2022

REPORT CARD FOR MINNESOTA'S INFRASTRUCTURE

MINNESOTA AND DULUTH SECTIONS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

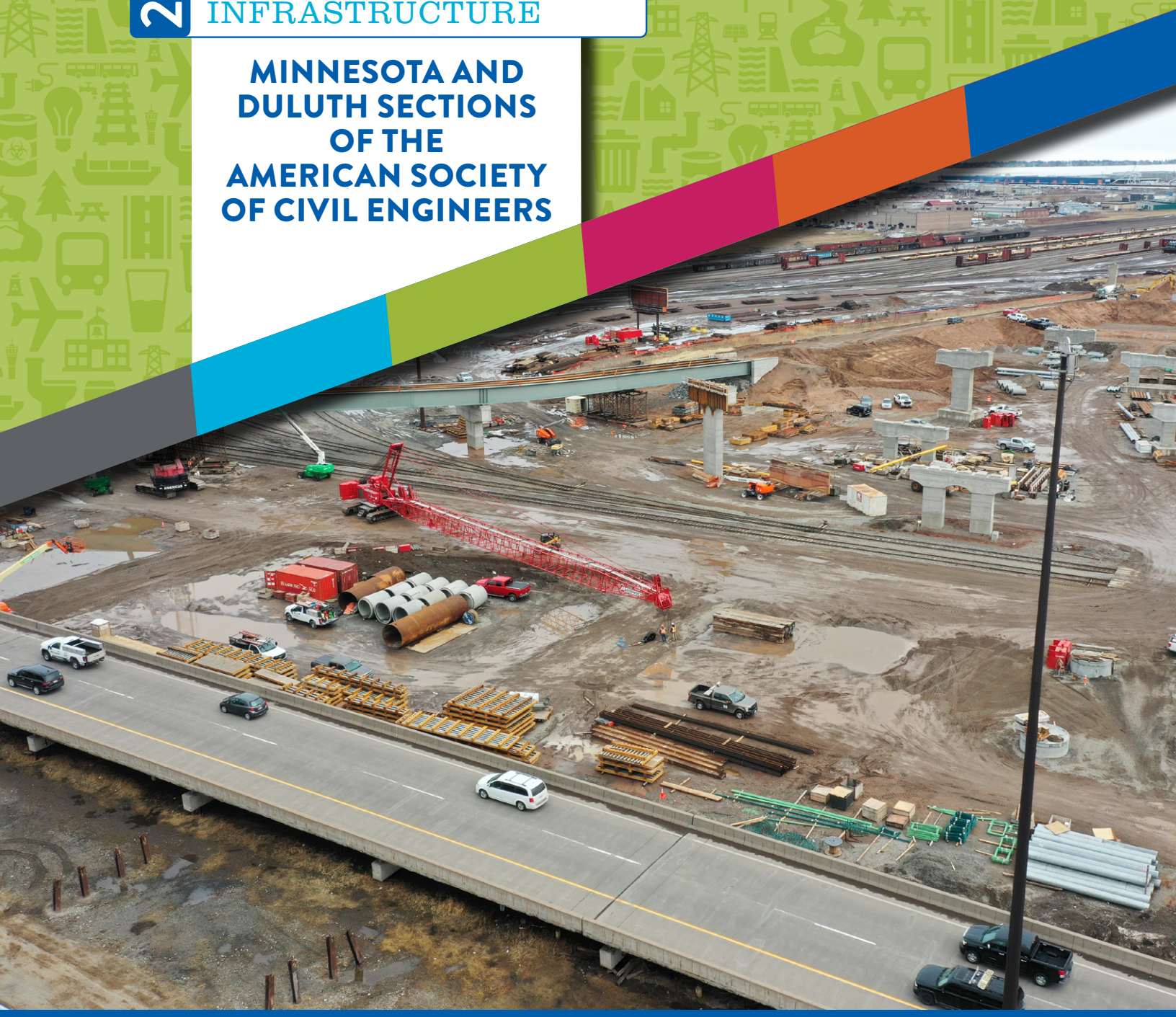

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PHOTO CREDIT: MINNESOTA DEPARTMENT OF NATURAL RESOURCES

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2022 Minnesota's Report Card Executive Summary

The first canon in the code of ethics of the American Society of Civil Engineers (ASCE) is to "first and foremost, protect the health, safety, and welfare of the public." ASCE's Minnesota membership is composed of 1,400 professionals who work to design, construct, and maintain our state's infrastructure. This 2022 Report Card for Minnesota's Infrastructure is a simple tool to help residents, businesses, and policymakers understand the state of our infrastructure systems. We want this Report Card to build on existing relationships and create new conversations about how to prepare our infrastructure for the coming years.

Our state is home to continuous population growth and increasingly extreme weather events, putting significant strain on our aging infrastructure network. We rely on infrastructure to function properly so that residents can feel safe and our communities can prosper.

In 2018, we released our first Minnesota-specific Report Card, which assessed nine categories, for which Minnesota received a C grade overall. The ASCE national organization reported in 2021 that

America's cumulative GPA was a C-. Minnesota's updated 2022 Report Card committee looks at aviation, bridges, dams, drinking water, energy, ports, public parks (new in 2022!), roads, transit, and wastewater. Our infrastructure is composed of large, expensive, long-lived investments that underpin our communities. We take most of these investments for granted until there is a crisis. These systems need to serve everyone and remain functional for our economy and our people to thrive.

As we stated in our 2018 Report Card, much of Minnesota's infrastructure is past or reaching the end of its expected lifespan. The majority of our systems were built in the 20th century before much of today's modern technologies were developed. In addition, new materials and expanded environmental stewardship require system updates. Built decades ago, the energy grid, transportation systems, sewers, and drinking water systems need upgrading to better prepare for increasingly more demanding storm events, increased use of resources, and evolving populations.

Regular maintenance and repairs of current systems and new construction are important to keep our communities functioning. In fact, it's more cost-effective to pay attention to regular maintenance than it is to perform major repairs or replacements. The Minnesota Department of Transportation (MnDOT), in partnership with local jurisdictions, has created an asset management system (one of our recommendations in the 2018 Report Card). Asset management systems are designed to inform systematic operations, maintenance, and upgrades. When we can comprehensively track the infrastructure that we have, the backlog of maintenance and repairs can lead to less-frequent emergency work.

This report card has been prepared largely during the COVID-19 pandemic. These last two years have shown our communities that emergency work in the face of a crisis like this ongoing pandemic is expensive and stressful on Minnesota's infrastructure. When we provide reliable, well-maintained systems, we are providing jobs, as well as access to education, to keep our economy moving.

The American Rescue Plan Act (ARPA) has been helpful legislation to keep Minnesota progressing. The Infrastructure Investment and Jobs Act (IIJA) has the potential to help Minnesota even further. IIJA can provide funding to Minnesota's state, local, and tribal governments over the next five years. To do so, we will need state legislative authority to actually authorize these funds, including state or local matches, as needed.

The 2022 Report Card reflects decision-making and investments to date, not into the future. IIJA and legislative action over the next three to four years could influence Minnesota's grade in a future Infrastructure Report Card.

We hope this Report Card empowers our communities to understand and advocate for our infrastructure, and helps individuals talk about it with their legislators and neighbors. Every one of us, our families, and our friends deserve access to clean water, jobs, education, and a living wage. When we can provide for each other, we can keep our economy moving.

About The Report Card for Minnesota's Infrastructure

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

Methodology

The purpose of the Report Card for Minnesota'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 owner's 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. The system is 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.

INCOMPLETE

The infrastructure in the system or network does not have sufficient data to provide a grade.

2022 Report Card for Minnesota's Infrastructure

G.P.A.

C

AVIATION B	PORTS C-
BRIDGES C	PUBLIC PARKS B-
DAMS C	ROADS D+
DRINKING WATER C-	TRANSIT C-
ENERGY C	WASTEWATER C

Recommendations to Raise the Grade

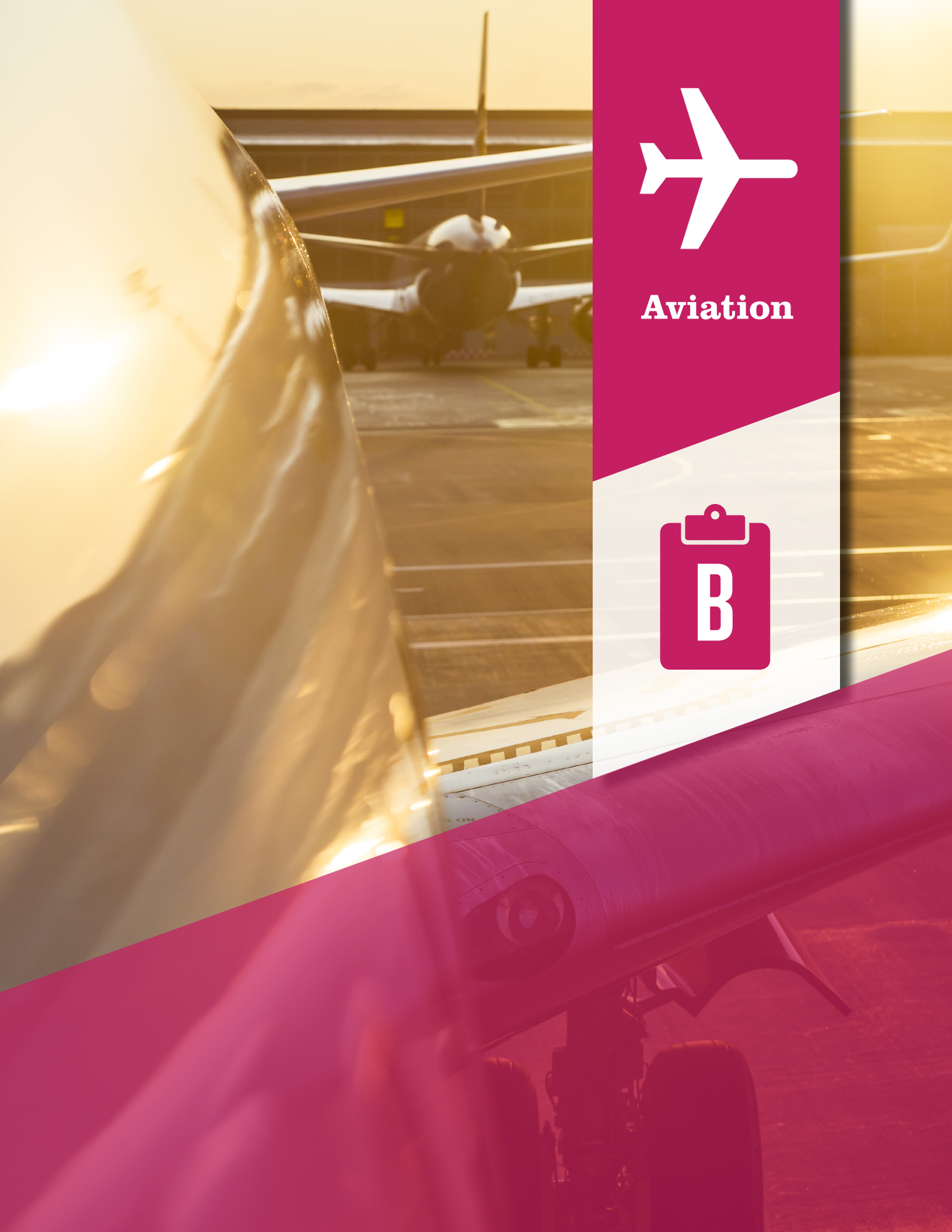
The work necessary to raise the grades will be difficult and unavoidably expensive, but it is indeed doable. If we are ready to improve our infrastructure, here are our recommendations:

- **The Minnesota Legislature must act to maximize available federal dollars through IIJA by providing the required matching funds over the next five years and beyond.** Most of Minnesota's funding shortfalls project out 20 years, and not five. The state and municipalities should also apply for additional funding through discretionary grant programs. Federal funding must support, rather than replace, existing revenue sources so we can meaningfully reverse decades of decline in our infrastructure systems and plan for the future.

- **The Minnesota Legislature must regularly pass the Capital Investment bill and include strategic and robust investments in water systems and surface transportation networks.** It is our hope that this Report Card will help inform these decisions.

- **Water utilities, municipalities, and other infrastructure owners should follow the Minnesota Department of Transportation's strategy by adopting asset management strategies to stretch available dollars and prioritize needed repairs.** The state should help establish an office dedicated to dispersing asset management assistance to local governments. Knowledge is power when it is necessary to identify deficiencies in our infrastructure and find ways to address those deficiencies. Collecting and tracking data is the next step toward making the most of limited funding dollars.

AERIAL OF GREAT RIVER ROAD OR HIGHWAY 61 ALONG BANKS OF MISSISSIPPI RIVER AND WOODED BLUFFS OF JOHN LATSCH STATE PARK, MINNESOTA



Aviation

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EXECUTIVE SUMMARY

The Minnesota aviation system services 2.3 million aircraft operations (takeoffs and landings) annually and includes 133 airports, 96 of which are a part of the National Plan of Integrated Airport Systems. Nine airports provide commercial airline service. The facilities accommodated a record 19.6 million enplanements in 2019, of which 98% occurred at Minneapolis-St. Paul International Airport (MSP). Minnesota's runway pavement conditions are acceptable, with ratings falling between 74 and 79 on a 100-point scale. COVID-19 had a significant impact on enplanements in 2020 — reductions were in the 40% to 70% range — which impacted revenue streams for airport improvements and capacity enhancements. In general, however, commercial airport terminals improved significantly over the last 10 years in greater Minnesota. Data indicate minimal near-term capacity issues. Safety records are solid, and sustainability is integrated within infrastructure and operational decisions.

BACKGROUND

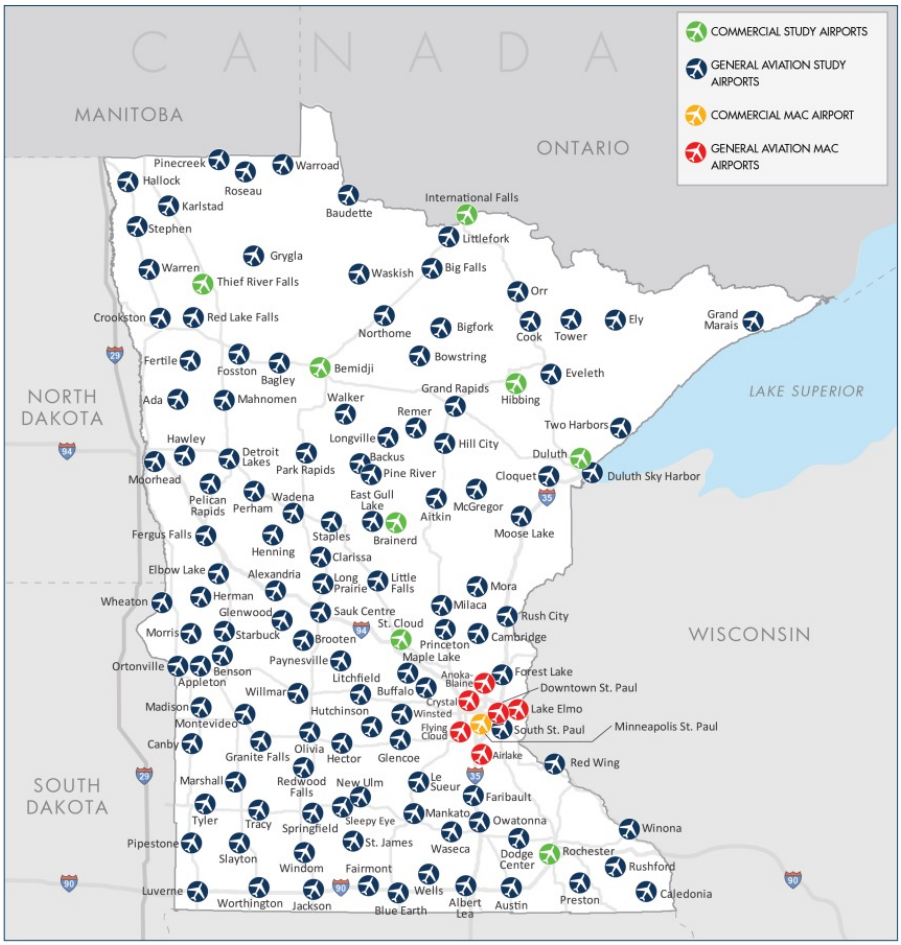
The Minnesota aviation system encompasses 133 airports that service, on average, 2.3 million aircraft operations annually. Of these airports, 96 are part of the National Plan of Integrated Airport Systems (NPIAS) and eligible for federal funding. Nine of the NPIAS airports currently provide commercial airline service. They are:

- MSP International
- Rochester
- St. Cloud
- Brainerd
- Duluth
- Hibbing
- Bemidji
- Thief River Falls
- International Falls

The system is augmented by a number of private airports, heliports, and sea bases. The Minnesota State Aviation System Plan is being updated in two phases. Phase 1 was completed in 2019. Phase 2 is currently ongoing.

The Minnesota Aeronautics Commission formed in 1933, and in 1943 the Legislature transformed it into the Department of Aeronautics. That same year, the Metropolitan Airports Commission (MAC) formed as an "owner/operator" of airports throughout the Twin Cities Metropolitan Area. MSP International, Anoka County/Blaine, Flying Cloud, Crystal, Airlake, St. Paul Downtown, and Lake Elmo compose the MAC system.

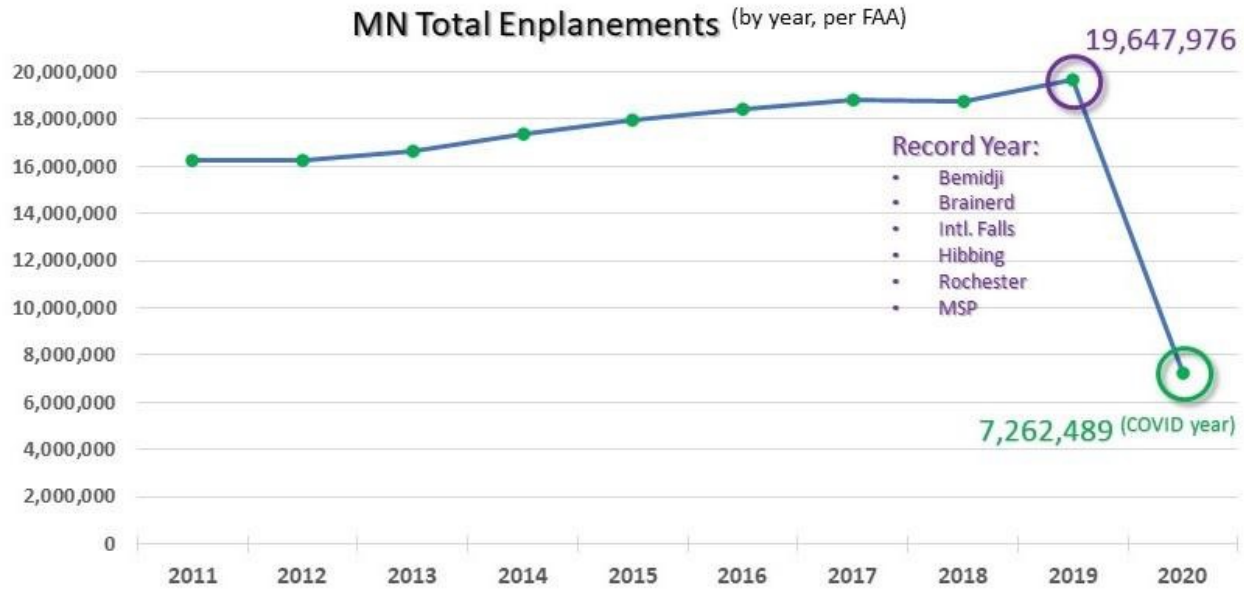
FIGURE 1 – FROM 2019 MINNESOTA ECONOMIC IMPACT STUDY, COURTESY MNDOT AERONAUTICS



Of the airports served by airlines in 2019, statewide passenger enplanements totaled a record 19.6 million. MSP accommodated roughly 98% of the passenger enplanements (19.1 million), followed by Rochester and Duluth — each serving more than 150,000 people. As of May 2018, MSP passengers utilize 17 carriers to access 160 destinations globally. COVID-19 significantly reduced enplanements to 7.3 million in 2020, interrupting the consistent annual growth of flight demand that preceded it.

The economic role of Minnesota's aviation system is significant. The 2019 Statewide Airport Economic Impact Study reports that airports generate approximately $623 million in annual state and local tax revenues and an estimated $18.2 billion in annual economic activity, and support approximately 94,000 jobs.

FIGURE 2 - ENPLANEMENT TRENDS STATEWIDE IN MINNESOTA



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CAPACITY

COMMERCIAL (MSP)

In general, capacity is sufficient at MSP, and enhancements are taking place to accommodate growing enplanements. In 2019, MSP's reported operations were 393,285, roughly 72% of its 2004 peak. More than 73,000 flights were delayed at MSP in 2019. In 2018, 80.4% of flights were on time, and in 2017, 83.2% of flights were on time. Departures represented two-thirds of those delays in all three years.

Despite a reduced number of aircraft operations, MSP set a record for enplanements of 19,192,917 in 2019, which translates to a total accommodation of over 38 million passengers. Planning documents indicate that by 2030, MSP is expected to see 48 million passengers. By 2035, that number could reach 54 million. An upcoming long-term plan (LTP) of the airport will study capacity analysis for ticketing, security checkpoints, and baggage claim, as will parking and airside needs. The 2040 LTP (in progress) will focus on improvements to passenger facilities, aircraft/airfield movements, and landside enhancements.

COMMERCIAL (Greater Minnesota)

Landside and airside improvements over recent years, together with current trends, do not appear to indicate capacity issues for the near future. Accessibility to the air transportation network is a concern for many Greater Minnesota residents who rely on the Essential Air Service (EAS) program. As of October 2016, the FAA recognizes five Minnesota communities as eligible under the EAS program. They are Bemidji, Brainerd, Hibbing, International Falls, and Thief River Falls.

EAS requires reliable funding and available pilots so airlines can fly routes to/from these airports. The latter was identified as a significant issue in a 2017 U.S. Department of Transportation working group report on air service to small communities.

CONDITION

Condition of the aviation system is evaluated on two fronts: airside pavement condition and terminals at the commercial airports. The Minnesota Department of Transportation's performance metrics for pavement condition index (PCI) were used for airports of the state except those operated by MAC. Data for 113 airports is available for the years 2016-2018. State pavement analysis indicates that Minnesota airports have an overall satisfactory rating, with averages between 74 and 79 on the PCI scale. Runways at are in good condition at reliever airports and MSP. However, based on current pavement conditions, MAC anticipates a need to spend nearly $150 million in MSP airfield pavement construction/ rehabilitation by 2027.

MNDOT PCI RATING SCALE

Excellent	100 > PCI > 85
Satisfactory	85 > PCI > 70
Fair	70 > PCI > 55
Poor	55 > PCI > 40
Very Poor	40 > PCI > 0

Sixty-five Minnesota airports had adequate approaches for aircraft in 2017, as determined by MnDOT's Office of Aeronautics. A metric of airport capacity and condition, that total has increased from 62 in 2016 and 2017, up from 61 and 58 in the preceding two years.

Terminals are assessed qualitatively based on critically needed improvements and how recently those improvements were made. Most Greater Minnesota commercial airport terminals have seen significant improvements over the past 10 years up to and including full replacement. Many terminal projects also included hangar expansions, additional parking, support for local business, and environmentally conscious installations such as geothermal heating/cooling systems. Overall, Minnesota's commercial airport terminals are in good to excellent condition.

Condition of the aviation system is evaluated on two fronts: airside pavement condition and terminals at the commercial airports. The Minnesota Department of Transportation's performance metrics for pavement condition index (PCI) were used for airports of the state except those operated by MAC.

COMMERCIAL AIRPORT TERMINAL PROJECTS (NON-MSP)

AIRPORT	YEAR(s)	Leading Improvements
Bemidji	2009-14	More Gates, Doubled SF, Security, ADA, Parking, Fire & Rescue
Brainerd	2012	Sky-bridge, Security, ADA
Duluth	2013	Replacement of Terminal Buildings
Hibbing	2015	Full Terminal Replacement
Int. Falls	2017-18	Full Terminal Replacement
Rochester	2018	Upgrade security, ADA, and facility life-extension
St. Cloud	2009	90% Expansion, Security, ADA
Thief River Falls	2011	Roof replacement, Heating & Air

FUNDING AND FUTURE NEED

COVID-19 had a significant impact on the aviation industry. Enplanements and operations were reduced by 40 to 70% in 2020, resulting in diminished income from passenger operations. MAC immediately instituted policies to protect human and financial resources, taking advantage of the Coronavirus Aid, Relief, and Economic Security (CARES) Act, and other federal funding. CARES sent $1.5 million to the MAC to improve police and first-responder operations at MSP. The airport operator anticipates that a return to normal passenger and operations levels will be slow.

Projects at airports are funded through a variety of sources, including investments from federal, state, and local levels. The largest program is the Airport Improvement Program (AIP), administered through the Federal Aviation Administration (FAA). AIP provides grants for the planning and development of public-use airports that are included in the National Plan of Integrated Airport Systems (NPIAS). Historically, federal AIP grants to Minnesota have averaged $48.3 million/year (2010 – 2017).

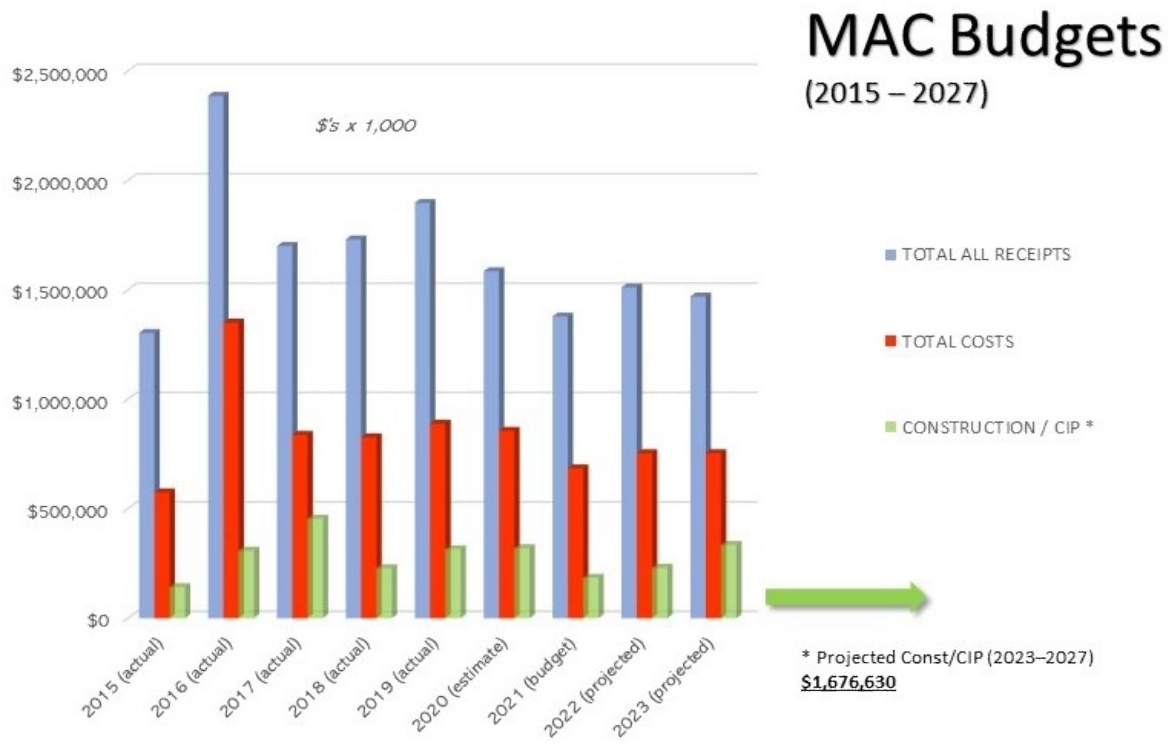
Federal grants require a local match (10% at most airports). Prior to 2015, that burden was fully shouldered by local airport owners. This caused some reluctance to submit eligible needs to the Airports Capital Improvement Plan (CIP). Statewide aviation needs in Minnesota appeared to trend downward, and by 2015 available funds exceeded demand (approximately $6.5 million). MnDOT then changed its rate structure to allow the state to shoulder half of the 10% match. The resulting CIP demand from local airport owners exceeded $30 million by 2017.

Minnesota funds a considerable number of aviation projects across the state's airports, including nearly $15 million per year for airport construction, plus operations and maintenance (O&M) grant programs. MnDOT has conducted studies and capital improvement projections to determine the actual need and improve demand forecasts for state funding. These efforts have led the state to identify over $30 million per year in need for its construction and O&M grant programs. In the most recent pre-COVID CIP, which was enacted in 2019, 239 projects with needs totaling $44.3 million were eligible for state funding. Minnesota's budget allocated $8.07 million in state dollars (combined with local matches for a total of $9.8 million) to fund 73 airport projects. To continue to support state projects, MnDOT Aeronautics has requested increases in funding. If project needs are unmet, needed maintenance of existing airport infrastructure and necessary expansion projects may be delayed, as airport sponsors will be unable to fully fund projects.

Commercial airports can collect passenger facility charges (PFCs). This charge is capped at $4.50 per enplaned passenger per flight segment, up to a maximum of four segments for a round trip (or $18). Since 1992, more than $2.1 billion has been collected in Minnesota, and $1.78 billion of PFC collections for current projects has been approved by FAA. PFC collections at Minnesota airports amounted to more than $330 million in calendar year 2019. PFC funds must be used at the specific airports from which they are collected. Additional revenue is provided from parking, on-site concessions, fuel sales, hangar rentals, and land leases to aid these communities with AIP matches.

For MAC airports, CIP totals from 2018–2022 are $854 million, or approximately $170 million/year. Based on historic performance and recent or active projects, initial review of MAC indicates no near-term gap in its ability to operate and support CIP needs.

FIGURE 5 - APPROX. MAC BUDGETS (2015 - 2023)



Looking forward to 2035, MAC data indicates that expansions needed at MSP will cost $2.54 billion, which translates to an average of $127 million per year over 20 years.

OPERATIONS AND MAINTENANCE

MnDOT reimburses Greater Minnesota airports for maintenance efforts in an amount of nearly $5 million annually. These reimbursements reduce funding challenges for local airports and ensure year-round, safe operations. However, these funds address only part of a more than $14 million operations and maintenance (O&M) need. In 2016, MnDOT increased its participation rates from 66% to 75% for O&M as part of an overall rate increase to Greater Minnesota airports.

MnDOT operates and maintains a number of the state's navigational aids and weather reporting systems to ensure a higher level of coverage and access to current/accurate weather information for pilots.

The 2017-18 maintenance budget for MAC, including MSP and all reliever airports, averages $38 million per year, of which 11% ($4.2 million) goes toward airfield maintenance and 39% ($14.8 million) goes toward buildings.

PUBLIC SAFETY

A runway incursion is an incident in which an unauthorized vehicle, person, or aircraft is on the runway. At MSP, runway incursion incidents have been few; there were only seven from 2010–2016, and only one from 2014–2016. At the six non-MSP metro airports, reported events are higher, totaling 46 from 2010–2016.

Initial review of the National Transportation Safety Board (NTSB) accident database from 2010–2016 revealed no fatalities in the state due to infrastructure, the navigation system, or air traffic control-related causes.

RESILIENCE

Despite its performance record of 99% uptime (i.e. properly functioning) for navigation systems, MnDOT is facing a workforce shortage of qualified personnel (in-agency and contractors) to respond to equipment failures. This is due to pending retirements and the difficulties in attracting new talent to replace these workers. Contractors already comprise part of MnDOT's navigation system team, and other states share this situation.

Older portions of the nation's airway navigational system (such as nondirectional beacons and VORs, a type of short-range radio navigation system) are undergoing decommissioning to make way for FAA's Next Generation Air Transportation System (NextGen), which is based on GPS. Rollout started in 2007, but major components are not expected to be operational until 2025, which raises some concern over how this will be addressed. NextGEN components such as area navigation (RNAV) and data communications (DataCOMM) have found their way into operations at MSP, yet full implementation is still reliant on national efforts.

MSP features redundant power feeds from Xcel Energy, which allows one source to feed the airport should the other fail. MSP's infrastructure has benefited from this dual system for decades. At MSP, MAC is in the process of continuing to enhance redundancy and capacity of its electrical and emergency power systems. MAC also institutes a comprehensive resilience strategy for key personnel at all of its airports.

INNOVATION

Nearly all commercial airports in Minnesota that have made significant improvements in the past 10 years have implemented a sustainability practice and/or constructed infrastructure that is directly relevant to sustainability. Examples include the use of geothermal energy, facility retrofits to reduce water and energy consumption, the use of more locally produced and more durable fixtures, green roofs to reduce stormwater runoff, the use of solar power, and the installation of energy-efficient parking ramp lighting.

Aviation

RECOMMENDATIONS TO RAISE THE GRADE

- Address shortfall of funding needs: the Legislature should increase budget money appropriated to MnDOT Aeronautics so that the agency can fund a higher percentage of eligible capital improvement projects submitted by airports in the state.
- Congress should remove the $4.50 PFC collection cap, which would allow airports to raise PFCs to increase revenue and position them to be in a better position to leverage state and federal grants.
- Congress should protect the Essential Air Service (EAS) for Bemidji, Brainerd, Hibbing, International Falls, and Thief River Falls. This will require funding enhancements to the EAS program and that pilot shortages, which directly impact small community air service, be addressed.
- Foster early adoption of NextGEN equipment and training for general aviation (GA) aircraft owners and pilots and accelerate NextGEN implementation efforts.
- Toward enhancing GA, reform the non-primary entitlements (NPE) portion of AIP to allow rollover beyond the current four years and foster an environment where public/private engagement and investment can more effectively coexist.
- Concurrent to reforming the Airport Improvement Program (AIP) (banking entitlements to save for future projects without losing to another state), create a simple means of sharing current statewide CIP needs among local decision-makers so they may coordinate priorities with each other.
- Reinforce the proactive efforts of MnDOT needs meetings for Greater Minnesota communities, particularly to inspire local business participation and the development of new aviators.
- Monitor the CARES ACT and other federal legislation so as to enable state agencies to continue to maintain facilities and continue to provide funding assistance to the aviation industry as it recovers from the impacts of COVID-19.

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Aviation

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Bridges

C

MINNEAPOLIS THIRD AVENUE BRIDGE AND SKYLINE

EXECUTIVE SUMMARY

There are 874 bridges in poor condition in Minnesota. This is a decrease from 1,080 bridges in poor condition in 2017. While this is encouraging, the number of bridges that have slipped from good to fair condition is growing. As the number of bridges in fair condition increases, it will become more difficult to keep the "poor" bridge percentage small. Meanwhile, more than 1,400 bridges are posted with signs stating they have a reduced or substandard load capacity. In general, bridges in Minnesota need $8.2 billion in funding over the next 20 years for identified rehabilitation and repair needs. Current plans include approximately $4 billion in funding, leaving a shortfall of $4.2 billion, or $210 million each year. Large bridge projects, such as the Blatnik Bridge in Duluth, will require $900 million in funding from Minnesota within a decade.

BACKGROUND

Bridges in Minnesota are owned by a variety of different agencies and levels of government, as well as the private sector. Counties, cities, and other local government units own 15,192 bridges across the state. These bridges are typically somewhat smaller in size and carry city streets, county routes, and township roads. The Minnesota Department of Transportation (MnDOT) owns 4,417 bridges, primarily on Interstate routes and other major corridors. There are also hundreds of bridges located on trails in parks throughout Minnesota that are owned and maintained by local and regional park systems and the Minnesota Department of Natural Resources (DNR). This report does not address the costs to maintain private bridges (e.g., railroad bridges or skyway bridges).

Minnesota has 87.5 million square feet (sq. ft.) of bridge and culvert deck area[1], the equivalent of 1,519 football fields. Today, 20.9 million sq. ft. of this bridge and culvert deck area (24% of the total) is over 50 years old, and exceeds the design life of those structures when they were built. If nothing is done, in another 10 years 35.9 million sq. ft. of bridge and culvert deck area (41%) will exceed 50 years in age. Given an additional decade, 50.7 million sq. ft. of bridge and culvert deck area (58%) will be more than 50 years old.

FIGURE 1 - STRUCTURE AREA OF BRIDGES AND CULVERTS BY DECADE CONSTRUCTED - (BRIDGE AREA IN BLUE, CULVERT AREA IN GRAY)

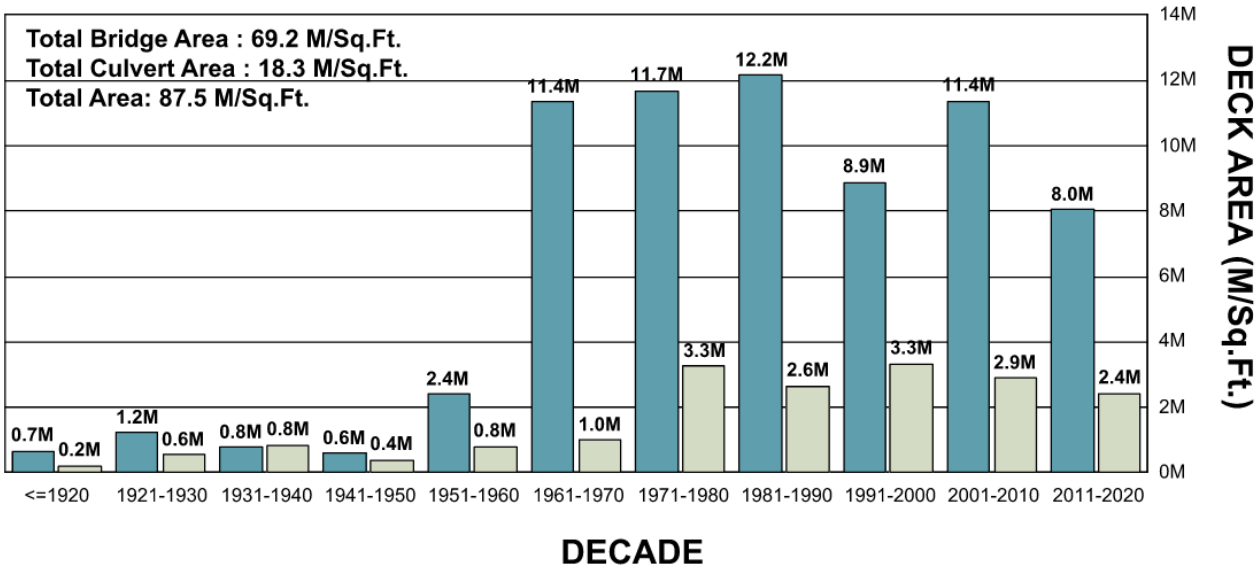


Figure 1 shows that a large amount of bridge and culvert deck area built during the Interstate era is reaching 50 years of age.

In Minnesota, state statute defines a bridge as having a length of 10 feet or more. The federal definition of a bridge is different: bridges are defined as having a length of 20 feet or more. The following two tables summarize the number of bridges on the trunk highway and local systems. Table 1 uses the Minnesota definition. Table 2 uses the federal definition and summarizes the number of bridges rated in good, fair, and poor condition by ownership.

TABLE 1 – DATA WITH THE MINNESOTA DEFINITION OF A BRIDGE (10 FT IN LENGTH OR LONGER), ALL TYPES[2]

HIGHWAY STRUCTURES						
ROUTE SYSTEM	HWY ON BRIDGE	RR	PED	BLDG	OTHR	HWY TOTAL
TRUNK HIGHWAY	4,417	105	137	3	8	4,670
LOCAL HIGHWAY	15,192	229	269	15	10	15,715
SUBTOTAL	19,609	334	406	18	18	20,385
MISC ROUTES ①	332	1	43	1	0	377
TOTAL	19,941	335	449	19	18	20,762

① Federal lands roads, state lands roads, ramps, and private roads.

TABLE 2 - DATA WITH FHWA DEFINITION OF A BRIDGE (20 FT IN LENGTH OR LONGER)

CONDITION OF HIGHWAY STRUCTURES				
ROUTE SYSTEM	HWY ON BRIDGE	CONDITION (# of Bridges)		
		GOOD	FAIR	POOR
TRUNK HIGHWAY	3,503	1,416 (40.4%)	2,012 (57.4%)	75 (2.1%)
LOCAL HIGHWAY	9,784	6,368 (65.1%)	2,872 (29.4%)	544 (5.6%)
TOTAL	13,287	7,784 (58.6%)	4,884 (36.8%)	619 (4.7%)

CAPACITY

The capacity of a bridge is typically presented in terms of its load-carrying ability (e.g., how big a truck can safely cross the bridge) or its geometric standards.

The load capacity of a bridge is considered adequate if it can safely carry Minnesota's legal loads. If it can't carry legal loads, the bridge is posted with signage to inform truckers and other travelers of the reduced capacity of the bridge. In Minnesota, there are 1,475 load-posted bridges (17 on the state highway system, and 1,458 owned by others). This number is significantly higher than the 547 bridges that were reported as load-posted in the 2018 Minnesota Infrastructure Report Card. The increase is due to extensive load rating analysis contracts performed on bridges within local road networks.

Businesses often cite load restrictions on bridges as being a hindrance to the movement of goods and services throughout the state. Milk haulers, for example, use rural roads to access area farms. These bridges are vital to local businesses but are seldom part of the "Corridors of Commerce" program, created by the Minnesota Legislature in 2013.

The sum area of highway bridge decks in Minnesota has grown by more than 60% over the past 30 years. Our analysis of Federal Highway Administration (FHWA) data indicates that bridge deck area totals grow by

roughly 1.7% each year through the construction of new bridges, replacement bridges that exceed the size of the original bridge, and bridge widening projects. Currently, the bridge deck area in Minnesota is increasing by roughly 1.3 million sq. ft. (about 30 acres) each year.

CONDITION

Bridges in Minnesota are inspected by trained and certified personnel at least once every two years. Some culverts are inspected on a four-year cycle. Inspections may be required annually or more frequently on bridges with certain attributes or details, or on those bridges that are in poor condition.

Different scales are used by inspectors to describe the condition of different components of a bridge. The most common is a 0-9 National Bridge Inventory (NBI) scale utilized by the FHWA to describe the general condition of three components (deck, superstructure, substructure) on a scale from 0 to 9, where 0 represents a totally failed condition and 9 represents an excellent condition. As bridges age, their condition deteriorates and they receive lower condition codes from inspectors. A condition code of 4 or lower is assigned to a component that is in poor condition: that is, the component exhibits advanced section loss, deterioration, spalling, or scour. Rehabilitation projects can raise the NBI rating of a bridge.

Sample images of bridge elements in poor condition

There are 874 bridges in poor condition in Minnesota. This number has improved from the 2018 Minnesota Infrastructure Report Card value, where 1,080 bridges were listed in poor condition. Bridges in fair condition receive condition codes of 5 or 6. Bridges in good condition receive condition codes 7, 8, or 9.

FIGURE 2 - FHWA CONDITION DATA ON MINNESOTA BRIDGES 1993-2020

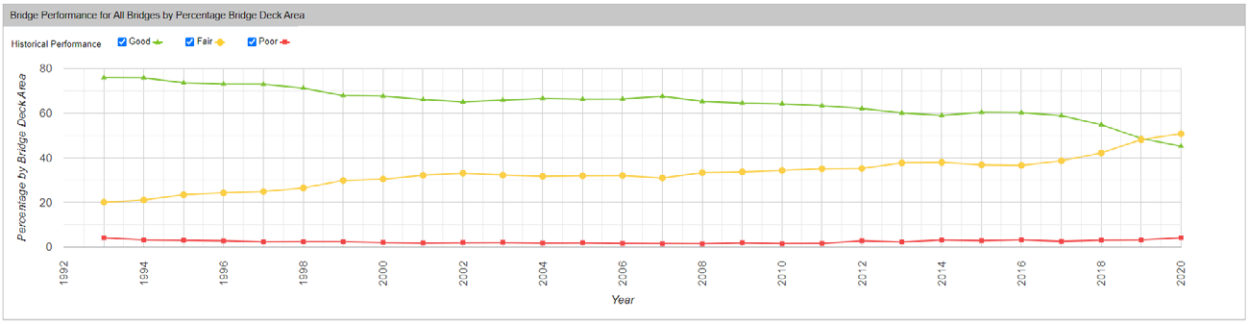
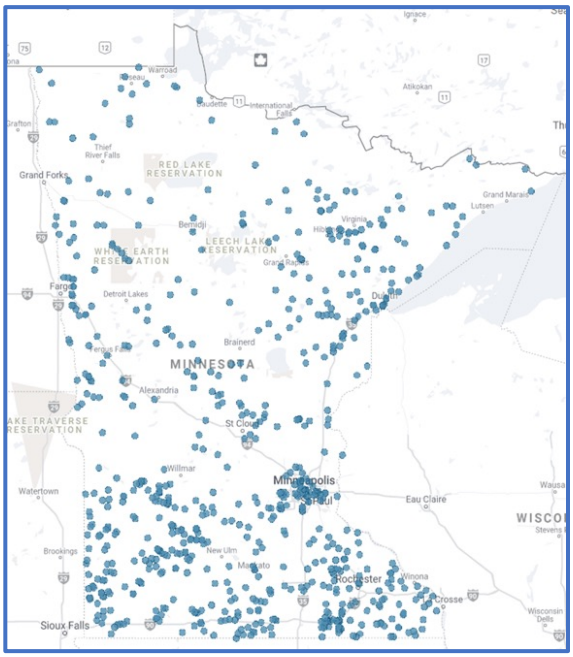


Figure 2 shows the FHWA data on bridge condition in Minnesota over the past 30 years based on deck area. From one perspective, the graph is encouraging. It shows that in 1993, only a small percentage of Minnesota's bridges were in poor condition. The graph also shows that the state has kept that percentage low over the past 30 years. That's the good news. The more concerning trend is the growing percentage of bridges listed in fair condition. In 1993, bridges rated as good accounted for over 75% of the deck area; those rated as fair accounted for just 20%. Slowly and steadily, the fraction of good bridges has decreased and the fraction of fair bridges has increased. The 2020 data for Minnesota shows a larger percentage of bridge deck area in the fair category than in the good category. As a state, we have spent down the condition of our bridges.

As the number of bridges in fair condition increases, it will become more and more difficult to "keep" the poor bridge percentage small.

FIGURE 3 SHOWS THE LOCATION OF BRIDGES RATED AS POOR USING THE FHWA'S LONG-TERM BRIDGE PERFORMANCE PORTAL.



FUNDING AND FUTURE NEED

Bridges are a key component of our infrastructure. They are expensive to construct, rehabilitate, and maintain. The Minnesota Chapter 152 Bridge Improvement Program that ended on June 30, 2018, replaced or rehabilitated 136 bridges and provided funding for the maintenance and minor repairs of another 33 bridges in Minnesota.[4]

The anticipated funding need for bridges in Minnesota exceeds $8.2 billion over the next 20 years. The Trunk Highway System bridge need is estimated to be $6.35 billion. Local highway system need is estimated to be $1.7 billion. Funding needed for bridges in parks and on trails is estimated to be more than $150 million over the next 20 years.

The federal Infrastructure Investment and Jobs Act (IIJA) identifies $302 million for Minnesota bridge replacement and repairs over five years, contingent on a 20% state match.[4] In addition, MnDOT has submitted a preliminary request to the state Legislature for $800 million in trunk highway bonds to fund improvements to high-priority bridge projects and for an additional $200 million in general obligation bonds to pay for the repair and replacement of deficient bridges owned by cities, counties, and townships throughout Minnesota.[5]

Over the past five years (2017-2021), $933 million has been spent on highway bridges in Minnesota, an average of $186 million each year. However, the amount expended in an individual year varies greatly. In 2017, over $337 million was spent, while in 2019, the expenditure was $61 million.

We anticipate that future funding amounts will be similar to past funding amounts. Therefore, multiplying $186 million by 20 years results in anticipated funding of $3.7 billion. To this, we added $302 million from IIJA for Minnesota bridges and determined that expected funding will be approximately $4.0 billion.

The difference between the need and expected funding is $4.2 billion. Averaged over 20 years, the shortfall is $210 million per year.

MnDOT's approach to bridge asset management continues to improve. In the past, the worst bridges were the first to be funded, which has also been the approach on the local system. Recently, MnDOT has been identifying and performing early preservation activities for bridges. These activities are investments that pay a high rate of return by reducing costs in future years.

At times, the Minnesota Legislature has provided "one-time" money to address bridge needs. These occasional investments complicate the delivery of bridge projects. The need to ramp up and subsequently ramp down staffing levels and shift staff assignments is an inefficient way to approach systemwide bridge needs.

Older bridges that are part of large river crossings are difficult to fund. Project costs for repair or replacement of these bridges can be too large for a local government agency to pay for. It is likely that the resources planned to address many smaller bridges in poor condition in a local agency's inventory will be deferred to cover the costs associated with the repair or replacement of large bridges.

Currently, there is no dedicated source of funding available to owners of park and trail bridges. As there are hundreds of bridges in this network (many of them old railroad bridges), there are significant needs. These needs have not been consolidated, but needed funding is expected to be at least $7 million per year.

SAFETY AND RESILIENCE

MnDOT considers several risk factors while prioritizing bridge projects on the state highway system. These factors include traffic interruptions, load restrictions, and the likelihood of full-service interruptions.

Among the more than 3,800 bridges in Minnesota that are more than 50 years old, many were built according to old design standards. These bridges often have narrow lanes and narrow shoulders, which do not meet user needs and current safety standards.

When local bridges in rural areas are taken out of service, long detours often result. This can significantly affect the response times of first responders, ambulances, and fire engines responding to emergencies, especially when load-posted rural bridges limit access. Such detours also increase the cost of transporting goods and services.

INNOVATION

MnDOT and the DNR have embraced innovation to help assess the condition of existing bridges and ensure that replacement bridges are durable. Examples of innovative bridge assessment techniques include the use of drones for bridge inspections and sophisticated timber testing tools to determine the internal condition of timber bridges.

MnDOT has begun using 3D project delivery for a limited number of bridge projects. 3D project delivery utilizes three-dimensional models. These are passed from the designer to the contractor. Traditionally, bridge projects have used plans and specifications to communicate the project's intent to the contractor. For example, a project on TH169 used 3D project delivery. MnDOT also recently introduced a bridge service life manual to complement its bridge design manual.

Bridges

RECOMMENDATIONS TO RAISE THE GRADE

- Establish a reliable funding stream for bridges through the Minnesota Legislature and the federal government.
- Identify a source of dedicated funding for park and trail bridges.
- Continue efforts by MnDOT to find the right balance between funding for operations and preventative maintenance, minor projects involving deck overlays, major rehabilitation projects involving deck replacements, and total bridge replacements.
- Continue the progress MnDOT has made in its approach to asset management. Encourage similar asset management practices for local bridge owners.
- Develop a mechanism to provide local government agencies with funding to address preventative bridge maintenance and rehabilitation in addition to the bridge replacement funding they already receive.

SOURCES

1. 2021 Minnesota Department of Transportation Bridge Report
2. FHWA's Long-Term Bridge Performance Portal – 2020 NBI Data
3. Communications with Mr. David Conkel, MnDOT State Aid Bridge Engineer
4. Communications with Ms. Nicole Bartelt, MnDOT Bridge Planning Engineer
5. Communications with Mr. Paul Ouren, Minnesota Department of Natural Resources Bridge Engineer
6. Communications with Mr. David Hedeen, MnDOT Bridge, Asset Management Engineer
7. MNDOT 2019 Final Report on the Trunk Highway Bridge Improvement Program: Chapter 152
8. Minnesota State Demographic Center Department of Administration Long-Term Population Projections for Minnesota, October 2020.
9. Salisbury, Bill. "MnDOT's $1 billion plan to address state's ailing bridges." Pioneer Press, 29 September 2021.

Dams

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THE ROOT RIVER SPILLS OVER THE LANESBORO DAM. LANESBORO, MINNESOTA

EXECUTIVE SUMMARY

Dams provide positive benefits to Minnesota. Among them are their contributions to water supply, recreation, hydroelectric power, and environmental protection, with most dams serving more than one purpose. The typical design life for a dam is 50 years, and the majority of Minnesota's dams were built at least 50 years ago. Fortunately, 96% of high-hazard potential dams in the state — dams that, should they fail, would likely result in loss of life and economic damage — have emergency action plans. There are current federal and state programs that support dam rehabilitation and dam removal to promote and protect public health, safety, and welfare. State-regulated dams are typically reliant on state bond funding to provide a stable, predictable funding source for inspection, maintenance, repairs, and rehabilitation.

CONDITION

Both the Minnesota DNR and the U.S. Army Corps of Engineers (USACE) maintain databases of all of Minnesota's dams. These databases differ in their definitions of dams, but both monitor and report similar physical and safety-related information. Sixty-nine dams with documented condition in the state are classified as unsatisfactory or poor condition.

The DNR defines a dam as a structure that is greater than 6 feet in height and that retains more than 15 acre-feet of water.

USACE defines a dam as meeting one of the following criteria:

1. If the dam were to fail, loss of human life would likely occur.
2. If the dam were to fail, economic loss, environmental damage, disruption of lifeline facilities, or other impacts to the public would result.
3. The dam is greater than or equal to 25 feet in height and retains 15 acre-feet of water or more.
4. The dam is greater than or equal to 6 feet in height and retains 50 acre-feet of water storage or more.

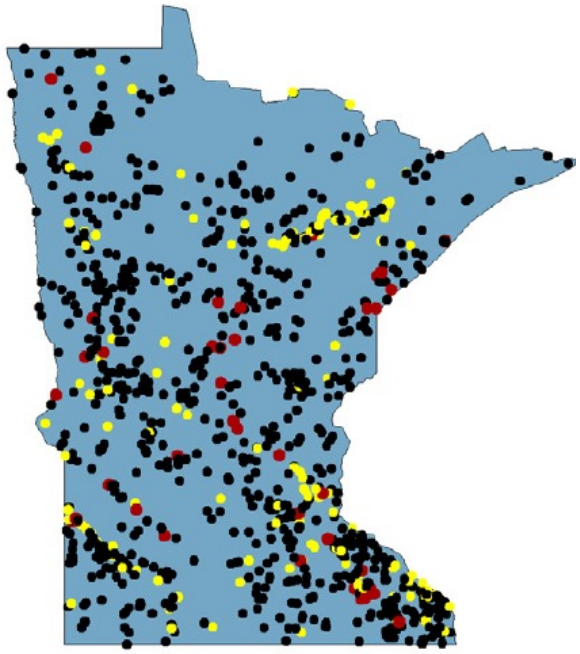
Minnesota's dams are built using a variety of materials, and are built to different heights with different water storage volumes. These dams are located throughout the state as shown in the adjacent figure (Association of State Dam Safety Officials, or ASDSO, Dam Safety Performance Report). The associated definitions are also defined within the ASDSO Dam Safety Performance Report.

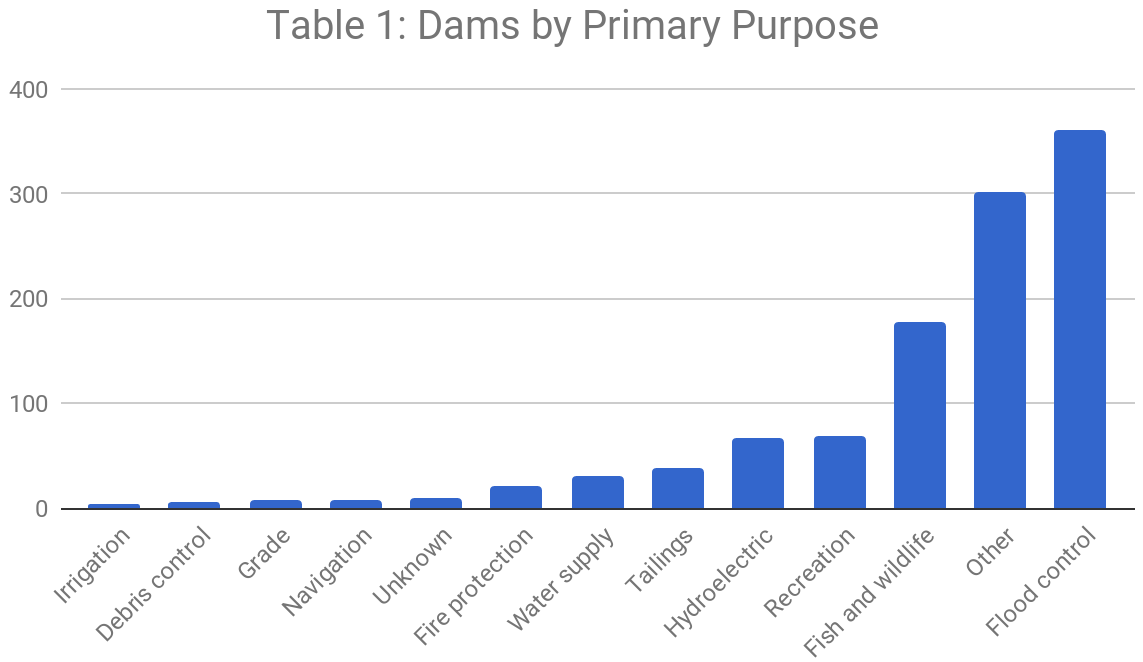
RED indicates high-hazard potential dams, which are typically defined as dams whose failure or improper operation could potentially cause loss of human life and/or significant property damage. Thirty-three dams are classified as high-hazard dams.

YELLOW indicates significant-hazard potential dams, typically defined as a dam whose failure or improper operation could potentially cause significant property damage. In Minnesota, 148 dams are classified as significant-hazard dams.

BLACK indicates low-hazard potential dams, typically defined as a dam whose failure or improper operation would likely only cause minimal property damage. There are 980 dams classified as low-hazard dams in the state.

The public most commonly thinks of high-profile dams as only those that provide hydroelectric power or regional water supply, but Minnesota's dams serve many, and often multiple, purposes. Flood control is the primary purpose for most of the state's dams, followed by fish and wildlife management. Other purposes include recreation, hydroelectric power generation, tailings retention, and water supply.





Minnesota's dams are maintained by private, local, state, and federal entities. Of the dams shown in the table above, about one-third serve more than one purpose. Both the Minnesota DNR and the Federal Emergency Management Agency (FEMA) provide grants for rehabilitation and removal of dams. Dam rehabilitation commonly involves increasing functionality while also repairing deficiencies to improve dam safety. Dam removals can occur when a dam either no longer serves its primary purpose or poses an unacceptable level of risk to downstream populations. Dam removals typically have ecological benefit also. In addition to these funding mechanisms, the Infrastructure Investment and Jobs Act, which became law in 2021, provides substantial funding for necessary improvements to the nation's dams through programs such as the National Dam Safety Program and the High Hazard Potential Dam Rehabilitation Grant program, and other programs through the U.S. Department of Energy. These funds will improve the safety of existing dams and infrastructure while encouraging the addition of incremental hydropower generation and development of energy storage projects.

CAPACITY AND OPERATIONS AND MAINTENANCE

Safe operation and maintenance of dam structures or embankments is critical to properly serve local populations. Proper operation and maintenance help to significantly reduce the risk associated with a dam failure. Minnesota's state-regulated dams are subject to regulations related to hazard classification, disaster mitigation, emergency repairs, and inspection frequency, among other requirements that are in effect to protect the public.

The majority of Minnesota's dams are older than 50 years. These structures continue to age and may become subject to stricter design criteria as their hazard classifications change due to downstream development. What may have been a reasonable basis for design 50 years ago may not be appropriate today due to these changed conditions.

Minnesota legislation provides for dam inspections of state-regulated dams. These inspections are completed as funding and current staffing allows. Dam owners are liable for the costs to maintain these dams and have the responsibility to ensure their integrity. Federally regulated, power-producing dams fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC). Refer to Table 1 below. FERC-regulated dams also require regular inspections based on hazard classification. Owners of a FERC-regulated dam are billed annually to fund FERC dam safety programs and annual inspections conducted by FERC engineers.

TABLE 1: REGULATED DAM INSPECTION FREQUENCY SCHEDULE

Class	Hazard Potential	State Inspection Frequency	Federal Inspection Frequency
I	High	1 every year	1 every year
II	Significant	1 every 4 years	1 every year
III	Low	1 every 8 years	1 every 3 years

When a state-regulated dam becomes a hindrance to the community/environment and no longer serves its intended purpose, the state may provide up to 100% of the funds required for removal to cities, counties, townships, and watershed districts, but not privately owned dams.

PUBLIC SAFETY AND RESILIENCE

To ensure public safety, the risk of dam failure should be reduced. The failure of a dam may not only pose an immediate life-and-safety risk to the public but may also damage roads, bridges, and associated utilities. Such infrastructure may serve as critical assets that are needed by the public immediately following an event to restore community functionality. Due to the age of Minnesota's dams, many dams will require significant upgrades to account for current climate trends.

The DNR defines an Emergency Action Plan (EAP) as "a formal document that identifies potential emergency conditions at a dam and specifies preplanned actions to be followed in order to minimize property damage or loss of life in the case of a dam failure." All high-hazard dams are required to have an EAP. Minnesota has 86 state regulated high- or significant-hazard dams; 83 of these have an emergency action plan. Minnesota legislation requires that these EAPs be communicated to communities that could be potentially affected. If a high-hazard dam lacks an EAP, this information should also be communicated to affected communities. The USDA Natural Resources Conservation Service (NRCS) and ASDSO have worked to create a sample EAP that is available online to assist dam owners.

Another important component of a strong dam safety plan is the education of asset owners as well as communities whose economies or lives could be impacted by the failure of a dam. ASDSO and the Federal Emergency Management Agency (FEMA) have prepared information to help answer questions about dams, including their purpose, associated risks, and what to do if individuals are impacted by a dam failure.

FUNDING

The state should provide sufficient funding and professional staff to complete inspections of all state-regulated dams requiring inspection. These inspections will help ensure that dam owners are performing proper maintenance and that improvements to dam structures are being completed. As the state's population continues to increase and precipitation patterns change, dam programs will require continued investment. Environmental and community changes can impact the hazard classification of a dam as downstream populations grow. Dam improvements needed to meet higher hazard classifications can be costly and require significant funding. Dam owners are required to improve the dam to meet the higher classification and could be found liable for damages incurred if the dam does not comply with current standards. Funds and grants need to be available for both public and private dam owners to improve these facilities.

According to the DNR, an estimated $103 million is needed over the next 20 years to ensure that public state-regulated, non-powered dams remain in a safe and stable condition. The DNR creates a Project Priority Needs List through its Dam Safety Program every odd-numbered year to request funding. This list includes recently completed projects, current projects, and projects that still need funding, as well as the total estimated cost for each project. The 2021 list included:

- 71 ranked projects, estimated to cost over $26 million
- 108 projects overall, estimated to cost over $32 million

Forty-three of the ranked projects required repairs related to safety concerns.

Over the past 20 years, Minnesota has decreased the number of regulated dams per staff member and increased the state safety budget per dam. Since the publication of the 2018 Minnesota Infrastructure Report Card, the backlog has been reduced. This is primarily due to the $20 million in funding provided for the Lake Bronson Dam rebuild. The dam safety bonding bill appropriations have increased in recent years from an average of $1 million annually to over $2 million annually. These steps have helped with the backlog; however, the yearly repair costs will continue to rise as projects with lower priority don't receive the funding they need. Deferred maintenance will continue to drive up the estimated costs to own and maintain Minnesota's dam infrastructure. Dam owners and agencies need to work together to obtain proper funding to repair deficient dams to protect the public.

Dams

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RECOMMENDATIONS TO RAISE THE GRADE

- Fund state dam safety programs, including an increase in inspection staff.
- Fund state grant programs to rehabilitate and/or remove dams.
- Develop EAPs for all significant-hazard dams.
- Educate members of the public so they learn where dams are located, and the hazards and risks associated with them.
- Educate government entities on the increased need for funding as dams age and require increased maintenance.
- Require that the review of existing dams compare the original design to current design standards.

SOURCES

Association of State Dam Safety Officials, Minnesota Performance Report

Minnesota Department of Natural Resources, Dams and Dam Safety

U.S. Army Corps of Engineers, National Inventory of Dams

The Ford Dam during summer in Minneapolis, Minnesota

Drinking Water

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EXECUTIVE SUMMARY

Approximately 80% of Minnesotans are served by community water systems, while 20% of the population relies on private wells for drinking water. Although drinking water systems in large communities have consistently met federal standards, far less is known about the private wells on which many people in rural Minnesota rely. Meanwhile, much of the drinking water infrastructure in the state is over 50 years old. Some system components are closer to 100 years old and reaching the end of their useful life. The U.S. Environmental Protection Agency estimates the 20-year drinking water infrastructure need for Minnesota at over $7.5 billion. An emerging area of concern is the amount of lead in our drinking water, which is caused by lead service lines. Recently, Minnesota increased the Safe Drinking Water Connection Fee from $6.36 to $9.72 per service connection per year starting in 2020, which will restore $80 million over 20 years for local infrastructure needs.

BACKGROUND

Drinking water and wastewater systems are often considered "invisible" assets since many aspects of these systems are buried or maintained out of the public eye. Water systems are not in the headlines until there is a problem. Infrastructure failure of drinking water treatment and distribution systems can have major impacts on communities. Most importantly, people's health can be at risk when treatment does not comply with standards or when infrastructure damage allows contaminants to enter the water system or precludes reliable fire protection. In addition, failures in drinking water distribution such as water main breaks can have environmental and economic impacts. Water losses can lead to business closures and place a strain on water resources.[1]

Minnesotans receive drinking water from two main sources: surface water, such as a river or lake, and groundwater. Drinking water is either conveyed from a public water system or a private well. The breakdown is shown in Table 1.

TABLE 1

Source of drinking water for Minnesotans[1]	Estimated population (millions)	Percent of population
Public groundwater (Community system)	3.0	54%
Public surface water (Community system)	1.4	26%
Private wells	1.2	20%

[1] *Estimates provided in Minnesota Department of Health "Drinking Water by the Numbers"*[12]

Approximately 80% of Minnesota residents are served by community water systems. Community water systems include all systems that serve at least 15 service connections or serve an average of at least 25 people for at least 60 days a year.[2] There are 6,649 such systems in Minnesota: 964 community systems provide water to consumers in their places of residence, and 5,685 noncommunity systems provide drinking water in settings like factories, schools, restaurants, recreational vehicle parks, and highway rest stops.[12]

Drinking water systems can be broken into several components: source, treatment, and storage and distribution. Depending on the community and the needs of each individual community, drinking water treatment and distribution may encounter different challenges related to source water, aging infrastructure, changes in population, and more.

CAPACITY

In general, the capacity of drinking water treatment plants in Minnesota is adequate. However, the Minnesota State Demographic Center projects a gain of 1.1 million residents through 2070 as well as a decline in population in more than two-thirds of Minnesota's 87 counties. As populations increase in urban areas, there will be a need to modify existing drinking water treatment plants or construct new water treatment plants to provide treatment. Declining populations in rural counties will also lead to changes in the way these communities provide drinking water to their residents. These projects can be expensive, and face considerable competition for infrastructure funding, as discussed below in the Funding and Future Need Section. In addition, the capacity of drinking water treatment systems relies on having sufficient source water for treatment. As noted in the Resilience section, protecting groundwater and surface water is key to maintaining a sustainable water supply.

Much of the drinking water infrastructure in Minnesota is over 50 years old. Some system components are closer to 100 years old and reaching the end of their useful life. As this infrastructure ages, communities may be faced with huge multiyear projects to replace large portions of the entire water system.

CONDITION

Much of the drinking water infrastructure in Minnesota is over 50 years old. Some system components are closer to 100 years old and reaching the end of their useful life.[1] As this infrastructure ages, communities may be faced with huge multiyear projects to replace large portions of the entire water system.[1]

In Minneapolis, the Water Treatment and Distribution Service manages more than 1,000 miles of water mains, over 15,000 isolation valves, nine pump stations, and eight finished water reservoirs. As of 2020, Minneapolis averaged approximately 44 prominent water main breaks a year and most pipes involved were over 100 years old. In St. Paul, where the infrastructure is over 100 years old, the city averaged 124 water main breaks along its 1,200 miles of service lines from 2016-2021. The city has instituted an annual replacement program, which aims to replace 11 to 12 miles of mains each year.

OPERATION AND MAINTENANCE

Asset management, a tool for managing a utility's assets, can assist utility operators to make sound decisions on caring for their aging assets. The goal of asset management is to ensure the long-term sustainability of the water and/or wastewater utility.[4] As a water system ages over time, the asset deteriorates and loses value. As this happens, the level of service that the utility's customers desire may become compromised, operation and maintenance costs can increase, and the utility may have extreme and unpredictable costs that it can't afford.[4] Effective asset management can be a valuable tool for utilities to use to maintain their systems and minimize the risk of aging infrastructure.

Asset management plans are not required; however, the Minnesota Department of Health (MDH) encourages the use and preparation of asset management plans for drinking water systems. A short-term goal of the Drinking Water Revolving Fund (DWRF), as identified in the 2022 Intended Use Plan (IUP), is to encourage DWRF recipients to develop asset management plans.[6]

In addition to the challenges of managing aging infrastructure systems, small communities have identified the task of retaining institutional knowledge as water operators and other water system staff retire as another significant challenge. To help water utilities develop asset management plans and retain knowledge, MDH and the Minnesota Rural Water Association developed an asset management planning spreadsheet for small water systems (populations of less than 1,000).[4]

FUNDING AND FUTURE NEED

Treatment plants and distribution systems are expensive to build, operate, and maintain. Distribution projects often require work in the street, which can involve extensive planning to minimize disruptions to the public. Investment in existing systems and funding for future infrastructure are essential to asset management. Financial assistance for water infrastructure is currently available in the form of low-interest loans. Limited grant funds are also available to communities based on project cost and average household income.[6] Funding also comes from revenue generated by ratepayers; however, a user's water bill is often lower than the true cost of service.

The EPA assesses the nation's drinking water infrastructure needs every four years and uses the findings to allocate funds for the states' Drinking Water State Revolving Fund programs. The results of the 2015 Drinking Water Infrastructure Needs Survey and Assessment determined that the 20-year drinking water infrastructure need for Minnesota is over $7.5 billion.[2,9] The breakdown of these costs by public water system size are shown in Table 2 below.

TABLE 2: MINNESOTA 20-YEAR NEED REPORTED BY SYSTEM SIZE[1]

System Size	20-Year Need (in millions of January 2015 dollars)
Large – serving over 100,000 people	$1,110.0
Medium – serving 3,301 to 100,000 people	$4,322.9
Small – serving 3,300 and fewer people	$1,735.5
Not-for-profit noncommunity water systems	$339.5
Total:	$7,507.9

[1] *Information obtained from the USEPA "Drinking Water Infrastructure Needs Survey and Assessment"*[9]

The seventh Drinking Water Infrastructure Needs Survey and Assessment is currently in progress and will provide updated information on the nation's drinking water infrastructure needs over the next 20 years. This survey will also include data collected on lead service line inventory and operator workforce.

The Drinking Water Revolving Fund (DWRF) provides financing for municipal drinking water systems, including treatment plants, water towers, water mains, wells, and pumphouses. Demand for drinking water loans is driven by the need to replace aging facilities, provide additional treatment to meet public health standards, and replace old water mains to minimize water loss and potential contamination problems. Since the program's inception in 1998, the DWRF has funded more than $1 billion in projects through this program. In fiscal year 2019, 40 projects were funded. They consisted of five new treatment plants, seven treatment plant upgrades, four storage projects, several new wells with associated wellhouses, six storage tanks, two meter upgrades, and 17 water main projects.[2]

Projects that the Public Facilities Authority (PFA) intends to fund from the DWRF within a state fiscal year are identified in an Intended Use Plan (IUP). To fund these projects and activities for 2022 (fiscal year from July 1, 2021 to June 30, 2022), the PFA will use a combination of funds from the 2021 federal capitalization grant, loan repayments, and PFA revenue bond proceeds.[6]

Demand for DWRF financing has grown in recent years. Total requests for the 2022 IUP exceed $373 million, eight times the sustainable long-term lending capacity of the fund. To maintain balance between current demand and future lending capacity, each year the PFA in consultation with MDH determines a fundable range for new projects listed on the IUP based on Project Priority List (PPL) priority points.[6] It is important to note that while there is a significant gap between requests and capacity, the total requests may overestimate the annual funding need due to requests from systems that are not ready for construction or are also seeking state grant funds to offset some of the loan.

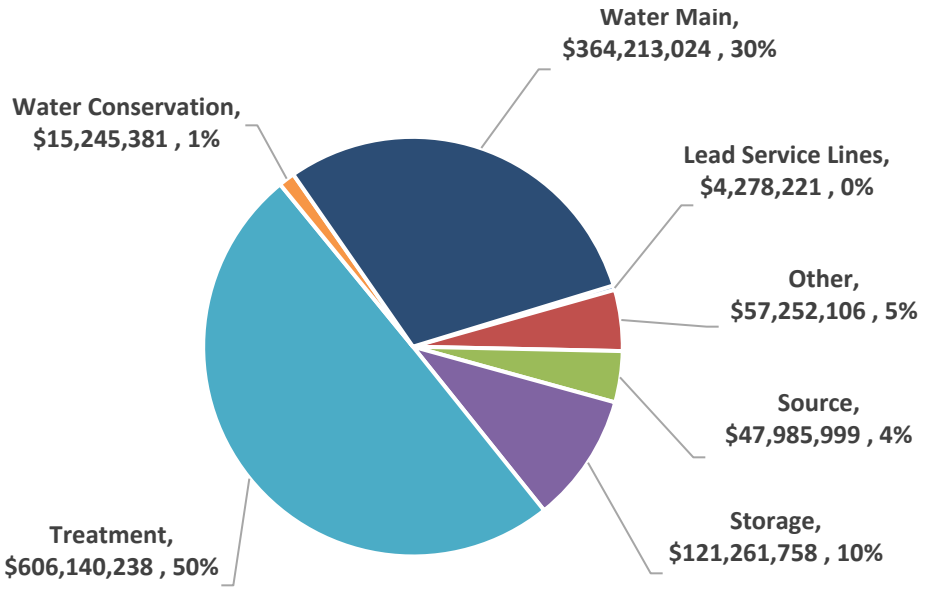
The five-year need identified by the 2022 Drinking Water PPL has more than doubled since 2017 to a total of 513 projects at a cost of $1.2 billion (see Table 3).[6] Smaller cities with a population under 3,300 account for 417 projects at a cost of $660 million. Project types are shown in Figure 1.

TABLE 3: PROJECT PRIORITY LIST FIVE-YEAR NEED[1]

Drinking Water PPL by year	Five-year need
(in millions of dollars)	$1,110.0
2017	$559
2018	$607
2019	$750
2020	$739
2021	$966
2022	$1,216

[1]Information obtained from Minnesota Department of Health "2022 DWRF PPL Summary Tables"[6]
[2] Fiscal year from July 1 to June 30

FIGURE 1: 2022 DRINKING WATER PROJECT PRIORITY LIST COST AND PROJECT TYPE



Information from Minnesota Department of Health "2022 DWRF PPL Summary Tables"[6]

To help cover costs incurred by MDH to provide inspection services, protection plans, and technical assistance for the public water systems in Minnesota, the Minnesota Legislature established the Safe Drinking Water Connection Fee. This annual connection fee is an important component of the funding MDH needs to aid Minnesota's drinking water systems. In addition to assisting public water systems, the Safe Drinking Water Connection fee provides funding for laboratory costs for water testing, data management and reporting, and grants to disadvantaged communities. In 2019, the Minnesota Legislature voted to increase the Safe Drinking Water Connection Fee from $6.36 to $9.72 per service connection per year starting in 2020. This was the first increase to the fee in 14 years. The fee increase has allowed MDH to reduce the drinking water program's dependence on DWRF and to restore $80 million over 20 years for local infrastructure needs.[2]

SAFETY

In recent years, more than 99% of the state's population has access to drinking water that meets federal standards.[2] When a drinking water system test shows that the level of a contaminant exceeds a federal limit, the public water system receives notice of a health-based violation. Health-based violations can occur when a public water system's source water quality changes or when the system has a failure in operation or treatment that can affect health. When a violation occurs, MDH works with the affected water system on corrective actions. The actions always include notifying the customers of the system.

Although Minnesota has been successful at meeting safe drinking water standards, communities must continue to actively protect and maintain the quality of their drinking water. As technology and research increase our understanding of contaminants and treatment options, drinking water utilities may face new challenges as they strive to meet state regulations and fund alternative treatment technologies.

Per- and polyfluoroalkyl substances (PFAS)

PFAS are a family of human-made chemicals that have been widely used for decades. PFAS are emerging contaminants and have been included in the third and fifth Unregulated Contaminant Monitoring Rule (UCMR) monitoring as well as statewide monitoring programs. MDH began sampling public water systems for PFAS in 2006. Much of this sampling has taken place in the East Metro and in other areas of the state where aqueous film-forming foam (AFFF) was used, such as airports and military bases.[14]

The human health impacts of PFAS exposure are being actively studied. Numerous studies have shown that higher levels of exposure to PFAS are associated with a wide range of human health effects, including higher cholesterol, changes to liver function, reduced immune response, thyroid disease, and cancer. MDH has developed health-based guidance values for several PFAS in drinking water. The guidance values are levels that MDH considers safe for all people to consume, including at-risk populations. The guidance values apply to short time periods as well as a lifetime of exposure. MDH continues to monitor the growing body of science about PFAS and will adjust health advice as needed.[15]

Lead and Copper

Lead has been recognized as an environmental hazard for many years. It returned to the national spotlight due to events in Washington, D.C., and Flint, Michigan. Lead is a harmful contaminant that can have long-term health effects, particularly in children. Lead contamination in water is most often attributed to distribution system components such as lead service lines, fixtures, and solder.[3]

The federal Safe Drinking Water Act, enforced by MDH, contains the Lead and Copper Rule (1991), which regulates testing and governs allowable levels of lead and copper in drinking water. If a public water supply exceeds the action level, the utility is required to act to reduce lead and/or copper by taking steps such as conducting corrosion control studies, installing corrosion control treatment, and removing lead service lines.

In 2017, the Minnesota Legislature passed a law requiring all public schools to test their public drinking water for lead and make the information available to the public. MDH also provides guidance and education tools to help schools and communities better understand how they can protect their drinking water quality.

In 2020, one community system in Minnesota exceeded the lead action level and 28 exceeded the copper action level; five noncommunity systems exceeded the lead action level, and six exceeded the copper action level.[10] MDH is conducting public education programs and working with the drinking water utilities within these communities to obtain compliance.

RESILIENCE

Approximately 74% of Minnesotans have drinking water that is sourced from groundwater, which may be provided by a private well or a public water system. As a result, sustainable groundwater use is important to maintaining the drinking water supply in the state. MDH coordinates with state agencies and local organizations to develop Groundwater Restoration and Protection Strategies (GRAPS) reports for watersheds in Minnesota. A GRAPS report identifies key groundwater quality and quantity concerns using existing data and information about groundwater and land use practices in the watershed. The reports can then be used to develop watershed-scale groundwater and drinking water management strategies to integrate into local water management plans.[8] Groundwater is an important source of drinking water for Minnesotans, and sustainable practices are imperative.

The Source Water Protection grant program funds diverse activities that protect drinking water. Activities include well sealing, public education, and managing and eliminating potential sources of contamination in Drinking Water Supply Management Areas (DWSMAs). In 2019, MDH awarded 99 such grants, for a total of $825,000. Source water protection is key to preventing contamination and preserving drinking water sources for future use.[2] A variety of grants that benefit public water supplies are also available for farmers and local governments through the Minnesota Board of Water and Soil Resources.

Minnesota has an active Water and Wastewater Agency Response Network (MNWARN) whereby cities can provide mutual assistance during emergencies or catastrophic events. In addition, the governor has called out the Minnesota National Guard during catastrophic events such as floods and tornadoes. The Legislature also has approved or provided funding assistance when it is in session. The MNWARN system is an organization that the Minnesota Legislature may wish to consider for future funding.

COVID-19 Response

The COVID-19 pandemic has greatly impacted and challenged the drinking water industry. COVID-19 has not been detected in drinking water supplies and there is no evidence that the COVID-19 virus survives the disinfection process for drinking water.[2] However, much of the drinking water industry relies on in-person staff and operators to maintain public water systems. A nationwide 2020 survey conducted by the USEPA indicated that 36% of water and wastewater utilities faced supply chain disruptions and 27% experienced personnel shortages.[16]

Throughout the pandemic, MDH has worked with water systems across the state to continue to provide safe drinking water. Some examples of activities supported by MDH in the early stages of the pandemic include providing online training, adapting sampling plans to protect health of staff, updating guidance and policies as needs changed, contracting to provide certified operators, and providing technical assistance and support to water systems. A joint effort by MDH and the Minnesota Section of the American Water Works Association facilitated statewide engagement of water utilities throughout the pandemic and provided a forum to discuss needs and lessons learned.

Drinking Water

RECOMMENDATIONS TO RAISE THE GRADE

To raise the drinking water infrastructure grade in Minnesota, the following actions are recommended:

- Increase funding for the Drinking Water Revolving Fund. This will augment the annual lending capacity maintained by the PFA. Increased grant funding is also needed to help address affordability needs for communities with high-priority projects. Completion of these projects will reduce the risk of infrastructure failures. Funding for infrastructure improvements could be obtained from a drinking water tax specifically earmarked for this purpose, increased user rates (to better reflect the true cost of water treatment), or from other general funding sources. Additional funding for the research and monitoring of emerging contaminants would also be beneficial.
- Encourage the use of asset management and development of asset management plans at the local level. This will provide valuable information on the needs of drinking water systems statewide. Asset management can improve operations and maintenance and delay loss of condition within a drinking water system by focusing resources as needed. Tracking aging infrastructure will also help utilities make informed decisions on pipe replacement and treatment system upgrades. An improved understanding of infrastructure needs statewide would better inform the funding process.
- Act to educate the public on water quality issues and the challenges involved in maintaining a drinking water system. A well-informed citizenry will be engaged and can better advocate for the needs of their community. Encourage people in the community to join the drinking water workforce and support workforce education.

Drinking Water

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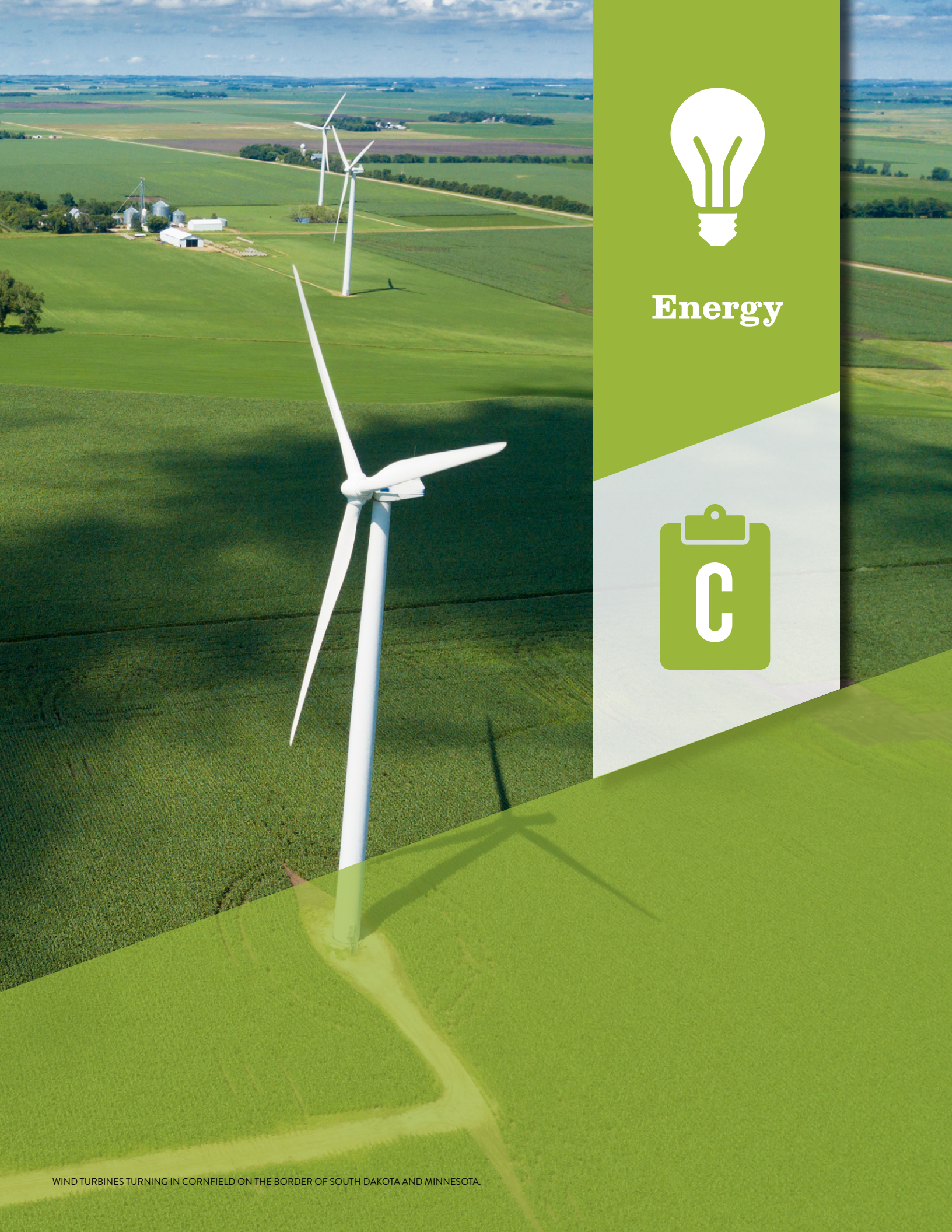

Energy

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WIND TURBINES TURNING IN CORNFIELD ON THE BORDER OF SOUTH DAKOTA AND MINNESOTA.

EXECUTIVE SUMMARY

In 2020, nearly one-third of Minnesota's electricity was produced by renewable energy. That is almost a five-fold increase from 2005 and puts Minnesota ahead of many other states. However, growth in renewable energy generation must be met with investments in the transmission system — the "interstate highway" of the electric grid. There are two transmission upgrades planned in Minnesota totaling $68 million that will enhance capacity in the system. Meanwhile, the distribution system — the "last mile" of the electric grid — also needs investment to ensure reliability in the face of increasingly severe storms. Minnesota's residential electricity rates are increasing to help fund necessary improvements, but rate growth from 2018 to 2021 was still 3.5% less than the U.S. average increase.

BACKGROUND

Electric utilities in Minnesota are classified as either investor-owned, cooperative utilities, or municipal utilities. The Minnesota Public Utilities Commission (MPUC) regulates all investor-owned utilities. Specifically, MPUC regulates rate changes, service areas, mergers and acquisitions, facility planning — including large electric power plants and electric transmission lines — and other items.

Most Minnesota electric utilities are members of the Midcontinent Independent System Operator (MISO). MISO is responsible for the delivery of electricity across 15 states and Canada, including Minnesota.

In 2020, nearly one-third of Minnesota's electricity was produced by renewable energy — or 29%, to be precise. That is almost a five-fold increase from 2005. There has been a continued reduction in the use of coal for electricity generation. In 2020, 25% of electricity generation was from coal, a significant reduction from 53% in 2011. Minnesota's two nuclear power plants, Monticello and Prairie Island, accounted for 26% of the state's net electricity generation in 2020. Natural gas accounted for 20% of the state's net electricity generation.

Sherburne County Generation Station, the state's largest coal fire plant, has three generators, Sherco 1, 2, and 3. The plants are scheduled to be retired in phases, beginning with Sherco 2 in 2023, Sherco 1 in 2026, and Sherco 3 in 2030. Extensive planning will be required to replace Minnesota's largest coal power plant.

CAPACITY

Minnesota consumes more electricity than it generates within the state. Over the past decade, Minnesota has imported about one-fifth of its annual electricity requirement from other states and Canada. In general, electricity sales and generation declined in Minnesota from 2018 through 2020. In 2020, total retail electricity sales were below 2011 levels.

As nonrenewable resources become less available and their environmental impacts become better understood, the state needs to generate energy with cleaner sources. Firms are phasing out fossil fuel plants. Xcel Energy, Minnesota's largest investor-owned utility, has proposed beginning to phase out coal-fired plants within this decade. The company plans to increase wind and solar generation to fill the gap.

Xcel Energy announced a commitment to generate 100% clean energy by 2050.

In 2007, the Minnesota Legislature established the state's Renewable Energy Standard (RES) requirements. These requirements set renewable standards for public utilities, generation and transmission electric cooperatives, municipal power agencies, and power districts operating in the state. The standard requires that at least 25% of retail electricity sales be generated or procured using eligible renewable sources by 2025. Of Xcel Energy's retail electricity sales, at least 30% must be generated or procured using eligible renewable sources by 2025. Currently, utilities are on track to meet this requirement.

The transition to renewables requires additional capacity on Minnesota's decades-old transmission grid. That grid moves renewable energy from generation to consumption: from the solar farm to the kitchen outlet. Adding capacity requires years of advanced planning and forecasting. Coordinated investment and communication between utility operators, investors, regulators, and end users is necessary to properly plan and prepare that forecasting.

Minnesota legislation requires utilities to file proposed Integrated Resource Plans (IRP) every two years that project electricity demand 15 years ahead. IRPs include proposed changes to meet anticipated demand and document how each utility stands to meet Minnesota's 25% renewable RES standard.

Progress is being made on transmission capacity, also. In 2021 the MPUC issued permits for two high-voltage transmission projects. In addition to these two projects, there are six transmission line projects currently at various stages of the state permitting process. The 2021 Biennial Transmission Projects Report identifies 103 separate "reasonably foreseeable future inadequacies" in the transmission system across the state.

On the other side of power generation is conservation, or reduction in need. Minnesota's Conservation Improvement Program (CIP) sets goals for energy savings. The state aspires to an energy savings of 1.5% of average annual retail sales each year for electric and natural gas utilities, unless that figure is adjusted by the commission to no less than 1.0% (Minn. Stat. 216.241). During 2017 and 2018, electric utilities exceeded the CIP goal of 1.5% savings and natural gas utilities exceeded the statutory minimum of 1% annual energy savings. These energy savings total over $279 million extra for Minnesota businesses and residents and around 15.2 trillion Btu of energy from 2017 to 2018. That's enough energy to heat, cool, and power more than 160,000 Minnesota homes for a year.

Finally, when considering capacity, it is important to examine whether electrification is causing congestion on the grid. Electrification of cars, buildings, and other everyday features of a modern society place strain on existing and aging electric infrastructure. Just as roadways can become congested during peak hours, electricity grids can also become overpowered (congested).

After years of slow load growth, increased electrification presents a unique challenge for Minnesota electric utilities and the transmission system. MISO's Transmission Expansion Plan (MTEP21) examines how best to prepare for increasing electrification. The plan includes two Minnesota transmission line projects: the Appleton - Benson 115 kV line and the Panther - Big Swan Rebuild. The cost of both projects totals approximately $68 million.

CONDITION AND OPERATION AND MAINTENANCE

Minnesota's four investor-owned utilities and all but six of the other electric utilities that operate in Minnesota are members of MISO. This membership allows MISO to control transmission facilities while the utilities keep ownership. MISO is an independent system operator (ISO) third-party organization that manages transmission and power generation while looking out for end-use customers. In doing so, MISO develops policies and procedures to maximize overall systems operation, generation, transmission, and delivery. MISO works with utility owners to advocate for the end users of the electrical system, as well as needed upgrades of power generation and transmission systems.

Minnesota's transmission system operates across borders through the Upper Midwest, Eastern United States, and Canada. Minnesota's primary electric load centers

are the seven-county Twin Cities Metro Area, Duluth, Mankato, Rochester, and St. Cloud. As populations grow and technology advances, these centers, as well as Greater Minnesota, will require more electric transmission capacity and reliability. Additionally, as base load plants are retired, the need for increased storage capacity will become part of the mix that will affect the transmission system.

In its 2019 Integrated Distribution Plan (IDP), Xcel Energy provides an overview of a five-year capital expenditure budget. Included in the budget is $141 million for grid modernization and pilot projects, $117 million for system expansion or upgrades for reliability and power quality, and $78 million for age-related replacements and asset renewal, all in the year 2022.

PUBLIC SAFETY AND RESILIENCE

Minnesota set ambitious goals for reductions in greenhouse gas emissions. The target: reduce greenhouse gas emissions by 15% in 2015, compared to 2005. That didn't happen. In 2018, greenhouse gas emissions had decreased by only 8% from 2005 levels. But, Minnesota's energy generation sector is doing its part. The power generation cohort achieved a 29% reduction in 2018 from 2005 levels. For those cuts to continue, the state needs to accelerate renewable generation. Minnesota obtained only 16% of its total energy from renewable resources in 2018 and is at risk of missing its goal of a reduction of 25% by 2025.

FIGURE 1: MINNESOTA'S GREENHOUSE GAS (GHG) EMISSIONS FROM 2005-2018

blue line = actual GHG emissions green line = goal

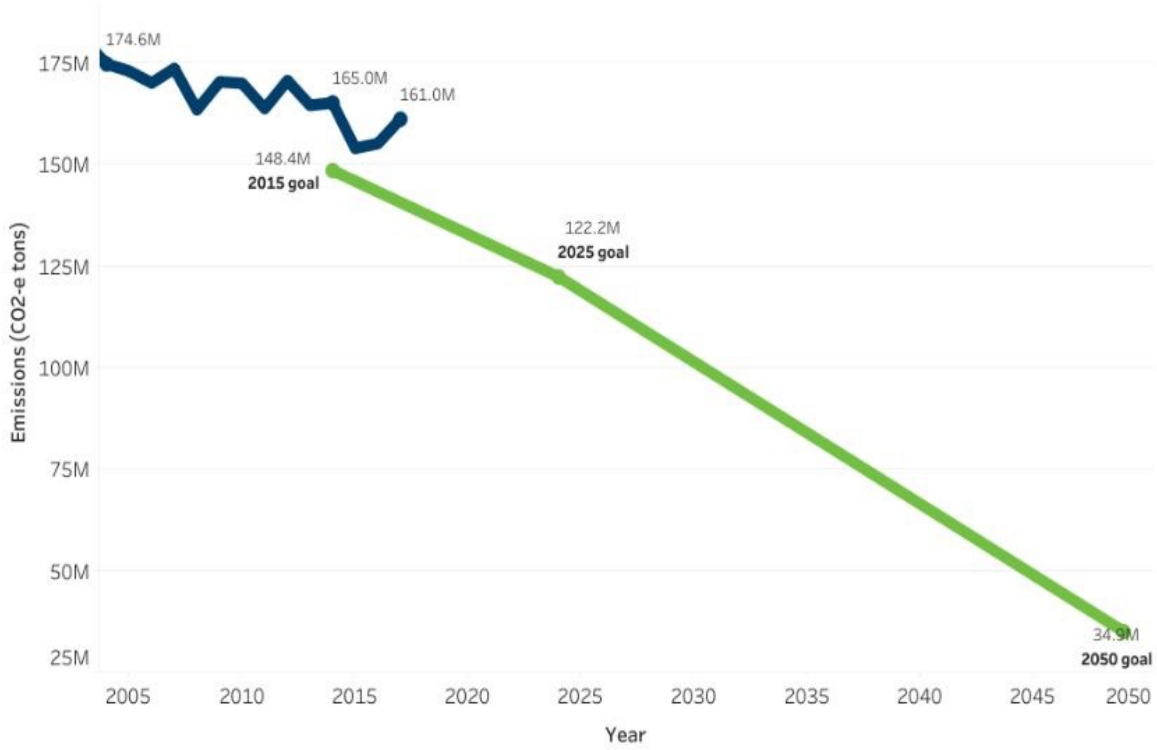


Figure 1-D: Minnesota is not on track to meet its 2025 GHG emissions goals.

Source: Minnesota Pollution Control Agency

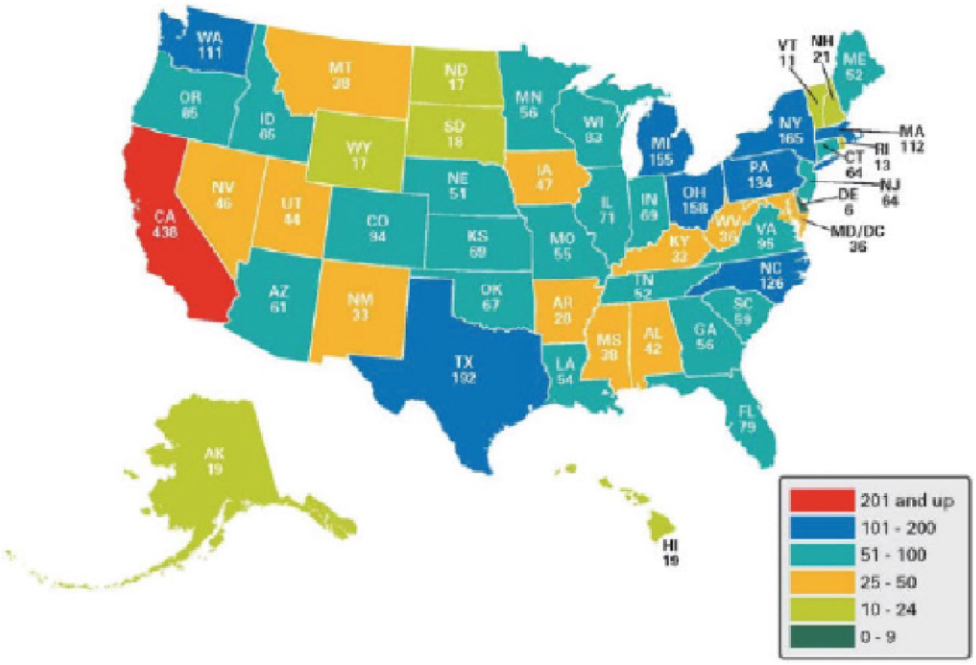
https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data

GHG emissions pose health and safety concerns. Worsening air pollution levels can have negative impacts on respiratory and cardiovascular conditions. GHG's trap heat in the atmosphere, impacting temperature and rainfall. Both have negative affects on health and safety. As we move away from fossil fuels as energy sources, our current energy infrastructure will require adaptations and changes. The electrical infrastructure is already experiencing changes as more electricity is produced from renewable sources. These sources of renewable energy create congestion on the current electrical transmission system. As we move toward a future of more electrification, such as electric vehicles to reduce GHG emissions in the transportation sector, these challenges for the electricity generation and transmission sector will continue to grow.

In 2021, the Natural Gas Innovation Act (NGIA), a bipartisan bill, was signed into law by the governor. The NGIA will help Minnesota take an important step toward improvements in public safety and health. The legislation creates a pathway for gas and dual-fuel utilities to explore available opportunities to shift from fossil fuels to wind, solar, and other zero-carbon energy sources and decarbonize across their service territories.

Minnesota's electrical grid is only middling on resilience to natural disasters and storms worsened by climate change. It ranked 22nd in states affected by power outages in 2016 and 2017. In 2017, there were 56 reported outages. On average, 1,378 people were affected per outage. The duration of each outage averaged 76 minutes. The power goes out and costs add up everywhere. Businesses can't welcome customers; goods can't be sold and services can't be delivered online; families lose the food in their fridge; and governments are left with nonfunctioning facilities.

FIGURE 2: NUMBER OF REPORTED POWER OUTAGES BY STATE IN 2017



In its MTEP21 report, MISO discussed the ability to move large amounts of power during the 2021 Arctic storm that crippled Texas. MISO stated that regional transmission will become even more important for the resiliency of the electric system if the trend of severe weather events continues. This is true in Minnesota's transmission system, especially, where weather impacts caused 72% of the outages in 2015-16. By comparison, Minnesota power generation sites caused no unplanned outages in 2017.

To improve resilience, we must build more capacity than we think we might need for redundancy and incorporate new, different grid structures. Microgrids can improve resiliency. The energy division of Minnesota's Department of Commerce is taking steps to incentivize those small-grid systems.

Little data is available in the public domain about the state's efforts toward the adoption of policies intended to protect the grid from cyberattacks.

INNOVATION

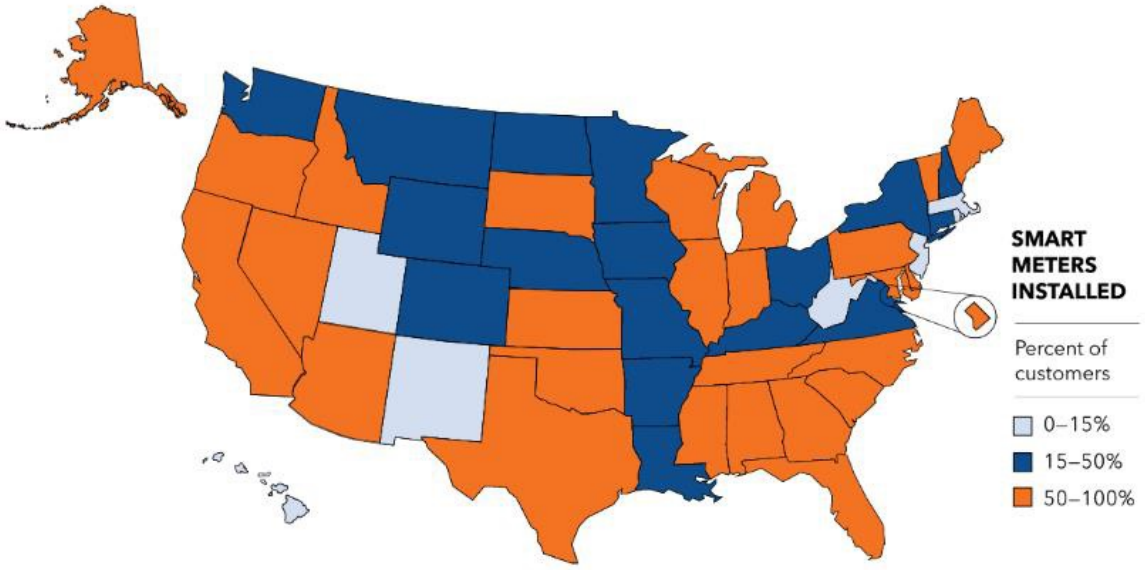
The NGIA legislation, passed in 2021, specifically allows a natural gas utility to submit an "innovation plan" for approval by the Minnesota Public Utilities Commission (PUC). An innovation plan could propose the use of renewable energy resources and innovative technologies, such as:

- Renewable natural gas (produces energy from organic materials such as wastewater, agricultural manure, food waste, agricultural or forest waste)
- Renewable hydrogen gas (produces energy from water through electrolysis with renewable electricity such as solar)
- Energy efficiency measures (avoids energy consumption in excess of the utility's existing conservation programs)
- Innovative technologies (reduces or avoids greenhouse gas emissions using technologies such as carbon capture)

Electricity meters serve as the interface between utilities and customers. Older meters were analog and recorded the amount of energy used so the amount could be read on dials and recorded. Utilities in many states have adopted a newer metering technology known as advanced metering infrastructure (AMI), or "smart meters." Smart meters allow for two-way communication between utilities and customers, and enhance energy grid resiliency and operations. Smart meters provide a digital link between electric companies and their customers by opening the door to new and expanded services, such as smart home energy management, load control, budget billing, usage alerts, outage notifications, and time-varying pricing.

Nationwide, there were more than 99 million smart meters deployed to utility customers as of 2019. Minnesota Power located in Duluth, has nearly 100% deployment of AMI's.

FIGURE 3: AMI ADOPTION BY STATE 2019



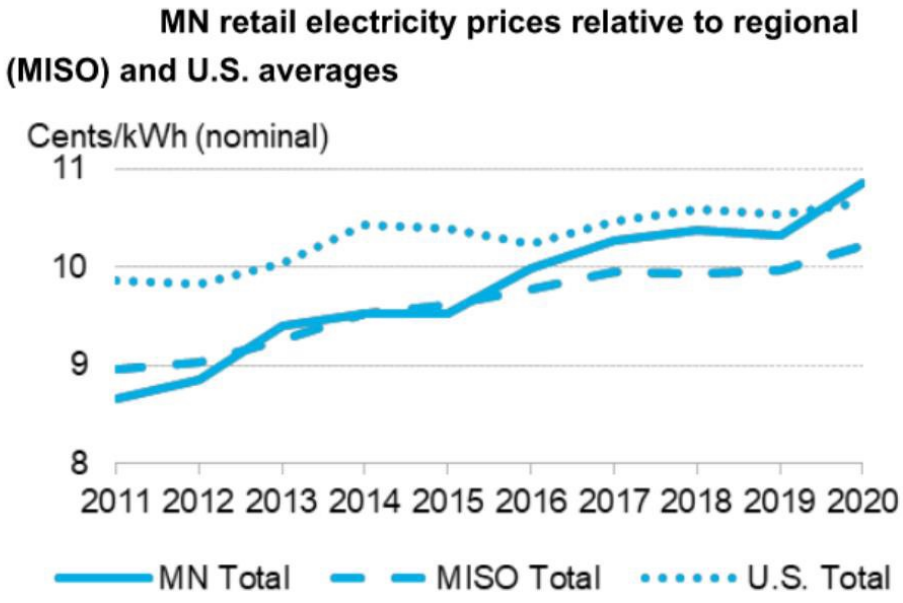
FUNDING

Funding for the electric grid is derived from electricity fees. Minnesota's electricity prices per kWh are compared to the U.S. average in the table below.

Electricity	Minnesota	U.S. Average	Period
Residential	13.60 cents/kWh	14.12 cents/kWh	November 2021
Commercial	11.32 cents/kWh	11.33 cents/kWh	November 2021
Industrial	8.83 cents/kWh	7.47 cents/kWh	November 2021

Source: https://www.eia.gov/state/data.php?sid=MN#Prices

Prices for electricity in Minnesota have been increasing. Compared to 2018 prices, 2021 prices increased by 8.3% for residential electricity rates and 13.6% for industrial electricity rates. Commercial and industrial rate increases have outpaced the U.S. average. However, Minnesota's residential electricity rates in 2021 were 3.5% less than the U.S. average. Affordable electricity is necessary; additional investments are also needed to support grid modernization, build out the necessary network to support a transition to renewables, and invest in resilience and reliability.



Minnesota must maintain affordable energy prices, continue the reliable and resilient delivery of electricity, and keep public safety at the forefront to maintain strong economic growth for our future.

FUTURE NEED

Minnesota's energy needs are expected to increase. Even though Minnesota's electricity wholesale numbers have declined from 2018 to 2020, the population of Minnesota is predicted to grow. An increased population means that more devices and appliances are plugged in. Residential and commercial electrification presents challenges that could require utilities to increase electricity capacity while maintaining affordable rates to consumers. In energy generation, further decarbonization poses a challenge to MISO and Minnesota utilities: wind and solar farms produce energy differently than the on-demand generation of coal and natural gas plants.

All of these challenges require grid modernization and transmission enhancements. MISO has identified transmission needs in the MEPT21 report. The organization notes that wind and solar generators are often located farther from load centers than their fossil fuel counterparts. And rather than just building more power lines, the system needs to be made smarter with real-time topology optimization, advanced power flow controllers, and dynamic line ratings. Transmission projects, many of them crossing state or even international borders, are necessary to ensure the movement of clean energy from the place it is generated to the consumer. The MISO MTEP reports and utility IRP plans identify future needs and investments on a regular basis.

Additional energy storage and funding for that effort are needed to help maintain reliability from generation of wind and solar. Energy conservation and demand-side management programs are also important resources in Minnesota. These programs not only help manage load growth but are the cheapest and most environmentally friendly way to meet the demand. In recent years, regulated utilities' IRP's have generally indicated a need for additional resources to meet Minnesota's projected demand for electricity and to replace retiring coal-fueled and other generating plants. Analyses done in the IRP process consider energy conservation and demand-side management resources integrally in both the assessment of forecasted demand and in the selection of potential resources to meet an identified need.

Minnesota's energy needs are expected to increase. Even though Minnesota's electricity wholesale numbers have declined from 2018 to 2020, the population of Minnesota is predicted to grow.

Energy

RECOMMENDATIONS TO RAISE THE GRADE

To raise the energy infrastructure grade in Minnesota, the following actions are recommended:

- Promote energy conservation and demand-side management. Continue to deploy technologies such as advanced metering infrastructure.
- Fund transmission infrastructure needs, including increasing energy storage capacity and distribution.
- Expand the CIP program to broaden efficiency programs.
- Continue to look at expanding SB 2030 (sustainable design guidelines to reduce energy consumption).

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Ports

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AERIAL VIEW OF DULUTH MINNESOTA HARBOR

EXECUTIVE SUMMARY

In Minnesota, 83% of the state's port capacity is found in ports along Lake Superior (St. Lawrence Seaway); the remaining 16.5% of capacity is found in ports along the Mississippi River. Ports are major economic drivers, linking cities to world markets. While capacity at Minnesota's ports is currently sufficient, the ability to maintain or improve the condition of existing facilities and develop new infrastructure varies. Many port structures will require attention in the immediate or near future, as the structures are nearing the end of their 50-year design life. Other challenges that facility operators are addressing include accelerated freshwater corrosion of steel structures; increased storm frequency and flooding; low- and high-water levels; dredging backlogs; deferred dock wall construction; the need for new storage facilities; necessary building/road/rail rehabilitation; improvements in land access to the ports; increased industrial land gentrification, which complicates operations; and upgrades to meet safety codes. Additional challenges in 2019 to 2021 have arisen due to the COVID-19 pandemic, which caused shortages in vessels, cargo, workforce, and supplies.

BACKGROUND

Approximately 65 to 75 million tons of cargo are moved through the ports in Minnesota each year. Table 1 below shows 2019 tonnage as reported by Minnesota Department of Transportation (MnDOT) Ports and Waterways.

TABLE 1

PORT 2019	NET TONS	PERCENTAGE
DULUTH-SUPERIOR	33,535,349	49.88%
TWO HARBORS	16,942,617	25.20%
SAINT PAUL	7,300,722	10.86%
SILVER BAY	5,632,842	8.38%
SAVAGE	1,631,519	2.43%
WINONA	1,584,831	2.36%
RED WING	609,543	0.91%
TOTALS	**67,237,423**	**100%**

The largest port in Minnesota is the Port of Duluth-Superior, a bistate international port at the far western end of the Great Lakes/St. Lawrence Seaway. Located within the natural estuary of the St. Louis River, the port has 19 miles of federally dredged navigation channels. The shipping season is seasonal, with an approximately two-month closure for domestic shipments and three-month closure for overseas shipments.

Cargoes generally are dry bulk and not containerized, and the largest tonnages are of iron ore, coal, limestone, grain, and salt. Break-bulk cargoes of mining and energy industry equipment, steel, lumber, and paper products are handled at docks owned by the Duluth Seaway Port Authority. Additional efforts to increase the shipping of containerized cargoes to the Duluth ports are underway.

The importance of these cargoes and modern, well-maintained ports to the North American economy is best evidenced by the shipment of iron ore. The iron ore in a single, 70,000-ton cargo shipment on a 1,000-foot freighter will be utilized in the manufacturing of over $2 billion in finished products within the North American economy. Great Lakes taconite shipped from Minnesota amounted to 42.2 million tons in 2019. Taconite amounted to 75% of Minnesota's overall tonnage in 2019. Iron ore decreased in price and tonnages shipped dropped to an all-time low in 2020 due to the COVID-19 pandemic but rebounded in 2021. Iron ore shipment tonnages are now on pace to exceed the 2019 tonnages.

The Saint Paul Port Authority owns the majority of the multimodal Mississippi River Terminal property, where commodities are loaded on and off of barges throughout the shipping season. Over 7.3 million tons of commodities passed through the Saint Paul Port Authority river terminals in 2019, including corn, soybeans, and wheat. Imports included sand, gravel, fertilizer, salt, cement, and coal. The river ports account for more than 50% of Minnesota's agricultural exports. See Figure 1.

FIGURE 1: (STATEWIDE PORTS AND WATERWAYS PLAN, TABLE 2.3)

MISSISSIPPI RIVER SYSTEM	GREAT LAKES-ST. LAWRENCE SEAWAY SYSTEM
Grain	Iron or (taconite)
Aggregate	Coal
Fertilizer	Grain
Cement	Limestone
Salt	Salt
Iron	Bentonite
Coal	Kaolin clay
Limestone	Bituminous aggregate
Petroleum products	Oil field equipment
Animal feed products	Project cargo
Slag	Break-bulk
Steel	Aggregate
Twine	Sinter ore
Urea	Wind energy components

CAPACITY

The ports reviewed for this Report Card, including Minnesota's largest, the Port of Duluth-Superior, currently have sufficient capacity for the short term. However, owing to the expansion of containerized and specialty shipping to relieve other currently congested ports, large areas of land near or on the waterways will be needed to accommodate future receiving and multimodal distribution. Another current trend is the gentrification of land in and near port areas. Land that is considered ideal for freight shipping purposes is increasingly in competition with residential, commercial, public, and recreational land uses. This trend has begun to displace the potential for freight terminals along shorelines and has reduced the availability of land for marine freight transport.

A portion of the upper Mississippi River was designated a Marine Highway by the Maritime Administration (MARAD) in 2014. The M-35 corridor, also known as the "Waterway of the Saints," runs between Saint Louis, Missouri, and Minneapolis-Saint Paul. This designation is anticipated to assist in providing a seamless transition across freight modes by leveraging marine services and locations to complement landside surface transportation routes. This expands Minnesota shippers' ability to distribute freight to the region and the world.

CONDITION

The physical condition of docks and piers (both above water and below), breakwalls, jetties, and landside facilities all factor into the condition of a port. One specific challenge facing the Lake Superior ports is that steel structures in the upper 10 feet of the water column are subject to high rates of corrosion due to microbiologically induced corrosion (MIC) that began around the mid-1970s. Existing steel structures are being protected utilizing unique corrosion remediation methods. New steel structures are protected by coatings; and occasionally, fully composite materials are used in lieu of steel. Composite materials are slowly developing and becoming cost-effective alternatives, and are planned to be used more in the future.

In general, structural conditions of both lake and river port facilities vary widely throughout the state. Some facilities are very poorly maintained and have been completely taken out of service or need complete replacement. Other facilities have recently undergone significant rehabilitation or replacement and are in excellent condition.

Many existing port structures are nearing their 30- to 50-year design life, and many others have far exceeded their practical design life. Property owners need to allocate proper resources to maintain and improve their facilities and keep up with the ongoing degradation from corrosion, environmental changes, and overall wear and tear before those facilities are deemed unsafe and beyond practical repair.

FUNDING AND FUTURE NEED

Minnesota limits eligibility for its repair and construction program, the Port Development Assistance Program (PDAP), to publicly owned properties. This limitation makes Minnesota slightly less competitive when compared with the neighboring state of Wisconsin, as the Wisconsin Harbor Assistance Program (HAP) supports dock repair and construction projects for both municipal and private docks. If the Minnesota PDAP grant program is ever modified to include privately owned facilities, the physical condition and future competitiveness of the facilities in Minnesota ports will benefit.

Private industry funding to repair docks has been very limited in Minnesota. High costs to repair and replace aging infrastructure has forced dock owners to consolidate operations and improve only the areas that are absolutely necessary to maintain operations.

In 2021, four port development projects received grants totaling $14 million to support freight movement on Minnesota's waterways. Some $7.3 million went to the Saint Paul Port Authority; $7.4 million went to the Duluth Seaway Port Authority; and $300,000 went to the Wabasha Port Authority. Each year, PDAP receives project requests for project needs usually exceeding available funds by $30+ million. Project requests included dredging in dock areas, dock maintenance and rehabilitation, new dock construction, creation of new storage facilities, building/road rehabilitation, improving land access to the ports, and upgrades to meet safety codes. The $14 million in 2021 PDAP funding was provided to the following projects:

- Redevelopment of the Duluth Seaway Port Authority's Garfield Berth 11 – 1,175 feet of dock
- Duluth Seaway Port Authority 112,500-square-foot warehouse
- Saint Paul Port Authority's Barge Terminal No. 2 – 1,460 feet of dock replacement
- Wabasha Port Authority – River Barge Terminal

The U.S. Army Corps of Engineers also increased funding in the last few years (and for the foreseeable future) by providing additional Great Lakes Restoration Initiative dredging dollars and a larger allocation of the Harbor Maintenance Trust Fund dollars. Current work to delist the harbor as an Area of Concern (AOC) brought federal dollars through the Great Lakes Restoration Initiative (GLRI) to relieve the multiyear dredging backlog and restore 1,700 acres of nearshore shallow water habitat.

Along the Mississippi River system, commercial barge operators pay a user fee of 29 cents per gallon of fuel purchased. These dollars fund half of major federal lock structure improvements. While these improvements may technically lie outside of the scope of this chapter, dredging and lock improvements on the Mississippi need to be adequately funded to ensure that ships traveling downstream do not need to be "light-loaded."

Private industry funding to repair docks has been very limited in Minnesota. High costs to repair and replace aging infrastructure has forced dock owners to consolidate operations and improve only the areas that are absolutely necessary to maintain operations. Other dock owners have shut down facilities and moved to other states where public funding is available, which often funds up to 80% of the rehabilitation. The lack of private facility funding is accelerating the rapid decay of many active docks and forcing some owners to shut down operations completely.

OPERATION AND MAINTENANCE

Port owners and operators react differently to operation and maintenance issues. Some repair immediately upon initial notice, while others wait for issues to become critical. The rate of inspections is also inconsistent—some facilities conduct inspections annually, where others do not perform inspections until a failure or grounding of a vessel occurs. Some facilities have recently undergone significant upgrades and, as a result, their maintenance and inspection schedule needs are significantly lower than facilities that have made no improvements.

The overall industry trend is now slowly moving toward creating detailed asset management strategies and inspection programs, which should improve long-term maintenance planning. The most common maintenance items are typically fender protection systems, dredging to maintain vessel clearances, and grading and clearing for proper site access.

The Mississippi River system is maintained by the U.S. Army Corps of Engineers, which dredges the width and depth of the channel to accommodate barges of up to a 9-foot draft.

PUBLIC SAFETY

Public safety is always important. There are several port facilities with high exposure and foot traffic by the general public, but the majority of properties have little to no public exposure. Most are located out of sight within an industrial area away from high-traffic areas, which allows operations to be conducted without any potential harm to the general public. However, no port in Minnesota is completely inaccessible, as there is always water access. Some ports have simply posted signs to discourage trespassing.

Recent intrusions into active port areas by canoers and kayakers have generated public safety concerns. There have been many instances where members of the general public have been sightseeing or stopping and resting along the shorelines of industrial lands that are typically restricted at the land entrances. Many facilities are beginning to step up security and increase signage along unsafe areas of their facilities to keep the public out of unsafe areas of the industrial ports and from interfering with barge and shipping operations.

RESILIENCE

Port resilience is essential to business and multimodal continuity. Facilities in Minnesota must withstand ongoing corrosion issues and extreme weather conditions, including flash floods, fluctuations in high/low water elevations, ice, and heavy winds in an increasingly complex and uncertain world. The resilience of a port is defined by its capacity to adapt to and recover from disruptions.

As well as physical disruptions, port facilities must effectively respond to short-term economic changes and product flexibility. Some docks have the capability to import and export multiple types of products (i.e., grain industry facilities, port authority facilities, and general bulk material storage docks), while others are currently dedicated to a single product (i.e., iron ore, coal, and fuel). Under those circumstances, tonnage on and off that dock is strictly tied to a single demand.

Ports can be exposed to a wide array of disruptions, so it is essential that infrastructure and operations are able to recover from a disruption in a timely fashion.

INNOVATION

Within the wide range of docks and facilities in the various harbors and ports, there is a large disparity in the use of innovative technology. Over the past 15 years, significant innovation has taken place in the prevention of steel corrosion. Many of the steel dock structures now incorporate epoxy coatings, protection panels, or composite jackets for protection. Owners of some significantly older docks have upgraded their old wood structures with new coated steel sheet piles. Several dock operators have lacked the capacity or funding to modernize or innovate their facilities, or simply have no need to do so.

Additional governmental and private research and development of new composite, plastic, concrete, and hybrid steel piling products is now paving the way to solve many of the repair and resiliency issues. The state of Minnesota and private industry need to be willing to step away from old technology and fund full-scale product testing to advance these innovations.

Federal and local agencies responsible for dredging operations have creatively reused dredged material to cap/remediate historically contaminated areas of harbors.

Ports

C-

RECOMMENDATIONS TO RAISE THE GRADE

To raise the infrastructure grade of Minnesota's ports, the following actions are recommended:

- Port Authorities such as the Port of Duluth-Superior should continue to preserve land uses, maximize the efficiency of rail/truck/ship (intermodal) connections, and seek new cargo potentials.
- Expand the Minnesota's Port Development Assistance Program (PDAP) to provide increased yearly funding to Port Authorities.
- Find additional sources of funding or grants to assist private industry dock owners to restore port and harbor facilities.
- Continue to protect the federal Harbor Maintenance Trust Fund to prevent and address dredging backlogs in the system and support structural repairs conducted by the U.S. Army Corps of Engineers.
- Maintain federal Great Lakes Restoration Initiative (GRLI) funding and direct dollars into dredging projects.
- Incentivize the use of alternative and new products to repair, restore, and replace old infrastructure with resilient materials.

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Public Parks

B-

EDGE OF THE HIGH FALLS OF BAPTISM RIVER AT TETTEGOUCHE STATE PARK

EXECUTIVE SUMMARY

Minnesota has one national park, 72 state park and recreation areas, 25 state trails, and 56 regional parks located in the Twin Cities metro area. In 2021, St. Paul was ranked No. 2 and Minneapolis No. 3 by the Trust for Public Land's ParkScore, which considers park access and acreage, among other factors. Historically, Minnesota's parks have been well maintained. However, one of the results of the COVID-19 pandemic is that our parks and trails were heavily utilized while most systems are struggling with a backlog of maintenance. St. Paul reports a $91 million backlog in needed park repairs. Minnesota's Department of Natural Resources, meanwhile, reports an annual need of $15.7 million for asset management, a 100-mile backlog of trail rehabilitation needs with an estimated cost of $261,000 per mile, and an annual deferred maintenance total of $2.4 million. There are plans to increase park acreage from the current total of 54,000 acres to 70,000 acres; to triple the length of trails available from the current total of 340 miles to a total of 1,100 miles; and to increase the number of regional parks by three.

CONDITION AND CAPACITY

Minnesota is blessed with abundant natural and built facilities that enhance and increase outdoor and indoor opportunities for its residents and visitors. In addition to facilities that are built and maintained by federal, state, local, and private entities, there are natural features that provide additional recreational opportunities. The state has in excess of 10,000 lakes, plus thousands of acres of grassy areas, forests, and wetlands available to the public for recreation.

Minnesota has one national park, Voyageurs; two national monuments, Pipestone and Grand Portage; the Mississippi National River and Recreational Area; North Country National Scenic Trail; and 300,000 acres of national wildlife land. Voyageurs National Park, along with Minnesota's Boundary Waters Canoe Area, encompasses 234,000 acres and is one of the nation's most popular wilderness destinations, attracting 150,000 visitors each year.

State facilities consist of 66 state parks, nine state recreational areas, nine state wayside rests, 43 state forest campgrounds, 25 state trails, 35 state water trails, and 3,000 public water accesses to the state's lakes and rivers. Of the 1,500 miles of state trail, 620 are paved. There are also 4,100 miles of hiking, biking, and motorized trails and 22,000 miles of snowmobile trails. In addition, the state controls 1.3 million acres of wildlife management areas. Nature-based tourism contributes to the $12.5 billion annual sales that result from overall travel and tourism within the state.

Metro Regional facilities consist of 54,286 acres open for public use, 56 regional parks and park reserves, eight special recreational features such as the Como Park Zoo

and Marjorie McNeely Conservatory, and 40 regional trails (349 miles).

Cities and townships also have park and public spaces. Each city provides park and open space opportunities for its citizens. In 2021, St. Paul was ranked No. 2 and Minneapolis No. 3 in the nation on the Trust For Public Land's ParkScore ranking, meaning access, acreage, investment, amenities, and equity is nearly unparalleled in the United States. The National Recreation and Park Association awarded the City of Plymouth the Innovation in Park Design Award in 2019 and the City of Golden Valley the Innovation in Health Award in 2020.

The Minneapolis Park System was established in 1883 and consists of 6,809 acres, or 15% of the land area of the city. This park system includes 180 park properties, 55 miles of parkways, 102 miles along the Grand Rounds Scenic Byway (a scenic drive encircling the city), biking and walking paths, 22 lakes, 12 formal gardens, seven golf courses, and 49 recreational centers. The Trust for Public Land recommends that community citizens have the opportunity to live within a 10-minute walk of a public park. A review of nine cities located throughout the state indicates that the number of city residents within a 10-minute walk of a public park ranges between 56% and 98% of the city's population.

Funding for the state's parks and recreational resources comes from a variety of sources. General funds from federal, state, regional, and city authorities are the main sources. All facilities rely on admission fees, user fees, and development fees, among other various funding mechanisms. However, there is an ongoing need for additional funding to maintain, equip, expand, and support Minnesota's recreational facilities.

OPERATIONS & MAINTENANCE, FUNDING, AND FUTURE NEED

Funding for the state's parks and recreational resources comes from a variety of sources. General funds from federal, state, regional, and city authorities are the main sources. All facilities rely on admission fees, user fees, and development fees, among other various funding mechanisms. However, there is an ongoing need for additional funding to maintain, equip, expand, and support Minnesota's recreational facilities.

The Minnesota Department of Natural Resources' (DNR) 10-Year Strategic Plan, 2015 to 2025, indicates that there are issues that need addressing. The plan indicates the state is challenged to maintain basic operations at many state recreation facilities. As the number of facilities increase, funds available for basic maintenance and expansion have not kept pace. Specifically, DNR reports an annual need of $15.7 million for asset management; a 100-mile backlog of trail rehabilitation needs with an estimated cost of $261,000 per mile; and an annual deferred maintenance total of $2.4 million.

This concern is also noted in reports prepared by local agencies, for example, Minneapolis and the City of Maple Grove. Minneapolis prepared a 20-Year Neighborhood Park Plan (NPP20), which was adopted in 2016. The plan recognizes the need for increased maintenance of the facilities, and the Minneapolis Parks and Recreation Board subsequently increased funding to the park system by an additional $20 million per year. The City of Maple Grove approved its Maple Grove Park and Recreation System Plan. The plan states that facilities are generally above average; however, operations and maintenance (O&M) and the replacement program has not kept up, and there is deferred maintenance.

Much of the state's population expansion occurs in the Minneapolis/St Paul metropolitan area. The Regional Parks Policy Plan Summary 2040 indicates that there is a need for increased park acreage. There are plans to increase park acreage from the current total of 54,000 acres to 70,000 acres; to triple the length of trails

available from the current total of 340 miles to a total of 1,100 miles; and to increase the number of regional parks by three. Additionally, one of the results of the COVID-19 pandemic is that our parks and trails were heavily utilized while most of those systems are struggling with a backlog of maintenance. St. Paul reports a $91 million backlog in needed park repairs.

PUBLIC SAFETY, RESILIENCY AND INNOVATION

The COVID-19 pandemic has affected the operation of all facilities. Public indoor spaces and programming was suspended while leaving the parklands and trails open and heavily utilized as a safe outdoor destination for family activities.

Residents of the state awaited the opportunity to return to a more normal use of parks and recreational facilities and the availability of programs. Last summer, the state resumed the operation of many of the activities available to its citizens. Recently, the Department of Natural Resources (DNR) contributed park access passes to local libraries to increase opportunities for park access to low-income residents. Additional programs have been put in place to educate residents about recreational and outdoor activities available to them.

Minnesota's parks and recreational facilities incorporate many examples of innovation. The most evident is the dual use of many facilities. Parks departments collaborate with school districts to share outdoor facilities that are necessary for the success of their respective programs. Storm drainage and green infrastructure design reduces stormwater runoff while providing amenities that not only benefit the user, but enhance the beauty of the recreational facility. State parks are designed and located such that many of the unique features of the state are incorporated into the facility for the enjoyment of the user. Park infrastructure is generally designed to be resilient and last for long periods of time.

Japanese garden at Como Park in St. Paul, Minnesota

Public Parks

RECOMMENDATIONS TO RAISE THE GRADE

- Provide financial support for parks commensurate with increased usage associated with the COVID-19 pandemic.
- Prioritize maintenance of parks and recreational facilities in municipal budgets.
- Employ asset management to improve the life expectancy of park features, reduce maintenance costs, and address long-term resiliency of recreational facilities.
- Provide educational and interpretive information within recreational facilities in a variety of languages to enhance user experiences.

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Roads

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MINNEAPOLIS, MINNESOTA

EXECUTIVE SUMMARY

Minnesota has the fourth-highest number of public roadway miles in the U.S. Even as our economy remains strong, Minnesota faces a growing transportation funding shortfall with no clear remedy. The Minnesota State Highway Investment Plan (MnSHIP), published in 2017, estimates that state roads are underfunded by $17.7 billion over the next 20 years, for an annual funding gap of $885 million. The state has passed record bonding bills in recent years, which help finance infrastructure projects. But while over 72% of state-owned non-National Highway System miles are in good condition, local roads suffer from a lack of available funding. In 2021, the Minnesota Department of Transportation awarded $80.5 million to 83 projects through the Local Road Improvement Program (LRIP), but received applications for $835 million, demonstrating that LRIP is extremely oversubscribed. Condition of roads is not the only concern. Congestion is a major problem in the Twin Cities.

BACKGROUND

Minnesota has nearly 142,000 miles of public roadways. Of this mileage, over 118,000 miles are rural. The remaining miles of public roads, less than 16% of the total, are urban.[1] Whether urban or rural, the state's roadway system is vital to Minnesota's economic strength. The investments required to maintain these streets and roadways not only come from the federal and state government, but also our counties, cities, and townships.

CONDITION

Each year, the Minnesota Department of Transportation (MnDOT) uses a sophisticated inspection vehicle to collect and evaluate pavement surface roughness on the entire state highway system and on many of the county state aid highway systems. The roughness of the pavement is reported on MnDOT's rating scale as ride quality index (RQI). The RQI is a combination of the measured international roughness index (IRI) and the perceived roughness as determined by a rating panel consisting of 30 to 40 people. A roadway is determined to be in "good," "fair," or "poor" condition based on its RQI rating. The percentage of roadway miles with an RQI of "good" has seen an upward trajectory over the past 10 years.[4] It has risen from 69.8% (2011) to 87.0% (2020) on Interstate miles, from 66.5% (2011) to 79.9% (2020) on "other NHS" miles, and from 58.6% (2011) to 72.2% (2020) on non-NHS miles.[4] However, projections, which include work currently listed in the State Transportation Improvement Program (STIP), predict a reversal of this positive trend. This decline will be the most destructive to the state trunk highways, which are not part of the National Highway

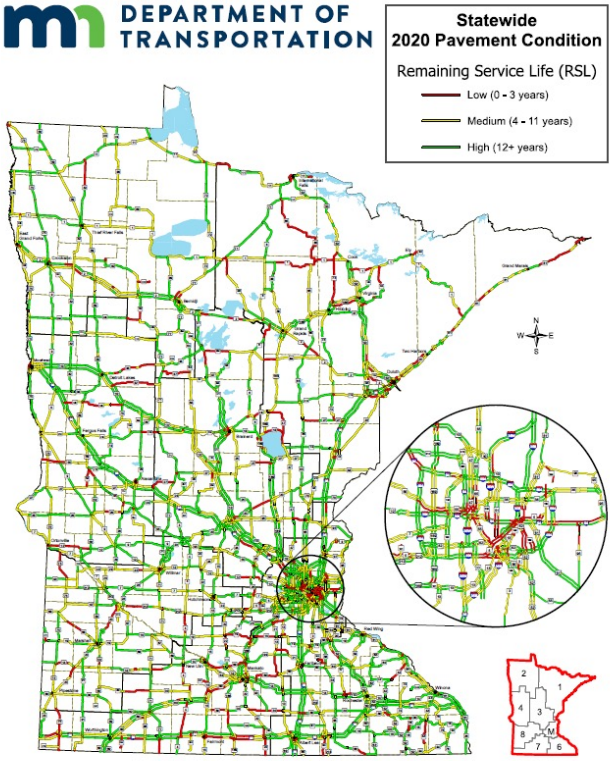
System. We are projected to lose our past eight years of progress in just the next four years. Once pavement falls into the "poor" category, it requires major rehabilitation or reconstruction to restore its service life. The repairs required once highways receive the "poor" rating are much more expensive.

As for the remaining 92% of Minnesota roadways, which include state aid roads and county, city, and township roads, condition data is not widely available. The data is not rated or stored in a uniform way such that it can be easily combined or compared. However, based on past and current funding and inflation, it is anticipated that the pavement conditions for thousands of miles of local roads will deteriorate significantly unless additional investments occur soon. In May and July of 2021, MnDOT awarded $80.5 million to 83 projects through the Local Road Improvement Program (LRIP). There were 425 applications worth $835 million, a 94% increase in applications submitted from the previous solicitation. This demonstrates an increased need on the non-NHS systems.

A survey was conducted of Minnesota city and county engineers in the summer of 2021. Twenty of the 29 respondents indicated that their roadway systems were "mediocre" or "poor".

To improve roadway conditions statewide, the Minnesota Legislature and the U.S. Congress passed bipartisan laws that require MnDOT to better manage our roadway assets (MN Statute 174.03 and MAP-21). MnDOT must complete a 10-year capital highway investment plan in each district that is based on expected funding; identifies investments within asset categories; recommends specific trunk highway segments to be removed from the trunk highway system; and delivers annual progress toward achieving the state transportation goals.

If roadways are removed from the trunk highway system, these roadways become the responsibility of local governments. These local governments will then require additional resources in order to maintain the additional miles added to their systems.



CAPACITY

An analysis of 300 urban areas across the U.S. found that one of Minnesota's urban areas, the Twin Cities, has the 18th-worst level of traffic congestion of all urban areas in the U.S.[3] In 2019, the average driver in the Twin Cities spent 59 peak hours in congestion, averaging a cost of $1,119 per driver. These financial losses total more than $2.3 billion due to congestion in just one area that year. The COVID-19 pandemic provided a historic traffic hiatus, but preliminary 2021 data shows that the pause didn't last long.[3] Traffic congestion remains an issue for Minnesotans, primarily in the Twin Cities.

FUNDING AND FUTURE NEED

Funding for the state's roadway systems is derived from several sources:

- Federal aid
- State motor fuel tax
- State vehicle registration tax (tab fees)
- Motor vehicle sales tax (MVST)
- Local taxes (property tax, sales tax, assessments)
- Other income

Most of the revenue is derived from federal and state motor fuel taxes, which are a fixed portion of fuel price and not tied to inflation. Because the cost of transportation infrastructure rises annually, the buying power of these revenue sources declines. The Minnesota fuel tax was last raised in 2012 to 28.5 cents per gallon. Nearly all of that fuel tax increase was wisely invested in Minnesota's bridges after the Interstate 35W bridge collapsed into the Mississippi River. An unfortunate result is that the condition of our highways has continued to decline.

The Minnesota Constitution requires that 100% of the state fuel tax and tab fees and not more than 60% of the MVST be deposited into the Highway User Tax Distribution Fund (HUTDF) and used only for highway purposes. Furthermore, the HUTDF must suballocate 62% of total revenue to the Trunk Highway Fund (THF) and the remaining 38% to County State Aid Highway Fund (CSAH) and Municipal State Aid Street Fund (MSAS) roadways.

The federal FAST Act provided $4.2 billion to Minnesota from fiscal years 2016 to 2021, an average of $695 million per year. From 2015 to 2019, the federal government provided $1.04 for road improvements in Minnesota for every dollar state motorists paid in federal highway user fees. From 2015 to 2019, federal funds provided the equivalent of 52% of the amount of Minnesota capital outlays on road and bridge projects, including construction, engineering, and right-of-way acquisition.[6]

The federal Infrastructure Investment and Jobs Act (IIJA), signed into law in late 2021, included $1.2 trillion. However, only $558 billion is for new infrastructure. The remaining amount funds existing programs. It is estimated that Minnesota will receive nearly $4.5 billion over the next five years for all apportioned highway programs. Bipartisan bills like IIJA are crucial to addressing future needs but do not replace the need for long-term sustainable funding. The current 20-Year State Highway Investment Plan (MnSHIP) estimates a funding shortfall of nearly $18 billion on state trunk highways and the national highway system alone.

A future need in transportation is the increased demand for electric infrastructure to meet the increased use of electric vehicles (EVs). Since 2018, Minnesota EV registrations have more than doubled, and it is anticipated that the sale of EV's will increase annually by 10%-40%. The state of Minnesota currently has 1,259 total charging points, which provides only about 1 charging point per 123 currently registered EVs. Moreover, the current distribution of charging points is concentrated in urban areas. This unequal distribution creates two main groups that are underserved: minority populations and rural Minnesotans.

INNOVATION

As Minnesota's roads have aged and become more congested, the state has become increasingly reliant on innovation. Minnesota has a deep interest in transportation and roadway innovation, and many Minnesotans take pride in the early adoption of these practices. Minnesota has a Local Road Research Board (LRRB), which was established by the Minnesota Legislature in 1959 and is governed by county and city engineers. The LRRB identifies promising innovative technologies and then finances further development, pilot testing, and implementation of these new technologies.

In addition, MnDOT continues to innovate as demonstrated by these examples below:

MnROAD Pavement Research – MnDOT's materials lab is finding ways to extend road life and improve performance, reduce construction and maintenance costs, speed up construction, and reduce environmental impacts. MnDOT is currently working with 17 states and over 50 partners (universities, industry groups, and consultants) on two major research efforts with the National Road Research Alliance (NRRA) and the MnROAD/National Center for Asphalt Technologies (NCAT) partnership. MnROAD's research data from more than 50 unique test sections is positively impacting roadways in Minnesota and across the U.S.

Contract Procurement/Delivery Methods – MnDOT utilizes several different types of contract procurement and project delivery, including two that many other states have yet to adopt: the Construction Manager/General Contractor program (CMGC) and the Design-Build program (DB).

Intelligent Construction – MnDOT has pioneered the use of intelligent compaction and thermal profiling in the construction of hot-mixed asphalt (HMA) pavements. MnDOT continues to advance this technology through a variety of efforts, including the development of the Veta intelligent construction software. This technology will significantly improve the performance of HMA pavement.

MnPASS Lanes – MnPASS is a strategy MnDOT uses to manage and reduce congestion on some of the state's busiest roads. Congestion pricing on a MnPASS lane varies from $0.25 to $8.00 per trip and is used to keep traffic in the lane flowing at speeds between 50 and 55 miles per hour.

OPERATION AND MAINTENANCE

The cost of maintaining pavements in a serviceable condition increases as these pavements approach the end of their serviceable lifespans. However, Minnesota weather requires that more attention be given to other factors than just the condition of the pavement. Keeping pavements clear, whether from snow, ice, or large debris, is a major factor in road operation and maintenance. The availability of materials, equipment, and staff can affect the ability of highway crews to keep pavements clear.

Salt is one of the main materials used in Minnesota to keep pavements clear of ice through the winter. The price of salt alone rose from $29.33 per ton in state fiscal year (FY) 2001 to $69.16 per ton in FY 2019. Because of limited financial resources, owners of roadways must prioritize services such as snow and ice control, which redirects money from other priority areas. This results in lower levels of service in other maintenance areas, such as surface repair, drainage, and roadside maintenance.

Minnesota transportation users not only expect clear roads, but also safe roads. One of the best benefit/cost solutions for safety is the use of guardrail along many high-speed roadways. However, as more guardrail and high-tension cable barrier is installed, the demand on maintenance crews to keep up with these facilities increases. In 2010, cable median barrier in Minnesota averaged over five hits/mile, which required the expense of time and money for repairs. As Minnesota advances the use of these products, roadway owners must also staff and fund their repair. Whenever possible, repair costs are recovered through the insurance companies of the individuals responsible for the damage.

PUBLIC SAFETY AND RESILIENCE

Safety can be measured in many ways. Toward Zero Deaths, the state's cornerstone traffic safety program, is a program to eliminate deaths on our roads. Minnesota had experienced a steady decrease in traffic deaths in recent years; there was an 11% decrease from 2009 to 2019.[2] However, preliminary numbers from 2021 have shown a sharp increase — 465 as of November 2021. Crashes on two-way undivided highways and those two-way highways with unprotected medians yield the highest figures: 246 of the 364 fatalities in 2019.[2] As 84% of Minnesota's roadway system mileage is classified as rural[1], safety needs to be addressed across the state, not just in urban areas.

HIGHWAY IMPROVEMENTS TO INCREASE PUBLIC SAFETY

- **Increase sight distances at existing intersections**
- **Remove obstacles from the highway clear zone**
- **Add medians, and improve existing medians**
- **Widen shoulders where there is minimal existing shoulder**
- **Improve traffic flow (increased capacity), which could reduce incident-related delays**
- **Implement low-cost/high-benefit highway improvements, including:**
  - **Rumble strips/stripes**
  - **Cable median guardrail**
  - **Rural intersection lighting**
  - **Curve chevrons**
  - **Signpost reflectors**
  - **Traffic signal reflectorized background shields**

MnDOT estimates that roughly 3,100 guardrail end terminals, or about 20% of the total, have been upgraded statewide in the last two years.

MnDOT is actively investigating how the changing climate is impacting its assets and the people who depend on reliable transportation. To further advance this work, MnDOT is assessing future flood risks, engaging in equity conversations, and studying how freeze/thaw cycles have been changing.[7] Minnesota does not currently have a vulnerability assessment, resilience index, or state adaptation plan, which would help predict impact on transportation assets and guide future policy changes. The Minnesota Legislature amended statute 174.03, which is referenced above in the "Condition" section. This statute now requires MnDOT to "construct resilient infrastructure" and include "corridor risk assessment."

Roads

RECOMMENDATIONS TO RAISE THE GRADE

To raise the infrastructure grade for roads in Minnesota, the following actions are recommended:

- Adopt a sustainable revenue structure to close the existing transportation funding gap.
- Index revenue sources, such as the fuel tax, to inflation to create a more sustainable, long-term funding source.
- Encourage the implementation of asset management programs like the asset management program currently in use at MnDOT among local agencies statewide.
- Promote innovative practices that reduce costs and improve project delivery.
- Improve Twin Cities area freeway mobility/reliability using active traffic management, spot mobility improvements, expansion of MnPASS lanes, and strategic capacity enhancements.
- Encourage state and local agencies to search for opportunities to partner with the private sector to provide new mobility projects.
- Improve connections to pedestrian, bicycle, and transit networks that enhance safety and improve opportunities for all people.
- Fully implement state statute 174.03, which requires annual performance targets for trunk highway owners to construct resilient infrastructure and enhance project selection.

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Transit

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LIGHT RAIL TRANSIT OR LRT TRAINS EN ROUTE TO MINNEAPOLIS SAINT PAUL AIRPORT

EXECUTIVE SUMMARY

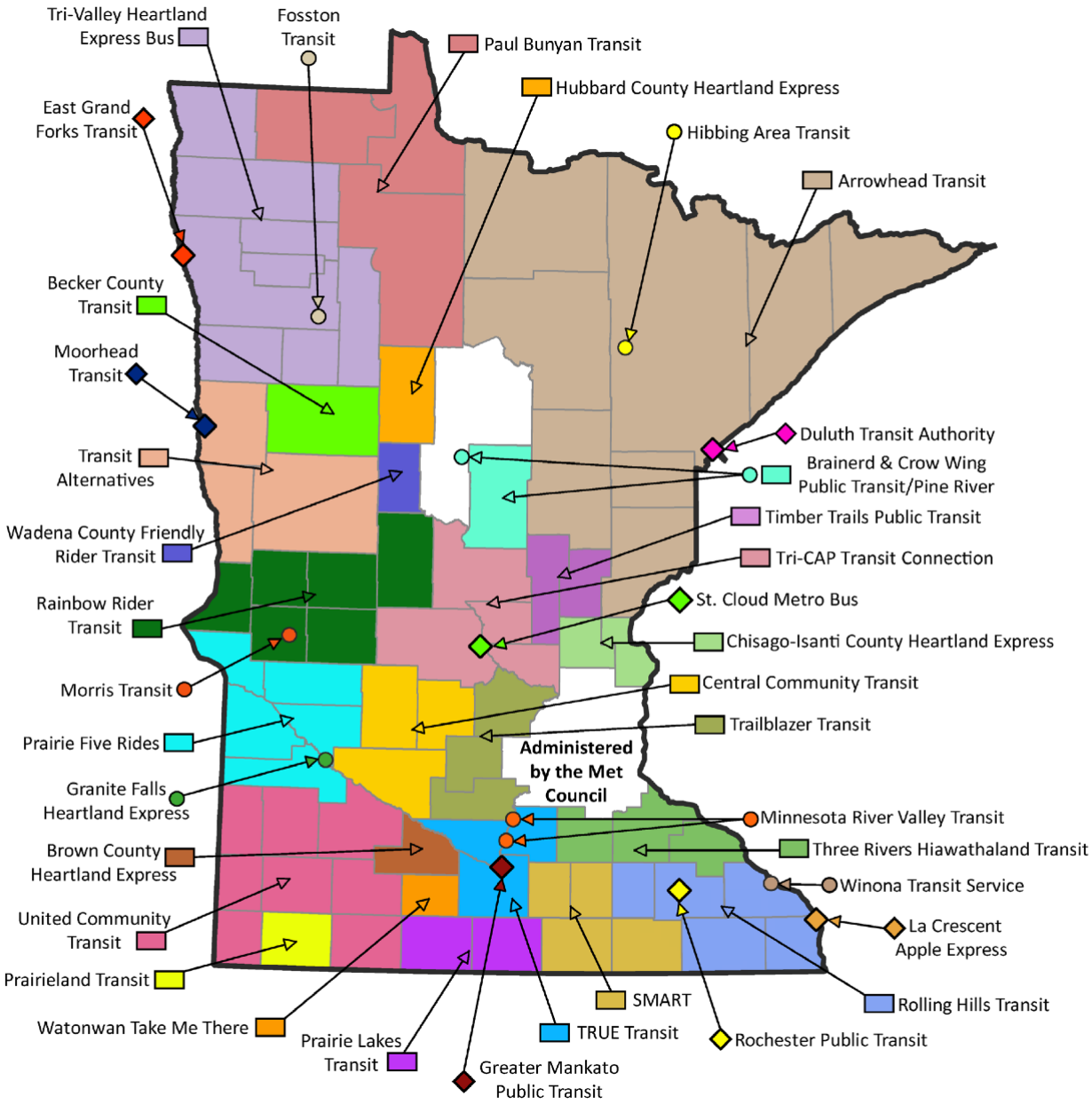
Transit and active transportation provides access to destinations for Minnesotans who choose to walk, ride, and roll. Approximately 92 million rides in the Twin Cities and 12 million rides in Greater Minnesota are taken by Minnesotans each year across more than 50 public transit systems. Minnesota's transit and active transportation infrastructure is in fair condition, but significant funding shortfalls exist, especially as the state strives to meet climate goals and encourage multimodal transportation. Greater Minnesota's five-year funding gap between projected revenues and projected needs is $167 million. Investment is needed to replace aging buses, complete bike networks, and make pedestrian safety improvements. A sustained reliable investment in transit and active transportation is needed to deliver effective transportation options to Minnesotans to safely provide access to work, school, health care, and other destinations.

BACKGROUND

Public transit systems and active transportation provide mobility choices that include traditional and express bus routes, bus rapid transit, light rail transit, commuter rail, paratransit, and dial-a-ride. These transportation options reduce traffic congestion and energy consumption; connect people to jobs, health care, education, and recreation; and improve our quality of life by reducing air pollution. MnDOT's Office of Transit and Active Transportation administers state and federal financial assistance to public transit providers in the 80 counties of Greater Minnesota. Within those counties, 47 public transit systems are operated by local governments, joint powers organizations, nonprofits, and tribal governments. MnDOT supports these systems through planning, research, technical assistance, and management of state and federal transit funding programs (MnDOT, 2022). Transit services in the seven-county Twin Cities region are delivered by the Metropolitan Council, University of Minnesota, Minnesota Valley Transit Authority, Southwest Transit, Maple Grove Transit, and Plymouth Metrolink. Of these, Metro Transit is the largest transit provider, accounting for approximately 80% of all statewide ridership in 2018 (Minnesota House Research, 2020).

Greater Minnesota's five-year funding gap between projected revenues and projected needs is $167 million. Investment is needed to replace aging buses, complete bike networks, and make pedestrian safety improvements.

GREATER MINNESOTA PUBLIC TRANSIT AGENCIES (MNDOT, 2021)



CAPACITY

Transit ridership has increased in both Greater Minnesota and the Twin Cities during the last decade, with the exception of the recent decrease due to the COVID-19 pandemic. The impact of the pandemic is clear, according to the Federal Transit Administration, which recommends that data from 2020 and 2021 are not suitable for use without accounting for the national health emergency (Federal Transit Administration, 2021). Meanwhile, essential workers continued to rely on regular and reliable transit service during 2020 and 2021. Although the COVID-19 pandemic has resulted in fewer riders generally, ridership is anticipated to return to pre-2020 levels and continue to grow in the future. As a result, the need for buses and transit

facilities will also continue to grow. Transit ridership in Greater Minnesota in 2015 reached a record high of 12 million rides, and service hours peaked at 1.4 million hours in 2016. In 2020, during the pandemic, ridership in Greater Minnesota was less than 7 million rides (MnDOT, 2021). In the Twin Cities, Metro Transit's bus rapid transit (BRT) A Line and C Line delivered nearly three million rides in 2019; the A Line BRT set an annual ridership record. Green Line light rail transit (LRT) had more than 14 million rides and also set an annual ridership record in 2019. The popularity of these routes demonstrates Minnesotan's desire for continuing transit improvements, and metro area developers continue to invest along high-frequency transit routes. Approximately $13.8 billion in permitted development occurred along these routes between 2003 and 2019 and it is expected that this initial development will encourage additional development and result in increased ridership (Metropolitan Council 2020).

CONDITION

Minnesota's transit and active transportation infrastructure is in fair condition. However, to fully assess condition, both the transit vehicles and the pathways on which the vehicles travel must be evaluated. Unfortunately, at this time only the vehicle condition is able to be measured with some confidence. The condition of the pathways, where the transit vehicles travel and the people walk or roll, are not well characterized. Decision-making will be improved when additional condition information is gathered and asset management is enhanced. Asset management is required by federal law and is recognized as a best practice by businesses worldwide. Transit providers are required to measure, analyze, and report their assets to the Federal Transit Administration and develop annual targets to ensure a state of good repair. Both the Metropolitan Council and MnDOT are implementing asset management systems, which include performance targets to better monitor condition and plan more effectively (Metropolitan Council, 2021; MnDOT, 2021; National Academies, 2021). The four required performance measures are:

- Rolling stock: The percentage of buses and rail vehicles that exceed their useful life.
- Equipment: The percentage of service vehicles that exceed their useful life.
- Infrastructure: The percentage of rail track segments that have performance restrictions.
- Facilities: The percentage of facilities in poor condition.

The Metropolitan Council's fleet management procedures help the agency meet its performance targets and achieve expected vehicle life for its buses and light rail vehicles. Metro Transit operates more than 880 buses on traditional, express, and BRT routes, and 97 light rail vehicles. In 2020, the average age of Metro Transit buses was 8.4 years, and the average age of light rail vehicles was 9.5 years. These vehicles are in fairly good condition and will require ongoing maintenance investments to provide reliable service (Metropolitan Council, 2020).

FUNDING

Transit and active transportation investments in Minnesota come from federal, state, local, and individual sources, which include the fares paid by riders. Other sources of revenue include state and federal grants to rural areas, smaller cities, and larger urban areas for operating costs and capital investments. The Minnesota Legislature determines funding levels and allocates approximately 65% of transit system operating investments, which largely determine transit service quantity and quality. Minnesota statute requires that a minimum of 40% of the state motor vehicle sales tax revenue be dedicated to transit. Twin Cities transit receives 36% of state motor vehicle sales tax revenue and Greater Minnesota transit receives 4% (MnDOT, 2021).

Transit providers nationally continue to see dramatic declines in revenue from decreased ridership due to the pandemic. To mitigate a portion of these losses in 2020,

the FTA announced that urbanized and rural areas would receive additional funding. Minnesota received a total of $725.8 million, which included $226.5 million (Coronavirus Aid, Relief, and Economic Security Act, or CARES Act funding), $185.9 million (Coronavirus Response and Relief Supplemental Appropriations Act, or CRRSAA funding), and $313.4 million (American Rescue Plan, or ARP funding). MnDOT received $54.4 million to administer rural area transit activities and provided $12.5 million to Greater Minnesota to purchase buses, improve facilities, and enhance technology (Metropolitan Council, 2021, MnDOT, 2021).

In the Twin Cities, transportation resources available to highway, transit, and nonmotorized projects are expected to total approximately $5.1 billion between 2022 to 2025. These funds include capital investments for highways, transit, and nonmotorized modes and some operating funds for Twin Cities transit systems. Highway programs, such as the Surface Transportation Block Grant Program, provide funding for nonmotorized investments, such as the pedestrian and bicycle elements of roadway projects. The total expenditures expected from 2022 through 2025 for the Twin Cities Transportation Improvement Program are listed below (Metropolitan Council, 2021).

Federal highways	$1.3 billion
State trunk highways	$0.5 billion
Federal transit	$1.5 billion
Local and transportation revolving loan fund	$0.4 billion
Regional bonds and local transit funds	$1.1 billion
State bonds	$0.3 billion
Total	**$5.1 billion**

FUTURE NEED

Well-designed transit and active transportation systems produce wealth for the communities they serve. Greater investment is necessary to attract new businesses, retain existing employers, and enhance quality of life. Current funding is not adequate to properly maintain what has been built and to meet future transportation needs. Greater Minnesota and the Twin Cities will require additional investment due to job creation, economic growth, and an aging population, all of which require additional transportation options. The Greater Minnesota five-year funding gap between projected revenues and projected needs is $167 million (MnDOT, 2021). The Twin Cities transit system funding gap continues to grow due to a legislatively enacted reduction prior to the pandemic. The annual state appropriation for transit dropped from $113 million in fiscal year (FY) 2020 to $89 million in FY 2022. That loss has been compounded by reduced ridership caused by the pandemic, which has resulted in fare revenues that amount to only 40% of those received in 2019. As the pandemic recedes and ridership recovers, ridership and fare revenues are expected to return to 2019 levels sometime after 2026 (Metropolitan Council, 2021).

The current funding level will not sustain Minnesota's transit infrastructure. While it is expected that Minnesota transit providers will continue to innovate, innovation alone will not replace an appropriate investment in transit vehicles and infrastructure. Without additional funding, Greater Minnesota and Twin Cities transit systems will not be able to deliver the service needed. Future transit needs in Greater Minnesota are estimated using demographic information that includes our aging population and other data. Greater Minnesota transit must provide 17 million rides by 2025 to meet a legislatively required target of 90% of that future need. MnDOT estimates bus replacement eligibility based on the FTA's recommended limits on age and mileage. Currently, there are 172 buses eligible for replacement in Greater Minnesota at a cost of $24 million. Additionally, there will be 112 buses eligible for replacement in 2023

($18 million), 115 in 2024 ($23 million), 42 in 2025 ($5 million), and 51 in 2026 ($27 million). Vehicles eligible for replacement range from small vans to large traditional buses, and costs range from $100,000 to $700,000. Also in Greater Minnesota, MnDOT has six unfunded facility projects ($37 million) and over 100 unfunded large capital and technology projects ($70 million). In addition, transit service dispatch systems for many Greater Minnesota communities are fast approaching, or have already reached, their expected service life. MnDOT's district bicycle plans estimate the need to complete the bicycle network on the trunk highways to be $2.35 billion during the next 20 years. The statewide pedestrian plan estimates the cost to implement safety improvements at the highest-priority locations on the trunk highways to be $1.15 billion during the next 20 years (MnDOT, 2021).

OPERATION AND MAINTENANCE

Our transit and active transportation systems must be effectively operated and maintained to deliver high-quality service to Minnesotans. The Metropolitan Council and MnDOT are implementing asset management systems, which include annual performance targets to enhance operation and maintenance (Transportation Improvement Program, Metropolitan Council, 2021; Asset Management Strategic Implementation Plan, MnDOT, 2021). It is even more important for these agencies to achieve better life cycle performance as transit ridership grows and active transportation options are delivered throughout Minnesota. These efforts will become more effective as the 2021 state statute requiring MnDOT to better manage our transit and active transportation assets on the trunk highway system (MN Statute 174.03) is fully implemented. MnDOT must implement performance measures and annual targets for transit and active transportation assets on the trunk highway system in order to construct resilient infrastructure, enhance the project selection for all transportation modes, improve economic security, and achieve the state transportation goals. Transportation planning must include an inventory of transportation assets, including bridge, pavement, geotechnical, pedestrian, bicycle, and transit assets; lag and lead performance measures; and annual targets that are statewide and district-specific for a period of up to 60 years. These performance measures and annual targets must be identified in collaboration with the public, and any differences between the annual performance target and the current condition of the asset must be explained. In addition, life cycle assessment and corridor risk assessment must be part of asset management programs in each district of the department. Finally, MnDOT's 10-year capital highway investment plan for each district must identify investments for each asset category, including active transportation assets; deliver annual progress toward achieving the state transportation goals; and recommend specific trunk highway segments to be removed from the trunk highway system. MnDOT must report to the Legislature annually by December 15, and this report must be signed by the chief engineer.

PUBLIC SAFETY

Pedestrian fatalities in urban areas have increased by 62% nationwide since 2010, and cyclist fatalities have increased by 49% (National Highway Traffic Safety Administration, 2020). Tragically, in Minnesota in 2021, more than one person was killed by a vehicle every week while walking on our roads. It is well understood that transit riders must feel safe, and this expectation is a core responsibility of our transit providers. Metro Transit continues to improve safety at its facilities and promote safety awareness through educational campaigns. Transit infrastructure design and construction also provide an opportunity to improve safety, and safety is included as a key scoring criterion during the biennial regional solicitation for transportation projects (Metropolitan Council, 2021). In addition, Greater Minnesota and the Twin Cities are experiencing significant bus driver shortages due to the pandemic, which has reduced service and affected public health by reducing health care access.

Throughout the pandemic, transit systems have helped serve neighborhoods by supporting food security and access to testing and vaccination sites. Between March 2020 and November 2021, some 645,663 meals were delivered to Minnesotans by Greater Minnesota transit providers. All transit providers have deployed some combination of safety enhancements to increase rider confidence during the pandemic. To provide transportation to COVID-positive riders, the Minnesota Department of Health and MnDOT participated in launching the nonemergency COVID-19 Positive Client Transportation Project (MnDOT, 2021).

RESILIENCE

The resilience of transit and active transportation is impacted by extreme weather events and natural disasters. It is critical that transit agencies prepare for emergencies and recover quickly to restore service. It is expected that the Metropolitan Council, MnDOT, and local agencies will work together with greater urgency to improve resilience because of the need caused by more frequent extreme weather events. State statute requires MnDOT to implement performance measures and annual targets for pedestrian, bicycle, and transit assets on the trunk highway system in order to construct resilient infrastructure (MN Statute 174.03). A greater focus on resilience is also being encouraged nationally (National Academies, 2021), and the following list of recommendations applies equally well to transit and active transportation (General Accounting Office, 2021). The recommendations include:

- Integrate climate resilience into policy and guidance.
- Update design standards and building codes to account for climate resilience.
- Provide authoritative, actionable, forward-looking climate information.
- Add climate resilience funding eligibility requirements to grant programs.
- Expand discretionary funding for climate resilience improvements.
- Alter emergency relief programs to provide incentives to improve resilience.
- Establish additional climate resilience planning and project requirements.
- Link climate resilience actions and requirements to incentives and penalties.
- Condition eligibility, funding, or project approval on resilience improvement.

INNOVATION

Innovation continues to contribute to the success and strong demand for effective transit and active transportation options. Providers are developing technology growth plans to improve technology, deliver better service, and meet customer expectations. Some specific examples of innovative practices include:

- Construction of bus-only highway lanes and bus-rapid-transit to increase effectiveness and enhance service delivery.
- Construction of bike sharing, ride sharing, and park/ride facilities to create greater synergy between transit, active transportation, and other transportation modes.
- Performance measures that encourage connecting people to destinations and less on expanding vehicle capacity.
- Best management transit system design to optimize station spacing and signal timing.
- Development of public-private partnership opportunities.

Transit

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RECOMMENDATIONS TO RAISE THE GRADE

The following actions are recommended to raise the grade of transit and active transportation infrastructure in Minnesota:

- Fully implement state statute 174.03, which requires annual performance targets for transit and active transportation on trunk highways to construct more resilient infrastructure, enhance project selection, improve economic security, and achieve state transportation goals.
- Develop transportation and land use plans to strategically create transit market opportunities that build wealth in our communities.
- Invest in transit vehicle maintenance and active transportation facilities to keep systems in a state of good repair and reduce life cycle costs.
- Increase transit and active transportation options in rural, suburban, and urban communities to ensure access to effective transportation for all Minnesotans.
- Establish sustainable funding sources for transit and active transportation similar to the funding sources used to build and maintain our roads and bridges.

Transit

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Wastewater

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EXECUTIVE SUMMARY

About 75% of Minnesota residents' sewage is treated at a centralized collection and treatment system, while the remaining 25% is treated by an on-site collection and treatment system such as a septic system. Although capacity is adequate at most facilities throughout the state, funding needs for upgrading and replacing treatment and collection systems at the end of their service life is increasing due to continually aging infrastructure. This is particularly true for small communities that do not have the population and, therefore, revenue to support infrastructure upgrades and maintenance that includes robust asset management. The current estimated annual capital need for wastewater infrastructure across Minnesota is more than $500 million, of which local communities will provide about 70%. Ratepayers were charged a median annual rate of $372 in 2021 in the Twin Cities Metro Area for operation and maintenance and capital investments. In Greater Minnesota, user fees are much higher and will continue to rise as decreasing populations shoulder more of the burden of increasing rates. With passage of the federal Infrastructure Investment and Jobs Act, which includes additional funding for the federal Clean Water Revolving Loan programs, some of the burden may be removed from users.

INTRODUCTION

Wastewater infrastructure is critical to our public health. In the late 19th century, many sewers were constructed in urban areas to remove both stormwater and human wastewater. However, it was not until the 1930s in the United States that treatment of wastewater (often combined with stormwater) began.

In the Twin Cities Metro Area, the first wastewater treatment plant on the Mississippi River was constructed and placed into service in 1938. Water quality in the Mississippi River improved almost immediately as a result. Periodic expansions and upgrades to the Metropolitan Wastewater Treatment Plant (Metro Plant) have continued to produce a higher-quality effluent over the ensuing years. The Metro Plant along with eight other plants in the metro area are managed by Metropolitan Council Environmental Services (MCES). These metro-area facilities account for 31% of wastewater funding needs identified in Minnesota.[2]

Today, approximately 75% of Minnesota residents' sewage is treated at a centralized collection and treatment system, and approximately 25% is treated by an on-site collection and treatment system, such as a septic system, also referred to as decentralized or subsurface sewage treatment systems (SSTS). This estimate was determined based on the state's population from communities with central wastewater collection and treatment systems

(shown in Table 1).[1,2,3]

TABLE 1: MINNESOTA 2020 CENSUS ESTIMATED POPULATIONS SERVED BY WASTEWATER COLLECTION AND TREATMENT, BY CITY SIZE.[1,2,3]

City size:	> 100,000	50 – 100,000	25 – 50,000	10 – 25,000	< 10,000	TOTALS
Population Served[a]	871,779	1,240,330	910,352	1,000,570	580,581	**4,603,612**
Unserved Population[b]	0	0	0	0	1,495,249	**1,495,249**
State total	**871,779**	**1,240,330**	**910,352**	**1,000,570**	**2,075,830**	**6,098,861**

a Includes served township areas
b Unserved population is estimated based on population within cities of <10,000 remaining after populations from served cities of <10,000 were subtracted. Additional unserved properties in larger cities were not captured for this estimate.

CAPACITY

Most wastewater treatment plants in Minnesota have adequate capacity at the present time. However, as populations increase in some areas, there is a need for plant modifications to provide treatment for increased flows. This situation is generally uncommon in Minnesota except in the seven-county Twin Cities Metro Area, where the population has been increasing.

Within the metropolitan area, the largest facility is the Metro Plant, located on the Mississippi River in St. Paul. It currently has reserve capacity and is able to handle additional flows. This additional flow capacity is the result of a program of flow reduction implemented over the past three decades. A sewer separation program pursued in Minneapolis and St. Paul in the 1990s and early 2000s separated combined sewers into separate stormwater and sanitary sewer systems. Now that the stormwater systems no longer connect to the treatment facility, additional capacity is available. In addition, a program to reduce inflow and infiltration (I/I) in the tributary wastewater collection systems of many suburban cities freed up additional capacity. These decade-old investments have directly improved Mississippi River water quality and provided reserve capacity at the Metro Plant.

The current need for upgrades to wastewater treatment plants statewide is largely driven by changing requirements for plant discharges, which must meet higher water quality standards. These changes not only reduce discharge limits for conventional pollutants but also involve increased removal of other pollutants. Proposed pollutants currently under review include contaminants of emerging concern such as per-and polyfluoroalkyl substances (PFAS), as well as pesticides, pharmaceuticals, nutrients (phosphorus and nitrogen in its various forms), disinfection byproducts, chlorides, and/or additional industrial chemicals. It is expected that, in time, these as well as additional pollutants may be regulated for the protection of the environment and public health.[5]

CONDITION

There are two components to wastewater systems in Minnesota: collection and treatment. These components need to be looked at separately, since they have different life expectancies and their condition is different.

Collection Systems

Collection systems typically have a life expectancy on the order of 100 years. Wastewater collection systems in Minnesota vary in age; within the cities of Minneapolis and St. Paul, 85% of sewers are more than 50 years old. Substantial portions of the sewers located in older suburban areas of the seven counties — cities such as Crystal, Golden Valley, Richfield, Roseville, and St. Louis Park — are more than 50 years old; however, Metropolitan Council Environmental Services (MCES) estimates that only 40% of the sewers across the metropolitan area are older than 50 years.[2]

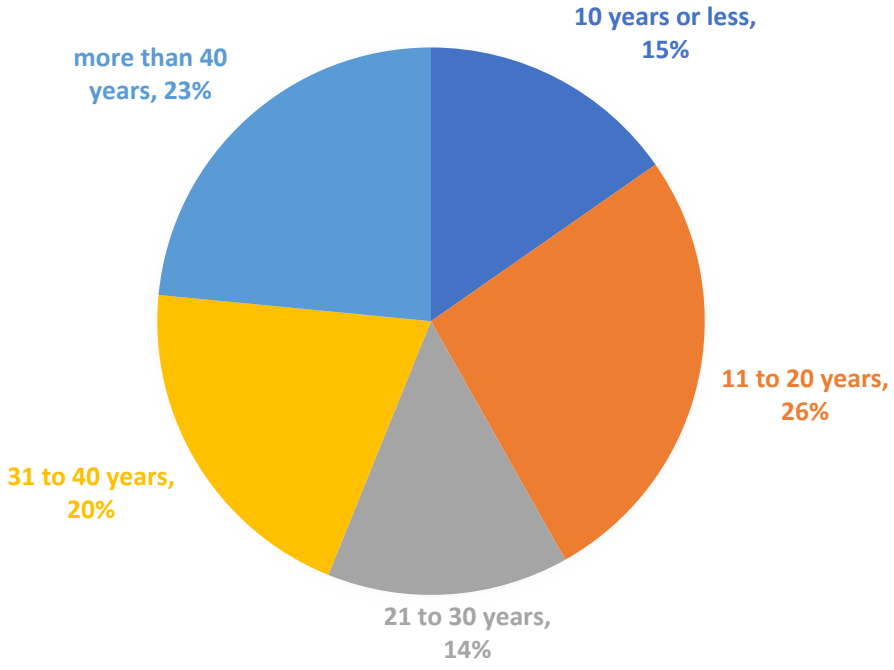
In Greater Minnesota, wastewater collection systems are generally newer: an average of the responses in the data collected for the 2022 Water Infrastrucure Needs Survey (WINS) indicates approximately 32% were installed more than 50 years ago, 38% were installed between 30 and 50 years ago, and 51% are less than 30 years old.[2]

Treatment Plants

Wastewater treatment plants are somewhat newer, simply because the cities of Minneapolis and St. Paul constructed their plants several years after the sewer collection systems were installed. For example, the Metro Plant was originally constructed in the 1930s; major upgrades took place beginning in the 1960s through the early 2000s. Although this plant continues to be upgraded to meet effluent quality requirements, many of the basic plant components now exceed 50 years of age.

Figure 1 depicts the average ages of wastewater treatment plants in Greater Minnesota. Of those in Greater Minnesota, 23% are more than 40 years of age, 20% are between 31 and 40 years old, 14% are between 21 and 30 years old, 26% are between 11 and 20 years old, and 15% are 10 years of age or newer. It is important to remember that the life expectancy of a wastewater treatment plant is in the range of 40 to 50 years. As a result, 23% of these plants in Greater Minnesota may need upgrades or complete replacement in the near future.[2]

FIGURE 1: GREATER MINNESOTA WASTEWATER TREATMENT PLANT AGES.[2]



OPERATION AND MAINTENANCE

Operation and maintenance expenses, along with local shares of capital expenditures, are paid by the users, customers that discharge to a wastewater treatment plant. As a result, these costs are included in the rates charged to users by the community in which they live. In the seven-county Twin Cities Metro Area, the median annual charge per household was $372 in 2021.[2] The median annual costs in Greater Minnesota are generally higher; most are in the range of $400 to $600 per household.[2] Generally, the rate charged for operation and maintenance of a wastewater treatment plant increases as the number of customers served decreases (i.e., smaller communities have higher annual rates). Therefore, rates charged to users for operation and maintenance expenses in Greater Minnesota are much more variable.

Operation and maintenance needs for wastewater systems are especially burdensome for smaller communities because their financial resources are more limited. Many communities struggle to prioritize deferred maintenance over needs that arise due to emergencies such as flooding and structural failures. The 2022 Wastewater Infrastructure Needs Survey (WINS) report indicated that an average of 150 wastewater releases into Minnesota lakes and streams occur each year due to flooding. The report also identified that 50 wastewater treatment systems across the state are at severe risk of significant flooding over the next 30 years.[2] As more unpredictable and severe weather events occur, more resources are diverted from much-needed regular maintenance.

According to the data collected for the 2022 WINS report, over half of Minnesota communities currently have an asset management program in place.[2] With support from Minnesota's Drinking Water Revolving Fund Technical Assistance set-aside, the Minnesota Rural Water Association (MRWA) in 2016 began conducting asset management training sessions. The organization has provided technical assistance to 32 cities while they have developed asset management plans. MRWA also provides wastewater operator training. An asset management template that includes wastewater assets is available on its website.[6] Although the technical assistance and training programs offered by MRWA are not specifically tailored to the management of wastewater assets, some cities with wastewater systems have benefitted from these programs. MRWA plans to expand its technical assistance and training programs to include wastewater assets. This is a valuable resource that will aid Minnesota communities to better manage available resources and identify future needs.[6]

FUNDING AND FUTURE NEED

Wastewater system improvements in the form of capital projects are funded from multiple local, state, and federal sources in Minnesota. As with operation and maintenance expenses, local funding for capital projects comes from user revenues and is specific to each community's local policies and procedures. Local funding for wastewater infrastructure capital projects has been increasing in recent years to meet needs, and is estimated to be around $400-500 million per year.[4,7] The recent increase is likely due to a combination of aging infrastructure, population growth, increased state affordability and pollutant-based grants, and/or increased user fees.

Nonlocal support for wastewater projects in Minnesota is dependent on state appropriations and annual federal funding and financing. The primary nonlocal funding mechanism for wastewater projects in Minnesota is the Clean Water State Revolving Fund (CWSRF). The CWSRF is made up of a combination of funds from federal capitalization grants, state matching funds, loan repayments, and, if necessary, revenue bond proceeds. Using input from the communities, the state identifies projects and activities it intends to fund from the CWSRF along with other state programs. [1]

1 The Minnesota Pollution Control Agency (MPCA) conducts the WINS, through which it collects data every two years from local governments on the condition of their collection and treatment systems and their projected capital improvement needs over the next 20 years.[2] The MPCA also assesses community wastewater needs on an annual basis to create the Project Priority List (PPL), which includes projects for which cities are seeking funding over a five-year period.[3] The WINS and PPL data are used to help determine future state funding needs. The projects are prioritized based on a point system, and those that meet the scoring criteria are incorporated into the final PPL. The estimated costs of the new eligible projects on the PPL, along with any eligible projects that carried over from the previous year, are used to determine a fundable range. Communities with projects on the PPL in the fundable range are then able to apply for a loan from the CWSRF within that state fiscal year (SFY).

The majority (around 75%) of state and federal funding is distributed annually via loans and principal forgiveness grants from the CWSRF program. The CWSRF and other loan programs are administered by the Public Facilities Authority (PFA), which assists local governments with the construction of wastewater facilities. The remaining 25% of related funding for decentralized wastewater as well as stormwater projects provided annually is through other state-administered subsidization programs. These "other" state programs include the state Water Infrastructure Fund (WIF) to address affordability needs, Point Source Implementation Grants (PSIG), as well as nonpoint-source programs such as the Clean Water Partnership loan program and the U.S. Department of Agriculture (USDA) Agriculture Best Management Practices Loan Program.[7] Stormwater projects account for less than 5% of overall CWSRF-related funding, or ~$4 million per year, on average.

One such program administered by PFA, the Small Community Wastewater Treatment Program, aims to help communities replace noncompliant septic systems and straight pipes with new individual or cluster SSTS that will be publicly owned, operated, and maintained. Technical assistance grants and construction grants and loans for the program are provide via funds that have been appropriated by the Legislature from the CWSRF via the Clean Water, Land and Legacy Amendment.

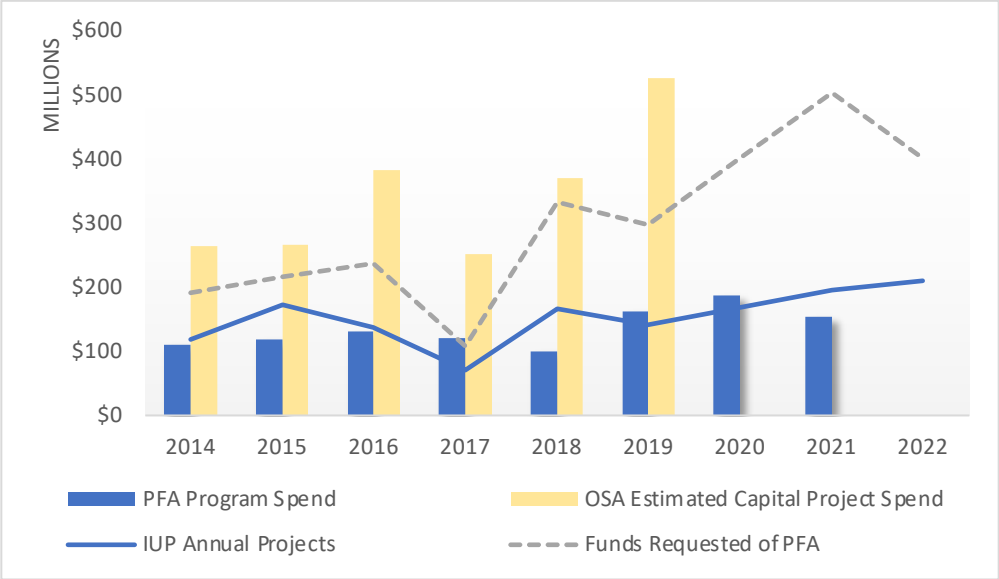
The PFA estimates that the average annual lending capacity of the CWSRF has ranged between approximately $25 and $115 million over the life of the program.[8-16] Since 2014, the lending capacity has hovered around $100 million. [8-16] Table 2 provides data collected from the PFA and Office of State Auditor (OSA).[3,4,7] Figure 2 depicts the funding requests from the Intended Use Plans (IUP) compared to the actual funds spent over 2014-2021.[3,4,7] For fiscal year 2022, the sum of the project requests received for loans and grants exceeds the sustainable long-term lending capacity of the CWSRF by a factor of more than 3; in 2020 and 2021, requests exceeded capacity by a factor of 4 and 5, respectively. This indicates there may be shortfalls in available funds. However, because the requests span a five-year period and other funding sources are available, the actual shortfall is negligible.

TABLE 2: MINNESOTA WASTEWATER CAPITAL PROJECT FUNDING VERSUS NEED ($ IN MILLIONS).[3,4,7]

Year	PFA Annual Sustainable Capacity	PFA Program Spending[1]			IUP Annual Projects[2]	OSA Estimated Total Annual Spending[3]
		CWSRF	Other	Total		
2014	$100	$95	$15	$111	$119	$263
2015	$100	$92	$25	$117	$172	$265
2016	$103	$113	$18	$130	$137	$383
2017	$94	$87	$32	$119	$69	$250
2018	$94	$49	$36	$98	$166	$370
2019	$95	$119	$41	$161	$142	$524
2020	$103	$144	$43	$187	$168	Not available
2021	$110	$104	$50	$154	$194	Not available
2022	$115	In-progress	In-progress	In-progress	$210	Not available

1. Actual PFA project funding per year.[7]
2.PFA's annual Intended Use Plan (IUP) includes Project Priority List (PPL) project costs over a five-year period. This column includes those project costs divided by 5 to represent the annual cost.
3.The OSA Local Finances Reports were used to estimate local government units total annual spending based on capital outlays plus borrowing.[4] The borrowing includes the PFA program spending.

FIGURE 2: MINNESOTA WASTEWATER CAPITAL PROJECT FUNDING VERSUS NEED FROM 2014-2021 ($ IN MILLIONS).[3,4,7]



Given state and federal loan and grant programs, a total of $150-250 million in annual funding is available in Minnesota for municipal wastewater projects. Local capital budgets make up the additional $400-500 million for wastewater infrastructure in communities across Minnesota.[4] Based on further breakdown of the OSA data shown in Table 2 and Figure 2, it can be observed that in recent years, capital project funding relies more and more on local funding, meaning that wastewater charges/fees are increasing. State funding has not risen proportionately in recent years, putting more burden on users: from 2014-2016, 40-50% of capital project funding was provided by the state funding and borrowing programs; in 2017-2019, state support dropped to 27-37% of capital project funding.

In the metropolitan area specifically, MCES uses funding from its capital program to preserve and rehabilitate existing wastewater infrastructure, meet more stringent water and air quality regulations, and expand the system capacity to meet regional growth needs. This program relies in part on funds from the CWSRF programs described above (25% in 2022-2027 Capital Improvement Plan), but is mostly funded from regional bonds (63% in 2022 Capital Improvement Plan).[17] For example, the MCES 2022 capital budget includes $227 million for wastewater projects, and it requested $50 million in funding from the CWSRF.[8,17]

Current market instability challenges the normal methods of quantifying project costs and, therefore, needs. This will be a challenge for future funding projections.

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PUBLIC SAFETY AND RESILIENCE

The health, safety, and welfare of Minnesotans are not in any immediate danger from the state's wastewater collection and treatment systems. However, this may not be the case if underfunding becomes more prevalent. For example, unexpected catastrophic failure of treatment systems due to a lack of needed maintenance could contaminate drinking water sources. The MPCA, which is responsible for ensuring that permitted facilities comply with rules and regulations designed to protect the environment and human health, reported an average of 13 municipal wastewater violations per year according to 2019, 2020, and 2021 enforcement action summaries, which amounted to a total of over $170,000 for the three-year period.[18]

Ongoing revisions to water quality standards, especially those directed at protection of the environment, could also have the unintended consequence of diverting funds needed for regular upkeep. There could be negative impacts on public health if these water quality revisions do not receive the necessary funding dollars they require. Degradation of wastewater collection and treatment facilities could compromise the protection of public health from acute diseases.

An increase in extreme weather events due to climate change also impacts the resiliency of Minnesota's infrastructure. According to the 2022 WINS Report, only 6% of the 537 communities that responded reported that they had completed a climate resiliency plan or a climate vulnerability assessment. Of the communities that responded that they did not have a plan, 15% said they were interested in completing one. From the 2022 report, "The 2022 WINS responses indicate a critical need for support from the state of Minnesota to help local governments prepare their infrastructure for the impacts of climate change."[2] As many communities lack dedicated resources to address flooding, there is a significant gap in education, awareness, planning, maintenance, and capital project funding. Because of the far-reaching effects of climate change beyond wastewater collection and treatment, large-scale coordination is needed at the state or regional level between city and regional organizations.

Minnesota has an active Water and Wastewater Agency Response Network (MNWARN) whereby cities can provide mutual assistance during emergencies or catastrophic events. In addition, the governor has called on the National Guard during catastrophic events such as floods and tornadoes. The Legislature also has approved or provided funding assistance when it is in session. The MNWARN system is an organization that the Minnesota Legislature may wish to consider for future funding.[6]

The COVID-19 pandemic has also introduced many new challenges for water and wastewater systems. One USEPA survey conducted in 2020 indicated that 36% of water and wastewater utilities faced supply chain disruptions and 27% experienced personnel shortages.[19] Despite challenges from the pandemic, statewide wastewater surveillance by the University of Minnesota (U of M) in partnership with the Minnesota Department of Health (MDH) has proven to be a valuable resource. The research suggests that viral detection in wastewater provides an approximately two-week lead time before cases emerge in clinics and hospitals. This allows communities to better prepare for potential future spikes in cases.[20]

INNOVATION

Minnesota communities continue to establish innovative practices to enhance wastewater projects across the state. The city of St. Cloud received special recognition in the category of "innovative financing" following its nomination for the EPA's PISCES award. The St. Cloud Nutrient, Energy and Water Recovery Facility converts wastewater into valuable resources, including nutrients (for fertilizer), energy (biogas into electricity), and clean water from wastewater (which is returned to the Mississippi River). The project was funded through a combination of federal and state funding totaling $22.3 million (a $16.7 million Clean Water State Revolving Fund Loan and $6.6 million Point Source Implementation Grant from the PFA) for a project to enhance performance in all of these areas.[21]

MCES also engages in several innovative projects to enhance and extend its services. One such project will create a 3D model of the aeration tanks, meter pits, and underdrains as part of a renewal project at its largest wastewater treatment facility to facilitate operations and maintenance and future projects.[22] Another project involves adding a fourth incinerator to its existing Metro Plant Solids Management facility in St. Paul. MCES also produces biosolids from wastewater that can be used by local farmers to improve soil health and promote plant growth. Land application services are free to farmers who are enrolled in the program.[23]

MCES manages an Industrial Pretreatment Incentive Program (IPIP) that is built into its Capital Improvement Plan. This program provides financial incentives to assist high-strength industrial wastewater dischargers to pretreat the wastewater at their site, which reduces or eliminates the high-strength discharge and reduces MCES cost to treat that discharge. This innovative public-private partnership yields benefits to MCES ratepayers, private industry, and the environment. Currently, two facilities participate in the program, at an overall projected cost over the life of the program estimated at $26 million.[24]

The Metropolitan Council and Minnesota Department of Natural Resources along with some Minnesota counties work closely with communities on water conservation and sustainability. Metropolitan Council provides Water Efficiency Grant funding to install smart irrigation controllers, spray sprinkler bodies, toilets, and clothes washers, and conduct irrigation audits to promote indoor and outdoor residential water efficiency, which saves an estimated 52 million gallons of water annually. Metropolitan Council also applies economic analysis models to demonstrate savings for drinking water demand and wastewater treatment.[25] The Minnesota Department of Natural Resources (DNR) maintains a Water Conservation Database to track community water use and conservation trends.[26] These and other measures implemented across Minnesota can have a significant impact on wastewater infrastructure needs: for example, the implementation of centralized water softening to reduce home water softening and lower chlorides in the waste stream.

Wastewater

RECOMMENDATIONS TO RAISE THE GRADE

To raise the wastewater infrastructure grade in Minnesota, the following actions are recommended:

- Address the disparity in funding between large and small communities by continuing and bolstering programs focused on small and disadvantaged communities that do not have the income base (population) to support significant improvements that large communities have.
- Continue to fund the Clean Water State Revolving Fund (which supplements wastewater infrastructure funding) to provide the requisite lending capacity from the PFA. Increased funding will be necessary in the future to pay for a larger number of priority projects as a result of aging infrastructure. Future funding needs may also be influenced by project cost increases due to market instability caused by the COVID-19 pandemic or other global supply chain disruptions.
- Continue to add flexibility into funding sources, such as enacting legislation that allows the use of Clean Water Legacy funds for wastewater treatment plant projects rather than just nonpoint-source stormwater projects. CWL funds have previously supported PSIGs and SSTS grants.
- Provide additional funding to existing PFA programs, not project-specific earmarks, for additional treatment of effluents from WWTPs or modifications to drinking water processes (for example, centralized lime softening and removal of in-home water softeners) to comply with more stringent water quality standards and for aged and failing collections systems.
- Encourage local governments to develop asset management plans. Asset management can improve wastewater system operations and maintenance and delay loss of condition by focusing resources as needed. A better understanding of communities' needs statewide would improve the accuracy and efficiency of nonlocal funding programs.
- Educate the public on the potential impacts that inadequate wastewater infrastructure can have on water quality and public health by harnessing the volunteer efforts of community groups and individuals.
- Improve education, awareness, planning, and capital project funding surrounding climate resiliency.

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