Allegan County Road Commission 2023 Transportation Asset Management Plan

A plan describing the Allegan County Road Commission's transportation assets and conditions

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EXECUTIVE SUMMARY

As conduits for commerce and connections to vital services, roads and bridges are some of the most important assets in any community, and other assets like culverts, traffic signs, traffic signals, and utilities support and affect roads and bridges. The Allegan County Road Commission's (ACRC) roads, bridges, and support systems are also some of the most valuable and extensive public assets, all of which are paid for with taxes collected from ordinary citizens and businesses. The cost of building and maintaining these assets, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to plan, build, and maintain roads, bridges, and support assets in an efficient and effective manner. This asset management plan is intended to report on how ACRC is meeting its obligations to maintain the public assets for which it is responsible.

This plan identifies ACRC's assets and condition and how ACRC maintains and plans to improve the overall condition of those assets. An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of ACRC's obligations towards meeting these requirements. However, this plan and its supporting documents are intended to be much more than a fulfillment of required reporting. This asset management plan helps to demonstrate ACRC's responsible use of public funds by providing elected and appointed officials as well as the general public with the inventory and condition information of ACRC's assets, and it gives taxpayers the information they need to make informed decisions about investing in ACRC's essential transportation infrastructure.

INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals". In other words, asset management is a process that uses data to manage and track assets, like roads and bridges, in a cost-effective manner using a combination of engineering and business principles. This process is endorsed by leaders in municipal planning and transportation infrastructure, including the Michigan Municipal League, County Road Association of Michigan, the Michigan Department of Transportation (MDOT), and the Federal Highway Administration (FHWA). The Allegan County Road Commission is supported in its use of asset management principles and processes by the Michigan Transportation Asset Management Council (TAMC), formed by the State of Michigan.

Asset management, in the context of this plan, ensures that public funds are spent as effectively as possible to maximize the condition of the road and bridge network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing transportation infrastructure with a limited budget.

The Allegan County Road Commission (ACRC) has adopted an "asset management" business process to overcome the challenges presented by having limited financial, staffing, and other resources while needing to meet road users' expectations. ACRC is responsible for maintaining and operating over 1796.7 centerline miles of roads and 156 bridge structures. It is also responsible for an estimated 5,000 culverts and 2 signals.

This 2023 plan identifies ACRC's transportation assets and their condition as well as the strategy that ACRC uses to maintain and upgrade particular assets given ACRC's condition goals, priorities of network's road users, and resources. An updated plan is to be released approximately every three years both to comply with Public Act 325 and to reflect changes in road conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to Craig Atwood at 1308 Lincoln Road, Allegan, Michigan 49010 or at (269)-673-2184 or catwood@alleganroads.org.A copy of this plan can be accessed on our website at alleganroads.org.

1. PAVEMENT ASSETS

ACRC is responsible for 1796.742 centerline miles of public roads. An inventory of these miles divides them into different network classes based on road purpose/use and funding priorities as identified at the state level: county primary road network, which is prioritized for state-level funding, and county local road network.

Inventory of Assets

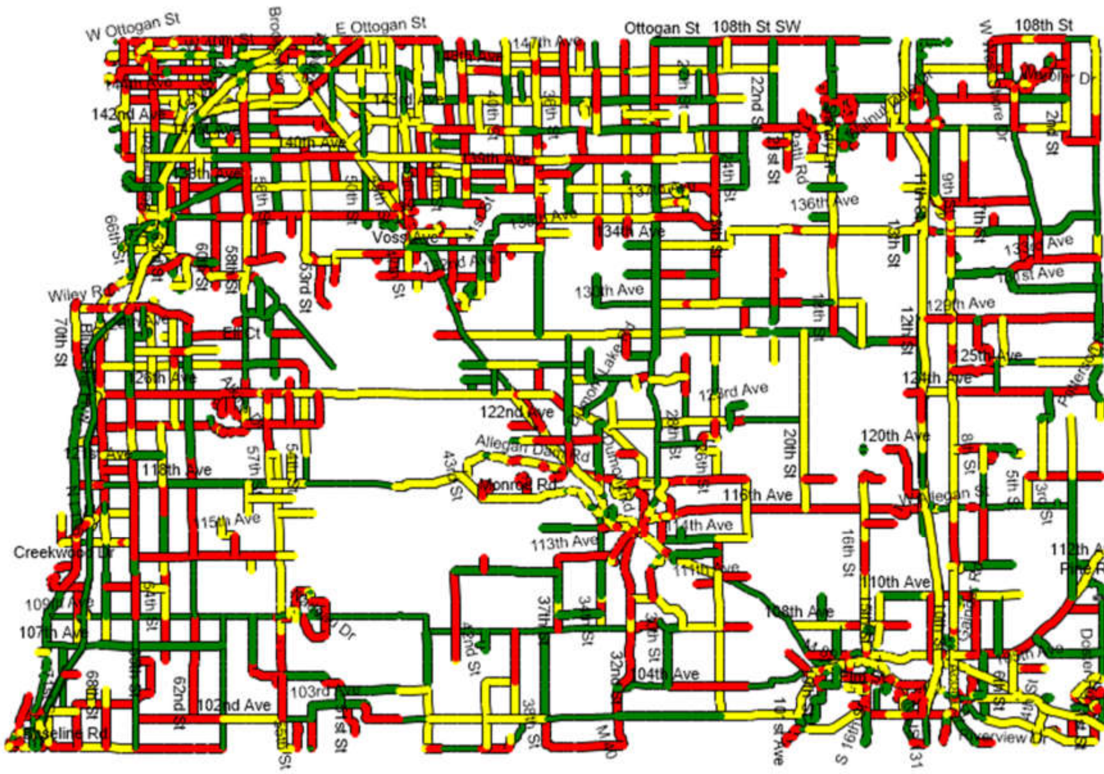

Figure 1: Map showing location or roads managed by ACRC and the current condition for paved roads in green for good (PASER 10, 9, 8), yellow for fair (PASER 7, 6, 5), and red for poor (PASER 4, 3, 2, 1) and for unpaved roads in blue

Of ACRC's 1796.742 miles of road, 519.699 miles are classified as county primary and 1277.0 miles are classified as county local (Figure 1identifies these paved roads in green, yellow, and red with the colors being determined based on the road segment's condition). In addition, ACRC has 628.0 miles of unpaved roads (Figure 1 identifies these unpaved roads in blue).

More detail about these road assets can be found in ACRC's Roadsoft database or by contacting ACRC.

Types

ACRC has multiple types of pavements in its jurisdiction, including asphalt, sealcoat, concrete, and undefined; it also has unpaved roads (i.e., gravel and/or earth). Figure 2 shows a breakdown of these pavement types for all of ACRC's road assets.

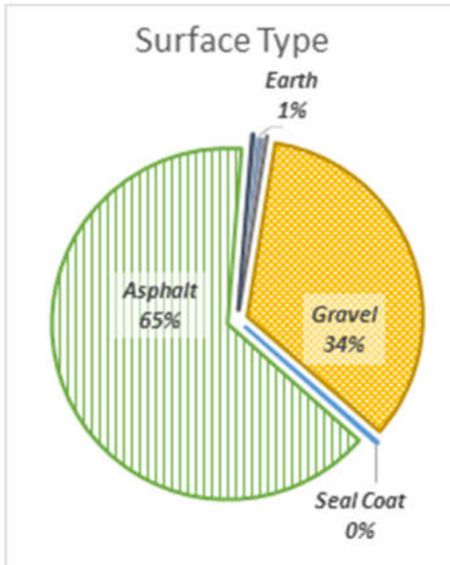

Figure 2: Pavement type by percentage maintained by ACRC. Undefined pavements have not been inventoried in ACRC's asset management system to date, but will be included as data becomes available.

Condition, Goals, and Trend

Paved Roads

Paved roads in Michigan are rated using the Pavement Surface Evaluation and Rating (PASER) system, which is a 1 to 10 scale with 10 being a newly constructed surface and 1 being a completely failed surface. PASER scores are grouped into TAMC definition categories of good (8-10), fair (5-7), and poor (1-4) categories. ACRC collects PASER data every two years on 100 percent of those portions of its county primary and county local networks that are eligible for federal funding. In addition, ACRC uses its own staff and resources to collect PASER data on 100 percent of its county primary and county local networks that are not eligible for federal funding.

Currently, the county primary network has 38% of its roads in good condition, 36% in fair condition, and 26% in poor condition, and the county local network has 30% of its roads in good condition, 29% in fair condition, and 41% in poor condition (Figure 3 and Figure 4). ACRC's long-range goal for the county primary network is to have 40% of roads in good condition, 35% in fair condition, and 25% in poor condition, and for the county local network is to have 35% of roads in good condition, 30% in fair condition, and 35% in poor condition (Figure 3 and Figure 4). Figure 3 and Figure 4 illustrate the historical and current condition (solid bars) of ACRC's county primary and county local networks, respectively; they also illustrate the projected trend (shaded bars), the overall trend in condition (trendlines), and ACRC's goal (final solid bar).

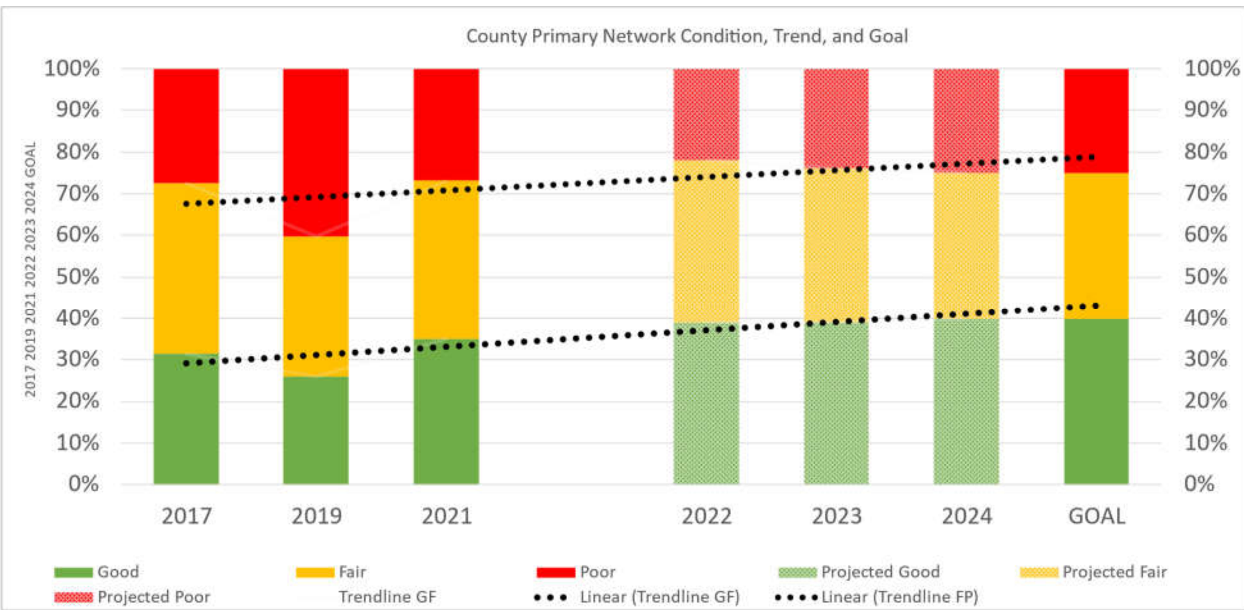

Figure 3: county primary network condition, goals, and trend

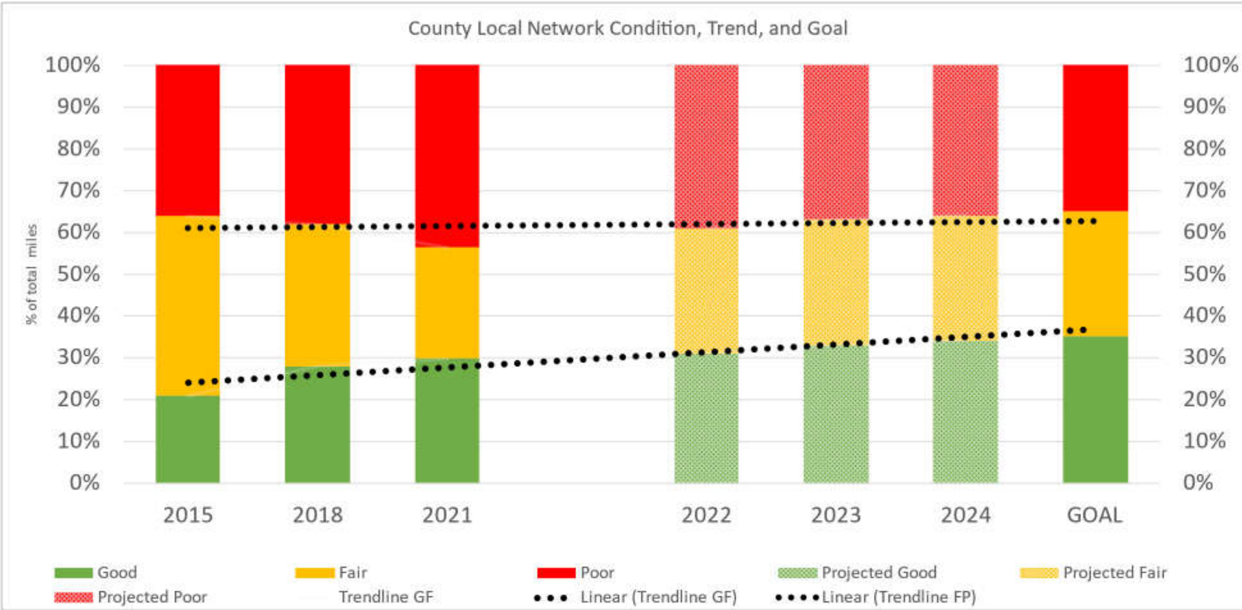

Figure 4: county local network condition, goals, and trend

Unpaved Roads

Unpaved roads rated with the Inventory-based Rating System™ receive an IBR number ranging from 1 to 10, with a 9 or 10 (less than one year old) having good surface width, good or fair drainage, and good structural adequacy and a 1 having poor surface width, poor drainage, and poor structural adequacy. IBR numbers can be grouped in a similar fashion as the TAMC definitions into good (8-10), fair (5-7), and poor (1-4) categories. Figure 5 illustrates the historical and/or current condition (solid bars), the projected trend (shaded bars), and ACRC's goal (final solid bar).

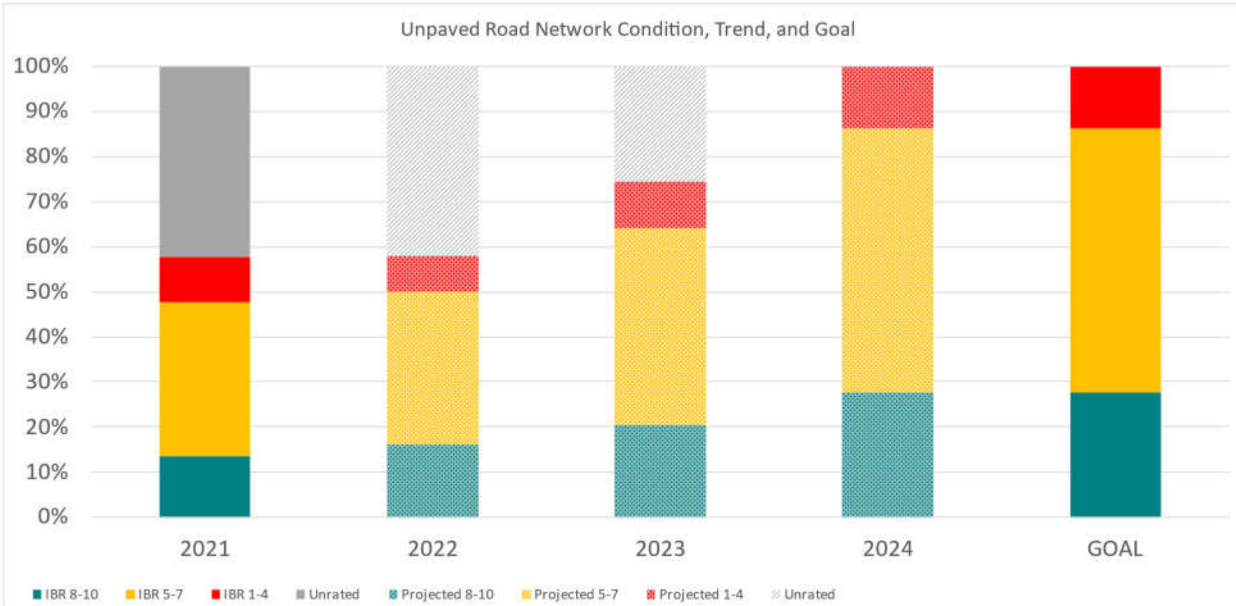

Figure 5: Distribution of IBR numbers for current condition (solid) and for goals (dotted)

Modelled Trends, Gap Analysis, and Planned Projects

Table 1: NCPP Modelled Trends, Planned Projects, and Gap Analysis for ACRC's Road Assets

Primary Network (<519.699 miles)

				Planned Projects			
Treatment	**Average Yearly Miles of Treatment**	**Years of Life**	**Mile-Years**	**Average Yearly Miles of Treatment**	**Mile-Years**	**Average Yearly Miles of Treatment**	**Mile-Years**
Crack Seal	10.5	1	10.5	15	15		
Seal Coat	31.86	5	159.3	35	175		
Overlay	10	10	100	10	100		
Cold Mill and Ovly	10.66	12	127.92	10	120		
Crush and Shape	3.74	15	56.1	5	75		
Reconstruction	0.5	20	10	1	20		
[Treatment 7]							
[Treatment 8]							
Total			463.82		505		
Gap Analysis: (Deficit)/Surplus			-27.18		14		

Local Network (1277.043 miles)

				Planned Projects		Additional Work Necessary to Overcome Deficit	
Treatment	**Average Yearly Miles of Treatment**	**Years of Life**	**Mile-Years**	**Average Yearly Miles of Treatment**	**Mile-Years**	**Average Yearly Miles of Treatment**	**Mile-Years**
Crack Seal	4.93	1	4.93	10	10		
Seal Coat	15	5	75	40	200		
Overlay	34	10	340	35	350		
Cold Mill and Ovly	1	12	12	1	12		
Crush and Shape	2	15	30	2	30		
Reconstruction	3.6	20	72	4	80		
[Treatment 7]							
[Treatment 8]							
Total			533.93		682		
Gap Analysis: (Deficit)/Surplus			-143.07		5		

Modelled Trends & Gap Analysis

The Roadsoft network analysis of ACRC's planned projects for the county primary and county local networks from ACRC's currently-available budget does not allow ACRC to reach its pavement condition goals given the projects planned for the next three years.

Unpaved Road Condition Trends

ACRC maintains nearly 600 miles primary and local gravel roads with 29 miles of these roads being primary. Additionally, 59 miles of seasonal roads are maintained of which many of these roads traverse through the Allegan State Game Area.

Maintenance and improvement of unpaved roads is important to the tax base in Allegan County. Several miles of primary and local roads are re-graveled annually. ACRC also works with townships to reconstruct gravel roads into paved roadways. An average of 6.2 miles of gravel roads have been reconstructed annually over the last five years. This commitment to reconstructing gravel roadways is increasing the likelihood of maintaining road millages throughout the townships of Allegan County.

Planned Projects

ACRC has projects planned for the next four years. These projects are identified in Figure 6.

Figure 6 : Map illustrating planned projects for pavement assets

The total cost of the projects illustrated in Figure 6 is approximately $21.8 million.

2. BRIDGE ASSETS

ACRC is responsible for 156 bridges that provide safe service to road users across the agency network. ACRC seeks to implement a cost-effective program of preventive maintenance to maximize the useful service life and safety of the local bridges under its jurisdiction.

Inventory of Assets

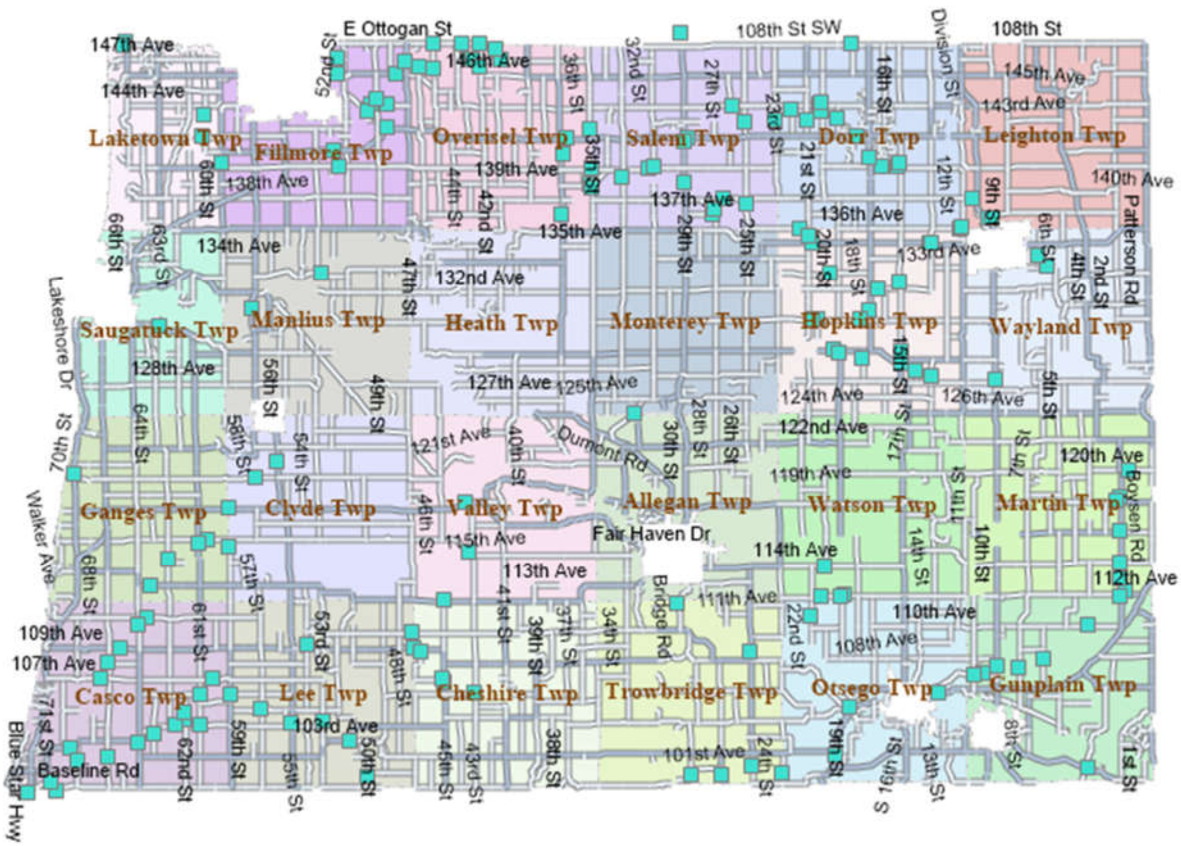

Figure 7: Map illustrating locations of ACRC's bridge assets

ACRC has 156 total bridges in its road and bridge network; these bridges connect various points of the road network, as illustrated in Figure 7. These bridge structures can be summarized by type, size, and condition, which are detailed in Table 2. More information about each of these structures can be found in ACRC's MiBRIDGE database or by contacting ACRC.

Table 2: Type, Size, and Condition of ACRC's Bridge Assets								
	Total Number of Bridges	Total Deck Area (sq ft)	Condition: Structurally Deficient, Posted, or Closed			2021 Condition		
Bridge Type			Struct. Deficient	Posted	Closed	Poor	Fair	Good
Aluminum – Culvert	1	897	0	0	0	0	0	1
Concrete – Culvert	10	13981	0	0	0	0	4	6
Concrete – Girder and floorbeam	1	1457	1	0	0	1	0	0
Concrete – Tee beam	1	1252	0	0	0	0	1	0
Concrete continuous – Slab	1	2593	0	0	0	0	1	0
Prestressed concrete – Box beam/girders—multiple	49	105761	2	5	0	2	26	21
Prestressed concrete – Box beam/girders—single/spread	5	22906	0	0	0	0	1	4
Prestressed concrete – Multistringer	6	21791	0	0	0	0	0	5
Steel – Culvert	54	44500	21	10	0	21	29	4
Steel – Multistringer	8	15326	2	2	1	2	5	1
Timber – Culvert	1	1260	0	0	0	0	1	0
Timber – Slab	19	27446	9	10	0	9	7	3
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Total SD/Posted/Closed			**35**	**27**	**1**			
Total	**156**	**259170**				**35**	**76**	**45**
Percentage (%)			**22%**	**17**	**1**	**22**	**49**	**29**

Condition, Goals, and Trend

Bridges in Michigan are given a good, fair, or poor rating based on the National Bridge Inspection Standards (NBIS) rating scale, which was created by the Federal Highway Administration to evaluate a bridge's deficiencies and to ensure the safety of road users. The current condition of ACRC's bridge network based on the NBIS is 45 structures rated good, 76 structures rated fair, and 35 structures rated poor (Table 2).

Bridges are designed to carry legal loads in terms of vehicles and traffic. Due to a decline in condition, a bridge may be "posted" with a restriction for what would be considered safe loads passing over the bridge. On occasion, posting a bridge may also restrict other load-capacity-related elements like speed and number of vehicles on the bridge, but this type of posting designates the bridge differently. ACRC has 27 structures that are posted for load restriction (Table 2). Designating a bridge as "posted" has no influence on its condition rating. A "closed" bridge is one that is closed to all traffic. Closing a bridge is contingent upon its ability to carry a set minimum live load. ACRC has 1 structure that is closed (Table 2).

The goal of the program is the preservation and safety of ACRC's bridge network.

Figure 8 illustrates the baseline condition, projected trend, and goal that ACRC has for its good/fair and its structurally deficient bridges.

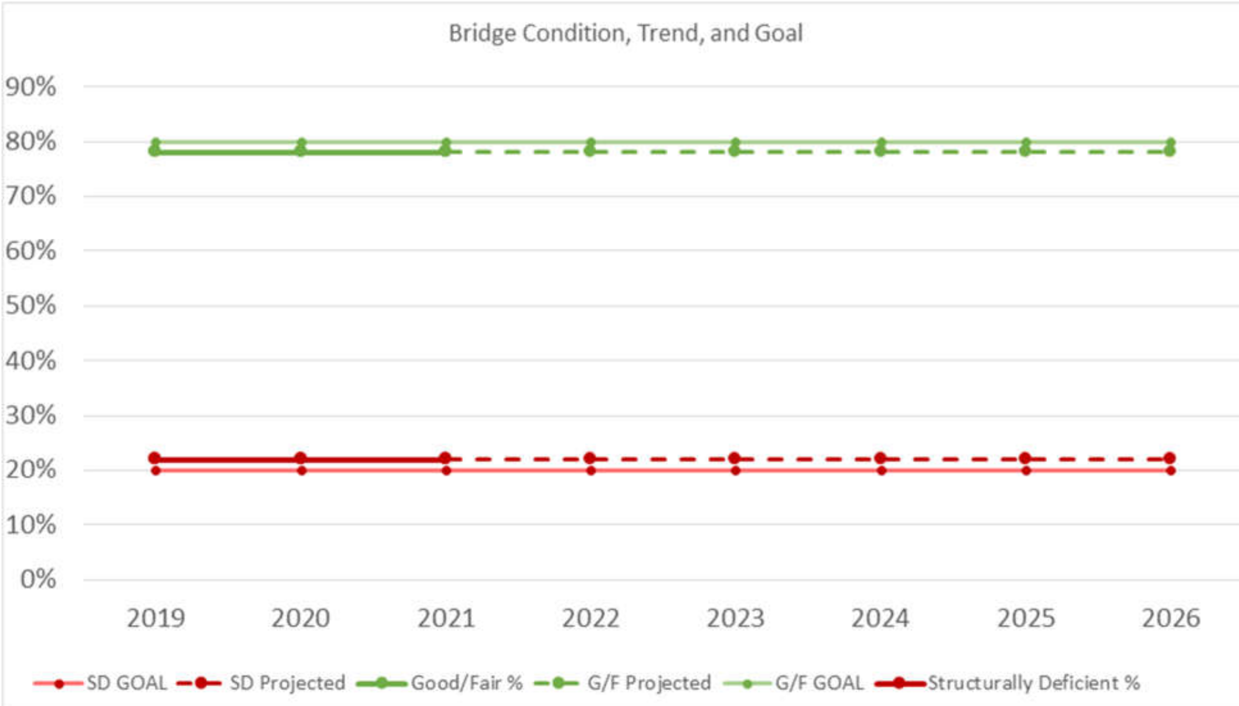

Figure 8: Condition, projected trend, and goal for ACRC's good/fair and structurally deficient bridges

Programmed/Funded Projects, Gap Analysis, and Planned Projects

ACRC will receive $758,000 in total funding for the years 2023-2025. Preventive maintenance is a more effective use of these funds than the costly alternative of major rehabilitation or replacement. Since ACRC recognizes that limited funds are available for improving the bridge network, it seeks to identify those bridges that will benefit from a planned maintenance program, and it plans to spend $100,000 per year for the next three years on preventive maintenance of bridges. ACRC plans to replace one bridge within the next three years at a cost of $758,000. By performing the aforementioned preventive maintenance and replacement of bridge structures, ACRC will not achieve its goal of keeping its overall bridge network at the same condition.

Table 3 illustrates the programmed/funded projects that will be undertaken in order to achieve ACRC's goal. These programmed/funded projects are juxtaposed with priority projects that remain unfunded.

Table 3: Planned Projects and Gap Analysis

Strategy	2022	2023	2024	2025	2026
Replacement					
296	$828,000				
190	$685,000				
189		$758,000			
204			$825,000		
254				$2,341,000	
205				$2,381,000	
Subtotal	$1,513,000	$758,000	$825,000	$4,722,000	$0
Rehabilitation					
202	$111,000				
198	$90,000				
168	$107,000				
253				$427,000	
249				$376,000	
Subtotal	$308,000	$0	$0	$803,000	$0
Preventive Maintenance					
299			$206,000		
228			$60,000		
188			$96,000		
283				$31,000	
274				$79,000	
273				$59,000	
235				$47,000	
209				$71,000	
208				$71,000	
201				$61,000	
200				$86,000	
199				$182,000	
197				$68,000	
195				$63,000	
194				$221,000	
173				$61,000	
Subtotal	$0	$0	$362,000	$1,100,000	$0
Total:	$1,821,000	$758,000	$1,187,000	$6,625,000	$0

3. CULVERT ASSETS

Inventory of Assets

At present, ACRC tracks inventory and condition data of its culvert assets. ACRC has inventoried 3654 culverts, which is 73 percent of the estimated 5000 culverts that ACRC owns. Of ACRC's 3654 tracked and rated culverts, ACRC has culverts considered good, culverts considered fair, culverts considered poor, and culverts considered failed based on the culvert rating system that ACRC uses (see Appendix C *Culvert Asset Management Plan Supplement*).

More detail about these culvert assets can be found in ACRC's Roadsoft database or by contacting ACRC.

Goals

The goal of ACRC's asset management program is the preservation of its culvert network. ACRC is responsible for preserving 3,654 inventoried culverts as well as any un-inventoried culverts that are under its entire road network. ACRC has a goal to completely inventory our assets within the next 5 years depending upon staffing availability.

Planned Projects

ACRC's policy is to replace or repair culvert assets concurrent with projects affecting road segments carried by the particular culverts. ACRC also includes culvert assets in scheduled maintenance projects affecting road segments carried by the particular culverts. Townships can also elect to replace any poor or failing culverts as a single project.

4. SIGNAL ASSETS

Inventory of Assets

At present, ACRC tracks only inventory data for traffic signals. ACRC has inventoried 2 traffic signals, which is 100 percent of the actual 2 traffic signals that ACRC owns.

More detail about these traffic signal assets can be obtained by contacting ACRC.

Goals

The goal of ACRC's asset management program is the preservation of its traffic signals. ACRC is responsible for preserving 2 inventoried traffic signals.

Planned Projects

ACRC's policy is to evaluate traffic signal assets based on condition assessment for replacement or repair during any reconstruction, rehabilitation, preventive maintenance, of schedule maintenance activities on the roadway affected by the particular signal. It also conducts replacements or repairs for those traffic signal assets reported as non-functional or as performing with reduced function. ACRC adheres to regular maintenance and servicing policies outlined in the *Michigan Manual of Uniform Traffic Control Devices*.

5. FINANCIAL RESOURCES

Public entities must balance the quality and extent of services they can provide with the tax resources provided by citizens and businesses, all while maximizing how efficiently funds are used. Therefore, ACRC will overview its general expenditures and financial resources currently devoted to transportation infrastructure maintenance. This financial information is not intended to be a full financial disclosure or a formal report. Full details of ACRC's financial status can be found on our website at alleganroads.org/annual-reports.html or by request submitted to our agency contact (listed in this plan).

Anticipated Revenues & Expenses

ACRC receives funding from the following sources:

- **State funds** – ACRC's principal source of transportation funding is received from the Michigan Transportation Fund (MTF). This fund is supported by vehicle registration fees and the state's per-gallon gas tax. Allocations from the MTF are distributed to state and local governmental units based on a legislated formula, which includes factors such as population, miles of certified roads, and vehicle registration fees for vehicles registered in the agency's jurisdiction. ACRC also receives revenue from the Michigan Department of Transportation to maintain (e.g. plow, patch, mow) the state trunklines within its jurisdictional boundary. Revenue from these maintenance contracts are received on a time and materials basis as resources are expended to maintain the State's roads. While these contracts do not allow for capital gain (profit) and only bring in revenue to cover the cost of the work, they do provide a benefit to ACRC by allowing an economy of scale that enables us to provide better service at a lower cost for ACRC's roads while allowing the same for the State of Michigan. Examples of state grants also include local bridge grants, economic development funds, and metro funds.

- **Federal and state grants for individual projects** – These are typically competitive funding applications that are targeted at a specific project type to accomplish a specific purpose. These may include safety enhancement projects, economic development projects, or other targeted funding. Examples of federal funds include Surface Transportation Program (STP) funds, C and D funds, bridge funds, MDOT payments to private contractors, and negotiated contracts.

- **Local government entities or private developer contributions to construction projects for specific improvements** – This category includes funding received to mitigate the impact of commercial developments as a condition of construction of a specific development project, and can also include funding from a special assessment district levied by another governmental unit. Examples of contributions from local units include city, village, and township contributions to the county; special assessments; county appropriations; bond and note proceeds; contributions from counties to cities and villages; city general fund transfers; city municipal street funds; capital improvement funds; and tax millages (see below).

- **Local tax millages** – Many local agencies in Michigan use local tax millages to supplement their road-funding budget. These taxes can provide for additional construction and maintenance for new or existing roads that are also funded using MTF or MDOT funds. ACRC has local tax millages in its road-funding budget. There is a county-wide primary road millage, and individual township road millages for local roads that varies by township.

- **Interest** – Interest from invested funds.

- **Permit fees** – Generally, permit fees cover the cost of a permit application review.

- **Other** – Other revenues can be gained through salvage sales, property rentals, land and building sales, sundry refunds, equipment disposition or installation, private sources, and financing.

- **Charges for services** – Funds from partner agencies who contract with ACRC to construct or maintain its roads, or roads under joint or neighboring jurisdictions, including state trunkline maintenance and non-maintenance services and preservation.

ACRC is required to report transportation fund expenditures to the State of Michigan using a prescribed format with predefined expenditure categories. The definitions of these categories according to Public Act 51 of 1951 may differ from common pavement management nomenclature and practice. For the purposes of reporting under PA 51, the expenditure categories are:

- **Construction/Capacity Improvement Funds** – According to PA 51 of 1951, this financial classification of projects includes, "new construction of highways, roads, streets, or bridges, a project that increases the capacity of a highway facility to accommodate that part of traffic having neither an origin nor destination within the local area, widening of a lane width or more, or adding turn lanes of more than 1/2 mile in length."[1]

- **Preservation and Structural Improvement Funds** – Preservation and structural improvements are "activit[ies] undertaken to preserve the integrity of the existing roadway system."[2]

[1] Public Act 51 of 1951, 247.660c Definitions
[2] Public Act 51 of 1951, 247.660c Definitions

Preservation includes items such as a reconstruction of an existing road or bridge, or adding structure to an existing road.

- **Routine and Preventive Maintenance Funds** – Routine maintenance activities are "actions performed on a regular or controllable basis or in response to uncontrollable events upon a highway, road, street, or bridge".[3] Preventive maintenance activities are "planned strategy[ies] of cost-effective treatments to an existing roadway system and its appurtenances that preserve assets by retarding deterioration and maintaining functional condition without significantly increasing structural capacity".[4]
- **Winter Maintenance Funds** – Expenditures for snow and ice control.
- **Trunkline Maintenance Funds** – Expenditures spent under ACRC's maintenance agreement with MDOT for maintenance it performs on MDOT trunkline routes.
- **Administrative Funds** – There are specific items that can and cannot be included in administrative expenditures as specified in PA 51 of 1951. The law also states that the amount of MTF revenues that are spent on administrative expenditures is limited to 10 percent of the annual MTF funds that are received.
- **Other Funds** – Expenditures for equipment, capital outlay, debt principal payment, interest expense, contributions to adjacent governmental units, principal, interest and bank fees, and miscellaneous for cities and villages.

The Table (below) details the revenues and expenditures for ACRC.

Table 4: Annual Fiscal-Year Revenues & Expenditures per FY 2020

REVENUES			**EXPENDITURES**		
Item	**Estimated $**	**Percent of Total**	**Item**	**Estimated $**	**Percent of Total**
State funds	15,462,109	50.8	Construction & capacity improvement (CCI)	0.00	0.0
Federal funds	581,827	1.9	Preservation & structural improvement (PSI)	17,576,575	53.6
Contributions for local units	14,068,755	46.2	Routine Maintenance	11,841,322	36.1
Interest, rents, and other	308,105	1.0	Winter Maintenance (Routine)	1,913,265	5.8
Charges for services	0.00	0.0	Administrative	1,151,051	3.5
			Other	306,541	0.9
TOTAL	$30,420,796	100%	TOTAL	32,761,755	100%
Verify the information in this table. You can find your agency's information in the TAMC dashboard at https://www.mcgi.state.mi.us/mitrp/tamcDashboards.					

[3] Public Act 51 of 1951, 247.660c Definitions
[4] Public Act 51 of 1951, 247.660c Definitions

6. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by ACRC provides road users with multiple alternate options in the event of an unplanned disruption of one part of the system. There are, however, key links in the transportation system that may cause significant inconvenience to users if they are unexpectedly closed to traffic. Key transportation links include:

- **Geographic divides:** Areas where a geographic feature (river, lake, hilly terrain, or limited access road) limits crossing points of the feature; bridge failures, in particular, can create loss of access to entire regions of the state
- **Emergency alternate routes for high-volume roads and bridges:** Roads and bridges that are routinely used as alternate routes for high-volume assets are included in an emergency response plan
- **Limited access areas:** Roads and bridges that serve remote or limited access areas that result in long detours if closed
- **Main access to key commercial districts:** Areas with a large concentration of businesses or where large-size business will be significantly impacted if a road is unavailable
- Our road and bridge network includes the following critical assets: Any bridge on the primary system is considered a critical asset. Figure 9 illustrates the key transportation links in ACRC's road and bridge network.

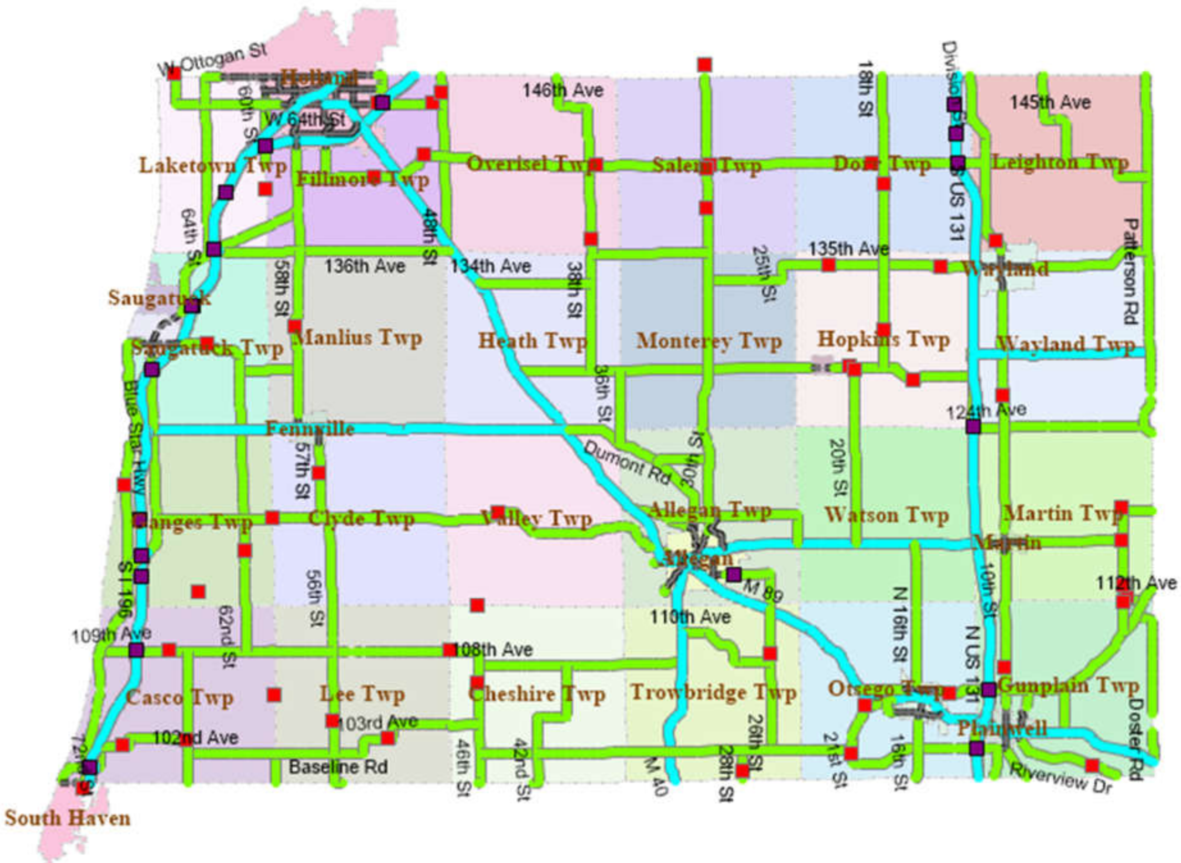

Figure 9: Key transportation links in ACRC's road and bridge network

7. COORDINATION WITH OTHER ENTITIES

An asset management plan provides a significant value for infrastructure owners because it serves as a platform to engage other infrastructure owners using the same shared right of way space. ACRC communicates with both public and private infrastructure owners to coordinate work in the following ways:

ACRC coordinates with local municipalities on projects that span through different jurisdictions as well as non-motorized funding grants.

ACRC has acted as Congestion Mitigation Air Quality (CMAQ) grant recipient for non-motorized path construction by Friends of the Blue Star Trail (FBST). Acting as a pass-through grant recipient for the FBST has provided this organization with the funding opportunities to construct a non-motorized segment of the Blue Star Trail.

ACRC also coordinates with several utility companies (gas, water, sewer, electric, communications) in all townships. Infrastructure owners are sent all project locations a year in advance of construction commencing. When a utility has planned projects that will disrupt transportation services or cause damage to existing pavements, mitigation measures are proposed to minimize the impacts. The ACRC also does not allow utilities to open cut a roadway while asphalt plants are closed, to minimize disruptions and damages to traveled ways.

8. PROOF OF ACCEPTANCE

PUBLIC ACT 325

CERTIFICATION OF TRANSPORTATION ASSET MANAGEMENT PLAN

Certification Year: 2023

Local Road-owning Agency Name: Allegan County Road Commission

Beginning October 2019 and on a three-year cycle thereafter, certification must be made for compliance to Public Act 325. A local road-owning agency with 100 certified miles or more must certify that it has developed an asset management plan for the road, bridge, culvert, and traffic signal assets. Signing this form certifies that the hitherto referred agency meets with minimum requirements as outlined by Public Act 325 and agency-defined goals and objectives.

This form must be signed by the chairperson of the local road-owning agency or the county executive and chief financial officer of the local road-owning agency.

Signature [signed]	Signature [signed]
Printed Name Craig Atwood	Printed Name Sheryl L. Parrish
Title Managing Director Date 10/3/2022	Title Finance Director Date 10/3/2022

Due every three years based on agency submission schedule

Submittal Date: 10/3/2022

See attached council meeting minutes and/or resolution.

A. PAVEMENT ASSET MANAGEMENT PLAN

An attached pavement asset management plan follows.

Allegan County Road Commission 2023 Pavement Asset Management Plan

A plan describing the Allegan County Road Commission's roadway assets and conditions

Prepared by:
Ryan Kemppainen, P.E.
County Highway Engineer
1308 Lincoln Road
Allegan, MI 49010

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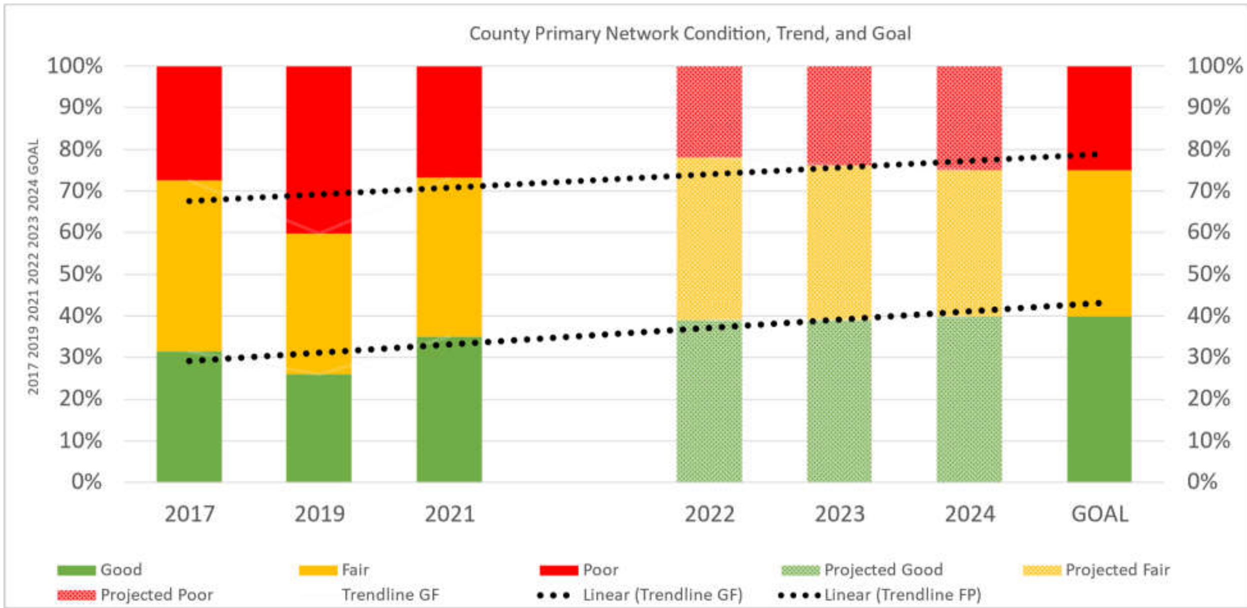
EXECUTIVE SUMMARY

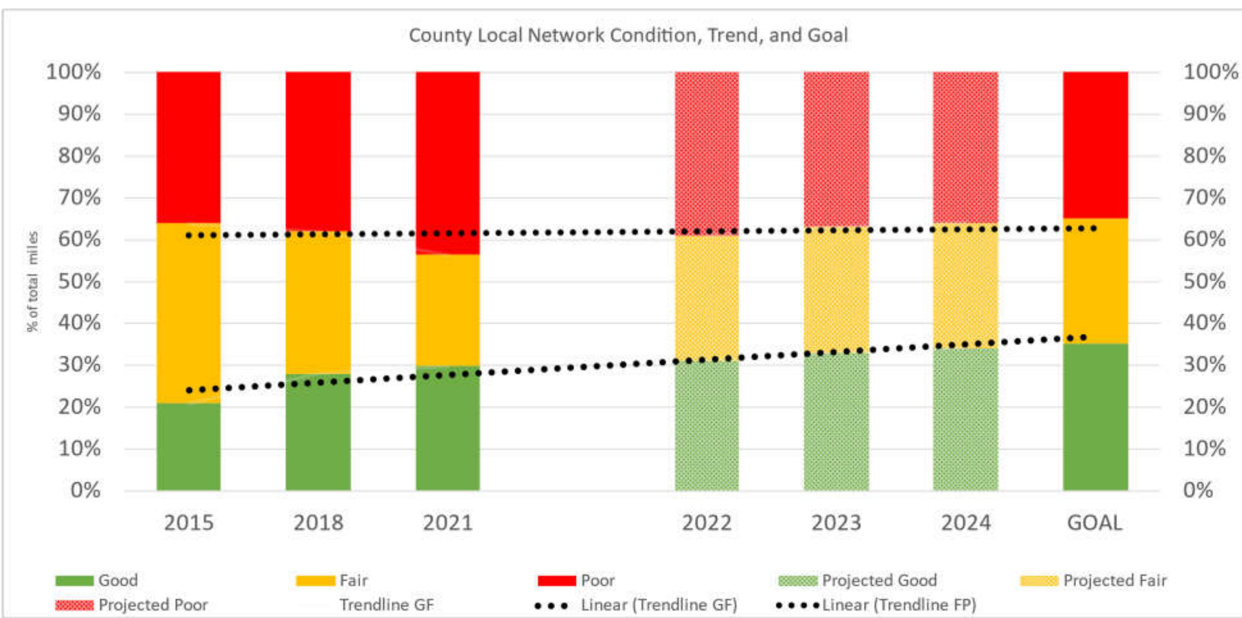
As conduits for commerce and connections to vital services, roads are among the most important assets in any community along with other assets like bridges, culverts, traffic signs, traffic signals, and utilities that support and affect roads. The Allegan County Road Commission's (ACRC) roads, other transportation assets, and support systems are also some of the most valuable and extensive public assets, all of which are paid for with taxes collected from ordinary citizens and businesses. The cost of building and maintaining roads, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to plan, build, and maintain the road network in an efficient and effective manner. This asset management plan is intended to report on how ACRC is meeting its obligations to maintain the public assets for which it is responsible.

This plan overviews ACRC's road assets and condition and explains how ACRC works to maintain and improve the overall condition of those assets. These explanations can help answer the following questions:

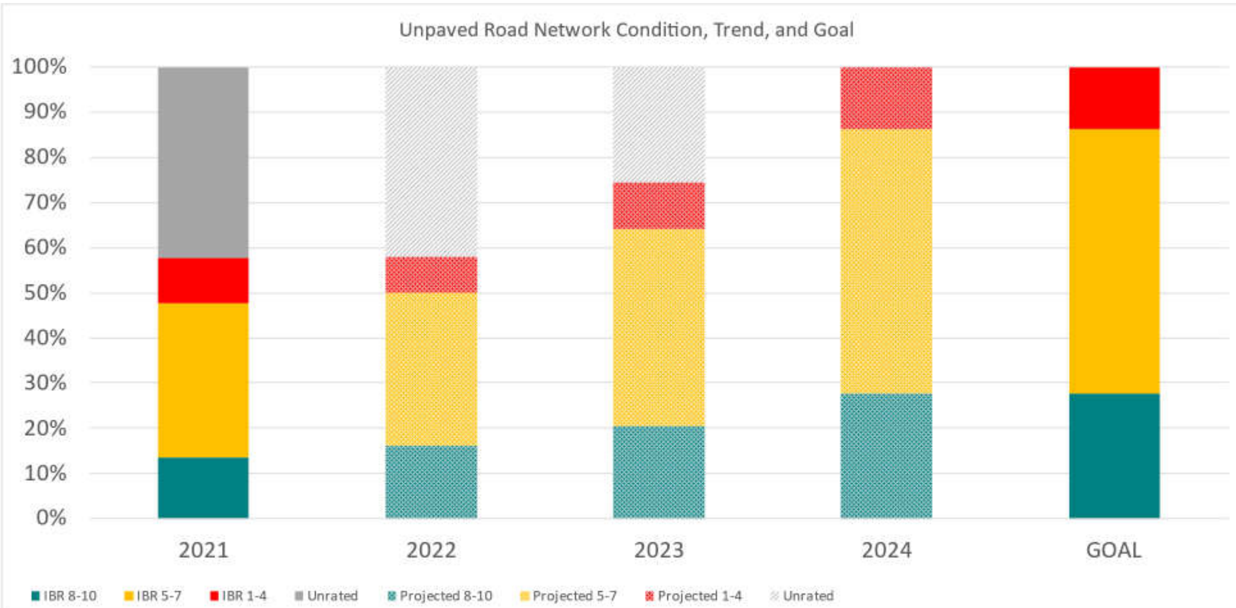
- What kinds of road assets ACRC has in its jurisdiction, who owns them, and the different options for maintaining these assets.
- What tools and processes ACRC uses to track and manage road assets and funds.
- What condition ACRC's road assets are in compared to statewide averages.
- Why some road assets are in better condition than others and the path to maintaining and improving road asset conditions through proper planning and maintenance.
- How agency transportation assets are funded and where those funds come from.
- How funds are used, and the costs incurred during ACRC's road assets' normal life cycle.
- What condition ACRC can expect its road assets if those assets continue to be funded at the current funding levels
- How changes in funding levels can affect the overall condition of all of ACRC's road assets.

ACRC owns and/or manages 1796.7 centerline miles of roads. This road network can be divided into the county primary network, the county local network, and the unpaved road network based on the different factors these roads have that influence asset management decisions. A summary of ACRC historical and current network conditions, projected trends, and goals for county primary network and county local network can be seen in the two figures, below:


County Primary Network Condition, Trend, and Goal
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2017 2019 2021 2022 2023 2024 GOAL
2017
2019
2021
2022
2023
2024
GOAL
Good
Fair
Poor
Projected Good
Projected Fair
Projected Poor
Trendline GF
Linear (Trendline GF)
Linear (Trendline FP)


County Local Network Condition, Trend, and Goal
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% of total miles
2015
2018
2021
2022
2023
2024
GOAL
Good
Fair
Poor
Projected Good
Projected Fair
Projected Poor
Trendline GF
Linear (Trendline GF)
Linear (Trendline FP)

A summary of ACRC historical and current network conditions, projected trend and goal for the unpaved road network can be seen in the figure, below:



An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of ACRC's obligations towards meeting these requirements. This asset management plan also helps demonstrate ACRC's responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of ACRC's road assets and gives taxpayers the information they need to make informed decisions about investing in its essential transportation infrastructure.

INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals". In other words, asset management is a process that uses data to manage and track assets, like roads and bridges, in a cost-effective manner using a combination of engineering and business principles. This process is endorsed by leaders in municipal planning and transportation infrastructure, including the Michigan Municipal League, County Road Association of Michigan, the Michigan Department of Transportation (MDOT), and the Federal Highway Administration (FHWA). ACRC is supported in its use of asset management principles and processes by the Michigan Transportation Asset Management Council (TAMC), formed by the State of Michigan.

Asset management, in the context of this plan, ensures that public funds are spent as effectively as possible to maximize the condition of the road network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing road infrastructure with a limited budget.

The ACRC has adopted an "asset management" business process to overcome the challenges presented by having limited financial, staffing, and other resources while needing to meet road users' expectations. ACRC is responsible for maintaining and operating over 1796.7 centerline of roads.

This plan outlines how ACRC determines its strategy to maintain and upgrade road asset condition given agency goals, priorities of its road users, and resources provided. An updated plan is to be released approximately every three years to reflect changes in road conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to Craig Atwood at 1308 Lincoln Road, Allegan, Michigan 49010 or at (269)-673-2184 or catwood@alleganroads.org. Key terms used in this plan are defined in ACRC's comprehensive transportation asset management plan (also known as the "compliance plan") used for compliance with PA 325 or 2018.

Knowing the basic features of the asset classes themselves is a crucial starting point to understanding the rationale behind an asset management approach. The following primer provides an introduction to pavements.

Pavement Primer

Roads come in two basic forms—paved and unpaved. Paved roads have hard surfaces. These hard surfaces can be constructed from asphalt, concrete, composite (asphalt and concrete), sealcoat, and brick and block materials. On the other hand, unpaved roads have no hard surfaces. Examples of these surfaces are gravel and unimproved earth.

The decision to pave with a particular material as well as the decision to leave a road unpaved allows road-owning agencies to tailor a road to a particular purpose, environment, and budget. Thus, selecting a pavement type or leaving a road unpaved depends upon purpose, materials available, and budget. Each choice represents a trade-off between budget and costs for construction and maintenance.

Maintenance enables the road to fulfill its particular purpose. To achieve the maximum service for a pavement or an unpaved road, continual monitoring of a road's pavement condition is essential for choosing the right time to apply the right fix in the right place.

Here is a brief overview of the different types of pavements, how condition is assessed, and treatment options that can lengthen a road's service life.

Surfacing

Pavement type is influenced by several different factors, such as cost of construction, cost of maintenance, frequency of maintenance, and type of maintenance. These factors can have benefits affecting asset life and road user experience.

Paved Surfacing

Typical benefits and tradeoffs for hard surface types include:

- **Concrete pavement:** Concrete pavement, which is sometimes called a rigid pavement, is durable and lasts a long time when properly constructed and maintained. Concrete pavement can have longer service periods between maintenance activities, which can help reduce maintenance-related traffic disruptions. However, concrete pavements have a high initial cost and can be challenging to rehabilitate and maintain at the end of their service life. A typical concrete pavement design life will provide service for 30 years before major rehabilitation is necessary.
- **Hot-mix asphalt pavement (HMA):** HMA pavement, sometimes known as asphalt or flexible pavement, is currently less expensive to construct than concrete pavement (this is, in some part, due to the closer link between HMA material costs and oil prices that HMA pavements have in comparison with other pavement types). However, they require frequent maintenance activities to maximize their service life. A typical HMA pavement design life will provide service for 18 years before major rehabilitation is necessary. The vast majority of local-agency-owned pavements are HMA pavements.

- **Composite pavements:** Composite pavement is a combination of concrete and asphalt layers. Typically, composite pavements are old concrete pavements exhibiting ride-related issues that were overlaid by several inches of HMA in order to gain more service life from the pavement before it would need reconstruction. Converting a concrete pavement to a composite pavement is typically used as a "holding pattern" treatment to maintain the road in usable condition until reconstruction funds become available.

- **Sealcoat pavement:** Sealcoat pavement is a gravel road that have been sealed with a thin asphalt binder coating that has stone chips spread on top (not to be confused with a chip seal treatment over HMA pavement). This type of a pavement relies on the gravel layer to provide structure to support traffic, and the asphalt binder coating and stone chips shed water and eliminate the need for maintenance grading. Nonetheless, sealcoat pavement does require additional maintenance steps that asphalt, and gravel do not require and does not last as long as HMA pavement, but it provides a low-cost alternative for lightly-trafficked areas and competes with asphalt for ride quality when properly constructed and maintained. Sealcoat pavement can provide service for ten or more years before the surface layer deteriorates and needs to be replaced.

Unpaved Surfacing

Typical benefits and tradeoffs for non-hard surfacing include:

- **Gravel:** Gravel is a low-cost, easy-to-maintain road surface made from layers of soil and aggregate (gravel). However, there are several potential drawbacks such as dust, mud, and ride smoothness when maintenance is delayed or traffic volume exceeds design expectations. Gravel roads require frequent low-cost maintenance activities. Gravel can be very cost effective for lower-volume, lower-speed roads. In the right conditions, a properly constructed and maintained gravel road can provide a service life comparable to an HMA pavement and can be significantly less expensive than the other pavement types.

Pavement Condition

Besides traffic congestion, pavement condition is what road users typically notice most about the quality of the roads that they regularly use—the better the pavement condition, the more satisfied users are with the service provided by the roadwork performed by road-owning agencies. Pavement condition is also a major factor in determining the most cost-effective treatment—that is, routine maintenance, capital preventive maintenance, or structural improvement—for a given section of pavement. As pavements age, they transition between "windows" of opportunity when a specific type of treatment can be applied to gain an increase in quality and extension of service life. Routine maintenance is day-to-day, regularly-scheduled, low-cost activity applied to "good" roads to prevent water or debris intrusion. Capital preventive maintenance (CPM) is a planned set of cost-effective treatments for "fair" roads that corrects pavement defects, slows further deterioration, and maintains the functional condition without increasing structural capacity. ACRC uses pavement condition and age to anticipate when a specific section of pavement will be a potential candidate for preventive maintenance. More detail on this topic is included in the *Pavement Treatment* section of this primer.

Pavement condition data is also important because it allows road owners to evaluate the benefits of preventive maintenance projects. This data helps road owners to identify the most cost-effective use of road construction and maintenance dollars. Further, historic pavement condition data can enable road owners to predict future road conditions based on budget constraints and to determine if a road network's condition will improve, stay the same, or degrade at the current or planned investment level. This analysis can help determine how much additional funding is necessary to meet a network's condition improvement goals.

Paved Road Condition Rating System

ACRC is committed to monitoring the condition of its road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. ACRC uses the Pavement Surface Evaluation and Rating (PASER) system to assess its paved roads. PASER was developed by the University of Wisconsin Transportation Information Center to provide a simple, efficient, and consistent method for evaluating road condition through visual inspection. The widely-used PASER system has specific criteria for assessing asphalt, concrete, sealcoat, and brick and block pavements. Information regarding the PASER system and PASER manuals may be found on the TAMC website at: http://www.michigan.gov/tamc/0,7308,7-356-82158_82627---,00.html.

The TAMC has adopted the PASER system for measuring statewide pavement conditions in Michigan for asphalt, concrete, composite, sealcoat, and brick-and-block paved roads. Broad use of the PASER system means that data collected at ACRC is consistent with data collected statewide. PASER data is collected using trained inspectors in a slow-moving vehicle using GPS-enabled data collection software provided to road-owning agencies at no cost to them. The method does not require extensive training or specialized equipment, and data can be collected rapidly, which minimizes the expense for collecting and maintaining this data.

The PASER system rates surface condition using a 1-10 scale where 10 is a brand new road with no defects that can be treated with routine maintenance, 5 is a road with distresses but is structurally sound that can be treated with preventive maintenance, and 1 is a road with extensive surface and structural distresses that is in need of total reconstruction.

Roads with lower PASER scores generally require costlier treatments to restore their quality than roads with higher PASER scores. The cost effectiveness of treatments generally decreases the as the PASER number decreases. In other words, as a road deteriorates, it costs more dollars per mile to fix it, and the dollars spent are less efficient in increasing the road's service life. Nationwide experience and asset management principles tell us that a road that has deteriorated to a PASER 4 or less will cost more to improve and the dollars spent are less efficient. Understanding this cost principle helps to draw meaning from the current PASER condition assessment.

The TAMC has developed statewide definitions of road condition by creating three simplified condition categories— "good", "fair", and "poor"—that represent bin ranges of PASER scores having similar contexts with regard to maintenance and/or reconstruction. The definitions of these rating conditions are:

- "Good" roads, according to the TAMC, have PASER scores of 8, 9, or 10. Roads in this category have very few, if any, defects and only require minimal maintenance; they may be kept in this category longer using PPM. These roads may include those that have been recently seal coated or newly constructed. Figure 1 illustrates an example of a road in this category.
- "Fair" roads, according to the TAMC, have PASER scores of 5, 6, or 7. Roads in this category still show good structural support, but their surface is starting to deteriorate. Figure 1 illustrates two road examples in this category. CPM can be cost effective for maintaining the road's "fair" condition or even raising it to "good" condition before the structural integrity of the pavement has been severely impacted. CPM treatments can be likened to shingles on a roof of a house: while the shingles add no structural value, they protect the house from structural damage by maintaining the protective function of a roof covering.
- "Poor" roads, according to the TAMC, have PASER scores of 1, 2, 3, or 4. These roads exhibit evidence that the underlying structure is failing, such as alligator cracking and rutting. These roads must be rehabilitated with treatments like a heavy overlay, crush and shape, or total reconstruction. Figure 1 illustrates a road in this category.

Figure 1: *Top image, right*– PASER 8 road that is considered "good" by the TAMC exhibit only minor defects. *Second image, right*– PASER 5 road that is considered "fair" by the TAMC. Exhibiting structural soundness but could benefit from CPM. *Third image, right*– PASER 6 road that is considered "fair" by the TAMC. *Bottom image, right*– PASER 2 road that is considered "poor" by the TAMC exhibiting significant structural distress.

The TAMC's good, fair, and poor categories are based solely on the definitions, above. Therefore, caution should be exercised when comparing other condition assessments with these categories because other condition assessments may have “good”, “fair”, or “poor” designations similar to the TAMC condition categories but may not share the same definition. Often, other condition assessment systems define the “good”, “fair”, and “poor” categories differently, thus rendering the data of little use for cross-system comparison. The TAMC’s definitions provide a statewide standard for all of Michigan’s road-owning agencies to use for comparison purposes.

PASER data is collected 100 percent every two years on all federal-aid-eligible roads in Michigan. The TAMC dictates and funds the required training and the format for this collection, and it shares the data regionally and statewide. In addition, ACRC collects 100 percent of its paved non-federal-aid-eligible network using its own staff and resources.

Unpaved Road Condition Rating System (IBR System™)

The condition of unpaved roads can be rapidly changing, which makes it difficult to obtain a consistent surface condition rating over the course of weeks or even days. The PASER system works well on most paved roads, which have a relatively stable surface condition over several months, but it is difficult to adapt to unpaved roads. To address the need for a reliable condition assessment system for unpaved roads, the TAMC adopted the Inventory Based Rating (IBR) System™, and ACRC also uses the IBR System™ for rating its unpaved roads. Information about the IBR System™ can be found at http://ctt.mtu.edu/inventory-based-rating-system.

Figure 2: *Top*– Road with IBR number of 1 road that has poor surface width, poor drainage adequacy, and poor structural adequacy. *Middle*– Road IBR number of 7 that has fair surface width, fair drainage adequacy, and fair structural adequacy. *Bottom*– Road with IBR number of 9 road that has good surface width, good drainage adequacy, and good structural adequacy.

The IBR System™ gathers reliable condition assessment data for unpaved road by evaluating three features—surface width, drainage adequacy, and structural adequacy—in comparison to a baseline, or generally considered “good”, road. These three assessments come together to generate an overall 1-10 IBR number. A high IBR number reflects a road with wide surface width, good drainage, and a well-designed and well-constructed base, whereas a low IBR number reflects a narrow road with no ditches and little gravel. A good, fair, or poor assessment of each feature is not an endorsement or indictment of a road’s suitability for use but simply provides context on how these road elements compare to a baseline condition.

Figure 2 illustrates the range over which features may be assessed. The top example in Figure 2 shows an unpaved road with a narrow surface width, little or no drainage, and very little gravel thickness. Using the IBR System™, these assessments would yield an IBR number of “1” for this road. The middle example in Figure 2 shows a road with fair surface width, fair drainage adequacy, and fair structural adequacy. These assessments would yield an IBR number of “7” for this road. The bottom example in Figure 2 shows a road with good surface width, good drainage adequacy, and good structural adequacy. These assessments would yield an IBR number of “9” for this road.

Unpaved roads are constructed and used differently throughout Michigan. A narrow, unpaved road with no ditches and very little gravel (low IBR number) may be perfectly acceptable in a short, terminal end of the road network, for example, on a road segment that ends at a lake or serves a limited number of unoccupied private properties. However, high-volume unpaved roads that serve agricultural or other industrial activities with heavy trucks and equipment will require wide surface width, good drainage, and a well-designed and well-constructed base structure (high IBR number). Where the unpaved road is and how it is used determines how the road must be constructed and maintained: just because a road has a low IBR number does not necessarily mean that it needs to be upgraded. The IBR number are not an endorsement or indictment of the road’s suitability for use but rather, an indication of a road’s capabilities to support different traffic volumes and types in all weather.

Pavement Treatments

Selection of repair treatments for roads aims to balance costs, benefits, and road life expectancy. All pavements are damaged by water, traffic weight, freeze/thaw cycles, and sunlight. Each of the following treatments and strategies—reconstruction, structural improvements, capital preventive maintenance, and others used by ACRC—counters at least one of these pavement-damaging forces.

Reconstruction

Pavement reconstruction treats failing or failed pavements by completely removing the old pavement and base and constructing an entirely new road (Figure 3). Every pavement has to eventually be reconstructed and it is usually done as a last resort after more cost-effective treatments are done, or if the road requires significant changes to road geometry, base, or buried utilities. Compared to the other treatments, which are all improvements of the existing road, reconstruction is the most extensive rehabilitation of the roadway and therefore, also the most expensive per mile and most disruptive to regular traffic patterns. Reconstructed pavement will subsequently require one or more of the previous maintenance treatments to maximize service life and performance. A reconstructed road lasts approximately 15 years and costs

Figure 3: Examples of reconstruction treatments—(left) reconstructing a road and (right) road prepared for full-depth repair.

$250,000 per lane mile. The following descriptions outline the main reconstruction treatments used by ACRC.

Full-depth Concrete Repair

A full-depth concrete repair removes sections of damaged concrete pavement and replaces it with new concrete of the same dimensions (Figure 3). It is usually performed on isolated deteriorated joint locations or entire slabs that are much further deteriorated than adjacent slabs. The purpose is to restore the riding surface, delay water infiltration, restore load transfer from one slab to the next, and eliminate the need to perform costly temporary patching. This repair lasts approximately twelve years and typically costs $100,000 per mile.

Ditching (for Unpaved Roads)

Water needs to drain away from any roadway to delay softening of the pavement structure, and proper drainage is critical for unpaved roads where there is no hard surface on top to stop water infiltration into the road surface and base. To improve drainage, new ditches are dug or old ones are cleaned out. Unpaved roads typically need to be re-ditched every 15 years at a cost of $10,000 per mile.

Gravel Overlay (for Unpaved Roads)

Unpaved roads will exhibit gravel loss over time due to traffic, wind, and rain. Gravel on an unpaved road provides a wear surface and contributes to the structure of the entire road. Unpaved roads typically need to be overlaid with four inches of new gravel every 15 years at a cost of $25,000 per mile.

Structural Improvement

Roads requiring structural improvements exhibit alligator cracking and rutting and rated poor in the TAMC scale. Road rutting is evidence that the underlying structure is beginning to fail and it must be either rehabilitated with a structural treatment. Examples of structural improvement treatments include HMA overlay with or without milling, and crush and shape (Figure 4). The following descriptions outline the main structural improvement treatments used by ACRC.

Figure 4: Examples of structural improvement treatments—(from left) HMA overlay on an unmilled pavement, milling asphalt pavement, and pulverization of a road during a crush-and-shape project.

Hot-mix Asphalt (HMA) Overlay with/without Milling

An HMA overlay is a layer of new asphalt (liquid asphalt and stones) placed on an existing pavement (Figure 4). Depending on the overlay thickness, this treatment can add significant structural strength. This treatment also creates a new wearing surface for traffic and seals the pavement from water, debris, and sunlight damage. An HMA overlay lasts approximately five to ten years and costs $50,000 to $100,000 per lane mile. The top layer of severely damaged pavement can be removed by the milling, a technique that helps prevent structural problems from being quickly reflected up to the new surface. Milling is also done to keep roads at the same height of curb and gutter that is not being raised or reinstalled in the project. Milling adds $10,000 per lane mile to the HMA overlay cost.

Crush and Shape

During a crush and shape treatment, the existing pavement and base are pulverized and then the road surface is reshaped to correct imperfections in the road's profile (Figure 4). An additional layer of gravel is often added along with a new wearing surface such as an HMA overlay. Additional gravel and an HMA overlay give an increase in the pavements structural capacity. This treatment is usually done on rural roads with severe structural distress; Adding gravel and a wearing surface makes it more prohibitive for urban roads if the curb and gutter is not raised up. Crush and shape treatments last approximately 14 years and cost $150,000 per lane mile.

Capital Preventive Maintenance

Capital preventive maintenance (CPM) addresses pavement problems of fair-rated roads before the structural integrity of the pavement has been severely impacted. CPM is a planned set of cost-effective treatments applied to an existing roadway that slows further deterioration and that maintains or improves the functional condition of the system without significantly increasing the structural capacity. Examples of such treatments include crack seal, fog seal, chip seal, slurry seal, and microsurface (Figure 5). The purpose of the following CPM treatments is to protect the pavement structure, slow the rate of deterioration, and/or correct pavement surface deficiencies. The following descriptions outline the main CPM treatments used by ACRC.

Figure 5: Examples of capital preventive maintenance treatments—(from left) crack seal, fog seal, chip seal, and slurry seal/microsurface.

Crack Seal

Water that infiltrates the pavement surface softens the pavement structure and allows traffic loads to cause more damage to the pavement than in normal dry conditions. Crack sealing helps prevent water infiltration by sealing cracks in the pavement with asphalt sealant (Figure 5). ACRC seals pavement cracks early in the life of the pavement to keep it functioning as strong as it can and for as long as it can.

Crack sealing lasts approximately two years and costs $4,000 per lane mile. Even though it does not last very long compared to other treatments, it does not cost very much compared to other treatments. This makes it a very cost-effective treatment when ACRC looks at what crack filling costs per year of the treatment's life.

Fog Seal

Fog sealing sprays a liquid asphalt coating onto the entire pavement surface to fill hairline cracks and prevent damage from sunlight (Figure 5). Fog seals are best for good to very good pavements and last approximately two years at a cost of $1,000 per lane mile.

Chip Seal

A chip seal, also known as a sealcoat, is a two-part treatment that starts with liquid asphalt sprayed onto the old pavement surface followed by a single layer of small stone chips spread onto the wet liquid asphalt layer (Figure 5). The liquid asphalt seals the pavement from water and debris and holds the stone chips in place, providing a new wearing surface for traffic that can correct friction problems and helping to prevent further surface deterioration. Chip seals are best applied to pavements that are not exhibiting problems with strength, and their purpose is to help preserve that strength. These treatments last approximately five years and cost $12,000 per lane mile.

Slurry Seal/Microsurface

A slurry seal or microsurface's purpose is to protect existing pavement from being damaged by water and sunlight. The primary ingredients are liquid asphalt (slurry seal) or modified liquid asphalt (microsurface), small stones, water and portland cement applied in a very thin (less than a half an inch) layer (Figure 5). The main difference between a slurry seal and a microsurface is the modified liquid asphalt used in microsurfacing provides different curing and durability properties, which allows microsurfacing to be used for filling pavement ruts. Since the application is very thin, these treatments do not add any strength to the pavement and only serves to protect the pavement's existing strength by sealing the pavement from sunlight and water damage. These treatments work best when applied before cracks are too wide and too numerous. A slurry seal treatment lasts approximately four years and costs $20,000 per lane mile, while a microsurface treatment tends to last for seven years and costs $25,000 per lane mile.

Partial-Depth Concrete Repair

A partial-depth concrete repair involves removing spalled (i.e., fragmented) or delaminated (i.e., separated into layers) areas of concrete pavement, usually near joints and cracks and replacing with new concrete (Figure 6). This is done to provide a new wearing surface in isolated areas, to slow down water infiltration, and to help delay further freeze/thaw damage. This repair lasts approximately five years and typically costs $20,000 per mile.

Maintenance Grading (for Unpaved Roads)

Maintenance grading involves regrading an unpaved road to remove isolated potholes, washboarding, and ruts then restoring the compacted crust layer (Figure 6). Crust on an unpaved road is a very tightly compacted surface that sheds water with ease but takes time to be created, so destroying a crusted surface with maintenance grading requires a plan to restore the crust. Maintenance grading often needs to be performed three to five times per year and each grading costs $300 per mile.

Dust Control (for Unpaved Roads)

Dust control typically involves spraying chloride or other chemicals on a gravel surface to reduce dust loss, aggregate loss, and maintenance (Figure 6). This is a relatively short-term fix that helps create a crusted surface. Chlorides work by attracting moisture from the air and existing gravel. This fix is not effective if the surface is too dry or heavy rain is imminent, so timing is very important. Dust control is done two to four times per year and each application costs $700 per mile.

Figure 6: Examples of capital preventive maintenance treatments, cont'd—(from left) concrete road prepared for partial-depth repair, gravel road undergoing maintenance grading, and gravel road receiving dust control application (dust control photo courtesy of Weld County, Colorado, weldgov.com).

Maintenance

Maintenance is the most cost-effective strategy for managing road infrastructure and prevents good and fair roads from reaching the poor category, which require costly rehabilitation and reconstruction treatments to create a year of service life. It is most effective to spend money on routine maintenance and CPM treatments, first; then, when all maintenance project candidates are treated, reconstruction and rehabilitation can be performed as money is available. This strategy is called a "mix-of-fixes" approach to managing pavements.

1. PAVEMENT ASSETS

Building a mile of new road can cost over $1 million due to the large volume of materials and equipment that are necessary. The high cost of constructing road assets underlines the critical nature of properly managing and maintaining the investments made in this vital infrastructure. The specific needs of every mile of road within an agency's overall road network is a complex assessment, especially when considering rapidly changing conditions and the varying requisites of road users; understanding each road-mile's needs is an essential duty of the road-owning agency.

In Michigan, many different governmental units (or agencies) own and maintain roads, so it can be difficult for the public to understand who is responsible for items such as planning and funding construction projects, [patching] repairs, traffic control, safety, and winter maintenance for any given road. MDOT is responsible for state trunkline roads, which are typically named with "M", "I", or "US" designations regardless of their geographic location in Michigan. Cities and villages are typically responsible for all public roads within their geographic boundary with the exception of the previously mentioned state trunkline roads managed by MDOT. County road commissions (or departments) are typically responsible for all public roads within the county's geographic boundary, with the exception of those managed by cities, villages, and MDOT.

In cases where non-trunkline roads fall along jurisdictional borders, local and intergovernmental agreements dictate ownership and maintenance responsibility. Quite frequently, roads owned by one agency may be maintained by another agency because of geographic features that make it more cost effective for a neighboring agency to maintain the road instead of the actual road owner. Other times, road-owning agencies may mutually agree to coordinate maintenance activities in order to create economies of scale and take advantage of those efficiencies.

The ACRC is responsible for a total of 1,796.74 centerline miles of public roads.

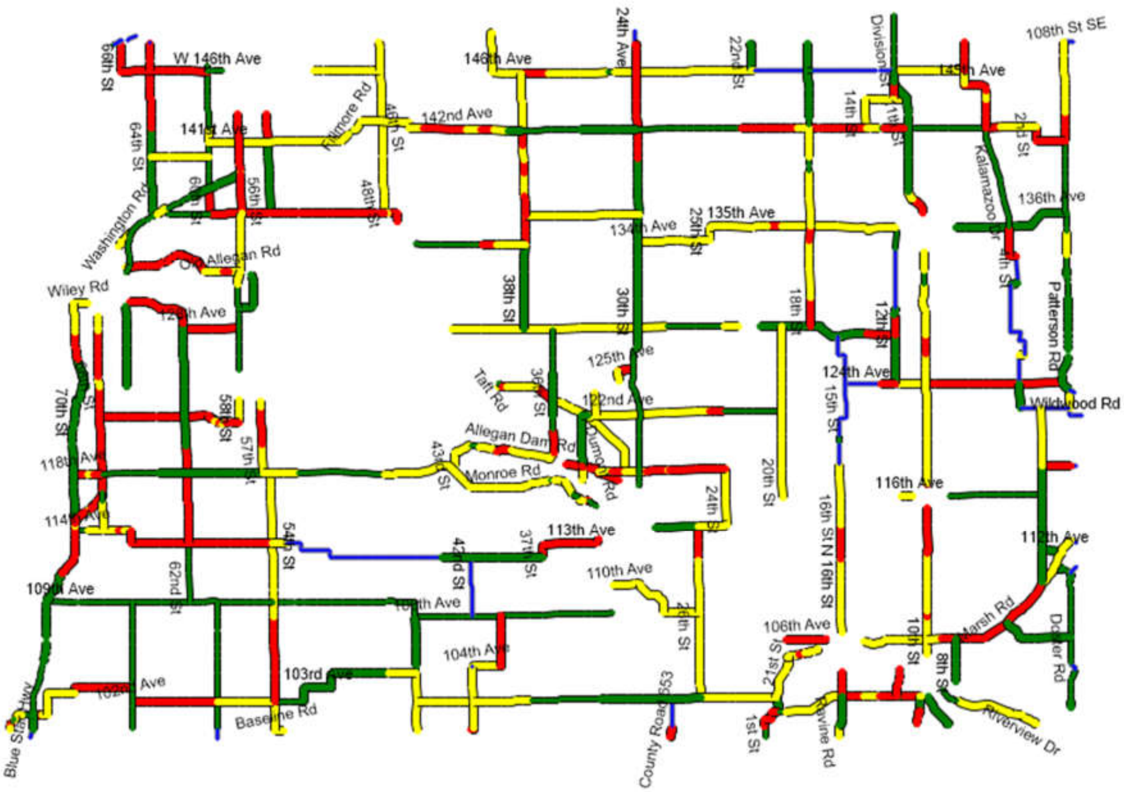


Figure 7: Map showing location of ACRC's primary paved roads (i.e., those managed by ACRC) and their current condition for paved roads with green for good (i.e., PASER 10, 9, 8), yellow for fair (i.e., PASER 7, 6, 5), and red for poor (i.e., PASER 4, 3, 2, 1), as well as the location of ACRC's unpaved primary roads in blue

Inventory

Michigan Public Act 51 of 1951 (PA 51), which defines how funds from the Michigan Transportation Fund (MTF) are distributed to and spent by road-owning agencies and classifies roads owned by ACRC as either county primary or county local roads. State statute prioritizes expenditures on the county primary road network.

Of the 1,796.74 centerline of public roads owned and/or managed by ACRC, approximately 82% of all County Primary roads are classified as federal aid eligible, which allows them to receive federal funding for their maintenance and construction. Only 1% of County Local roads are considered federal aid eligible, which means state and local funds must be used to manage these roads.

Figure 8 illustrates the percentage of roads owned by ACRC that are classified as county primary and county local roads . Figure 9 illustrates this breakdown of these road networks by township boundary within ACRC's jurisdiction. ACRC also owns and manages 628.0 miles of unpaved roads.

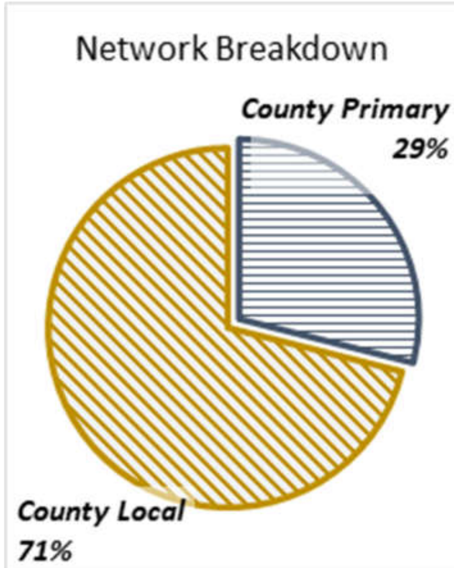
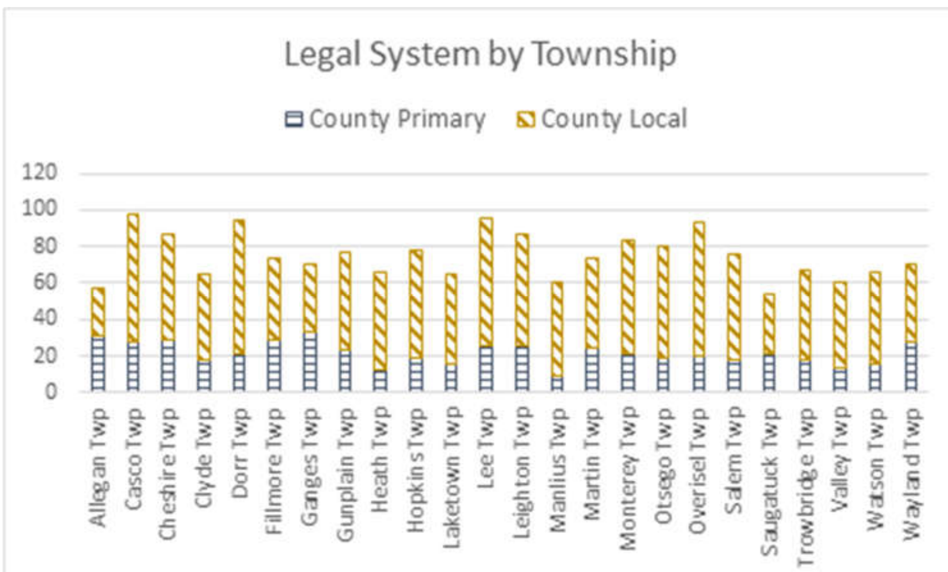


Figure 8: Percentage of county primary and county local roads for ACRC.



..Figure 9: county primary and county local roads by township for ACRC's jurisdiction.

Types

ACRC has multiple types of pavements in its jurisdiction, including: asphalt, sealcoat, concrete, and undefined; it also has unpaved roads (i.e., gravel and/or earth). Factors influencing pavement type include cost of construction, cost of maintenance, frequency of maintenance, type of maintenance, asset life, and road user experience. More information on pavement types is available in the Introduction's Pavement Primer.

Figure 10 illustrates the percentage of various pavement types that ACRC has in its network. Figure 11 shows the pavement type by Township boundary for ACRC's jurisdiction.

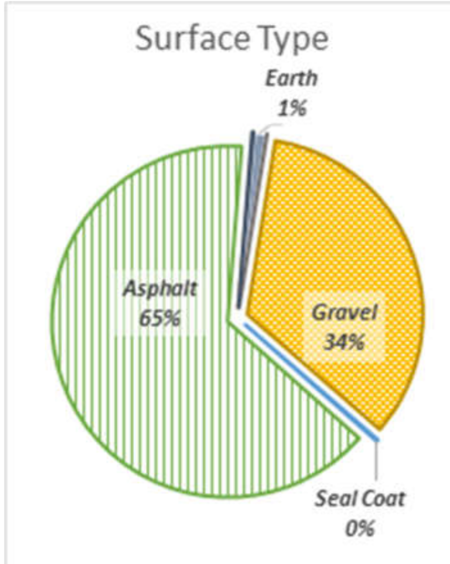


Figure 10: Pavement type by percentage maintained by ACRC Undefined pavements have not been inventoried in ACRC's asset management system to date, but will be included as data becomes available.

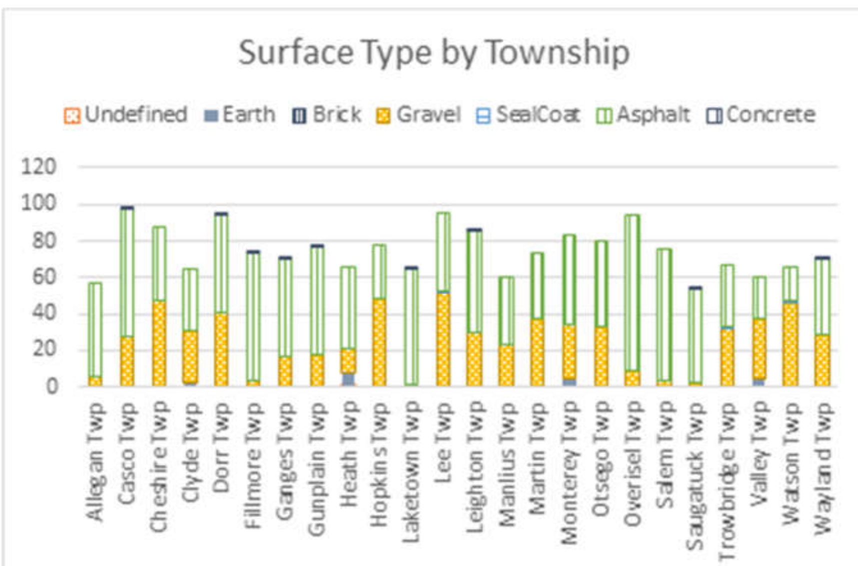


Figure 11: Pavement type by township within ACRC's jurisdiction. Undefined pavements have not been inventoried in ACRC's asset management system to date, but will be included as data becomes available.

Locations

Locations and sizes of each asset can be found in ACRC's Roadsoft database. For more detail, please refer to the agency contact listed in the *Introduction* of this pavement asset management plan.

Condition

The road characteristic that road users most readily notice is pavement condition. Pavement condition is a major factor in determining the most cost-effective treatment—that is, routine maintenance, capital preventive maintenance, or structural improvement—for a given section of pavement. ACRC uses pavement condition and age to anticipate when a specific section of pavement will be a potential candidate for preventive maintenance. Pavement condition data enables ACRC to evaluate the benefits of preventive maintenance projects and to identify the most cost-effective use of road construction and maintenance dollars. Historic pavement condition data can be used to predict future road conditions based on budget constraints and to determine if a road network's condition will improve, stay the same, or degrade at the current or planned investment level. This analysis helps to determine how much additional funding is necessary to meet a network's condition improvement goals. More detail on this topic is included in the Introduction's *Pavement Primer*.

Paved Roads

ACRC is committed to monitoring the condition of its road network and using pavement condition data to drive cost-effective decision-making and preservation of valuable road assets. ACRC uses the Pavement Surface Evaluation and Rating (PASER) system, which has been adopted by the TAMC for measuring statewide pavement conditions, to assess its paved roads. The PASER system provides a simple, efficient, and consistent method for evaluating road condition through visual inspection. More information regarding the PASER system can be found in the Introduction's Pavement Primer.

ACRC collects 100 percent of its PASER data every two years on all federal-aid-eligible roads in Michigan. In addition, ACRC collects 100 percent of its paved non-federal-aid-eligible network using its own staff and resources.

ACRC's 2021 paved county primary road network has 38 percent of roads in the TAMC good condition category, 36 percent in fair, and 26 percent in poor (Figure 12A). The paved county local road network has 30 percent in good, 29 percent in fair, and 41 percent in poor (Figure 12B).

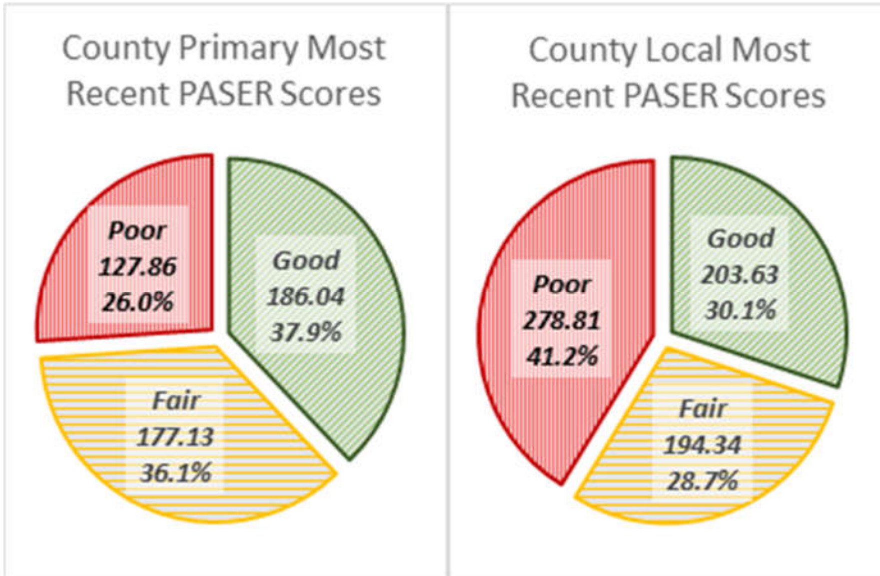


Figure 12: (A) Left: ACRC paved county primary road network conditions by percentage of good, fair, or poor, and (B) Right: paved county local road network conditions by percentage of good, fair, or poor

In comparison, the statewide paved county primary road network has 21 percent of roads in the TAMC good condition category, 40 percent in fair, and 39 percent in poor (Figure 13A). The statewide paved county local road network has 16 percent in good, 30 percent in fair, and 54 percent in poor (Figure 13B). Comparing Figure 12A and Figure 13A shows that ACRC's paved county primary road network is better than similarly classified roads in the rest of the state, while Figure 12B and Figure 13B show that ACRC's paved county local road network is better than similarly classified roads in the rest of the state. Other road condition graphs can be viewed on the TAMC pavement condition dashboard at: http://www.mcgi.state.mi.us/mitrp/Data/PaserDashboard.aspx.

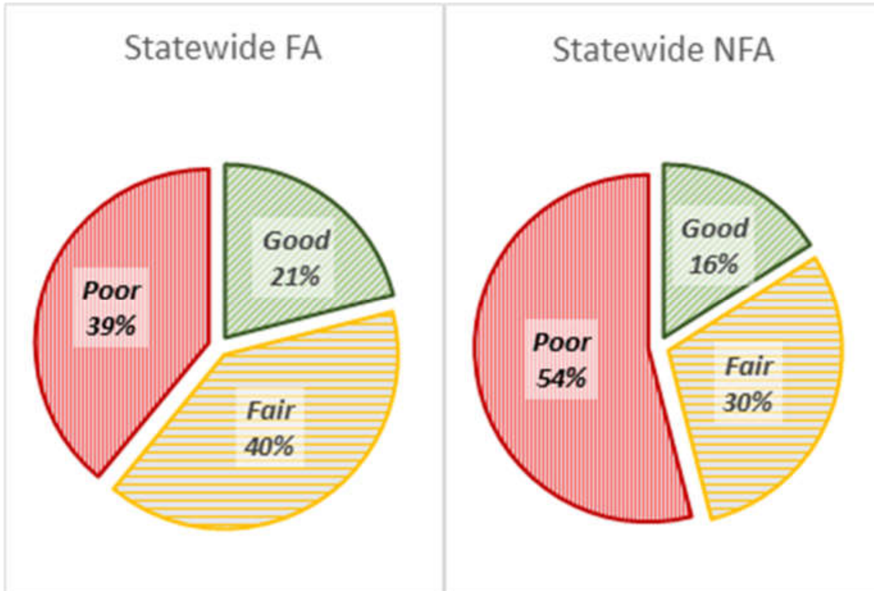


Figure 13: (A) Left: Statewide paved county primary road network conditions by percentage of good, fair, or poor, and (B) Right: paved county local road network conditions by percentage of good, fair, or poor

ACRC has had a county wide millage since the 1968 which has evolved since its inception but remains a key funding source for ACRC's primary road system. In addition to the primary millage 21 out of 24 townships have local road millages which contribute to a large portion of the funding of all local resurfacing, culvert replacement, and reconstruction.

Figure 15 and Figure 16 show the number of miles for ACRC's roads with PASER scores expressed in TAMC definition categories for the paved county primary road network (Figure 14) and the paved county local road network (Figure 15). ACRC considers road miles on the transition line between good and fair (PASER 8) and the transition line between fair and poor (PASER 5) as representing parts of the road network where there is a risk of losing the opportunity to apply less expensive treatments that gain significant improvements in service life.

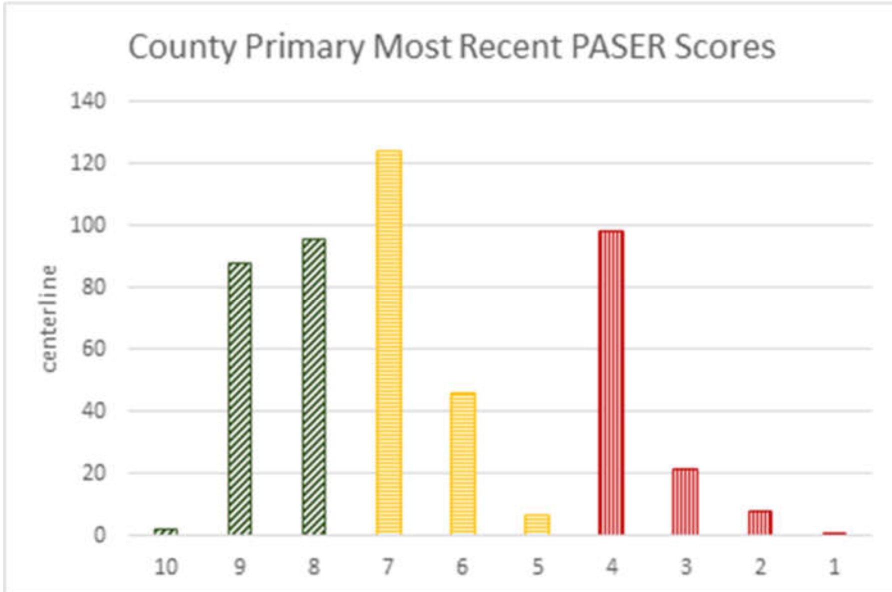


Figure 14: ACRC paved county primary road network conditions. Bar graph colors correspond to good/fair/poor TAMC designations.

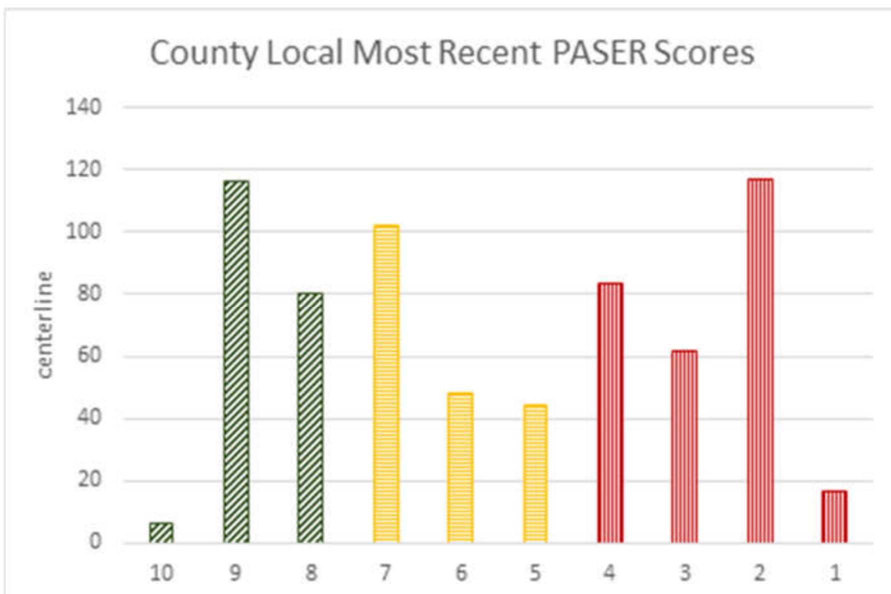


Figure 15: ACRC paved county local network condition by PASER rating. Bar graph colors correspond to good/fair/poor TAMC designations.

Figure 16 illustrates ACRC's entire paved road network divided by township into the TAMC good/fair/poor designations.

Figure 17 provides a map illustrating the geographic location of paved roads and their respective PASER condition. An online version of the most recent PASER data is located at https://www.mcgi.state.mi.us/tamcMap/.

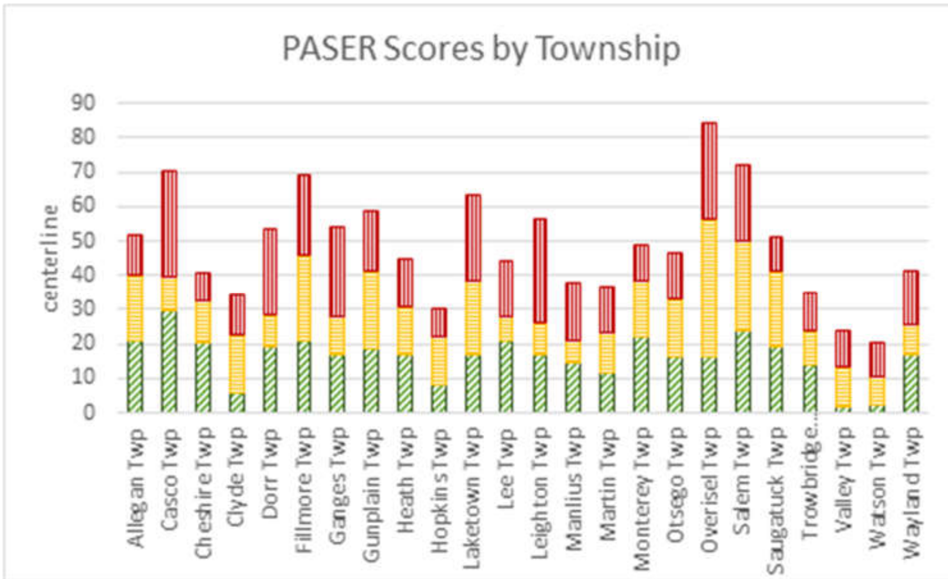


Figure 16: Number of miles of paved road in each township divided in categories of good (PASER 10, 9, 8), fair (PASER 7, 6, 5), and poor (PASER 4, 3, 2, 1).

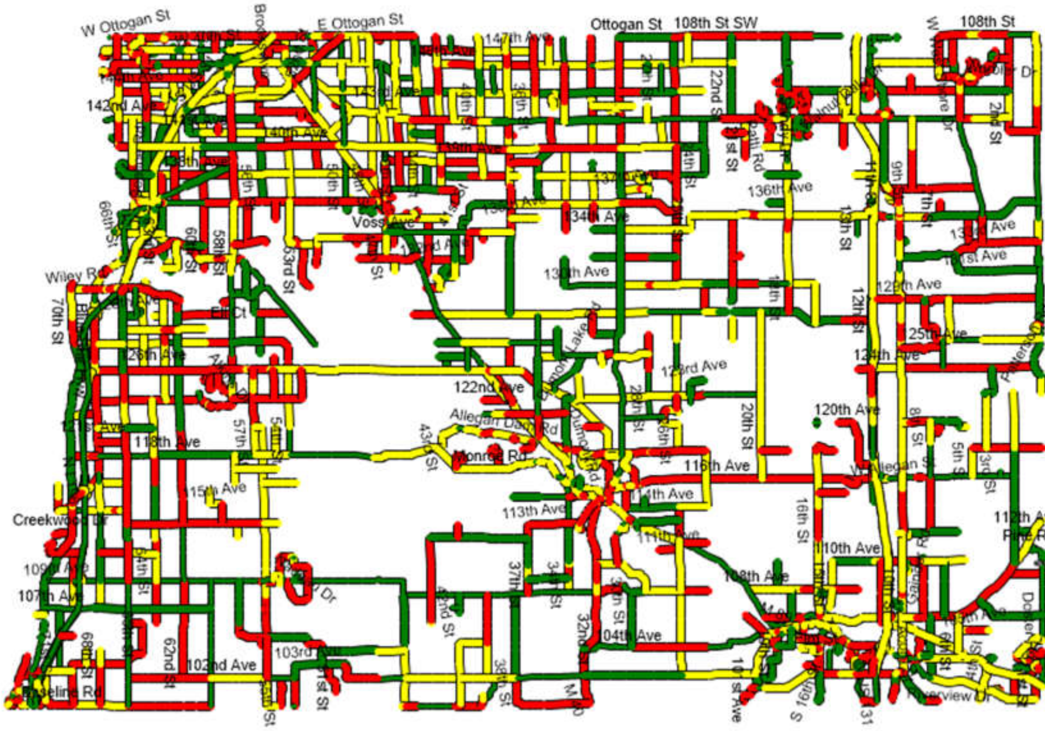


Figure 17: Map of the current paved road condition in good (PASER 10, 9, 8) shown in green, fair (PASER 7, 6, 5) shown in yellow, and poor (PASER 4, 3, 2, 1) shown in red. Only Roads owned by ACRC are shown.

Historically, the overall quality of ACRC's paved county primary roads have been increasing since 2019, before that the quality was staying the same as can be observed in Figure 18.

Comparing ACRC's paved county primary road condition trends illustrated in Figure 18 with overall statewide condition trends for similarly-classified roads, which are illustrated in Figure 19, shows a different trend locally as in the rest of the state. In comparison ACRC's primary roads are over the 60 percent good/fair condition that the statewide primary road average shows. This is large in part due to the county wide primary millage funding.

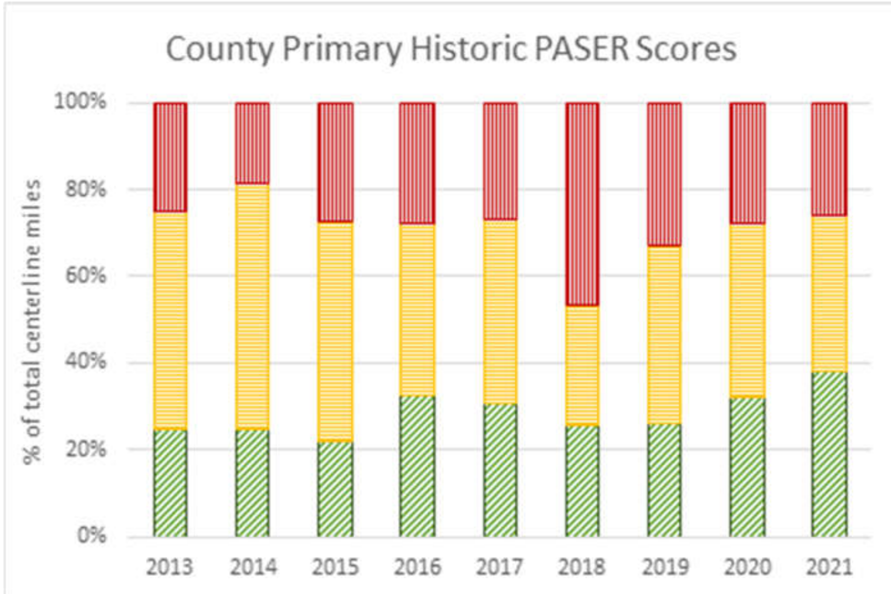


Figure 18: Historical ACRC paved county primary road network condition trend

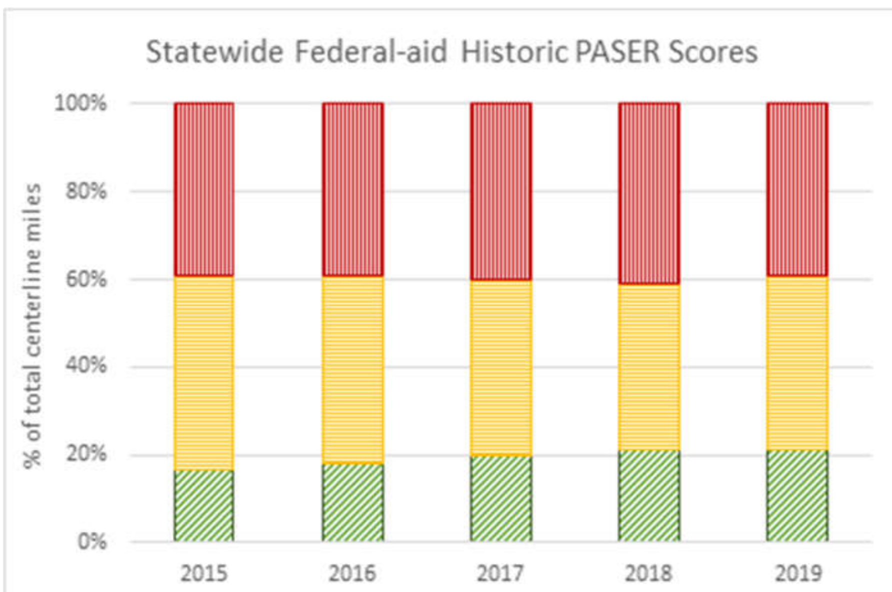


Figure 19: Historical statewide county primary road network condition trend

Historically, the overall quality of ACRC's paved county local roads have been more stagnant than the paved county primary road network because they lack a source of state and federal funding and therefore must be supported locally. While the local road network has not been increasing in PASER ratings as much as the primary road network, it is still in better condition than the statewide averages. Figure 20 illustrates the condition of the paved county local road network in ACRC while Figure 21 illustrates these conditions statewide.

Comparing ACRC's paved county local road condition trends illustrated in Figure 20 with overall statewide condition trends for all paved county local roads illustrated in Figure 21 indicates a different trend locally as in the rest of the state because 21 out of 24 of the townships in Allegan County have road millages that contribute to resurfacing, reconstructing, and preventative maintenance such as seal coat and crack sealing. The work being completed at the local level throughout the county is reflected positively in the graphical comparisons with statewide agencies.

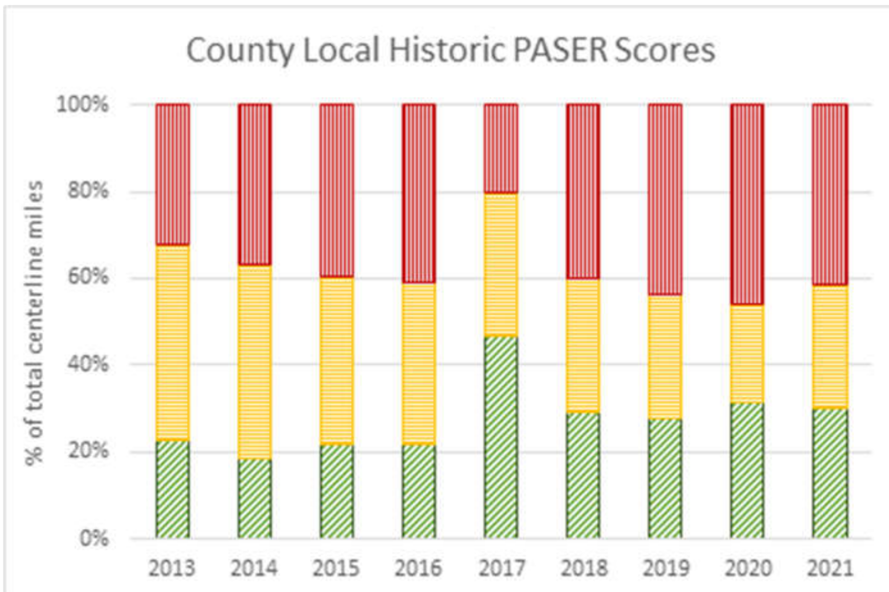


Figure 20: Historical ACRC paved county local road network condition trend

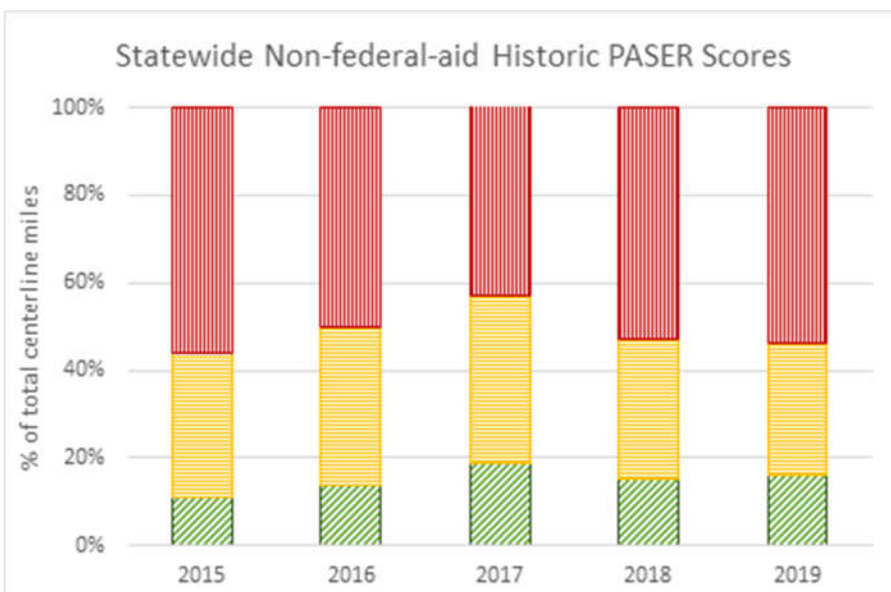


Figure 21: Historical statewide paved county local road network condition trend

Unpaved Roads

The condition of unpaved roads can be rapidly changing, which makes it difficult to obtain a consistent surface condition rating over the course of weeks or even days. The TAMC adopted the Inventory Based Rating (IBR) System™ for rating unpaved roads, and ACRC uses the IBR System™ for rating its unpaved roads. More information regarding the IBR System™ can be found in Introduction's Pavement Primer.

ACRC maintains nearly 600 miles primary and local gravel roads with 29 miles of these roads being primary. Additionally, 59 miles of seasonal roads are maintained of which many of these roads traverse through the Allegan State Game Area.

Figure 22 shows the percentage of unpaved roads in each IBR number ranges of 10, 9, and 8; 7, 6, and 5; and 4, 3, 2, and 1, for all roads. Figure 23 illustrates the miles of unpaved roads in IBR number ranges of 10, 9, and 8; 7, 6, and 5; and 4, 3, 2, and 1, for each township.

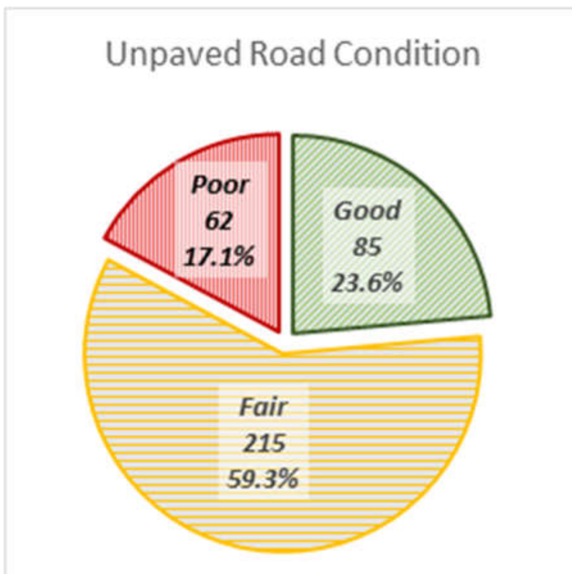


Figure 22: ACRC's unpaved road network condition by percentage of roads with IBR numbers of 10, 9, and 8; roads with IBR numbers of 7, 6, and 5; and IBR numbers of 4, 3, 2, and 1.

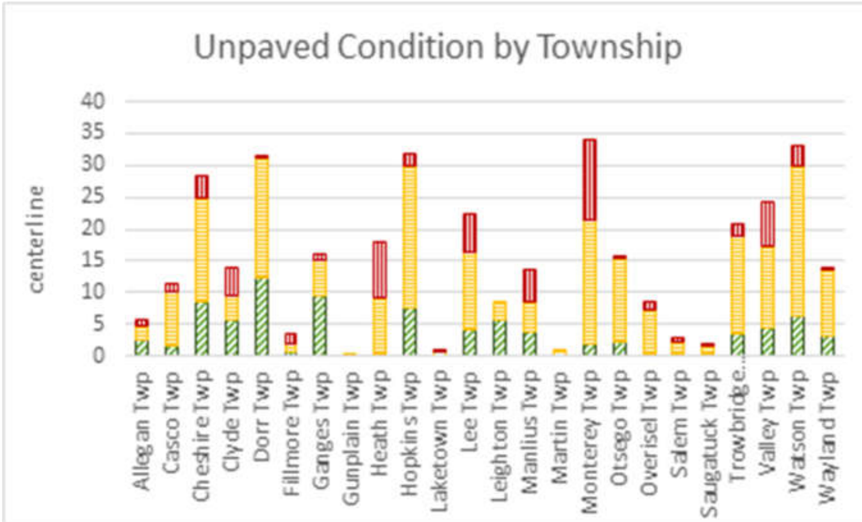


Figure 23: Number of miles of unpaved road in each township divided in categories of roads with IBR numbers of 10, 9, and 8; IBR numbers of 7, 6, and 5; and IBR numbers of 4, 3, 2, and 1.

Figure 24, Figure 25, and Figure 26 are maps illustrating the geographic location of unpaved roads and the assessment of the IBR elements, respectively: surface width, drainage adequecy, and structural adequecy.

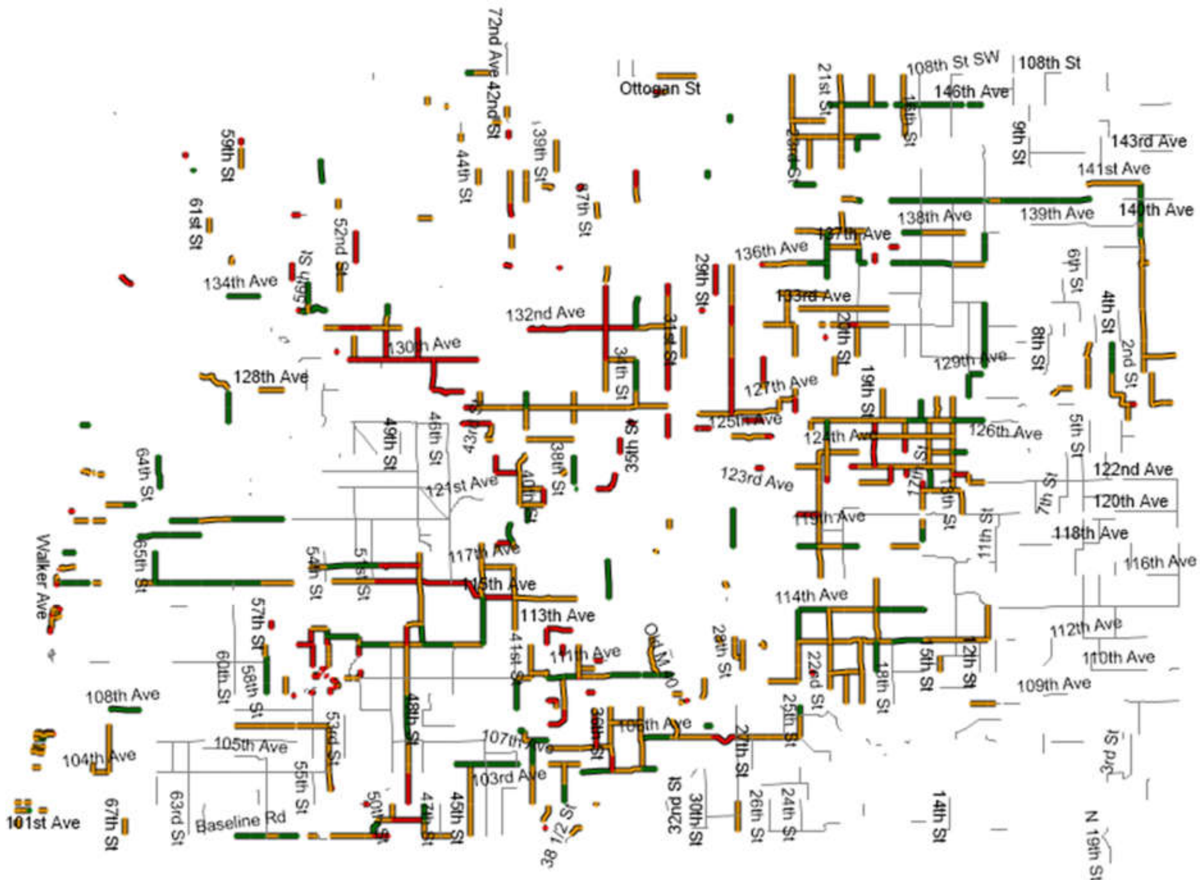


Figure 24: Map of the current IBR for surface width with good (22' and greater) shown in green, fair (16' to 21') shown in orange, and poor (15' or less) shown in red. Only unpaved roads owned by ACRC are shown.

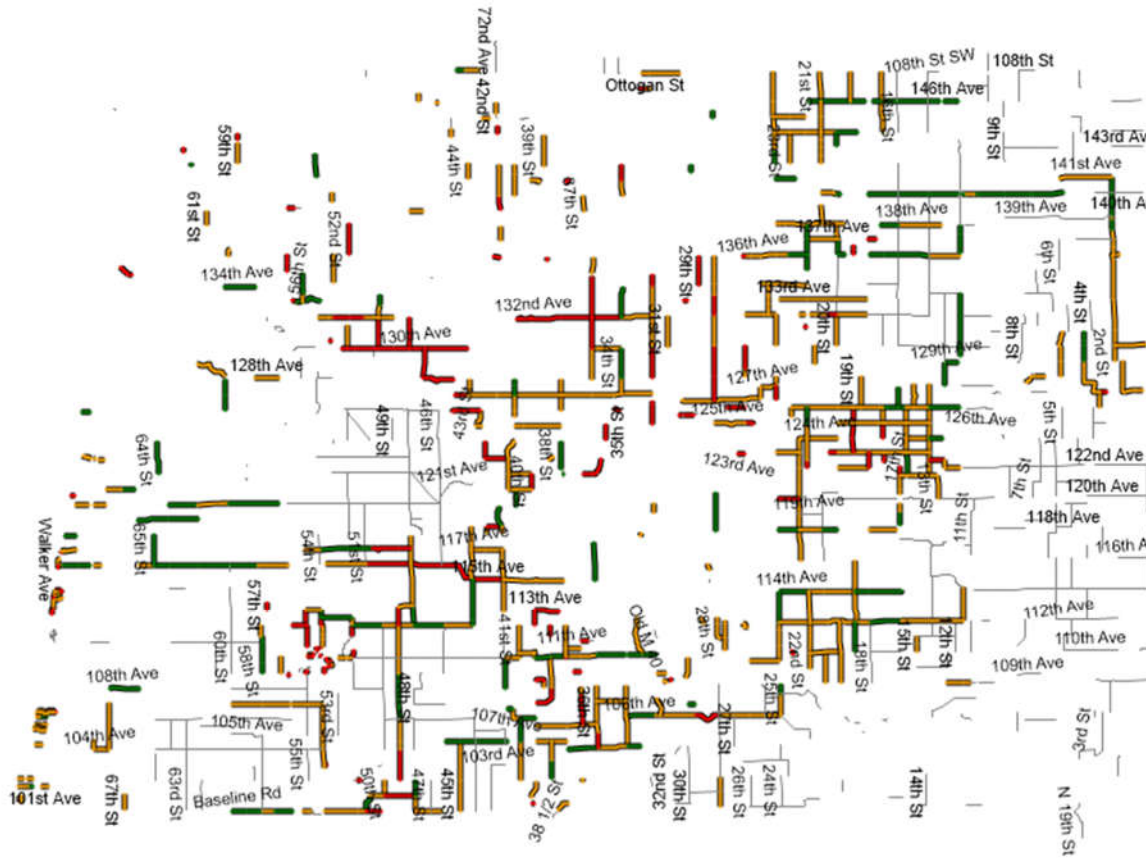


Figure 25: Map of the current IBR for drainage adequacy with good (2' or more) shown in green, fair (0.5' to less than 2') shown in orange, and poor (less than 0.5') shown in red. Only unpaved roads owned by ACRC are shown.

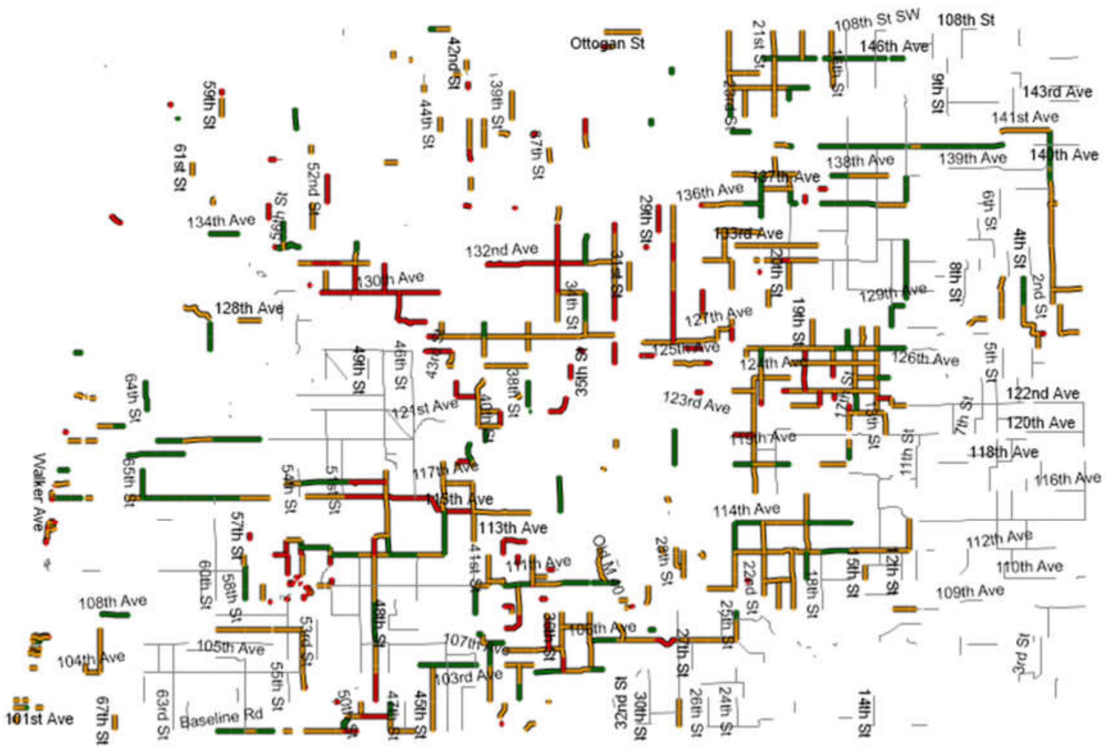


Figure 26: Map of the current IBR structural adequacy good (greater than 7") shown in green, fair (4" to 7") shown in orange, and poor (less than 4") shown in red. Only unpaved roads owned by ACRC are shown.

Maintenance and improvement of unpaved roads is important to the tax base in Allegan County. Several miles of primary and local roads are re-graveled annually. ACRC also works with townships to reconstruct gravel roads into paved roadways. An average of 6.2 miles of gravel roads have been reconstructed annually over the last five years. This commitment by the Townships to reconstructing gravel roadways is increasing the likelihood of maintaining road millages throughout the townships of Allegan County.

Goals

Goals help set expectations to how pavement conditions will change in the future. Pavement condition changes are influenced by water infiltration, soil conditions, sunlight exposure, traffic loading, and repair work performed. ACRC is not able to control any of these factors fully due to seasonal weather changes, traffic pattern changes, and its limited budget. In spite of the uncontrollable variables, it is still important to set realistic network condition goals that efficiently use budget resources to build and maintain roads meeting taxpayer expectations. An assessment of the progress toward these goals is provided in the *1. Pavement Assets*: *Gap Analysis* section of this plan.

Goals for Paved County Primary Roads

The overall goal for ACRC's paved county primary road network is to maintain or improve road conditions network-wide at 2021 levels. The baseline condition for this goal is illustrated in Figure 27.

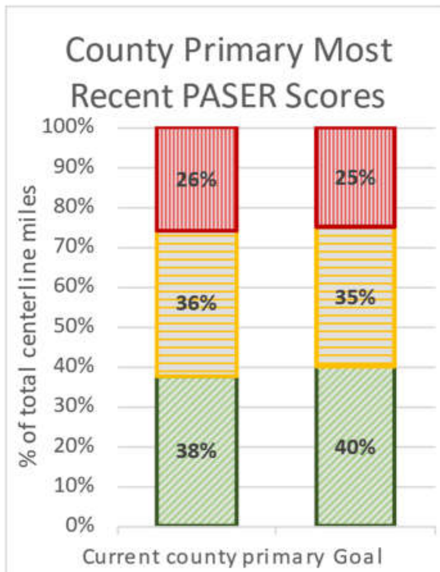


Figure 27: ACRC's 2021 county primary road network condition by percentage of good/fair/poor

ACRC's network-level pavement condition strategy for paved county primary roads is:

1. Prevent its good and fair (PASER 10 - 5) paved county primary from becoming poor (PASER 4 - 1).
2. Maintain or improve paved county primary roads at 2021 levels through high inflation and unknown funding amounts through the next five years.

Goals for Paved County Local Roads

The overall goal for ACRC's paved county local road network is to maintain or improve road conditions network-wide at 2021 levels. The baseline condition for this goal is illustrated in Figure 28.

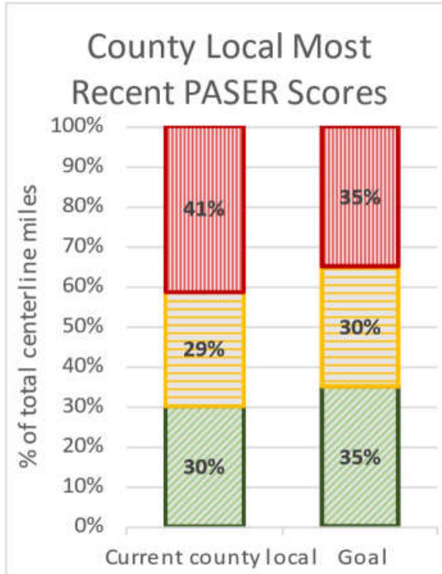


Figure 28: ACRC 2021 paved county local road network condition by percentage of good/fair/poor

ACRC's network-level pavement condition strategy for paved county local roads is:

1. Prevent its good and fair (PASER 10 - 5) paved county local roads from becoming poor (PASER 4 - 1).

2. Move 5 percent of paved county local roads out of the poor category.

Goals for Unpaved Roads

The overall goal for ACRC's unpaved road network is to maintain or improve road conditions network-wide at 2021 levels. The baseline condition for this goal is illustrated in Figure 29.

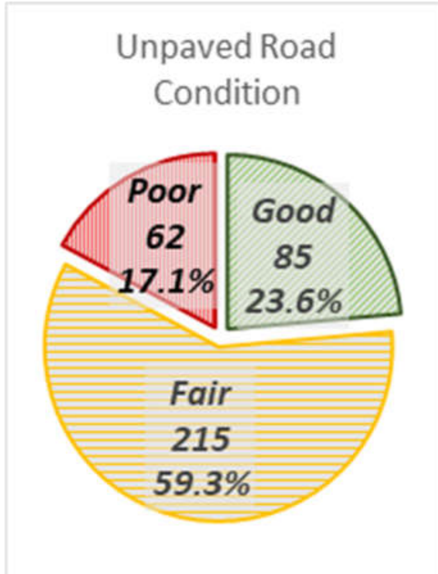


Figure 29: ACRC's 2021 unpaved road network condition by percentage of good/fair/poor

Our year-round unpaved roads will be maintained at their current structural adequacy assessments and current drainage adequacy assessments for roads where these two IBR elements are assessed as good or fair. Currently there is only 56% of the unpaved network rated. ACRC will set a goal to rate all gravel roads by the end of 2024. Currently, 83 percent of ACRC's rated year-round unpaved roads have good or fair structural adequacy and 83 percent have good or fair drainage adequacy. Year-round unpaved roads that have either or both of these two categories assessed as poor will be strategically upgraded as funding is available to address, first, drainage issues and, then, structural issues. Surface widths will be addressed on an as-needed basis to provide service or to address safety issues. Seasonal roads will be addressed to provide passability and safety but do not have a goal associated with them.

Modelled Trends

Roads age and deteriorate just like any other asset. All pavements are damaged by water, traffic weight, freeze/thaw cycles, sunlight, and traffic weight. To offset natural deterioration and normal wear-and-tear on the road, ACRC must complete treatment projects that either protect and/or add life to its pavements. The year-end condition of the whole network depends upon changes or preservation of individual road section condition that preservation treatments have affected.

ACRC uses many types of repair treatments for its roads, each selected to balance costs, benefits, and road life expectancy. When agency trends are modelled, any gap between goals and accomplishable work becomes evident. Financial resources influence how much work can be accomplished across the network within agency budget and what treatments and strategies can be afforded; a full discussion of ACRC's financial resources can be found in the *5. Financial Resources* section.

Treatments and strategies that counter pavement-damaging forces include reconstruction, structural improvement, capital preventive maintenance, innovative treatments, and maintenance. For a complete discussion on the pavement treatment tools, refer to the *1. Introduction*'s *Pavement Primer*.

Correlating with each PASER score are specific types of treatments best performed either to protect the pavement (CPM) or to add strength back into the pavement (structural improvement) (Table 1). MDOT provides guidance regarding when a specific pavement may be a candidate for a particular treatment. These identified PASER scores "trigger" the timing of projects appropriately to direct the right pavement fix at the right time, thereby providing the best chance for a successful project. The information provided in Table 1 is a guide for identifying potential projects; however, this table should not be the sole criteria for pavement treatment selection. Other information such as future development, traffic volume, utility projects, and budget play a role in project selection. This table should not be a substitute for engineering judgement.

Table 1: Service Life Extension (in Years) for Pavement Types Gained by Fix Type[1]

	Life Extension (in years)*			
Fix Type	**Flexible**	**Composite**	**Rigid**	**PASER**
HMA crack treatment	1-3	1-3	N/A	6-7
Overband crack filling	1-2	1-2	N/A	6-7
One course non-structural HMA overlay	5-7	4-7	N/A	4-5****
Mill and one course non-structural HMA overlay	5-7	4-7	N/A	3-5
Single course chip seal	3-6	N/A	N/A	5-7†
Double chip seal	4-7	3-6	N/A	5-7†
Single course microsurface	3-5	**	N/A	5-6
Multiple course microsurface	4-6	**	N/A	4-6****
Ultra-thin HMA overlay	3-6	3-6	N/A	4-6****
Paver placed surface seal	4-6	**	N/A	5-7
Full-depth concrete repair	N/A	N/A	3-10	4-5***
Concrete joint resealing	N/A	N/A	1-3	5-8
Concrete spall repair	N/A	N/A	1-3	5-7
Concrete crack sealing	N/A	N/A	1-3	4-7
Diamond grinding	N/A	N/A	3-5	4-6
Dowel bar retrofit	N/A	N/A	2-3	3-5***
Longitudinal HMA wedge/scratch coat with surface treatment	3-7	N/A	N/A	3-5****
Flexible patching	**	**	N/A	N/A
Mastic joint repair	1-3	1-3	N/A	4-7
Cape seal	4-7	4-7	N/A	4-7
Flexible interlayer “A”	4-7	4-7	N/A	4-7
Flexible interlayer “B” (SAMI)	4-7	4-7	N/A	3-7
Flexible interlayer “C”	4-7	4-7	N/A	3-7
Fiber reinforced flexible membrane	4-7	4-7	N/A	3-7
Fog seal	**	**	N/A	7-10
GSB 88	**	**	N/A	7-10
Mastic surface treatment	**	**	N/A	7-10
Scrub seal	**	**	N/A	4-8

* The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

** Data is not available to quantify the life extension.

*** The concrete slabs must be in fair to good condition.

**** Can be used on a pavement with a PASER equal to 3 when the sole reason for rating is rutting or severe raveling of the surface asphalt layer.

† For PASER 4 or less providing structural soundness exists and that additional pre-treatment will be required for example, wedging, bar seals, spot double chip seals, injection spray patching or other pre-treatments.

[1] Part of Appendix D-1 from *MDOT Local Agency Programs Guidelines for Geometrics on Local Agency Projects* 2017 Edition Approved Preventive Maintenance Treatments

Roadsoft Pavement Condition Forecast to Forecast Future Trends

ACRC uses Roadsoft, an asset management software suite, to manage road- and bridge-related infrastructure. Roadsoft is developed by Michigan Technological University and is available for Michigan local agencies at no cost to them. Roadsoft uses pavement condition data to drive network-level deterioration models that forecast future road conditions based on planned construction and maintenance work. A screenshot of Roadsoft's pavement condition model and the associated output is shown in Figure 30.

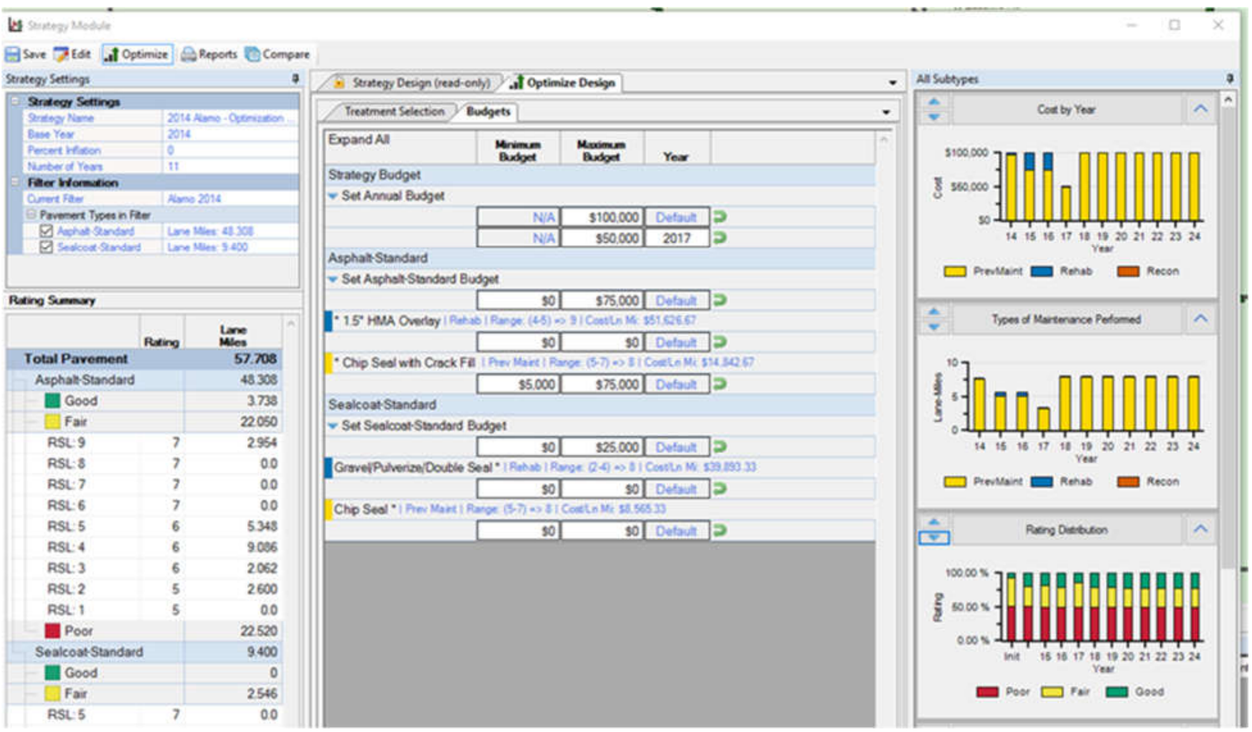


Figure 30: Pavement condition forecast model in the software program Roadsoft.

Paved County Primary Roads

Table 2 illustrates the network-level model inputs for Roadsoft on the paved county primary road network. Other pavement types in this network were neglected due to their small numbers relative to HMA pavements. The treatments outlined in Table 2 are the average treatment volume of planned projects scheduled to be completed in 2023-2026. See Appendix A of this plan for details on planned projects. Full model inputs and outputs are included in Appendix D.

Table 2: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for ACRC's Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved County Primary Road Network Forecast			
Treatment Name	**Average Yearly Miles of Treatment**	**Years of Life**	**Mile-Years**
Crack Seal	10.5	1	10.5
Seal Coat	31.86	5	159.3
Overlay	10	10	100
Cold Mill and Ovly	10.66	12	127.92
Crush and Shape	3.74	15	75
Reconstruction	0.5	20	10

Results from the Roadsoft network condition model for the county primary roads are shown in Figure 31. The Roadsoft network analysis of ACRC's planned projects from its currently-available budget does not allow ACRC to reach its pavement condition goals given the projects planned for the next three years.

Figure 31: Forecast good/fair/poor changes to ACRC network condition from planned projects on the county primary road network.

Paved County Local Road

A screenshot of Roadsoft's pavement condition model and the associated output is shown in Figure 32.

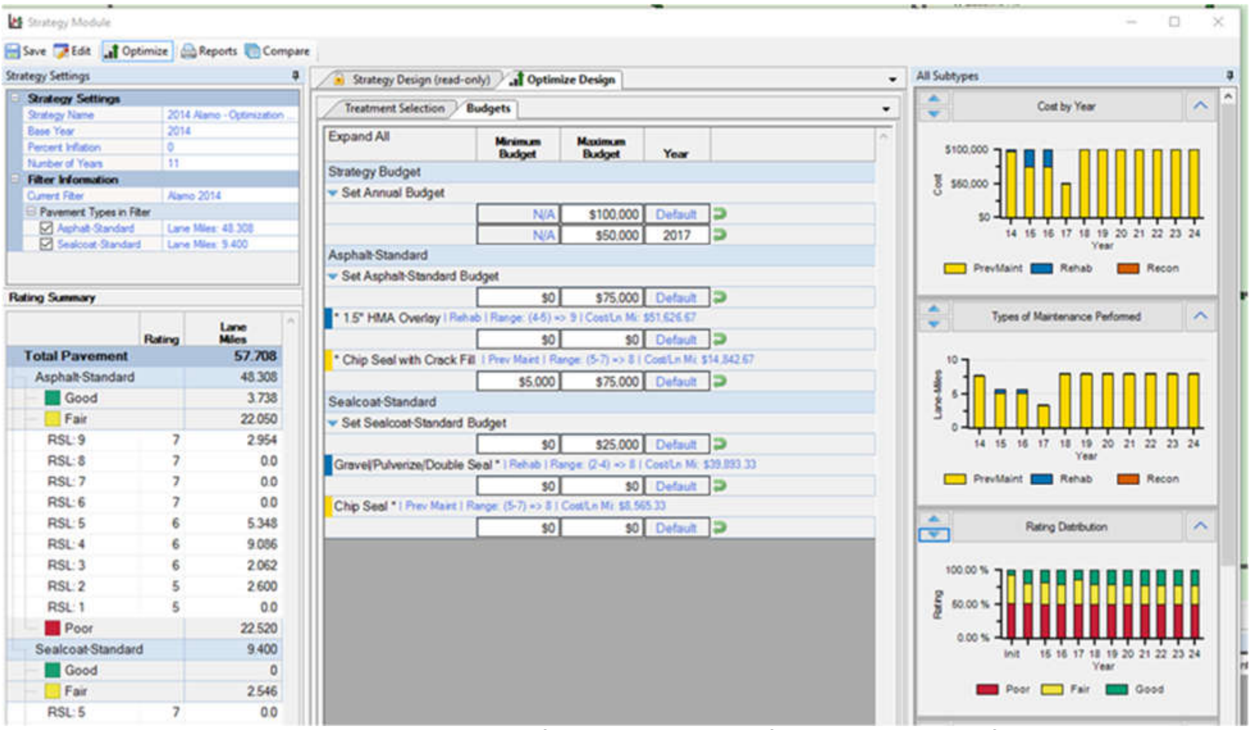


Figure 32: Pavement condition forecast model in the software program Roadsoft.

Table 3 illustrates the network-level model inputs for Roadsoft on the paved county local road network. Other pavement types in this network were neglected due to their small numbers relative to HMA pavements. The treatments outlined in Table 3 are the average treatment volume of planned projects scheduled to be completed in 2023-2025 Details on planned projects are included in Appendix A, and full model inputs and outputs are included in Appendix D.

Table 3: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for ACRC's Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved County Local Road Network Forecast

Treatment Name	Average Yearly Miles of Treatment	Years of Life	Mile-Years
Crack Seal	4.93	1	4.93
Seal Coat	15	5	75
Overlay	34	10	340
Cold Mill and Ovly	1	12	12
Crush and Shape	2	15	30
Reconstruction	3.6	20	72

Results from the Roadsoft network condition model for the paved county local roads are shown in Figure 33. The Roadsoft network analysis of ACRC's planned projects from its currently available budget does not allow ACRC to reach its pavement condition goal given the projects planned for the next three years.

Figure 33: Forecast good/fair/poor changes to ACRC network condition from planned projects on the paved county local road network.

Planned Projects

ACRC plans construction and maintenance projects several years in advance. A multi-year planning threshold is required due to the time necessary to plan, design, and finance construction and maintenance projects on the paved county primary road network. This includes planning and programming requirements from state and federal agencies that must be met prior to starting a project and can include studies on environmental and archeological impacts, review of construction and design documents and plans, documentation of rights-of-way ownership, planning and permitting for storm water discharges, and other regulatory and administrative requirements.

Per PA 499 of 2002 (later amended by PA 199 of 2007), road projects for the upcoming three years are required to be reported annually to the TAMC. Planned projects represent the best estimate of future activity; however, changes in design, funding, and permitting may require ACRC to alter initial plans. Project planning information is used to predict the future condition of the road networks that ACRC maintains. The *1. Pavement Assets*: *Modelled Trends* section of this plan provides a detailed analysis of the impact of the proposed projects on their respective road networks.

For the years 2023-2026, ACRC plans to do the following projects:

Paved County Primary Projects

ACRC is currently planning the construction and maintenance projects listed in Appendix A for the paved county primary road network. The locations of these projects are shown in Figure 34. The total cost of these projects is approximately 21.8 million over the next 4 years.

Figure 34: Map showing paved county primary road projects planned for 2023-2026.

Paved County Local Projects

ACRC is currently planning the construction and maintenance projects listed in Appendix B for the paved county local road network. The total cost of these projects is approximately $2.1 million.

Unpaved Road Projects

ACRC is currently planning the construction and maintenance projects listed in Appendix C for the unpaved road network.. The total cost of these projects is approximately $4.4 million.

More detailed information on these projects can be found in Appendix A-C.

Gap Analysis

The current funding levels that ACRC receives are not sufficient to meet the goals for the paved county primary road network, the paved county local road network, and the unpaved road network. The *1. Pavement Assets*: *Goals* section of this plan provides further detail about the goals and the *1. Pavement Assets*: *Modelled Trends* section provides further detail on the shortfall given the current budget. However, ACRC believes that the overall condition of this network can be maintained or improved with additional funding for construction and maintenance. An alternate strategy may be used to overcome the current shortfall and meet the goals on the paved county primary road network, the paved county local road network, and the unpaved road network:

Roadsoft Pavement Condition Forecast for the Paved County Primary and County Local Network

ACRC used Roadsoft to forecast the necessary additional construction and maintenance work for meeting agency goals on the paved county primary and county local road networks. Table 4 and Table 5 illustrate the network-level model inputs used for this simulation. Full model inputs and outputs are included in Appendix D.

Table 4: NCPP Modelled Trends, Planned Projects, and Gap Analysis for ACRC's Road Assets—Planned Projects and Gap Analysis: Roadsoft Annual Work Program for Paved County Primary Road Network Forecast

Planned Projects			
Treatment Name	**Average Yearly Miles of Treatment**	**Years of Life**	**Mile-Years**
Crack Seal	15	1	15
Seal Coat	35	5	175
Overlay	10	10	100
Cold Mill and Ovly	10	12	120
Crush and Shape	5	15	75
Reconstruction	1	20	20
[Treatment 7]			
[Treatment 8]			
Treatment	**Average Yearly Miles of Treatment**	**Years of Life**	**Mile-Years**
Crack Seal		1	
Seal Coat		5	
Overlay		10	
Cold Mill and Ovly		12	
Crush and Shape		15	
Reconstruction		20	
[Treatment 7]			
[Treatment 8]			

Table 5: NCPP Modelled Trends, Planned Projects, and Gap Analysis for ACRC's Road Assets—Planned Projects and Gap Analysis: Roadsoft Annual Work Program for Paved County Local Road Network Forecast

Planned Projects

Treatment Name	Average Yearly Miles of Treatment	Years of Life	Mile-Years
Crack Seal	10	1	10
Seal Coat	40	5	200
Overlay	35	10	350
Cold Mill and Ovly	1	12	12
Crush and Shape	2	15	30
Reconstruction	4	20	80
[Treatment 7]			
[Treatment 8]			

Additional Work Necessary to Overcome Deficit

Treatment	Average Yearly Miles of Treatment	Years of Life	Mile-Years
Crack Seal		1	
Seal Coat		5	
Overlay		10	
Cold Mill and Ovly		12	
Crush and Shape		15	
Reconstruction		20	
[Treatment 7]			
[Treatment 8]			

Results for the paved county local road network from the Roadsoft network condition model given the inputs in Table 5 are shown in Figure 35 below. Results indicate if ACRC continue to maintain our current projected treatments the network will improve slightly over time.

Figure 35: Forecast good/fair/poor Changes to ACRC Network Condition from planned projects on the county local paved road network.

2. FINANCIAL RESOURCES

Public entities must balance the quality and extent of services they can provide with the tax resources provided by citizens and businesses, all while maximizing how efficiently funds are used. ACRC will overview its general expenditures and financial resources currently devoted to pavement maintenance and construction. This financial information is not intended to be a full financial disclosure or a formal report. Michigan agencies are required to submit an Act 51 Report to the Michigan Department of Transportation each year; this is a full financial report that outlines revenues and expenditures. This report can be obtained on our website at alleganroads.org/annual-reports.html or by request submitted to our agency contact (listed in this plan).

ACRC has a total budget for pavement asset management of approximately $14,000,000 between county primary and county local networks.

County Primary Network

ACRC has historically spent $3,000,000 to $5,000,000 annually on pavement-related projects. Over the next three years, ACRC plans to spend approximately $4,000,000 each year on county primary-network projects consisting of, but not limited to, reconstruction, overlay, culvert replacement, and preventive maintenance. Spending on projects depends on revenue from Michigan Transportation Fund (MTF), millages, township contributions, and federal/state programs.

County Local Network

ACRC has historically spent $10 million annually on pavement-related projects. Over the next three years, ACRC plans to spend $10 million on county local-network projects consisting of, but not limited to, reconstruction, overlay, culvert replacement, and preventive maintenance. Spending on projects depends on revenue from millages, township contributions, and federal/state programs.

3. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by ACRC provides road users with multiple alternate options in the event of an unplanned disruption of one part of the system. There are, however, key links in the transportation system that may cause significant inconvenience to users if they are unexpectedly closed to traffic. Figure 36 illustrates the key transportation links in ACRC's road network, including those that meet the following types of situations:

- **Geographic divides:** Areas where a geographic feature (river, lake, mountain or limited access road) limits crossing points of the feature
- **Emergency alternate routes for high-volume roads:** Roads which are routinely used as alternate routes for high volume roads or roads that are included in an emergency response plan
- **Limited access areas:** Roads that serve remote or limited access areas that result in long detours if closed
- **Main access to key commercial districts:** Areas where large number or large size business will be significantly impacted if a road is unavailable.

Our road network includes the following critical assets: All of our county-primary roads and bridges are considered critical assets in our network. (see Figure 36).

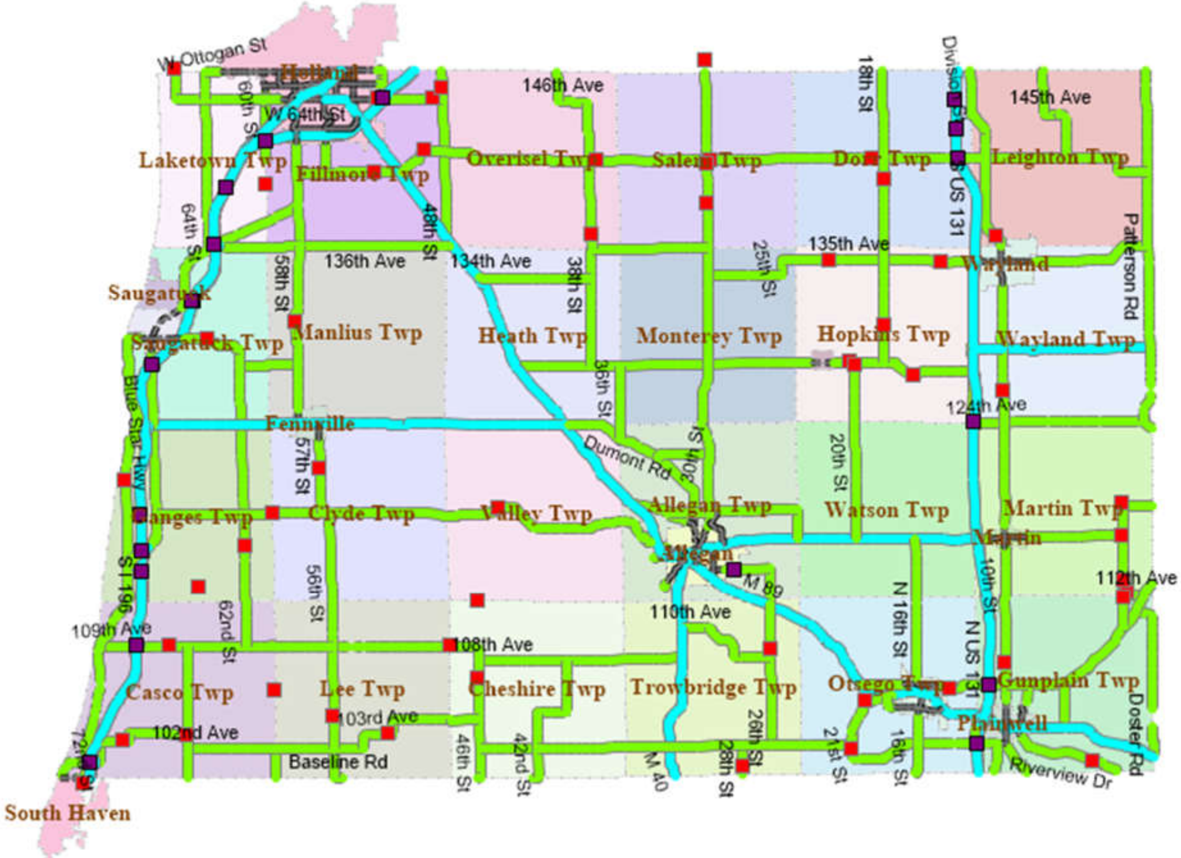


Figure 36: Key transportation links in ACRC's road network

4. COORDINATION WITH OTHER ENTITIES

An asset management plan provides a significant value for infrastructure owners because it serves as a platform to engage other infrastructure owners using the same shared right of way space. ACRC communicates with both public and private infrastructure owners to coordinate work in the following ways:

COORDINATED PLANNING

ACRC coordinates with local municipalities on projects that span through different jurisdictions as well as non-motorized funding grants.

ACRC has acted as the Act 51 Transportation Alternative Plan grant recipient for non-motorized path constructions by Friends of the Blue Star Trail (FBST). Acting as a pass-through grant recipient for the FBST has provided this organization with the funding opportunities to construct non-motorized segments of the Blue Star Highway Trail.

ACRC also coordinates with several utility companies (gas, water, sewer, electric, communications) in all townships. Infrastructure owners are sent all project locations a year in advance of construction commencing. When a utility has planned projects that will disrupt transportation services or cause damage to existing pavements, mitigation measures are proposed to minimize the impacts. The ACRC also does not allow utilities to open cut a roadway while asphalt plants are closed, to minimize disruptions and damages to traveled ways.

APPENDIX A: 2023-2026 PAVED COUNTY PRIMARY ROAD PLANNED PROJECTS

PRIMARY ROAD RESURFACING MILLAGE FUND
FUTURE PROPOSED PROJECTS

TOWNSHIP	PROJECT LOCATION	TYPE OF WORK	MILES	TOTAL COSTS	PROPOSED YEAR
All	136th Ave, 58th St to 50th St (2023)	Resurface, HMA 4E1 - 220 #/syd	4.00	$700,000.00	2023
Saugatuck	Old Allegan Rd, Blue Star Hwy to 58th St	Mill and Resurface, HMA 4E1 - 220 #/syd	4.24	$775,000.00	2023
Saugatuck	Riverside Dr & 62nd St, Village of Douglas to 128th Ave	Mill and Resurface, HMA 4E1 - 220 #/syd	2.55	$475,000.00	2024
Laketown & Fillmore	Blue Star Highway - 500' south of 142nd Avenue to 143rd Avenue (2024)	Crush, Shape, and Resurface; Widen to include center left turn lane	0.60	$830,000.00	2024
Fillmore	48th Street - 142nd Avenue to Ottogan Street (2025)	Mill and Resurface, HMA 4E1 - 220 #/syd (split with Area 2)	2.77	$623,250.00	2025
Fillmore & Manlius	136th Avenue - 50th Street to M-40 (2026)	Crush, Shape, and Resurface HMA 4E1 - 440 #/syd (2 courses) Widen to include center left turn lane	1.22	$1,700,000.00	2026
		SUB-TOTAL AREA 1	**15.38**	**$5,103,250.00**	
Overisel	48th Street - 142nd Avenue to Ottogan Street (2025)	Mill and Resurface, HMA 4E1 - 220 #/syd (split with Area 1)	2.77	$623,250.00	2025
Overisel	142nd Ave, 48th St to 46th St & 46th St, 142nd Ave to 142nd Ave	Mill and Resurface, HMA 4E1 - 220 #/syd	1.14	$250,000.00	2026
Overisel	142nd Ave, 46th St to 39th St	Resurface, HMA 4E1 - 220 #/syd	3.50	$575,000.00	2024
Heath	134th Ave, 41st St to 38th St	Mill and Resurface, HMA 4E1 - 220 #/syd	2.48	$450,000.00	2025
Heath/Overisel	38th St, 134th Ave to 142nd Ave	Mill and Resurface, HMA 4E1 - 220 #/syd	3.99	$800,000.00	2023
		SUB-TOTAL AREA 2	**13.88**	**$2,698,250.00**	
Leighton	Division St, Wayland City Limits to 1,000' south of 138th Ave	Mill, Chipseal, and Resurface, HMA 4E1 - 220 #/syd	1.00	$220,000.00	2025
Wayland	4th St, 133rd Ave to 135th Ave	Renovate, Crush, Shape, and Resurface HMA 4E1 - 440 #/syd (2 courses)	1.02	$450,000.00	2024
Dorr	142nd Ave, 23rd St to US-131 (2024)	Mill and Resurface, HMA 4E1 - 220 #/syd	5.92	$1,600,000.00	2024
Dorr	146th Ave, 22nd St to 18th St	Reconstruct for Future Paving	1.90	$895,000.00	
Dorr	146th Ave, 22nd St to 18th St	Resurface, HMA 4E1 - 440 #/syd (2 courses)	1.90	$560,000.00	
Hopkins/Watson	124th Ave, 15th St east to Existing Asphalt (2024)	Reconstruct for Future Paving (1/2 per area)	1.20	$280,000.00	2024
Hopkins/Wayland	128th Avenue & 12th Street, 14th Street to 129th Ave	Mill and Resurface, HMA 4E1 - 220 #/syd	1.67	$350,000.00	2023
Hopkins/Watson	124th Ave, 15th St east to Existing Asphalt (2025)	Pave, HMA 4E1 - 440 #/syd (2 courses)(1/2 per area)	1.20	$185,000.00	2025
Leighton	142nd Ave, 2nd St, 141st Ave, Kalamazoo Dr to Patterson Rd	Mill and Resurface, HMA 4E1 - 220 lb/syd			2026
		SUB-TOTAL AREA 3	**15.81**	**$4,540,000.00**	
Ganges	Blue Star Highway - 118th Avenue to M-89	Renovate, Crush, Shape, and Resurface HMA 4E1 - 440 #/syd (2 courses)	3.05		2025
Ganges & Clyde	122nd Ave, Blue Star Hwy to 58th St	Resurface, HMA 4E1 - 220 #/syd	5.04	$820,000.00	2025
Lee	56th St, 102nd Ave to 109th Ave	Resurface, HMA 4E1 - 220 #/syd	3.49	$560,000.00	2024
Casco	102nd Ave, 66th St to 60th St	Resurface, HMA 4E1 - 220 #/syd	2.99	$480,000.00	2023
Ganges	113th Avenue - 66th Street to 56th Street	Resurface, HMA 4E1 - 220 #/syd	4.94	$790,000.00	2026
		SUB-TOTAL AREA 4	**19.51**	**$2,650,000.00**	
Allegan	26th St, M-89 to 114th Ave (2023)	Resurface, HMA 4E1 - 220 #/syd	1.26	$200,000.00	2023
Allegan	Monroe Rd, Grove St to M-40 (2023)	Resurface, HMA 4E1 - 220 #/syd	1.37	$195,000.00	2023
Allegan	118th Ave, Industrial Dr to 24th St	Renovate and Resurface HMA 4E1 - 220 #/syd	2.60	$556,000.00	2023
Cheshire	104th Ave & 40th St, 42nd St to 108th Ave	Resurface, HMA 4E1 - 220 #/syd	2.64	$450,000.00	2024
Allegan & Valley	37th Street, 113th Avenue, 33rd Street - 112th Avenue to City of Allegan	Mill and Resurface, HMA 4E1 - 220 #/syd	2.51	$440,000.00	2025
Cheshire	42nd St, 108th Ave to 112th Ave	Pave, HMA 4E1 - 440 #/syd (2 courses)	2.00	$400,000.00	2023
		SUB-TOTAL AREA 5	**12.38**	**$2,241,000.00**	
Gun Plain	106th Ave & Marsh Rd, 10th St to County Line (2023)	Resurface, HMA 4E1 - 220 #/syd	6.68	$1,400,000.00	2023
Otsego	106th Ave, M-89 to Otsego City Limits	Renovate, Crush, Shape, and Resurface HMA 4E1 - 440 #/syd (2 courses)	1.43	$710,000.00	2025
Martin	10th Street - 112th Avenue to Village of Martin	Mill, Chipseal, and Resurface, HMA 4E1 - 220 #/syd	1.63	$360,000.00	2023
Hopkins/Watson	124th Ave, 15th St east to existing asphalt (2024)	Reconstruct for Future Paving (1/2 per area)	1.20	$280,000.00	2024
Hopkins/Watson	124th Ave, 15th St east to existing asphalt (2025)	Resurface, HMA 4E1 - 440 #/syd (2 courses)(1/2 per area)	1.20	$185,000.00	2025
Martin	122nd Avenue - 4th Street to Patterson Road	Reconstruct for future paving	1.75	$1,200,000.00	
Martin	122nd Avenue - 4th Street to Patterson Road	Pave, HMA 4E1 - 440 #/syd (2 courses)	1.75	$445,000.00	
		SUB-TOTAL AREA 6	**15.64**	**$4,580,000.00**	
		GRAND TOTAL	**92.60**	**$21,812,500.00**	

APPENDIX B: 2023 PAVED COUNTY LOCAL ROAD PLANNED PROJECTS

LOCAL ROADS RESURFACING/RECONSTRUCTION
FUTURE PROPOSED PROJECTS

TOWNSHIP	PROJECT LOCATION	TYPE OF WORK	MILES	TOTAL COSTS
Overisel	43rd Street - 137th Ave to 142nd Ave (2023)	Pave, HMA 4E1 - 220 #/syd (1 course)	2.51	$390,500.00
Overisel	140th Avenue - 43rd Street to 38th Street (2023)	Pave, HMA 4E1 - 220 #/syd (1 course)	2.47	$385,000.00
Wayland	Gregorville Road - 6th Street to Patterson Road (2023)	Pave, HMA 4E1 - 330 #/syd (2 courses)	3.14	$650,000.00
Dorr	16th Street - 142nd 0.87 miles south (2023)	Pave, HMA 4E1 - 330 #/syd (2 courses)	0.87	$200,000.00
Gun Plain	9th Street - 106th Ave to 110th Ave (2023)	Pave, HMA 4E1 - 220 #/syd (1 course)	2.01	$340,000.00
Gun Plain	105th Ave, 6th Street east to end of pavement (2023)	Pave, HMA 4E1 - 220 #/syd (1 course)	1.01	$176,000.00
		GRAND TOTAL	**9.50**	**$2,141,500.00**

APPENDIX C: UNPAVED ROAD PLANNED PROJECTS

LOCAL ROADS RECONSTRUCTION
FUTURE PROPOSED PROJECTS

TOWNSHIP	PROJECT LOCATION	TYPE OF WORK	MILES	TOTAL COSTS
Salem	34th Street - 140th Avenue north 0.50 miles (2023)	Reconstruct for Future Paving	0.50	$250,000.00
Overisel	47th Street - 146th Avenue north 0.15 miles (2023)	Reconstruct for Future Paving	0.15	$110,000.00
Overisel	41st Street - 142nd Avenue south 0.33 miles (2023)	Reconstruct for Future Paving	0.33	$200,000.00
Monterey	28th Street - 134th Ave to 136th Ave (2024)	Reconstruct for Future Paving	0.93	$710,000.00
Heath	125th Avenue - 41st Street to 38th Street (2024)	Reconstruct for Future Paving	1.50	$800,000.00
Dorr	138th Avenue - 24th Street to 21st Street (2023)	Reconstruct for Future Paving	1.55	$990,000.00
Wayland	125th Avenue - 10th Street to 7th Street (2024)	Reconstruct for Future Paving	1.54	$800,000.00
Ganges	119th Avenue - 66th Street to 64th Street (2024)	Reconstruct for Future Paving	0.99	$550,000.00
		GRAND TOTAL	**6.99**	**$4,410,000.00**

APPENDIX D

A Quick Check of Your Highway Network Health

By Larry Galehouse, Director, National Center for Pavement Preservation and

Jim Sorenson, Team Leader, FHWA Office of Asset Management

Historically, many highway agency managers and administrators have tended to view their highway systems as simply a collection of projects. By viewing the network in this manner, there is a certain comfort derived from the ability to match pavement actions with their physical/functional needs. However, by only focusing on projects, opportunities for strategically managing entire road networks and asset needs are overlooked. While the "bottom up" approach is analytically possible, managing networks this way can be a daunting prospect. Instead, road agency administrators have tackled the network problem from the "top down" by allocating budgets and resources based on historical estimates of need. Implicit in this approach, is a belief that the allocated resources will be wisely used and prove adequate to achieve desirable network service levels.

Using a quick checkup tool, road agency managers and administrators can assess the needs of their network and other highway assets and determine the adequacy of their resource allocation effort. A quick checkup is readily available and can be usefully applied with minimum calculations.

It is essential to know whether present and planned program actions (reconstruction, rehabilitation, and preservation) will produce a net improvement in the condition of the network. However, before the effects of any planned actions on the highway network can be analyzed, some basic concepts should be considered.

Assume every lane-mile segment of road in the network was rated by the number of years remaining until the end of life (terminal condition). Remember that terminal condition does not mean a failed road. Rather, it is the level of deterioration that management has set as a minimum operating condition for that road or network. Consider the rated result of the current network condition as shown in Figure 1.

Figure 1 – Current Condition

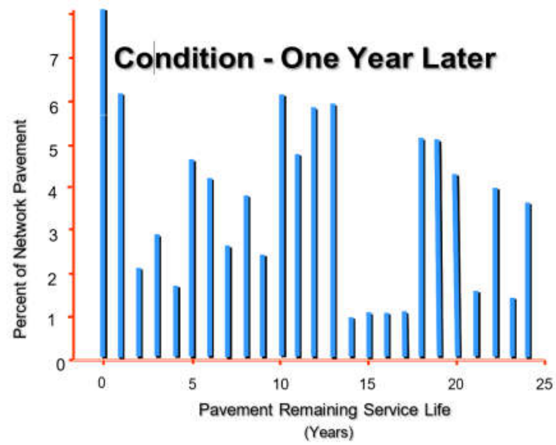


Figure 2 – Condition 1-Year Later

If no improvements are made for one year, then the number of years remaining until the end of life will decrease by one year for each road segment, except for those stacked at zero. The zero- stack will increase significantly because it maintains its previous balance and also becomes the recipient of those roads having previously been stacked with one year remaining. Thus, the entire network will age one year to the condition shown in Figure 2, with the net lane-miles in the zero stack raised from 4% to 8% of the network.

Some highway agencies still subscribe to the old practice of assigning their highest priorities to the reconstruction or rehabilitation of the worst roads. This practice of "worst first", i.e., continually addressing only those roads in the zero-stack, is a proven death spiral strategy because reconstruction and rehabilitation are the most expensive ways to maintain or restore serviceability. Rarely does sufficient funding exist to sustain such a strategy.

The measurable loss of pavement life can be thought of as the network's total lane-miles multiplied by 1 year, i.e., lane-mile-years. Consider the following quantitative illustration. Suppose your agency's highway network consisted of 4,356 lane-miles. Figure 3 shows that without intervention, it will lose 4,356 lane-mile-years per year.

Agency Highway Network = 4,356 lane miles

Each year the network will lose

4,356 lane-mile-years

Figure 3 – Network Lane Miles

To offset this amount of deterioration over the entire network, the agency would need to annually perform a quantity of work equal to the total number of lane-mile-years lost just to maintain the status quo. Performing work which produces fewer than 4,356 lane-mile-years would lessen the natural decline of the overall network, but still fall short of maintaining the status quo. However, if the agency produces more than 4,356 lane-mile-years, it will improve the network.

In the following example, an agency can easily identify the effect of an annual program consisting of reconstruction, rehabilitation, and preservation projects on its network. This assessment involves knowing the only two components for reconstruction and rehabilitation projects: lane-miles and design life of each project fix. Figure 4 displays the agency's programmed activities for reconstruction and Figure 5 displays it for rehabilitation.

Reconstruction Evaluation

Projects this Year = 2

Project	Design Life	Lane Miles	Lane Mile Years	Lane Mile Cost	Total Cost
No. 1	25 yrs	22	550	$463,425	$10,195,350
No. 2	30 yrs	18	540	$556,110	$10,009,980
	Total	=	**1,090**		$20,205,330

Figure 4 - Reconstruction

Rehabilitation Evaluation

Projects this Year = 3

Project	Design Life	Lane Miles	Lane Mile Years	Lane Mile Cost	Total Cost
No. 10	18 yrs	22	396	$263,268	$5,791,896
No. 11	15 yrs	28	420	$219,390	$6,142,920
No. 12	12 yrs	32	384	$115,848	$3,707,136
	Total	=	**1,200**		$15,641,952

Figure 5 – Rehabilitation

When evaluating pavement preservation treatments in this analysis, it is appropriate to think in terms of "extended life" rather than design life. The term design life, as used in the reconstruction and rehabilitation tables, relates better to the new pavement's structural adequacy to handle repetitive loadings and environmental factors. This is not the goal of pavement preservation. Each type of treatment/repair has unique benefits that should be targeted to the specific mode of pavement deterioration. This means that life extension depends on factors such as type and severity of distress, traffic volume, environment, etc. Figure 6 exhibits the agency's programmed activities for preservation.

Preservation Evaluation

Project	Life Extension	Lane Miles	Lane Mile Years	Lane Mile Cost	Total Cost
No. 101	2 yrs	12	24	$2,562	$30,744
No. 102	3 yrs	22	66	$7,743	$170,346
No. 103	5 yrs	26	130	$13,980	$363,480
No. 104	7 yrs	16	112	$29,750	$476,000
No. 105	10 yrs	8	80	$54,410	$435,280
	Total	=	**412**		$1,475,850

Figure 6 – Preservation

To satisfy the needs of its highway network, the agency must accomplish 4,356 lane-mile-years of work per year. The agency's program will derive 1,090 lane-mile-years from reconstruction, 1,200 lane-mile-years from rehabilitation, and 412 lane-mile-years from pavement preservation, for a total of 2,702 lane-mile-years. Thus, these programmed activities fall short of the minimum required to maintain the status quo, and hence would contribute to a net loss in network pavement condition of 1,653 lane-mile-years. The agency's programmed tally is shown in Figure 7.

Network Trend

Programmed Activity	Lane-Mile-Years	Total Cost
Reconstruction	1,090	$20,205,330
Rehabilitation	1,200	$15,641,952
Preservation	412	$1,475,850
Total	**2,702**	**$37,323,132**
Network Needs (Loss)	(-) 4,356	
Deficit =	**- 1,654**	

Figure 7 – Programmed Tally

This exercise can be performed for any pavement network to benchmark its current trend. Using this approach, it is possible to see how various long-term strategies could be devised and evaluated against a policy objective related to total-network condition.

Once the pavement network is benchmarked, an opportunity exists to correct any shortcomings in the programmed tally. A decision must first be made whether to improve the network condition or just to maintain the status quo. This is a management decision and system goal.

Continuing with the previous example, a strategy will be proposed to prevent further network deterioration until additional funding is secured.

The first step is to modify the reconstruction and rehabilitation (R&R) programs. An agonizing decision must be made about which projects to defer, eliminate, or phase differently with multi- year activity. In Figure 8, reductions are made in the R&R programs to recover funds for less costly treatments in the pavement preservation program. The result of this decision recovered slightly over $6 million.

Program Modification

Programmed Activity	**Lane-Mile-Years**	**Cost Savings**
Reconstruction ***31 lane miles*** ~~(40 lane-miles)~~	***820*** ~~(1,090)~~	**$5,004,990**
Rehabilitation ***77 lane miles*** ~~(82 lane-miles)~~	***1,125*** ~~(1,200)~~	**$1,096,950**
Pavement Preservation (84 lane-miles)	(412)	**0**
Total =	***2,357*** **(2,702)**	**$6,101,940**

Figure 8 – Revised R & R Programs

Modifying the reconstruction and rehabilitation programs has reduced the number of lane-mile- years added to the network from 2,702 to 2,357 lane-mile-years. However, using less costly treatments elsewhere in the network to address roads in better condition will increase the number of lane-mile-years added to the network. A palette of pavement preservation treatments, or mix of fixes, is available to address the network needs at a much lower cost than traditional methods.

Preservation treatments are only suitable if the right treatment is used on the right road at the right time. In Figure 9, the added treatments used include concrete joint resealing, thin hot-mix asphalt (HMA) overlay (≤ 1.5”), microsurfacing, chip seal, and crack seal. By knowing the cost per lane-mile and the treatment life-extension, it is possible to create a new strategy (costing $36,781,144) that satisfies the network need. In this example, the agency saved in excess of $500,000 from traditional methods (costing $37,323,132), while erasing the 1,653 lane-mile-year deficit produced by the initial program tally. Network Strategy

Programmed Activity		Lane Mile Years	Total Cost
Reconstruction	(31 lane-miles)	820	$15,200,340
Rehabilitation	(77 lane-miles)	1,125	$14,545,002
Pavement Preservation	(84 lane-miles)	412	$1,475,850
Concrete Resealing	(4 years x 31 lane-miles)	124	$979,600
Thin HMA Overlay	(10 years x 16 lane-miles)	160	$870,560
Microsurfacing	(7 years x 44 lane-miles)	308	$1,309,000
Chip Seal	(5 years x 79 lane-miles)	395	$1,104,420
Crack Seal	(2 years x 506 lane-miles)	1,012	$1,296,372
	Total =	4,356	$36,781,144

Figure 9 – New Program Tally

In a real-world situation, the highway agency would program its budget to achieve the greatest impact on its network condition. Funds allocated for reconstruction and rehabilitation projects must be viewed as investments in the infrastructure. Conversely, funds directed for preservation projects must be regarded as protecting and preserving past infrastructure investments.

Integrating reconstruction, rehabilitation, and preservation in the proper proportions will substantially improve network conditions for the taxpayer while safeguarding the highway investment.

APPENDIX E: MEETING MINUTES VERIFYING PLAN ACCEPTANCE BY GOVERNING BODY

ALLEGAN COUNTY ROAD COMMISSION

EXTRACT COPY

The following is an extract copy of the minutes of the meeting of the Board of County Road Commissioners of Allegan County, held in the office in Allegan on Wednesday, September 21, 2022.

"It was moved by Commissioner Kleinheksel and seconded by Commissioner Rybicki to approve the following resolution for the Transportation Asset Management Plan as required by Public Act 325.

WHEREAS, the Allegan County Road Commission is an Act 51 Local Agency with ownership of over 100 certified miles of roadway within the State of Michigan; and,

WHEREAS, the Legislature of the State of Michigan has passed Public Act 325 which requires all Local Agencies, with ownership of over 100 certified miles of roadway, to adopt a three-year Asset Management Compliance Plan (Plan); and,

WHEREAS, the Allegan County Road Commission is required to submit the required Plan to the Michigan Transportation Asset Management Council by October 1, 2022; and

WHEREAS, the Allegan County Road Commission has created said Plan in compliance with Public Act 325; and,

NOW, THEREFORE, BE IT RESOLVED, that the Board of Road Commissioners of Allegan County hereby approves the drafted Plan and directs the Managing Director and Finance Director approve the Plan by signing the Proof of Acceptance.

ROLL CALL VOTE AYES: Commissioners Kleinheksel and Rybicki
NAYS:

MOTION CARRIED"

I hereby certify that the above is a true extract copy of the Resolution taken from the minutes of the Board of County Road Commissioners regular meeting of September 21, 2022.

Craig Atwood - Clerk

B. BRIDGE ASSET MANAGEMENT PLAN

An attached bridge asset management plan follows.

Allegan County Road Commission 2022 Bridge Asset Management Plan

A plan describing the Allegan County Road Commission's transportation assets and conditions

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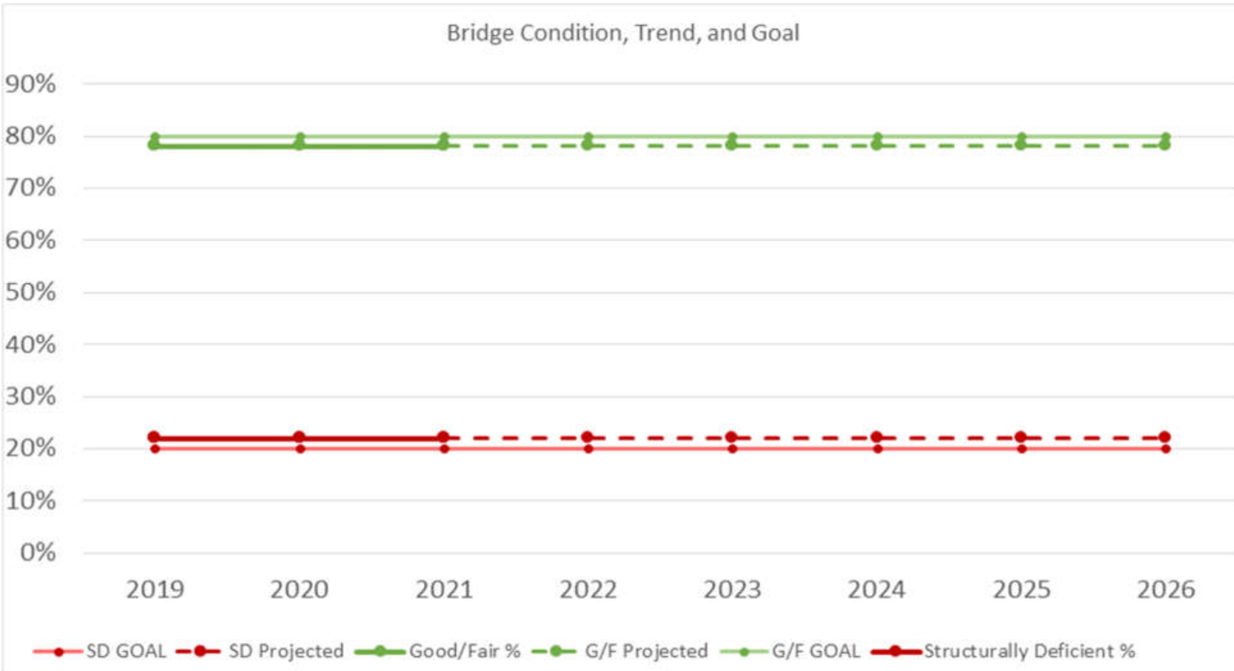
EXECUTIVE SUMMARY

As conduits for commerce and connections to vital services, bridges are among the most important assets in any community along with other assets like roads, culverts, traffic signs, traffic signals, and utilities that support and affect the road network. The Allegan County Road Commission's (ACRC) bridges, other road-related assets, and support systems are some of the most valuable and extensive public assets, all of which are paid for with taxes collected from ordinary citizens and businesses. The cost of building and maintaining bridges, their importance to society, and the investment made by taxpayers all place a high level of responsibility on local agencies to plan, build, and maintain the road and bridge network in an efficient and effective manner. This asset management plan is intended to report on how ACRC is meeting its obligations to maintain the bridges for which it is responsible.

This plan overviews ACRC's bridge assets and conditions and explains how Allegan County Road Commission works to maintain and improve the overall condition of those assets. These explanations can help answer:

- What kinds of bridge assets ACRC has in its jurisdiction and the different options for maintaining these assets.
- What tools and processes ACRC uses to track and manage bridge assets and funds.
- What condition ACRC's bridge assets are in compared to statewide averages.
- Why some bridge assets are in better condition than others and the path to maintaining and improving bridge asset conditions through proper planning and maintenance.
- How agency bridge assets are funded and where those funds come from.
- How funds are used and the costs incurred during ACRC's bridge assets' normal life cycle.
- What condition ACRC can expect of its bridge assets if those assets continue to be funded at the current funding levels
- How changes in funding levels can affect the overall condition of all of ACRC's bridge assets.

ACRC owns and/or manages 156 bridges. A summary of its historical and current bridge asset conditions, projected trends, and goals can be seen in the figure, below.



An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of ACRC's obligations towards meeting these requirements. This asset management plan also helps demonstrate ACRC's responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of ACRC's bridge assets, and gives taxpayers the information they need to make informed decisions about investing in essential transportation infrastructure.

INTRODUCTION

Asset management is defined by Public Act 325 of 2018 as "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals". In other words, asset management is a process that uses data to manage and track assets, like roads and bridges, in a cost-effective manner using a combination of engineering and business principles. This process is endorsed by leaders in municipal planning and transportation infrastructure, including the Michigan Municipal League, County Road Association of Michigan, the Michigan Department of Transportation (MDOT), and the Federal Highway Administration (FHWA). The Allegan County Road Commission is supported in its use of asset management principles and processes by the Michigan Transportation Asset Management Council (TAMC), formed by the State of Michigan.

Asset management, in the context of this plan, ensures that public funds are spent as effectively as possible to maximize the condition of the bridges in Allegan County Road Commission's road network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial challenges of managing infrastructure with a limited budget.

The Allegan County Road Commission (ACRC) has adopted an "asset management" business process to overcome the challenges presented by having limited financial, staffing, and other resources while needing to meet safety standards and bridge users' expectations. ACRC is responsible for maintaining and operating 156 bridges.

This 2022 plan outlines how ACRC determines its strategy to maintain and upgrade bridge asset condition given agency goals, priorities of its bridge users, and resources provided. An updated plan is to be released approximately every three years to reflect changes in bridge conditions, finances, and priorities.

Questions regarding the use or content of this plan should be directed to Craig Atwood at 1308 Lincoln Road, Allegan, MI 49010or at (269) 673-2184 and/or catwood@alleganroads.org. A copy of this plan can be accessed on our website at www.alleganroads.org.

Key terms used in this plan are defined in ACRC's comprehensive transportation asset management plan (also known as the "compliance plan") used for compliance with PA 325 or 2018.

Knowing the basic features of an asset class is a crucial starting point to understanding the rationale behind an asset management approach. The following primer provides an introduction to bridges.

Bridge Primer

Bridge Types

Bridges are structures that span 20 feet or more. These bridges can extend across one or multiple spans.

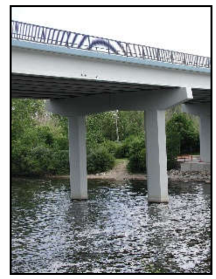


Figure 1: Girder bridge

If culverts are placed side by side to form a span of 20 feet or more (for example, three 6-foot culverts with one-foot between each culvert), then this culvert system would be defined as a bridge. (Note: The Compliance Plan Appendix C contains a primer on culverts not defined as bridges.)

Bridge types are classified based on two features: design and material.

The most common bridge design is the **girder system** (Figure 1). With this design, the bridge deck transfers vehicle loads to girders (or beams) that, in turn, transfer the load to the piers or abutments (see Figure 6).

Figure 2: Slab bridge

A similar design that lacks girders (or beams) is a **slab bridge** (Figure 2, and see Figure 6). A slab bridge transfers the vehicle load directly to the abutments and, if necessary, piers.

Truss bridges were once quite common and consist of a support structure that is created when structural members are connected at joints to form interconnected triangles (Figure 4). Structural members may consist of steel tubes or angles connected at joints with gusset plates.

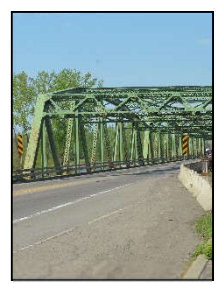


Figure 3: Truss bridge

Another common bridge design in Michigan is the three-sided pre-cast box or arch bridge (Figure 4).

Michigan is also home to several unique bridge designs.

Adding another layer of complexity to bridge typing is the primary construction materials used (Figure 5). Bridges are generally constructed from concrete, steel, pre-stressed concrete, or timber. Some historical bridges or bridge components in Michigan may be constructed from stone or masonry.

Figure 4: Three-sided box bridge

Figure 5: Examples of common bridge construction materials used in Michigan

Bridge Condition

Michigan inspectors rate bridge condition on a 0-9 scale known as the National Bridge Inventory (NBI) rating scale (see Table for a summary of the NBI Rating scale). Elements of the bridge's superstructure, deck, and substructure receive a 9 if they are in excellent condition down to a 0 if they are in failed condition. A complete guide for Michigan bridge condition rating according to the NBI can be found in the MDOT Bridge Field Services' *Bridge Safety Inspection NBI Rating Guidelines* (https://www.michigan.gov/documents/mdot/BIR_Ratings_Guide_Combined_2017-10-30_606610_7.pdf).

Table 1: Summary of the NBI Rating Scale

NBI Rating	General Condition
9-7	Like new/good
6-5	Fair
4-3	Poor/serious
2-0	Critical/failed

Bridge Treatments

Replacement

Replacement work is typically performed when a bridge is in poor condition (NBI rating of 4 or less) and will improve the bridge to good condition (NBI rating of 7 or more). The Local Bridge Program, a part of MDOT's Local Agency Program, defines bridge replacement as full replacement, which removes the entire bridge (superstructure, deck, and substructure) before re-building a bridge at the same location (Figure 6). The decision to perform a total replacement over rehabilitation (see below) should be made based on a life-cycle cost analysis. Generally, replacement is selected if rehabilitation costs more than two-thirds of the cost of replacement. Replacement is generally the most expensive of the treatment options.

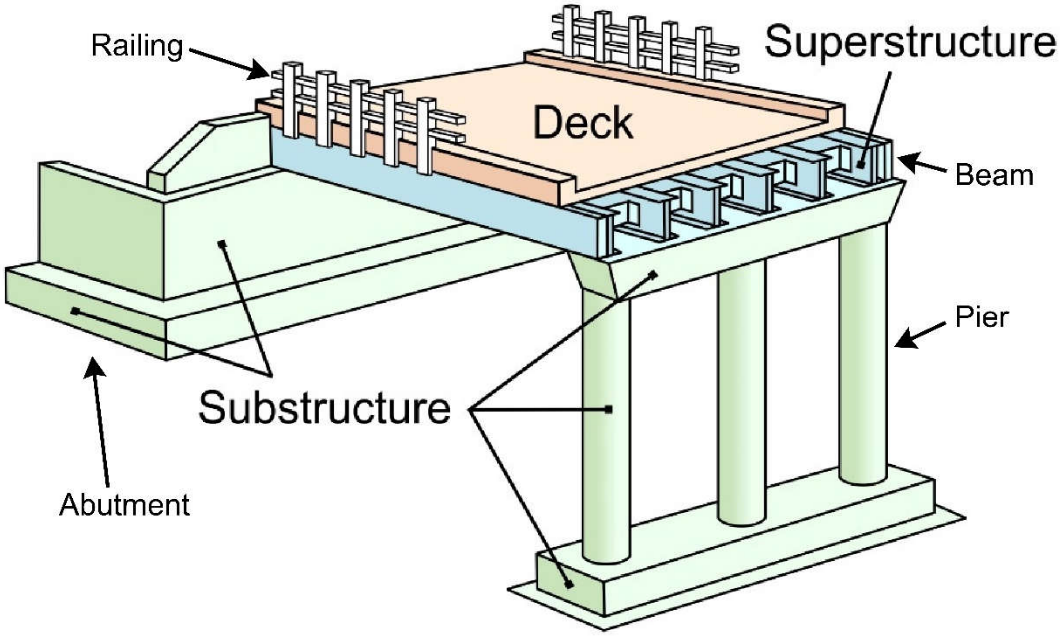


Figure 6: Diagram of basic elements of a bridge

Rehabilitation

Rehabilitation involves repairs that improve the existing condition and extend the service life of the structure and the riding surface. Most often, rehabilitation options are associated with bridges that have degraded beyond what can be fixed with preventive maintenance. Rehabilitation is typically performed on poor-rated elements (NBI rating of 4 or less) to improve them to fair or good condition (NBI rating of 5 or more). Rehabilitation can include superstructure replacement (removal and replacement of beams and deck) or deck replacement. While typically more expensive than general maintenance, rehabilitation treatments may be more cost-effective than replacing the entire structure.

- **Railing retrofit/replacement:** A railing retrofit or replacement either reinforces the existing railing or replaces it entirely (Figure 6). This rehabilitation is driven by a need for safety improvements on poor-rated railings or barriers (NBI rating less than 5).
- **Beam repair:** Beam repair corrects damage that has reduced beam strength (Figure 6). In the case of steel beams, it is performed if there is 25 percent or more of section loss in an area of the beam that affects load-carrying capacity. In the case of concrete beams, this is performed if there is 50 percent or more spalling (i.e., loss of material) at the ends of beams.
- **Substructure concrete patching and repair:** Patching and repairing the substructure is essential to keep a bridge in service. These rehabilitation efforts are performed when the abutments or piers are fair or poor (NBI rating of 5 or 4), or if spalling and delamination affect less than 30 percent of the bridge surface.

Preventive Maintenance

The Federal Highway Administration's (FHWA) *Bridge Preservation Guide* (2018) defines preventive maintenance as "a strategy of extending service life by applying cost-effective treatments to bridge elements…[that] retard future deterioration and avoid large expenses in bridge rehabilitation or replacements."

Preventive maintenance work is typically done on bridges rated fair (NBI rating of 5 or 6) in order to slow the rate of deterioration and keep them from falling into poor condition.

- **Concrete deck overlay:** A concrete deck overlay involves removing and replacing the driving surface. Typically, this is done when the deck surface is poor (NBI rating is less than 5) and the underneath portion of the deck is at least fair (NBI rating greater than 4). A shallow or deep concrete overlay may be performed depending on the condition of the bottom of the deck. The MDOT *Bridge Deck Preservation* matrices provide more detail on concrete deck overlays (see https://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773---,00.html).

- **Deck repairs:** Deck repairs include three common techniques: HMA overlay with or without waterproof membranes, concrete patching, deck sealing, crack sealing, and joint repair/replacement. An HMA overlay with an underlying waterproof membrane can be placed on bridge decks with a surface rating of fair or lower (NBI of 5 or less) and with deficiencies that cover between 15 and 30 percent of the deck surface and deck bottom. An HMA overlay without a waterproof membrane should be used on a bridge deck with a deck surface and deck bottom rating of serious condition or lower (NBI rating of 3 or less) and with deficiencies that cover greater than 30 percent of the deck surface and bottom; this is considered a temporary holdover to improve ride quality when a bridge deck is scheduled to undergo major rehabilitation within five years. All HMA overlays need to be accompanied by an updated load rating. Patching of the concrete on a bridge deck is done in response to an inspector's work recommendation or when the deck surface is in good, satisfactory, or fair condition (NBI rating of 7, 6, or 5) with minor delamination and spalling. To preserve a good bridge deck in good condition, a deck sealer can be used.

  Deck sealing should only be done when the bridge deck has surface rating of fair or better (NBI of 5 or more). Concrete sealers should only be used when the top and bottom surfaces of the deck are free from major deficiencies, cracks, and spalling. An epoxy overlay may be used when between 2 and 5 percent of the deck surface has delaminations and spalls, but these deficiencies must be repaired prior to the overlay. An epoxy overlay may also be used to repair an existing epoxy overlay. Concrete crack sealing is an option to maintain concrete in otherwise good condition that has visible cracks with the potential of reaching the steel reinforcement. Crack sealing may be performed on concrete with a surface rating of good, satisfactory, or fair (NBIS rating of 7, 6, or 5) with minor surface spalling and delamination; it may also be performed in response to a work recommendation by an inspector who has determined that the frequency and size of the cracks require sealing.

- **Steel bearing repair/replacement:** Rather than sitting directly on the piers, a bridge superstructure is separated from the piers by bearings. Bearings allow for a certain degree of movement due to temperature changes or other forces. Repairing or replacing the bearings is considered preventive maintenance. Girders and a deck in at least fair condition (NBI of 5 or higher) and bearings in poor condition (NBI rating of 4 or less) identifies candidates for this maintenance activity.
- **Painting:** Re-painting a bridge structure can either be done in totality or in part. Total re-painting is done in response to an inspector's work recommendation or when the paint condition is in serious condition (NBI rating of 3 or less). Partial re-painting can either consist of zone re-painting, which is a preventive maintenance technique, or spot re-painting, which is scheduled maintenance (see below). Zone re-painting is done when less than 15 percent of the paint in a smaller area, or zone, has failed while the rest of the bridge is in good or fair condition. It is also done if the paint condition is fair or poor (NBI rating of 5 or 4).
- **Channel improvements:** Occasionally, it is necessary to make improvements to the waterway that flows underneath the bridge. Such channel improvements are driven by an inspector's work recommendation based on a hydraulic analysis or to remove vegetation, debris, or sediment from the channel and banks (Figure 6).
- **Scour countermeasures:** An inspector's work recommendations or a hydraulic analysis may require scour countermeasures (see the *Risk Management* section of this plan for more information on scour). This is done when a structure is categorized as scour critical and is not scheduled for replacement or when NBI comments in abutment and pier ratings indicate the presence of scour holes.
- **Approach repaving:** A bridge's approach is the transition area between the roadway leading up to and away from the bridge and the bridge deck. Repaving the approach areas is performed in response to an inspector's work recommendation, when the pavement surface is in poor condition (NBI rating of 4 or less), or when the bridge deck is replaced or rehabilitated (e.g., concrete overlay).
- **Guardrail repair/replacement:** A guardrail is a safety feature on many roads and bridges that prevents or minimizes the effects of lane departure incidents. Keeping bridge guardrails in good condition is important. Repair or replacement of bridge guardrail should be done when a guardrail is missing or damaged, or when it needs a safety improvement.

Scheduled Maintenance

Scheduled maintenance activities are those activities or treatments that are regularly scheduled and intend to maintain serviceability while reducing the rate of deterioration.

- **Superstructure washing:** Washing the superstructure, or the main structure supporting the bridge, typically occurs in response to an inspector's work recommendation or when salt-contaminated dirt and debris collected on the superstructure is causing corrosion or deterioration by trapping moisture.

- **Drainage system cleanout/repair:** Keeping a bridge's drainage system clean and in good working order allows the bridge to shed water effectively. An inspector's work recommendation may indicate drainage system cleanout/repair. Signs that a drainage system needs cleaning or repair include clogs and broken, deteriorated, or damaged drainage elements.
- **Spot painting:** Spot painting is a form of partial bridge painting. This scheduled maintenance technique involves painting a small portion of a bridge. Generally, this is done in response to an inspector's work recommendation and is used for zinc-based paint systems only.
- **Slope repair/reinforcement:** The terrain on either side of the bridge that slopes down toward the channel is called the slope. At times, it is necessary to repair the slope. Situations that call for slope repair include when the slope is degraded, when the slope has significant areas of distress or failure, when the slope has settled, or if the slope is in fair or poor condition (NBI rating of 5 or less). Other times, it is necessary to reinforce the slope. Reinforcement can be added by installing Riprap, which is a side-slope covering made of stones. Riprap protects the stability of side slopes of channel banks when erosion threatens the surface.
- **Vegetation control and debris removal:** Keeping the area around a bridge structure free of vegetation and debris safeguards the bridge structure from these potentially damaging forces. Removing or restricting vegetation around bridges prevents damage to the structure. Vegetation control is done in response to an inspector's work recommendation or when vegetation traps moisture on structural elements or is growing from joints or cracks. Debris in the water channel or in the bridge can also cause damage to the structure. Removing this debris is typically done in response to an inspector's work recommendation or when vegetation, debris, or sediment accumulates on the structure or channel.
- **Miscellaneous repairs:** These are uncategorized repairs in response to an inspector's work recommendation.

1. BRIDGE ASSETS

ACRC seeks to implement an asset management program for its bridge structures. This program balances the decision to perform reconstruction, rehabilitation, preventive maintenance, scheduled maintenance, or new construction, with ACRC's bridge funding in order to maximize the useful service life and to ensure the safety of the local bridges under its jurisdiction. In other words, ACRC's bridge asset management program aims to preserve and/or improve the condition of its local bridge network within the means of its financial resources.

Nonetheless, ACRC recognizes that limited funds are available for improving the bridge network. Since preservation strategies like preventive maintenance are generally a more effective use of these funds than costly alternative management strategies like major rehabilitation or replacement, ACRC seeks to identify those bridges that will benefit from a planned maintenance program while addressing those bridges that pose usability and/or safety concerns.

The three-fold goal of ACRC's asset management program is the preservation and safety of its bridge network, increase of its bridge assets' useful service life by extending of the time that bridges remain in good and fair condition, and reduction of future maintenance costs. To quantify this goal, ACRC specifically aims to have to have 80% or more of the agency's local bridges in fair to good condition and to have less than 20% classify as structurally deficient over its five-year plan.

Thus, ACRC's asset management plan objectives are:

- To establish the current condition of the county's bridges
- To develop a "mix of fixes" that will:
    - Program scheduled maintenance actions to impede deterioration of bridges in good condition
    - Implement selective corrective repairs or rehabilitation for degraded bridge elements order to restore functionality
    - Identify and program those eligible bridges in need of replacement
- To identify available funding sources, such as:

  - Dedicated county resources
  - County funding through Michigan's Local Bridge Program
  - Opportunities to obtain other funding
- To prioritize the programmed actions within available funding limitations
- To preserve bridges currently rated fair (5) or higher in their current condition in order to extend their useful service life.

Inventory

ACRC is responsible for 156 local bridges. Table 2 summarizes ACRC's bridge assets by type, sizes by bridge type, and condition by bridge type. Additional inventory data, condition ratings, and proposed preventive maintenance actions for each bridge are contained in the tables in Appendixes 3, 4, and 5. The bridge inventory data was obtained from MDOT MiBRIDGE and other sources, and the 2021 condition data and maintenance actions are taken from the inspector's summary report (see Appendix 2).

Types

Of the ACRC's 156 structures, 13 are concrete bridges, 62 are steel bridges, 60 are pre-stressed concrete bridges, and 20 are timber bridges.

Locations and Sizes

Figure 7 illustrates the locations of bridge assets owned by ACRC. Details about the locations and sizes of each individual asset can be found in ACRC's MiBRIDGE database. For more information, please refer to the agency contact listed in the *Introduction* of this bridge asset management plan.

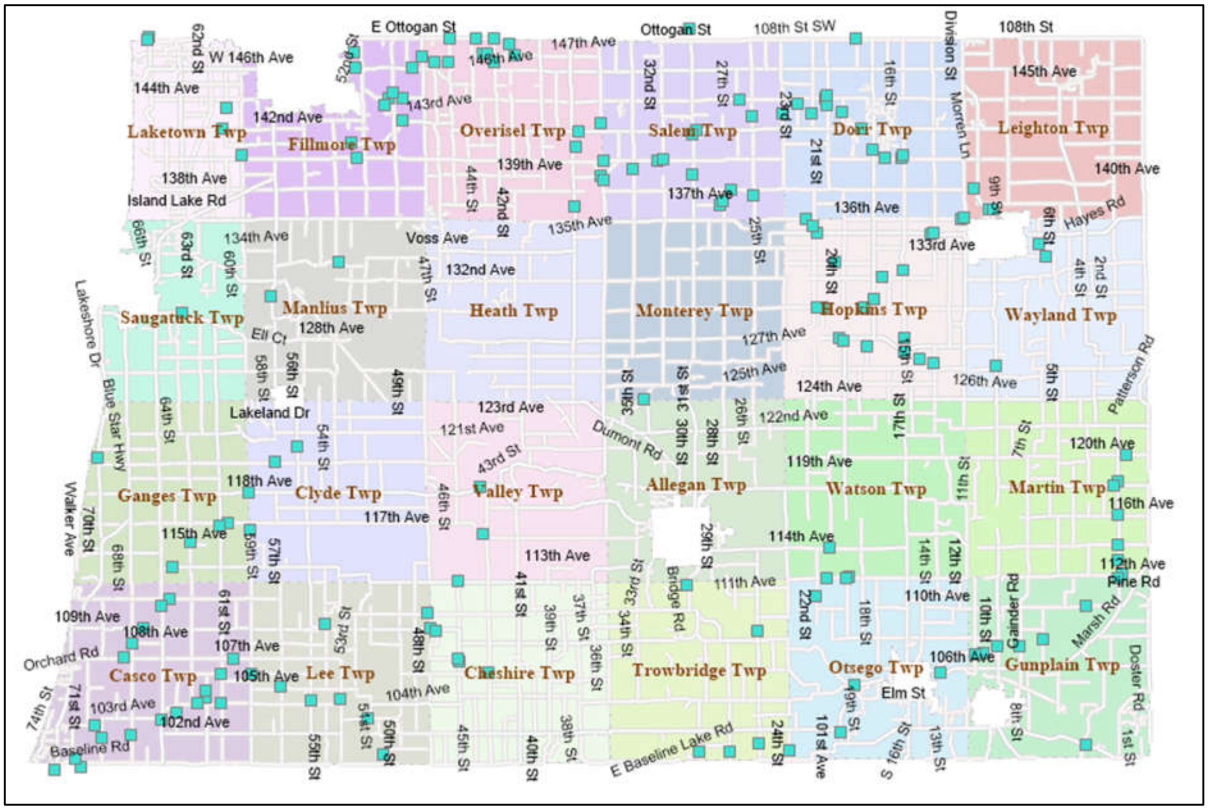


Figure 7: Map illustrating locations ACRC's of bridge assets

Condition

ACRC evaluates its bridges according to the National Bridge Inspection Standards rating scale, with a rating of 9 to 7 being like new to good condition, a rating of 6 and 5 being fair condition, and a rating of 4 or lower being poor or serious/critical condition. The current condition of ACRC's bridge network is 45 (29%) are good, 76 (49%) are fair, and 35 (22%) are poor or lower.

Another layer of classification of ACRC's bridge inventory classifies 35 (22%) bridges as structurally deficient, 27 (17%) bridges as posted, and 1 (1%) bridge as closed. Structurally deficient bridges are those with a deck, superstructure, substructure, and/or culvert rated as "poor" according to the NBI rating scale, with a load-carrying capacity significantly below design standards, or with a waterway that regularly overtops the bridge during floods. Posted bridges are those that have declined in condition to a point where a restriction is necessary for what would be considered a safe vehicular or traffic load passing over the bridge; designating a bridge as "posted" has no influence on its condition rating. Closed bridges are those that are closed to all traffic; closing a bridge is contingent upon its ability to carry a set minimum live load.

Table 2: Bridge Assets by Type: Inventory, Size, and Condition								
Bridge Type	Total Number of Bridges	Total Deck Area (sq ft)	Condition: Structurally Deficient, Posted, Closed			2021 Condition		
			Struct. Defic	Posted	Closed	Poor	Fair	Good
Aluminum – Culvert	1	897	0	0	0	0	0	1
Concrete – Culvert	10	13,981	0	0	0	0	4	6
Concrete – Girder and floorbeam	1	1,457	1	0	0	1	0	0
Concrete – Tee beam	1	1,252	0	0	0	0	1	0
Concrete continuous – Slab	1	2,593	0	0	0	0	1	0
Prestressed concrete – Box beam/girders—multiple	49	105,761	2	5	0	2	26	21
Prestressed concrete – Box beam/girders—single/spread	5	22,906	0	0	0	0	1	4
Prestressed concrete – Multistringer	6	21,791	0	0	0	0	0	5
Steel – Culvert	54	44,500	21	10	0	21	29	4
Steel – Multistringer	8	15,326	2	2	1	2	5	1
Timber – Culvert	1	1,260	0	0	0	0	1	0
Timber – Slab	19	27,446	9	10	0	9	7	3
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Total SD/Posted/Closed			**35**	**27**	**1**			
Total	**156**	**259,170**				**35**	**76**	**45**
Percentage (%)			**22%**	**17**	**1**	**22**	**49**	**29**

Statewide, MDOT's statistics for local agency bridges show that 14% are poor and 86% are good/fair, indicating that the ACRC has a greater percentage of poor bridges compared to the statewide average for local agencies. Correspondingly, ACRC has 78% of its bridges in fair/good condition versus the statewide average of 86% for local agency bridges. Statewide, 97% of local agency bridge deck area classifies as structurally deficient compared to 22% of ACRC's bridge deck area.

Goals

The goal of ACRC's asset management program is the preservation and safety of its bridge network; it also aims to extend the period of time that bridges remain in good and fair condition, thereby increasing their useful service life and reducing future maintenance costs.

Specifically, this goal translates into long-range goals of having 80% of its bridges rated fair/good and having less than 20% classify as structurally deficient within 10 years. These goals are juxtaposed with the historic and current condition and the projected trend in Figure 8.

Several metrics will be used to assess the effectiveness of this asset management program. ACRC will monitor and report the annual change in the number of its bridges rated fair/good (5 or higher) and the annual change in the number of its bridges classified as structurally deficient.

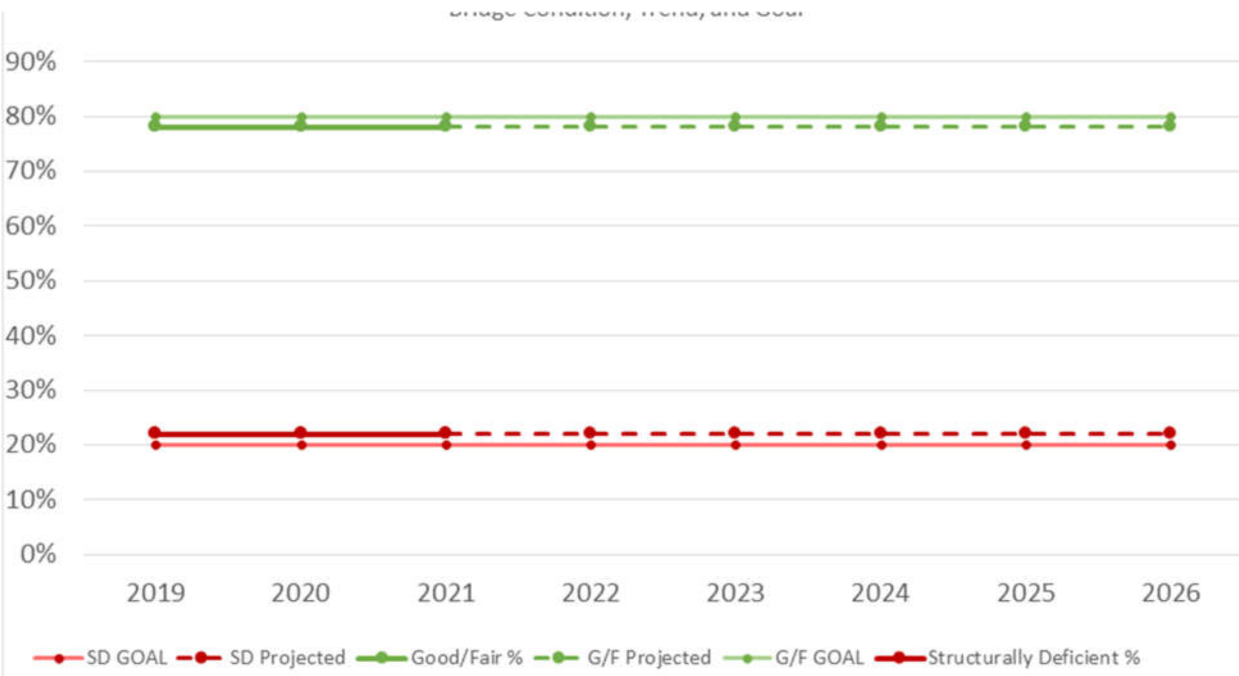

Figure 8: Progress tracking graph indicating ACRC's historic and current bridge conditions, projected trends, and goals.

Based on past inspection records and condition ratings, ACRC will establish a baseline of past performance by determining the average period of time that a bridge remains in good or fair condition. The performance measure will be the increased average amount of time a bridge is in the good or fair condition status after implementation of the asset management strategy when compared to the baseline time before implementation.

Prioritization, Programmed/Funded Projects, and Planned Projects

Prioritization

ACRC's asset management program aims to address the structures of critical concern by targeting elements rated as being in poor condition and to improve and maintain the overall condition of the bridge network to good or fair condition through a "worst-first" strategy. Therefore, ACRC prioritizes bridges for projects by evaluating five factors and weighting them as follows: condition –30%, load capacity –10%, traffic –10%, safety –30%, and detour –20%. There are several components within each factor that are used to arrive at its score. Each project under consideration is scored, and its total score is then compared with other proposed project to establish a priority order.

ACRC annually reviews the current condition of each of the its bridges using the NBIS inspection data contained in the *MDOT Bridge Safety Inspection Report* and the inspector's work recommendations contained in MDOT's *Bridge Inspection Report*. The inspection inventory and condition data are consolidated in spreadsheet format for ACRC's bridges in Appendix 3. ACRC then determines management and preservation needs and corresponding actions for each bridge(Appendix 4) As well as inspection follow-up actions (Appendix 5). The management and preservation actions are selected in accordance with criteria contained in the *Summary of Preservation Criteria* table (below) and adapted to ACRC's specific bridge network.

Table 3: Summary of Preservation Criteria

Preservation Action	Bridge Selection Criteria	Expected Service Life
Replacement		
Total Replacement	• NBI rating of 3 or less [1] [2] • *OR* Cost of rehabilitation exceeds cost of replacement [1] • *OR* Bridge is scour critical with no counter-measures available [1]	70 years
Rehabilitation		
Superstructure Replacement	• NBI rating of 4 or less for the superstructure [1] [2] • *OR* Cost of superstructure and deck rehabilitation exceeds cost of replacement [1]	40 years [1]
Deck Replacement Epoxy Coated Steel Black Steel	• Use guidelines in MDOT's Bridge Deck Preservation Matrix [3] [4] • NBI rating of 4 or less for the deck surface and deck bottom [1] [2] • Deck bottom has more than 25% total area with deficiencies [1] • *OR* Replacement cost of deck is competitive with rehabilitation [1]	60+ years [3] [4]
Substructure Replacement (Full or Partial)	• NBI rating of 4 or less for abutments, piers, or pier cap [1] [2] • Has open vertical cracks, signs of differential settlement, or active movement [1] • Pontis rating of 3 or 5 for more than 30 percent of the substructure [1] [5]	40 years [1*]

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
	• *OR* Bridge is scour critical with no counter-measures available	
Steel Beam Repair	• More than 25% section loss in an area of the beam that affects load carrying capacity [1] • *OR* To correct impact damage that impairs beam strength [1]	40 years [1*]
Prestressed Concrete Beam Repair	• More than 5% spalling at ends of prestressed I-beams [1] • *OR* Impact damage that impairs beam strength or exposes prestressing strands [1]	40 years [1*]
Substructure Concrete Patching and Repair	• NBI rating of 5 or 4 for abutments or piers, and surface has less than 30% area spalled and delaminated [1] [2] • *OR* Pontis rating of 3 or 4 for the column or pile extension, pier wall, and/or abutment wall and surface has between 2% and 30% area with deficiencies [1] [5] • *OR* In response to inspector's work recommendation for substructure patching [1]	
Abutment Repair/Replacement	• NBI rating of 4 or less for the abutment [1] [2] • *OR* Has open vertical cracks, signs of differential settlement, or active movement	
Railing/Barrier Replacement	• NBI rating greater than 5 for the deck [1] [2] • NBI rating less than 5 for the railing with more than 30% total area having deficiencies [1] [2] • *OR* Pontis rating is 4 for railing [1] [5] • *OR* Safety improvement is needed [1]	
Culvert Repair/Replacement	• NBI rating of 4 or less for culvert or drainage outlet structure • *OR* Has open vertical cracks, signs of deformation, movement, or differential settlement	
Preventive Maintenance		
Shallow Concrete Deck Overlay	• NBI rating is 5 or less for deck surface, and deck surface has more than 15% area with deficiencies [1] [2] • NBI rating of 4 or 5 for deck bottom, and deck bottom has between 5% and 30% area with deficiencies [1] [2] • *OR* In response to inspector's work recommendation [1]	12 years
Deep Concrete Deck Overlay	• NBI rating of 5 or less for deck surface, and deck surface has more than 15% area with deficiencies [1] [2] • NBI deck bottom rating is 5 or 6, and deck bottom has less than 10% area with deficiencies [1] [2] • *OR* In response to inspector's work recommendation [1]	25 years
HMA Overlay with Waterproofing Membrane	• NBI rating of 5 or less for deck surface, and both deck surface and bottom have between 15% and 30% area with deficiencies [1] [2] • *OR* Bridge is in poor condition and will be replaced in the near future and the most cost-effective fix is HMA overlay [1]	
HMA Overlay Cap without Membrane	• Note: All HMA caps should have membranes unless scheduled for replacement within five years. • NBI rating of 3 or less for deck surface and deck bottom, and deck surface and deck bottom have more than 30% area with deficiencies. Temporary holdover to improve ride quality for a bridge in the five-year plan for rehab/replacement. [1] [2]	3 years

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
Concrete Deck Patching	• NBI rating of 5, 6, or 7 for deck surface, and deck surface has between 2% and 5% area with delamination and spalling [1] [2] • *OR* In response to inspector's work recommendation [1]	5 years
Steel Bearing Repair/Replacement	• NBI rating of 5 or more for superstructure and deck, and NBI rating 4 or less for bearing [2]	
Deck Joint Replacement	• Always include when doing deep or shallow concrete overlays [1] • NBI rating of 4 or less for joints [1] [2] • *OR* Joint leaking heavily [1] • *OR* In response to inspector's work recommendation for replacement [1]	
Pin and Hanger Replacement	• NBI rating of 4 or less for superstructure for pins and hangers [1] [2] • Pontis rating of 1, 2, or 3 for a frozen or deformed pin and hanger [1] [5] • *OR* Presence of excessive section loss, severe pack rust, or out-of-plane distortion [1]	15 years
Zone Repainting	• NBI rating of 5 or 4 for paint condition, and paint has 3% to 15% total area failing [1] [2] • *OR* During routine maintenance on beam ends or pins and hangers [1] • *OR* less than 15% of existing paint area has failed and remainder of paint system is in good or fair condition [1]	10 years
Complete Repainting	• NBI rating of 3 or less for paint condition [1] [2] • *OR* Painted steel beams that have greater than 15% of the existing paint area failing [1]	
Partial Repainting	• See Zone or Spot Painting	
Channel Improvements	• Removal of vegetation, debris, or sediment from channel and banks to improve channel flow • *OR* in response to inspector's work recommendation	
Scour Countermeasures	• Pontis scour rating of 2 or 3 and is not scheduled for replacement [1] [5] • OR NBI comments in abutment and pier ratings indicate presence of scour holes [1] [2]	

Approach Repaving	• Approach pavement relief joints should be included in all projects that contain a significant amount of concrete roadway (in excess of 1000' adjacent to the structure). The purpose is to alleviate the effects of pavement growth that may cause distress to the structure. Signs of pavement growth include:
	  ○ Abutment spalling under bearings [1]
	  ○ Beam end contact [1]
	  ○ Closed expansion joints and/or pin and hangers [1]
	  ○ Damaged railing and deck fascia at joints [1]
	  ○ Cracking in deck at reference line (45 degree angle) [1]	

Guard Rail Repair/Replacement	• Guard rail missing or damaged [2*] • *OR* Safety improvement is needed [2*]	
Scheduled Maintenance		

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
Superstructure Washing	• When salt contaminated dirt and debris collected on superstructure is causing corrosion or deterioration by trapping moisture [1] • *OR* Expansion or construction joints are to be replaced and the steel is not to be repainted [1] • *OR* Prior to a detailed replacement [1] • *OR* In response to inspector's work recommendation [1]	2 years
Drainage System Clean-Out/Repair	• When drainage system is clogged with debris [1] • *OR* Drainage elements are broken, deteriorated, or damaged [1] • *OR* NBI rating comments for drainage system indicate need for cleaning or repair [1] [2]	2 years
Spot Repainting	• For zinc-based paint systems only. Do not spot paint with lead-based paints. • Less than 5% of paint area has failed in isolated areas [1] • *OR* In response to inspector's work recommendation [1]	5 years
Slope Paving Repair	• NBI rating is 5 or less for slope protection [1] [2] • *OR* Slope is degraded or sloughed • *OR* Slope paving has significant areas of distress, failure, or has settled [1]	
Riprap Installation	• To protect surface when erosion threatens the stability of side slopes of channel banks	
Vegetation Control	• When vegetation traps moisture on structural elements [1] • *OR* Vegetation is growing from joints or cracks [1] • *OR* In response to inspector's work recommendation for brush cut [1]	1 year
Debris Removal	• When vegetation, debris, or sediment accumulates on the structure or in the channel • *OR* In response to inspectors work recommendation	1 year
Deck Joint Repair	• Do not repair compression joint seals, assembly joint seals, steel armor expansions joints, and block out expansion joints; these should always be replaced. [1] • NBI rating is 5 for joint [1] [2] • *OR* In response to inspector's work recommendation for repair [1]	
Concrete Sealing	• Top surface of pier or abutments are below deck joints and, when contaminated with salt, salt can collect on the surface [1] • *OR* Surface of the concrete has heavy salt exposure. Horizontal surfaces of substructure elements are directly below expansion joints [1]	
Concrete Crack Sealing	• Concrete is in good or fair condition, and cracks extend to the depth of the steel reinforcement [1] • *OR* NBI rating of 5, 6, or 7 for deck surface, and deck surface has between 2% and 5% area with deficiencies [1] [2] • *OR* Unsealed cracks exist that are narrow and/or less than 1/8" wide and spaced more than 8' apart [1] • *OR* In response to inspector's work recommendation [1]	5 years
Minor Concrete Patching	• Repair minor delaminations and spalling that cover less than 30% of the concrete substructure [1]	

Table 3: Summary of Preservation Criteria		
Preservation Action	**Bridge Selection Criteria**	**Expected Service Life**
	• *OR* NBI rating of 5 or 4 for abutments or piers, and comments indicate that their surface has less than 30% spalling or delamination [1] [2] • *OR* Pontis rating of 3 or 4 for the column or pile extension, pier wall and/or abutment wall, and surface has between 2% and 30% area with deficiencies [1] [5] • *OR* In response to inspector's work recommendation [1]	
HMA Surface Repair/Replacement	• HMA surface is in poor condition • *OR* In response to inspector's work recommendation	
Seal HMA Cracks/Joints	• HMA surface is in good or fair condition, and cracks extend to the surface of the underlying slab or sub course • *OR* In response to inspector's work recommendation	
Timber Repair	• NBI rating of 4 or less for substructure for timber members • *OR* To repair extensive rot, checking, or insect infestation	
Miscellaneous Repair	• Uncategorized repairs in response to inspector's work recommendation	

This table was produced by TransSystems and includes information from the following sources:
[1] MDOT, *Project Scoping Manual*, MDOT, 2019.
[2] MDOT, *MDOT NBI Rating Guidelines*, MDOT, 2017.
[3] MDOT, *Bridge Deck Preservation Matrix - Decks with Uncoated "Black" Rebar*, MDOT, 2017.
[4] MDOT, *Bridge Deck Preservation Matrix - Decks with Epoxy Coated Rebar*, 2017.
[5] MDOT, *Pontis Bridge Inspection Manual*, MDOT, 2009.
* From source with interpretation added.

In terms of management and preservation actions, ACRC's bridge asset management program uses a "mix of fixes" strategy that is made up of replacement.

Replacement involves substantial changes to the existing structure, such as bridge deck replacement, superstructure replacement, or complete structure replacement, and is intended to improve critical or closed bridges to a good condition rating.

Rehabilitation is undertaken to extend the service life of existing bridges. The work will restore deficient bridges to a condition of structural or functional adequacy, and may include upgrading geometric features. Rehabilitation actions are intended to improve the poor or fair condition bridges to fair or good condition.

Preventive maintenance work will improve and extend the service life of fair bridges, and will be performed with the understanding that future rehabilitation or replacement projects will contain appropriate safety and geometric enhancements. Preventive maintenance projects are directed at limited bridge elements that are rated in fair condition with the intent of improving these elements to a good rating. Most preventive maintenance projects will be one-time actions in response to a condition state need. Routine preventive work will be performed by contracted agencies.

ACRC's **scheduled maintenance** program is an integral part of the preservation plan, and is intended to extend the service life of fair and good structures by preserving the bridges in their current condition for a longer period of time. Scheduled maintenance is proactive and not necessarily condition driven. In-house maintenance crews will perform much of this work.

Certain of the severely degraded and structurally deficient bridges require replacement or major rehabilitation. Several of the remaining bridges require one-time preventive maintenance actions to repair defects and restore the structure to a higher condition rating. Most bridges are included in a scheduled maintenance plan with appropriate maintenance actions programmed for groups of bridges of similar material and type, bundled by location.

The replacement, rehabilitation, and preventive maintenance projects are generally eligible for funding under the local bridge program, and any requests for funding will be submitted with Allegan County Road Commission's annual applications.

To achieve its goals, a primary objective of ACRC's asset management program is improvement of three bridges rated poor (4 or lower) to a rating of fair (5) or higher within a five-year time period through management and/or preservation activities. The primary work activities that will be used to meet this improvement objective include rehabilitation.The work has been prioritized by considering each individual bridge's needs, its importance, the present costs of improvements, and the impact of deferral (i.e., cost increase due to increased degradation). Additionally, ACRC's asset management program incorporates preservation of bridges currently rated fair (5) or higher in their current condition in order to extend their useful service life. The primary work activities used to meet this preservation objective include preventive maintenance. A bridge-by-bridge preservation—or maintenance—plan is presented in the Appendix 4.

Programmed/Funded Projects

ACRC received $1,000,000 in total funding per year for the years 2021-2022. To achieve its goals, ACRC plans to spend $100,000 per year on preventive maintenance of bridges. ACRC plans to replace one bridges at a cost of $1,000,000. By performing the aforementioned preventive maintenance and replacement of bridge structures, ACRC will not meet its overall bridge network condition goals.

ACRC computes the estimated cost of each typical management and/or preservation action using unit prices in the latest *Bridge Repair Cost Estimate* spreadsheet contained in MDOT's *Local Bridge Program Call for Projects*. The cost of items of varying complexity, such as maintenance of traffic, staged construction, scour counter-measures, and so forth, are computed on a bridge-by-bridge basis. The cost estimates are reviewed and updated annually. A summary of the programmed/funded projects and investments can be found in Table 4, the Cost Projection table, below.

Planned Projects

ACRC identifies additional priority projects that remain unfunded. Highlighed below are structures that are funded. Strucure 296 was constructed in 2022, Structure 189 is scheduled to be built in 2023 and

Structure 204 is part of Phase 2 of the bridge bundling program. The rest of the bridges applications have been submitted but were not selected as part of the Michigan Bridge Program.

Table 4: Cost Projection Table

Strategy	2022	2023	2024	2025	2026
Replacement					
296	$828,000				
190	$685,000				
189		$758,000			
204			$825,000		
254				$2,341,000	
205				$2,381,000	
Subtotal	$1,513,000	$758,000	$825,000	$4,722,000	$0
Rehabilitation					
202	$111,000				
198	$90,000				
168	$107,000				
253				$427,000	
249				$376,000	
Subtotal	$308,000	$0	$0	$803,000	$0
Preventive Maintenance					
299			$206,000		
228			$60,000		
188			$96,000		
283				$31,000	
274				$79,000	
273				$59,000	
235				$47,000	
209				$71,000	
208				$71,000	
201				$61,000	
200				$86,000	
199				$182,000	
197				$68,000	
195				$63,000	
194				$221,000	
173				$61,000	
Subtotal	$0	$0	$362,000	$1,100,000	$0

Gap Analysis

When ACRC compares its funding and its programmed/funded projects with all of its prioritized projects as shown in Table 4, ACRC believes it should be able to achieve some of its asset management goals for the period of this plan.

2. FINANCIAL RESOURCES

Anticipated Revenues

ACRC has programmed projects and/or has been granted MDOT local-aid funding, a county appropriation of monies for bridge preservation, and federal funding, for the purpose(s) of replacement for the following bridge(s): 296, and 189. This funding is intended for use in the following funding year(s): 2022-2023.

ACRC applied for MDOT local-aid funding, a county appropriation of monies for bridge preservation, and federal funding, in 2022-2025 for the purpose(s) of replacement, rehabilitation, and preventive maintenance for the following bridge(s): 254, 205, 253, 249, 283, 274, 273, 235, 209, 208, 201, 200, 199, 197, 195, 194, 173. This funding would be intended for use in the following funding year(s): 2022-2025

Any projects submitted to the local aid program that are not selected for funding will be added to future year applications.

Anticipated Expenses

Scheduled maintenance activities and minor repairs that are not affiliated with any applications, grants, or other funded projects will be performed by the agency's in-house maintenance forces and funded through the agency's annual operating budget.

3. RISK MANAGEMENT

ACRC recognizes that the potential risks associated with bridges generally fall into several categories:

- Personal injury and property damage resulting from a bridge collapse or partial failure;
- Loss of access to a region or individual properties resulting from bridge closures, restricted load postings, or extended outages for rehabilitation and repair activities; and
- Delays, congestion, and inconvenience due to serviceability issues, such as poor quality riding surface, loose expansion joints, or missing expansion joints.

ACRC addresses these risks by implementing regular bridge inspections and a preservation strategy including preventive maintenance.

ACRC administers the biennial inspection of its bridges in accordance with NBIS and MDOT requirements. The inspection reports document the condition of ACRC's bridges and evaluates them in order to identify new defects and monitor advancing deterioration. The summary inspection report in Appendix 1 identifies items needing follow-up, special inspection actions, and recommended bridge-by-bridge maintenance activities.

Bridges that are considered "scour critical" pose a risk to ACRC's road and bridge network. Scour is the depletion of sediment from around the foundation elements of a bridge commonly caused by fast-moving water. According to MDOT's *Michigan Structure Inventory and Appraisal Coding Guide*, a scour critical bridge is one that has unstable abutment(s) and/or pier(s) due to observed or potential (based on an evaluation study) scour. Bridges receiving a scour rating of 3 or less are considered scour critical. ACRC has scour critical bridges, which are listed in Table 5.

Table 5: Bridges that are Considered Scour Critical

Scour Critical Bridges	
Bridge Structure Number	**Scour Critical Rating**
192	3
205	3
207	3
217	3
244	3
248	3
250	3
251	3
252	3
261	3
291	3
305	3

ACRC has posted or closed bridges that are critical to accessing entire areas or individual properties within its jurisdiction. These bridges are listed in Table 6.

Table 6: Posted or Closed Bridges that are Critical Links

Posted/Closed Bridges that are Critical Links		
Bridge Structure Number	**P/K**	**Comments**
189	P	146th Ave over S Br Macatawa River
190	P	66th Street M Branch Black River
205	P	18th Street over Rabbit River
207	P	2nd Street over Gun River
167	P	103rd Ave N Br of Black River

The preservation strategy identifies actions in the operations and maintenance plan that are preventive or are responsive to specific bridge conditions. The actions are prioritized to correct critical structural safety and traffic issues first, and then to address other needs based on the operational importance of each bridge and the long-term preservation of the network. The inspection results serve as a basis for modifying and updating the operations and maintenance plan annually.

Appendix 1

Allegan County Road Commission 2021 Bridge Inspection Report Summary of Additional Inspection Recommendations

Structure Number	Facility Carried	Features Intersected	Inpection Frequency (Months)
233	144TH AVE	LITTLE RABBIT RIVER	3
204	16TH STREET	MILLER CREEK	3
232	140TH AVE	RED RUN DRAIN	6
246	116TH AVE	LEVERIDGE DRAIN	6
191	64TH STREET	N BR OF BLACK RIVER	12
167	103RD AVE	N BR OF BLACK RIVER	12
187	142ND AVE	RED RUN DRAIN	12
14334	18TH ST	RED RUN DRAIN	12
189	146TH AVE	S BR MACATAWA RIVER	12
179	RIVERSIDE ROAD	ORCHARD CREEK	24
238	21ST STREET	LITTLE RABBIT RIVER	12
239	20TH STREET	RED RUN DRAIN	12
306	WILLIAMS ROAD	KALAMAZOO RIVER	12
213	63RD STREET	SPICEBUSH CREEK	12
240	16TH STREET	RED RUN DRAIN	12
224	107TH AVE	SWAN CREEK	12
310	114TH AVE	MINER CREEK DRAIN	12
212	107TH AVE	SCOTT CREEK	12
243	RUSSCHER ROAD	S BR MACATAWA RIVER	12
247	62ND STREET	LEVERIDGE DRAIN	12
218	70TH STREET	M BR BLACK RIVER	12
289	OTTOGAN STREET	S BR MACATAWA RIVER	12
241	144TH AVE	S BR MACATAWA RIVER	12
220	68TH STREET	N BR OF BLACK RIVER	12
254	130TH AVE	RABBIT RIVER	12
260	16TH STREET	PIERCE DRAIN	12

Appendix 2

Allegan County Road Commission 2021 and 2022 Bridge Inspection Report Executive Summary

SCECO SCOTT CIVIL ENGINEERING COMPANY
1345 Monroe Ave., Ste 136, Grand Rapids, MI 49505 Ph:(616) 458-8792 Fax:(616) 643-0811

December 8, 2021

Mr. Jason Edwards, P.E.
County Highway Engineer
Allegan County Road Commission
1308 Lincoln Road
Allegan, MI 49010

SUBJECT: 2021 Primary System Bridge Inspections

Dear Mr. Edwards:

The bridge inspections for 50 Allegan County Primary System bridges have been completed. In addition, inspections were completed for 4 Local System bridges that are on a 3-month or 6-month frequency. All necessary forms on the MiBridge website have been updated. All of the current inspection data is being submitted in PDF format. The PDF files contain the following for each bridge:

- Structure Inventory and Appraisal (SI&A) form
- Bridge or Culvert Safety Inspection Report
- Work Recommendations Report
- Photographs

Additional documents such as load ratings, streambed cross sections, or plan sketches are included if they were updated. Below is a summary of which structures have updated information.

Load ratings were updated as needed to reflect any changes to the structure. Note that load ratings were also updated for several local bridges as required by MDOT since PM work including HMA resurfacing was performed on the bridges this summer. In addition, there were a few load rating updates requested by MDOT's QA review consultant. The local bridge load rating updates are included in a separate folder with the submittal package. Load ratings were updated for the following primary route structures:

SN 167	103rd Avenue	N Br Black River
SN 168	103rd Avenue	M Br Black River
SN 174	112th Avenue	Swan Creek
SN 175	112th Avenue	Gun River
SN 176	118th Avenue	Leveridge Drain
SN 179	Riverside Road	Orchard Creek
SN 188	146th Avenue	N Br Macatawa River
SN 194	58th Street	Kalamazoo River
SN 205	18th Street	Rabbit River
SN 210	10th Street	Consolidated Railroad
SN 211	Division Street	Rabbit River

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Load posting changes are as follows (an email was sent previously for these changes):

Structure Number	Facility Carried	Feature Intersected	Previous Posting	New Posting
167	103rd Avenue	N Br Black River	None	23/29/54
174	112th Avenue	Swan Creek	36	None
179	Riverside Road	Orchard Creek	None	42/63/76
205	18th Street	Rabbit River	42/52/64	20/22/31
217	111th Avenue	N Br Black River	42/73/82	42/65/76
297	140th Avenue	Little Rabbit River	42/68/82	42/61/71

According to the Michigan Vehicle Code (Section 631), advance posting signs are required for all posted bridges. The following primary route structures are missing advance posting signs:

SN 189	146th Avenue	S Br Macatawa River
SN 190	66th Street	M Br Black River
SN 205	18th Street	Rabbit River

Per MDOT Bridge Advisory 2019-03, all bridges were required to have a plan sketch created and uploaded to MiBridge. A plan sketch was created for the following structures, and all of the sketches have been uploaded to MiBridge:

SN 167	103rd Avenue	N Br Black River
SN 174	112th Avenue	Swan Creek
SN 180	128th Avenue	Miller Creek
SN 182	135th Avenue	Rabbit River
SN 185	142nd Avenue	Black Creek Drain
SN 186	142nd Avenue	Little Rabbit River
SN 188	146th Avenue	N Br Macatawa River
SN 189	146th Avenue	S Br Macatawa River
SN 190	66th Street	M Br Black River
SN 191	64th Street	N Br Black River
SN 192	60th Street	M Br Black River
SN 198	28th Street	Baseline Creek
SN 203	20th Street	Miller Creek
SN 205	18th Street	Rabbit River
SN 13992	60th Street	Kuipers Drain
SN 14334	18th Street	Red Run Drain

New streambed cross sections were completed for the following structure:

SN 199	26th Street	Kalamazoo River

Specific comments on the recent inspection are as follows:

1. SN 167 103rd Avenue over N Br Black River – The east abutment remains in poor condition. The load rating was updated to consider the reduced bearing area of the abutment cap on the piles. The area of rot on pier pile 1S has increased slightly since the last inspection, and rot

has started on a few other piles. A bolted steel repair may be considered for the rotting piles, but the best long-term fix considering the abutment condition is a full bridge replacement.

2. SN 172 106th Avenue over Gun River – Several railing posts have missing attachment bolts which should be replaced to ensure full capacity of the railing.

3. SN 174 112th Avenue over Swan Creek – The stream is moving east at the culvert and cutting into the southeast bank. Riprap should be added behind the timber wingwall to protect the roadway embankment.

4. SN 175 112th Avenue over Gun River – The east post-tensioning rod is broken and should be replaced to ensure proper load transfer between the beams. All wingwalls have rotten timber piles. An option for repair would be to drive steel piles next to the rotting timber piles or drive sheeting behind the wingwall.

5. SN 177 118th Avenue over Swan Creek – The slope is washing out in the southwest quadrant behind the guardrail, and the HMA shoulder is starting to undermine in front of the guardrail. Riprap should be placed on the slope before undermining causes damage to the approach roadway.

6. SN 179 Riverside Road over Orchard Creek – Severe rot was found on one of the pier piles that had previously been underwater. The pile can no longer take any load, and posting is required to prevent overloading of the pier cap over the failed pile. Installing a splice in the rotten section would allow the posting to be removed. Decay was also noted on the other pier piles and a few abutment piles, and with the age of the bridge it is time to start budgeting for a full replacement.

7. SN 186 142nd Avenue over Little Rabbit River – The bridge rail connections to the fascia beams have significant corrosion which may impact the strength of the railing. The railing does not meet current standards and the approach guardrail has rotten posts, so a full rail upgrade should be considered.

8. SN 188 146th Avenue over N Br Macatawa River – 7 out of 8 railing posts on each side are rotting. The HMA surface has numerous cracks that were sealed recently, but this bridge remains a good candidate for preventive maintenance including railing replacement and resurfacing.

9. SN 190 66th Street over S Br Black River – The R4 bridge rail is in very poor condition and sections of the rail are falling apart. A possible rehab project could include a deep concrete deck overlay and railing replacement which would also increase the clear width slightly.

10. SN 191 64th Street over N Br Black River – Holes in the culvert walls may soon progress to tears with possible loss of backfill. Funding should be sought to replace the structure. The guardrail over the culvert is also in need of replacement.

11. SN 197 38th Street over Rabbit River – The slope paving in the northeast quad is undermined and failing. Breaking up the failing slope paving and adding heavy riprap where settlement has occurred should stabilize the slope.

12. SN 198 28th Street over Baseline Creek – The HMA surface over the bridge is heavily cracked, and there are holes forming in the bridge rail. A preventive maintenance project should include HMA resurfacing and rail replacement.

13. SN 200 30th Street over Rabbit River – Pieces of wood forming remain in the expansion gap at the south end of the beams. The wood pieces need to be removed in order to allow for normal expansion of the bridge.

14. SN 204 16th Street over Miller Creek – The south barrel remains in serious condition, but no major changes were noted since the last inspection. With the east shoulder closure, there is less concern for danger to traffic with potential loss of backfill. Replacement of the structure remains a high priority.

15. SN 205 18th Street over Rabbit River – Field measurements indicate that there is more HMA on the bridge deck than previously assumed. With approximately 14 inches of HMA, there is a significant amount of dead load on the bridge which decreases the live load capacity. Removing most of the HMA on the bridge would allow the posting to be increased. There is also scour occurring along the south abutment, and riprap should be added to prevent undermining of the spread footing during high flow events.

16. SN 207 2nd Street over Gun River – The stream flows along the south abutment, and previous footing exposure was noted. Since the abutment is on a spread footing, riprap should be placed along the abutment to protect against scour.

17. SN 211 Division Street over Rabbit River – There are areas of spalled and delaminated concrete on the concrete tee beams, and exposed longitudinal reinforcement was noted on a few beams where concrete had poor consolidation. The load rating analysis was updated to account for the deterioration, and posting is not required at this time. However, the spalling will need to be monitored, and the load rating may need to be updated if the condition worsens.

18. SN 232 140th Avenue over Red Run Drain – The tear at the north end of the west barrel continues to be monitored. The wall remains buckled inward about 3 inches and there is a potential for loss of backfill. Additional holes continue to form in both barrels. This structure should be scheduled for replacement in the near future.

19. SN 233 144th Avenue over Little Rabbit River – The west wall of the west barrel remains in serious condition with numerous holes and possible loss of backfill. This structure should be scheduled for replacement in the near future. In the short term, the larger holes may be filled with grout or foam to prevent loss of backfill.

20. SN 246 116th Avenue over Leveridge Drain – Tears are forming in the west wall of the west barrel which could lead to loss of backfill as the tears progress. The inspection frequency remains at 6 months for now, and replacement should be scheduled in the near future.

21. SN 296 138th Avenue over Pigeon Creek – The bridge was closed to traffic due to the potential for beam end failure or localized deck failures. The replacement project is currently advertised for the January bid letting with construction anticipated to begin in April.

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Currently, 18% of Allegan County's primary bridges are in poor, serious, or critical condition, and two-thirds of these are culvert structures. The rate at which some of these structures are deteriorating is concerning, and many of them will likely need to be replaced or closed in the next 10 years. MDOT's Local Bridge Program is underfunded and cannot address all of the needs that exist. Contech has some precast concrete options that could work for replacement of smaller structures if budget allows. Kent County and Barry County have recently completed repairs on a few CMP culverts that involved lining the culvert bottom and lower portion of the walls with reinforced concrete. This is a relatively low-cost option that could extend the life of the culvert by 25 years, but the reduction in flow area would need to be approved by EGLE and/or the drain commission. I also recommend keeping up to date on MDOT's Bridge Bundling program as this could be a way to get several serious or critical structures replaced.

Several bridges and culverts have dense brush growing around the footprint of the structure which obscures portions of the structure and makes access difficult during inspections. In some cases, the brush is growing into the bridge fascia or over the railing which could eventually become a traffic hazard. Please review the work recommendations reports to see where brush cutting is needed. Woody vegetation should be cut down to ground level at these bridges.

On behalf of Scott Civil Engineering Company, I want to thank you for the opportunity to assist you on this project. If you have any questions or comments, please give me a call.

Sincerely,

Robert Lothschutz

Robert Lothschutz, P.E.
Project Engineer

Enclosures

SCECO SCOTT CIVIL ENGINEERING COMPANY
1345 Monroe Ave., Ste 136, Grand Rapids, MI 49505 Ph:(616) 458-8792 Fax:(616) 643-0811

June 9, 2022

Mr. Ryan Kemppainen, P.E.
County Highway Engineer
Allegan County Road Commission
1308 Lincoln Road
Allegan, MI 49010

SUBJECT: 2022 April and May Bridge Inspections

Dear Mr. Kemppainen:

The bridge inspections for 1 primary system bridge and 20 local system bridges have been completed. All necessary forms on the MiBridge website have been updated. All of the current inspection data is being submitted in PDF format. The PDF files contain the following for each bridge:

- Structure Inventory and Appraisal (SI&A) form
- Bridge or Culvert Safety Inspection Report
- Work Recommendations Report
- Photographs

No posting changes are required at this time. Specific comments on the recent inspection are as follows:

1. SN 204 16th Street over Miller Creek – Backfill continues to wash through the large holes in the south barrel. There is potential for inward buckling of the culvert wall which would result in a rapid loss of backfill and development of a hole in the road shoulder, and the barrier is in place above to keep vehicles away from this area. This structure is included for replacement as part of MDOT's Phase II bridge bundling project.

2. SN 218 70th Street over M Br Black River – Decay on the north abutment piles has not changed significantly since the last inspection. A bolted steel repair should be installed over the rotten areas on piles 1E and 5E. Debris is caught on the piers and partially blocking flow.

3. SN 220 68th Street over N Br Black River – The west end of the south abutment cap is rotting and the rotten area extends past the first pile. Repairs should be made before the deterioration becomes more extensive.

4. SN 224 107th Avenue over Swan Creek – No new cracked deck boards were noted. A bolted steel repair should be installed over the crack in the east abutment cap.

5. SN 232 140th Avenue over Red Run Drain – The tear at the north end of the west barrel continues to be monitored. The wall remains buckled inward about 3 inches and there is a potential for loss of backfill. Additional holes continue to form in both barrels. This structure should be scheduled for replacement in the near future.

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6. SN 233 144th Avenue over Little Rabbit River – Backfill is washing through numerous large holes in the west wall of the west barrel. A hole has developed above in the north slope and is currently 6 feet from the edge of the road. This should be watched closely as enlargement of the hole may require shoulder closure. The culverts should be scheduled for replacement in the near future. In the short term, the larger holes may be filled with grout or foam to prevent loss of backfill.

7. SN 240 16th Street over Red Run Drain – The stream is diverting around the riprap at the structure outlet and is eroding the south stream bank. The riprap should be repositioned so that the stream flows down the center of the channel.

8. SN 246 116th Avenue over Leveridge Drain – Tears are forming in the west wall of the west barrel which could lead to loss of backfill as the tears progress. The inspection frequency remains at 6 months for now, and replacement should be scheduled in the near future.

9. SN 254 130th Avenue over Rabbit River – A few additional cracked boards were noted during the inspection, but the current posting is adequate for now. This bridge should be a priority for replacement.

10. SN 296 138th Avenue over Pigeon Creek – The post-construction inspection was performed since all of the structural components had been completed. Approach construction was on-going at the time of inspection. The load rating analysis for the new bridge along with streambed cross sections are included with the report.

11. SN 306 Williams Road over Kalamazoo River – As noted after the last inspection, an underwater inspection should be scheduled in 2023 to check the condition of the pier piles. Due to the continued deterioration and because it is a large bridge, it would be a good idea to start budgeting or applying for funding for a full bridge replacement.

On behalf of Scott Civil Engineering Company, I want to thank you for the opportunity to assist you on this project. If you have any questions or comments, please give me a call.

Sincerely,

Robert Lothschutz

Robert Lothschutz, P.E.
Project Engineer

Enclosures

Appendix A-3

APPENDIX A-3

Inventory Data														Inspection Findings												Appraisal				
Bridge Type	Structure Number	Bridge ID	Facility Carried	Features Intersected	Primary or Secondary Route	Structure Type Main Span (Item 43A - Material)	Structure Type Main Span (Item 43B)	Number of Main Span (Item 45)	Total Str Length (Item 49)	Year Built (Item 27)	Year Reconstr (Item 106)	ADT	Year of ADT	Inspection Date	Operational Status (Item 41)	Deck Rating (Item 58)	Deck Bottom Rating (Item XX)	SuperStr Rating (Item 59)	Substr Rating (Item 60)	Channel Rating (Item 61)	Culvert Rating (Item 62)	Surface Rating (Item 58A)	Paint Rtg	Exp Joint Rating (Item XX)	Other Joints	Structure Evaluation	Structurally Deficient	Sufficiency Rating	Section Loss	Scour Critical (Item 113)
Timber – Slab	167	03200002000B010	103RD AVE	N BR OF BLACK RIVER	Primary	7	1	2	48	1965		444	2003	09/15/2021	P	5	5	5	3	6	N	7	N	N	N	P	Struct Def	33.1	N	5
Prestressed concrete – Box beam/girders—multiple	168	03200004000B010	103RD AVE	M BR BLACK RIVER	Primary	5	5	1	28	1970		481	2003	09/16/2021	A	6	N	6	5	6	N	8	N	N	N	F		86.8	N	5
Steel – Culvert	169	03200008000B010	JEFFERSON ROAD	PINE CREEK	Primary	3	19	2	43	1975		1806	2003	09/20/2021	A	N		N	N	7	5					F		76.7		8
Prestressed concrete – Box beam/girders—multiple	170	03200010000B010	109 TH AVE	N BR OF BLACK RIVER	Primary	5	5	2	66	1977		2153	2016	09/15/2021	A	7	N	7	7	6	N	8	N	8	N	G		95.9	N	5
Prestressed concrete – Box beam/girders—multiple	171	03200010000B020	109TH AVE	SWAN CREEK	Primary	5	5	1	36	1979		1676	2016	09/16/2021	A	8	N	7	8	6	N	8	N	N	N	G		97.2	N	5
Prestressed concrete – Box beam/girders—multiple	172	03200012000B010	106TH AVE	GUN RIVER	Primary	5	5	2	69.9	1971		3322	2003	09/02/2021	A	7	N	8	5	6	N	7	N	6	N	F		85.4	N	4
Prestressed concrete – Box beam/girders—multiple	173	03200015000B010	113TH AVE	N BR OF BLACK RIVER	Primary	5	5	1	68	2012		249	2012	09/15/2021	A	7	N	8	8	7	N	7	N	5	N	G		99.9	N	5
Timber – Culvert	174	03200016000B010	112TH AVE	SWAN CREEK	Primary	7	19	4	25.2	1964		288	2003	09/16/2021	A	N		N	N	5	6					F		73.3		8
Prestressed concrete – Box beam/girders—multiple	175	03200017000B010	112TH AVE	GUN RIVER	Primary	5	5	1	48.9	1970		438	2003	09/02/2021	A	5	N	5	5	7	N	7	N	N	N	F		84.9	N	5
Prestressed concrete – Box beam/girders—multiple	176	03200018000B010	118TH AVE	LEVERIDGE DRAIN	Primary	5	5	1	33.8	1970		833	2003	09/15/2021	A	7	N	7	5	5	N	9	N	N	N	F		85.7	N	5
Concrete – Girder and floorbeam	177	03200018000B020	118TH AVE	SWAN CREEK	Primary	1	3	1	49.9	1924		1077	2003	09/16/2021	A	4	4	5	6	8	N	7	N	N	N	P	Struct Def	53.4	N	5
Concrete – Culvert	178	03200020000B010	116TH AVE	GUN RIVER	Primary	1	19	1	43	2009		1582	2007	09/02/2021	A	N		N	N	7	6					F		99.6		5
Timber – Slab	179	03200027000B010	RIVERSIDE ROAD	ORCHARD CREEK	Primary	7	1	2	40	1969		1042	2003	10/13/2021	P	5	6	6	3	6	N	5	N	N	N	P	Struct Def	39.7	N	5
Steel – Culvert	180	03200029000B010	128TH AVE	MILLER CREEK	Primary	3	19	2	28.5	1972		2555	2003	10/05/2021	A	N		N	N	6	6					F		97.2		8
Prestressed concrete – Box beam/girders—single/sprea	181	03200035000B010	135TH AVE	RABBIT RIVER	Primary	5	6	1	79	2009		1223	2007	10/05/2021	A	7	8	7	8	7	N	7	N	5	N	G		99.2	N	5
Steel – Culvert	182	03200035000B020	135TH AVE	RABBIT RIVER	Primary	3	19	2	50	1974		3555	2003	10/05/2021	A	N		N	N	5	6					F		97.2		8
Concrete – Culvert	183	03200037000B010	141ST AVE	KLEINHEKSEL DRAIN	Primary	1	19	1	30	2009		1800	2008	10/06/2021	A	N		N	N	7	7					G		99.5		5
Concrete – Culvert	184	03200037000B020	FILLMORE ROAD	EAST FILLMORE DRAIN	Primary	1	19	1	36	2009		1640	2008	10/06/2021	A	N		N	N	6	6					F		99.5		5
Steel – Culvert	185	03200037000B030	142ND AVE	BLACK CREEK DRAIN	Primary	3	19	2	33.5	1970		2208	2003	10/06/2021	A	N		N	N	6	6					F		99.3		8
Steel – Multistringer	186	03200037000B040	142ND AVE	LITTLE RABBIT RIVER	Primary	3	2	1	68.3	1971		6984	2019	10/06/2021	A	6	5	6	8	6	N	6	N	N	N	F		92.8	3	5
Steel – Culvert	187	03200037000B050	142ND AVE	RED RUN DRAIN	Primary	3	19	2	24.9	1973		8204	2003	10/05/2021	A	N		N	N	6	4					P	Struct Def	68.6		4
Prestressed concrete – Box beam/girders—multiple	188	03200039000B010	146TH AVE	N BR MACATAWA RIVER	Primary	5	5	1	35.8	1979		4413	2019	10/06/2021	A	6	N	6	7	6	N	6	N	N	N	F		93.4	N	5
Steel – Culvert	189	03200039000B020	146TH AVE	S BR MACATAWA RIVER	Primary	3	19	3	37.5	1972		2504	2010	10/06/2021	P	N		N	N	5	3					P	Struct Def	39.8		4
Steel – Multistringer	190	03200045000B010	66TH STREET	M BR BLACK RIVER	Primary	3	2	1	65	1949		1133	2003	09/16/2021	P	5	6	6	7	5	N	4	5	N	N	F		78.4	2	5
Steel – Culvert	191	03200047000B010	64TH STREET	N BR OF BLACK RIVER	Primary	3	19	2	31	1966		324	2003	09/15/2021	A	N		N	N	6	3					P	Struct Def	54.8		8
Prestressed concrete – Box beam/girders—multiple	192	03200054000B010	60TH STREET	M BR BLACK RIVER	Primary	5	5	1	60.5	1969		320	2003	09/16/2021	A	7	N	7	7	6	N	8	N	N	N	G		96.9	N	3
Prestressed concrete – Multistringer	193	03200055000B010	56TH STREET	M BR BLACK RIVER	Primary	5	2	1	50	2018		1565	2017	09/16/2021	A	8	8	8	8	7	N	8	N	7	7	G		99.5	N	5
Prestressed concrete – Box beam/girders—single/sprea	194	03200057000B010	58TH STREET	KALAMAZOO RIVER	Primary	5	6	5	321	1974		6042	2010	10/13/2021	A	7	7	5	5	5	N	7	N	7	6	F		69.4	2	5
Prestressed concrete – Multistringer	195	03200059000B010	48TH STREET	S BR MACATAWA RIVER	Primary	5	2	1	65	2010		3679	2009	10/06/2021	A	7	7	7	7	7	N	7	N	5	N	G		99	N	5
Prestressed concrete – Box beam/girders—multiple	196	03200060000B010	46TH STREET	SWAN CREEK	Primary	5	5	1	36	2003		900	2016	09/16/2021	A	8	N	8	8	8	N	8	N	N	N	G		99.7	N	5
Steel – Multistringer	197	03200066000B010	38TH STREET	RABBIT RIVER	Primary	3	2	2	117.6	1970		910	2010	10/13/2021	A	6	6	6	6	5	N	8	N	7	6	F		98	3	5
Timber – Slab	198	03200068000B010	28TH STREET	BASELINE CREEK	Primary	7	1	1	24	1979		203	2003	09/20/2021	A	6	6	6	6	6	N	5	N	N	N	F		97	N	5
Prestressed concrete – Multistringer	199	03200069000B010	26TH STREET	KALAMAZOO RIVER	Primary	5	2	4	209	1975		1978	2010	09/20/2021	A	7	7	7	7	6	N	8	N	7	5	G		97.5	2	5
Prestressed concrete – Multistringer	200	26TH STREET	KALAMAZOO RIVER	RABBIT RIVER	Primary	5	2	1	100	2018		4721	2016	10/13/2021	A	7	7	8	7	8	N	7	N	7	7	G		98.9	N	5
Steel – Multistringer	201	03200071000B020	30TH STREET	LITTLE RABBIT RIVER	Primary	3	2	1	60	1947	2012	5818	2012	10/06/2021	A	7	7	7	7	7	N	7	N	7	6	G		97.6	3	7
Timber – Slab	202	03200072000B010	21ST STREET	PINE CREEK	Primary	7	1	2	40	1968		1565	2003	09/20/2021	A	6	6	6	5	5	N	6	N	N	N	F		71.7	N	5
Steel – Culvert	203	03200074000B010	20TH STREET	MILLER CREEK	Primary	3	19	2	22.5	1968		1327	2003	10/05/2021	A	N		N	N	6	6					F		92.5		8
Steel – Culvert	204	03200075000B010	16TH STREET	MILLER CREEK	Primary	3	19	2	27.6	1978		178	2003	02/16/2022	P	N		N	N	6	2					P	Struct Def	40.8		8
Steel – Multistringer	205	03200078000B010	18TH STREET	RABBIT RIVER	Primary	3	2	1	46	1929		2216	2019	10/13/2021	P	6	6	6	5	5	N	7	6	N	N	F	Funct Obs	40.8	2	3
Prestressed concrete – Multistringer	206	03200083000B010	10TH STREET	GUN RIVER	Primary	5	2	2	70	1927	1995	2832	2016	09/02/2021	A	8	8	7	7	6	N	8	N	6	6	G		99.2	N	5
Prestressed concrete – Box beam/girders—multiple	207	03200085000B010	2ND STREET	GUN RIVER	Primary	5	5	1	55.8	1981		296	2003	09/02/2021	P	6	N	6	6	6	N	8	N	N	N	F		88.3	N	3
Prestressed concrete – Box beam/girders—single/sprea	208	03200086000B010	2ND STREET	GUN RIVER	Primary	5	6	1	82	2012		580	2010	09/02/2021	A	7	7	7	7	8	N	7	N	6	N	G		99.9	N	5
Prestressed concrete – Box beam/girders—single/sprea	209	03200086000B020	2ND STREET	GUN RIVER	Primary	5	6	1	70	2014		1230	2013	09/02/2021	A	7	7	7	7	8	N	7	N	6	N	G		99.4	N	5
Prestressed concrete – Box beam/girders—multiple	210	03200087000R010	10TH STREET	CONSOLIDATED RAIL CORP	Primary	5	5	3	150.5	1939	2006	2222	2016	09/02/2021	A	7	N	6	7	N	N	8	N	7	6	F	Funct Obs	94.9	N	N
Concrete – Tee beam	211	03200088000B010	DIVISION STREET	RABBIT RIVER	Primary	1	4	1	32.7	1940		3443	2013	10/05/2021	A	6	6	5	7	6	N	6	N	N	N	F		86.7	N	U
Steel – Culvert	212	03302H00013B010	107TH AVE	SCOTT CREEK	Secondary	3	19	2	21.8	1974		193	2002	04/21/2022	P	N		N	N	5	3					P	Struct Def			8
Steel – Culvert	213	03302H00030B010	63RD STREET	SPICEBUSH CREEK	Secondary	3	19	2	25.3	1973		32	2002	04/21/2022	P	N		N	N	6	3					P	Struct Def			8
Prestressed concrete – Box beam/girders—multiple	214	03302A00005B010	65TH STREET	M BR BLACK RIVER	Secondary	5	5	2	84	1982		34	2017	05/13/2021	A	7	N	8	6	6	N	8	N	7	N	F		100	N	5
Prestressed concrete – Box beam/girders—multiple	215	03302A00007B010	104TH AVE	M BR BLACK RIVER	Secondary	5	5	2	82	1983		63	2020	05/13/2021	A	7	N	8	6	6	N	9	N	9	N	F		97	N	5
Timber – Slab	216	03302A00012B010	107TH AVE	N BR BLACK RIVER	Secondary	7	1	2	51.8	1968		284	2002	05/13/2021	P	5	5	5	5	5	N	6	N	N	N	F		65.6	N	5
Prestressed concrete – Box beam/girders—multiple	217	03302A00018B010	111TH AVE	N BR OF BLACK RIVER	Secondary	5	5	1	59.7	1987		64	2002	05/13/2021	P	7	N	8	7	6	N	7	N	N	N	G		95.5	N	3
Timber – Slab	218	03302A00023B010	70TH STREET	M BR BLACK RIVER	Secondary	7	1	4	104	1971		277	2020	05/13/2021	P	5	5	5	4	6	N	6	N	N	N	P	Struct Def	60.6	N	5
Prestressed concrete – Box beam/girders—multiple	219	03302A00024B010	68TH STREET	M BR BLACK RIVER	Secondary	5	5	2	84	1982		78	2016	05/13/2021	A	8	N	8	6	6	N	8	N	7	N	F		100	N	5
Timber – Slab	220	03302A00024B020	68TH STREET	N BR OF BLACK RIVER	Secondary	7	1	2	51.8	1968		273	2002	05/13/2021	P	6	6	6	4	6	N	6	N	N	N	P	Struct Def	58.1	N	5
Prestressed concrete – Box beam/girders—multiple	221	03302A00027B010	66TH STREET	N BR BLACK RIVER	Secondary	5	5	2	63.1	1973		396	2017	05/13/2021	A	7	N	6	6	6	N	8	N	8	N	F		99.9	N	5
Prestressed concrete – Box beam/girders—multiple	222	03302A00030B020	63RD STREET	M BR BLACK RIVER	Secondary	5	5	2	73	1987		31	2020	04/06/2021	A	7	N	7	6	6	N	6	N	7	N	F		95	N	5
Prestressed concrete – Box beam/girders—multiple	223	03302A00033B010	62ND STREET	M BR BLACK RIVER	Secondary	5	5	2	100	1980		353	2017	04/06/2021	P	8	N	8	6	7	N	8	N	7	N	F		97.8	N	5
Timber – Slab	224	03303H00014B010	107TH AVE	SWAN CREEK	Secondary	7	1	1	32	1974		55	2020	04/21/2022	P	4	4	4	4	6	N	7	N	N	N	P	Struct Def		N	5
Prestressed concrete – Box beam/girders—multiple	225	03303H00014B020	48TH STREET	SWAN CREEK	Secondary	5	5	1	50	1983		85	2016	04/27/2021	A	8	N	8	8	6	N	7	N	N	N	G		98.5	N	5
Prestressed concrete – Box beam/girders—multiple	226	03303H00018B010	110TH AVENUE	SWAN CREEK	Secondary	5	5	1	44.9	2003		40	2003	04/27/2021	A	7	N	7	8	5	N	6	N	N	N	G		100	N	5
Timber – Slab	227	03303H00024B010	44TH STREET	SWAN CREEK	Secondary	7	1	1	31.8	1969		392	2002	04/27/2021	P	5	5	6	6	6	N	6	N	N	N	F		81.8	N	5
Prestressed concrete – Box beam/girders—multiple	228	03304H00008B010	120TH AVENUE	LEVERIDGE DRAIN	Secondary	5	5	1	35.8	1993		53	2002	05/25/2021	A	7	N	6	6	7	N	6	N	N	N	F		95	N	5
Prestressed concrete – Box beam/girders—multiple	229	03305H00001B010	136TH AVENUE	RABBIT RIVER	Secondary	5	5	1	90	1993		170	2020	05/17/2021	A	8	N	7	6	7	N	9	N	N	N	F		95	N	5
Timber – Slab	230	03305H00002B010	136TH AVE	RABBIT RIVER	Secondary	7	1	2	40	1971		112	2002	04/16/2021	A	6	6	6	6	5	N	5	N	N	N	F		92	N	5
Steel – Culvert	231	03305H00006B010	140TH AVE	RED RUN DRAIN	Secondary	3	19	2	25.5	1974		279	2002	04/16/2021	A	N		N	N	5	6					F		98.9		4
Steel – Culvert	232	03305H00006B020	140TH AVE	RED RUN DRAIN	Secondary	3	19	2	30.6	1974		279	2002	04/21/2022	P	N		N	N	6	2					P	Struct Def			8
Steel – Culvert	233	03305H00008B010	144TH AVE	LITTLE RABBIT RIVER	Secondary	3	19	2	28.9	1973		147	2002	04/21/2022	P	N		N	N	5	2					P	Struct Def			8
Prestressed concrete – Box beam/girders—multiple	234	03305H00010B010	24TH STREET	LITTLE RABBIT RIVER	Secondary	5	5	1	38	1980		189	2017	04/23/2021	A	8	N	8	7	6	N	7	N	N	N	G		99.9	N	5
Prestressed concrete – Box beam/girders—multiple	235	03305H00011B010	23RD STREET	LITTLE RABBIT RIVER DRN	Secondary	5	5	1	50	2006		87	2005	04/23/2021	A	6	N	6	8	6	N	6	N	N	6	F		100	N	5
Prestressed concrete – Box beam/girders—multiple	236	03305H00013B010	22ND STREET	LITTLE RABBIT RIVER	Secondary	5	5	1	52	1983		257	2017	04/23/2021	A	8	N	8	6	5	N	7	N	N	N	F		99.8	N	5
Steel – Culvert	237	03305H00014B010	21ST STREET	RED RUN DRAIN	Secondary	3	19	2	26.8	1971		209	2002	04/23/2021	A	N		N	N	6	5					F		80.6		8
Steel – Culvert	238	03305H00014B020	21ST STREET	LITTLE RABBIT RIVER	Secondary	3	19	2	30.6	1973		168	2002	04/21/2022	P	N		N	N	5	3					P	Struct Def			8
Steel – Culvert	239	03305H00016B010	20TH STREET	RED RUN DRAIN	Secondary	3	19	2	24.9	1972		245	2002	04/21/2022	A	N		N	N	5	4					P	Struct Def			8
Steel – Culvert	240	03305H00019B010	16TH STREET	RED RUN DRAIN	Secondary	3	19	2	30.8	1974		436	2002	04/21/2022	P	N		N	N	3	3					P	Struct Def			8
Steel – Culvert	241	03306H00019B010	144TH AVE	S BR MACATAWA RIVER	Secondary	3	19	2	36.3	1984		147	2002	05/25/2021	A	N		N	N	5	4					P	Struct Def	46.7		8
Steel – Culvert	242	03306H00019B020	144TH AVE	ESKES DRAIN	Secondary	3	19	3	40	1973		286	2002	05/25/2021	A	N		N	N	5	5					F		66.9		8
Steel – Culvert	243	03306H00021B010	RUSSCHER ROAD	S BR MACATAWA RIVER	Secondary	3	19	2	35.3	1981		141	2002	05/25/2021	A	N		N	N	5	3					P	Struct Def	40.8		8
Prestressed concrete – Box beam/girders—multiple	244	03306H00022B010	147TH AVE	N BR MACATAWA RIVER	Secondary	5	5	1	40	1990		896	2013	05/25/2021	A	8	N	7	4	4	N	8	N	N	N	P	Struct Def	67.3	N	3
Steel – Culvert	245	03306H00033B010	50TH STREET	S BR MACATAWA RIVER	Secondary	3	19	2	40.3	1991		223	2002	05/25/2021	A	N		N	N	5	6					F		97.2		8
Steel – Culvert	246	03307H00003B010	116TH AVE	LEVERIDGE DRAIN	Secondary	3	19	2	28.9	1973		125	2002	11/05/2021	P	N		N	N	6	2					P	Struct Def	40.9		8
Steel – Culvert	247	03307H00017B010	62ND STREET	LEVERIDGE DRAIN	Secondary	3	19	2	32.6	1972		754	2002	05/25/2021	A	N		N	N	6	4					P	Struct Def	59.4		8
Prestressed concrete – Box beam/girders—multiple	248	03308H00008B010	107TH AVENUE	GUN RIVER	Secondary	5	5	1	60	1982		200	2002	04/05/2021	A	7	N	7	8	6	N	6	N	N	N	G		96	N	3
Steel – Multistringer	249	03308H00015B010	110TH AVE	GUN RIVER	Secondary	3	2	1	66.9	1972		125	2002	04/05/2021	A	5	6	7	8	6	N	5	N	N	N	F		96	3	5
Prestressed concrete – Multistringer	250	03308H00016B010	11TH STREET	GUN RIVER	Secondary	5	2	1	64	1958		1073	2002	04/05/2021	A	7	8	7	6	6	N	6	N	N	4	F		82.6	N	3
Prestressed concrete – Box beam/girders—multiple	251	03308H00019B010	9TH STREET	GUN RIVER	Secondary	5	5	1	55.5	1982		268	2013	04/05/2021	A	7	N	7	7	6	N	7	N	N	N	G		99.9	N	3
Prestressed concrete – Box beam/girders—multiple	252	03308H00023B010	7TH STREET	GUN RIVER	Secondary	5	5	1	53.5	1978		250	2013	04/05/2021	A	8	N	8	7	6	N	7	N	N	N	G		99.9	N	3
Concrete continuous – Slab	253	03310H00005B010	130TH AVENUE	RABBIT RIVER	Secondary	2	1	3	85	1978		714	2002	05/17/2021	A	6	6	6	8	6	N	5	N	N	N	F		91.9	N	5
Timber – Slab	254	03310H00005B020	130TH AVE	RABBIT RIVER	Secondary	7	1	3	77.8	1971		682	2002	05/17/2021	P	3	3	3	5	6	N	5	N	N	N	P	Struct Def	29.4	N	5
Prestressed concrete – Box beam/girders—multiple	256	03310H00008B020	132ND AVENUE	RABBIT RIVER	Secondary	5	5	1	91.9	2001		67	2002	05/17/2021	A	6	N	6	7	5	N	6	N	N	N	F		100	N	5
Prestressed concrete – Box beam/girders—multiple	257	03310H00009B010	133RD AVENUE	RABBIT RIVER	Secondary	5	5	1	87.9	1996		63	2002	05/17/2021	A	8	N	7	8	7	N	7	N	N	N	G		95	N	5
Prestressed concrete – Box beam/girders—multiple	258	03310H00016B010	22ND STREET	RABBIT RIVER	Secondary	5	5	2	103	1980		396	2017	05/17/2021	P	7	N	6	6	5	N	8	N	7	N	F		95.8	N	5
Steel – Culvert	259	03310H00019B010	19TH STREET	MILLER CREEK	Secondary	3	19	2	28.9	1974		93	2002	05/12/2021	A	N		N	N	6	6					F		70.7		8
Steel – Culvert	260	03310H00022B010	16TH STREET	PIERCE DRAIN	Secondary	3	19	2	22.2	1974		270	2002	05/12/2021	A	N		N	N	5	3					P	Struct Def	54.9		8
Prestressed concrete – Box beam/girders—multiple	261	03310H00022B020	16TH STREET	RABBIT RIVER	Secondary	5	5	1	47	1982		120	2015	05/17/2021	A	8	N	8	7	6	N	7	N	N	N	G		100	N	3
Steel – Culvert	262	03310H00023B010	15TH STREET	MILLER CREEK	Secondary	3	19	2	22.7	1973		70	2002	05/12/2021	A	N		N	N	6	6					F		68.3		8
Steel – Culvert	263	03310H00024B010	14TH STREET	MILLER CREEK	Secondary	3	19	2	21.7	1969		100	2002	05/12/2021	A	N		N	N	6	4					P	Struct Def	47.4		8
Prestressed concrete – Box beam/girders—multiple	264	03310H00025B020	14TH STREET	RABBIT RIVER	Secondary	5	5	1	60.7	1999		208	2002	04/16/2021	A	7	N	7	7	6	N	7	N	N	N	G		99.9	N	5
Concrete – Culvert	265	03311H00044B010	61ST STREET	KUIPERS DRAIN	Secondary	1	19	2	38.3	2004		116	2005	05/25/2021	A	N		N	N	5	6					F		99		8

Appendix A-3

APPENDIX A-3

Inventory Data														Inspection Findings												Appraisal				
Bridge Type	Structure Number	Bridge ID	Facility Carried	Features Intersected	Primary or Secondary Route	Structure Type Main Span (Item 43A - Material)	Structure Type Main Span (Item 43B)	Number of Main Span (Item 45)	Total Str Length (Item 49)	Year Built (Item 27)	Year Reconstr (Item 106)	ADT	Year of ADT	Inspection Date	Operational Status (Item 41)	Deck Rating (Item 58)	Deck Bottom Rating (Item XX)	SuperStr Rating (Item 59)	Substr Rating (Item 60)	Channel Rating (Item 61)	Culvert Rating (Item 62)	Surface Rating (Item 58A)	Paint Rtg	Exp Joint Rating (Item XX)	Other Joints	Structure Evaluation	Structurally Deficient	Sufficiency Rating	Section Loss	Scour Critical (Item 113)
Prestressed concrete – Box beam/girders—multiple	**266**	03312H00023B010	58TH STREET	M BR BLACK RIVER	Secondary	5	5	2	69	1978		372	2015	04/06/2021	A	8	N	8	7	7	N	7	N	6	N	G		99.9	N	5
Timber – Slab	**267**	03312H00026B010	55TH STREET	SCOTT CREEK	Secondary	7	1	1	21	1979		538	2020	04/27/2021	A	6	6	6	6	6	N	5	N	N	N	F		89.2	N	5
Prestressed concrete – Box beam/girders—multiple	**268**	03312H00028B010	54TH STREET	M BR BLACK RIVER	Secondary	5	5	1	46	2004		140	2020	04/06/2021	A	7	N	7	8	7	N	6	N	N	N	G		100	N	5
Concrete – Culvert	**269**	03312H00031B010	51ST STREET	M BR BLACK RIVER	Secondary	1	19	1	41.9	2017		100	2017	04/06/2021	A	N		N	N	7	8					G		100		5
Steel – Culvert	**271**	03313H00006B010	138TH AVENUE	RABBIT RIVER	Secondary	3	19	2	34.8	1983		82	2002	04/16/2021	A	N		N	N	6	6					F		69.3		8
Timber – Slab	**272**	03313H00022B010	12TH STREET	RABBIT RIVER	Secondary	7	1	2	40	1969		380	2020	04/16/2021	A	6	6	6	5	5	N	4	N	N	N	F		78.4	N	5
Prestressed concrete – Box beam/girders—single/spread	**273**	03313H00024B010	10TH STREET	RABBIT RIVER DRAIN	Secondary	5	6	1	45	2009		1271	2007	04/16/2021	A	7	7	8	8	6	N	7	N	7	N	G		99.7	N	5
Prestressed concrete – Box beam/girders—multiple	**274**	03314H00014B020	133RD AVENUE	RABBIT RIVER	Secondary	5	5	2	142	2013		500	2013	05/25/2021	A	8	N	8	8	7	N	7	N	7	8	G		99.6	N	5
Concrete – Culvert	**276**	03315H00004B010	114TH AVENUE	GUN RIVER DRAIN	Secondary	1	19	1	24	1995		26	2002	04/05/2021	A	N		N	N	7	6					F		100		8
Steel – Culvert	**277**	03315H00009B010	118TH AVE	GUN RIVER	Secondary	3	19	2	32.8	1977		274	2002	04/05/2021	A	N		N	N	6	5					F		73		8
Prestressed concrete – Box beam/girders—multiple	**278**	03315H00013B010	120TH AVENUE	GUN RIVER DRAIN EXT	Secondary	5	5	1	80	2004		120	2020	04/05/2021	A	7	N	7	8	6	N	6	N	N	N	G		100	N	5
Steel – Culvert	**279**	03316H00019B010	DUMONT LAKE ROAD	DUMONT CREEK	Secondary	3	19	2	23.3	1986		270	2002	04/27/2021	A	N		N	N	7	7					G		98.9		8
Steel – Culvert	**280**	03317H00023B010	24TH STREET	PINE CREEK	Secondary	3	19	2	34.8	1979		162	2002	04/26/2021	A	N		N	N	5	5					F		59.9		8
Prestressed concrete – Box beam/girders—multiple	**281**	03317H00028B010	22ND STREET	SCHNABLE BROOK	Secondary	5	5	1	65	2003		130	2020	04/26/2021	A	6	N	6	8	6	N	7	N	N	N	F		100	N	5
Prestressed concrete – Box beam/girders—multiple	**283**	03318H00007B010	139TH AVENUE	BLACK CREEK DRAIN EXTN	Secondary	5	5	1	60	2008		182	2007	05/18/2021	A	7	N	6	8	7	N	7	N	6	N	F		100	N	5
Steel – Culvert	**284**	03318H00010B010	140TH AVE	BLACK CREEK	Secondary	3	19	2	34.8	1974		920	2002	05/27/2021	A	N		N	N	7	6					F		98.8		8
Steel – Culvert	**285**	03318H00013B010	141ST AVENUE	BLACK CREEK	Secondary	3	19	2	34.8	1980		125	2002	05/27/2021	A	N		N	N	5	6					F		69.3		8
Steel – Culvert	**286**	03318H00019B010	147TH AVE	PETERS DRAIN	Secondary	3	19	2	28.2	1987		600	2002	05/27/2021	A	N		N	N	5	5					F		88		8
Steel – Culvert	**287**	03318H00019B020	147TH AVE	OVER A SMALL CREEK	Secondary	3	19	2	27.5	1987		600	2002	05/27/2021	A	N		N	N	6	6					F		98.8		8
Steel – Culvert	**288**	03318H00019B030	147TH AVE	OVER A SMALL CREEK	Secondary	3	19	2	24.1	1984		433	2002	05/27/2021	A	N		N	N	5	6					F		98.9		8
Timber – Slab	**289**	03318H00020B010	OTTOGAN STREET	S BR MACATAWA RIVER	Secondary	7	1	2	40	1969		1580	2020	05/27/2021	A	6	6	6	4	4	N	5	N	N	N	P	Struct Def	53.5	N	5
Steel – Multistringer	**290**	03318H00024B010	47TH STREET	S BR MACATAWA RIVER	Secondary	3	2	1	31.8	1926		36	2002	05/27/2021	K	1	1	4	4	5	N	2	N	N	N	P	Struct Def		1	U
Prestressed concrete – Box beam/girders—multiple	**291**	03318H00027B010	46TH STREET	S BR MACATAWA RIVER	Secondary	5	5	1	41.5	1978		550	2013	05/27/2021	A	7	N	7	4	5	N	7	N	N	N	P	Struct Def	69.7	N	3
Steel – Culvert	**292**	03318H00035B010	43RD STREET	OVER A SMALL CREEK	Secondary	3	19	2	25.5	1988		548	2002	05/27/2021	A	N		N	N	4	6					F		98		8
Steel – Culvert	**293**	03318H00035B020	43RD STREET	UNNAMED CREEK	Secondary	3	19	2	32.2	1992		145	2002	05/27/2021	A	N		N	N	6	7					G		99		8
Steel – Culvert	**294**	03318H00039B010	42ND STREET	UNNAMED CREEK	Secondary	3	19	2	28.7	1991		31	2002	05/27/2021	A	N		N	N	6	7					G		99		8
Steel – Culvert	**295**	03319H00002B010	137TH AVENUE	PIGEON CREEK	Secondary	3	19	2	22	1979		185	2002	05/18/2021	A	N		N	N	6	7					G		98		8
Steel – Multistringer	**296**	03319H00003B010	138TH AVE	PIGEON CREEK	Secondary	3	2	1	27.9	1969		1417	2019	11/05/2021	K	3	3	1	3	5	N	4	3	N	N	P	Struct Def			5
Prestressed concrete – Box beam/girders—multiple	**297**	03319H00005B010	140TH AVE	LITTLE RABBIT RIVER	Secondary	5	5	1	60	1979		396	2020	05/18/2021	P	8	N	7	7	7	N	9	N	N	N	G		96.7	N	5
Steel – Culvert	**298**	03319H00009B010	144TH AVE	SMALL CREEK	Secondary	3	19	2	21	1980		344	2002	04/23/2021	A	N		N	N	5	6					F		98.9		8
Prestressed concrete – Box beam/girders—multiple	**299**	03319H00012B020	36TH STREET	RABBIT RIVER	Secondary	5	5	2	110.9	1987		300	2002	05/18/2021	A	6	N	6	6	6	N	6	N	5	N	F		96.9	N	5
Steel – Culvert	**300**	03319H00013B010	36TH STREET	BLACK CREEK	Secondary	3	19	2	30.8	1974		135	2002	05/27/2021	A	N		N	N	6	5					F		59.3		8
Prestressed concrete – Box beam/girders—multiple	**301**	03319H00015B010	34TH STREET	RABBIT RIVER	Secondary	5	5	2	112	1989		575	2017	05/18/2021	A	7	N	6	6	5	N	8	N	7	N	F		99.7	N	5
Prestressed concrete – Box beam/girders—multiple	**302**	03319H00019B010	32ND STREET	LITTLE RABBIT RIVER	Secondary	5	5	1	99.7	2001		716	2002	05/18/2021	A	7	N	6	8	6	N	7	N	N	N	F		98.6	N	5
Steel – Culvert	**303**	03319H00022B010	28TH STREET	PIGEON CREEK	Secondary	3	19	2	23.2	1971		262	2002	05/18/2021	A	N		N	N	6	5					F		85.9		8
Prestressed concrete – Box beam/girders—multiple	**304**	03319H00027B010	26TH STREET	RABBIT RIVER	Secondary	5	5	2	70	1976		432	2016	05/17/2021	A	7	N	6	6	6	N	8	N	N	N	F		98.8	N	5
Prestressed concrete – Box beam/girders—multiple	**305**	03319H00029B010	26TH STREET	LITTLE RABBIT RIVER	Secondary	5	5	1	37	1978		1015	2016	04/23/2021	A	7	N	7	6	5	N	8	N	N	N	F		92.4	N	3
Timber – Slab	**306**	03321H00029B010	WILLIAMS ROAD	KALAMAZOO RIVER	Secondary	7	1	8	191.9	1968		714	2002	04/21/2022	P	4	4	4	4	5	N	4	N	N	N	P	Struct Def		N	4
Aluminum – Culvert	**307**	03321H00032B010	26TH STREET	BASELINE CREEK	Secondary	9	19	2	29.9	1981		136	2002	04/26/2021	A	N		N	N	5	7					G		95.3		8
Steel – Culvert	**308**	03322H00003B010	115TH AVENUE	SWAN CREEK	Secondary	3	19	2	34.8	1981		40	2002	04/27/2021	A	N		N	N	5	6					F		98		8
Prestressed concrete – Box beam/girders—multiple	**309**	03323H00001B010	112TH AVENUE	MINER CREEK	Secondary	5	5	1	62	2005		176	2002	04/26/2021	A	8	N	8	8	8	N	8	N	N	6	G		99.9	N	5
Timber – Slab	**310**	03323H00002B010	114TH AVE	MINER CREEK DRAIN	Secondary	7	1	1	28.2	1974		300	2020	04/21/2022	P	5	5	5	4	6	N	8	N	N	N	P	Struct Def		N	5
Steel – Culvert	**311**	03324H00022B010	133RD AVENUE	RABBIT RIVER	Secondary	3	19	2	20	1981		122	2002	04/16/2021	A	N		N	N	5	4					P	Struct Def	65.2		8
Steel – Culvert	**312**	03324H00030B010	7TH STREET	RABBIT RIVER	Secondary	3	19	2	21	1971		300	2002	04/16/2021	P	N		N	N	6	4					P	Struct Def	47.2		8
Concrete – Culvert	**13537**	03200044000C010	LAKESHORE DRIVE	PLUMMERS CREEK	Primary	1	19	1	21.6	2009		818	2008	09/16/2021	A	N		N	N	6	8					G		99.6		7
Concrete – Culvert	**13558**	03200009000C010	RIVERVIEW DRIVE	SILVER CREEK	Primary	1	19	1	25.5	2012		2024	2009	09/02/2021	A	N		N	N	5	7					G		99.9		8
Steel – Culvert	**13574**	03318H00020C010	OTTOGAN STREET	PETERS DRAIN EXTENSION	Secondary	3	19	2	23.9	1971	2010	235	2010	05/27/2021	A	N		N	N	4	5					F		85.9		8
Concrete – Culvert	**13583**	03321H00025C010	30TH STREET	BASELINE CREEK	Secondary	1	19	1	21.9	2009		115	2010	04/26/2021	A	N		N	N	6	7					G		90.9		8
Timber – Slab	**13691**	03304H00002B010	60TH STREET	COUNTY DRAIN	Secondary	7	1	1	22	2012		15	2012	05/25/2021	A	8	8	8	8	7	N	6	N	N	N	G		96.5	N	5
Concrete – Culvert	**13749**	03200056000C010	57TH STREET	SEVERENS DRAIN	Primary	1	19	1	22	2013		2985	2012	09/15/2021	A	N		N	N	7	7					G		98.5		8
Timber – Slab	**13841**	03323H00001B020	112TH AVENUE	SCHNABLE BROOK	Secondary	7	1	1	26	2014		50	2014	04/26/2021	A	8	8	8	8	6	N	6	N	N	N	G		91.3	N	5
Timber – Slab	**13842**	03317H00030B010	20TH STREET	SCHNABLE BROOK	Secondary	7	1	1	26	2014		50	2014	04/26/2021	A	8	8	8	8	7	N	6	N	N	N	G		92.3	N	5
Steel – Culvert	**13875**	03310H00005C010	130 AVENUE	BEAR CREEK	Secondary	3	19	2	39.8	1977		714	2002	05/17/2021	A	N		N	N	7	6					F		98.9		8
Steel – Culvert	**13947**	03302A00034C010	62ND STREET	SPICEBUSH CREEK	Secondary	3	19	2	25.3	1975		353	2002	04/06/2021	A	N		N	N	6	5					F		87.9		8
Steel – Culvert	**13992**	03200053000C010	60TH STREET	KUIPERS DRAIN	Primary	3	19	2	22.4	1984		1845	2014	10/06/2021	A	N		N	N	6	4					P	Struct Def	71.6		8
Steel – Culvert	**13993**	03311H00015C010	142ND AVE	KUIPERS DRAIN	Secondary	3	19	2	28.3	1996		50	2015	05/25/2021	A	N		N	N	5	5					F		76.4		8
Steel – Culvert	**14334**	03200078000C010	18TH ST	RED RUN DRAIN	Primary	3	19	2	25.4	1970		7600	2011	10/05/2021	A	N		N	N	6	3					P	Struct Def	52.6		8
Steel – Culvert	**14480**	03306H00008C010	140TH AVE	KLEINHEKSEL DRAIN	Secondary	3	19	2	23	1970		554	2021	07/28/2021	A	N		N	N	5	5					F		88		8

Appendix A-4

APPENDIX A-4

Inventory Data											Replacement				Rehabilitation											Proposed Preventive Maintenance									Proposed Scheduled Maintenance														
Bridge Type	Structure Number	Bridge ID	Facility Carried	Features Intersected	Structure Type Main Span (Item 43A - Material)	Structure Type Main Span (Item 43B)	Number of Main Span (Item 45)	Total Str Length (Item 49)	Total Str Width (Item 52)	Total Str (sq ft)	Total	Super-structure	Deck	Sub-structure	Deep Overlay	Shallow Overlay	HMA Overlay w/ Membrane	HMA Cap	Replace/Retrofit Railing	Steel Beam Repairs	P/S Conc Beam Repairs	Repair/Replace Culvert	Repair/Replace Retaining Wall	Geometric Upgrades	Patch Substruct Concrete	Repair/Replace Deck	Repair/Replace Steel Bearings	Complete Painting	Zone Painting	Epoxy Overlays	HMA Cap w/o Membrane	Concrete Deck Patching	Channel Improvements	Scour Counter Measures	Superstruc Washing	Concrete Surface Washing	Vegetation Control	Debris Removal	Clean Drainage System	Spot Painting	Repair/Replace HMA Surface	Seal HMA Cracks/Joints	Seal Concrete Cracks/Joints	Minor Concrete Patching	Timber Repairs	Repair/Replace Guardrails	Repave Approaches	Repair Slopes	Install RipRap
Timber – Slab	167	03200002000B010	103RD AVE	N BR OF BLACK RIVER	7	1	2	48	30	1440																																							
Prestressed concrete – Box beam/girders—multiple	168	03200004000B010	103RD AVE	M BR BLACK RIVER	5	5	1	28	33.4	935							x		x		x																									x		x	
Steel – Culvert	169	03200008000B010	JEFFERSON ROAD	PINE CREEK	3	19	2	43	44	1892																																							
Prestressed concrete – Box beam/girders—multiple	170	03200010000B010	109 TH AVE	N BR OF BLACK RIVER	5	5	2	66	33.4	2204																																							
Prestressed concrete – Box beam/girders—multiple	171	03200010000B020	109TH AVE	SWAN CREEK	5	5	1	36	33.4	1202																																							
Prestressed concrete – Box beam/girders—multiple	172	03200012000B010	106TH AVE	GUN RIVER	5	5	2	69.9	33.1	2314																																							
Prestressed concrete – Box beam/girders—multiple	173	03200015000B010	113TH AVE	N BR OF BLACK RIVER	5	5	1	68	37.8	2570																				x													x						
Timber – Culvert	174	03200016000B010	112TH AVE	SWAN CREEK	7	19	4	25.2	50	1260																																							
Prestressed concrete – Box beam/girders—multiple	175	03200017000B010	112TH AVE	GUN RIVER	5	5	1	48.9	33.1	1619																																							
Prestressed concrete – Box beam/girders—multiple	176	03200018000B010	118TH AVE	LEVERIDGE DRAIN	5	5	1	33.8	33.1	1119																																							
Concrete – Girder and floorbeam	177	03200018000B020	118TH AVE	SWAN CREEK	1	3	1	49.9	29.2	1457																																							
Concrete – Culvert	178	03200020000B010	116TH AVE	GUN RIVER	1	19	1	43	56.1	2412																																							
Timber – Slab	179	03200027000B010	RIVERSIDE ROAD	ORCHARD CREEK	7	1	2	40	29.9	1196																																							
Steel – Culvert	180	03200029000B010	128TH AVE	MILLER CREEK	3	19	2	28.5		969																																							
Prestressed concrete – Box beam/girders—single/spread	181	03200035000B010	135TH AVE	RABBIT RIVER	5	6	1	79	42.7	3373																																							
Steel – Culvert	182	03200035000B020	135TH AVE	RABBIT RIVER	3	19	2	50		1800																																							
Concrete – Culvert	183	03200037000B010	141ST AVE	KLEINHEKSEL DRAIN	1	19	1	30	50	1500																																							
Concrete – Culvert	184	03200037000B020	FILLMORE ROAD	EAST FILLMORE DRAIN	1	19	1	36	50	1800																																							
Steel – Culvert	185	03200037000B030	142ND AVE	BLACK CREEK DRAIN	3	19	2	33.5		1106																																							
Steel – Multistringer	186	03200037000B040	142ND AVE	LITTLE RABBIT RIVER	3	2	1	68.3	33	2254																																							
Steel – Culvert	187	03200037000B050	142ND AVE	RED RUN DRAIN	3	19	2	24.9		849																																							
Prestressed concrete – Box beam/girders—multiple	188	03200039000B010	146TH AVE	N BR MACATAWA RIVER	5	5	1	35.8	33.5	1199							x																													x	x		
Steel – Culvert	189	03200039000B020	146TH AVE	S BR MACATAWA RIVER	3	19	3	37.5		1275	x																																						
Steel – Multistringer	190	03200045000B010	66TH STREET	M BR BLACK RIVER	3	2	1	65	29.4	1911	x																																						
Steel – Culvert	191	03200047000B010	64TH STREET	N BR OF BLACK RIVER	3	19	2	31		744																																							
Prestressed concrete – Box beam/girders—multiple	192	03200054000B010	60TH STREET	M BR BLACK RIVER	5	5	1	60.5	33.5	2027																																							
Prestressed concrete – Multistringer	193	03200055000B010	56TH STREET	M BR BLACK RIVER	5	2	1	50	42.9	2145																																							
Prestressed concrete – Box beam/girders—single/spread	194	03200057000B010	58TH STREET	KALAMAZOO RIVER	5	6	5	321	36.4	11684																				x																			
Prestressed concrete – Multistringer	195	03200059000B010	48TH STREET	S BR MACATAWA RIVER	5	2	1	65	42	2730																				x																			
Prestressed concrete – Box beam/girders—multiple	196	03200060000B010	46TH STREET	SWAN CREEK	5	5	1	36	37.4	1346																																							
Steel – Multistringer	197	03200066000B010	38TH STREET	RABBIT RIVER	3	2	2	117.6	33	3881																				x													x						x
Timber – Slab	198	03200068000B010	28TH STREET	BASELINE CREEK	7	1	1	24	29.7	713																															x						x		
Prestressed concrete – Multistringer	199	03200069000B010	26TH STREET	KALAMAZOO RIVER	5	2	4	209	37.3	7796																				x													x						
Prestressed concrete – Multistringer	200	26TH STREET	KALAMAZOO RIVER	RABBIT RIVER	5	2	1	100	42.9	4290																				x													x						
Steel – Multistringer	201	03200071000B020	30TH STREET	LITTLE RABBIT RIVER	3	2	1	60	42.3	2538																				x													x						
Timber – Slab	202	03200072000B010	21ST STREET	PINE CREEK	7	1	2	40	29.9	1196									x																						x					x	x	x	
Steel – Culvert	203	03200074000B010	20TH STREET	MILLER CREEK	3	19	2	22.5		900																																							
Steel – Culvert	204	03200075000B010	16TH STREET	MILLER CREEK	3	19	2	27.6		718	x																																						
Steel – Multistringer	205	03200078000B010	18TH STREET	RABBIT RIVER	3	2	1	46	28.5	1311	x																																						
Prestressed concrete – Multistringer	206	03200083000B010	10TH STREET	GUN RIVER	5	2	2	70	42.3	2961																																							
Prestressed concrete – Box beam/girders—multiple	207	03200085000B010	2ND STREET	GUN RIVER	5	5	1	55.8	34.1	1903																																							
Prestressed concrete – Box beam/girders—single/spread	208	03200086000B010	2ND STREET	GUN RIVER	5	6	1	82	36.1	2960																				x													x						
Prestressed concrete – Box beam/girders—single/spread	209	03200086000B020	2ND STREET	GUN RIVER	5	6	1	70	42.2	2954																				x													x						
Prestressed concrete – Box beam/girders—multiple	210	03200087000R010	10TH STREET	CONSOLIDATED RAIL CORP	5	5	3	150.5	43.8	6592																																							
Concrete – Tee beam	211	03200088000B010	DIVISION STREET	RABBIT RIVER	1	4	1	32.7	38.3	1252																																							
Steel – Culvert	212	03302H00013B010	107TH AVE	SCOTT CREEK	3	19	2	21.8		414																																							
Steel – Culvert	213	03302H00030B010	63RD STREET	SPICEBUSH CREEK	3	19	2	25.3		557																																							
Prestressed concrete – Box beam/girders—multiple	214	03302A00005B010	65TH STREET	M BR BLACK RIVER	5	5	2	84	31.1	2612																																							
Prestressed concrete – Box beam/girders—multiple	215	03302A00007B010	104TH AVE	M BR BLACK RIVER	5	5	2	82	31	2542																																							
Timber – Slab	216	03302A00012B010	107TH AVE	N BR BLACK RIVER	7	1	2	51.8	29.2	1513																																							
Prestressed concrete – Box beam/girders—multiple	217	03302A00018B010	111TH AVE	N BR OF BLACK RIVER	5	5	1	59.7	31	1851																																							
Timber – Slab	218	03302A00023B010	70TH STREET	M BR BLACK RIVER	7	1	4	104	29.5	3068																																							
Prestressed concrete – Box beam/girders—multiple	219	03302A00024B010	68TH STREET	M BR BLACK RIVER	5	5	2	84	31.1	2612																																							
Timber – Slab	220	03302A00024B020	68TH STREET	N BR OF BLACK RIVER	7	1	2	51.8	29.2	1513																																							
Prestressed concrete – Box beam/girders—multiple	221	03302A00027B010	66TH STREET	N BR BLACK RIVER	5	5	2	63.1	30.4	1918																																							
Prestressed concrete – Box beam/girders—multiple	222	03302A00030B020	63RD STREET	M BR BLACK RIVER	5	5	2	73	34.3	2504																																							
Prestressed concrete – Box beam/girders—multiple	223	03302A00033B010	62ND STREET	M BR BLACK RIVER	5	5	2	100	30.4	3040																																							
Timber – Slab	224	03303H00014B010	107TH AVE	SWAN CREEK	7	1	1	32	29.5	944																																							
Prestressed concrete – Box beam/girders—multiple	225	03303H00014B020	48TH STREET	SWAN CREEK	5	5	1	50	31.1	1555																																							
Prestressed concrete – Box beam/girders—multiple	226	03303H00018B010	110TH AVENUE	SWAN CREEK	5	5	1	44.9	31.1	1396																																							
Timber – Slab	227	03303H00024B010	44TH STREET	SWAN CREEK	7	1	1	31.8	29.2	929																																							
Prestressed concrete – Box beam/girders—multiple	228	03304H00008B010	120TH AVENUE	LEVERIDGE DRAIN	5	5	1	35.8	30.8	1103							x																														x		
Prestressed concrete – Box beam/girders—multiple	229	03305H00001B010	136TH AVENUE	RABBIT RIVER	5	5	1	90	31.1	2799																																							
Timber – Slab	230	03305H00002B010	136TH AVE	RABBIT RIVER	7	1	2	40	29.2	1168																																							
Steel – Culvert	231	03305H00006B010	140TH AVE	RED RUN DRAIN	3	19	2	25.5		638																																							
Steel – Culvert	232	03305H00006B020	140TH AVE	RED RUN DRAIN	3	19	2	30.6		734																																							
Steel – Culvert	233	03305H00008B010	144TH AVE	LITTLE RABBIT RIVER	3	19	2	28.9		864																																							
Prestressed concrete – Box beam/girders—multiple	234	03305H00010B010	24TH STREET	LITTLE RABBIT RIVER	5	5	1	38	30.4	1155																																							
Prestressed concrete – Box beam/girders—multiple	235	03305H00011B010	23RD STREET	LITTLE RABBIT RIVER DRN	5	5	1	50	33.1	1655																				x		x											x						
Prestressed concrete – Box beam/girders—multiple	236	03305H00013B010	22ND STREET	LITTLE RABBIT RIVER	5	5	1	52	31.1	1617																																							
Steel – Culvert	237	03305H00014B010	21ST STREET	RED RUN DRAIN	3	19	2	26.8		590																																							
Steel – Culvert	238	03305H00014B020	21ST STREET	LITTLE RABBIT RIVER	3	19	2	30.6		796																																							
Steel – Culvert	239	03305H00016B010	20TH STREET	RED RUN DRAIN	3	19	2	24.9		745																																							
Steel – Culvert	240	03305H00019B010	16TH STREET	RED RUN DRAIN	3	19	2	30.8		770																																							
Steel – Culvert	241	03306H00019B010	144TH AVE	S BR MACATAWA RIVER	3	19	2	36.3		1089																																							
Steel – Culvert	242	03306H00019B020	144TH AVE	ESKES DRAIN	3	19	3	40		1196																																							
Steel – Culvert	243	03306H00021B010	RUSSCHER ROAD	S BR MACATAWA RIVER	3	19	2	35.3		777																																							
Prestressed concrete – Box beam/girders—multiple	244	03306H00022B010	147TH AVE	N BR MACATAWA RIVER	5	5	1	40	31.1	1244																																							
Steel – Culvert	245	03306H00033B010	50TH STREET	S BR MACATAWA RIVER	3	19	2	40.3		927																																							
Steel – Culvert	246	03307H00003B010	116TH AVE	LEVERIDGE DRAIN	3	19	2	28.9		864																																							
Steel – Culvert	247	03307H00017B010	62ND STREET	LEVERIDGE DRAIN	3	19	2	32.6		913																																							
Prestressed concrete – Box beam/girders—multiple	248	03308H00008B010	107TH AVENUE	GUN RIVER	5	5	1	60	31	1860																																							
Steel – Multistringer	249	03308H00015B010	110TH AVE	GUN RIVER	3	2	1	66.9	33	2208					x				x															x												x			
Prestressed concrete – Multistringer	250	03308H00016B010	11TH STREET	GUN RIVER	5	2	1	64	29.2	1869																																							
Prestressed concrete – Box beam/girders—multiple	251	03308H00019B010	9TH STREET	GUN RIVER	5	5	1	55.5	31.1	1726																																							
Prestressed concrete – Box beam/girders—multiple	252	03308H00023B010	7TH STREET	GUN RIVER	5	5	1	53.5	30.4	1626																																							
Concrete continuous – Slab	253	03310H00005B010	130TH AVENUE	RABBIT RIVER	2	1	3	85	30.5	2593						x			x																														
Timber – Slab	254	03310H00005B020	130TH AVE	RABBIT RIVER	7	1	3	77.8	29.2	2272	x																																						
Prestressed concrete – Box beam/girders—multiple	256	03310H00008B020	132ND AVENUE	RABBIT RIVER	5	5	1	91.9	31.2	2867																																							
Prestressed concrete – Box beam/girders—multiple	257	03310H00009B010	133RD AVENUE	RABBIT RIVER	5	5	1	87.9	30	2637																																							
Prestressed concrete – Box beam/girders—multiple	258	03310H00016B010	22ND STREET	RABBIT RIVER	5	5	2	103	30.4	3131																																							
Steel – Culvert	259	03310H00019B010	19TH STREET	MILLER CREEK	3	19	2	28.9		578																																							
Steel – Culvert	260	03310H00022B010	16TH STREET	PIERCE DRAIN	3	19	2	22.2		577																																							
Prestressed concrete – Box beam/girders—multiple	261	03310H00022B020	16TH STREET	RABBIT RIVER	5	5	1	47	30.6	1438																																							
Steel – Culvert	262	03310H00023B010	15TH STREET	MILLER CREEK	3	19	2	22.7		409																																							
Steel – Culvert	263	03310H00024B010	14TH STREET	MILLER CREEK	3	19	2	21.7		434																																							
Prestressed concrete – Box beam/girders—multiple	264	03310H00025B020	14TH STREET	RABBIT RIVER	5	5	1	60.7	31.2	1894																																							
Concrete – Culvert	265	03311H00044B010	61ST STREET	KUIPERS DRAIN	1	19	2	38.3		919																																							
Prestressed concrete – Box beam/girders—multiple	266	03312H00023B010	58TH STREET	M BR BLACK RIVER	5	5	2	69	30.4	2098																																							
Timber – Slab	267	03312H00026B010	55TH STREET	SCOTT CREEK	7	1	1	21	29.5	620																																							
Prestressed concrete – Box beam/girders—multiple	268	03312H00028B010	54TH STREET	M BR BLACK RIVER	5	5	1	46	31.1	1431																																							
Concrete – Culvert	269	03312H00031B010	51ST STREET	M BR BLACK RIVER	1	19	1	41.9	49.2	2061																																							
Steel – Culvert	271	03313H00006B010	138TH AVENUE	RABBIT RIVER	3	19	2	34.8	30	1044																																							
Timber – Slab	272	03313H00022B010	12TH STREET	RABBIT RIVER	7	1	2	40	29.5	1180																																							
Prestressed concrete – Box beam/girders—single/spread	273	03313H00024B010	10TH STREET	RABBIT RIVER DRAIN	5	6	1	45	43	1935																				x													x						
Prestressed concrete – Box beam/girders—multiple	274	03314H00014B020	133RD AVENUE	RABBIT RIVER	5	5	2	142	34.5	4899																																							
Concrete – Culvert	276	03315H00004B010	114TH AVENUE	GUN RIVER DRAIN	1	19	1	24	44	1056																																							
Steel – Culvert	277	03315H00009B010	118TH AVE	GUN RIVER	3	19	2	32.8		981																																							
Prestressed concrete – Box beam/girders—multiple	278	03315H00013B010	120TH AVENUE	GUN RIVER DRAIN EXT	5	5	1	80	31.1	2488																																							
Steel – Culvert	279	03316H00019B010	DUMONT LAKE ROAD	DUMONT CREEK	3	19	2	23.3		652																																							
Steel – Culvert	280	03317H00023B010	24TH STREET	PINE CREEK	3	19	2	34.8		1041																																							
Prestressed concrete – Box beam/girders—multiple	281	03317H00028B010	22ND STREET	SCHNABLE BROOK	5	5	1	65	31	2015																																							
Prestressed concrete – Box beam/girders—multiple	283	03318H00007B010	139TH AVENUE	BLACK CREEK DRAIN EXTN	5	5	1	60	31.5	1890																				x													x						
Steel – Culvert	284	03318H00010B010	140TH AVE	BLACK CREEK	3	19	2	34.8		1041																																							
Steel – Culvert	285	03318H00013B010	141ST AVENUE	BLACK CREEK	3	19	2	34.8		1041																																							
Steel – Culvert	286	03318H00019B010	147TH AVE	PETERS DRAIN	3	19	2	28.2		790																																							
Steel – Culvert	287	03318H00019B020	147TH AVE	OVER A SMALL CREEK	3	19	2	27.5		798																																							
Steel – Culvert	288	03318H00019B030	147TH AVE	OVER A SMALL CREEK	3	19	2	24.1		699																																							
Timber – Slab	289	03318H00020B010	OTTOGAN STREET	S BR MACATAWA RIVER	7	1	2	40	29.5	1180																																							
Steel – Multistringer	290	03318H00024B010	47TH STREET	S BR MACATAWA RIVER	3	2	1	31.8	14	445																																							
Prestressed concrete – Box beam/girders—multiple	291	03318H00027B010	46TH STREET	S BR MACATAWA RIVER	5	5	1	41.5	30.4	1262																																							
Steel – Culvert	292	03318H00035B010	43RD STREET	OVER A SMALL CREEK	3	19	2	25.5		587																																							
Steel – Culvert	293	03318H00035B020	43RD STREET	UNNAMED CREEK	3	19	2	32.2		902																																							
Steel – Culvert	294	03318H00039B010	42ND STREET	UNNAMED CREEK	3	19	2	28.7		918																																							
Steel – Culvert	295	03319H00002B010	137TH AVENUE	PIGEON CREEK	3	19	2	22		658																																							
Steel – Multistringer	296	03319H00003B010	138TH AVE	PIGEON CREEK	3	2	1	27.9	27.9	778	x																																						
Prestressed concrete – Box beam/girders—multiple	297	03319H00005B010	140TH AVE	LITTLE RABBIT RIVER	5	5	1	60	30.4	1824																																							
Steel – Culvert	298	03319H00009B010	144TH AVE	SMALL CREEK	3	19	2	21		588																																							
Prestressed concrete – Box beam/girders—multiple	299	03319H00012B020	36TH STREET	RABBIT RIVER	5	5	2	110.9	31	3438							x		x																														
Steel – Culvert	300	03319H00013B010	36TH STREET	BLACK CREEK	3	19	2	30.8		921																																							
Prestressed concrete – Box beam/girders—multiple	301	03319H00015B010	34TH STREET	RABBIT RIVER	5	5	2	112	31.1	3483																																							
Prestressed concrete – Box beam/girders—multiple	302	03319H00019B010	32ND STREET	LITTLE RABBIT RIVER	5	5	1	99.7	37.4	3729																																							
Steel – Culvert	303	03319H00022B010	28TH STREET	PIGEON CREEK	3	19	2	23.2		650																																							
Prestressed concrete – Box beam/girders—multiple	304	03319H00027B010	26TH STREET	RABBIT RIVER	5	5	2	70	30.4	2128																																							
Prestressed concrete – Box beam/girders—multiple	305	03319H00029B010	26TH STREET	LITTLE RABBIT RIVER	5	5	1	37	30.4	1125																																							
Timber – Slab	306	03321H00029B010	WILLIAMS ROAD	KALAMAZOO RIVER	7	1	8	191.9	27.2	5220																																							
Aluminum – Culvert	307	03321H00032B010	26TH STREET	BASELINE CREEK	9	19	2	29.9	30	897																																							
Steel – Culvert	308	03322H00003B010	115TH AVENUE	SWAN CREEK	3	19	2	34.8		1041																																							
Prestressed concrete – Box beam/girders—multiple	309	03323H00001B010	112TH AVENUE	MINER CREEK	5	5	1	62	34.5	2139																																							
Timber – Slab	310	03323H00002B010	114TH AVE	MINER CREEK DRAIN	7	1	1	28.2	29.4	829																																							
Steel – Culvert	311	03324H00022B010	133RD AVENUE	RABBIT RIVER	3	19	2	20		598																																							
Steel – Culvert	312	03324H00030B010	7TH STREET	RABBIT RIVER	3	19	2	21		628																																							
Concrete – Culvert	13537	03200044000C010	LAKESHORE DRIVE	PLUMMERS CREEK	1	19	1	21.6	51.9	1121																																							
Concrete – Culvert	13558	03200009000C010	RIVERVIEW DRIVE	SILVER CREEK	1	19	1	25.5	65	1658																																							
Steel – Culvert	13574	03318H00020C010	OTTOGAN STREET	PETERS DRAIN EXTENSION	3	19	2	23.9		550																																							
Concrete – Culvert	13583	03321H00025C010	30TH STREET	BASELINE CREEK	1	19	1	21.9		438																																							
Timber – Slab	13691	03304H00002B010	60TH STREET	COUNTY DRAIN	7	1	1	22	33.3	733																																							
Concrete – Culvert	13749	03200056000C010	57TH STREET	SEVERENS DRAIN	1	19	1	22	46.2	1016																																							
Timber – Slab	13841	03323H00001B020	112TH AVENUE	SCHNABLE BROOK	7	1	1	26	33.3	866																																							
Timber – Slab	13842	03317H00030B010	20TH STREET	SCHNABLE BROOK	7	1	1	26	33.3	866																																							

Appendix A-4

APPENDIX A-4

Inventory Data											Replacement				Rehabilitation											Proposed Preventive Maintenance									Proposed Scheduled Maintenance														
Bridge Type	Structure Number	Bridge ID	Facility Carried	Features Intersected	Structure Type Main Span (Item 43A - Material)	Structure Type Main Span (Item 43B)	Number of Main Span (Item 45)	Total Str Length (Item 49)	Total Str Width (Item 52)	Total Str (sq ft)	Total	Super-structure	Deck	Sub-structure	Deep Overlay	Shallow Overlay	HMA Overlay w/ Membrane	HMA Cap	Replace/Retrofit Railing	Steel Beam Repairs	P/S Conc Beam Repairs	Repair/Replace Culvert	Repair/Replace Retaining Wall	Geometric Upgrades	Patch Substruct Concrete	Repair/Replace Deck	Repair/Replace Steel Bearings	Complete Painting	Zone Painting	Epoxy Overlays	HMA Cap w/o Membrane	Concrete Deck Patching	Channel Improvements	Scour Counter Measures	Superstruc Washing	Concrete Surface Washing	Vegetation Control	Debris Removal	Clean Drainage System	Spot Painting	Repair/Replace HMA Surface	Seal HMA Cracks/Joints	Seal Concrete Cracks/Joints	Minor Concrete Patching	Timber Repairs	Repair/Replace Guardrails	Repave Approaches	Repair Slopes	Install RipRap
Steel – Culvert	**13875**	03310H00005C010	130 AVENUE	BEAR CREEK	3	19	2	39.8		955																																							
Steel – Culvert	**13947**	03302A00034C010	62ND STREET	SPICEBUSH CREEK	3	19	2	25.3		506																																							
Steel – Culvert	**13992**	03200053000C010	60TH STREET	KUIPERS DRAIN	3	19	2	22.4		717																																							
Steel – Culvert	**13993**	03311H00015C010	142ND AVE	KUIPERS DRAIN	3	19	2	28.3		566																																							
Steel – Culvert	**14334**	03200078000C010	18TH ST	RED RUN DRAIN	3	19	2	25.4		813																																							
Steel – Culvert	**14480**	03306H00008C010	140TH AVE	KLEINHEKSEL DRAIN	3	19	2	23		690																																							

Appendix A-5

APPENDIX A-5

Inventory Data											Inspection Items							
Bridge Type	**Structure Number**	**Bridge ID**	**Facility Carried**	**Features Intersected**	**Structure Type Main Span (Item 43A - Material)**	**Structure Type Main Span (Item 43B)**	**Number of Main Span (Item 45)**	**Total Str Length (Item 49)**	**Total Str Width (Item 52)**	**Total Str (sq ft)**	**Initial Inspection**	**In Depth Steel Inspection**	**Pin and Hanger Inspection**	**Diving Inspection**	**Provide Monitoring**	**Review Scour Criticality**	**Load Rating**	**Update SIA**
Timber – Slab	**167**	03200002000B010	103RD AVE	N BR OF BLACK RIVER	7	1	2	48	30	1440								
Prestressed concrete – Box beam/girders—multiple	**168**	03200004000B010	103RD AVE	M BR BLACK RIVER	5	5	1	28	33.4	935								
Steel – Culvert	**169**	03200008000B010	JEFFERSON ROAD	PINE CREEK	3	19	2	43	44	1892								
Prestressed concrete – Box beam/girders—multiple	**170**	03200010000B010	109 TH AVE	N BR OF BLACK RIVER	5	5	2	66	33.4	2204								
Prestressed concrete – Box beam/girders—multiple	**171**	03200010000B020	109TH AVE	SWAN CREEK	5	5	1	36	33.4	1202								
Prestressed concrete – Box beam/girders—multiple	**172**	03200012000B010	106TH AVE	GUN RIVER	5	5	2	69.9	33.1	2314								
Prestressed concrete – Box beam/girders—multiple	**173**	03200015000B010	113TH AVE	N BR OF BLACK RIVER	5	5	1	68	37.8	2570								
Timber – Culvert	**174**	03200016000B010	112TH AVE	SWAN CREEK	7	19	4	25.2	50	1260								
Prestressed concrete – Box beam/girders—multiple	**175**	03200017000B010	112TH AVE	GUN RIVER	5	5	1	48.9	33.1	1619								
Prestressed concrete – Box beam/girders—multiple	**176**	03200018000B010	118TH AVE	LEVERIDGE DRAIN	5	5	1	33.8	33.1	1119								
Concrete – Girder and floorbeam	**177**	03200018000B020	118TH AVE	SWAN CREEK	1	3	1	49.9	29.2	1457								
Concrete – Culvert	**178**	03200020000B010	116TH AVE	GUN RIVER	1	19	1	43	56.1	2412								
Timber – Slab	**179**	03200027000B010	RIVERSIDE ROAD	ORCHARD CREEK	7	1	2	40	29.9	1196								
Steel – Culvert	**180**	03200029000B010	128TH AVE	MILLER CREEK	3	19	2	28.5		969								
Prestressed concrete – Box beam/girders—single/sprea	**181**	03200035000B010	135TH AVE	RABBIT RIVER	5	6	1	79	42.7	3373								
Steel – Culvert	**182**	03200035000B020	135TH AVE	RABBIT RIVER	3	19	2	50		1800								
Concrete – Culvert	**183**	03200037000B010	141ST AVE	KLEINHEKSEL DRAIN	1	19	1	30	50	1500								
Concrete – Culvert	**184**	03200037000B020	FILLMORE ROAD	EAST FILLMORE DRAIN	1	19	1	36	50	1800								
Steel – Culvert	**185**	03200037000B030	142ND AVE	BLACK CREEK DRAIN	3	19	2	33.5		1106								
Steel – Multistringer	**186**	03200037000B040	142ND AVE	LITTLE RABBIT RIVER	3	2	1	68.3	33	2254								
Steel – Culvert	**187**	03200037000B050	142ND AVE	RED RUN DRAIN	3	19	2	24.9		849								
Prestressed concrete – Box beam/girders—multiple	**188**	03200039000B010	146TH AVE	N BR MACATAWA RIVER	5	5	1	35.8	33.5	1199								
Steel – Culvert	**189**	03200039000B020	146TH AVE	S BR MACATAWA RIVER	3	19	3	37.5		1275								
Steel – Multistringer	**190**	03200045000B010	66TH STREET	M BR BLACK RIVER	3	2	1	65	29.4	1911								
Steel – Culvert	**191**	03200047000B010	64TH STREET	N BR OF BLACK RIVER	3	19	2	31		744								
Prestressed concrete – Box beam/girders—multiple	**192**	03200054000B010	60TH STREET	M BR BLACK RIVER	5	5	1	60.5	33.5	2027								
Prestressed concrete – Multistringer	**193**	03200055000B010	56TH STREET	M BR BLACK RIVER	5	2	1	50	42.9	2145								
Prestressed concrete – Box beam/girders—single/sprea	**194**	03200057000B010	58TH STREET	KALAMAZOO RIVER	5	6	5	321	36.4	11684								
Prestressed concrete – Multistringer	**195**	03200059000B010	48TH STREET	S BR MACATAWA RIVER	5	2	1	65	42	2730								
Prestressed concrete – Box beam/girders—multiple	**196**	03200060000B010	46TH STREET	SWAN CREEK	5	5	1	36	37.4	1346								
Steel – Multistringer	**197**	03200066000B010	38TH STREET	RABBIT RIVER	3	2	2	117.6	33	3881								
Timber – Slab	**198**	03200068000B010	28TH STREET	BASELINE CREEK	7	1	1	24	29.7	713								
Prestressed concrete – Multistringer	**199**	03200069000B010	26TH STREET	KALAMAZOO RIVER	5	2	4	209	37.3	7796								
Prestressed concrete – Multistringer	**200**	26TH STREET	KALAMAZOO RIVER	RABBIT RIVER	5	2	1	100	42.9	4290								
Steel – Multistringer	**201**	03200071000B020	30TH STREET	LITTLE RABBIT RIVER	3	2	1	60	42.3	2538								
Timber – Slab	**202**	03200072000B010	21ST STREET	PINE CREEK	7	1	2	40	29.9	1196								
Steel – Culvert	**203**	03200074000B010	20TH STREET	MILLER CREEK	3	19	2	22.5		900								
Steel – Culvert	**204**	03200075000B010	16TH STREET	MILLER CREEK	3	19	2	27.6		718								
Steel – Multistringer	**205**	03200078000B010	18TH STREET	RABBIT RIVER	3	2	1	46	28.5	1311								
Prestressed concrete – Multistringer	**206**	03200083000B010	10TH STREET	GUN RIVER	5	2	2	70	42.3	2961								
Prestressed concrete – Box beam/girders—multiple	**207**	03200085000B010	2ND STREET	GUN RIVER	5	5	1	55.8	34.1	1903								
Prestressed concrete – Box beam/girders—single/sprea	**208**	03200086000B010	2ND STREET	GUN RIVER	5	6	1	82	36.1	2960								
Prestressed concrete – Box beam/girders—single/sprea	**209**	03200086000B020	2ND STREET	GUN RIVER	5	6	1	70	42.2	2954								
Prestressed concrete – Box beam/girders—multiple	**210**	03200087000R010	10TH STREET	CONSOLIDATED RAIL CORP	5	5	3	150.5	43.8	6592								
Concrete – Tee beam	**211**	03200088000B010	DIVISION STREET	RABBIT RIVER	1	4	1	32.7	38.3	1252								
Steel – Culvert	**212**	03302H00013B010	107TH AVE	SCOTT CREEK	3	19	2	21.8		414								
Steel – Culvert	**213**	03302H00030B010	63RD STREET	SPICEBUSH CREEK	3	19	2	25.3		557								
Prestressed concrete – Box beam/girders—multiple	**214**	03302A00005B010	65TH STREET	M BR BLACK RIVER	5	5	2	84	31.1	2612								
Prestressed concrete – Box beam/girders—multiple	**215**	03302A00007B010	104TH AVE	M BR BLACK RIVER	5	5	2	82	31	2542								
Timber – Slab	**216**	03302A00012B010	107TH AVE	N BR BLACK RIVER	7	1	2	51.8	29.2	1513								
Prestressed concrete – Box beam/girders—multiple	**217**	03302A00018B010	111TH AVE	N BR OF BLACK RIVER	5	5	1	59.7	31	1851								
Timber – Slab	**218**	03302A00023B010	70TH STREET	M BR BLACK RIVER	7	1	4	104	29.5	3068								
Prestressed concrete – Box beam/girders—multiple	**219**	03302A00024B010	68TH STREET	M BR BLACK RIVER	5	5	2	84	31.1	2612								
Timber – Slab	**220**	03302A00024B020	68TH STREET	N BR OF BLACK RIVER	7	1	2	51.8	29.2	1513								
Prestressed concrete – Box beam/girders—multiple	**221**	03302A00027B010	66TH STREET	N BR BLACK RIVER	5	5	2	63.1	30.4	1918								
Prestressed concrete – Box beam/girders—multiple	**222**	03302A00030B020	63RD STREET	M BR BLACK RIVER	5	5	2	73	34.3	2504								
Prestressed concrete – Box beam/girders—multiple	**223**	03302A00033B010	62ND STREET	M BR BLACK RIVER	5	5	2	100	30.4	3040								
Timber – Slab	**224**	03303H00014B010	107TH AVE	SWAN CREEK	7	1	1	32	29.5	944								
Prestressed concrete – Box beam/girders—multiple	**225**	03303H00014B020	48TH STREET	SWAN CREEK	5	5	1	50	31.1	1555								
Prestressed concrete – Box beam/girders—multiple	**226**	03303H00018B010	110TH AVENUE	SWAN CREEK	5	5	1	44.9	31.1	1396								
Timber – Slab	**227**	03303H00024B010	44TH STREET	SWAN CREEK	7	1	1	31.8	29.2	929								
Prestressed concrete – Box beam/girders—multiple	**228**	03304H00008B010	120TH AVENUE	LEVERIDGE DRAIN	5	5	1	35.8	30.8	1103								
Prestressed concrete – Box beam/girders—multiple	**229**	03305H00001B010	136TH AVENUE	RABBIT RIVER	5	5	1	90	31.1	2799								
Timber – Slab	**230**	03305H00002B010	136TH AVE	RABBIT RIVER	7	1	2	40	29.2	1168								
Steel – Culvert	**231**	03305H00006B010	140TH AVE	RED RUN DRAIN	3	19	2	25.5		638								
Steel – Culvert	**232**	03305H00006B020	140TH AVE	RED RUN DRAIN	3	19	2	30.6		734								
Steel – Culvert	**233**	03305H00008B010	144TH AVE	LITTLE RABBIT RIVER	3	19	2	28.9		864								
Prestressed concrete – Box beam/girders—multiple	**234**	03305H00010B010	24TH STREET	LITTLE RABBIT RIVER	5	5	1	38	30.4	1155								
Prestressed concrete – Box beam/girders—multiple	**235**	03305H00011B010	23RD STREET	LITTLE RABBIT RIVER DRN	5	5	1	50	33.1	1655								
Prestressed concrete – Box beam/girders—multiple	**236**	03305H00013B010	22ND STREET	LITTLE RABBIT RIVER	5	5	1	52	31.1	1617								
Steel – Culvert	**237**	03305H00014B010	21ST STREET	RED RUN DRAIN	3	19	2	26.8		590								
Steel – Culvert	**238**	03305H00014B020	21ST STREET	LITTLE RABBIT RIVER	3	19	2	30.6		796								
Steel – Culvert	**239**	03305H00016B010	20TH STREET	RED RUN DRAIN	3	19	2	24.9		745								
Steel – Culvert	**240**	03305H00019B010	16TH STREET	RED RUN DRAIN	3	19	2	30.8		770								
Steel – Culvert	**241**	03306H00019B010	144TH AVE	S BR MACATAWA RIVER	3	19	2	36.3		1089								
Steel – Culvert	**242**	03306H00019B020	144TH AVE	ESKES DRAIN	3	19	3	40		1196								
Steel – Culvert	**243**	03306H00021B010	RUSSCHER ROAD	S BR MACATAWA RIVER	3	19	2	35.3		777								
Prestressed concrete – Box beam/girders—multiple	**244**	03306H00022B010	147TH AVE	N BR MACATAWA RIVER	5	5	1	40	31.1	1244								
Steel – Culvert	**245**	03306H00033B010	50TH STREET	S BR MACATAWA RIVER	3	19	2	40.3		927								
Steel – Culvert	**246**	03307H00003B010	116TH AVE	LEVERIDGE DRAIN	3	19	2	28.9		864								
Steel – Culvert	**247**	03307H00017B010	62ND STREET	LEVERIDGE DRAIN	3	19	2	32.6		913								

Appendix A-5

APPENDIX A-5																		
Inventory Data											Inspection Items							
Bridge Type	**Structure Number**	**Bridge ID**	**Facility Carried**	**Features Intersected**	**Structure Type Main Span (Item 43A - Material)**	**Structure Type Main Span (Item 43B)**	**Number of Main Span (Item 45)**	**Total Str Length (Item 49)**	**Total Str Width (Item 52)**	**Total Str (sq ft)**	**Initial Inspection**	**In Depth Steel Inspection**	**Pin and Hanger Inspection**	**Diving Inspection**	**Provide Monitoring**	**Review Scour Criticality**	**Load Rating**	**Update SIA**
Prestressed concrete – Box beam/girders—multiple	**248**	03308H00008B010	107TH AVENUE	GUN RIVER	5	5	1	60	31	1860								
Steel – Multistringer	**249**	03308H00015B010	110TH AVE	GUN RIVER	3	2	1	66.9	33	2208								
Prestressed concrete – Multistringer	**250**	03308H00016B010	11TH STREET	GUN RIVER	5	2	1	64	29.2	1869								
Prestressed concrete – Box beam/girders—multiple	**251**	03308H00019B010	9TH STREET	GUN RIVER	5	5	1	55.5	31.1	1726								
Prestressed concrete – Box beam/girders—multiple	**252**	03308H00023B010	7TH STREET	GUN RIVER	5	5	1	53.5	30.4	1626								
Concrete continuous – Slab	**253**	03310H00005B010	130TH AVENUE	RABBIT RIVER	2	1	3	85	30.5	2593								
Timber – Slab	**254**	03310H00005B020	130TH AVE	RABBIT RIVER	7	1	3	77.8	29.2	2272								
Prestressed concrete – Box beam/girders—multiple	**256**	03310H00008B020	132ND AVENUE	RABBIT RIVER	5	5	1	91.9	31.2	2867								
Prestressed concrete – Box beam/girders—multiple	**257**	03310H00009B010	133RD AVENUE	RABBIT RIVER	5	5	1	87.9	30	2637								
Prestressed concrete – Box beam/girders—multiple	**258**	03310H00016B010	22ND STREET	RABBIT RIVER	5	5	2	103	30.4	3131								
Steel – Culvert	**259**	03310H00019B010	19TH STREET	MILLER CREEK	3	19	2	28.9		578								
Steel – Culvert	**260**	03310H00022B010	16TH STREET	PIERCE DRAIN	3	19	2	22.2		577								
Prestressed concrete – Box beam/girders—multiple	**261**	03310H00022B020	16TH STREET	RABBIT RIVER	5	5	1	47	30.6	1438								
Steel – Culvert	**262**	03310H00023B010	15TH STREET	MILLER CREEK	3	19	2	22.7		409								
Steel – Culvert	**263**	03310H00024B010	14TH STREET	MILLER CREEK	3	19	2	21.7		434								
Prestressed concrete – Box beam/girders—multiple	**264**	03310H00025B020	14TH STREET	RABBIT RIVER	5	5	1	60.7	31.2	1894								
Concrete – Culvert	**265**	03311H00044B010	61ST STREET	KUIPERS DRAIN	1	19	2	38.3		919								
Prestressed concrete – Box beam/girders—multiple	**266**	03312H00023B010	58TH STREET	M BR BLACK RIVER	5	5	2	69	30.4	2098								
Timber – Slab	**267**	03312H00026B010	55TH STREET	SCOTT CREEK	7	1	1	21	29.5	620								
Prestressed concrete – Box beam/girders—multiple	**268**	03312H00028B010	54TH STREET	M BR BLACK RIVER	5	5	1	46	31.1	1431								
Concrete – Culvert	**269**	03312H00031B010	51ST STREET	M BR BLACK RIVER	1	19	1	41.9	49.2	2061								
Steel – Culvert	**271**	03313H00006B010	138TH AVENUE	RABBIT RIVER	3	19	2	34.8	30	1044								
Timber – Slab	**272**	03313H00022B010	12TH STREET	RABBIT RIVER	7	1	2	40	29.5	1180								
Prestressed concrete – Box beam/girders—single/sprea	**273**	03313H00024B010	10TH STREET	RABBIT RIVER DRAIN	5	6	1	45	43	1935								
Prestressed concrete – Box beam/girders—multiple	**274**	03314H00014B020	133RD AVENUE	RABBIT RIVER	5	5	2	142	34.5	4899								
Concrete – Culvert	**276**	03315H00004B010	114TH AVENUE	GUN RIVER DRAIN	1	19	1	24	44	1056								
Steel – Culvert	**277**	03315H00009B010	118TH AVE	GUN RIVER	3	19	2	32.8		981								
Prestressed concrete – Box beam/girders—multiple	**278**	03315H00013B010	120TH AVENUE	GUN RIVER DRAIN EXT	5	5	1	80	31.1	2488								
Steel – Culvert	**279**	03316H00019B010	DUMONT LAKE ROAD	DUMONT CREEK	3	19	2	23.3		652								
Steel – Culvert	**280**	03317H00023B010	24TH STREET	PINE CREEK	3	19	2	34.8		1041								
Prestressed concrete – Box beam/girders—multiple	**281**	03317H00028B010	22ND STREET	SCHNABLE BROOK	5	5	1	65	31	2015								
Prestressed concrete – Box beam/girders—multiple	**283**	03318H00007B010	139TH AVENUE	BLACK CREEK DRAIN EXTN	5	5	1	60	31.5	1890								
Steel – Culvert	**284**	03318H00010B010	140TH AVE	BLACK CREEK	3	19	2	34.8		1041								
Steel – Culvert	**285**	03318H00013B010	141ST AVENUE	BLACK CREEK	3	19	2	34.8		1041								
Steel – Culvert	**286**	03318H00019B010	147TH AVE	PETERS DRAIN	3	19	2	28.2		790								
Steel – Culvert	**287**	03318H00019B020	147TH AVE	OVER A SMALL CREEK	3	19	2	27.5		798								
Steel – Culvert	**288**	03318H00019B030	147TH AVE	OVER A SMALL CREEK	3	19	2	24.1		699								
Timber – Slab	**289**	03318H00020B010	OTTOGAN STREET	S BR MACATAWA RIVER	7	1	2	40	29.5	1180								
Steel – Multistringer	**290**	03318H00024B010	47TH STREET	S BR MACATAWA RIVER	3	2	1	31.8	14	445								
Prestressed concrete – Box beam/girders—multiple	**291**	03318H00027B010	46TH STREET	S BR MACATAWA RIVER	5	5	1	41.5	30.4	1262								
Steel – Culvert	**292**	03318H00035B010	43RD STREET	OVER A SMALL CREEK	3	19	2	25.5		587								
Steel – Culvert	**293**	03318H00035B020	43RD STREET	UNNAMED CREEK	3	19	2	32.2		902								
Steel – Culvert	**294**	03318H00039B010	42ND STREET	UNNAMED CREEK	3	19	2	28.7		918								
Steel – Culvert	**295**	03319H00002B010	137TH AVENUE	PIGEON CREEK	3	19	2	22		658								
Steel – Multistringer	**296**	03319H00003B010	138TH AVE	PIGEON CREEK	3	2	1	27.9	27.9	778								
Prestressed concrete – Box beam/girders—multiple	**297**	03319H00005B010	140TH AVE	LITTLE RABBIT RIVER	5	5	1	60	30.4	1824								
Steel – Culvert	**298**	03319H00009B010	144TH AVE	SMALL CREEK	3	19	2	21		588								
Prestressed concrete – Box beam/girders—multiple	**299**	03319H00012B020	36TH STREET	RABBIT RIVER	5	5	2	110.9	31	3438								
Steel – Culvert	**300**	03319H00013B010	36TH STREET	BLACK CREEK	3	19	2	30.8		921								
Prestressed concrete – Box beam/girders—multiple	**301**	03319H00015B010	34TH STREET	RABBIT RIVER	5	5	2	112	31.1	3483								
Prestressed concrete – Box beam/girders—multiple	**302**	03319H00019B010	32ND STREET	LITTLE RABBIT RIVER	5	5	1	99.7	37.4	3729								
Steel – Culvert	**303**	03319H00022B010	28TH STREET	PIGEON CREEK	3	19	2	23.2		650								
Prestressed concrete – Box beam/girders—multiple	**304**	03319H00027B010	26TH STREET	RABBIT RIVER	5	5	2	70	30.4	2128								
Prestressed concrete – Box beam/girders—multiple	**305**	03319H00029B010	26TH STREET	LITTLE RABBIT RIVER	5	5	1	37	30.4	1125								
Timber – Slab	**306**	03321H00029B010	WILLIAMS ROAD	KALAMAZOO RIVER	7	1	8	191.9	27.2	5220								
Aluminum – Culvert	**307**	03321H00032B010	26TH STREET	BASELINE CREEK	9	19	2	29.9	30	897								
Steel – Culvert	**308**	03322H00003B010	115TH AVENUE	SWAN CREEK	3	19	2	34.8		1041								
Prestressed concrete – Box beam/girders—multiple	**309**	03323H00001B010	112TH AVENUE	MINER CREEK	5	5	1	62	34.5	2139								
Timber – Slab	**310**	03323H00002B010	114TH AVE	MINER CREEK DRAIN	7	1	1	28.2	29.4	829								
Steel – Culvert	**311**	03324H00022B010	133RD AVENUE	RABBIT RIVER	3	19	2	20		598								
Steel – Culvert	**312**	03324H00030B010	7TH STREET	RABBIT RIVER	3	19	2	21		628								
Concrete – Culvert	**13537**	03200044000C010	LAKESHORE DRIVE	PLUMMERS CREEK	1	19	1	21.6	51.9	1121								
Concrete – Culvert	**13558**	03200009000C010	RIVERVIEW DRIVE	SILVER CREEK	1	19	1	25.5	65	1658								
Steel – Culvert	**13574**	03318H00020C010	OTTOGAN STREET	PETERS DRAIN EXTENSION	3	19	2	23.9		550								
Concrete – Culvert	**13583**	03321H00025C010	30TH STREET	BASELINE CREEK	1	19	1	21.9		438								
Timber – Slab	**13691**	03304H00002B010	60TH STREET	COUNTY DRAIN	7	1	1	22	33.3	733								
Concrete – Culvert	**13749**	03200056000C010	57TH STREET	SEVERENS DRAIN	1	19	1	22	46.2	1016								
Timber – Slab	**13841**	03323H00001B020	112TH AVENUE	SCHNABLE BROOK	7	1	1	26	33.3	866								
Timber – Slab	**13842**	03317H00030B010	20TH STREET	SCHNABLE BROOK	7	1	1	26	33.3	866								
Steel – Culvert	**13875**	03310H00005C010	130 AVENUE	BEAR CREEK	3	19	2	39.8		955								
Steel – Culvert	**13947**	03302A00034C010	62ND STREET	SPICEBUSH CREEK	3	19	2	25.3		506								
Steel – Culvert	**13992**	03200053000C010	60TH STREET	KUIPERS DRAIN	3	19	2	22.4		717								
Steel – Culvert	**13993**	03311H00015C010	142ND AVE	KUIPERS DRAIN	3	19	2	28.3		566								
Steel – Culvert	**14334**	03200078000C010	18TH ST	RED RUN DRAIN	3	19	2	25.4		813								
Steel – Culvert	**14480**	03306H00008C010	140TH AVE	KLEINHEKSEL DRAIN	3	19	2	23		690								

C. CULVERT ASSET MANAGEMENT PLAN SUPPLEMENT

Culvert Primer

Culverts are structures that lie underneath roads, enabling water to flow from one side of the roadway to the other (Figure C-1 and Figure C-2). The important distinguishing factor between a culvert and a bridge is the size. Culverts are considered anything under 20 feet while bridges, according to the Federal Highway Administration, are 20 feet or more. While similar in function to storm sewers, culverts differ from storm sewers in that culverts are open on both ends, are constructed as straight-line conduits, and lack intermediate drainage structures like manholes and catch basins. Culverts are critical to the service life of a road because of the important role they play in keeping the pavement layers well drained and free from the forces of water building up on one side of the roadway.

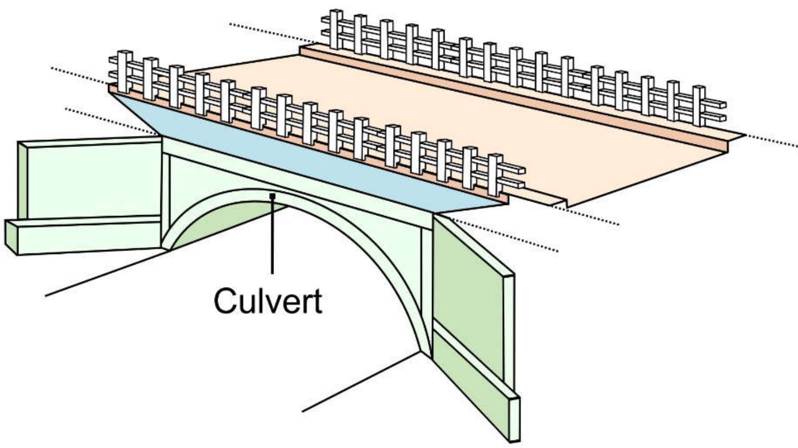

Figure C-1: Diagram of a culvert structure

Figure C-2: Examples of culverts. Culverts allow water to pass under the roadway (left), they are straight-line conduits with no intermediate drainage structures (middle), and they come in various materials (left: metal; middle and right: concrete) and shapes (left: arch; middle: round; right: box).

Culvert Types

Michigan conducted its first pilot data collection on local agency culverts in the state in 2018. Of almost 50,000 culverts inventoried as part of the state-wide pilot project, the material type used for constructing culverts ranged from (in order of predominance) corrugated steel, concrete, plastic, aluminum, and masonry/tile, to timber materials. The shapes of the culverts were (in order of predominance) circular, pipe arch, arch, rectangular, horizontal ellipse, or box. The diameter for the majority of culverts ranged from less than 12 inches to 24 inches; a portion, however, ranged from 30 inches to more than 48 inches.

Culvert Condition

Several culvert condition assessment practices exist. The FHWA has an evaluation method in its 1986 *Culvert Inspection Manual*. In conjunction with descriptions and details in the Ohio Department of Transportation's 2017 *Culvert Inspection Manual* and Wisconsin DOT's *Bridge Inspection Field Manual*, the FHWA method served as the method for evaluating Michigan culverts in the pilot. In 2018, Michigan local agencies participated in a culvert pilot data collection, gathering inventory and condition data; full detail on the condition assessment system used in the data collection can be found in Appendix G of the final report (https://www.michigan.gov/documents/tamc/TAMC_2018_Culvert_Pilot_Report_Complete_634795_7.pdf).

The Michigan culvert pilot data collection used a 1 through 10 rating system, where 10 is considered a new culvert with no deterioration or distress and 1 is considered total failure. Each of the different culvert material types requires the assessment of features unique to that material type, including structural deterioration, invert deterioration, section deformation, blockage(s) and scour. Corrugated metal pipe, concrete pipe, plastic pipe, and masonry culverts require an additional assessment of joints and seams. Slab abutment culverts require an additional assessment of the concrete abutment and the masonry abutment. Assessment of timber culverts only relied on blockage(s) and scour. The assessments come together to generate condition rating categories of good (rated as 10, 9, or 8), fair (rated as 7 or 6), poor (rated as 5 or 4), or failed (rated as 3, 2, or 1).

Culvert Treatments

The *MDOT Drainage Manual* addresses culvert design and treatments. Of most importance to the longevity of culverts is regular cleaning to prevent clogs. More extensive treatments may include re-positioning the pipe to improve its grade and lining a culvert to achieve more service life after structural deterioration has begun.

D. TRAFFIC SIGNALS ASSET MANAGEMENT PLAN SUPPLEMENT

Traffic Signals Primer

Types

Electronic traffic control devices come in a large array of configurations, which include case signs (e.g., keep right/left, no right/left turn, reversible lanes), controllers, detection (e.g., cameras, push buttons), flashing beacons, interconnects (e.g., DSL, fire station, phone line, radio), pedestrian heads (e.g., hand-man), and traffic signals. This asset management plan is only concerned with traffic signals (Figure D-1) as a functioning unit and does not consider other electronic traffic control devices.

Figure D-1: Example of traffic signals

Condition

Traffic signal assessment considers the functioning of basic tests on a pass/fail basis. These tests include battery backup testing, components testing, conflict monitor testing, radio testing, and underground detection.

Treatments

Traffic signals are maintained in accordance with the *Michigan Manual on Uniform Traffic Control Devices*. Maintenance of traffic signals includes regular maintenance of all components, cleaning and servicing to prevent undue failures, immediate maintenance in the case of emergency calls, and provision of stand-by equipment. Timing changes are restricted to authorized personnel only.

E. GLOSSARY & ACRONYMS

Glossary

Alligator cracking: Cracking of the surface layer of an asphalt pavement that creates a pattern of interconnected cracks resembling alligator hide. This is often due to overloading a pavement, sub-base failure, or poor drainage.[5]

Asset management: A process that uses data to manage and track road assets in a cost-effective manner using a combination of engineering and business principles. Public Act 325 of 2018 provides a legal definition: "an ongoing process of maintaining, preserving, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment and investment to achieve established performance goals".[6]

Biennial inspection: Inspection of an agency's bridges every other year, which happens in accordance with National Bridge Inspection Standards and Michigan Department of Transportation requirements.

Bridge inspection program: A program implemented by a local agency to inspect the bridges within its jurisdiction systematically in order to ensure proper functioning and structural soundness.

Capital preventative maintenance: Also known as CPM, a planned set of cost-effective treatments to address of fair-rated infrastructure before the structural integrity of the system has been severely impacted. These treatments aim to slow deterioration and to maintain or improve the functional condition of the system without significantly increasing the structural capacity. Light capital preventive maintenance is a set of treatments designed to seal isolated areas of the pavement from water, such as crack and joint sealing, to protect and restore pavement surface from oxidation with limited surface thickness material, such as fog seal; generally, application of a light CPM treatment does not provide a corresponding increase in a segment's PASER score. Heavy capital preventive maintenance is a set of surface treatments designed to protect pavement from water intrusion or environmental weathering without adding significant structural strength, such as slurry seal, chip seal, or thin (less than 1.5-inch) overlays for bituminous surfaces or patching or partial-depth (less than 1/3 of pavement depth) repair for concrete surfaces.

Chip seal: An asphalt pavement treatment method consisting of, first, spraying liquid asphalt onto the old pavement surface and, then, a single layer of small stone chips spread onto the wet asphalt layer.

City major: A road classification, defined in Michigan Public Act 51, that encompasses the generally more important roads in a city or village. City major roads are designated by a municipality's governing body and are subject to approval by the State Transportation Commission. These roads do not include roads under the jurisdiction of a county road commission or trunkline highways.

City minor: A road classification, defined in Michigan Public Act 51, that encompasses the generally less important roads in a city or village. These roads include all city or village roads that are not city major road and do not include roads under the jurisdiction of a county road commission.

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[5] https://en.wikipedia.org/wiki/Crocodile_cracking

[6] Inventory-based Rating System for Gravel Roads: Training Manual

Composite pavement: A pavement consisting of concrete and asphalt layers. Typically, composite pavements are old concrete pavements that were overlaid with HMA in order to gain more service life.

Concrete joint resealing: Resealing the joints of a concrete pavement with a flexible sealant to prevent moisture and debris from entering the joints. When debris becomes lodged inside a joint, it inhibits proper movement of the pavement and leads to joint deterioration and spalling.

Concrete pavement: Also known as rigid pavement, a pavement made from portland cement concrete. Concrete pavement has an average service life of 30 years and typically does not require as much periodic maintenance as HMA.

Cost per lane mile: Associated cost of construction, measured on a per lane, per mile basis. Also see *lane-mile segment*.

County local: A road classification, defined in Michigan Public Act 51, that encompasses the generally less important and low-traffic roads in a county. This includes all county roads that are not classified as county primary roads.

County primary: A road classification, defined in Michigan Public Act 51, that encompasses the generally more important and high-traffic roads in a county. County primary roads are designated by board members of the county road commissions and are subject to approval by the State Transportation Commission.

CPM: See *Capital preventive maintenance*.

Crack and seat: A concrete pavement treatment method that involves breaking old concrete pavement into small chunks and leaving the broken pavement in place to provide a base for a new surface. This provides a new wear surface that resists water infiltration and helps prevent damaged concrete from reflecting up to the new surface.

Crack seal: A pavement treatment method for both asphalt and concrete pavements that fills cracks with asphalt materials, which seals out water and debris and slows down the deterioration of the pavement. Crack seal may encompass the term "crack filling".

Crush and shape: An asphalt pavement treatment method that involves pulverizing the existing asphalt pavement and base and then reshaping the road surface to correct imperfections in the road's profile. Often, a layer of gravel is added along with a new wearing surface such as an HMA overlay or chip seal.

Crust: A very tightly compacted surface on an unpaved road that sheds water with ease but takes time to be created.

Culvert: A pipe or structure used under a roadway that allows cross-road drainage while allowing traffic to pass without being impeded; culverts span up to 20 feet.[7]

Dowel bar retrofit repair: A concrete pavement treatment method that involves cutting slots in a cracked concrete slab, inserting steel bars into the slots, and placing concrete to cover the new bars and fill the slots. It aims to reinforce cracks in a concrete pavement.

[7] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual

Dust control: A gravel road surface treatment method that involves spraying chloride or other chemicals on the gravel surface to reduce dust loss, aggregate loss, and maintenance. This is a relatively short-term fix that helps create a crusted surface.

Expansion joint: Joints in a bridge that allow for slight expansion and contraction changes in response to temperature. Expansion joints prevent the build up of excessive pressure, which can cause structural damage to the bridge.

Federal Highway Administration: Also known as FHWA, this is an agency within the U.S. Department of Transportation that supports state and local governments in the design, construction, and maintenance of the nation's highway system.[8]

Federal-aid network: Portion of road network that is comprised of federal-aid routes. According to Title 23 of the United States Code, federal-aid-eligible roads are "highways on the federal-aid highways systems and all other public roads not classified as local roads or rural minor collectors".[9] Roads that are part of the federal-aid network are eligible for federal gas-tax monies.

FHWA: See *Federal Highway Administration*.

Flexible pavement: See *hot-mix asphalt pavement*.

Fog seal: An asphalt pavement treatment method that involves spraying a liquid asphalt coating onto the entire pavement surface to fill hairline cracks and prevent damage from sunlight and oxidation. This method works best for good to very good pavements.

Full-depth concrete repair: A concrete pavement treatment method that involves removing sections of damaged concrete pavement and replacing it with new concrete of the same dimensions in order to restore the riding surface, delay water infiltration, restore load transfer from one slab to the next, and eliminate the need to perform costly temporary patching.

Geographic divides: Areas where a geographic feature (e.g., river, lake, mountain) limits crossing points of the feature.

Grants: Competitive funding gained through an application process and targeted at a specific project type to accomplish a specific purpose. Grants can be provided both on the federal and state level and often make up part of the funds that a transportation agency receives.

Gravel surfacing: A low-cost, easy-to-maintain road surface made from aggregate and fines.

Heavy capital preventive maintenance: See *Capital preventive maintenance*.

HMA: See *hot-mix asphalt pavement*.

Hot-mix asphalt overlay: Also known as HMA overlay, this a surface treatment that involves layering new asphalt over an existing pavement, either asphalt or concrete. It creates a new wearing surface for traffic and to seal the pavement from water, debris, and sunlight damage, and it often adds significant structural strength.

Hot-mix asphalt pavement: Also known as HMA pavement, this type of asphalt creates a flexible pavement composed of aggregates, asphalt binder, and air voids. HMA is heated for placement and

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[8] Federal Highway Administration webpage https://www.fhwa.dot.gov/
[9] Inventory-based Rating System for Gravel Roads: Training Manual

compaction at high temperatures. HMA is less expensive to construct than concrete pavement, however it requires frequent maintenance activities and generally lasts 18 years before major rehabilitation is necessary. HMA makes up the vast majority of local-agency-owned pavements.

IBR: See *IBR element*, *IBR number*, and/or *Inventory-based Rating System™*.

IBR element: A feature used in the IBR System™ for assessing the condition of roads. The system relies on assessing three elements: surface width, drainage adequacy, and structural adequacy.[10]

IBR number: The 1-10 rating determined from assessments of the weighted IBR elements. The weighting relates each element to the intensity road work needed to improve or enhance the IBR element category.[11]

Interstate highway system: The road system owned and operated by each state consisting of routes that cross between states, make travel easier and faster. The interstate roads are denoted by the prefix "I" or "U.S." and then a number, where odd routes run north-south and even routes run east-west. Examples are I-75 or U.S. 2.[12]

Inventory-based Rating System™: Also known as the IBR System™, a rating system designed to assess the capabilities of gravel and unpaved roads to support intended traffic volumes and types year round. It assesses roads based on how three IBR elements, or features—surface width, drainage adequacy, and structural adequacy—compare to a baseline, or "good", road.[13]

Investment Reporting Tool: Also known as IRT, a web-based system used to manage the process for submitting required items to the Michigan Transportation Asset Management Council. Required items include planned and completed maintenance and construction activity for roads and bridges and comprehensive asset management plans.

IRT: See *Investment Reporting Tool*.

Jurisdiction: Administrative power of an entity to make decisions for something. In Michigan, the three levels of jurisdiction classification for transportation assets are state highways, county roads, and city and village streets. State highways are under the jurisdiction of the Michigan Department of Transportation, county roads are under the jurisdiction of the road commission for the county in which the roads are located, and city and village streets are under the jurisdiction of the municipality in which the roads are located.

Jurisdictional borders: Borders between two road-owning-agency jurisdictions, or where the roads owned by one agency turn into roads owned by another agency. Examples of jurisdictional borders are township or county lines.

Lane-mile segment: A segment of road that is measured by multiplying the centerline miles of a roadway by the number of lanes present.

Lane-mile-years: A network's total lane-miles multiplied by one year; a method to quantify the measurable loss of pavement life.

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[10] Inventory-based Rating System for Gravel Roads: Training Manual
[11] Inventory-based Rating System for Gravel Roads: Training Manual
[12] https://www.fhwa.dot.gov/interstate/faq.cfm#question3
[13] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual

Light capital preventive maintenance: See *Capital preventive maintenance*.

Limited access areas: Areas—typically remote areas—serviced by few or seasonal roads that require long detours routes if servicing roads are closed.

Main access to key commercial districts: Areas where large number or large size business will be significantly impacted if a road is unavailable.

Maintenance grading: A surface treatment method for unpaved roads that involves re-grading the road to remove isolated potholes, washboarding, and ruts, and then restoring the compacted crust layer.

MDOT: See *Michigan Department of Transportation*.

MDOT's Local Bridge Program Call for Projects: A call for project proposals for replacement, rehabilitation, and/or preventive maintenance of local bridges that, if granted, receives bridge funding from the Michigan Department of Transportation. The Call for Projects is made by the Local Bridge Program.

MGF: See *Michigan Geographic Framework*.

Michigan Department of Transportation: Also known as MDOT, this is the state of Michigan's department of transportation, which oversees roads and bridges owned by the state or federal government in Michigan.

Michigan Geographic Framework: Also known as MGF, this is the state of Michigan's official digital base map that contains location and road information necessary to conduct state business. The Michigan Department of Transportation uses the MGF to link transportation assets to a physical location.

Michigan Public Act 51 of 1951: Also known as PA 51, this is a Michigan legislative act that served as the foundation for establishing a road funding structure by creating transportation funding distribution methods and means. It has been amended many times.[14]

Michigan Public Act 325 of 2018: Also known as PA 325, this legislation modified PA 51 of 1951 in regards to asset management in Michigan, specifically 1) re-designating the TAMC under Michigan Infrastructure Council (MIC); 2) promoting and overseeing the implementation of recommendations from the regional infrastructure asset management pilot program; 3) requiring local road three-year asset management plans beginning October 1, 2020; 4) adding asset classes that impact system performance, safety or risk management, including culverts and signals; 5) allowing MDOT to withhold funds if no asset management plan submitted; and 6) prohibiting shifting finds from a country primary to a county local, or from a city major to a city minor if no progress toward achieving the condition goals described in its asset plan.[15]

Michigan Public Act 499 of 2002: Also known as PA 499, this legislation requires road projects for the upcoming three years to be reported to the TAMC.

Michigan Transportation Asset Management Council: Also known as the TAMC, a council comprised of professionals from county road commissions, cities, a county commissioner, a township official, regional and metropolitan planning organizations, and state transportation department personnel. The

[14] Inventory-based Rating System for Gravel Roads: Training Manual
[15] Inventory-based Rating System for Gravel Roads: Training Manual

council reports directly to the Michigan Infrastructure Council.[16] The TAMC provides resources and support to Michigan's road-owning agencies, and serves as a liaison in data collection requirements between agencies and the state.

Michigan Transportation Fund: Also known as MTF, this is a source of transportation funding supported by vehicle registration fees and the state's per-gallon gas tax.

Microsurface treatment: An asphalt pavement treatment method that involves applying modified liquid asphalt, small stones, water, and portland cement for the purpose of protecting a pavement from damage caused by water and sunlight.

Mill and hot-mix asphalt overlay: Also known as a mill and HMA overlay, this is a surface treatment that involves the removal of the top layer of pavement by milling and the replacement of the removed layer with a new HMA layer.

Mix-of-fixes: A strategy of maintaining roads and bridges that includes generally prioritizes the spending of money on routine maintenance and capital preventive maintenance treatments to impede deterioration and then, as money is available, performing reconstruction and rehabilitation.

MTF: See *Michigan Transportation Fund*.

National Bridge Inspection Standards: Also known as NBIS, standards created by the Federal Highway Administration to locate and evaluate existing bridge deficiencies in the federal-aid highway system to ensure the safety of the traveling public. The standards define the proper safety for inspection and evaluation of all highway bridges.[17]

National Center for Pavement Preservation: Also known as the NCPP, a center that offers education, research, and outreach in current and innovative pavement preservation practices. This collaborative effort of government, industry, and academia entities was established at Michigan State University.

National Functional Class: Also known as NFC, a federal grouping system for public roads that classifies roads according to the type of service that the road is intended to provide.

National highway system: Also known as NHS, this is a network of roads that includes the interstate highway system and other major roads managed by state and local agencies that serve major airports, marine, rail, pipelines, truck terminals, railway stations, military bases, and other strategic facilities.

NBIS: See *National Bridge Inspection Standards*.

NCPP: See *National Center for Pavement Preservation*.

NCPP Quick Check: A system created by the National Center for Pavement Preservation that works under the premise that a one-mile road segment loses one year of life each year that it is not treated with a maintenance, rehabilitation, or reconstruction project.

NFC: See *National Functional Class*.

Non-trunkline: A local road intended to be used over short distances but not recommended for long-distance travel.

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[16] Inventory-based Rating System for Gravel Roads: Training Manual
[17] https://www.fhwa.dot.gov/bridge/nbis/

Other funds: Expenditures for equipment, capital outlay, debt principal payment, interest expense, contributions to adjacent governmental units, principal, interest and bank fees, and miscellaneous for cities and villages.

PA: See *Michigan Public Act 51*, *Michigan Public Act 325*, and/or *Michigan Public Act 499*.

Partial-depth concrete repair: A concrete pavement treatment method that involves removing spalled or delaminated areas of concrete pavement, usually near joints and cracks, and replacing with new concrete. This is done to provide a new wearing surface in isolated areas, to slow down water infiltration, and to help delay further freeze-thaw damage.

PASER: See *Pavement Surface Evaluation and Rating system*.

Pavement reconstruction: A complete removal of the old pavement and base and construction of an entirely new road. This is the most expensive rehabilitation of the roadway and also the most disruptive to traffic patterns.

Pavement Surface Evaluation and Rating system: Also known as the PASER system, the PASER system rates surface condition on a 1-10 scale, where 10 is a brand new road with no defects, 5 is a road with distress but that is structurally sound and requires only preventative maintenance, and 1 is a road with extensive surface and structural distresses that is in need of total reconstruction. This system provides a simple, efficient, and consistent method for evaluating the condition of paved roads.[18]

Pothole: A defect in a road that produces a localized depression.[19]

Preventive maintenance: Planned treatments to an existing asset to prevent deterioration and maintain functional condition. This can be a more effective use of funds than the costly alternative of major rehabilitation or replacement.

Proactive preventive maintenance: Also known as PPM, a method of performing capital preventive maintenance treatments very early in a pavement's life, often before it exhibits signs of pavement defect.

Public Act 51: See *Michigan Public Act 51 of 1951*

Public Act 325: See *Michigan Public Act 325 of 2018*

Public Act 499: See *Michigan Public Act 499 of 2002*

Reconstruction and rehabilitation programs: Programs intended to reconstruct and rehabilitate a road.

Restricted load postings: A restriction enacted on a bridge structure when is incapable of transporting a state's legal vehicle loads.

Rights-of-way ownership: The owning of the right-of-way, which is the land over which a road or bridge travels. In order to build a road, road agencies must own the right-of-way or get permission to build on it.

Rigid pavement: See *concrete pavement*.

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[18] Adapted from Inventory-based Rating System for Gravel Roads: Training Manual
[19] Inventory-based Rating System for Gravel Roads: Training Manual

Road infrastructure: An agency's road network and assets necessary to make it function, such as traffic signage and ditches.

Road: The area consisting of the roadway (i.e., the travelled way or the portion of the road on which vehicles are intended to drive), shoulders, ditches, and areas of the right of way containing signage.[20]

Roadsoft: An asset management software suit that enables agencies to manage road and bridge related infrastructure. The software provides tools for collecting, storing, and analyzing data associated with transportation infrastructure. Built on an optimum combination of database engine and GIS mapping tools, Roadsoft provides a quick, smooth user experience and almost unlimited data handling capabilities.[21]

Ruts/rutting: Deformation of a road that usually forms as a permanent depression concentrated under the wheel path parallel to the direction of travel.[22]

Scheduled maintenance: Low-cost, day-to-day activities applied to bridges on a scheduled basis that mitigates deterioration.[23]

Sealcoat pavement: A gravel road that has been sealed with a thin asphalt binder coating that has stone chips spread on top.

Service life: Time from when a road or treatment is first constructed to when it reaches a point where the distresses present change from age-related to structural-related (also known as the critical distress point).[24]

Slurry seal: An asphalt pavement treatment method that involves applying liquid asphalt, small stones, water, and portland cement in a very thin layer with the purpose of protecting an existing pavement from being damaged by water and sunlight.

Structural improvement: Pavement treatment that adds strength to the pavement. Roads requiring structural improvement exhibit alligator cracking and rutting and are considered poor by the TAMC definitions for condition.

Subsurface infrastructure: Infrastructure maintained by local agencies that reside underground, for example, drinking water distribution systems, wastewater collection systems, and storm sewer systems.

TAMC: See *Michigan Transportation Asset Management Council*.

TAMC pavement condition dashboard: Website for viewing graphs of pavement and bridge conditions, traffic and miles travelled, safety statistics, maintenance activities, and financial data for Michigan's cities and villages, counties, and regions, as well as the state of Michigan.

TAMC's good/fair/poor condition classes: Classification of road conditions defined by the Michigan Transportation Asset Management Council based on bin ranges of PASER scores and similarities in defects and treatment options. Good roads have PASER scores of 8, 9, or 10, have very few defects, and require minimal maintenance. Fair roads have PASER scores of 5, 6, or 7, have good structural support but a deteriorating surface, and can be maintained with CPM treatments. Poor roads have PASER scores

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[20] Inventory-based Rating System for Gravel Roads: Training Manual
[21] Inventory-based Rating System for Gravel Roads: Training Manual
[22] Paving Class Glossary
[23] Inventory-based Rating System for Gravel Roads: Training Manual
[24] Inventory-based Rating System for Gravel Roads: Training Manual

of 1, 2, 3, or 4, exhibit evidence that the underlying structure is failing, such as alligator cracking and rutting. These roads must be rehabilitated with treatments like heavy overlay, crush and shape, or total reconstruction.

Tax millages: Local tax implemented to supplement an agency's budget, such as road funding.

Thin hot-mix asphalt overlay: Application of a thin layer of hot-mix asphalt on an existing road to re-seal the road and protect it from damage caused by water. This also improves the ride quality and provides a smoother, uniform appearance that improves visibility of pavement markings.[25]

Transportation infrastructure: All of the elements that work together to make the surface transportation system function including roads, bridges, culverts, traffic signals, and signage.

Trigger: When a PASER score gives insight to the preferred timeline of a project for applying the correct treatment at the correct time.

Trunkline abbreviations: The prefixes *M*-, *I*-, and *US* indicate roads in Michigan that are part of the state trunkline system, the Interstate system, and the US Highway system. These roads consist of anything from 10-lane urban freeways to two-lane rural highways and even one non-motorized highway; they cover 9,668 centerline miles. Most of the roads are maintained by MDOT.

Trunkline bridges: Bridge present on a trunkline road, which typically connects cities or other strategic places and is the recommended rout for long-distance travel.[26]

Trunkline maintenance funds: Expenditures under a maintenance agreement with MDOT for maintenance activities performed on MDOT trunkline routes.

Trunkline: Major road that typically connects cities or other strategic places and is the recommended route for long-distance travel.[27]

Washboarding: Ripples in the road surface that are perpendicular to the direction of travel.[28]

Wedge/patch sealcoat treatment: An asphalt pavement treatment method that involves correcting the damage frequently found at the edge of a pavement by installing a narrow, 2- to 6-foot-wide wedge along the entire outside edge of a lane and layering with HMA. This extends the life of an HMA pavement or chip seal overlay by adding strength to significantly settled areas of the pavement.

Worst-first strategy: Asset management strategy that treats only the problems, often addressing the worst problems first, and ignoring preventive maintenance. This strategy is the opposite of the "mix of fixes" strategy. An example of a worst-first approach would be purchasing a new automobile, never changing the oil, and waiting till the engine fails to address any deterioration of the car.

List of Acronyms

CPM: capital preventive maintenance

[25] [second sentence] http://www.kentcountyroads.net/road-work/road-treatments/ultra-thin-overlay
[26] https://en.wikipedia.org/wiki/Trunk_road
[27] https://en.wikipedia.org/wiki/Trunk_road
[28] Inventory-based Rating System for Gravel Roads: Training Manual

FHWA: Federal Highway Administration

HMA: hot-mix asphalt

I: trunkline abbreviation for routes on the Interstate system

IBR: Inventory-based Rating

M: trunkline abbreviation for Michigan state highways

MDOT: Michigan Department of Transportation

MTF: Michigan Transportation Fund

NBIS: National Bridge Inspection Standards

NCPP: National Center for Pavement Preservation

NHS: National Highway System

PA 51: Michigan Public Act 51 of 1951

PASER: Pavement Surface Evaluation and Rating

R&R: reconstruction and rehabilitation programs

TAMC: (Michigan) Transportation Asset Management Council

US: trunkline abbreviation for routes on the US Highway system