400 miles through all five Great Lakes and connecting channels from Duluth, Minnesota to Ogdensburg, New York. The U.S. Army Corps of Engineers (USACE) is charged with maintaining the non-linear system comprised of interdependent locks, ports, harbors, navigation channels, dredged material disposal facilities, and navigation structures.

The GLNS hosts 19 of the nation's top 100 harbors by tonnage, with nearly 10 percent of all U.S. waterborne domestic traffic commodities moving through the system. Composed of 60 commercial ports and harbors and 80 recreational harbors across the U.S. portion of the Great Lakes, the system is linked with Canada and ports worldwide. The Great Lakes ports demonstrate tremendous efficiency and environmental sustainability in moving commodities. When maintained properly, the GLNS saves shippers approximately $3.9 billion per year over the next least costly transportation modes, such as road or rail.

Between 2015 and 2019, the GLNS transported an average of 122 million tons of cargo per year, supporting 147,500 U.S. jobs and $20.3 billion in U.S. business revenue. The system provides a safe, efficient, and environmentally sustainable transportation route for raw materials, agricultural commodities, and finished products.



CONDITION & CAPACITY

The condition of the federal navigation projects in Michigan are primarily driven by the age of the structures, climate impacts of the Great Lakes region, and the funding received to maintain them.

One of the most important indicators of both the condition and capacity of the GLNS is the depth the channels are dredged. Approximately 3 million cubic yards of material is naturally deposited annually within the harbors and channels of the Great Lakes. Harbors are dredged annually to ensure commercial navigation remains open. Failure to adequately dredge reduces available channel dimensions and increases transportation costs to shippers and industry when vessels, in response, are required to light load.

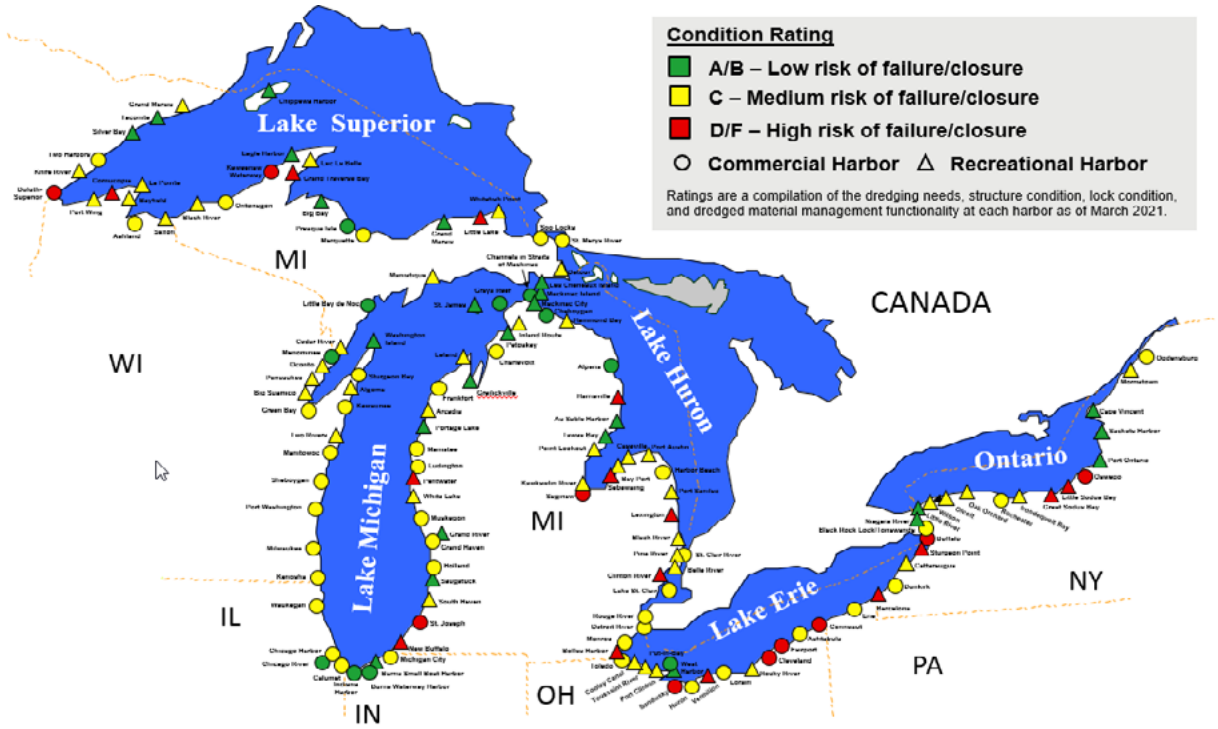
Age can also be a proxy for the condition functionality of GLNS navigation structures, especially when locks were constructed before the advent of the larger, modern ships utilized today. Most of the federal harbors in the Great Lakes were constructed between 1860 and 1940. Over 90% of Great Lakes coastal structures are older than 60 years, exceeding the typical 50-year design life expected at the time of construction, including the critical Soo Locks at Sault Ste. Marie, Michigan.

In addition to age, regularly constrained budgets, lake level fluctuations, ice conditions, and storms have contributed to both systemic and emergency maintenance needs. For example, many breakwater structures were built with timber substructure, and as such are subject to accelerated wood decay when exposed to the air during periods of low lake levels. Lakes Michigan and Huron experienced a prolonged period of lower-than-average levels from 1998 until 2014, followed by a rapid recovery to average and above average water levels. Since 2014, GLNS funding has recovered and USACE has made significant progress in backlog maintenance reduction. However, recent years of high water across all the Great Lakes coupled with large wave activity have caused significant shoreline erosion and accelerated deterioration of aging navigation structures.

The Soo Locks are critical to sustaining the Great Lakes shipping industry and the nation's economy. The 50+ year old Poe Lock is the only lock capable of accommodating the largest vessels, which carry 89 percent of all cargo passing through the Great Lakes. Roughly 7,000 vessels carrying a combined total of 80 million tons of freight pass through the locks annually. The Soo Locks are the only USACE lock with no alternate mode of transportation around the lock. A 2015 Department of Homeland Security study stated that a 30-day unscheduled closure of the Soo Locks would cost industry $160 million, and a breakdown lasting six months would cripple the United States economy, with 11 million jobs lost. A shutdown of Great Lakes steel production caused by a sudden halt in iron ore transportation would in turn shut down almost all production of North American appliance, automobile, construction, farm, and mining, and rail car equipment and equipment, and rail cars production within weeks.

Furthermore, conversely, a study commissioned by the U.S. Treasury Department stated that a second lock at this location will provide system resiliency that has an estimated economic benefit of $1.7 billion. USACE has made a priority of maintaining existing facilities; needs are planned for and tracked through an Asset Renewal Plan. In 2019, construction began on a redundant Poe-sized lock. While the cost is fully federally funded, Michigan contributed $52 million, accelerating the expected completion date to 2030. Maintaining the existing infrastructure through continued funding is critical for the navigation system to remain functional and to provide reliable service to the nation.

The 2021 USACE Great Lakes Navigation Team's assessment of the condition of GLNS projects. The assessment included dredging needs, condition of structures and locks, and availability of dredged material placement sites.

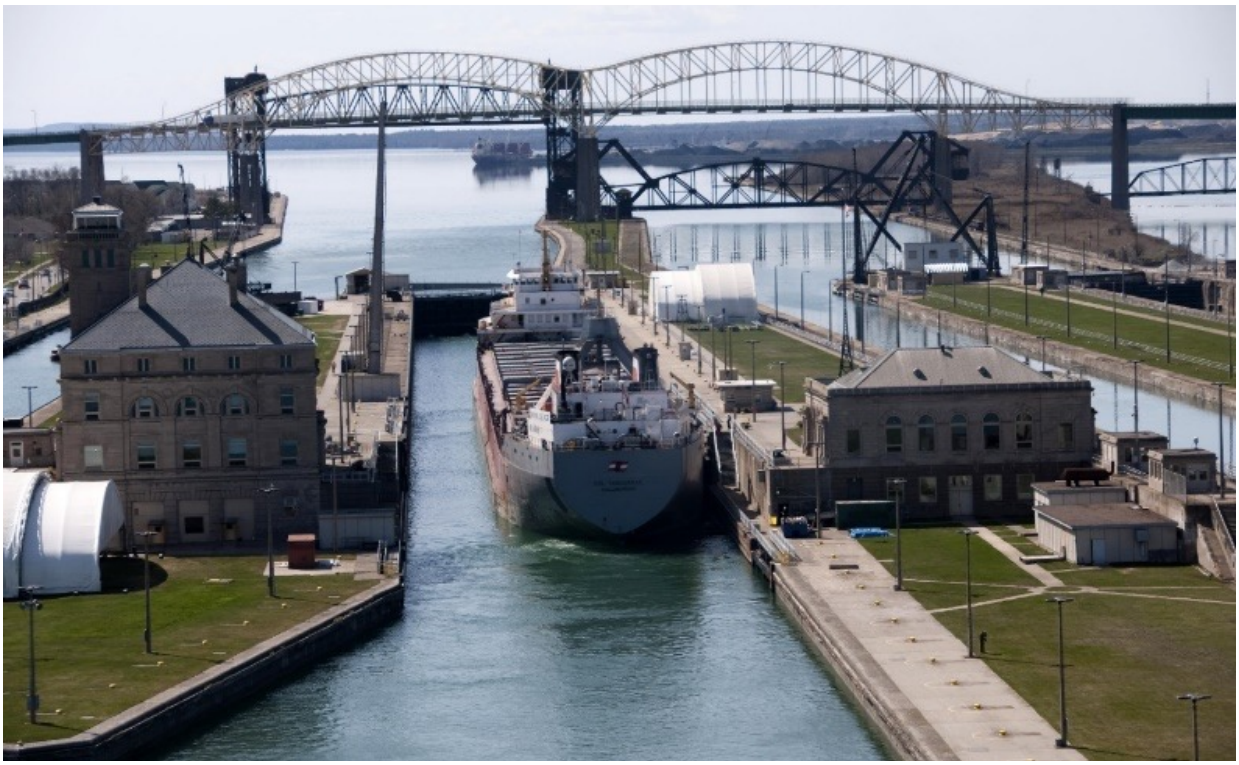


OPERATIONS & MAINTENANCE; FUNDING AND FUTURE NEED

Operations and maintenance funding for harbor structures and dredging comes from the Harbor Maintenance Trust Fund (HMTF). The Water Resources Development Act (WRDA) of 1986 established the HMTF, which allows fees to be collected on the value of cargo that is shipped out of the nation's coastal ports, including the Great Lakes. The Water Resources Reform and Development Act (WRDA) of 2014 resulted in increased investments in Great Lakes navigation, setting a path to fully use the HMTF by 2025. Increased funding has allowed USACE to address backlog dredging, lock maintenance, and breakwater maintenance.

With the passage of WRDA 2020[1], Congress directed the use of the roughly $9.3 billion in taxes that had accumulated within the HMTF to fund USACE's operation and maintenance activities across the nation's ports and harbors, including those on the Great Lakes. WRDA 2020 directed a gradually increasing investment from the HMTF surplus from 2021 to 2030. WRDA 2020 also specified that GLNS would receive not less than 13% of the funds dedicated to USACE HMTF-reimbursed projects on an annual basis, and not less than 15% for emerging harbors (those with less than 1 million tons moved annually). Great Lakes-wide, there is a backlog of over $1B in navigation maintenance activities. These changes in HTMF spending are expected to significantly increase investments in GLNS operations and maintenance in the coming years. Additionally, supplemental funding through the 2022, 2023, and 2024 Bipartisan Infrastructure Law (BIL) and the Disaster Relief Supplemental Appropriations Act provided $73.1M for federal navigation projects in Michigan alone.

Most federal navigable river channels located in Michigan waters handle substantial commercial navigation activity because they support multiple industries. Given high usage rates, these projects receive more reliable levels of maintenance funding. Unfortunately, shallow draft harbors have a lower economic priority for funding allocations. Reduced maintenance can increase shipping costs, reduce recreational usage opportunities, reduce protection of natural coastal assets, and reduce protection of infrastructure currently sheltered by harbor structures. With the lack of adequate maintenance, harbor structures will continue to deteriorate.



1 WRDA's 2022 iteration did not direct O&M spending.

RESILIENCE & INNOVATION

Navigation structures provide protection from powerful natural forces such as storm surges, large waves, ice, and increased material shoaling. They also provide critical flood and storm protection for buildings, roads, and facilities developed along the waterfront. In some cases, urban waterfront includes critical infrastructure for power generation, water supply, and wastewater treatment. The condition and resiliency of coastal structures impact not only navigation, but also the health of local economies in the State of Michigan.

The USACE has moved to a risk-based decision-making process to better prioritize which projects are addressed first. The Soo Locks asset renewal priorities are continually reviewed and adjusted to address the highest risk components to the system.

A redundant "Poe" sized lock will provide long-term capacity and reliability for operation of the system.

A second lock at this location will provide system resiliency that has an estimated economic benefit of $1.7 billion. The new lock chamber will have the same dimensions as the Poe Lock, and will include new updated features, such as hands-free mooring along the lock wall, improving safety.

Dredged material management has been a growing concern in the Great Lakes region. Maintenance dredging in harbors and channels is necessary to ensure safe and efficient navigation. Additional funding appropriated in recent years has proven critical to address the large backlog of dredging needs, yet there is declining capacity for new dredged material in existing confined disposal facilities. Although there has been progress in developing alternative placement sites and beneficial reuse solutions in the region, Michigan has an opportunity to further an underdeveloped market for the beneficial reuse of dredged material.

The condition and resiliency of coastal structures impact not only navigation, but also the health of local economies in the State of Michigan.

Inland Waterways

RECOMMENDATIONS TO RAISE THE GRADE

- Continue to utilize the HMTF (the source of maintenance funding for federal coastal projects throughout the nation) to full authorized levels to continue making progress reducing the dredging backlog and improving structure condition.
- Develop long-term dredged material management strategies to ensure continued dredging and maintenance of harbors and channels.
- Continue to define and fund maintenance requirements needed to maximize reliability and reduce the risk of catastrophic failure at the Soo Locks, including completion of the new lock at the Soo.

SOURCES

USACE website http://www.lre.usace.army.mil/Missions/Great-Lakes-Navigation

USACE operational condition assessments

USACE, Great Lakes Navigation System, Economic Strength to the Nation, 2021

U.S. Department of Homeland Security, The Perils of Efficiency: An Analysis of an Unexpected Closure of the Poe Lock and its Impact, October 2015

Public Parks

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EXECUTIVE SUMMARY

Michigan offers 3,300 miles of freshwater coastline on four of the five Great Lakes, over 11,000 inland lakes, and 8.2 million acres of public land. Parks in the state experienced 169% higher usage since 2020. An estimated 83% of Detroit residents and 78% of Grand Rapids residents live within a 10-minute walk of a city park, compared to the national average of 55%. In 2021, the State allocated $97 million to state parks, helping to address deferred maintenance. Additionally, Governor Gretchen Whitmer directed $250 million of American Rescue Plan Act dollars to the state park system, plus $150 million more to local parks. Implementing park elements of 2022's Building Michigan Together Plan and closing the estimated $330 million in backlogged infrastructure improvements requires dedicated, predictable, long-term funding methods that account for life-cycle costs, workforce challenges, and increased resilience needs

CONDITION AND CAPACITY

Michigan is home to 4.6 million acres of state-owned land maintained by the Michigan Department of Natural Resources (MDNR), (source: Public Lands) including:

- 3.9 million acres across six state forests
- 364,000 acres of state game and wildlife areas
- 103 state parks on over 360,000 acres
- 13,400 miles of state-designated trails, including hiking, rail, multi-use, and ORV trails (MDNR, Trail Plans)

Geographically, Michigan's parks are equally distributed throughout the state, and most major metropolitan areas are within a one-hour drive to a state park, state forest campground, or state trail system. This proximity to parks may be one reason why 63% of Michigan residents participate in outdoor recreation each year. (MI Fact Sheet)

Among the busiest are Holland State Park, which hosts almost 2 million visitors annually, and Belle Isle Park in Detroit. Bell Isle at 982 acres is the largest city island park, larger than New York City's Central Park,

The most recent addition to Michigan's state park system is another park in an urban setting — the New Flint River State Park on the former site of the Chevrolet plant in Flint. This park is being built with ARPA funds and will be a key element of the redevelopment of the Flint Riverfront area. (MDNR State Parks and Trails Project Dashboard) Once completed, the new park will become Michigan's 104th state park and the first in Genesee County.

In addition to the numerous offerings of outdoor activities at state parks, Michigan also has a robust network of state-designated trails. Since Governor Rick Snyder declared Michigan the "Trails State" in 2012, the DNR and other partners have added approximately 1,400 new miles to the state's extensive network of shared-use paths, rail trails, and bike paths. (Trails Plan)

Work continues on the state's flagship trail — which will also be the longest state-designated trail in the country — the Iron Belle Trail. This 2,064-mile-long trail will connect Belle Isle Park in Detroit to Ironwood in the western Upper

Peninsula. It follows two separate routes, one intended more for hiking and the other for biking. The 791-mile bicycle route is approximately 64% complete, following multi-use trails on the eastern side of the Lower Peninsula and US-2 on the southern side of the Upper Peninsula. The 1,273-mile hiking portion of the trail generally follows the North Country National Scenic Trail and traverses the western side of the Lower Peninsula and the northern section of the Upper Peninsula.

Overall, the parks and trails are generally considered to be in fair condition. Paved surfaces in parks across the state range from a complete failure to being brand new. Per MDNR staff, paved surfaces have an average Pavement Surface Evaluation Rating (PASER) of between 4 and 5, with 1 being very poor condition or "failed" and 10 being very good condition or brand new.

The COVID-19 pandemic profoundly affected life around the globe, and Michigan's state parks were no exception. Many people took advantage of this time to get outdoors, and the use of state parks increased by a dramatic 169% since 2020. As of April 2022, all parks had reopened and were available for use at pre-pandemic levels; however, this dramatic increase in usage, coupled with decades-old infrastructure systems already in disrepair, has presented a strain on the drinking water, wastewater, and electrical systems in the state parks.

Many of the state's rail-trails are in similar disrepair and need maintenance or overlays, though progress has been made in this area recently. Several of the state's largest rail-trails have been newly built or rehabilitated in the past

The COVID-19 pandemic profoundly affected life around the globe, and Michigan's state parks were no exception. Many people took advantage of this time to get outdoors, and the use of state parks increased by a dramatic 169% since 2020.

10 years. The White Pine Trail is currently being paved with asphalt from Sand Lake to Reed City, and resurfacing is expected to be complete in 2023 for another of the state's most popular rail-trails, Kal-Haven Trail.

In addition to state-run public parks, there are more than 30 federally owned parks in Michigan, as well as thousands of parks and playgrounds run by cities and municipalities (SCORP). Local parks play an essential role as community gathering centers, and they provide environmental, aesthetic, and recreation benefits to all residents. Detroit is by far the largest city in Michigan and has the largest number of parks at 379. An estimated 83% of Detroit residents live within a 10-minute walk of a city park. (Trust for Public Land) Grand Rapids, the second largest city, has 101 city parks, with an estimated 78% of residents living within a 10-minute walk of a park. With the national average being 55%, these Michigan cities are doing a good job of providing their residents closer access to local parks.

OPERATION AND MAINTENANCE

The Michigan Department of Natural Resources (MDNR) is charged with maintaining 4.6 million acres of state-owned land, including state parks, state forests, state-designated trails, and other recreation areas.

In 2023, MDNR published a Statewide Comprehensive Outdoor Recreation Plan (SCORP), complete with a number of public health and safety goals. To meet its goals, MDNR needs about 1,300 people to work in state parks each summer, the peak season for recreational activity. But workforce shortages continue to be a problem, as in many other industries. For the last few years, hundreds of seasonal positions at Michigan's state parks have gone unfilled. In some cases, contract workers are brought in, but that solution is more expensive than hiring full-time employees. To combat this trend and encourage more people to apply for these positions, the DNR increased its starting pay for seasonal workers to $15 an hour in 2022 (MDNR, Seasonal Park Workers). Grand Rapids Parks and Recreation is trying another tactic by adding full-time, permanent employees rather than relying on seasonal or contract workers (MLive). The national labor shortage continues to be a problem for operations and

maintenance of Michigan's parks.

Regarding maintenance issues alone, the state has close to $330 million in backlogged infrastructure improvements. While Governor Gretchen Whitmer recently directed $250 million of American Rescue Plan Act (ARPA) dollars to the state park system, this investment will not be enough to get the park system up to a state of good repair. In addition, the current rate of inflation and sharply rising construction costs are projected to reduce the actual value of this money. However, this infusion of dollars into infrastructure projects is expected to address a significant portion of the state parks' infrastructure needs.

Individual projects currently being implemented or planned include improvements in the following categories: utilities (57 projects), buildings (39 projects), parking lots/roads (30 projects), operational structures (20 projects), recreational structures (15 projects), historical structures (9 projects), trails (7 projects), and major developments (9 projects). The largest major development is the creation of the newest state park, the New Flint River State Park on the former site of the Chevrolet plant in Flint. (MDNR State Parks and Trails Project Dashboard).

While this influx of funds from the ARPA will fund many needed projects, the current parks budget is insufficient to cover all the operations needs of the state park system. Per staff, they are "just trying to keep up with deferred maintenance of the 103 state parks."

RESILIENCE AND INNOVATION

The past several years have been marked by extraordinary high-water levels in the Great Lakes — posing significant challenges to operations at many state parks along Lake Michigan. For example, at Orchard Beach State Park in Manistee, the historic pavilion built in the 1930s was threatened as rising water levels eroded the dunes. The MDNR embarked on an $8 million project to save the building by moving it off the bluff.

The high-water challenges also led to innovations in environmental resilience. Learning from the cyclical high-water cycle, staff developed ways to limit site runoff and change internal practices to help prevent erosion.

Another innovative strategy being implemented is the addition of transit collaborations to increase access to state and regional parks. The Huron-Clinton Metroparks joined with the Suburban Mobility Authority for Regional Transportation (SMART) and is adding routes to connect urban areas to the Metroparks (HCMA Park Access). In addition, MDNR has partnered with Detroit's nonprofit bike share company, MoGo, to make rentable bikes available on Belle Isle. The Belle Isle Conservancy is also working with MDNR on a multimodal mobility study to develop a phased strategy for implementing sustainable improvements to better manage all modes of travel on the island.

Another innovative public-private partnership is the addition of 30 electric vehicle (EV) charging stations to several state parks. Per Ron Olson, Parks and Recreation Chief at the MDNR, this will link several of the state parks for travelers with electric vehicles, with the added benefit of allowing the state to utilize its fleet of electric and utility vehicles more effectively.

Research and development of natural playgrounds is a growing concept at Michigan's state parks — using natural materials and amenities to create play areas that educate children about nature and the environment — mixing play and education.

Other innovations being provided with the much-needed funds from the ARPA and Building Michigan Together Plan include repairs and upgrades that will allow people with diverse abilities to access many of the state parks. By incorporating Universal Design principles, which are designed beyond standards of the 2010 Americans with Disabilities Act, these facilities will allow access to all users of all abilities.

FUNDING AND FUTURE NEEDS

In 2021, the state of Michigan allocated almost $159 million for outdoor-related operations, capital outlay

grants, and one-time funding. About $97 million went to state parks, approximately $26 million to state forest recreation and trails, and almost $33 million to recreational boating.

While the state of Michigan operates and maintains 4.6 million acres of state-owned land, only about 10% of MDNR's budget comes from state taxes. The state's parks are largely self-supporting, with major funding sources for the 2023 fiscal year including state-restricted funds ($340.4 million), federal funds ($93.6 million), general funds ($94.4 million), and private funds ($7.1 million). MDNR's funding sources come from about 50 different funds, many of which have unique revenue streams, including, for example, license fees paid by those who hunt and fish, camping and lodging fees, watercraft registration fees, timber sales on state forest land, and oil, gas, and minerals revenue (MDNR Funding).

Another source of income for the state's parks is the Recreation Passport, which in 2011 replaced daily passes and annual pass stickers and is now tied to Michigan license plate renewals. It has been a great success, immediately increasing revenue by about 8% in the first year alone. By 2017, funds through this program had reached $17.6 million annually. In 2023, the Recreation Passport fee increased by $1, based on the Consumer Price Index. This increase will ensure that rates are keeping pace with the economy.

In addition to funding state parks, campgrounds, trails, and boat launches, 10% of the Recreation Passport fees go toward local grant programs and back into local communities. In 2022, nearly $2 million was awarded to local communities for local park development and improvement projects, such as playgrounds, sports and fitness facilities, walkways, and trails (MDNR Recreation Passport).

Utilizing investments from the Michigan Natural Resources Trust Fund, motorized trail user fees, and other funding sources managed by the Trails Section, the DNR has invested more than $293 million in quality trail experiences. Further funding is required to promote, acquire, and develop new trail experiences in order to maintain Michigan's new reputation as the Trails State.

With $10.8 billion generated by outdoor recreation consumer spending in Michigan (ORSA) and 109,595 direct jobs generated by outdoor recreation in the state (ORSA), it is clear that outdoor recreation is a growing part of Michigan's economy. In addition, research done as part of the state's five-year plan found that the health benefits of outdoor recreation save Michigan an average of $2.8 billion annually in avoided health costs. (ORSA).

With public parks being a large driver of tourism, and tourism being a large economic driver in Michigan, the maintenance — and enhancement — of public parks is of paramount importance. When public parks are in great condition and being utilized, all citizens and communities can reap the benefits.

PUBLIC SAFETY

Public safety is of utmost importance and priority in public parks and is accomplished through effective law enforcement and education. Michigan state parks have two levels of enforcement. The first level includes approximately 300 park rangers, who are the primary contact for most park users and are trained as first responders and in de-escalation tactics in the case of conflict. The second level includes about 250 conservation officers, who are deputized and armed to enforce laws or prevent crime. Both rangers and conservation officers maintain good working relationships with local law enforcement.

RECOMMENDATIONS TO RAISE THE GRADE

To follow are recommendations to raise the grade of Public

Public Parks

Parks in Michigan:

- Continue to implement diverse funding streams to maintain and restore infrastructure and facilities in our public parks, while delivering on our promise of providing diversity, equity, inclusion, and accessibility.
- Implement Universal Design principles for all park projects, to the greatest extent possible, in order to improve and expand park access to all people, regardless of abilities.
- Explore advancements in technology that enhance the user experience at parks, including online outage maps or data sharing of key park assets, such drinking fountains, bathrooms, shower houses, or trails washed out in storms. Utilize technology to introduce children to nature, incorporate real park imagery in games to increase awareness of state parks, and add webcams to popular or remote park locations, etc.
- Continue to leverage partnerships — with other governmental agencies and outside agencies — in an effort to strengthen and broaden the impact of DNR's initiatives.
- Complete a roads plan to ensure appropriate access while also considering resource protection, maintenance, and management access. (DNR Managed Public Land Strategy)
- Utilize Michigan's Statewide Comprehensive Outdoor Recreation Plan (SCORP) as a foundation for funding and a platform for partnerships
- Commit to priorities outlined in the DNR Parks and Recreation Division Strategic Plan, 2023-2027
- Explore implementation of an asset management system to keep track of fixed assets in the state parks system, reducing redundancies and maximizing the value of the assets

SOURCES

Mr. Dakota Hewlett | MDNR

Ms. Kristen Bennet | MDNR

Ms. Annamarie Bauer | MDNR

Mr. Dave Heyboer | Friends of the White Pine Trail

Michigan Department of Natural Resources, "Michigan Statewide Comprehensive Outdoor Recreation Plan: 2023–2027"

Michigan Department of Natural Resources, Parks and Recreation Division, "Draft Strategic Plan, 2023–2027"

U.S. Department of Commerce, Bureau of Economic Analysis, "Outdoor Recreation Satellite Account (ORSA), 2021–Michigan"

Public Parks

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SOURCES (Cont.)

Michigan Department of Natural Resources, "Press Release: DNR announces name of new hiking and bicycling trail from Belle Isle to Ironwood," https://content.govdelivery.com/accounts/MIDNR/bulletins/ebca61, January 26, 2015

Michigan Department of Natural Resources, "State Parks Progress," accessed April 7, 2023, https://experience.arcgis.com/experience/51c444b129dd47f3b521d9daa6fda92f/

Michigan Department of Natural Resources, "Seasonal Park Workers," accessed April 11, 2023, https://www.michigan.gov/dnr/about/careers/park-workers

Michigan Department of Natural Resources, "Public Lands," updated Sept. 1, 2022. https://www.michigan.gov/dnr/managing-resources/public-land#:~:text=Your%20Public%20Lands,lands%20owned%20by%20Michigan%20residents

Michigan Trails and Greenways Alliance, www.michigantrails.org, accessed May 18, 2022

Michigan Trails and Greenways Alliance, "Iron Belle Trail," https://www.michigantrails.org/trails/featured-trails/iron-belle-trail/, accessed May 18, 2022

Trust for Public Land, "Detroit, MI," accessed April 11, 2023, https://www.tpl.org/city/detroit-michigan

Trust for Public Land, "Grand Rapids, MI," accessed April 11, 2023, https://www.tpl.org/city/grand-rapids-michigan

Bridge Michigan, "Five Years Later, State Parks Recreation Passport a Financial Success," July 16, 2015, https://www.bridgemi.com/quality-life/five-years-later-state-parks-recreation-passport-financial-success#:~:text=Climbing%20revenues&text=Under%20the%20old%20system%2C%20Michigan,recreation%20areas%20and%20boat%20launches

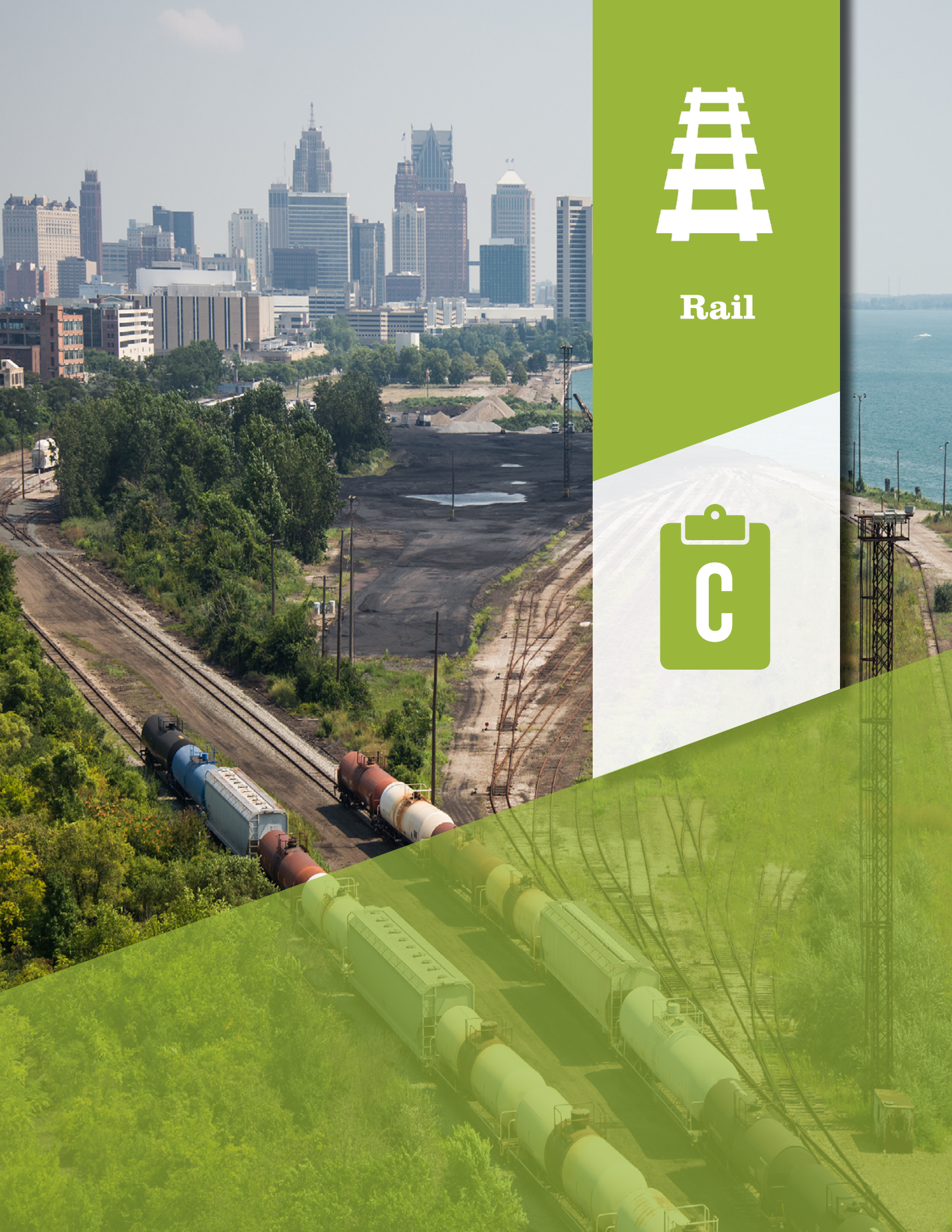
Huron-Clinton Metroparks, "2020 Park Access Plan," July 2020

Click On Detroit, "Electric vehicle charging stations coming to some state parks in Michigan: What to know," May 13, 2022, https://www.clickondetroit.com/news/michigan/2022/05/13/electric-vehicle-charging-stations-coming-to-some-state-parks-in-michigan-what-to-know/#:~:text=Around%2030%20electric%20vehicle%20charging%20stations%20are%20going,There%20will%20be%20others%20installed%20inland%20as%20well.

Friends of the Fred Meijer White Pine Trail, "Map," http://www.whitepinetrail.com/map, accessed August 2, 2022

PlaygroundEquipment.com, "U.S. States Ranked by State and National Park Coverage," accessed May 18, 2022, https://www.playgroundequipment.com/us-states-ranked-by-state-and-national-park-coverage/

Advance Local Media LLC, MLive, "Grand Rapids parks looks to add more full-time employees amid seasonal labor shortage," accessed April 11, 2023, https://www.mlive.com/news/grand-rapids/2023/01/grand-rapids-parks-looks-to-add-more-full-time-employees-amid-seasonal-labor-shortage.html



Rail

C

EXECUTIVE SUMMARY

Michigan's rail system has approximately 4,000 miles of track, 84% of which is owned and operated by 27 private railroad companies, with the remainder owned by the Michigan Department of Transportation (MDOT). 17% of freight moving in Michigan uses rail, transporting $194 billion annually in agricultural products, chemicals, large equipment, and other commodities. Three passenger rail services operate between Chicago and Michigan's cities, but the state is disconnected from high-ridership routes that connect Boston, New York, and Washington. Passage of the 2021 Bipartisan Infrastructure Law directed new funds, leveraged by state and private investment, for safety and service upgrades.

BACKGROUND

Michigan's rail system has approximately 4,000 miles of track. This track is operated by four Class I railroads and 23 short line railroads, all of which are private railroad companies. Except for 665 miles owned by MDOT and operated under contract by private companies, the rail infrastructure is privately owned.

Michigan is a peninsula state. Canada is Michigan's largest trading partner, and there are three (3) international rail border crossings in Michigan between Canada and the U.S. Michigan is at the epicenter of trade between Canada, Mexico, and the U.S. About 17% of freight tonnage that originates, terminates, or travels within Michigan moves via rail. The rail system moves over 89 million tons in commodities. By tonnage, approximately 21% of commodities move into the state and 19% move out of the state by rail. 46% of the tonnage moves through the state and 6% within the state using rail transport. The largest commodity types moved by rail include coal, chemical and allied products (including agriculture), transportation equipment, and metallic ore. Four (4) of the seven (7) Class I railroads operate in Michigan, as does Amtrak.

Michigan has three (3) intercity passenger rail routes that cover 521 route miles and serve 22 station communities. These routes directly serve approximately 750,000 passengers. Amtrak operates these services with a subsidy from the State. All three (3) routes link to the national rail network operated by Amtrak via Chicago. The Pere Marquette service connects Grand Rapids and Chicago via the CSX Transportation and Norfolk Southern (NS) corridors. The Blue Water service connects Port Huron and Chicago via portions of Canadian National (CN), MDOT, and Amtrak corridors. The Wolverine service connects Detroit/Pontiac and Chicago, with portions of the corridor owned by CN, NS, MDOT, Amtrak, and Conrail. The Wolverine service is part of the federally designated high-speed rail corridor; with speeds up to 110 miles per hour, it is one of the only places outside the Northeast Corridor where trains operate this fast. The 135-mile segment between Kalamazoo and Dearborn is owned by MDOT here after referred to as the Michigan Line. Under the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), all three (3) routes are now state supported. MDOT provides all operational and maintenance costs associated with the

services that ticket revenues do not. In addition, using state and federal funds, MDOT provides all maintenance and capital work funding on the Michigan Line.

Two (2) regional passenger rail routes, utilizing the existing infrastructure, are under consideration by local planning groups, but have not yet been implemented: Ann Arbor to Traverse City and Petoskey and Jackson/Ann Arbor to Detroit.

CAPACITY

Capacity on Michigan's rail system has only isolated areas of concern currently. However, the ability to accommodate future increased capacity is of concern, particularly in the Detroit metropolitan area, where federal freight forecasting models are predicting a 50% growth in tonnage by 2045. NS, CSX, and Conrail, in partnership with MDOT, are implementing improvements at Delray interlocking, the last staffed interlocking in the state, to eliminate a congestion point for freight trains. The long-standing project to build a new consolidated freight terminal in Detroit to address long-term capacity has not yet been completed.

Generally, most tracks can accommodate 286,000-pound rail cars, which is the current industry standard, with a few exceptions. Despite this, the state's rail infrastructure is not sufficient for planned increase in standards to 315,000-pound rail cars. The impact of the industry's push towards 315,000-pound capacity rail cars has not been assessed in Michigan.

Unit trains of the same commodity from origin to destination. Requirements of the railroads on shippers to handle larger capacity cars and longer trains turned quicker is a concern. Agricultural products are one (1) of the biggest commodities moved by rail. Unit trains are particularly important for Michigan's agricultural industry to remain competitive in the market. Current rail infrastructure configurations constrain capacity at yard locations, rail sidings, and shipping facilities.

Passenger rail ridership hit a record in 2013 when 795,996 people traveled the three (3) Michigan services, and in subsequent years was constrained by construction and COVID-19 travel restrictions. With improvements to the services that have been implemented recently, as well as new equipment scheduled to enter service later in 2022, ridership is expected to rebound and grow. A capacity analysis for the Wolverine Service was completed in 2016. There are plans to increase trips for the Wolverine Service to six (6) trips per day in the near term, with potential for up to ten (10) trips per day and add an additional roundtrip on the Blue Water and Pere Marquette by 2035. These planned increases are supported by the Amtrak Connect U.S. plan released in 2021. Amtrak and Canadian Pacific Railway (CP)/Kansas City Southern (KCS) announced plans to develop international service through the Detroit-Windsor Tunnel, which is favorable to passenger operation on the Wolverine service.

Once the infrastructure improvements on the Michigan Line and the new state-owned equipment is in operation the resulting speed increases and the associated travel time reductions will allow for the opportunity to economically increase frequencies between Chicago-Detroit-Pontiac. For new services expansions to grow there must be more local/regional champions to come forward and work in partnership with MDOT. Today, a missing link between Toledo and Detroit means a passenger traveling east/west has to detour to Chicago, or use unreliable bus connections, to arrive in Michigan.

New passenger rail support is emerging for a north Michigan passenger rail service between Ann Arbor-Traverse City-Petoskey but is not yet seen for the Holland-Grand Rapids-Lansing-Detroit service or other places. Metropolitan Planning Organizations in Michigan have been playing a role, and others need to step up too.

CONDITION

Track is generally kept in a condition appropriate for its current use. Unlike the highway system, rail speeds are assigned by segments of track, not routes. In turn, railroads can quickly make track improvements when warranted to accommodate a change in service demand. However, possibly even more so than on the roadway system due to the lack of alternative routing, rail bridge condition is critically important. 24 of the 215 rail bridges on the MDOT-owned system are functionally deficient.

MDOT rates surface condition of all the approximate 4,800 public roadway crossings of railway in the state. Over 95% of the public roadway crossings are in new, good, or fair condition. While MDOT has a long history of making investments in highway crossing surfaces, a new local roadway crossing surface program was added in 2017 to improve local crossing surface conditions at railways.

The overall condition of passenger rail stations is good. Several recently completed projects renovated existing or constructed new stations. While the condition of existing Amtrak passenger rail equipment is old and worn, new state-owned equipment for all three (3) routes in Michigan starting in 2022 and will continue over the next couple of years.

FUNDING

Because almost all of Michigan's rail infrastructure is privately owned and maintained, the funding for this infrastructure comes from the private sector. Historically, Class I railroads invest at levels to sustain current and somewhat for future operations, while short line railroads are less capable of providing this level of investment. Only roadway crossings, passenger rail operations and maintenance, and very limited capital improvement projects typically receive public dollars. In addition to the Michigan Tax Credit for investment in railroad infrastructure, Michigan legislators are looking at ways to bolster the state's investment in freight rail infrastructure improvement efforts.

For the past ten (10) years the Class I railroads have been making significant infrastructure investment to implement the federally mandated Positive Train Control (PTC) signaling system. For longer MDOT has been investing in infrastructure improvements to improve intercity passenger rail services for 110 mph maximum operating speeds. In 2023 the State appropriated additional funds for rail infrastructure investment to spur economic development. These investments are good, the question is will they be sustained?

The recent passage of the IIJA, aka Bipartisan Infrastructure Law, included $102 billion in dedicated rail funding ($66 billion of advanced appropriations and $36 billion in authorized funding). The framework for administering the IIJA funding is under development by the US Department of Transportation (USDOT). The IIJA, coupled with existing state, local, and private sector funding, may help shrink the funding gap helping to unlock Michigan's economic potential and advance the state's quality of life goals.

PUBLIC SAFETY

Total crashes on the Michigan rail system decreased from an average of 277 per year between 2000 and 2009 to an average of 169 per year between 2010 and 2019. There has been an approximate 20% reduction in car-train crashes at Michigan's public roadway crossings over the past five (5) years. Approximately 50% of the State's public crossings have active warning devices. However, crashes still occur at both actively and passively warned crossings.

The average number of trespasser fatalities per year decreased by 14% between the 2000 and 2009 period and the 2010 to 2019 period. The average number of fatalities at highway-rail grade crossings decreased by 40%, and fatalities from other causes declined by 73% between the same periods, leading MDOT to focus more on trespassers prevention. The injuries/fatalities related to trespassing incidents are of concern. Michigan continues to work closely with law enforcement agencies

and the railroad industry on opportunities to reduce incidents. MDOT, Amtrak, and the communities along the Michigan Line are working to implement trespasser countermeasures through a Federal Railroad Administration (FRA) grant and State funding.

The Rail Safety Improvement Act of 2008 (RSIA) mandated the implementation of PTC signaling systems on Class I railroads' main lines meeting certain conditions. PTC signaling systems are designed to prevent train-to-train collisions, over-speed derailments, incursions into established work zones, and movements of trains through switches left in the wrong position. Where required, PTC has been completed in compliance with requirements.

The five-year-old MDOT Crossing Surface program to fund local roadway crossing surface improvements has significantly improved crossing surface conditions, funding over 200 surfaces on local roads statewide.

The proposed legislation to create a state grade separation grant program and the new IIJA federal grade separation program have the potential to improve safety at high volume, high priority locations.

Michigan does not participate in the Rail State Safety Participation Program, consisting of States employing safety inspectors in the five (5) rail safety inspection disciplines. State programs emphasize planned, routine compliance inspections. States may undertake additional investigative and surveillance activities consistent with overall program needs and individual State capabilities.

The proposed legislation to create a state grade separation grant program and the new IIJA federal grade separation program have the potential to improve safety at high volume, high priority locations.

RESILIENCE

While concerns regarding routing redundancy and connections are not unique to Michigan, the State's peninsular geography and the location of its economic centers make routing concerns a more pronounced issue, especially in northern portions of the Lower Peninsula. In other parts of the country, if the track is out of service, there are reroutes available, even if long and with increased travel times. In the northern Lower Peninsula of Michigan there are no alternative routes. In addition, a series of recent unrelated events in Michigan have demonstrated how easily the system can "break" for the industries it serves. COVID-19 impacts on railroad staffing and material availability caused service disruptions in Michigan. However, on balance, the rail industry was able to respond in ways that worked to minimize the impacts of these events on the businesses that depend on rail.

INNOVATION

Most innovation in the rail industry is led by the individual Class I railroads, the seven (7) largest in the country, rail industry associations, and the FRA. With that said, Michigan is fortunate to have two (2) universities with significant rail programs. Michigan State University at the Broad College of Business has the Center for Railway Research & Education offering research and education in management specifically geared to the rail industry. At Michigan Technological University, the department of Civil, Environmental, and Geospatial Engineering has the Rail Transportation Program offering up to a Doctor of Philosophy (PhD) in rail related research. Students develop rail transportation and related engineering skills for the 21st century through an interdisciplinary and collaborative program that aligns Michigan Technological University Faculty and Students with the demands of the industry.

Rail

RECOMMENDATIONS TO RAISE THE GRADE

- Prepare Michigan's rail infrastructure for heavier and longer trains – bridges at least capable of today's 286K-pound capacity – and plan to upgrade to meet 315K-pound trains, with stacked containers, and more frequent, safe interactions between freight and passenger trains.
- Increase state financial support and local coordination for passenger rail with operations and capital investment to connect from Detroit to Toledo, increase frequency on the Wolverine to 8 and 10 daily trips, and provide additional roundtrips on the Blue Water and Pere Marquette.
- Continue to leverage federal funding opportunities in the Bipartisan Infrastructure Law to focus on long-term investment toward increased capacity and safety of freight and passenger service.
- Direct technical assistance, planning coordination, and workforce development so that rail service upgrades fit within an interconnected state and international network pulling travelers and shipping containers off Michigan roadways. Focus these efforts especially on proposed services: Ann Arbor-Traverse City-Petoskey, Holland-Lansing-Detroit and reestablishing connections to Toronto through Detroit and the east coast via Toledo and Cleveland.

SOURCES

The majority of the information for the Rail Report Card section was obtained through the MDOT Michigan Mobility 2045 Plan 2045 (MM2045) State Rail Plan Supplement. Attempts to reach out to most of the railroads in Michigan were made, with limited success. The lack of response was not unexpected; the information necessary for this report is deemed corporate sensitive and isn't shared. This is understandable due to the competitive nature of the transportation industry, not only between the railroads, but also between the railroads and trucking industry. Thanks to the MDOT Bureau of Transportation Planning and Office of Rail for their assistance and data in preparing this report.

Roads

D

EXECUTIVE SUMMARY

Traffic volumes have returned from pandemic-era lows. Vehicle miles traveled in 2021 were 97 billion, 95% of the 2019 number. Fortunately, the condition of roads Michiganders are driving on is improving, thanks in part to a 2017 funding package. Of Michigan's 120,000 miles of paved federal-aid-eligible roads, 25% are in good condition, up from 20% good in 2017. 42% of the roads are rated as fair, and 33% are in poor condition. Governor Whitmer's 2020 "Rebuilding Michigan Program" included $3.5 billion of one-time bond financing, accelerating major highway projects on state trunklines. To erase decades of underinvestment and meet future needs, decision-makers should increase dedicated funding for roads, re-tool fee models, prioritize traffic safety, and improve resilience to worsening environmental threats.

CONDITION AND CAPACITY

The Michigan Transportation Asset Management Council (TAMC) tracks pavement condition on the state's roadways under state and local jurisdiction. Their pavement condition forecasting system showed 25% of pavement in good condition, with 45% in fair condition, and 33% in poor condition. That's an improvement from 20% good in 2017 and reduction down from 40% poor in that same year.

The pavement tracking system estimates a continual decline in conditions between curbs using current funding models. As discussed below in the funding section, current dedicated funding, fee revenue, and estimated gas tax amounts show progress on pavement condition stalling and reversing. The percentage of paved roads in poor condition is forecasted to rise from 33 percent in 2023 to 48 percent in 2033 as depicted in the figure below.

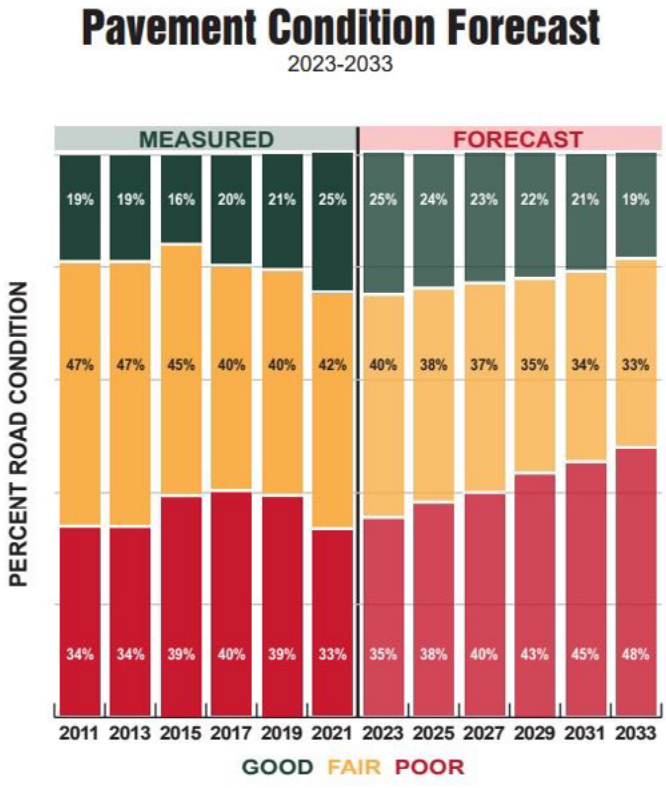


Figure 9 Source: 2021 TAMC

Per a 2022 report, "Where Are We Going" from the

Transportation Road Information Program (TRIP), Michigan households incur $1,093 each in additional vehicle operating costs because of deteriorated road conditions. Potholes and rough road surfaces accelerate and worsen damage to motor vehicles, increasing maintenance and repair costs. More fuel is consumed, and battery watt-hours drained, per mile as pavement conditions worsen.

In 2021, Michiganders drove 96.7 billion miles on the state's 120,000 paved, federal-aid roads, according to Michigan's Office of Highway Safety Planning. That's up from 86.3 billion during 2020's COVID-19 low, and 95% of 2019's 102.2 billion total – which had been stable at 102 billion the two years before. Per capita, that's 9,600 miles in 2021, up from 8,600 mi in 2020's COVID year and compared to approximately 10,200 miles in 2017-19.

According to the 2022 TRIP report, traffic delays due to congestion in the Detroit area increased by 15 percent from 2000 to 2019 from approximately and by 69 percent in the Grand Rapids area from approximately 10 million hours to 17 million hours. Those delays impact travel time reliability, or the uncertainty which motorists and freight operators have to account for: if a 30-minute trip sometimes takes 50 minutes without warning, road users have to plan for the extra 20 minutes.

The TRIP report lists the following highway segments as worst in Michigan on travel time reliability, for AM and PM peak times:

Rank	AM or PM	Metro Area	Route	From	To
1	AM	Detroit	I-75 SB	Chrysler Drive / Exit 78	I-75 BL / M-24 / Exit 81
2	AM	Ann Arbor	M-14 WB	US-23	Gotfredson Rd / Exit 15
3	AM	Ann Arbor	I-94 WB	State St / Exit 177	US-12 / Michigan Ave / Exit 181
4	AM	Detroit	I-75 NB	I-696 / Exit 61	14 Mile Road / Exit 65
5	AM	Detroit	I-75 SB	8 Mile Road/Exit 59	14 Mile Road / Exit 65
6	AM	Grand Rapids	I-196 EB	Fuller Ave / Exit 79	I-96 / M-37
7	AM	Ann Arbor	US-23 SB	Plymouth Rd / Exit 41	M-14 / Exit 42
8	AM	Detroit	M-10 SB	Webb St / Elmhurst St.	Wyoming St
9	AM	Detroit	I-96 EB	Milford Rd / Exit 155	Beck Rd / Exit 160
10	AM	Detroit	I-94 EB	30th St. / Exit 212	14th St.
11	AM	Detroit	I-696 WB	Southfield Rd / Exit 12	M-1 / Woodward Ave / Exit 16
12	AM	Grand Rapids	US-131 SB	Ann St / Exit 88	I-96 / M-37/Exit 98 (N)
13	AM	Detroit	I-94 WB	M-35 / Van Dyke / Exit 218	Cadieux Rd / Exit 223
14	AM	Detroit	I-275 NB	M-153 / Ford Rd / Exit 25	I-96 / M-14 / Exit 29
15	AM	Detroit	M-39 SB	Plymouth Rd / Exit 10	I-96 / Exit 11
16	AM	Detroit	I-75 NB	I-96/Ambassador Bridge/Exit 47 & 48	Grand River Ave Exit 50
17	AM	Detroit	I-75 SB	Clay Street / Exit 54	Caniff St. / Exit 55
18	AM	Grand Rapids	I-96 EB	Leonard St / Exit 36	M-21 / Exit 39
19	AM	Detroit	M-53	23 Mile Rd	26 Mile Rd
20	AM	Detroit	I-75 NB	M-59 / Exit 77	Chrysler Dr / Exit 78

Rank	AM or PM	Metro Area	Route	From	To
1	PM	Detroit	I-75 NB	I-75 BL / Exit 75	Joslyn Rd / Exit 83
2	PM	Detroit	I-696 EB	Orchard Lake Rd / Exit 5	M-10 / Exit 10
3	PM	Detroit	I-96 WB	Novi Rd / Exit 162	I-696 / M-5 / Exit 165
4	PM	Ann Arbor	I-94 EB	Ann Arbor Saline Rd / Exit 175	I-94 BR / US-23 / Exit 180
5	PM	Ann Arbor	US-23 SB	I-94 / Exit 35	Plymouth Rd / Exit 41
6	PM	Detroit	I-94 WB	14th St.	John R St / Exit 215
7	PM	Grand Rapids	I-196 EB	Fuller Ave / Exit 79	I-96 / M-37
8	PM	Detroit	M-39 NB	US-21 / Michigan Ave / Exit 6	Joy Rd. / Exit 9
9	PM	Detroit	I-75 NB	John R Rd/Exit 60	14 Mile Road / Exit 65
10	PM	Detroit	I-75 SB	11 Mile Road / Exit 62	Rochester Road / Exit 67
11	PM	Detroit	I-94 EB	I-96 / Exit 213	French Rd. / Exit 220
12	PM	Grand Rapids	US-131 NB	36th St / Exit 80	Cherry St / Exit 84
13	PM	Detroit	I-96 EB	8 Mile Rd / Exit 167	M-14 / Jeffries Fwy
14	PM	Detroit	I-94 EB	I-696 / 11 Mile Rd. / Exit 229	12 Mile Rd. / Exit 230
15	PM	Ann Arbor	US-23 NB	Silver Lake Rd / Exit 55	I-96 / Exit 60
16	PM	Grand Rapids	US-131 NB	Pearl St / Exit 85	Leonard St / Exit 87
17	PM	Detroit	I-94 EB	Harper Ave. / Exit 234	Metropolitan Pkwy / Exit 236
18	PM	Detroit	I-94 WB	Ecorse Rd / Exit 200	M-39 / Southfield Fwy / Exit 204
19	PM	Detroit	I-96 WB	7 Mile Rd / Exit 169	I-275 / M-14
20	PM	Ann Arbor	US-23 NB	Barker Rd / Exit 52	M-36 / Exit 54

Traffic data from 2021 and preliminary data from 2022 show a shift of motor vehicle traffic from traditional peak times associated with 9-5 office shifts. A TomTom Traffic Index in 2022 showed the worst traffic of afternoon rush in Metro Detroit shift into 3-5 PM compared to 4-7 PM in earlier years, potentially as teleworking residents run errands and shuttle children to after-school activities.

Traffic crashes significantly affect travel time reliability. The National Highway Traffic Safety Administration (NHTSA) estimates roadway crashes cost each Michigander $1,232 in 2019, the latest year for which data are available. That includes lost time, medical cost of care and insurance, economic activity lost, and motor vehicle insurance costs.

Increasing roadway dimensions is an expensive strategy for congestion relief, often resulting in environmental impacts. Strategies for capacity improvement can focus on changes within existing public right-of-way. Re-purposing existing space between curbs for dedicated transit use increases the operational performance of existing transit, better leverages investment in more frequent service, and raises the awareness and appeal of non-car alternatives. Upgrades such as bus-rapid transit increase the number of people a road can move per hour. Incorporating bicycle facilities with physical separation from vehicles increases the viability of bicycling as a transportation mode. Site-based transportation demand management techniques can also reduce roadway congestion.

Technology is a tool for improving capacity without expensive capital investment. MDOT is focused on getting the most out of the existing roadway network through the implementation of advanced technologies with Intelligent Transportation Systems. MDOT recently implemented a dynamic lane merge system, referred to as a “flex route”, along a high volume segment of US-23 to alleviate congestion and delays. Additional systems are planned on US-23 and I-96 in the next few years and improvements are expected.

An efficient transportation system moving goods and people, in and out of motor vehicles, is vital to successful commerce. Annually, $1.25 trillion in goods are shipped throughout Michigan, 78 percent of which are carried by trucks. The value of freight shipped from sites in Michigan, using inflation-adjusted dollars, is expected to increase 46 percent by 2045. A well-designed and highly accessible network of roads is more attractive for businesses considering locating or expanding in Michigan. Numerous firms cite reliable access to the interstate highway system and other major routes as a major factor for location choice.

OPERATIONS AND MAINTENANCE

With increased funding from state and federal sources, MDOT is reversing a years-long government employment trend by increasing their workforce. Governor Whitmer's draft budget for FY2024 includes 165 new full-time-equivalent positions at MDOT. The state agency and nine others in the Cabinet have been certified as Veteran-Friendly Employers through the Michigan Veterans Affairs Agency (MVAA). The veterans agency performs oversight on fellow agency performance for recruiting, training and retaining those public servants.

Winter storm maintenance is one area of Michigan roads infrastructure that feels the pinch of workforce challenges. During the COVID-19 pandemic and recently, MDOT and populous counties have reported struggles recruiting snow plow operators. The state agency uses approximately 450,000 tons of salt every winter, costing $25-$30 million.

PUBLIC SAFETY

Traffic safety in Michigan is better than national averages but shows disturbing trends in recent years. In 2021, there were 282,640 recorded crashes on Michigan roadways and 1,068 traffic fatalities. That's a rate of 1.17 deaths per 100M vehicle miles traveled and 10.8 deaths per 100K residents, lower than the national averages of 1.37 and 14.3 respectively. The 1.17 deaths per 100M VMT is down from 1.25 in 2020. However, both of those rates were jumps from a stable rate of approximately 1.00 from 2008 through 2019. 173 Michiganders lost their lives walking on roadways in 2021, and 170 in 2020 – significantly higher than 140 and 142 pedestrian deaths in 2019 and 2018 respectively. 2020's boom of bicycling sadly included 38 Michiganders killed while on state roadways and 28 in 2021, after averaging 22 in 2017-19.

People walking and biking are dying in Michigan where vulnerable road users and motorists are more likely to interact. From 2017 to 2021, the largest pedestrian fatalities per county were Wayne, Oakland, Macomb, Kalamazoo, and Ingham – in that order. Engineering and roadway design can protect human life with low-cost tactical designs for traffic calming, medium-cost pilot designs for road diets and re-envisioned intersections, and high-cost capital projects that separate road users by speed, mode, and ability. In addition to enforcement of speed limits and traffic safety laws, regular design review during repaving work can identify and modify roadway elements that induce unsafe user behavior.

Engineering interventions vary by context. For example, installation of cable barriers in the median of several high-speed freeways has significantly reduced vehicles from crossing into oncoming traffic. Improvements to roadway geometry, intersections, lighting, signs, and traffic signals all reduce the likelihood of traffic crashes. Cities throughout Michigan have implemented multimodal street redesign projects to improve the safety of all users for the past several years.

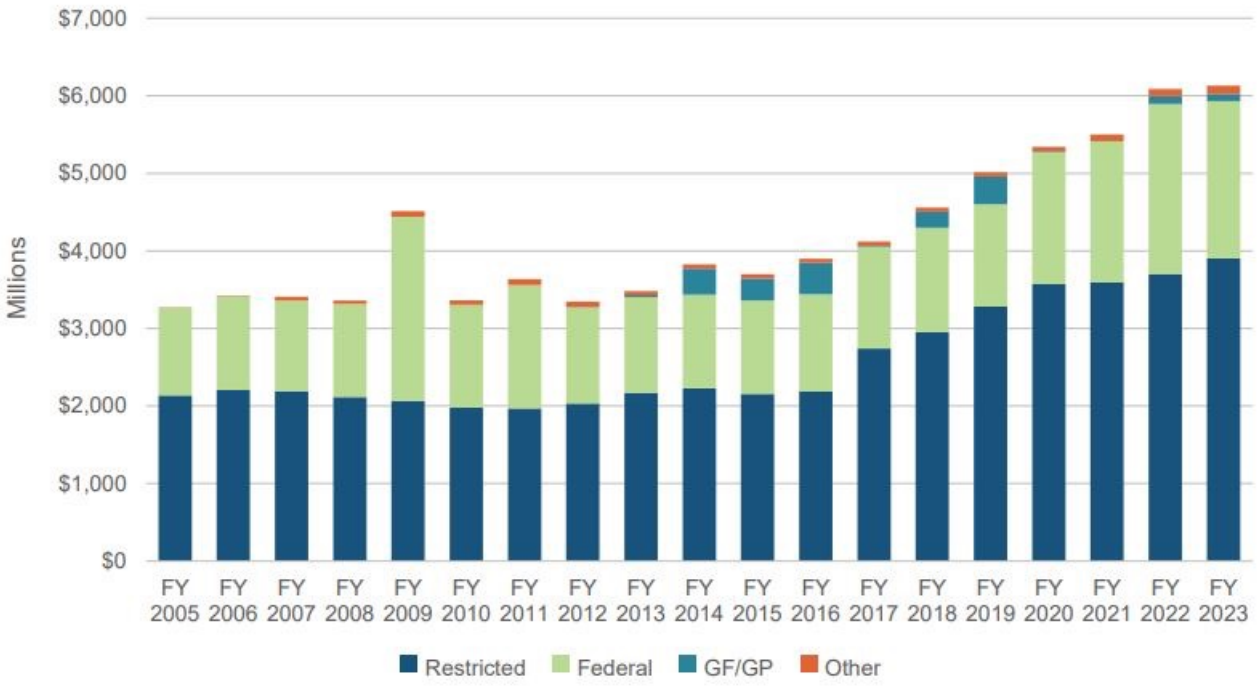
Local and state government should capitalize on pre-existing and new funding opportunities to improve the safety designs of roadways. The 2021 Bipartisan Infrastructure Law created a new Federal-to-local safety grant in Safe Streets and Roads for All (SS4A). City governments, counties, and regional coordination groups like SEMCOG can plan for, design, and implement even more projects that create safer and more welcoming conditions in their communities.

FUNDING AND FUTURE NEED

In 2020, the Michigan Governor introduced the Rebuilding Michigan plan which included the sale of $3.5 billion in bonds to fund projects on major highways over a 4-year period.

In November 2021, the President signed into law the Infrastructure Investment and Jobs Act (IIJA), aka Bipartisan Infrastructure Law. This federal legislation will provide Michigan approximately $336 million more per year (2022-2026) than under the previous transportation bill (FAST Act). Unfortunately, inflation and supply issues are undermining most of the increase as dollars are not going as far for transportation improvements.

Increases in state restricted funds beginning in FY 2016-17 reflect the November 2015 Road Funding Package. In FYs 2019-20 and 2020-21 federal aid includes COVID relief funding. Federal fund increases in FYs 2021-22 and 2022-23 reflect IIJA.



Note: FY 2008-09 increase in federal funds reflects ARRA "stimulus" program funding.

As indicated in the figure above, funding from state and federal sources has increased, but a substantial reduction is forecasted. The MDOT 5-year transportation program shows a total investment of $3.5 billion in 2023, but only $1.7 billion in 2027, a 51% drop. The revenue from fuel taxes has declined over the past several years due to improved fuel economy, and now with the increase in electric vehicles, revenue from motor fuel taxes is being further eroded. According to a study released by the Anderson Economic Group, by 2030 Michigan could lose $95 million in funding annually due to electric vehicles.

To maintain Michigan's progress on roadway and bridge condition outlined above – vehicle operating costs holding steady – TRIP estimates an additional $3.0 billion dollar investment need by 2031 and $3.5 billion by that year to "achieve a significant improvement in road and bridge conditions and performance." Those additional investments could also improve costs from safety and travel time unreliability but are not feasible with the funding picture explained above.

INNOVATION AND RESILIENCE

New technologies and materials, such as the use of recycled materials in pavement and full depth reclamation, are helping roads become more sustainable and resilient. The Michigan Statewide Transportation Innovation Council (STIC) brings together stakeholders to lead innovation, foster collaboration, and rapidly implement meaningful innovations. In 2021, Michigan received the National STIC Excellence award by the Federal Highway Administration for its efforts to foster a strong culture for innovation.

MDOT has also invested in Intelligent Transportation Systems strategies to help manage roadway congestion and provide information to drivers. MDOT's installation of sensors, closed caption TV cameras, and dynamic message signs disseminates travel time or alert information to motorists. Michigan is a leader in the development of autonomous/connected vehicle technology, with research and development at the MCity facility on the University of Michigan campus and the American Center for Mobility, an autonomous and connected vehicle testing facility constructed on the site of the former Willow Run bomber plant. These technologies are aimed at improving safety and mobility, reducing congestion, and supporting efficiencies and economic growth.

Resiliency of roadway design is an increasingly important consideration as more violent storms and more unpredictable, higher-magnitude temperature swings deteriorate pavement condition and concrete structures more quickly. It will save Michigan money in the long-run to design for tolerance to more extreme environmental threats, despite the additional upfront costs.

Resiliency of roadway design is an increasingly important consideration as more violent storms and more unpredictable, higher-magnitude temperature swings deteriorate pavement condition and concrete structures more quickly.

Roads

RECOMMENDATIONS TO RAISE THE GRADE

A deteriorating surface transportation system costs Michigan road users billions of dollars every year in wasted time and fuel, injuries and fatalities caused by traffic crashes, and wear and tear on motor vehicles. Making needed improvements to Michigan's roads is key to providing a safer, more efficient transportation system that will decrease fatalities, lower vehicle maintenance costs, and improve the state's economic livelihood. Therefore, we recommend the following to raise the road's grade:

- State leaders should provide substantial and sustainable investments that offsets the loss from fuel tax revenues with electrification and increases capability to reach and maintain high-quality conditions. Predictable, dedicated funding is essential from re-tooled models like road usage charges or other methods.
- Decision-makers at the state level should revise foundational transportation guidelines like Act 51 to successfully implement newer engineering design manuals such as the M2D2 Guidebook. Modifications should tie funding levels and performance measurements with the safety and movement of people in all travel modes, including new abilities to leverage state and federal funding for pedestrian and bicycle facilities outside curbs in public space.
- Michigan is a national leader in the establishment and development of a statewide asset management approach to managing its diverse transportation investment for roads and bridges. It is vitally important to continue this effort at all jurisdictional levels in order to provide the most efficient and effective use of transportation investment.
- Road designers and owners should review the total life cycle costs of the road to make strategic design decisions and prioritize maintenance and rehabilitation.
- As freight activity increases on Michigan roads, and adopts electrification, decision-makers and planners should facilitate and encourage improved travel time reliability and charging infrastructure ready to meet fleet demands in newer operational patterns.
- Michigan recently completed a statewide tolling study. The legislature and state leaders should evaluate and consider the strategic implementation plan contained in the study as a possible new method for funding the identified corridors.

Roads

SOURCES

21st Century Infrastructure Commission Report, Chapter 6, Transportation Recommendations, prepared by the 21st Century Infrastructure Commission, dated November 30, 2016.

Modernizing Michigan's Transportation System: Progress and Challenges in Providing Safe, Efficient and Well-Maintained Roads, Highways and Bridges, prepared by TRIP (a national transportation research group), dated March 2019.

Michigan's 2021 Roads & Bridges Annual Report, Michigan Transportation Asset Management Council

Where Are We Going? prepared by TRIP (a national transportation research group), dated April 2022.

The Impact of Electric Vehicle Adoption on Road Funding in Michigan, Anderson Economic Group, dated November 2022.

Michigan Statewide Tolling Study: Feasibility Analysis, completed by MDOT, HNTB and CDM Smith, Dated December 21, 2022.

Budget Briefing: Transportation, by William Hamilton, Senior Fiscal Analyst, House Fiscal Agency, dated February 2023.

Michigan Transportation Infrastructure Needs and Funding Solutions, Public Sector Consultants, dated March 2023.

Federal Aid in Michigan's Transportation Budget -Focus on the Federal-Aid Highway Program, House Fiscal Agency Fiscal Brief by William E. Hamilton, dated March 31, 2023.

2021 Statewide Traffic Crash Data Year End Report, Michigan State Police, Criminal Justice Information Center.

Overview of Motor Vehicle Crashes in 2021, USDOT National Highway Traffic Safety Administration, dated April 2023.

2023-2027 Five-Year Transportation Program approved by the State Transportation Commission on November 10, 2022.

Where Are We Going? Michigan's Current and Future Pavement and Bridge Conditions, Safety, and Congestion and Reliability Levels – April 2022, TRIP, on April 20, 2023

2020 U.S. Census and Census Reporter, on April 20, 2023

2023 TAMC Data Collection Manual, on April 20, 2023

TomTom Traffic Index 2022, on April 20, 2023

Car Crash Deaths and Rates, National Safety Council, on April 20, 2023

Michigan Traffic Crash Facts, Michigan Office of Highway Safety, on April 20, 2023

Fatality and Injury Reporting System Tool (FIRST), NHTSA, on April 20, 2023

M2D2 Guidebook, MDOT, on April 20, 2023

More Michigan state departments become Veteran-Friendly Employers, WLIX-TV, on April 20, 2023

There's a snowplow, salt truck driver shortage in Michigan: What it means for roads, Detroit Free Press, on April 20, 2023

The Economic and Societal Impact of Motor Vehicle Crashes, 2019, NHTSA, on April 20, 2023

Schools

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EXECUTIVE SUMMARY

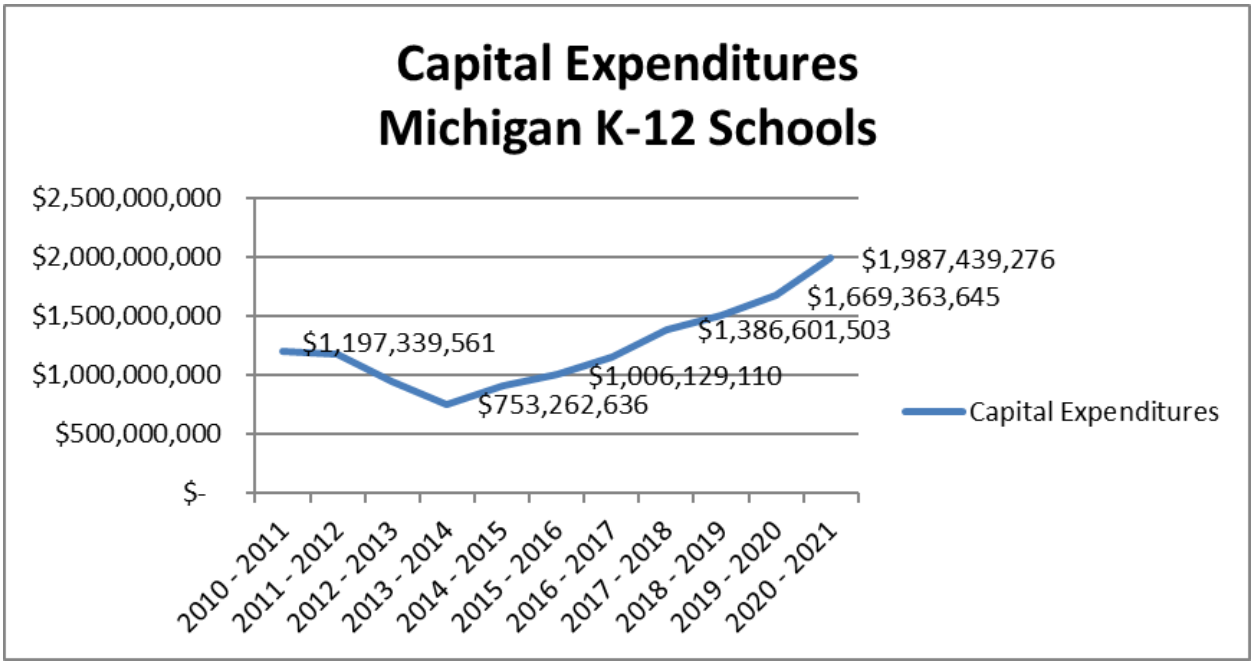
Michigan's educational facilities serve a critical role as community cornerstones. These institutions have made progress in rightsizing for leveling off enrollment and infrastructure investment shows positive trends. The state spent almost $2 billion on school capital expenditures during the 2020-21 school year, up from $1.7 billion and $1.4 billion in the previous two years. Per pupil facility spending in Michigan now roughly equals the national average of $1,376 per pupil. But much of recent investment comes from one-time increases expiring in 2024. Decisionmakers should direct predictable, dedicated infrastructure spending to schools, especially because the state is home to buildings constructed prior to 1970 – 50+ years ago – with some much older. Select systems at school facilities have seen upgrades to preserve functionality, but layouts often don't reflect the teaching needs of 21st century learners..

CONDITION

Michigan's schools continue to demonstrate a wide variety of conditions based on the individual community resources and approach to education. Overall, an increasing number of local K-12 districts have been able to make improvements and secure additional funds for capital expenditure. Investment in capital expenditures by Michigan's schools has more than doubled from 2014 – 2021 (see chart 1). Even after accounting for inflation in the design and construction markets over this time period, significant additional investments have been made in school capital outlays. Per pupil facilities spending in Michigan now roughly equals the stated national average of $1,376 per pupil, as documented by the National Center for Education Statistics (NCES).

There aren't aggregate data on usage of temporary or portable classrooms in Michigan. Strong building codes and plan approval processes make portable classrooms relatively expensive to implement in the state. Besides use on temporary basis to support construction, those alternative structures are not widely used.

The arrival of the COVID-19 pandemic has also brought a renewed focus on school facilities, specifically air quality and HVAC systems. Districts are examining air conditioning as a priority (along with increased ventilation rates and air purification systems) to improve both air quality and the learning environment. Along with this focus, Federal funds dedicated to air quality, food service, safety, security, and other dedicated programs attempt to address specific needs. These programs largely represent "one-time" funding sources with restricted uses and limited time horizons. The introduction of Elementary and Secondary School Emergency Relief (ESSER) funds boosted facilities spending, and was specifically targeted in communities with low-income students, as ESSER funds were partially distributed based on Title 1 guidelines. While not all these funds were earmarked for facilities, many schools made improvements in technology infrastructure, utilities, and learning environments. These funds will largely be spent by mid-2024.

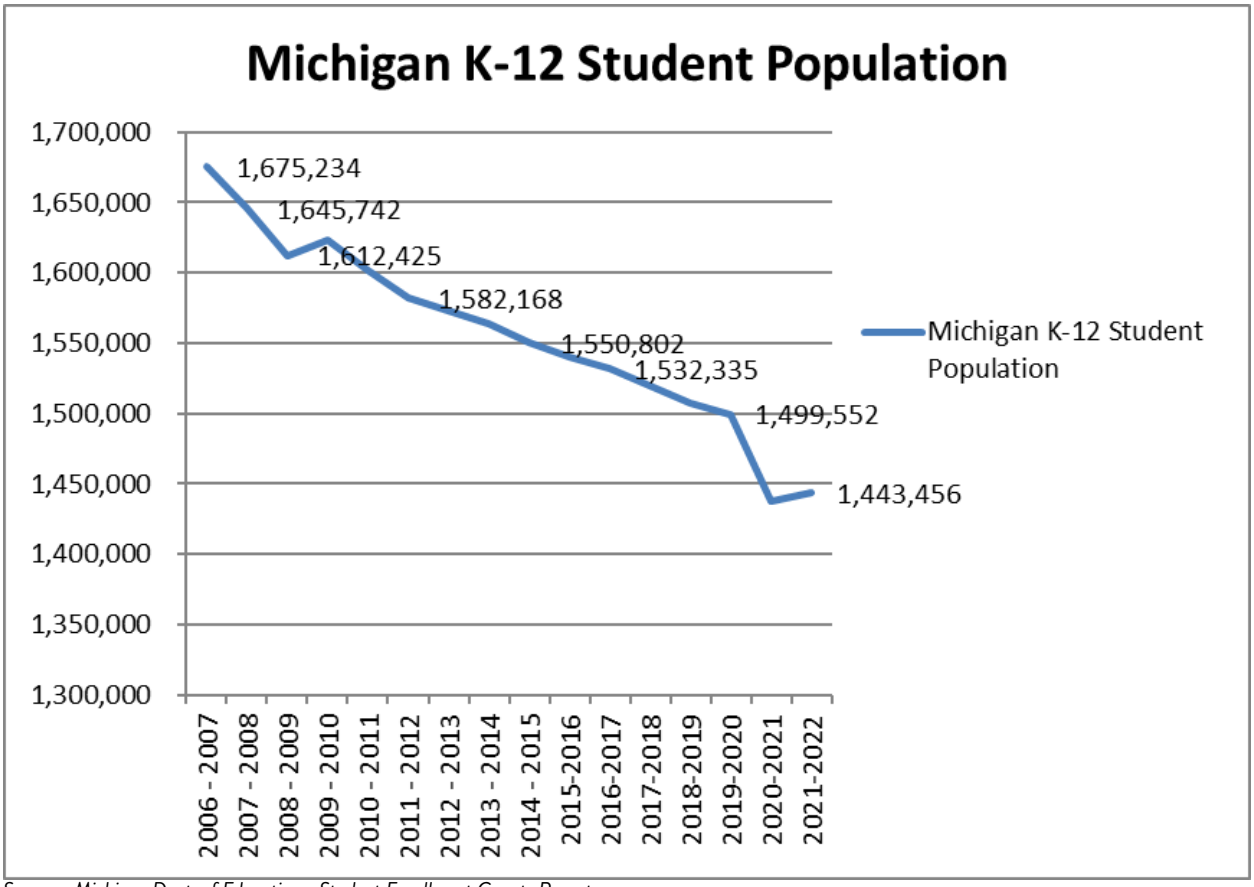


Source: Michigan Dept. of Education Bulletin 1011

CAPACITY

Michigan's schools maintain adequate overall capacity, although suburban schools in areas experiencing the heaviest population housing pressure, have been expanding. Based on the statewide declining enrollment of students, the capacity of Michigan schools will continue to be generally adequate. As the population of Michigan remains stable, school enrollment projections are largely predicted by the birth rates in the state. Based on an analysis of birth rates for the last 20 years, the rate of births appears to continue to slowly decline in Michigan, mirroring national trends.

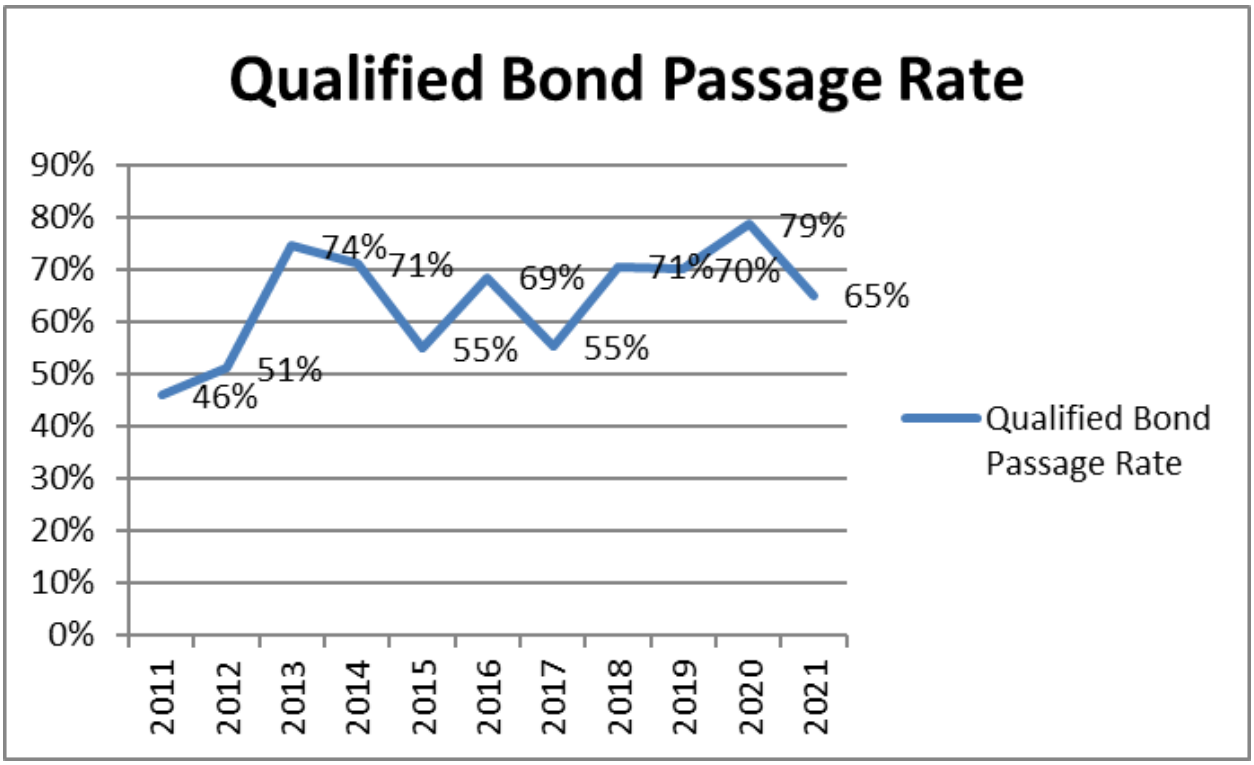
There aren't aggregate data on usage of temporary or portable classrooms in Michigan. Strong building codes and plan approval processes make portable classrooms relatively expensive to implement in the state. Besides use on temporary basis to support construction, those alternative structures are not widely used.



Source - Michigan Dept. of Education - Student Enrollment Counts Report

FUNDING

Despite recent, limited, influxes of additional funds, large scale capital improvements in Michigan's K-12 schools remain largely funded by local property tax millages. These millage issues have benefited from steadily increasing property values and favorable market conditions. While millage requests and passage rates remain stable, they also have been historically correlated to consumer confidence and require local voter approval. Millage programs also require planning years in advance of construction, often require multiple series to fund large projects, and many have fallen victim to a reduction in work scope due to quickly increasing construction prices. As interest rates and construction prices rise, school capital outlays will increase, but may not represent increased purchasing power or an equivalent improvement in facilities.



Source: Michigan Department of Treasury - School Bond Election Information

FUTURE NEEDS

Michigan's schools have made progress in recent years, increasing the nominal facilities expenditures, putting one time funding sources to work in facilities, developing and using strategic and master planning for facilities, and focusing on safety and security, but much work remains.

Michigan communities still utilize many facilities that were constructed prior to 1970 – now over 50 years old, with some much older. While select systems may have been updated to keep the structure functioning, the layouts may not reflect the teaching needs of 21st century learners. Recently constructed facilities benefit from flexible learning environments, forward thinking technology incorporation, and spaces that cater to a variety of teaching styles and curriculum. Outdated facilities that are in good condition may benefit from the slow student decline allowing redevelopment of existing classroom space into makerspace and collaboration spaces or small group instruction supporting the 21st century learning needs. Many school leaders face a planning challenge to use what they have, including current configuration, or replacement to allow a more modern layout and design.

While Michigan's K-12 schools largely saw a renewed appreciation for in-person instruction, Michigan's higher education institutions wrestle with future facility planning as enrollment generally lags5. Students are adapting to post COVID instruction including a mix of virtual and in person, rising student debt, and an increased focus on technical and trade schools. Michigan's higher education institutions will need to continue to adapt facilities to meet the demands of enrollees including adjustments to campus housing and curriculum.

PUBLIC SAFETY

There are limited data to analyze the safety of students and staff of public schools in Michigan. The National Center for Education Statistics2 reports that, as of 2020, 97.1% of American schools control access to buildings during school hours and 91.1% of public schools nationwide use security cameras to monitor the school. This is a significant improvement that's taken place over the last 20 years. However, that same organization says only 76.8% of faculty and staff are required to wear I.D. badges and only 10.1% require students to wear that identification.

Michigan created an Office of School Safety3, in 2018, under the Michigan State Police, which has prepared model security procedures, physical features to retrofit or install during building rehabilitation, training programs for firearm, behavioral health, and cybersecurity concerns, plus a voluntary program to bring school resource officers to campus. Data appear unavailable to analyze the uptake of these model procedures in K-12 or higher education contexts, where physical security has been threatened in recent tragedies at Oxford High School and Michigan State University. Many security improvements have proven to be difficult and expensive due to limitations of existing building and site layouts and will require significant building and site changes to achieve best security design practices.

The safety and asset management of school buildings and physical infrastructure is remarkably un-reported in Michigan. The state requires safety drills for weather, violent threats, and other emergencies – but not mandated inspection and reporting procedures for the facilities on campus.

Through the implementation of Public Act 144 of 2022, The Michigan Legislature allocated funding grants for building-by-building 3rd party safety infrastructure assessments. Many districts received these grants and have performed or are currently performing these assessments as of the writing of this report. Significant subsequent grant funding has also been approved in the current 2023-2024 budget to implement security recommendations from the initial reports. Fiscal Year 2023-24 state school budgets also included significant.

The safety and asset management of school buildings and physical infrastructure is remarkably un-reported in Michigan. The state requires safety drills for weather, violent threats, and other emergencies – but not mandated inspection and reporting procedures for the facilities on campus.

OPERATIONS & MAINTENANCE

Many schools continue to struggle to replace basic building systems including roofing, mechanical, and plumbing based on limited available operations budgets and quickly rising construction costs. Facilities staff creatively extend the service life of these systems, with many well beyond design expectancy. Mechanical, electrical, and life safety systems have also become more technologically integrated with increased complexity and experience obsolescence driven by technology and serviceability versus mechanical obsolescence. Based on a study updated in 20154, Michigan remains one of only 11 states in the country to not provide dedicated facility funding through either lump sum or matching aids. FY2023 budgets did provide a onetime appropriation for school facilities, but these funds were largely earmarked for consolidation, electric buses, or other narrow purposes. A consistent funding source that provides the ability to enact planned replacement and obsolescence schedules of core infrastructure such as roofing or heating systems would provide a more reliable response for struggling districts.

The Michigan State Legislature and Governor Whitmer also included funding in the FY2023 budget, specifically Section 11y of State School Aid, to develop a process to assess all school buildings in the State of Michigan. This process has the potential to create standardization in assessment criteria and priorities, as well as provide copious data on the conditions of K-12 school facilities throughout the state and globally identify the financial scope of facility needs.

INNOVATION

Educational facility managers continue to improve awareness of operations cost and focus on energy efficiency. Many projects include a life cycle analysis of building systems, with medium to long range horizons. As with security improvements, much of the low hanging fruit, including LED lighting upgrades and building management systems have been accomplished. Schools continue to grapple with increasing energy efficiency demands on new and significantly remodeled buildings as Michigan considers incorporation of the updated Michigan Energy Code in 2022. Buildings will continue to become more energy efficient and "smarter" and districts will have to adapt to the associated upfront costs, as well as energy cost benefit analysis. Geothermal and solar projects have been gaining popularity with many districts taking advantage of third-party developers to offset initial investment for these systems. Long term maintenance, third party agreements and energy purchase rates have been obstacles for wide adoption of the technology however the opportunity to leverage these technologies for energy savings continues to expand.

Schools

RECOMMENDATIONS TO RAISE THE GRADE

To improve the performance of school infrastructure in Michigan:

- Address facility funding inequity – While public schools receive very similar per pupil funding for education from the State of Michigan, major facility renovation projects remain almost exclusively funded using local district or independent school district (ISD) wide property tax millages. Those with large property tax bases and supportive voters continue to have access to more capital than their peers.
- Additionally, schools with declining enrollment may struggle to secure funding to improve remaining facilities and continue to operate at a level similar to districts with growing student population and tax base. We continue to recommend funding mechanisms that adopt a consistent, e quitable, baseline facility funding source for districts across the state.
- Implement reasonable physical security recommendations garnered from the school security assessments conducted in many districts over the past year. Carrying out these improvements will likely require additional financial resources, some of which were allocated in current year budgets, with additional resources likely needed.
- A comprehensive response to the statewide, ISD led, school facility assessments. currently being designed will also move school facilities forward. How this data is collected, analyzed, and subsequently acted on, will determine the trajectory of many declining K-12 school facilities in Michigan. We ask that leaders of this effort continue to keep engineers, designers, and contractors who specialize in school facilities at the table as this process is implemented.
- Coordinated code improvements – Michigan schools benefit from the focus of institutional code officials who ensure public safety. These schools also sometimes encounter conflicts between priorities of safety, fire, energy, and other rules. We'd encourage continued collaboration between those developing and enforcing code to create consistent policy that balances all the risks school occupants face and considers how schools renovate and continue using aging facilities given their funding sources. School structures function as community hubs and need to be robustly constructed and resilient in order to function as a haven in local emergencies and natural disasters. The continued coordination and focus of code, engineering, and public safety leaders will ensure schools facilities provide maximum value to the communities they serve.

SOURCES

Michigan Department of Treasury

Security statistic - https://nces.ed.gov/programs/coe/indicator/a19

Michigan Office of School Safety establishment https://www.michigan.gov/msp/divisions/grantscommunityservices/school-safety

Duncombe & Wang - https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1364078

National Student Clearinghouse Research Center - https://nscresearchcenter.org/current-term-enrollment-estimates/

Solid Waste

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EXECUTIVE SUMMARY

Municipal solid waste (MSW) disposed of in Michigan totaled approximately 17 million tons in 2021, a slight decline from previous years. Daily per capita waste generation is approximately 7.32 pounds, nearly double the national average. Michigan's solid waste disposal infrastructure remains industry competitive, with approximately 26 years of landfill disposal capacity remaining. Michigan's estimated residential recycling rate was 19% in 2021, up from 14% in 2016. While this is encouraging, the recycling rate is still much lower than the national average of 32%. Michigan is aiming for 30% recycling by 2030 and, since 2019, the number of households with available curbside recycling and drop-off sites has nearly doubled. To accomplish those goals and sustain recent progress, Michigan should expand the prevalence of residential and commercial recycling and composting at the curbside, paired with market incentives to minimize, divert, or reuse plastics.

CAPACITY AND CONDITION

For purpose of this report, MSW consists of wastes streams that could be landfilled, including residential, commercial, and other wastes, as identified in the "Report of Solid Waste Landfilled in Michigan." In 2021, over 17 million tons of MSW were disposed of in Michigan landfills. MSW imported and disposed in Michigan landfills was more than 3 million tons, approximately 17 % of the 2021 total. For comparison, in 2018, the total landfilled waste in the U.S. was 292.4 million tons. Michigan, with only 3% of the U.S. population, represented 6% of the total waste disposed in landfills nationally, a value impacted by imported waste streams. On average, Michigan disposed of 1.7 tons of MSW per person, compared to the U. S. average of 0.88 tons per person.

As shown on Table 1, since 1996, the overall total MSW disposed in Michigan increased by 12.1%, but yearly fluctuations occurred that appear to coincide with economic cycles and fluctuations in the volumes of imported MSW. Peak landfilling occurred in 2004 (21.4 million tons) and the greatest volume of imported waste occurred in 2006 with 2.3 million tons from surrounding states, and over 4 million tons from Canada, representing 30.9% of total landfilled MSW in Michigan.

TABLE 1 - MICHIGAN HISTORICAL WASTE DISPOSAL

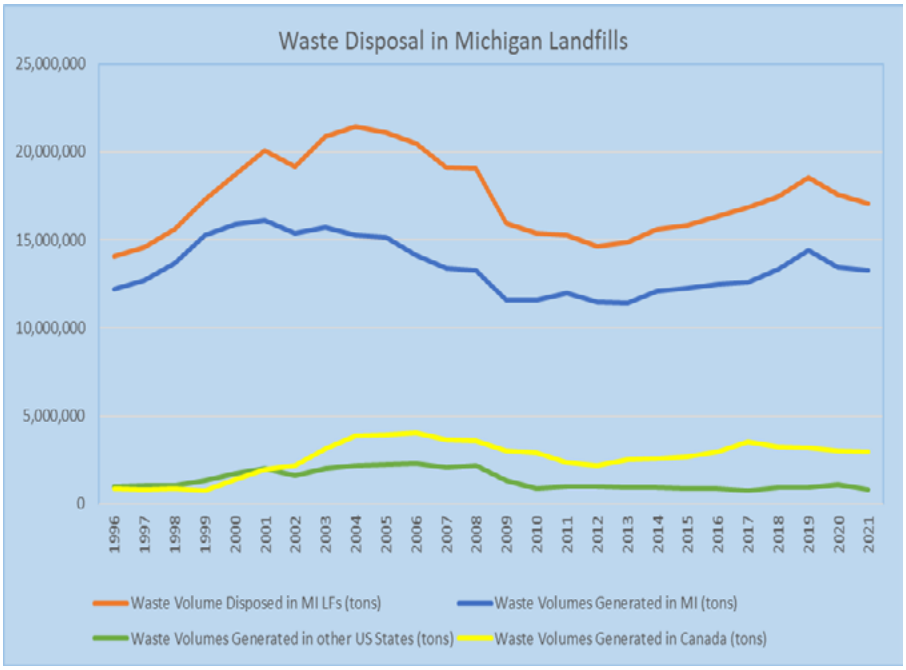
Year	Waste Volume Disposed in MI LFs (tons)	Waste Volumes Generated in MI (tons)	Waste Volumes Generated in other US States (tons)	Waste Volumes Generated in Canada (tons)
1996	14,094,134	12,225,765	1,011,731	884,858
1997	14,556,547	12,698,550	1,025,504	834,960
1998	15,580,411	13,649,043	1,062,117	849,605
1999	17,319,155	15,260,745	1,344,031	780,930
2000	18,717,437	15,884,131	1,738,705	1,405,605
2001	20,083,537	16,087,345	1,992,590	1,964,913
2002	19,180,307	15,348,826	1,628,862	2,202,619
2003	20,871,810	15,689,023	2,026,456	3,144,343
2004	21,429,085	15,260,221	2,192,468	3,852,966
2005	21,098,372	15,145,748	2,204,076	3,959,364
2006	20,501,110	14,155,926	2,316,882	4,028,302
2007	19,129,356	13,411,074	2,057,287	3,660,995
2008	19,039,965	13,304,545	2,161,365	3,574,055
2009	15,945,906	11,583,788	1,343,994	3,018,124
2010	15,374,312	11,600,955	854,352	2,919,005
2011	15,242,667	11,952,640	962,318	2,327,709
2012	14,629,515	11,495,178	970,917	2,170,741
2013	14,867,088	11,411,053	928,567	2,531,572
2014	15,575,820	12,093,906	943,412	2,546,389
2015	15,805,947	12,287,504	890,966	2,686,981
2016	16,354,546	12,496,296	896,931	2,961,319
2017	16,868,231	12,574,642	769,282	3,524,307
2018	17,481,738	13,310,776	914,167	3,256,795
2019	18,568,215	14,441,501	948,659	3,178,054
2020	17,565,749	13,462,213	1,085,573	3,017,963
2021	17,058,299	13,294,314	796,086	2,967,898

From EGLE's 2005 Annual Report of Solid Waste Landfilled in Michigan

From EGLE's 2016 Annual Report of Solid Waste Landfilled in Michigan

From EGLE's 2021 Annual Report of Solid Waste Landfilled in Michigan

FIGURE 1



As depicted on Figure 1, 2005 marked the beginning of a trend in declining annual MSW disposal in Michigan landfills that extended to 2012. During this period, which roughly coincided with the national economic recession, the amount of MSW landfilled in Michigan fell from 21 million tons to 14.6 million tons, an overall decrease of 30.7%. In the last few years, total landfilled MSW increased slightly, averaging approximately 17 million tons over the last 8 years, with imports from other states and Canada remaining relatively stable, averaging approximately 5 % and 17 %, respectively.

Solid Waste Composition

Michigan licensed landfills are categorized based on the type of waste disposed. These include: Type I (hazardous waste), Type II (residential, commercial, and institutional waste), which can also dispose of Construction and Demolition (C&D) and Industrial Waste (IW), and Type III (C&D and industrial wastes). Currently, excluding hazardous waste facilities, Michigan has 67 active Type II and Type III landfills (including all subcategories). [1]

Remaining Landfill Disposal Capacity

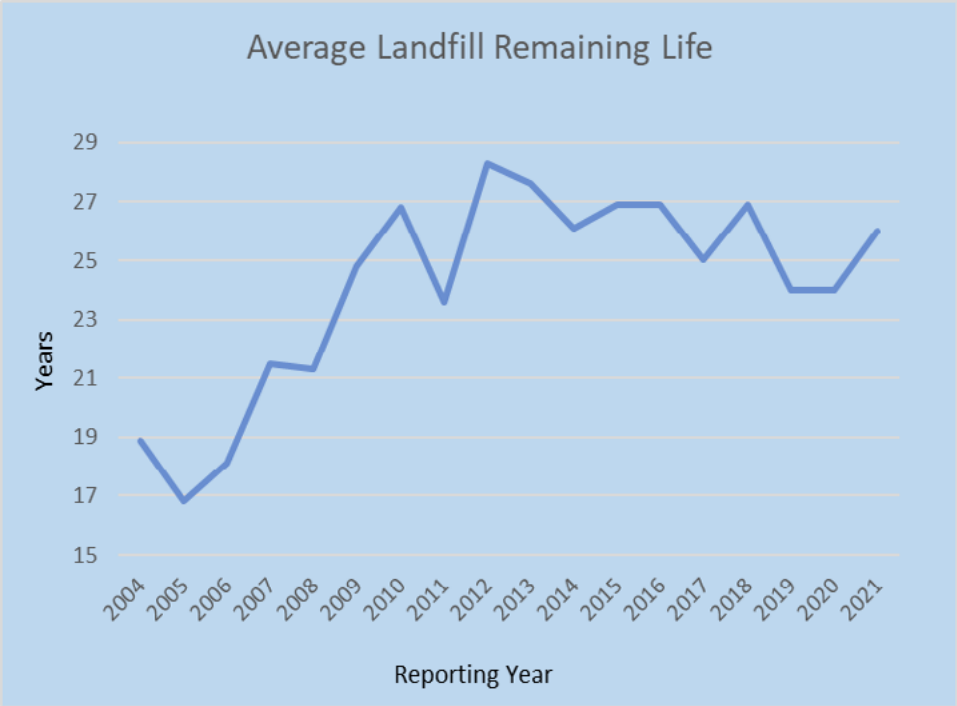
Michigan law requires each county to prepare a Solid Waste Management Plan to demonstrate waste disposal capacity for at least 10 years, or submit annual reports to certify compliance. Any county that reports capacity less than 66 months is subject to automatic siting criteria enforced by Michigan's Department of Environment, Great Lakes, and Energy (EGLE).

At present, all Michigan counties have access to disposal capacity more than 10 years, available in-county or via inter-county agreements. Based on EGLE's 2021 database, the capacity of individual landfills varies widely (2 to 431 years); however, the total available capacity of Michigan's 50 non-captive Type II landfills located within the state's 83 counties is more than 500 million cubic yards (175 million tons). At existing disposal rates, this equates to approximately 26 years of remaining disposal capacity.

As indicated in Figure 2, the overall remaining capacity trend of non-captive landfills has generally increased since 2004 when Michigan Department of Environmental Quality (MDEQ, now known EGLE) began tracking this statistic.

1 C&D waste is regulated similarly in Michigan under Subtitle D (a federal regulation), so C&D is disposed as MSW in Type II landfills, but not vice-versa.

FIGURE 2



Michigan's substantial landfill capacity results in a lower disposal fee than compared to surrounding states. The Environmental Research & Education Foundation (EREF) January 2021 report "Analysis of MSW Landfill Tipping Fees – 2020" indicates that within the U.S. Environmental Protection Agency (EPA) Region 5 states (i.e., Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin), the average landfill tipping fee ranges from $36/ton (Indiana) to $61/ton (Wisconsin); Michigan's average is $43/ton, the second lowest in EPA Region 5.

The abundant landfill capacity and relatively low disposal fees are typically cited as the primary factors contributing to Michigan's relatively low residential recycling rate. Landfill diversion for beneficial reuse and recycling will be addressed as part of county solid waste plan updates, many of which have not been revised for more than two decades. As part of this effort, Michigan is shifting its focus to materials management, where future county solid waste plan updates will be transitioned to materials management plans to increase recycling access, infrastructure, and market development. Increased composting, including food waste, is a goal so long as odor, vermin, and PFAS issues can be addressed.

Michigan has a statewide goal of increasing its recycling rate to 30% by 2025 and 45% by 2030. To achieve this goal, six priority initiatives were established: increasing residential recycling access, revising Part 115 solid waste laws, launching market development initiatives, having state office buildings "leading-by-example" in recycling, developing a statewide "education and engagement campaign," and obtaining funding for recycling and solid waste management.

The most recent data indicate that Michigan has steadily increased its recycling rate from what was historically the lowest in the Great Lakes region, and lower than the national rate (32%, including composting). Michigan's rate has increased one-third, from 14.25% prior to 2019 to 19.3%, based on EGLE's analysis. The increase in rate is attributed to Michigan's awareness program and increased public access to recycling services. Since 2019, the state has nearly doubled the number of households with available curbside recycling and drop-off sites. Additionally, grants to business and local government partners have helped with this effort.

MSW Recycling Facilities

Based on available information, MSW recycling operations occur primarily at material recovery facilities (MRFs) owned and operated by both public and private sector organizations. There are 65 MRFs located in Michigan; seven located in the Upper Peninsula (UP) and 58 in the Lower Peninsula (LP), with a few others planned or under construction. These facilities separate most traditional recyclable materials (e.g., metal, plastic, paper, and glass) generated in the state and sell to end-users in Michigan and elsewhere in the country.

Contaminated recyclable materials continue as an obstacle to increased recycling rate, which is an ongoing consumer education issue that the industry is addressing.

Contaminated recyclable materials continue as an obstacle to increased recycling rate, which is an ongoing consumer education issue that the industry is addressing.

OPERATIONS AND MAINTENANCE

Since 1965 Michigan has been establishing operating standards to prevent nuisance from MSW landfills; and in 1978, Michigan amended the solid waste regulations to establish siting, design, and monitoring requirements to be protective of human health, welfare, and the environment. Previous unregulated "dumps" or unlined facilities were closed or upgraded to meet existing regulatory requirements.

FUNDING & FUTURE NEEDS

Similar to Michigan, each of the six EPA Region 5 states use a variety of financial mechanisms to fund their respective MSW programs. Each state collects a waste disposal surcharge, which ranges from $0.36/ton to $13.00/ton, with Michigan charging the least and Wisconsin the most. Ohio, compared to other Great Lakes states, is most analogous to Michigan with respect to solid waste management infrastructure and population, appropriated nearly $20.7M for their solid waste program in 2016 compared to Michigan's $11.7M. This translates to $1.78 per capita/year in Ohio and $1.11 per capita/year in Michigan spent on solid waste management programs administered by the Ohio EPA and EGLE, respectively.

Michigan's state-level MSW program is funded by a combination of fees and legislative appropriations that cover EGLE staff salaries, expenses, and various grants distributed to local communities for recycling and pollution prevention activities. In 2021, the total budget allocated to administer the solid waste program was $15.9 million. EGLE's solid waste program employs 58 staff, or full-time equivalents. The budget also included $15.2 million from Renew Michigan funds to support recycling, staffing, and other related costs. This fund will be allocated on an annual basis to support recycling infrastructure, market development, and counties/municipalities' materials management planning activities.

Nearly half of EGLE's funding source is a $0.12/cubic yard ($0.36/ton) surcharge from all non-captive MSW landfills, which totaled nearly $4.5 million in 2021. Other major user fee-based funding sources include facility construction permits and operating licenses, as well as scrap tire, medical waste, and e-waste program registration and surcharge fees.

Approximately one-third of EGLE's solid waste program budget is allocated to pollution prevention and recycling grants, with scrap tire pile cleanup and market development projects the major recipients. Michigan also charges a $0.75/ton to be placed in a perpetual care fund for non-captive landfills, capped at $2.5M per facility, for use to manage facility environmental protection systems during the 30-year post-closure period or in the event of site abandonment.

At the local level, landfills and recycling centers are often privately-owned or publicly owned with contracted operators, both of which are for-profit.

INNOVATION

The waste industry continues to innovate with respect to safety, increased recycling, air space utilization, leachate treatment, gas to energy, and long-term materials management strategy.

Recycling innovation includes robotics and automation that improve MRF overall efficiency. The industry continues to innovate consumer education to reduce materials contamination that will increase recycling rates and reduce landfill disposal.

RESILIENCE

The waste industry is overcoming issues related to the COVID-19 pandemic (e.g., supply-chain management and driver shortages). Leachate per- and polyfluorinated alkyl substances (PFAS, the so-called "forever chemicals") management/disposal is an ongoing, growing challenge for the waste industry and wastewater treatment plants.

For PFAS, destruction technology research is underway. Meanwhile, landfills (and other industries) are working on source reduction to reduce wastewater treatment plan discharges.

Solid Waste

RECOMMENDATIONS TO RAISE THE GRADE

To increase its overall recycling rate and reduce landfilling, Michigan should take the following steps:

- Continue/increase EGLE's Materials Management Division (MMD) budget and grant programs to build on the current momentum to reach long-term recycling and beneficial reuse goals. This includes improving the current measurement, tracking, and reporting system; education, outreach, and technical assistance programs; market development and innovation support; updating county solid waste plans; and continued state-level leadership, as well as funding to enact the plan.
- Increase MSW diversion through composting and capitalize on side-effects by converting methane release into renewable energy, for example.
- Implement public-facing and resident-focused recycling programs, such as plastic bag fees at point of sale, rules to minimize packaging in consumer goods, and maximize the availability of curbside recycling and compost/food waste bins.
- Create incentives to increase recycling efforts by ensuring that recycling facilities and composting operations properly manage materials received, minimizing cross-contamination from single-stream recycling.
- Continue collaboration with wastewater treatment plants to reduce PFAS (and other "emerging contaminants") impacts to the environment and encourage legislative appropriation to address these growing and important societal issues.

SOURCES

Advancing Sustainable Materials Management - US EPA. https://www.epa.gov/sites/default/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf

"Analysis of MSW Landfill Tipping Fees: 2020 (PDF)." Environmental Research Education Foundation, https://erefdn.org/product/analysis-msw-landfill-tipping-fees-2/

"Announcing the 2020 State of Curbside Recycling Report." The Recycling Partnership, https://recyclingpartnership.org/stateofcurbside/

"Annual Reports of Solid Waste Landfilled in Michigan." Michigan Department of Environment, Great Lakes, and Energy, https://www.michigan.gov/egle/about/organization/materials-management/solid-waste/solid-waste-disposal-areas/annual-reports-of-solid-waste-landfilled-in-michigan

Defining and Measuring Solid Waste Recycling and Disposal, US EPA. https://www.epa.gov/sites/default/files/2015-09/documents/region_5_state_measurerment.pdf

EGLE Waste Data System (WDS)." Michigan Department of Environment, Great Lakes, and Energy. http://www.egle.state.mi.us/wdspi/Home.aspx/

Environmental Fees for Various Waste Categories ($/Ton) Revised 4/15/2022. Wisconsin Department of Natural Resources, https://dnr.wisconsin.gov/sites/default/files/topic/Landfills/EnvironmentalFeeSummary.pdf

Solid Waste

SOURCES (Cont.)

List of EGLE Registered Composting Facilities - Michigan Department of Environment, Great Lakes, and Energy. https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/MMD/Compost/Registered- Sites.

pdf?rev=8dcb1bab0bd74b1c88e655e6b625272a&hash=A751BA25BB64AB6F-DA39C53593CDA795

Managing Waste. "Solid Waste Reporting." Managing Waste, Indiana Department of Environmental Management, 30 Sept. 2022, https://www.in.gov/idem/waste/resources/solid-waste-reporting

"Michigan EGLE Recycling Reporting Fiscal Year 2021 Report." 2021 Annual Report Part 175." Michigan Department of Environment, Great Lakes, and Energy. https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/MMD/Recycling/2021-Annual-Report-Part-175.pdf?rev=62330a646d254d2db-9156661c9a1614e&hash=EC5CEB4361269B8B7F5C060767D22441

Michigan Recycling Coalition, https://michiganrecycles.org/part-115-update/#:~:-text=%2415%20million%20of%20the%20Renew,waste%20laws%20are%20finally%20adopted

Person. "Michiganders' Recycling Rate Reaches All-Time High as Access Grows, New EGLE Analysis Shows." EIN News, Michigan Department of Environment, Great Lakes & Energy, 22 Apr. 2022, https://www.einnews.com/pr_news/569612488/michiganders-recycling-rate-reaches-all-time-high-as-access-grows-new-egle-analysis-shows

Posted Gate Landfill Tip Fees for Municipal Solid Waste in Wisconsin . Wisconsin Department of Natural Resources. https://dnr.wi.gov/topic/landfills/documents/lftipfees.pdf

Published by Ian Tiseo, and Jun 21. "U.S. MSW Generation per Person 1960-2018." Statista, 21 June 2022, https://www.statista.com/statistics/186348/us-municipal-solid-waste-generated-per-person-since-1960/

"Solid Waste and Recycling Advisors." Michigan Department of Environment, Great Lakes, and Energy, https://www.michigan.gov/egle/about/Groups/Solid-Waste-and-Recycling-Advisors

Solid Waste Management Planning, Ohio Environmental Protection Agency, https://epa.ohio.gov/divisions-and-offices/materials-and-waste-management/dmwm-programs/solid-waste-management-planning

"Solid Waste Planning." Michigan Department of Environment, Great Lakes, and Energy, https://www.michigan.gov/egle/about/organization/materials-management/solid-waste/planning

Staff, America Counts. "Michigan's Population Topped 10 Million in 2020." Census.gov, 14 Apr. 2022, https://www.census.gov/library/stories/state-by-state/michigan-population-change-between-census-decade.html

"Wisconsin – Waste Disposal Surcharges." Institute for Local Self-Reliance, 15 Feb. 2022, https://ilsr.org/rule/waste-surcharges/wisconsin-waste-surcharges-2/

Stormwater

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EXECUTIVE SUMMARY

Stormwater management systems in Michigan provide flood protection, impact water quality, improve agricultural production, and extend the service life of roads. Stormwater threats from intense weather are growing. Total annual precipitation has increased by approximately 14% in the Great Lakes Region since 1900, but the amount of precipitation falling in the heaviest 1% of storms has increased by 35% since 1951. There have been 7 federal disaster declarations in Michigan related to severe storms and dam breaks in the past 10 years. Both public and private storm sewer systems do not have the capacity to safely convey water from those extreme water events. Recent implementation of asset management programs identifies greater needs and regulatory constraints. County road commissions own 75% of Michigan roadways for example, but funding for their drainage systems is capped by the State Drain Code at only half of necessary stormwater investment needed.

BACKGROUND

Water defines Michigan, which is home to 20 percent of the world's available freshwater, four of the Great Lakes, more than 11,000 inland lakes, 76,000 miles of rivers, 6.5 million acres of wetlands and more than 3,200 miles of freshwater coastline - the longest in the world. Additionally, Michigan has over 1,200 public beaches and over 1,400 public boat launches that support nationally recognized recreational opportunities. Stormwater management systems play an integral role in protecting and restoring these water resources. In fact, one in five Michigan jobs is directly related to water resources. The state is increasingly reliant on freshwater resources to achieve economic development, tourism and recreation opportunities.

Historically, design criteria focused on conveying stormwater from developed areas quickly and efficiently downstream through large infrastructure systems. Stormwater best management practices became more prevalent in the 1980s to provide greater flood control and to improve stormwater runoff quality. Modern design criteria, by contrast, focus on opportunities to manage rainfall where it lands through green infrastructure systems (e.g. infiltration/filtration and volume reduction), while also addressing flood control and conveyance alternatives.

Stormwater systems can include any combination of enclosed and open conveyance systems, underground and aboveground detention basins, and green infrastructure. Systems are owned and operated by cities, villages, townships, county road commissions, county drain commissioners, state and federal agencies and a multitude of private entities. Michigan also has combined sewer areas (CSOs), which are designed to collect everything from domestic sewage, to rainwater runoff, to industrial wastewater in the same pipe. Many lack adequate controls for wet-weather overflows, which result in untreated wastewater discharging to nearby bodies of water.

Patterns in precipitation have also been changing all across the Great Lakes Region. Since 1900, total annual precipitation has increased by approximately 14% in the Great Lakes Region. Since 1951, the amount of precipitation falling in the heaviest 1% of storms has increased by 35% . The highest multi-year average precipitation was recorded for the 2015 to 2020 period.

In 2019, Michigan experienced a record of close to 42 inches of annual rainfall, much higher than the annual average of 32 inches between 1985 & 2019 [NOAA State Climate Summaries].

Property damage from flooding is increasing. In 2014, more than 6 inches of rainfall occurred in Southeast Michigan resulting in over $1.8 billion in damages and a federal disaster declaration. In 2018, more than 5 inches of rainfall occurred in Houghton, Michigan resulting in more than $100 million in damages to public infrastructure. There have been 7 federal disaster declarations in the state related to severe storms, flooding, and dam breaks in the past 10 years. These disasters have resulted in nearly $450 million in FEMA disaster assistance funding to the state.

CAPACITY AND CONDITION

Municipal Systems

The majority of local governments lack adequate financial means to address stormwater issues. Recent condition assessments for several Michigan communities revealed that up to one third of storm sewer systems require structural rehabilitation to maintain their function in future years.

Based on an urban population of 7.4 million (U.S. Census, 2010) and typical per-capita quantities of storm sewer assets in Michigan communities, our estimate for the total urban stormwater infrastructure in Michigan is as follows:

- 38,000 miles of storm sewer pipe
- 725,000 manholes
- 1.6 million inlets and catch basins

While much of the stormwater infrastructure described is focused on separate storm sewer systems, combined sewer systems (CSOs) and the reduction of stormwater entering these systems are still high priorities in Michigan. Because green infrastructure works towards multiple outcomes including reduced treatment costs, basement backups, street flooding and untreated overflows into local waterways, in addition to beautifying and stabilizing neighborhoods, it continues to play a major role in addressing uncontrolled CSOs in Michigan. Focusing on reducing stormwater runoff volume into CSOs enhances the capacities of these systems and moves towards achieving water quality standards.

Private Drainage Systems

Private stormwater systems include catch basins and storm sewers under parking lots, minor storm sewers in residential areas outside of the right-of-way, and stormwater detention or retention ponds that are constructed to control peak flow rates. No system is in place to easily identify, track and determine private stormwater system functionality or maintenance needs. This is largely due to lack of funding at the local level. In many cases, both public and private storm sewer systems do not have the capacity to safely convey rainfall for the 5-year or 10-year rainfall event.

County Drainage Systems

There are approximately 41,000 miles of regulated county and inter-county drains in Michigan and more than 50% of them are open drains. More than 50% are over 75 years old and more than 30% are over 100 years old. Open drains are estimated at 65% of the total mileage, with the remaining 35% representing enclosed (pipes and culverts) systems. Replacement value of open drains is assumed to be $100/foot, and $200/foot for enclosed systems. Current maintenance practices for County Drainage systems are impacted by antiquated funding limitations set by the State's Drain Code. Currently, only $1,400 on average is invested per mile of County Drain per year. However, estimates suggest that this is an underinvestment of 80% to 90%. The limited resources that County Drain Commissioners have are often dedicated to basic maintenance only, such as open drain mowing and service calls.

State and County Road Systems

According to MDOT, 9,668 miles of road are state owned, 21,200 miles are owned by municipalities, and 89,444 miles are under the jurisdiction of County Road Commissions. It's estimated that approximately 80,000 miles of Michigan roads have linear drainage

infrastructure. Typically, the drainage component of roadway projects is 5% to 15% of the total project cost.

Limited transportation budgets increase challenges when addressing the underinvestment in Michigan's transportation infrastructure, including stormwater management. Continued underinvestment in stormwater infrastructure for the transportation network exacerbates the challenges in improving the quality of the state's water resources.

Flooded roads will cause user delays and result in considerable economic impacts. A recent study in Southeast Michigan estimated a flooded highway to cause tens of thousands of person hours of delay and an average of over $150,000 for each hour of closure. These values are considerable higher for peak travel times. For example, if all road segments in the region identified as highly exposed (i.e., highly likely to flood) were to be closed to flooding for just 1 hour, it would result in a total of over 2,271,345 person-hours of user delays (valued at over $36 million).

OPERATIONS AND MAINTENANCE

Asset Management

Asset management provides an opportunity to manage infrastructure in a more cost-effective manner, based on condition assessment and desired outcomes. While Michigan is a national leader with a statewide asset management program for roads, stormwater infrastructure is typically left out. Michigan is now leading a program to align underground infrastructure with roads in a more comprehensive asset management program, something no other state is doing.

Between 1982 and 2012, the total urbanized area in Michigan increased by nearly 50%. During the same time-period, the population increased by only 8%. This trend has continued over the past 10 years in much of the state. This reveals that we are expanding the size of infrastructure without increasing revenue. In other words, land is being developed quickly, with a focus on subdivisions in urban fringe areas at the expense of urban cores. These newly developed communities require additional lane miles, drinking and sewer pipes, but lack the density of population to fully pay for the needed infrastructure expansion. Finally, with the addition of stormwater quality and quantity rules applying to urbanized areas, we have added more Best Management Practices (BMPs) to the developments. Adding these components to a development requires more inspection, maintenance, and system management in order to provide a well-functioning system. Maintaining these assets in the future will be more complex than it has been in recent decades.

RESILIENCE & INNOVATION

Michigan has been a leader in development watershed management plans and programs that identify goals, objectives and actions to work towards achieving water quality standards and removing beneficial use impairments (BUIs) in local water resources.

Managing stormwater on a watershed basis to achieve local, regional and state environmental outcomes is critical to improving the state's stormwater infrastructure systems. Opportunities may include simple policy changes within codes and ordinances to more elaborate partnerships that seek to align resources through principles of asset management for construction of stormwater management systems.

Joint action and collaboration among jurisdictions to manage stormwater on a watershed basis is critical to strategically aligning financial and environmental objectives.

Michigan is behind other states with innovative materials and practices in stormwater infrastructure. Performance based specifications for new infrastructure are not required, which can shorten the actual service life of stormwater infrastructure.

Better estimates of future rainfall are needed for infrastructure design and management. The National Oceanic and Atmospheric Administration analyzes historical rainfall data to inform different rainfall and storms to plan for in reports known as Atlas 14. An update to these reports that includes the most recent years of increased rainfall would provide a better standard for future work.

FUNDING AND FUTURE NEED
Municipal and Private Systems

In 2018, the total investment in Michigan to eliminate uncontrolled Combined Sewer Overflows (CSOs) was estimated at $4 billion. The cost to continue eliminating CSOs in 2022 has certainly increased. In 2016, the 21st Century Infrastructure Commission Report approximated the annual statewide cost to identify and assess the condition of stormwater infrastructure will range from $400-$500 million per year. However, recent estimates in just 7 Southeast Michigan counties suggest that chronic underinvestment has led to an annual investment need of nearly $1 billion to get current systems into good condition. These values do not include privately owned systems or address improvements needed to alleviate flooding.

County Drainage Systems

County Drainage Systems need an additional $330 million annually for proper maintenance and renewal of those systems.

Stormwater Enterprise Funds in Michigan

Michigan is far behind its neighbors in the development of enterprise funds (i.e. "utilities") for municipal stormwater systems. This is largely due to legal precedent (Bolt v Lansing and Jackson County v City of Jackson) where stormwater utilities have been deemed "illegal taxes" under the Headlee Amendment of Michigan's Constitution. This has prevented the spread of stormwater utilities in Michigan. Currently, over 1,850 cities in the U.S. have a stormwater utility, while in Michigan, fewer than ten cities have one. Our neighboring states are far ahead of Michigan in establishing funding sources for stormwater: Wisconsin has 133 cities with a stormwater utility, Ohio has over 115, and Indiana has nearly 100.

Although there is proposed legislation to enable the creation of stormwater utilities in Michigan, it will be necessary for that legislation to be fully enacted before there is a mechanism to provide a dedicated funding source for this vital component of our infrastructure.

Several Michigan communities are exploring the concept of creating a stormwater utility. These efforts have revealed that local property owners and businesses are generally amenable to a dedicated funding source for stormwater if that cost can be linked to demonstrated need and if property owners are charged based on their relative demands on the system.

Asset Management Planning

The State of Michigan, through the Michigan Department of Environment, Great Lakes, and Energy (EGLE), has committed $450 million to allow communities to develop Asset Management Plans for stormwater and wastewater systems. Nearly 280 individual applications were received for Stormwater Asset Management Plans, totaling over $115 million in grant funding. These recently developed Asset Management Plans have highlighted the following:

Alarming budget gaps currently exist for stormwater systems since the vast majority of Michigan cities have no dedicated funding source for Asset Management Plans.

Communities do not have funding or staffing to regularly inspect their storm sewer systems. Because of this, public works staff are often unaware of where the next emergency will surface. Many communities have no rehabilitation/replacement programs for storm sewer systems.

Deterioration forecast modeling for numerous Michigan communities has revealed that systems will begin to fail with increasing frequency unless more investment is made to systematically rehabilitate aging sewers (i.e. fixing cracks, replacing structurally deficient pipes, etc.). This problem is more acute for older communities where the average asset age is over 60 years. Although younger communities (recently-developed suburban areas) do not yet require immediate attention, they will age; proactive asset rehabilitation and replacement programs will benefit all cities by reducing the frequency and cost of emergency repairs.

Stormwater

RECOMMENDATIONS TO RAISE THE GRADE

- Establish a dedicated source of funding for stormwater systems. This funding source needs to support collaborative planning, design, construction and long-term maintenance. Without a consistent, reliable source of funding, stormwater systems and the quality of our water resources will continue to deteriorate. Having a funding source would also allow stormwater system owners the ability to tackle larger projects with long term low interest loans.
- Integrate flexibility into regulatory programs for public agencies to address local stormwater challenges across jurisdictions.
- Stormwater systems are owned by multiple jurisdictions that lack integrated and collaborative planning mechanisms. Regulatory programs are also structured by jurisdiction, further reducing collaboration. Changing precipitation patterns also warrant a more holistic approach when addressing water resource challenges.
- Amend the County Drain Code to increase the statutory spending limit. The limited resources that County Drain Commissioners have are often dedicated to basic maintenance only. Underinvestment is driven by a statutory spending limit of less than $1 per foot of drain per year without a petition meeting the requirements of the Drain Code or a resolution to exceed the maintenance limits from a municipality.
- Align infrastructure improvements to achieve a sustainable future for our water resources. These improvements should include adopting principles of asset management across all infrastructure sectors, evaluating use of innovative materials, using performance-based specifications, and securing multiple funding mechanisms.
- Fund mainstream tools for data-driven decision-making. This includes asset management software, life-cycle cost analysis, and affordable rate structuring. This would allow more stormwater systems across the state to create comprehensive plans to manage their systems more effectively.Incorporate future rainfall into design standards. Design infrastructure projects to be resilient. Base the design on rainfall projections for the design life of the infrastructure and evaluate the design over the expected service life.

Stormwater

SOURCES

The stormwater grades are based on information collected from a variety of sources including:

- A survey of 54 different Michigan communities including City, County, State and local government councils.
- Governor's 21st Century Infrastructure Commission
- Michigan Water Strategy
- Southeast Michigan Council of Governments
- County Road Commissions
- County Drain (Water Resource) Commissions
- Cities, Towns and Villages
- Urban communities
- Rural communities.

SEMCOG Climate Resiliency and Flooding Mitigation Study.
https://www.semcog.org/wipg

NOAA State Climate Summaries
https://statesummaries.ncics.org/chapter/mi/
https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

Transit

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EXECUTIVE SUMMARY

n 2021, Michiganders took 32.6 million trips across 88 public transit systems in all 83 counties. The reliability and availability of transit services in many areas is inadequate to meet demand or attract new riders. Existing fleets and facilities are aging. The ability to invest in vehicle procurement, facilities upkeep, and larger capital improvements is constrained due to lack of funding. Over the next 25 years, public transit in Michigan needs $17.3 billion in investment. Of this total, approximately $5.9 billion is unmet needs under current revenue forecasts. The state is also experiencing a shortage of qualified bus operators and mechanics to operate and maintain transit fleets, which constrains service and limits growth potential. Greater funding from predictable, dedicated sources – state and local funds to match increased federal dollars – is necessary for Michigan to improve and expand transit services.

BACKGROUND

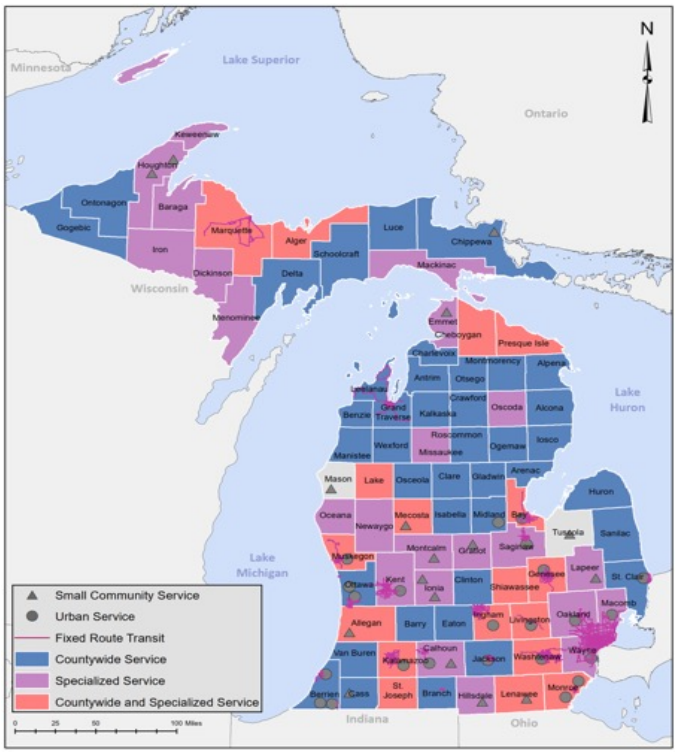
Michigan has 88 public transit agencies, which provide transit services to the general public within their local service areas (Figure 1). Twenty-one of those public transit agencies serve urbanized areas and 57 serve rural areas. In addition, MDOT provides financial support to 37 specialized providers whose services focus on people with disabilities and senior citizens. All 83 counties in Michigan have some form of transit service through the public transit agencies and specialized providers.

CAPACITY

Michigan transit has made significant improvements in recent years, including in the following areas:

- Laker Line Bus Rapid Transit (BRT) - Interurban Transit Partnership (aka The Rapid) launched the Laker Line BRT service, which connects Grand Valley State University to downtown Grand Rapids' Medical Mile.
- Fast, Affordable, Safe, Transit (FAST) Routes – Suburban Mobility Authority for Regional Transportation (SMART) launched three new express bus routes on Michigan, Woodward, and Gratiot Avenues.
- DART Regional Fare – SMART and Detroit Department of Transportation (DDOT) worked in partnership to develop a unified regional fare pass.
- SMART Flex – SMART launched three on-demand service zones in Clinton Township (along M-59), Troy, and Dearborn.
- Detroit to Ann Arbor (D2A2) Express Bus – Regional Transit Authority of Southeast Michigan (RTA) launched the D2A2 express bus service connecting downtown Ann Arbor to downtown Detroit.
- Battery electric buses - Blue Water Area Transit (BWAT) operated by the Blue Water Area Transportation Commission became the first public transit agency in Michigan to deploy fully battery-electric buses in its fleet.

FIGURE 1: TRANSIT AGENCIES IN MICHIGAN



In addition, there are multiple studies taking place within Michigan that are looking to bring additional enhancements to the existing transit network, which include:

- RTA recently approved an updated Regional Master Transit Plan (RMTP) that includes a strategic agenda for expanding and enhancing transit within its jurisdiction. This includes advancing major corridor projects and modernizing the existing fare payment system.
- The Rapid recently completed the Mobility for All study, which was a comprehensive look at the transit system and the Division United study, which was a targeted look at integrated land use and transit improvements to support development of a key corridor in Grand Rapids. The Rapid is scheduled to begin an update of its overall transit master plan in Spring 2023
- Capital Area Transportation Authority (CATA) is proposing a pilot program to use large (40-foot) automated electric buses on two existing fixed routes on the campus of Michigan State University (MSU) in East Lansing, Michigan.
- The Ann Arbor Area Transportation Authority (TheRide) is in the process of completing a long-range plan, TheRide 2045, and it is working to move forward with a large upgrade to its Ypsilanti Transit Center.

CONDITION

Between 2015 and 2019, local transit in Michigan saw a 5 percent decrease in overall ridership numbers, as shown in Table 1 below. The ridership decline reflects trends such as increased use of transportation network companies (e.g., Uber, Lyft) and more frequent working from home. Before the onset of the COVID-19 pandemic, there were some signs of the trend reversing. Specifically, there were significant route level ridership increases on the SMART FAST services and other premium services throughout the state. The COVID-19 pandemic caused an even greater reduction in ridership over the course of 2020 and 2021.

TABLE 1: 2015 – 2019 STATEWIDE OPERATING TRENDS

	2015	2016	2017	2018	2019
Riders	88,867,543	88,977,342	86,370,448	84,611,391	84,078,927
Service Hours	6,786,412	6,931,875	6,591,479	6,765,456	6,944,857
Service Miles	96,984,142	99,545,093	105,188,664	108,122,144	111,303,659

Michigan's transit agencies continue to utilize and maintain an aging fleet of vehicles to provide transportation services. In 2018, the Federal Transit Administration (FTA) required all transit operators develop Transit Asset Management Plans (TAMPs). In Michigan, 21 urban providers developed their own TAMP and the Michigan Department of Transportation (MDOT) developed a group TAMP for the remaining rural and non-profit providers. The MDOT group TAMP highlighted in 2018 that 16 percent of vehicles are past their useful life. A review of the urban provider TAMPs revealed vehicle replacement and maintaining an acceptable average vehicle age remains the top priority. However, facility modernization and expansion are a growing concern that is often overlooked, underfunded, and uncompetitive for large discretionary grant programs.

OPERATIONS & MAINTENANCE

Almost all categories of transit providers in Michigan saw operational expenses increase between 2015 and 2019, driven in part because labor and fuel costs. The largest increase has been in the urbanized areas, but rural service operators have also seen operational costs grow by more than 10 percent in this five-year time frame. Across the state, transit service expenses have risen nearly 15 percent since 2015. At the same time, transit is experiencing shortages of qualified bus operators and mechanics to operate and maintain transit fleets.

FUNDING & FUTURE NEED

Adequate, sustainable, and predictable funding for public transit's operating and capital needs have been challenging for many years.

Michigan Mobility 2045 (MM2045), the state's recently updated long-range transportation plan, projected revenue needs for the complete multimodal transportation system, including public transit, over the coming 25 years. Overall, Michigan's transportation needs are estimated to total $164.6 billion for all modes in that time period. For public transit, the total needs for the next 25 years are estimated to be $17.3 billion. Of this total, approximately $5.9 billion would be unmet needs under current revenue forecasts.

Transit receives funding from the federal, state, and local sources. Federal funding is provided in accordance with the Infrastructure Investment and Jobs Act (IIJA), aka Bipartisan Infrastructure Law, which is a five-year authorization bill that was approved in November 2021. IIJA includes $1 billion in transit formula funds over the next five years for Michigan, which is approximately a 30 percent increase over previous levels. State funding is provided through the Comprehensive Transportation Fund (CTF), which was established in 1951 by the Michigan Legislature through Public Act 51 (known as Act 51). Revenue sources for the CTF come from a portion of the state's motor fuel taxes, vehicle registration fees, and sales taxes on automobile purchases. These fees have lost their purchasing power because of inflation, fuel efficiency, and are rarely sufficient to sustain operations.

There are limited options for local transit operators to raise their own funds for operations and match for capital projects. Most agencies that raise local funds do so through local government general fund contributions and/or direct property tax millages. Currently, only the RTA in metro Detroit formed under a specific state law can raise vehicle

registration fees to enhance local transit funding. All other regional transit authorities that were formed under different state laws are not eligible to raise local transit funding through vehicle registration fees. Currently, local option sales taxes, which is a popular funding option in peer states to support public transit services, are not permitted under state law. Other options that could be explored include Transit Development Districts (TDDs), highway and managed lane tolling, income taxes, and fuel taxes. In addition, passenger fares as an overall percentage of funding continue to be lower than average while ridership still recovers from the COVID-19 pandemic.

PUBLIC SAFETY

Michigan's transit agencies experience about 10 collisions per million vehicle miles of bus transit travel. According to MDOT's Public Transit Management System Safety Data from 2016 to 2020, there was a 66 percent decrease in property damage only (PDO) accidents, and PDO accidents greater than $25,000 in damage stayed relatively flat. MDOT is embarking on a Resilience Improvement Plan in 2023 that will contextualize the relative safety of transit travel relative to passenger vehicles.

RESILIENCE

A resilient transit system is critical for achieving sustainable healthy communities by contributing to environmental quality, fostering economic vitality, and minimizing social disparities. Additionally, a resilient transit system avoids, minimizes, and mitigates risk. It can absorb the impacts of disaster, recover quickly, and return rapidly to providing the services that customers rely on to meet their essential travel needs. Transit in Michigan is proving its resilience by demonstrating these sustainability impacts as it works to build back from the effects of the COVID-19 pandemic. That ongoing recovery would not have been possible without federal recovery legislation that included specific funding for supporting transit operations and recovery. Additional funding will be needed for infrastructure that supports truly resilient operations, facilities, and workforce needs to optimize these beneficial and essential impacts to the communities transit serves.

INNOVATION

Technology advances in the last decade are dramatically impacting the public transit industry. Connected vehicle technology allows for installation of transit priority signals at high-ridership intersections, better service information to users, and real-time sensor data to manage operations through high-ridership periods and identify fleet maintenance concerns. Further planning, investigation, piloting, deployment, and integration of these transit technology advancements is an important need for operators. Research into connected and automated transit vehicles also continues to advance rapidly.

MDOT has been on the leading edge of these advancements through the following efforts:

- Lead participant in the Automated Bus Consortium.
- Working to develop a statewide Mobility as a Service (MaaS) platform. MaaS is the integration of many mobility services, generally through a smartphone app-based system that coordinates multiple travel options to complete a single trip. OPT is exploring a statewide MaaS project that would enable people anywhere in the state to connect with available transit options in their area.
- Supporting several agencies in piloting on-demand transit solutions. SMART and The Rapid both recently launched on-demand pilots that are leading the way in showing the integration of these solutions into our service offerings.

Transit

RECOMMENDATIONS TO RAISE THE GRADE

- **Create new funding tools to support transit operations and capital needs.** Transit reliability, state of good repair on fleet and facilities, and service levels attracting "choice riders" requires a combination of local, state, federal, and private investments. Michigan's Comprehensive Transportation Fund is not sufficient, and regulatory changes could close the gap. Examples include enabling local transit funding through flexible models such as vehicle registration fees, local sales taxes, Transit Development Districts, dedicated funds from tolled lanes, and transit surcharges on fuel taxes.
- **Follow-through on regional transit vision with state and local matches for federal dollars**. The RTA of Southeast Michigan was established a decade ago to implement a regional vision of bus-rapid transit, local transportation demand management, and eventually frequent light-rail in high-traffic corridors. The 2021 Bipartisan Infrastructure Law including a beefed-up FTA Capital Investment Grant program provides significant funding to accomplish RTA plans but requires state and local matching funds. Financial commitments from the state legislature and regional authorities would super-charge RTA's efforts to advance corridor projects and make operational improvements to connect and coordinate services. Similar efforts should be pursued in West Michigan and populated communities Up North and in the Upper Peninsula.
- **Intervene and allay transit's workforce crisis.** Decision makers should pursue comprehensive and sustainable solutions for persistent transit workforce issues through a combination of additional funding and flexible funding to increase wages and sponsored training opportunities to build a 21st century workforce.
- **Modify land-use rules to maximize the value of transit investments.** Successful transit systems depend on ridership from those who need it *and* those who chose it among travel options. Higher-density, mixed-use development patterns and retrofits within walking distance of transit corridors will maximize the potential of investments in greater service. Transit can connect Michiganders to their homes, their offices, their worksites, their schools, their health care facilities, their families, their friends, their recreation at parks, and their entertainment.

Wastewater

C

EXECUTIVE SUMMARY

It is essential to protect Michigan's $15 billion water economy with proper operation, management, and rehabilitation of our wastewater infrastructure. The Michigan Department of Environment, Great Lakes and Energy (EGLE) estimates over $18 billion is needed in the next 20 years to improve the state's treatment/conveyance systems. The State has made strides in these systems, forming in 2013 the Stormwater, Asset Management and Wastewater grant program, in 2018 the Michigan Water Asset Management Council, and in 2020 the MI Clean Water Plan, and use of funds from federal legislation. Centralized wastewater systems connect to two-thirds of Michigan's four million households; the remaining 1.3 million households are connected to septic systems. EGLE estimates 10% to 25% of these systems are at the end of their useful life or have failed. Sustaining wastewater progress requires more comprehensive asset management, evaluation of capacity concerns, proactive workforce development programs, and dependable funding to reduce the project backlog despite inflation.

BACKGROUND

In Michigan, wastewater facilities range from public collection, conveyance, and wastewater treatment facilities (WRRF/WWTP) to privately owned septic systems. Approximately 2/3 of Michigan's 4 million households are serviced by public collection/treatment systems. On average, our public systems are operating within their legal regulatory requirements. Public operations and maintenance staff work diligently in servicing, repairing, rehabilitating, and replacing equipment within our public systems. Even though effluent permit conditions are regularly met, many of our public WRRF and virtually all the secondary treatment facilities in Michigan were built after implementation of the 1972 Clean Water Act. Therefore, many of these facilities are approaching their designed 50-year service life and will require significant rehabilitation.

The remaining 1.3 million households utilize privately owned septic systems. The State of Michigan currently does not have statewide sanitary code for rules, regulations, and reporting of privately owned septic systems. Since these septic systems only filter and do not treat the wastewater from our homes, failures often lead to untreated wastewater leaking into our soil and potentially into our groundwater. There is a growing concern that this may be contributing to higher E-coli outbreaks along our recreational rivers, lakes, and streams. According to EGLE, in 2021 there were ____ septic failures reported to local Michigan Health Departments.

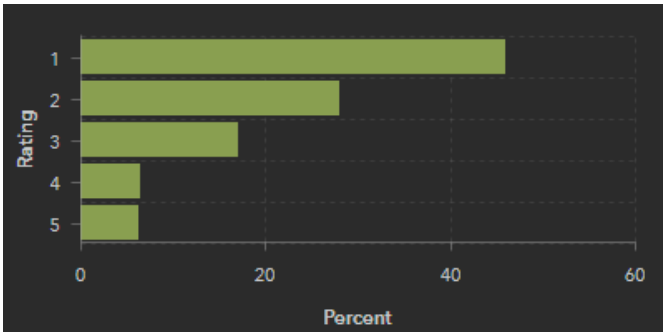
Below is the estimated number and type of public and private wastewater systems located in Michigan:

SYSTEM	MICHIGAN WASTEWATER INFRASTRUCTURE INVENTORY	
Public	Municipal WWTP/WRRF	247
	Total WWTP/WRRF	1,080
	Lagoon System	232
	RTB/CSO Facilities	47
	Miles of Sewers/Laterals	25,000/15,000
Private	Privately-Owned Septic Systems	1,300,000

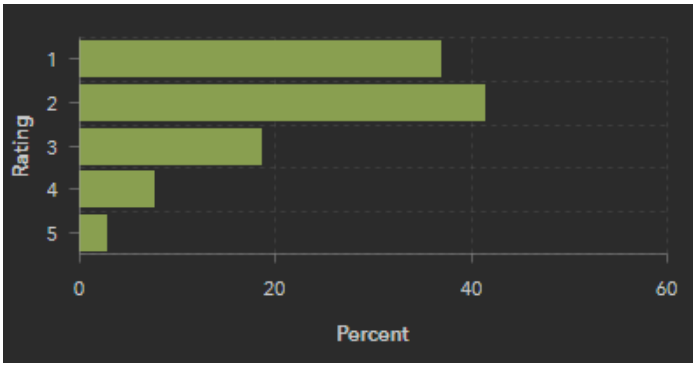
CONDITION & CAPACITY

With the completion of 436 SAW Grants and over $363 million invested in wastewater AMPs, since 2014, representing 70%-80% of the 2.7 million households connected into public wastewater systems, EGLE created a Wastewater Dashboard that summarizes the condition of participating wastewater infrastructure according to the NASSCO rating method. *(Condition Index for the following graphs: Good – 1, 2 ; Fair – 3 ; Poor -4 ; Failing – 5) .*

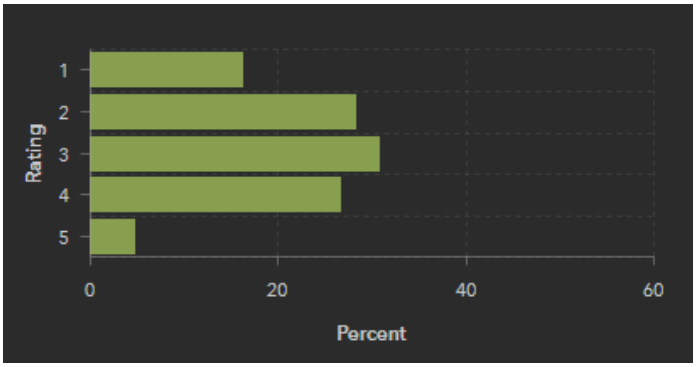
AVERAGE REPORTED PERCENT OF SEWER SYSTEM PACP RATING



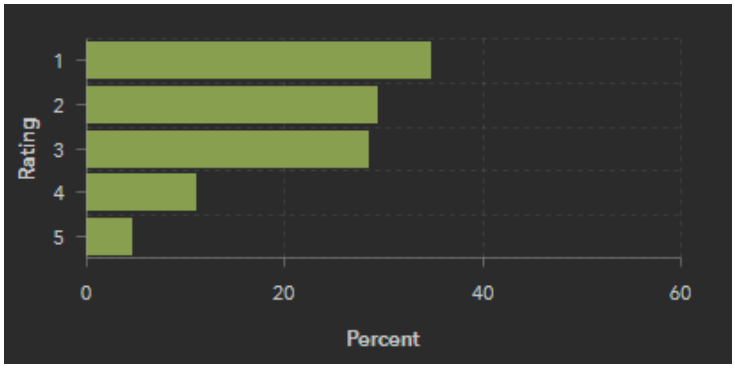
AVERAGE REPORTED PERCENT OF MANHOLE ASSET MACP RATING



AVERAGE REPORTED LIFT STATION ASSET RATINGS



AVERAGE REPORTED PERCENT WWTF ASSETS RATINGS



Source; EGLE Wastewater Dashboard

As more communities adopt AMPs for effective evaluation of infrastructure and facilities condition, as required by the NPDES permit, actual conditions will become more apparent.

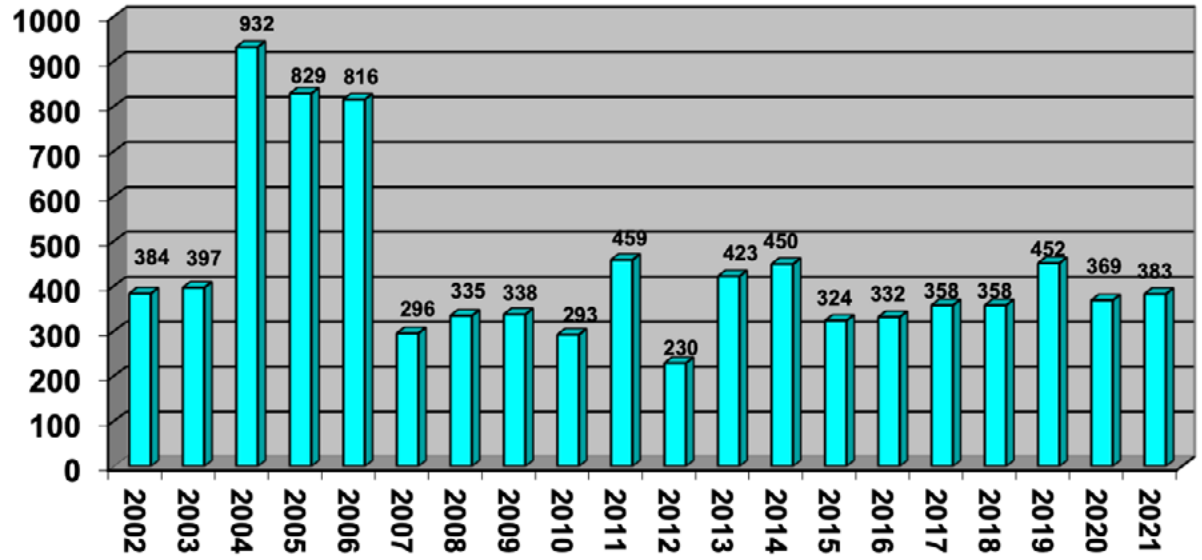
Capacity is the amount of liquid (hydraulic capacity) and waste constituents (treatment capacity) the infrastructure can safely convey and treat. Deficient capacity has the potential to discharge untreated or partially treated sewage into our waterways.

Almost all conveyance systems and WWTP/WRRFs in the state can effectively deliver and treat dry weather flow. However, the same is not true during wet weather events. Fundamentally, stormwater is tributary to combined sewer collection systems, however, stormwater (as groundwater) also migrates into sanitary collection systems as infiltration and inflow (I/I). Combined Sewer Overflow (CSO) events occur when significant volumes of stormwater drain into combined sewer collection systems. In addition, Sanitary Sewer Overflow (SSO) events can occur in saturated ground conditions in sanitary collection systems with significant volumes of I/I or numerous illicit discharges. Michigan has seen varying amounts of these SSOs/CSOs from 2009-2021, with a peak occurrence in 2011, the year coinciding with the most rainfall.

The EGLE – CSO, SSO and RTB 2021 Annual Report, reports information related to known discharges of untreated or partially treated sewage from sewer

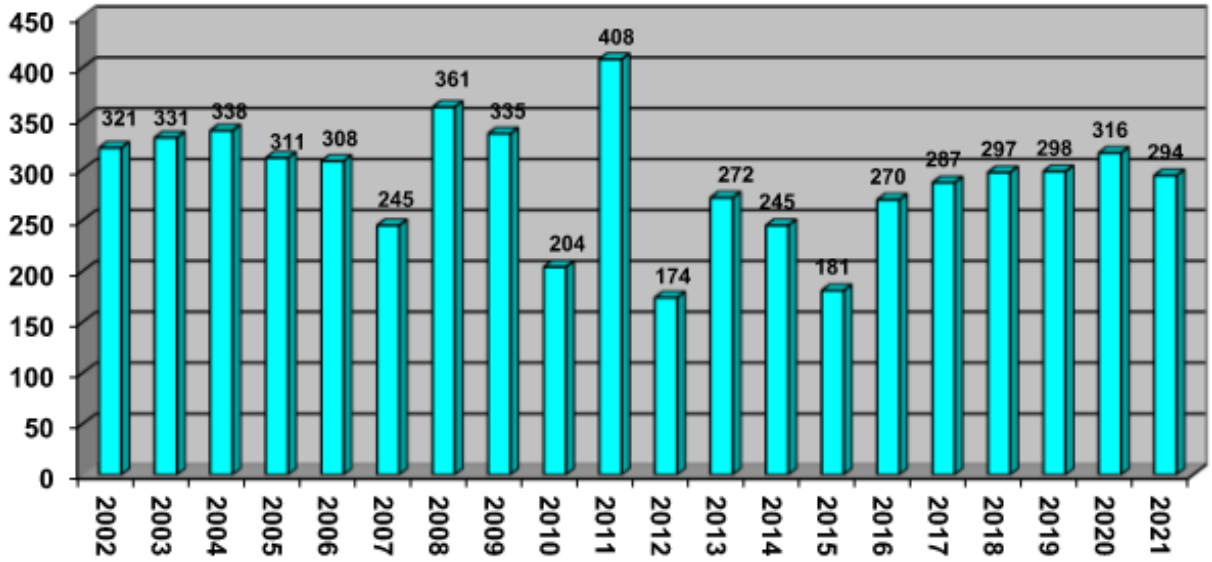
systems to land or waters of the state. This report also updates the status and progress of the State's programs for addressing the occurrence frequency and volume of these overflows and details the long-term goal of controlling these events.

CSO/RTB DISCHARGE EVENTS PER YEAR

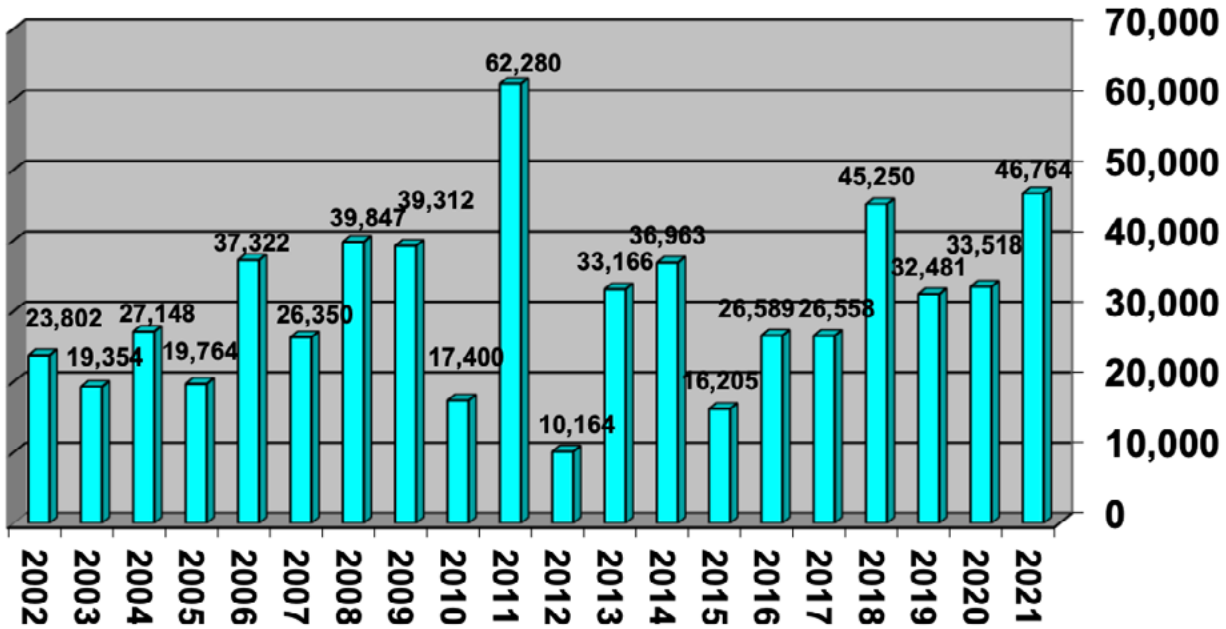


Note: Inconsistent reporting methodology was the basis for the high number of events reported in 2004 to 2006

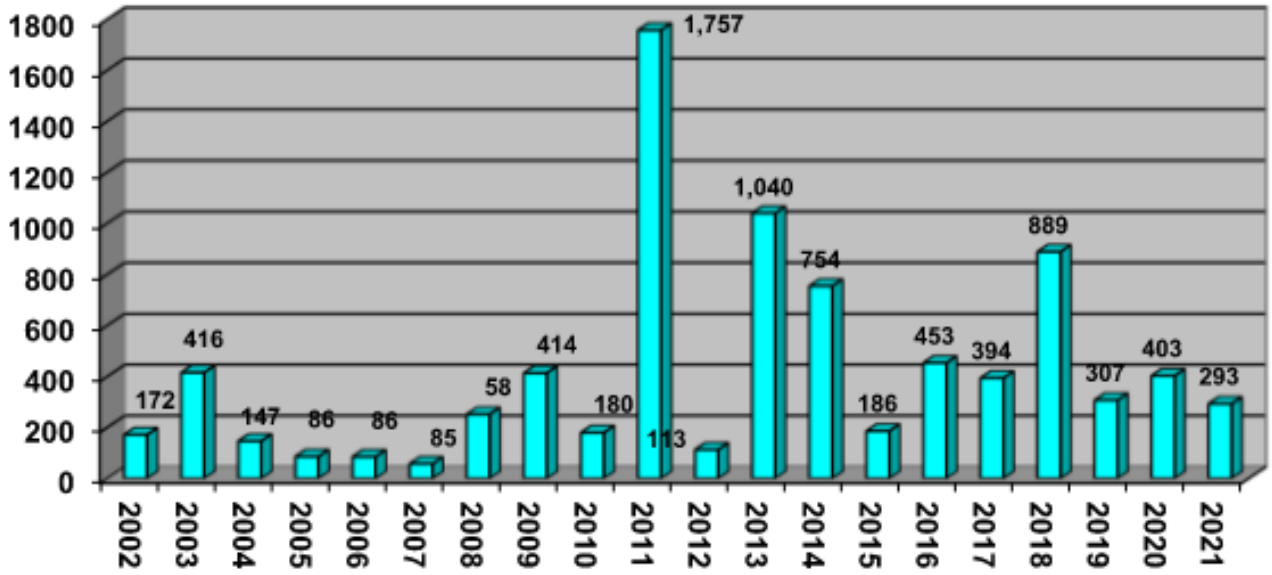
SSO DISCHARGE EVENTS PER YEAR



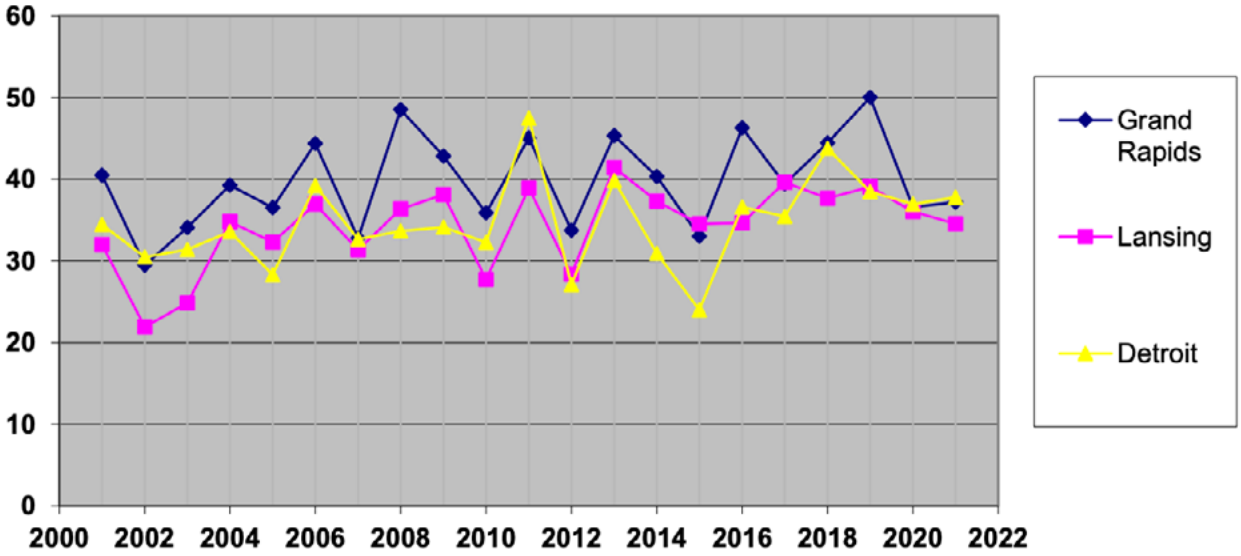
VOLUME IN MG FROM CSO/RTB AND RELATED WET WEATHER DISCHARGES



VOLUME IN MG FROM SSO DISCHARGES



ANNUAL PRECIPITATION (INCHES) VARIOUS MICHIGAN CITIES/YEAR



Source: EGLE CSO SSO RTB 2021 Annual Report

Another indicator of capacity concerns in the State's conveyance systems is basement flooding. Severe weather and resultant sewer system overloading has produced a dozen State of Emergencies to be declared since 2019. The frequencies of extreme rain events are increasing the risk of public health and safety due to basement backups and potential exposure to untreated wastewater.

In Michigan, a statewide sanitary code does not currently exist as it does in most other states. The condition of our privately owned septic systems is estimated based on known age and reported septic system failures. EGLE estimates that between 10% and 25% of the known septic fields are failing, up from previous reports and the national average. These statistics illustrate the growing need for a state-wide sanitary code and education for our private homeowners on septic management practices and the effects that failing septic systems can have on public health and the environment.

EGLE's MCSSD establishes criteria and standards for the design capacity of our private septic systems. Depending on the site, soil and water conditions, installation of these systems is typically regulated by local county jurisdictions, sometimes requiring engineering design, and must be permitted/installed by a certified contractor. Current Local Health Department (LHD) regulations appear to be adequate regarding septic system siting, location, and sizing, however, after systems are constructed, the LHD has very limited means to ensure the septic system continues to function as designed.

OPERATIONS AND MAINTENANCE, FUNDING, AND FUTURE NEED

While EGLE continues to improve information sharing on the condition of public wastewater infrastructure in Michigan, accurate reporting of statewide investment needs for repairs and maintenance remains lacking. The repair and maintenance backlog on wastewater systems largely depends on the community and system. Some community systems are well managed and well-funded, leading to little backlog. Other community systems have been underfunded and understaffed, both in management and in operations, for many decades, leading to large, costly capital improvement and maintenance backlogs that are difficult to recover. Additionally, operator shortages can also lead to more contract operators that are less committed to the sustainability of local systems. Many superintendents and operators are retiring, and fewer younger people are in training to replace them.

Since no federal funding may be used for O&M, wastewater systems generate revenue primarily via sewer rates, rather than taxes dedicated to the wastewater system. Rates are set based on O&M expenses and capital improvement needs. Michigan continues to make a significant effort to encourage communities to fund and create AMPs, to identify both the area and magnitude of system revenue needs.

Michigan's MI Clean Water initiative provided an historic $500 million investment ($293 million of wastewater) to address large infrastructure issues such as PFAS, undersized sewers, failing septic systems, SSO/CSO elimination and correction and illicit discharges. This one-time investment was a much-needed boost to infrastructure investment in the state, however, the need for a long-term, sustainable funding source is needed and remains the goal for future investments.

Requests for state and federal funding have increased significantly in recent years, indicating an increase in awareness of needs and increased availability of partial loan forgiveness. Through the CWSRF Program State ARPA funds have been made available for FY23 and FY24 and BIL funds are available from FY23-FY27. Refer to the below table.

EGLE CWSRF FINAL INTENDED USE PLAN – FISCAL YEAR 2021-2023

Fiscal Year	CWSRF Program Applications	Requested Project Totals	CWSRF Fundable Range	Partial Loan Forgiveness	Funding Deficit
2021	26	$286 million	$582 million	$22.2 million	$0
2022	53	$600 million	$786 million	$31 million	$0
2023	69	$1.65 billion	$1.0 billion	$276 million	$616 million
2024 (Projected)	250	$2.2 billion	$900 million	$280 million	???

EGLE CWSRF Final Intended Use Plan – Fiscal Year 2021-2023

The expectation is that the system needs again will far outweigh available funding, not to mention the need for many systems to address large and costly PFAS contamination, competing with other system needs.

Regional shifts in Michigan's population rather than population growth have created new pressures on public wastewater systems, especially in some urban centers. While state-wide growth remains fairly static at about 2% from 2010 to 2020, significant (6% - 12%) growth has occurred primarily in the West Michigan counties of Ottawa, Kent, and Allegan, in the Southeast Michigan counties of Washtenaw, Livingston, and Oakland, and in Grand Traverse County. While wastewater system expansion for this growth and development is typically funded by the private sector, connection of these new systems may stress existing downstream conveyance and treatment capacities.

Another significant issue that affects both private development and municipal operations, maintenance and replacement needs is the availability of equipment and materials. Lead times can be as much as 12 -15-month time frames from the time of ordering, resulting in major operation, maintenance, and replacement issues. These are supply chain issues caused by manufacturers inability to meet demand rather than a lack of funding to purchase the products. Additionally, inflation of material and labor costs are forcing some system owners to postpone projects, potentially exacerbating problems.

With little regulation for private septic systems, other than permitting and design standards, the average homeowner is typically unaware of their system's need for regular inspection, operation, and maintenance, resulting in reactionary and costly decisions for maintenance, repair and/or replacement at the sole expense of the homeowner.

PUBLIC SAFETY

Michigan Communities have eliminated thirteen (13) uncontrolled CSO outfalls between 2018 and 2021. Several areas have EGLE-approved LCTP through which extensive design and construction are working to reduce untreated CSO discharges. Untreated CSO discharges have been reduced from over 10 billion gallons annually between 2016-2018 to less than 4 billion gallons per year in 2019-2020. Unfortunately, due to a wet 2021 there were a reported 383 CSO/RTB events and approximately 8.78 billion gallons of untreated sewage that entered Michigan waterways in 2021.

Sanitary sewer overflows (SSO) in 2021 consisted of 294 events reported for a total SSO volume of approximately 293.5 million gallons, trending lower than in the previous three (3) years.

RESILIENCE & INNOVATION

In Michigan, resilience is mandated statutorily and built into each WRRF located within the state. This includes process and equipment redundancy, dual power source or back-up emergency power generation, and construction of pumping and treatment facilities above the 100-year floodplain elevation. Each of these measures are part of the design process and/or the construction permit review process. Additionally, materials resilient to wear and corrosion, such as stainless steel, ductile iron, HDPE, polyethylene encasement, and similar measures are commonplace.

As the magnitude and frequency of severe weather (including lake levels) in Michigan increases, existing weaknesses of and new threats to our wastewater infrastructure are continuously exposed. While resilience as described above is well ingrained in MI wastewater infrastructure, climate resilience - the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate - is currently a moving target.

Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks. The process of understanding what is required and how to implement it is in its infancy. Increasing system "intelligence" around existing assets is low hanging fruit for creating added resilience. Increasing "data density" within distribution and collection systems, as well as treatment processes, permits infrastructure professionals to leverage artificial intelligence (AI) to learn and then predict system responses to events that exceed design conditions.

Since Michigan's last report card, the concept of the UOTF, established by a collaboration of the NACWA, WEF, and WERF, has gained ground and logged many successes, primarily in the arena of energy – efficiency & biogas utilization. The UOTF program has been a good incentive for utilities to consider innovation and provided a new lens with which to look at water infrastructure improvements. Yet the pace at which MI water infrastructure has adopted the innovation promoted by the UOTF concept falls short of its intent, and the needs of MI infrastructure and the water environment. The needle for resource recovery in terms of nutrients and water has barely moved. While the environmental sustainability argument for recovery is sound, and many technologies to achieve it exist, the drivers to pursue and adopt it are not readily available... While it's cheaper and easier to discharge nutrients into ground and surface waters; there are no regulatory drivers for recovery. Economic drivers are non-existent and municipal utilities and governments are not structured properly to capitalize the recovered resources to make the economics of their recovery favorable. Recovery of these resources will most likely require non-traditional delivery methods (such as PPPs) to make the economics of recovering these resources sustainable. Financing, legal and public education/perception levers must be worked into the pursuit of sustainable resource recovery. As for tailwinds, innovative solutions abound. An example is the transformation of the traditional activated sludge process used at water resource recovery facilities, using algae to recover nutrients and produce non-detect effluent (re-usable) as well as a highly valuable co-product (algae) that has also sequestered massive amounts of CO2. In summary, vigorous pursuit of innovation is required to close the gap between current infrastructure and a sustainable water infrastructure envisioned by the UOTF. Attention should be given to creating new drivers and delivery methods for innovation to succeed and deliver the UOTFs required for sustainable wastewater infrastructure.

Adding to the headwinds, the difficulty of water recovery of wastewater (and biosolids) has been compounded exponentially by PFAS. Another example of how bountiful and accessible innovative solutions are, is the Grand Rapids BioCNG facility converting digester biogas into grid quality natural gas (99% CH4). The potential for communities to use wastewater infrastructure to decarbonize their footprint is significant, to levels far exceeding the CIP projects completed. Big (doable) leaps are required to unleash this potential. Changes of paradigm relating to funding, project delivery, and regulations are required to remove the fear surrounding such leaps.

Wastewater

RECOMMENDATIONS TO RAISE THE GRADE

- Create a uniform, statewide sanitary code that helps ensure public education, awareness for safely operating private septic systems.
- Extend the SAW grant program by providing additional funding to assist wastewater utilities that have not yet established asset management plans.
- Ensure that condition assessments and asset management plans are developed in a manner that enables consistent reporting in a statewide asset management database system.
- Develop a long-term, sustainable funding source and educational resource bank to assist public wastewater systems with the implementation of and support for their capital and O&M expenditures.
- Budget state funds annually for immediate public health risks and environmental emergencies due to failing wastewater infrastructure.
- Allocate funds annually to upkeep failing septic systems that are approaching their 25-year design life.
- Develop economic, funding and regulatory drivers to encourage innovation and promote alternative delivery methods to produce and sustain successful implementation.

SOURCES

Great Lake Sustainability Indicators – Drinking Water, "Water and Sewer Infrastructure Funding and Gap," March 2022

Public Sector Consultants, Inc., "Michigan's Water Infrastructure Investment Needs," April 2016

State of Michigan, "21st Century Infrastructure Commission Report," November 2016

DEFINITIONS

Michigan Department of Environment, Great Lakes and Energy (EGLE) – Michigan's state-wide regulatory agency for wastewater systems.

Stormwater, Asset Management and Wastewater Grant (SAW) – Established in 2013 to help municipalities develop, update, and improve asset management plans for their wastewater and stormwater systems. Most communities use the funding to create asset management plans to help save money, better provide services, and to inform their rate payers on the current and future needs of the systems.

Asset Management Plan (AMP) – A document developed by an infrastructure owner to assist in the long-term management of the assets necessary to support cost-effective, pro-active decisions. These include the creation, acquisition, operation & maintenance, and replacement/upgrade of system assets. In short, an AMP helps infrastructure owners keep track of everything in their systems and when things need to be replaced.

Combined Sewer Overflow (CSO) - An event resulting from combined storm and sanitary sewers being unable to accommodate the flow because of an exceeding of their capacity and untreated sewage is discharged into the environment prior to reaching sewage treatment facilities.

DEFINITIONS (Cont.)

Sanitary Sewer Overflow (SSO) – An event where untreated sewage is discharged from a sanitary sewer system into the environment prior to reaching sewage treatment facilities.

Water Resource Recovery Facility (WRRF) – Traditionally known as a Wastewater Treatment Plant (WWTP); facility that provides physical, biological, and chemical treatment of wastewater to remove contaminants prior to discharging waters into the environment.

Clean Water Act of 1972 – The primary federal law in the United States governing water pollution; establishes the basic structure for regulating discharges of pollutants into waterways and regulating quality standards for surface waters.

Retention Treatment Basin (RTB) – Facility that receives excess combined sewage flow during wet weather events where the sewage is stored, screened and/or settled, and disinfected prior to discharge.

National Association of Sewer Service Companies (NAASCO) – Organization that set industry standards for the assessment, maintenance, and rehabilitation of underground infrastructure.

Pipeline Assessment and Certification Program (PACP) – A NASSCO certification program to0 help pipeline system owners create comprehensive databases to properly identify, plan, prioritize, manage and renovate their assets based on condition evaluation.

Manhole Assessment and Certification Program (MACP) – A NASSCO certification program to0 help pipeline system owners create comprehensive databases to properly identify, plan, prioritize, manage and renovate their assets based on condition evaluation.

Lateral Assessment and Certification Program (LACP) – A NASSCO certification program to0 help pipeline system owners create comprehensive databases to properly identify, plan, prioritize, manage and renovate their assets based on condition evaluation.

Michigan Criteria for Subsurface Sewage Disposal (MCSSD) – Criteria utilized in the approval of on-site wastewater systems utilizing subsurface soil-based dispersal which treat sanitary sewage and/or domestic equivalent wastewater with flows up to 20,000 gallons per day (gpd). They establish a process for determining treatment objectives based upon risk. Provisions for long term operation and maintenance (O & M) are also stressed.

Infiltration & Inflow (I/I) – Excess water that flows into sewer pipes from groundwater and stormwater.

Water Quality Standards (WQS) – Water quality standards (WQS) are provisions of state, territorial, authorized tribal or federal law approved by EPA that describe the desired condition of a water body and the means by which that condition will be protected or achieved.

Operations & Maintenance (O&M) – A combination of general maintenance, management, training, budgeting, and business processes that are used collectively for the proper functioning of an infrastructure system.

Wastewater

DEFINITIONS (Cont.)

Long-Term CSO Control Program (LTCP) – A system wide evaluation of the sewage infrastructure, and the hydraulic relationship between the sewers, precipitation, treatment capacity and overflows. As part of the LTCP, the permittee must evaluate alternatives that will reduce or eliminate the discharges and develop a plan and implementation schedule to do so. LTCPs are created to identify the most cost-effective manner to regulate CSOs to meet water quality standards.

Clean Water State Revolving Fund (CWSRF) – A federal-state partnership that provides low-cost financing to communities for a wide range of water quality infrastructure projects, including municipal wastewater facilities, nonpoint source pollution control, decentralized wastewater treatment systems, stormwater runoff mitigation, green infrastructure, estuary protection, and water reuse.

Infrastructure & Investment Jobs Act (IIJA) – A five-year, $1.2 trillion infrastructure package that was signed into law in November 2021. The bipartisan IIJA marks the country's largest investment in infrastructure across all Report Card categories in nearly a century.

American Rescue Plan Act (ARPA) – The American Rescue Plan Act of 2021, also called the COVID-19 Stimulus Package or American Rescue Plan, is a US$1.9 trillion economic stimulus bill passed by the 117th United States Congress and signed into law by President Joe Biden on March 11, 2021, to speed up the country's recovery from the economic and health effects of the COVID-19 pandemic and the ongoing recession.

Utility of the Future (UOTF) – A World Bank program designed to ignite, materialize and maintain transformation efforts in water supply and sanitation utilities. The goal is to become the Utility of the Future — a future-focused utility, which provides reliable, safe, inclusive, transparent, and responsive WSS services through best-fit practices that allow it to operate in an efficient, resilient, innovative and sustainable manner.

Nation Association of Clean Water Agencies (NACWA) – A not-for-profit member organization that represents the interests of publicly owned wastewater treatment facilities, collection systems, and stormwater management agencies before the United States Congress, several Federal agencies, and in the courts.

Water Environment Federation (WEF) – A not-for-profit membership, technical, and educational organization of more than 34,000 individual members and 75 Member Associations (MAs) representing water quality professionals around the world.

Water Research Foundation (WRF, formerly WERF or WE&RF) – A 501(c)(3) nonprofit, educational organization that funds, manages, and publishes research on the technology, operation, and management of drinking water, wastewater, reuse, and stormwater systems.

Michigan Infrastructure Commission (MIC) – A commission convened by then-Governor Snyder to produce the "21st Century Infrastructure Commission Report" in 2016.

Polyfluoroalkyl Substances (PFAS) – are man-made chemicals that have been widely used in industry and consumer production since the 1940s and remain in the environment for a long time.

National Pollutant Discharge Elimination System (NPDES) – Permit program created in 1972 by the Clean Water Act that helps address water pollution by regulating point sources that discharge pollutants to waterways.