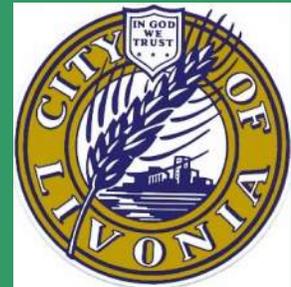


City of Livonia 2023 Transportation Asset Management Plan

September 27, 2023



A plan describing the City of Livonia'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 City of Livonia's 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 the City of Livonia is meeting its obligations to maintain the public assets for which it is responsible.

This plan identifies City of Livonia's assets and condition and how the City of Livonia 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 City of Livonia'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 City of Livonia'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 City of Livonia's assets, and it gives taxpayers the information they need to make informed decisions about investing in City of Livonia'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 City of Livonia 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.

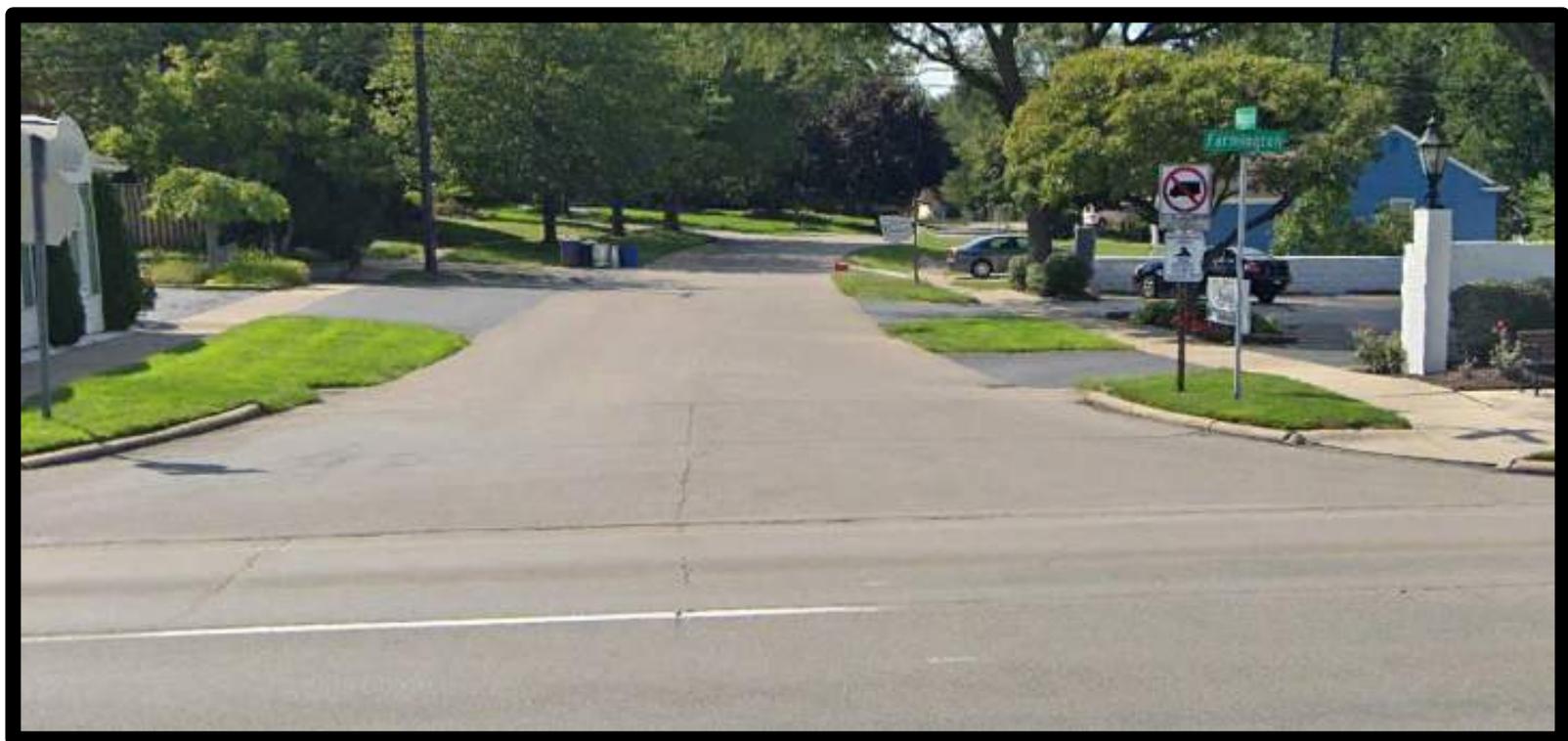
Asset management, in the context of this plan, ensures that public funds are spent as effectively as possible to maximize the condition of the road and bridge network. Asset management also provides a transparent decision-making process that allows the public to understand the technical and financial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

The City of Livonia 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. City of Livonia is responsible for maintaining and operating over 373 centerline miles of roads and two (2) bridge structures. It is also responsible for 28 culverts and 29 signals.

This 2023 plan identifies City of Livonia’s transportation assets and their condition as well as the strategy that the City of Livonia uses to maintain and upgrade particular assets given City of Livonia’s condition goals, priorities of network’s road users, and resources. This 2023 plan is an update to the initial plan submitted in 2020. An updated plan is to be released approximately every 3 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 Todd J. Zilincik, PE., City Engineer, 12973 Farmington Road, Livonia, Michigan A copy of this plan can be accessed on our website at www.livonia.gov for review.

1. PAVEMENT ASSETS



City of Livonia is responsible for 373.51 centerline miles (period ending June 30, 2023) 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 “City Major” road network, which is prioritized for state-level funding, and “City Local” road network.

Inventory of Assets



Figure 1: Map showing location of roads managed by City of Livonia 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 from 2023.

Of City of Livonia’s 373.51 miles of road, 60.52 miles are classified as City Major and 312.99 miles are classified as City Local. (Figure 1 identifies these paved roads in green, yellow, and red with the colors being determined based on the road segment’s condition). City of Livonia does not manage any roads that are classified as part of the National Highway System (NHS); the NHS is subject to special rules and regulations and has its own performance metrics dictated by the FHWA. In addition, City of Livonia has 1.50 miles of unpaved roads (Figure 1 identifies these unpaved roads in blue).

More detail about these road assets can be found in City of Livonia’s Roadsoft database or by contacting City of Livonia Engineering Department at (734) 466-2571.

Types

City of Livonia has multiple types of pavements in its jurisdiction, including: asphalt, concrete, composite and gravel. Figure 2 shows a breakdown of these pavement types for all of City of Livonia’s road assets.

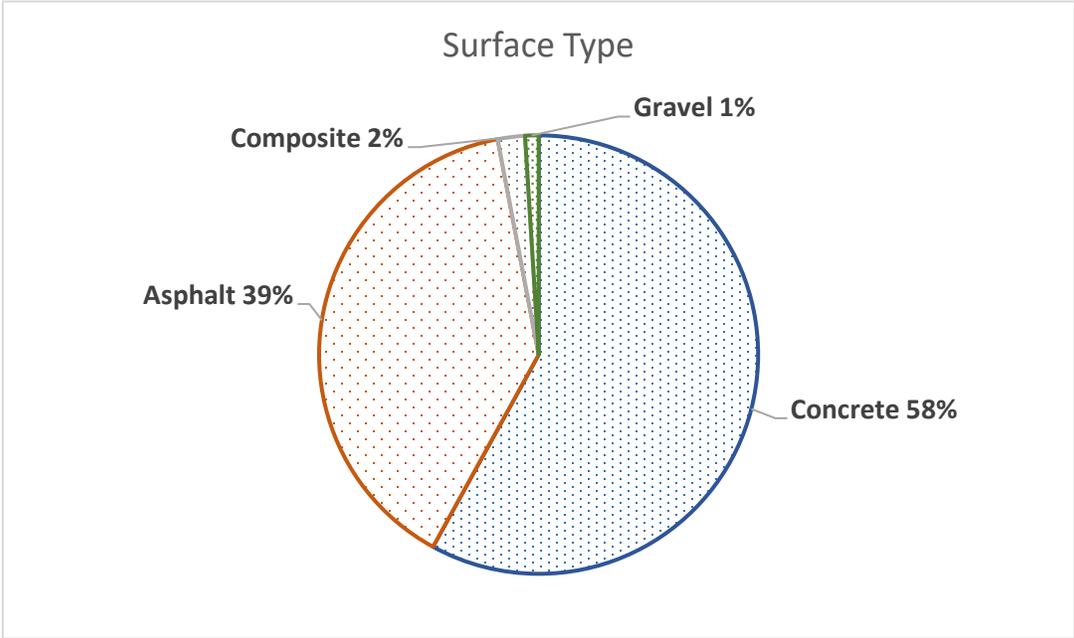


Figure 2: Pavement type by percentage maintained by City of Livonia.

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. City of Livonia collects PASER data every two years on 100 percent of those portions of its City Major and City Local networks that are eligible for federal funding. In addition, City of Livonia

uses its own staff and resources to collect PASER data on 100 percent of its City Major and City Local networks that are not eligible for federal funding.

Currently, the City Major network has 30% of its roads in good condition, 60% in fair condition, and 10% in poor condition, and the City Local network has 27% of its roads in good condition, 68% in fair condition, and 6% in poor condition (Figure 3 and Figure 4). City of Livonia’s long-range goal for the City Major network is to maintain the current road ratings of 30% of in good condition, 60% in fair condition, and 10% in poor condition, and for the City Local network is to have 30% of roads in good condition, 65% in fair condition, and 5% in poor condition (Figure 3 and Figure 4). Figure 3 and Figure 4 illustrate the historical and current condition (solid bars) of City of Livonia’s City Major and City Local networks, respectively; they also illustrate the projected trend (shaded bars), the overall trend in condition (trendlines), and the City of Livonia’s goal (final solid bar).

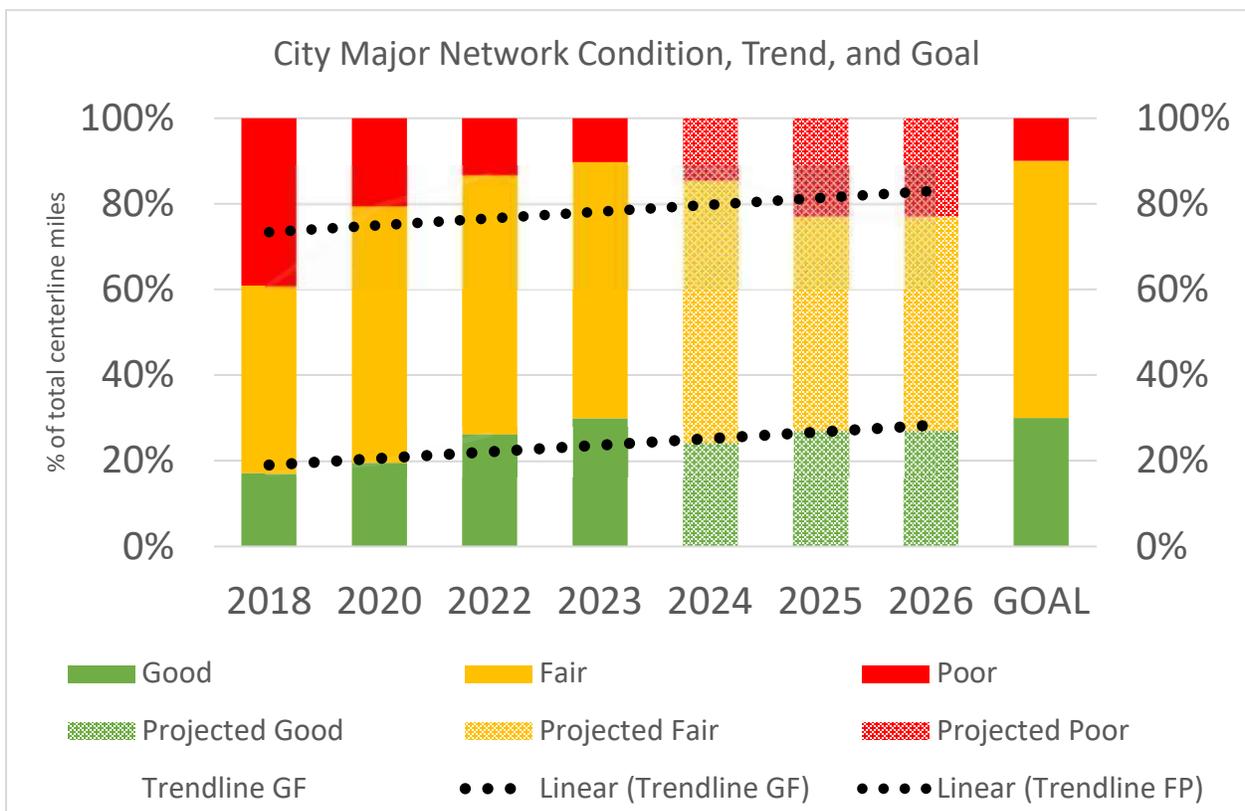


Figure 3: City Major network condition, goals, and trend

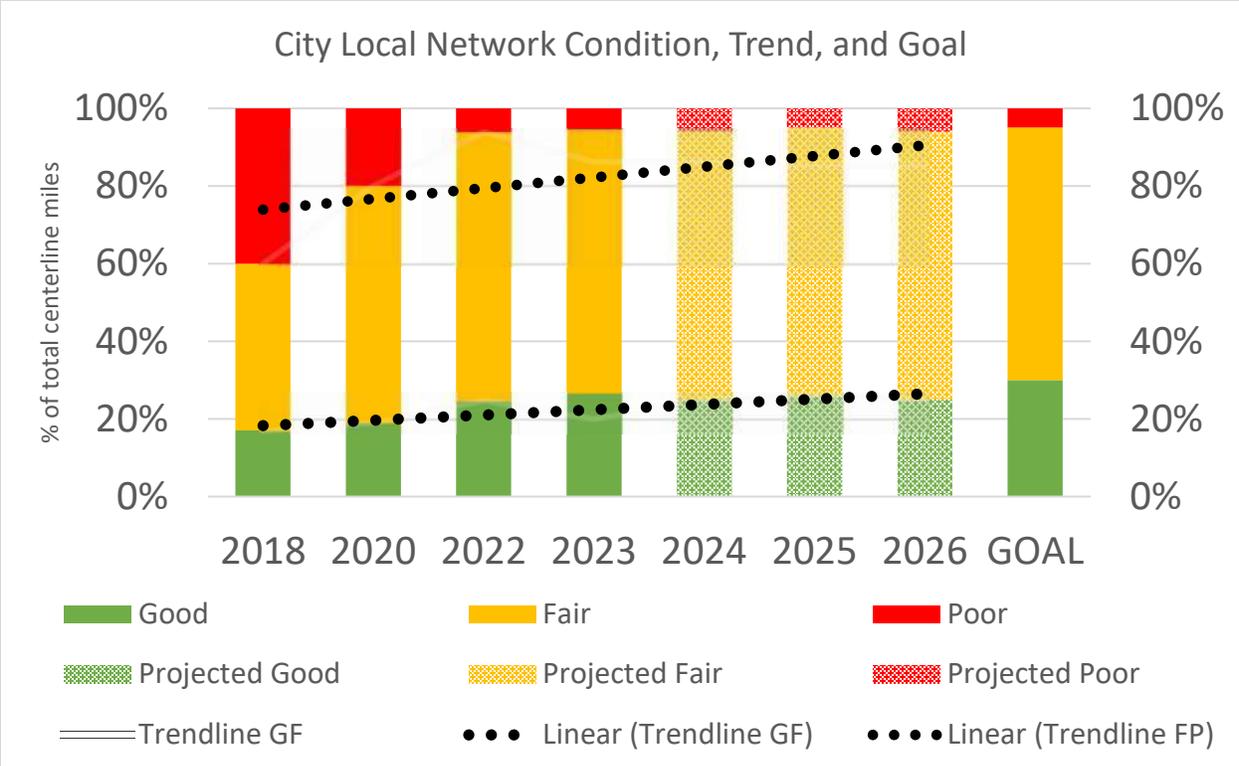


Figure 4: City Minor network condition, goals, and trend

Modelled Trends, Gap Analysis, and Planned Projects

Modelled Trends & Gap Analysis

Table 1: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for Livonia DPS Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved City Major and Local Road Network Forecast; Average treatments from 2021-2023

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger-Reset
Asphalt: Mill & Overlay	4.5	25	3, 4-9
Asphalt: Pulverize & Overlay	1.5	25	3, 4-9
Concrete: Reconstruction	3.5	30	1, 2, 3-10
Concrete: Full Depth / Slab Replacement	1.5	25	1, 2, 3-10

Total: +/- 11miles

The NCPP analysis of City of Livonia’s planned projects from our Annual Repair Program for the City of Livonia’s currently-available budget does allow the City of Livonia to head in the direction of its pavement condition goal given the projects planned for the City Major and City Local networks over the next three (3) years.

Unpaved Road Condition Trends

The City of Livonia currently has 1.50 miles of unpaved roads. The DPW will continue to provide grading and adding any additional aggregate to maintain the gravel roads. The gravel roads at any point and time are considered to be paved if the residents along the frontage want the roads to be paved by provided a petition to consider a Special Assessment District (SAD) for paving the road.

Planned Projects

The City of Livonia has projects planned for the fiscal years 2024. The tables below present the projects that the City of Livonia has planned for road reconstruction, rehabilitation and maintenance.

Concrete Road Reconstruction:

Project Year	Street Name	From	To
2024	Kenwood Ct	#30947 Kenwood Ct	Dead End
2024	Purlingbrook Rd	#19321 Purlingbrook Rd	#19385 Purlingbrook Rd
2024	Navin Ave	Laurel Ave	Gill Rd
2024	Bobrich Ave	Merriman Rd	Sunset Blvd
2024	Bobrich Ave	Middlebelt Rd	Dead End
2024	Cross Winds Ct	Cross Winds Rd	Dead End
2024	Cross Winds Rd	Six Mile Rd	Dead End
2024	Sunset Blvd	Pickford Ave	Clarita Ave
2024	Munger Ave	#30400 Munger Ave	Dead End
2024	Ellen Dr	Five Mile Rd	Roycroft Ave
2024	Comstock Dr	Mallory Dr	Whitcomb Dr
2024	Ladywood Rd	Levan Rd	Woodside Dr
2024	Sherwood Dr	Woodside Dr	Park Ln
2024	Sunnydale Ave	Myrna Ave	Levan Rd
2024	Huff Ave	Five Mile Rd	Lancaster Ave
2024	Richfield Ave	Five Mile Rd	Lancaster Ave
2024	Oakley Ave	Hubbard Rd	#32240 Oakley Ave
2024	Lyndon Ave	Harrison Rd (West)	Lyons Ave
2024	Alexander Ave	Buckingham Ave	Meadowlark Ave
2024	Sunbury Ave	Buckingham Ave	Meadowlark Ave
2024	Capitol Ave	#32432 Capitol Ave	Hubbard Ave
2024	Hathaway Ave	Henry Ruff Rd	Middlebelt Rd
2024	Olson Ave	Henry Ruff Rd	Hillcrest Ave
2024	West Chicago Ave*	Harrison Ave	Inkster Rd

*MDOT LAP Project

Asphalt Road Rehabilitation:

Project Year	Street Name	From	To
2024	St. Martins Ave	Middlebelt Rd	Weyher Ave
2024	Morlock Ave	Oporto Ave	Melvin Ave
2024	Purlingbrook Rd	#19385 Purlingbrook Rd	St. Martins Ave
2024	Purlingbrook Rd	Seven Mile Rd	#19321 Purlingbrook Rd
2024	Laurel Park Dr	Six Mile Rd	#17841 Laurel Park Dr
2024	Sunset Blvd	Clarita Ave	Seven Mile Rd
2024	Floral Ave	Lathers Dr	Curtis Ave
2024	Hubbard Rd	#16360 Hubbard Rd	Six Mile Rd

2024	Bell Creek Lane	6 Mile Road	Farmington Road
2024	Bloomfield Avenue	Farmington Road	Bell Creek Lane
2024	Edington Rd	Five Mile Rd	Roycroft Ave
2024	Southampton Rd	Roycroft Ave	Oakdale Ave
2024	Stamford Rd	Roycroft Ave	Rayburn Ave
2024	Whitby Rd	Dorais Ave	Hampshire Rd
2024	Tuscany Ct	Five Mile Rd	Dead End
2024	Levan Rd	CSX Railroad Tracks	Schoolcraft Rd
2024	Amrhein Rd	#37521 Amrhein Rd	#38101 Amrhein Rd
2024	Butwell St	Joy Rd	West Chicago Blvd
2024	Houghton Ave	Joy Rd	West Chicago Blvd
2024	Lamont St	Joy Rd	West Chicago Blvd
2024	Minton Ave	Hix Rd	Stonehouse Ave
2024	Northfield Ave	Hix Rd	Stonehouse Ave
2024	Stonehouse Ave	Joy Rd	West Chicago Blvd
2024	West Chicago Blvd	Houghton Ave	Stonehouse Ave

Concrete Road Maintenance:

Project Year	Street Name	From	To
2024	Navin Ave	Riverside Dr	Laurel Ave
2024	Laurel Ave	Navin Ave	Fargo St
2024	Aspen Dr	Seven Mile Rd	Dead End
2024	Garden Ave	Roycroft Ave	Rayburn Ave
2024	Roycroft Ave	Middlebelt Rd	Garden Ave
2024	Schoolcraft Rd	Farmington Rd	Merriman Rd
2024	Schoolcraft Rd	Yale	Farmington Rd
2024	Schoolcraft Rd	Newburgh Rd	Yale Ave
2024	Schoolcraft Rd	#38881 Schoolcraft Rd	Newburgh Rd
2024	Houghton Ave	Richland Ave	Ann Arbor Tr.
2024	Elmira Ave	Levan Rd	Dead End

The City of Livonia uses PASER ratings which are collected every two years to determine roads in need of improvement. The City staff visit selected streets to field verify that the streets selected by PASER ratings match the needs of the community. A combination of rehabilitation, reconstruction and maintenance streets are chosen and located regionally within one another in the community.

The projects selected for the 2024 year are shown in Figure 5. They are broken down by concrete, asphalt and slab replacement projects.

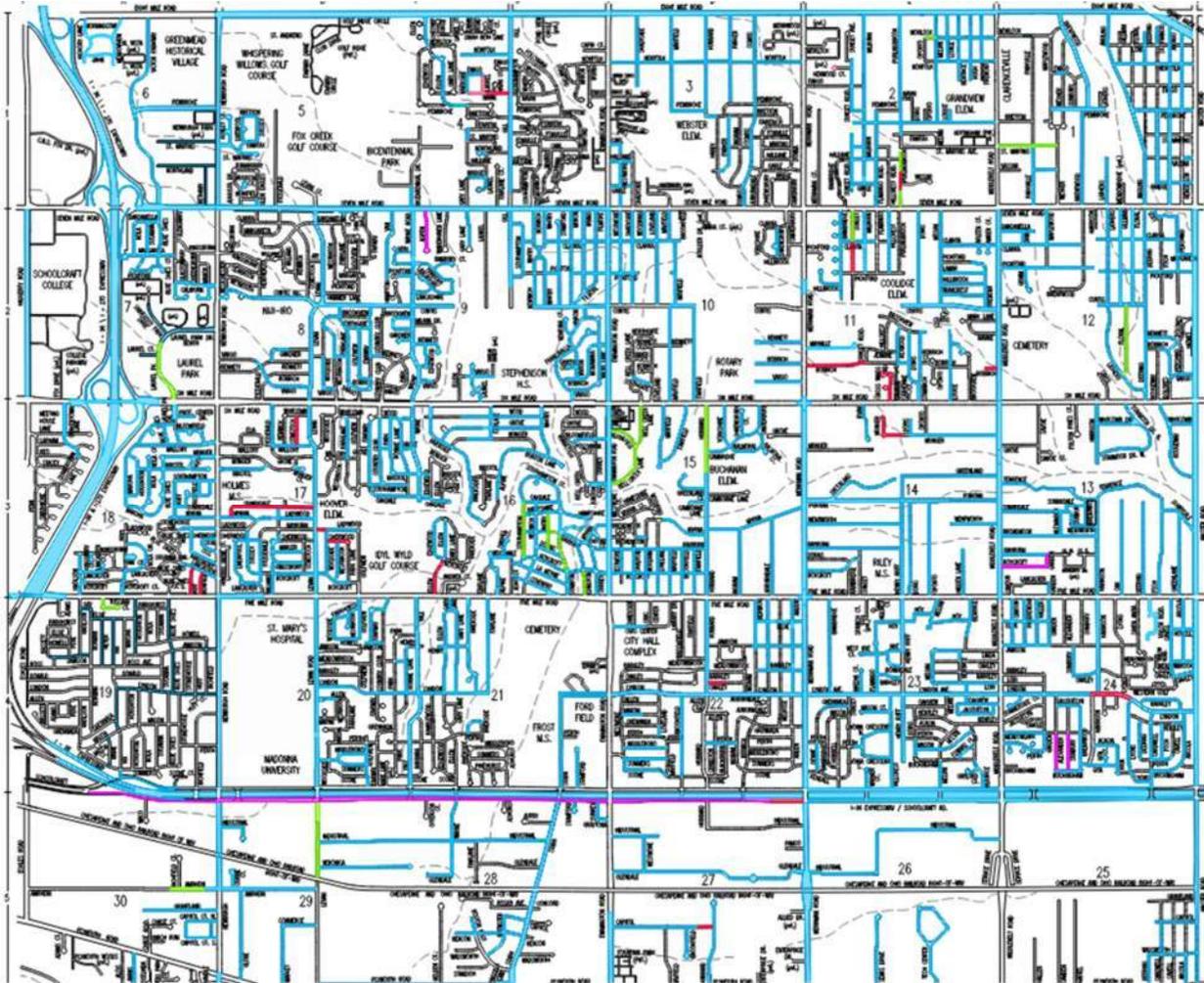
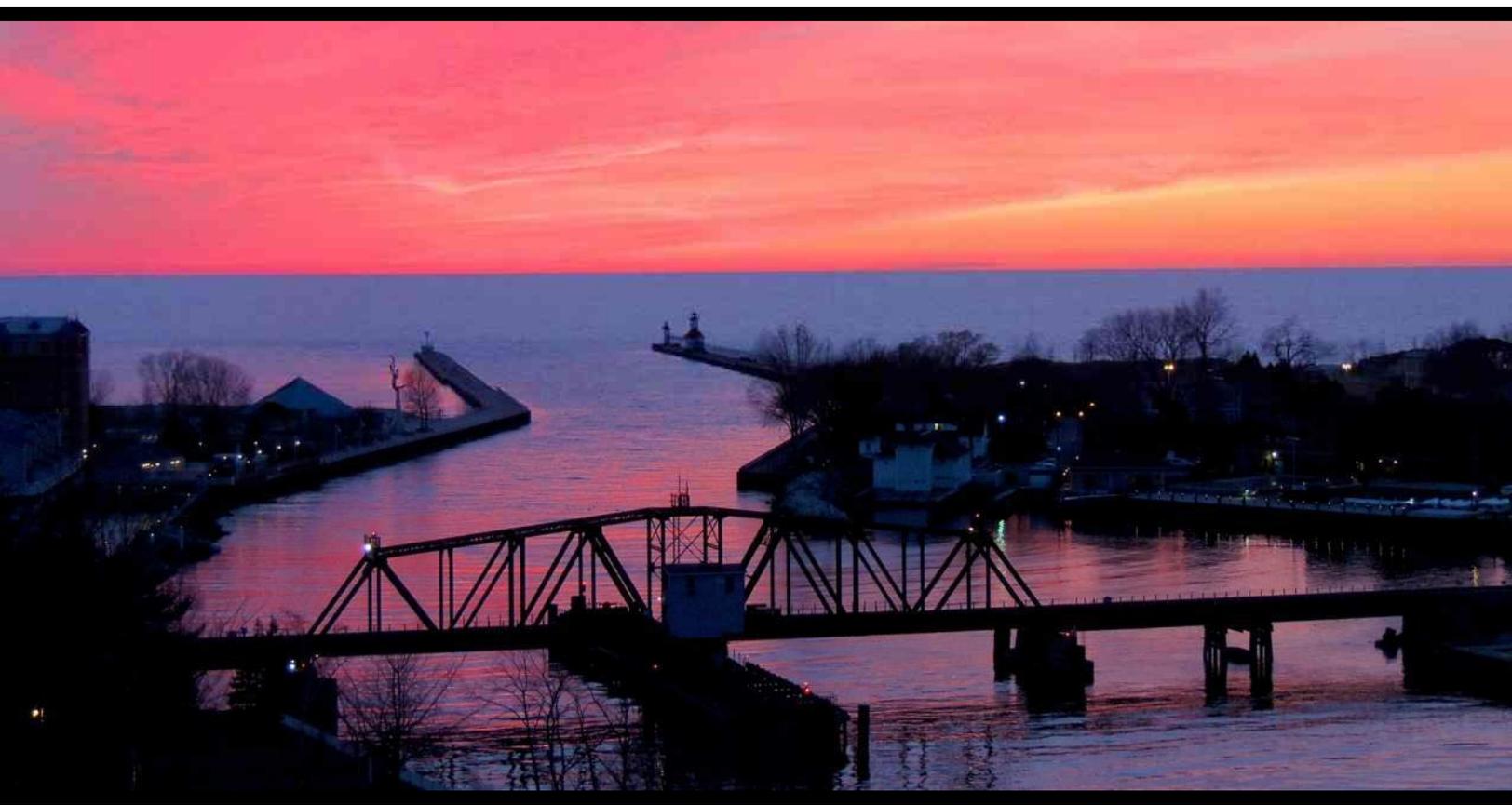


Figure 5 : City of Livonia’s Road Program Map. Roads in blue are previously completed road maintenance projects, roads in red are proposed concrete reconstructions, roads in green are proposed asphalt rehabilitation and roads in magenta are proposed slab replacements.

The total cost of the projects illustrated in Figure 5 is approximately \$10.2 million. This cost is around the average spent annually on road maintenance in the city’s network.

2. BRIDGE ASSETS



City of Livonia is responsible for two (2) bridges that provide safe service to road users across the agency network. The first bridge, Newburgh Road over Rouge River (MDOT Bridge ID # 8239944 3100100B01 / NBI Bridge ID 824399431001B01, Structure Number 12509) is a prestressed concrete type constructed in 1988. The second bridge, Hubbard Road over Bell Creek (MDOT Bridge ID # 8239944 1500100B01 / NBI Bridge ID 824399415001B01, Structure Number 12508 is an 18-inch slab bridge constructed in 1960 and reconstructed in 2004. It currently has a latex surface. The City of Livonia 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. The City is required to have the bridges inspected every 2 years. The next scheduled inspection is set for late 2024.

Inventory of Assets

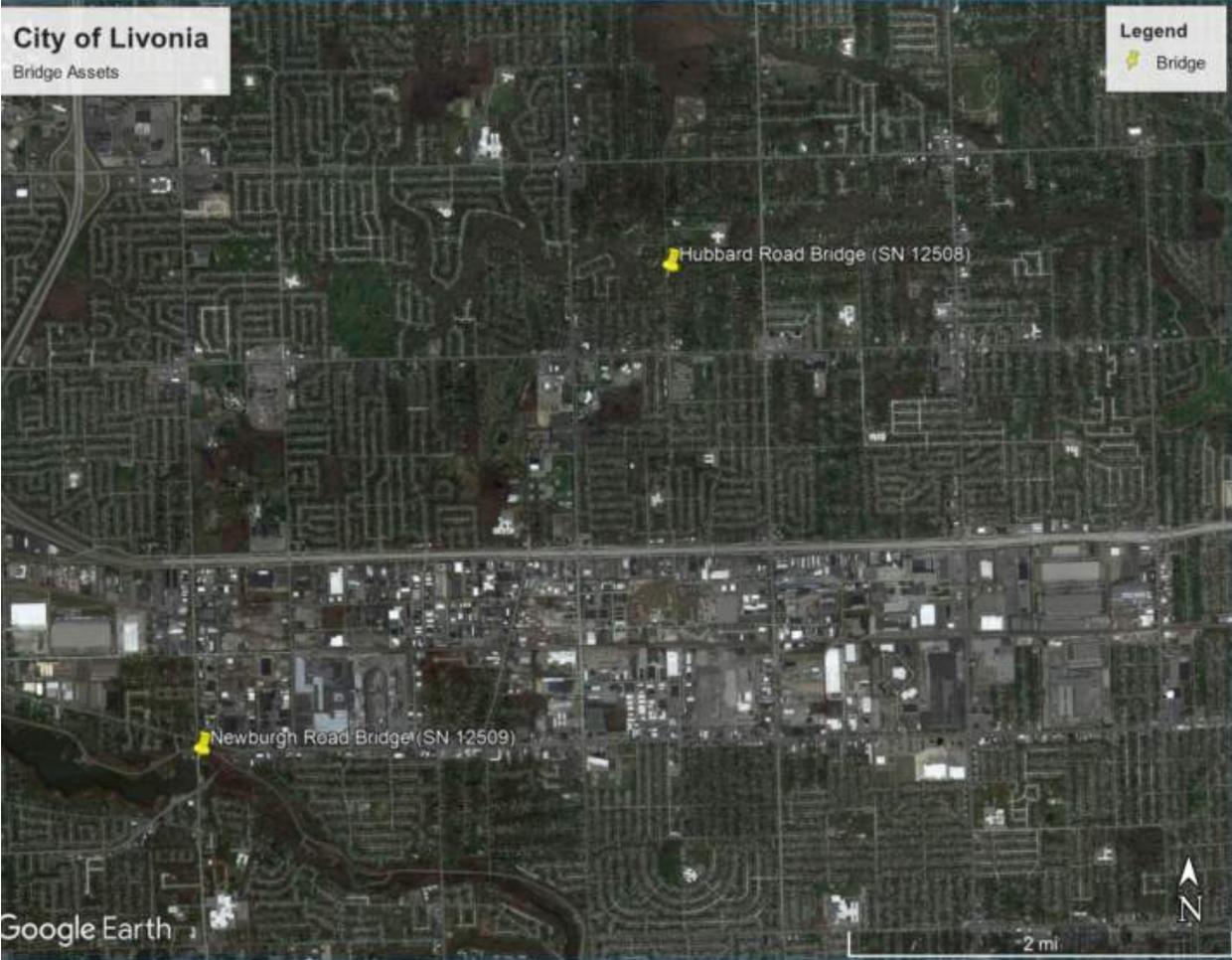


Figure 6: Map illustrating locations of City of Livonia's bridge assets

City of Livonia has two (2) total bridges in its road and bridge network; these bridges connect various points of the road network, as illustrated in Figure 6. 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 City of Livonia’s MiBRIDGE database or by contacting the City of Livonia Engineering Department at (734) 466-2571.

Table 2: Type, Size, and Condition of City of Livonia's Bridge Assets					
Bridge Name & Type	Bridge Type	Total Deck Area (sq ft)	2018 Condition	2020 Condition	2022 Condition
Newburgh Road (over Rouge River)	Prestressed Concrete	5,000	Fair	Fair	Fair
Hubbard Road (over Bell Creek)	Concrete	4,000	Fair	Fair	Fair
Total		6,565			

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 City of Livonia’s bridge network based on the NBIS is 2 structures rated fair (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. City of Livonia has zero structures that are posted for load restriction. 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. City of Livonia has 0 structures that are closed.

The goal of the program is the preservation and safety of City of Livonia’s bridge network. The City of Livonia is scheduled to reconstruct Newburgh Road from Ann Arbor Trail to Plymouth Road as part of the Michigan Department of Transportation (MDOT) Local Agency Program (LAP) JN 200183 for 2025. Funding in the amount of \$1,138,943 has been obtained towards this project.

As of September 2023, the City has identified two new bridges that were originally thought to be culverts. Due to the size of these spans, the City is in the process of adding these bridges to their MiBRIDGE database as well as collecting and reporting all the appropriate data. These locations are on Angling St (North of 7 Mile Rd) and Golfview Dr (South of 5 Mile Rd).

Figure 7 illustrates the baseline condition, projected trend, and goal that City of Livonia has for its good/fair and its structurally deficient bridges.

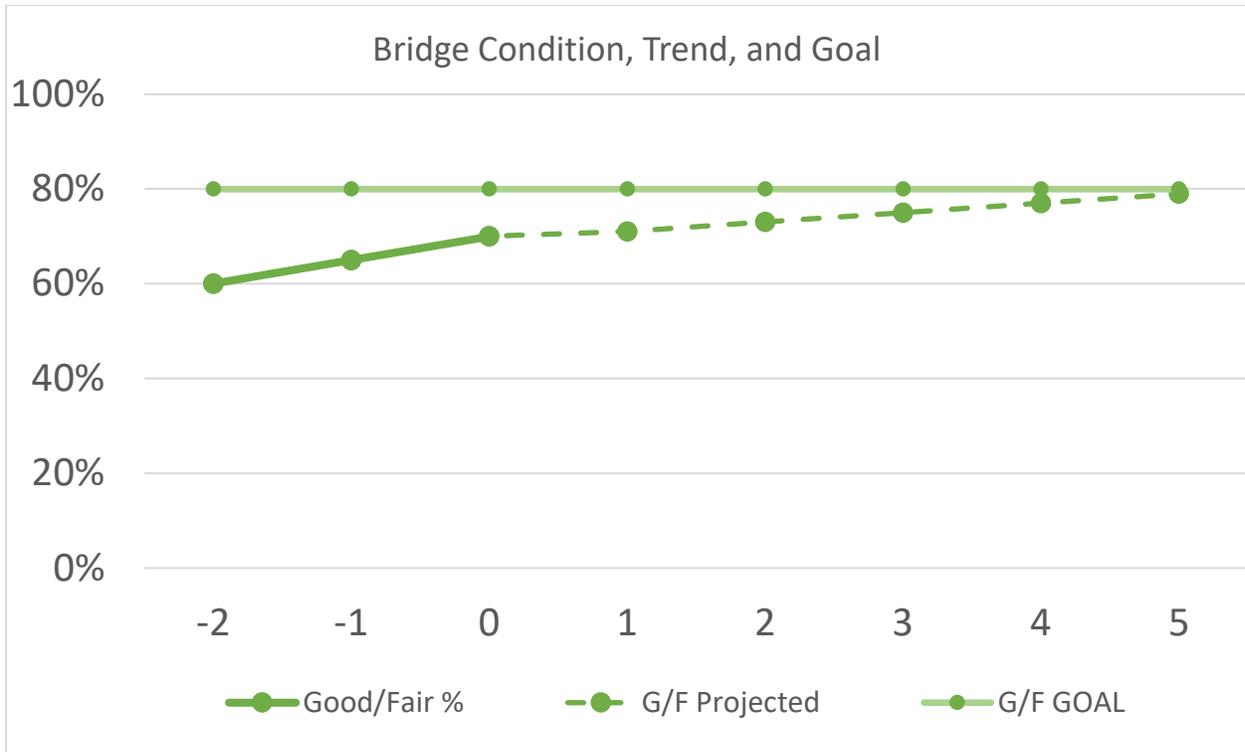


Figure 7: Condition, projected trend, and goal for City of Livonia's good/fair and structurally deficient bridges

Programmed/Funded Projects, Gap Analysis, and Planned Projects

City of Livonia will receive \$50,000 in total funding for the years 2024-2028. Preventive maintenance is a more effective use of these funds than the costly alternative of major rehabilitation or replacement. Since City of Livonia 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 \$10,000 per year for the next three years on preventive maintenance of bridges. City of Livonia plans to replace none of their bridges within the next three years, incurring no cost. By performing the aforementioned preventive maintenance and replacement of bridge structures, City of Livonia will achieve its goal of keeping its overall bridge network at the same condition.

3. CULVERT ASSETS



The City of Livonia exercises awareness of its culvert assets. In 2001, a joint venture between OHM Advisors and Hubbell, Roth & Clark, Inc. provided a Drain Inventory Report dated December 17, 2001.

Inventory of Assets

As of September 2023, the City of Livonia has inventoried and rated 100% of the culverts that they own. The City of Livonia owns 28 culverts. There are also an estimated 28 culverts within the City under Wayne County jurisdiction and one (1) under the Michigan Department of Transportation. Figure 8 below shows the culverts under City of Livonia jurisdiction.

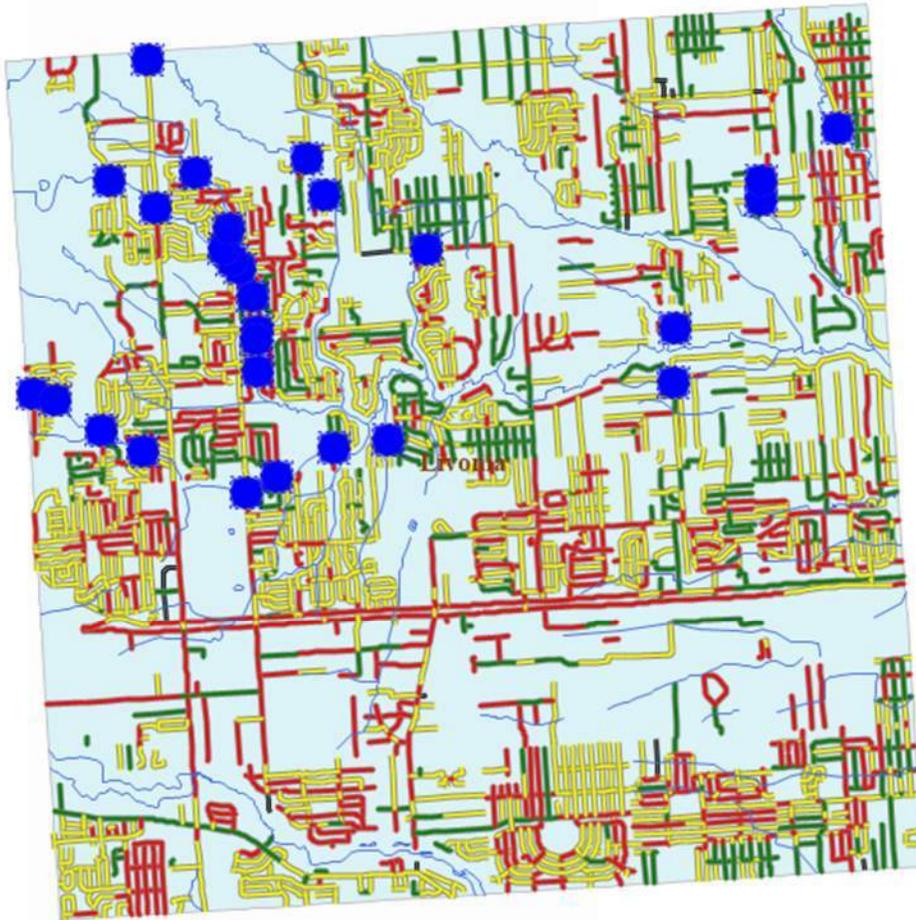


Figure 8: Culverts under City of Livonia jurisdiction

The City of Livonia inventoried and inspected all its culverts in September 2023. Of the culverts under City jurisdiction, 13 of them are concrete and 15 of them are corrugated metal pipe. Barrel ratings and vicinity ratings were collected for these culverts in 2023. Barrel ratings account for the shape, interior/exterior damage, buckling, joint separation or cracking, corrosion, barrel alignment and

infiltration or exfiltration of the pipe. Vicinity ratings account for the stability of adjacent pavement and shoulders, slope stability, embankment and bank erosion, bank scour, channel alignment, waterway blockage and settlement. Tables 4 and 5 below present a summary of the findings from these inspections.

Barrel Rating	Number of Culverts	Percentage (%)
Good	8	29
Fair	12	43
Poor	6	21
Severe	2	7

Table 4: Barrel Ratings for culverts under City of Livonia jurisdiction

Vicinity Rating	Number of Culverts	Percentage (%)
Good	3	11
Fair	19	68
Poor	6	21

Table 5: Vicinity Ratings for culverts under City of Livonia jurisdiction

More detail about these culvert assets can be found by contacting the City of Livonia DPW Department of Public Service at (734) 466-2655 and requesting to discuss information with Donald R. Rohraff, DPW Director.

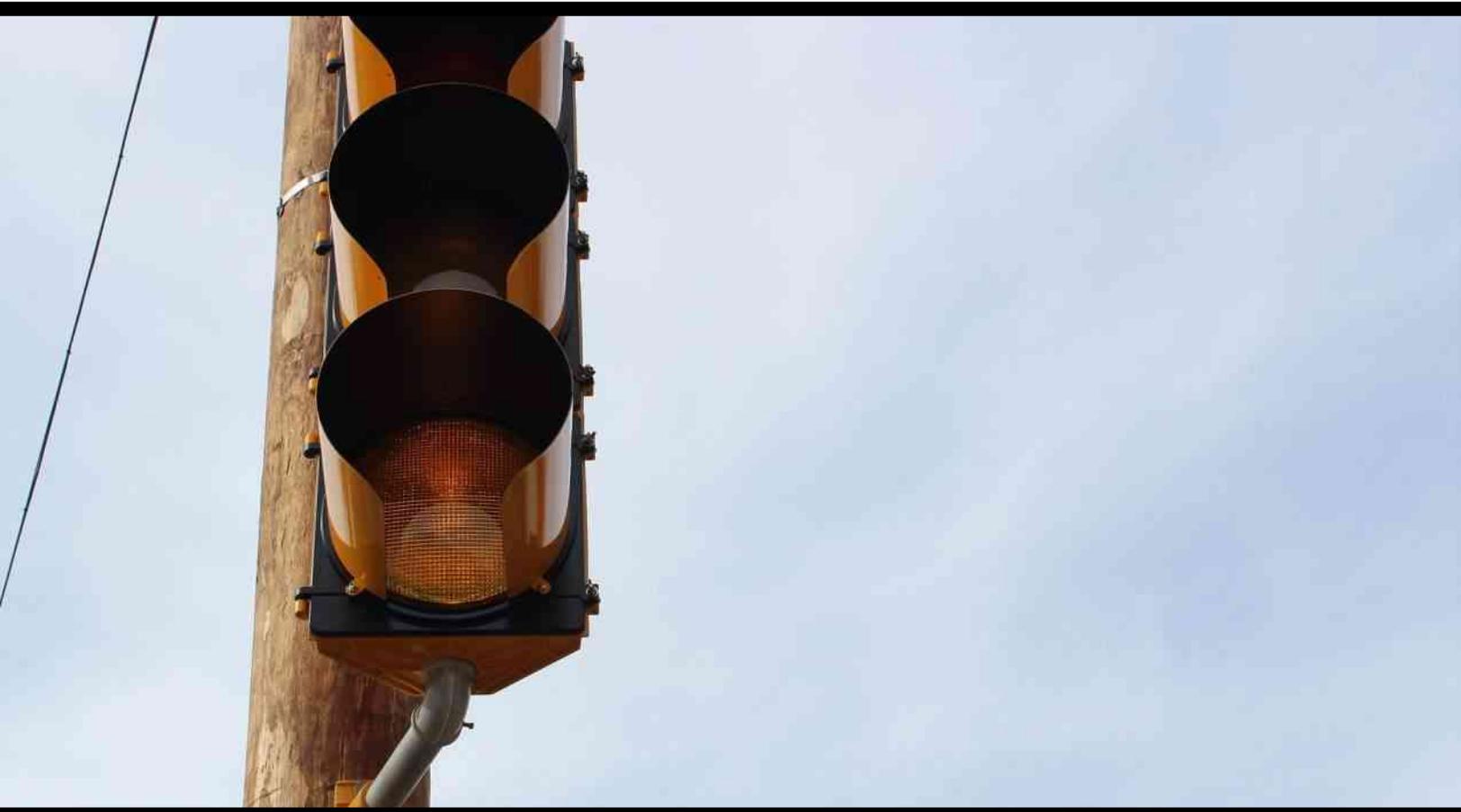
Goals

The goal of City of Livonia’s asset management program is the preservation of its culvert network. The City of Livonia is responsible for preserving 28 inventoried culverts that underlie its entire road network. The City’s current goal is to maintain the culverts within their system.

Planned Projects

City of Livonia’s policy is to replace or repair culvert assets concurrent with projects affecting road segments carried by the particular culverts. City of Livonia also includes culvert assets in scheduled maintenance projects affecting road segments carried by the particular culverts.

4. SIGNAL ASSETS



The City of Livonia exercises awareness of its traffic sign and signal assets. We receive invoices from Oakland County Road Commission for energy or maintenance costs related to the traffic signals at 8 Mile and Brentwood along with 8 Mile / Purlingbrook / Tuck. Additionally, the City of Livonia receives monthly invoices from Wayne County for maintenance costs that range from \$3,000 to \$5,000 per month and energy costs for just under \$3,000 for 85 traffic signals of which the City of Livonia owns 29.

Inventory of Assets

At present, the City of Livonia, tracks only inventory data for traffic signals. The City of Livonia has inventoried 29 traffic signals.

More detail about these traffic signal assets can be obtained by contacting the City of Livonia Engineering Department at (734) 466-2571.

Goals

The goal of City of Livonia's asset management program is the preservation of its traffic signals. City of Livonia is responsible for preserving 29 inventoried traffic signals as well as any un-inventoried traffic signals along its entire road network.

Planned Projects

City of Livonia'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. City of Livonia adheres to regular maintenance and servicing policies outlined in the *Michigan Manual of Uniform Traffic Control Devices* and coordinates with Wayne County for maintenance issues.

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, City of Livonia 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 City of Livonia’s financial status can be found by request submitted to our agency contact listed in this plan.

Anticipated Revenues & Expenses

City of Livonia receives funding from the following sources:

- **State funds** –City of Livonia'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. 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. City of Livonia does have a local tax millage in its road-funding budget. The City of Livonia levies 0.89 mills for our Road Repair Program that was renewed for a second time in 2022 for a length of ten years. A portion of the millage is used to address sidewalk vertical displacements from City trees in the right-of-way.
- **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 City of Livonia to construct or maintain its roads, or roads under joint or neighboring jurisdictions, including state trunkline maintenance and non-maintenance services and preservation.

City of Livonia 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 “activities undertaken to preserve the integrity of the existing roadway system.”² Preservation includes items such as a reconstruction of an existing road or bridge, or adding structure to an existing road.

¹ Public Act 51 of 1951, 247.660c Definitions

² Public Act 51 of 1951, 247.660c Definitions

- **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 the City of Livonia’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.

Table 3 (below) details the average revenues and expenditures for City of Livonia.

Table 3: Average Annual Fiscal Year Revenues & Expenditures from Fiscal Years 2021 & 2022				
Revenues		Expenditures		
Item	Estimated \$	Item	Estimated \$	Percent of Total
State Funds	\$13,698,643	Construction & Capacity Improvement (CCI)	\$0	0%
Federal Funds	\$0	Preservation & Structural Improvement (PSI)	\$13,659,400	85%
Contributions from Local Units	\$5,926,454	Routine Maintenance	\$864,057	5%
Interest, Rents and Other	\$31,626	Winter Maintenance	\$587,229	4%
Charges for Services	\$0	Trunkline Maintenance	\$0	0%
		Administrative	\$824,891	5%
		Other	\$67,300	0%
TOTAL	\$19,656,722	TOTAL	\$16,002,876	

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 City of Livonia 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:
 - Newburgh Road at I-96
 - Portions of Schoolcraft Road along I-96
 - Newburgh Road Bridge located between Ann Arbor Road and Edward Hines Drive

Figure 9 illustrates the key transportation links in City of Livonia's road and bridge network.

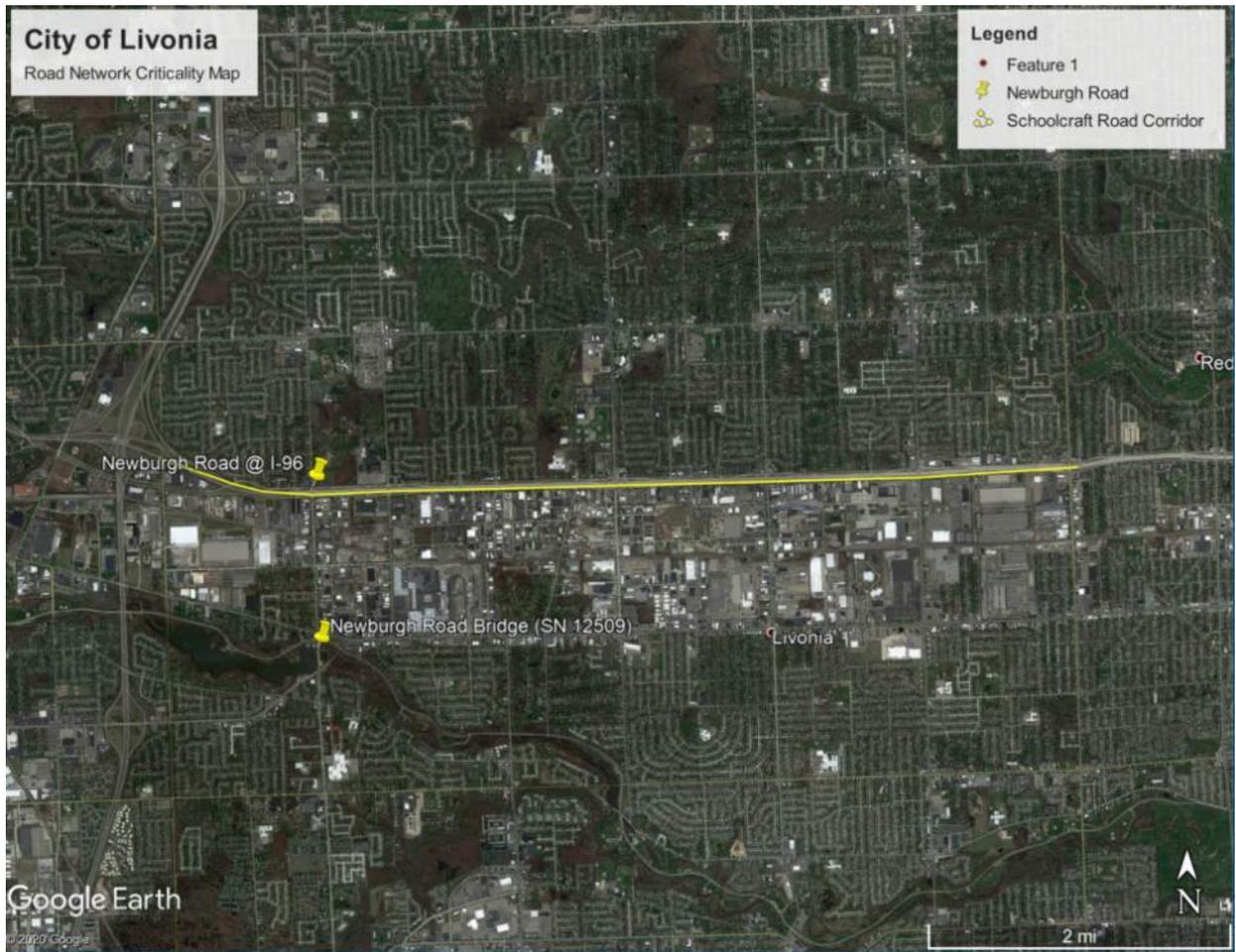


Figure 9: Key transportation links in the City of Livonia's road and bridge network

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. The City of Livonia communicates with both public and private infrastructure owners to coordinate work in the following ways:

City of Livonia coordinates with multiple agencies that maintain drinking water, sanitary, and storm sewer assets in addition to transportation assets. City of Livonia follows an asset management process for all of its assets by coordinating the upgrade, maintenance, and operation of all major assets.

Planned projects for sub-surface infrastructure that City of Livonia owns are listed in the following asset management plans: drinking water distribution system asset management plan, wastewater collection system asset management plan, storm sewer system asset management plan. These three sub-surface utility plans are coordinated with the transportation infrastructure plans to maximize value and minimize service disruptions and cost to the public.

City of Livonia takes advantage of coordinated infrastructure work to reduce cost and maximize value using the following policies:

- Roads which are in poor condition that have a subsurface infrastructure project planned which will destroy more than half the lane width will be rehabilitated or reconstructed full width using transportation funds to repair the balance of the road width.
- Subsurface infrastructure projects which will cause damage to pavements in good condition will be delayed as long as possible, or methods that do not require pavement cuts will be considered.

- Subsurface utility projects will be coordinated to allow all under pavement assets to be upgraded in the same project regardless of ownership.
- Road reconstruction projects will not be completed until agency owned sub surface utilities are upgraded to have at least a 40 years of remaining service life.

Annually, City of Livonia convenes a Citizen's Road Advisory Committee in October. This public meeting allows input on locations to consider for road repairs on City jurisdiction roads. Local business owners and residents from all of the major and local roads are provided notice for the meeting and are invited to attend. An attempt is made to coordinate the schedule of the event to allow the majority of infrastructure owners to attend.

City of Livonia provides all attendees of the infrastructure planning summit with a list of all planned road projects for the next two (2) years that include new pavement structure. Infrastructure owners are encouraged to discuss planned projects that would disrupt transportation services or cause damage to pavements. Projects which may cause damage to pavements in good or fair condition are discussed and mitigation measures are proposed to minimize the impact to pavements. Mitigation measures could include rescheduling and coordinating projects to maximize value and minimize disruptions and cost to the public.

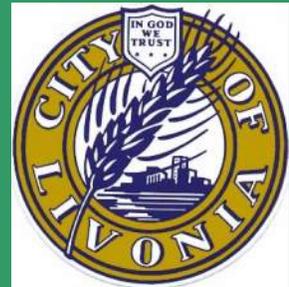
8. PROOF OF ACCEPTANCE

A. PAVEMENT ASSET MANAGEMENT PLAN

An attached pavement asset management plan follows.

City of Livonia 2023 Pavement Asset Management Plan

September 27, 2023



A plan describing the City of Livonia's roadway assets and conditions

Prepared by: City of Livonia

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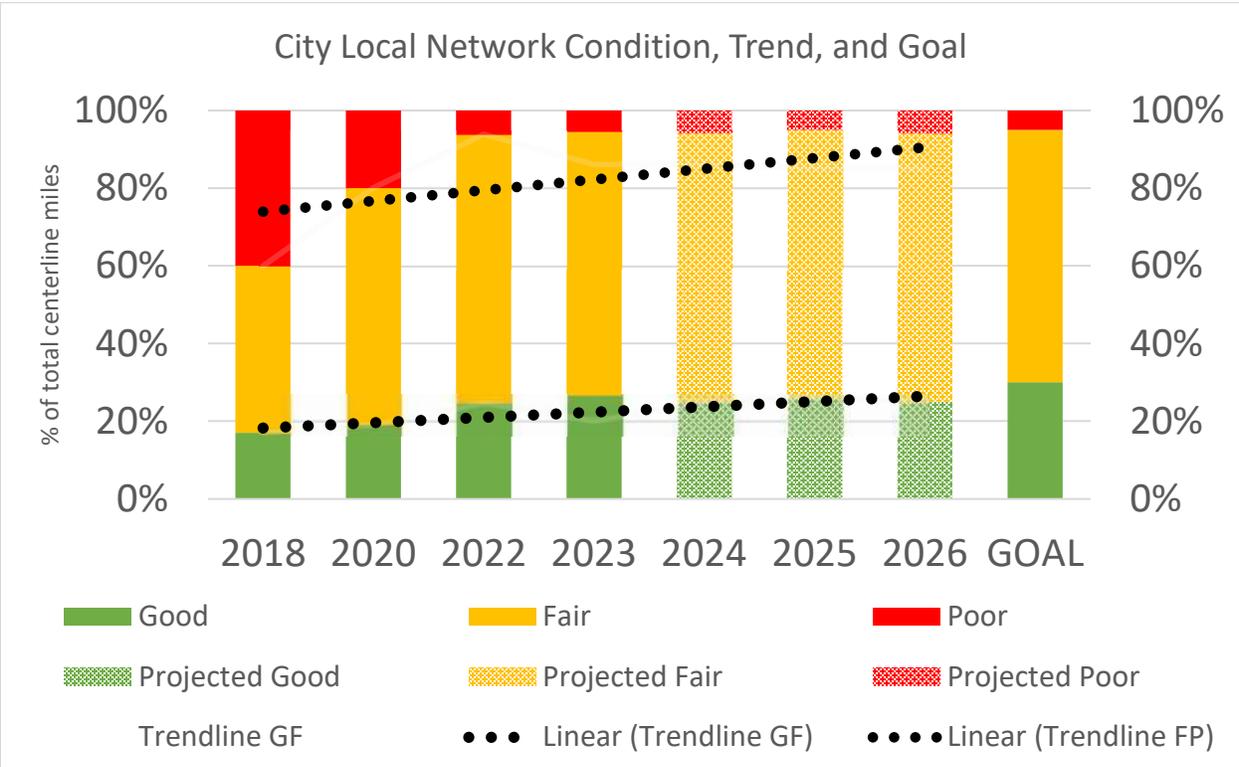
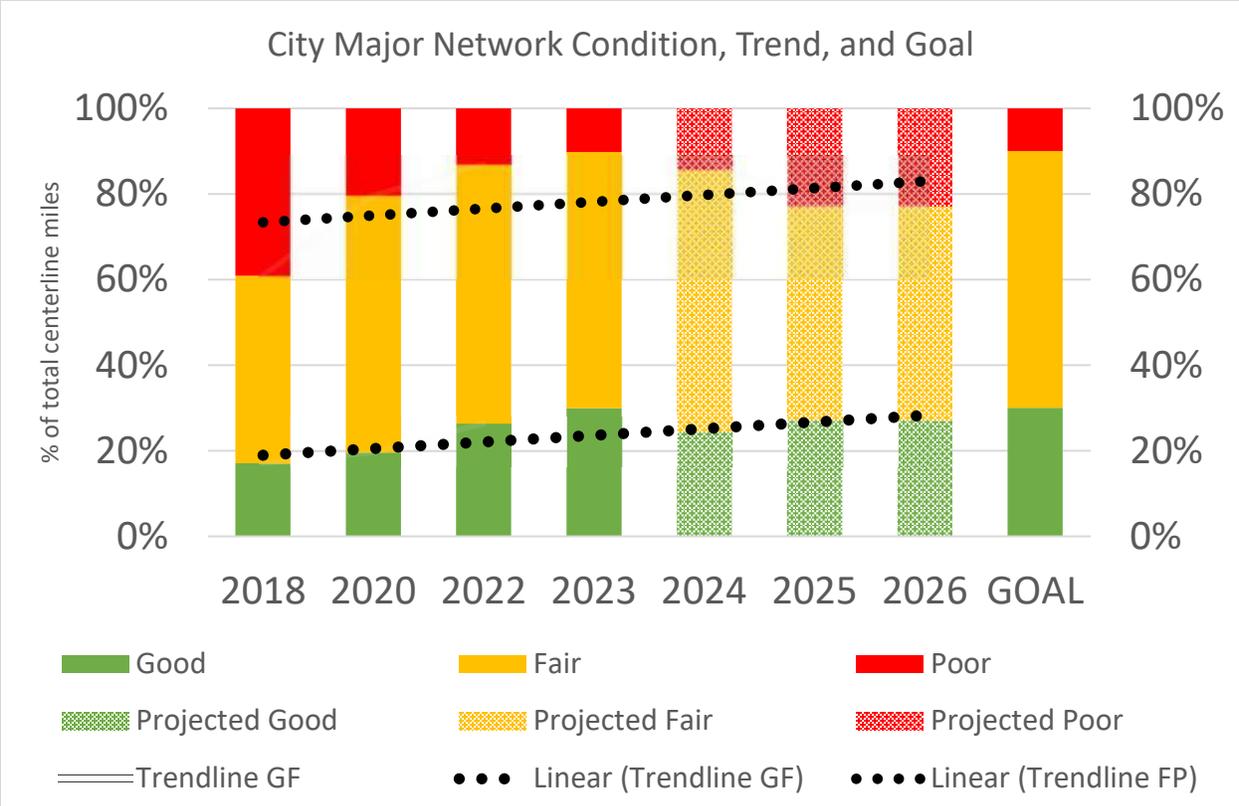
EXECUTIVE SUMMARY

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 City of Livonia's (City of Livonia DPW) 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 City of Livonia DPW is meeting its obligations to maintain the public assets for which it is responsible.

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

- What kinds of road assets City of Livonia DPW has in its jurisdiction, who owns them, and the different options for maintaining these assets.
- What tools and processes City of Livonia DPW uses to track and manage road assets and funds.
- What condition City of Livonia DPW'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 City of Livonia DPW's road assets' normal life cycle.
- What condition City of Livonia DPW 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 City of Livonia DPW's road assets.

City of Livonia DPW owns and/or manages 373.51 miles centerline of roads. This road network can be divided into the city major network, the city minor network and the unpaved road network based on the different factors these roads have that influence asset management decisions. A summary of City of Livonia DPW historical and current network conditions, projected trends, and goals for city major network and city minor network can be seen in the figures shown on the next page.



An asset management plan is required by Michigan Public Act 325 of 2018, and this document represents fulfillment of some of City of Livonia DPW's obligations towards meeting these requirements. This asset management plan also helps demonstrate City of Livonia DPW's responsible use of public funds by providing elected and appointed officials as well as the general public with inventory and condition information of City of Livonia DPW'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). City of Livonia DPW 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 City of Livonia (City of Livonia DPW) 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. City of Livonia DPW is responsible for maintaining and operating over 373.51 centerline miles of roads.

This plan outlines how City of Livonia DPW 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 Todd Zilincik at 12793 Farmington Road, Livonia, Michigan or at tzilincik@livonia.gov. A copy of this plan can be accessed on our website at www.livonia.gov. Key terms used in this plan are defined in City of Livonia DPW’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.

Roads come in two (2) 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. City of Livonia DPW 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

City of Livonia DPW 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. City of Livonia DPW 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 City of Livonia DPW 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 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.

Unpaved Road Condition Rating

Due to the extremely low number of unpaved roads in the City of Livonia, an in-depth analysis is not performed on their 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 City of Livonia gathers condition assessment data for unpaved roads by driving down unpaved roads and determining whether the road is suitable for the driving needs of the community. This assessment generates an overall rating of good, fair or poor. Roads in good condition have sufficient surface width, good drainage, and well-constructed base. A road in poor condition implies 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. The middle example in Figure 2 shows a road with fair surface width, fair drainage adequacy, and fair structural adequacy. The bottom example in Figure 2 shows a road with good surface width, good drainage adequacy, and good structural adequacy.



Figure 2: *Top*– Unpaved road with poor rating. *Middle*– Unpaved road with fair rating. *Bottom*– Unpaved road with good rating.

Unpaved roads are constructed and used differently throughout Michigan. Unpaved roads in the City of Livonia are primarily used for recreational purposes; therefore, an in-depth rating is not required for these roadways.

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 City of Livonia DPW—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 twenty to thirty years and costs \$600,000 to \$1,500,000 per lane mile. The following descriptions outline the main reconstruction treatments used by the City of Livonia.



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

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 fifteen years and typically costs \$200,000 per mile.

Structural Improvements

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 the City of Livonia.



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. 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. A 3” HMA mill and overlay lasts approximately five to ten years and costs \$300,000 per lane mile.

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 or chip seal. 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 ten years and costs \$250,000 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 the City of Livonia.



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). City of Livonia DPW 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 \$10,000 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 the City of Livonia 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 three to five years at a cost of \$20,000 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 lane mile.

Maintenance Grading & Dust Control (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 \$1500 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, weldco.gov)

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 City of Livonia DPW is responsible for a total of 373.51 centerline miles of public roads, as shown in Figure 7.



Figure 7: Map showing location of City of Livonia DPW's paved roads (i.e., those managed by City of Livonia DPW) 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 City of Livonia DPW's unpaved 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, classifies roads owned by City of Livonia DPW as either city major or city minor roads. State statute prioritizes expenditures on the city major road network.

Figure 8 illustrates the percentage of roads owned by City of Livonia DPW that are classified as city major and city minor roads.

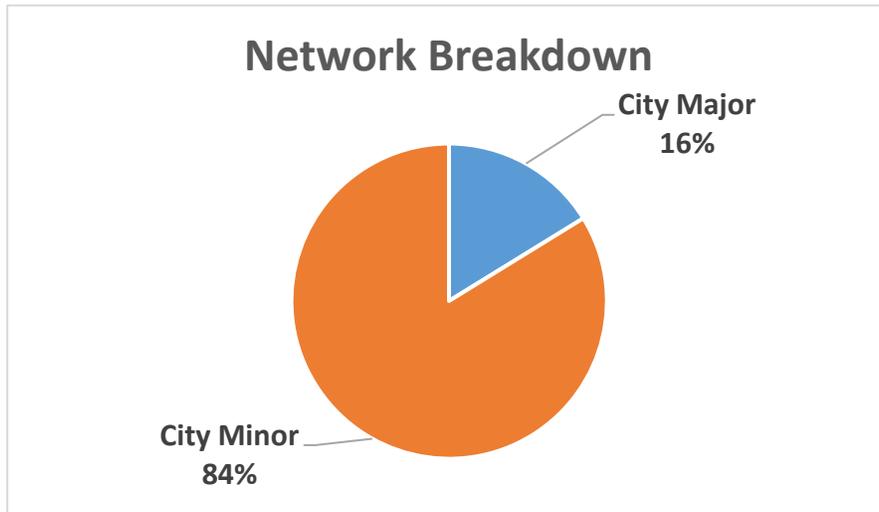


Figure 8: Percentage of city major and city minor roads for City of Livonia DPW.

The city minor road network includes 1.50 miles of unpaved roads owned and managed by the City of Livonia.

Types

City of Livonia DPW has multiple types of pavements in its jurisdiction, including: concrete, asphalt and composite; it also has gravel, unpaved roads. 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 9 illustrates the percentage of various pavement types that City of Livonia DPW has in its network.

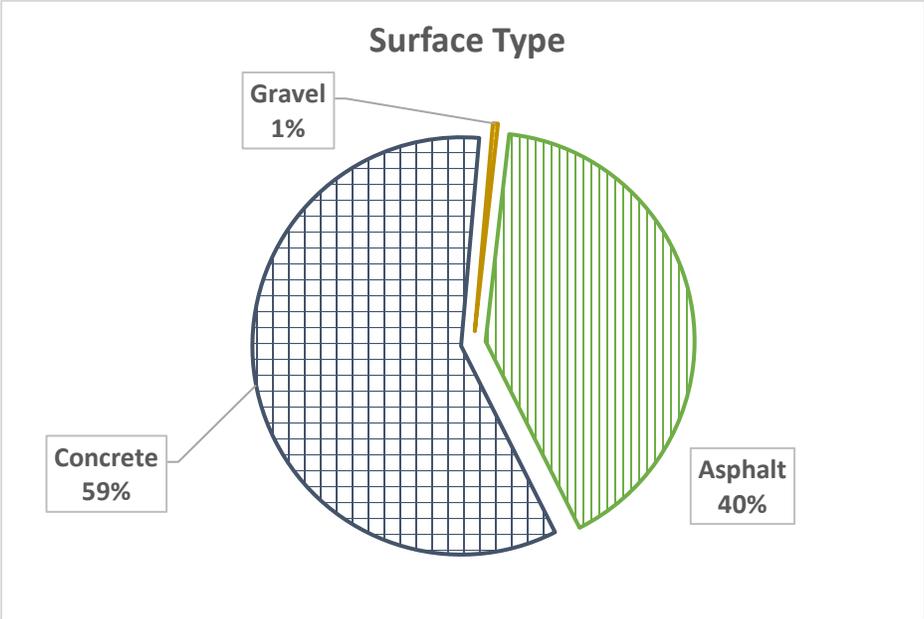


Figure 9: Pavement type by percentage maintained by City of Livonia DPW Undefined pavements have not been inventoried in City of Livonia DPW’s asset management system to date, but will be included as data becomes available.

Locations

Locations and sizes of each asset can be found in City of Livonia DPW’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. City of Livonia DPW 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 City of Livonia DPW 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

City of Livonia DPW 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. City of Livonia DPW 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*.

City of Livonia DPW collects 100 percent of its PASER data every two years on all federal-aid-eligible roads in Michigan.

City of Livonia DPW’s paved city major road network has 30.3 percent of roads in the TAMC good condition category, 59.4 percent in fair, and 10.3 percent in poor (Figure 10A). The paved city minor road network has 26.6 percent in good, 67.8 percent in fair, and 5.6 percent in poor (Figure 10B).

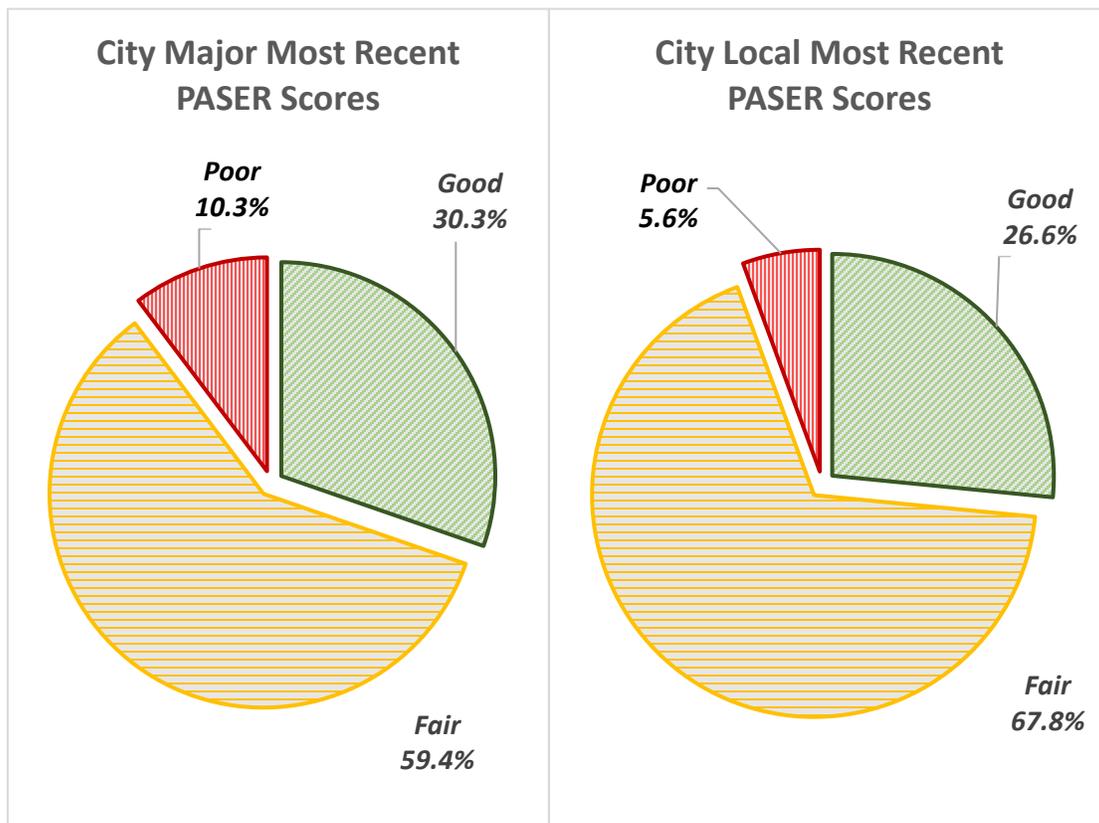


Figure 10: (A) Left: City of Livonia DPW paved city major road network conditions by percentage of good, fair, or poor, and (B) Right: paved city minor road network conditions by percentage of good, fair, or poor

In comparison, the statewide paved city major road network has 26 percent of roads in the TAMC good condition category, 42 percent in fair, and 32 percent in poor (Figure 11A). The statewide paved city minor road network has 20 percent in good, 35 percent in fair, and 45 percent in poor (Figure 11B). Comparing Figure 10A and Figure 11A shows that City of Livonia DPW's paved city major road network is the slightly better than similarly-classified roads in the rest of the state, while Figure 10B and Figure 11B show that the City of Livonia paved city minor road network is slightly 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>.

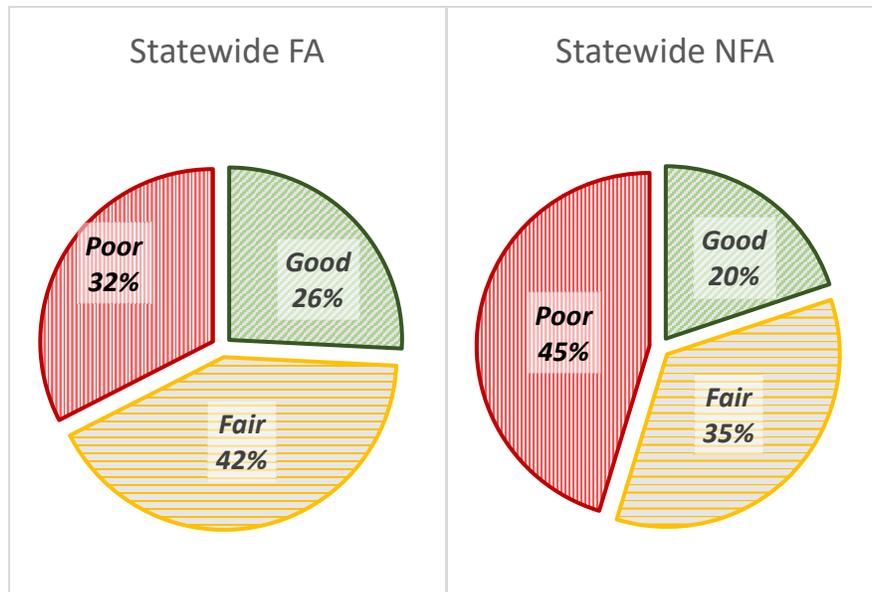


Figure 11: (A) Left: Statewide paved city major road network conditions by percentage of good, fair, or poor, and (B) Right: paved city minor road network conditions by percentage of good, fair, or poor

Figure 12 and Figure 13 show the number of miles for City of Livonia DPW's roads with PASER scores expressed in TAMC definition categories for the paved city major road network (Figure 12) and the paved city minor road network (Figure 13). City of Livonia DPW 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.

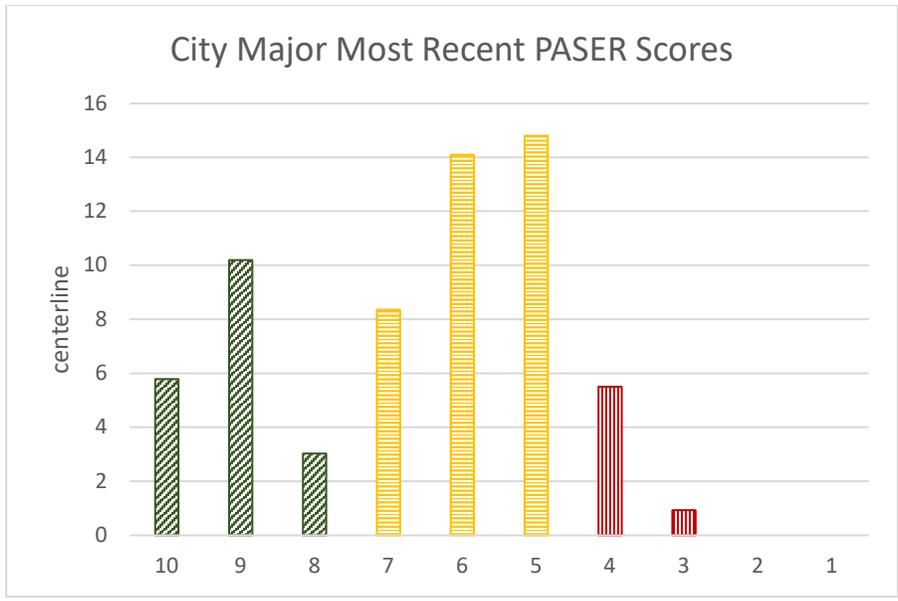


Figure 12: City of Livonia DPW paved city major road network conditions. Bar graph colors correspond to good/fair/poor TAMC designations.

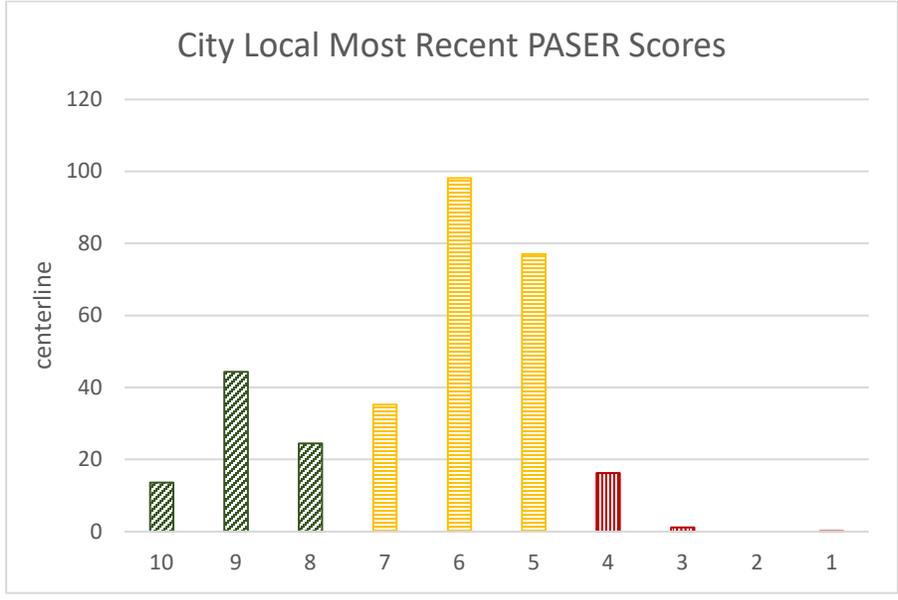


Figure 13: City of Livonia DPW paved city minor network condition by PASER rating. Bar graph colors correspond to good/fair/poor TAMC designations.

Figure 14 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 14: Map of the current paved road condition in good (PASE 10, 9, 8) shown in green, fair (PASE 7, 6, 5) shown in yellow, poor (PASE 4, 3, 2, 1) shown in red and unpaved shown in blue. Only Roads owned by City of Livonia DPW are shown.

Historically, the overall quality of the City of Livonia’s paved city major roads have been staying mostly the same, as can be observed in Figure 15. The City has made a great investment to improving their roads in the recent years which can be seen in the figure below.

Comparing the City of Livonia paved city major road condition trends illustrated in Figure 15 with overall statewide condition trends for similarly-classified roads, which are illustrated in Figure 16, shows a similar trend locally, as in the rest of the state. The City of Livonia has about half as many roads in poor condition as the rest of the state.

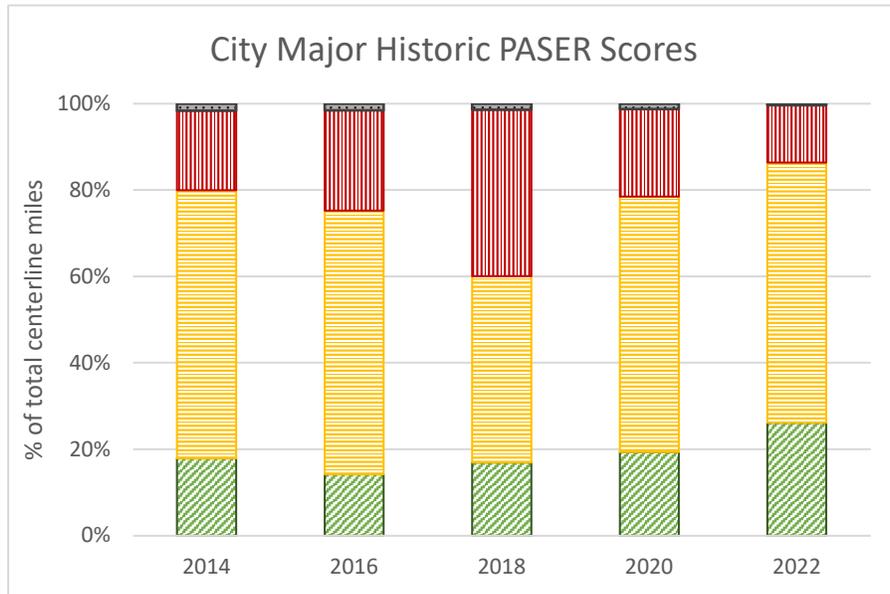


Figure 15: Historical City of Livonia DPW paved city major road network condition trend

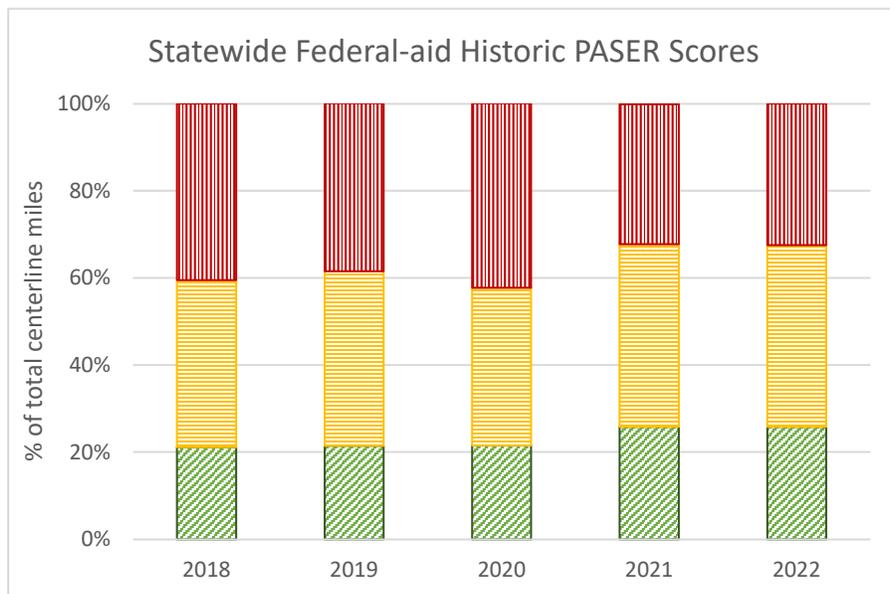


Figure 16: Historical statewide city major road network condition trend

Historically, the overall quality of City of Livonia DPW’s paved city minor roads have been better than the paved city major road network. This is largely due to their annual paving program which impacts many neighborhoods throughout the City. Figure 17 illustrates the condition of the paved city minor road network in the City of Livonia while Figure 18 illustrates these conditions statewide.

Comparing City of Livonia DPW’s paved city minor road condition trends illustrated in Figure 17 with overall statewide condition trends for all paved city minor roads illustrated in Figure 18 indicates that the City of Livonia’s minor roads are in much better condition than the rest of the state as the City has significantly less roads in the poor category.

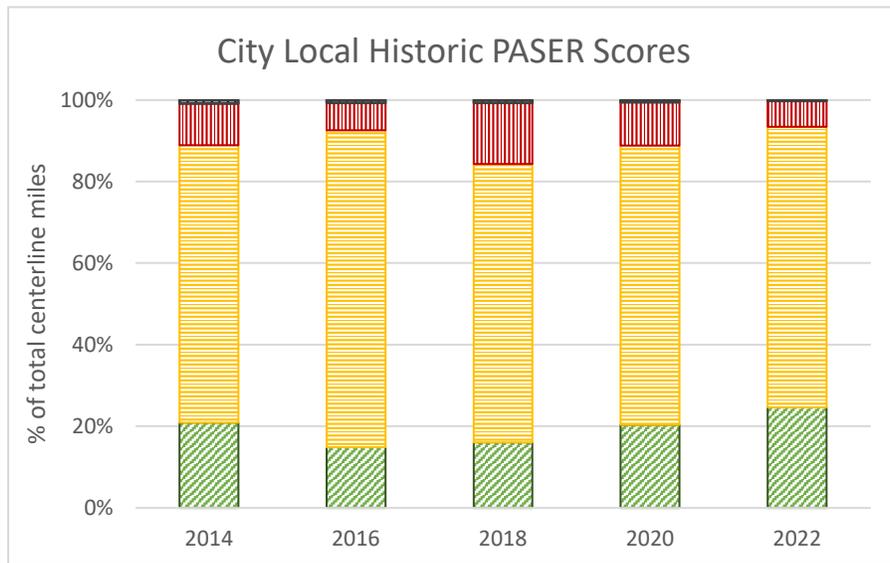


Figure 17: Historical City of Livonia DPW paved city minor road network condition trend

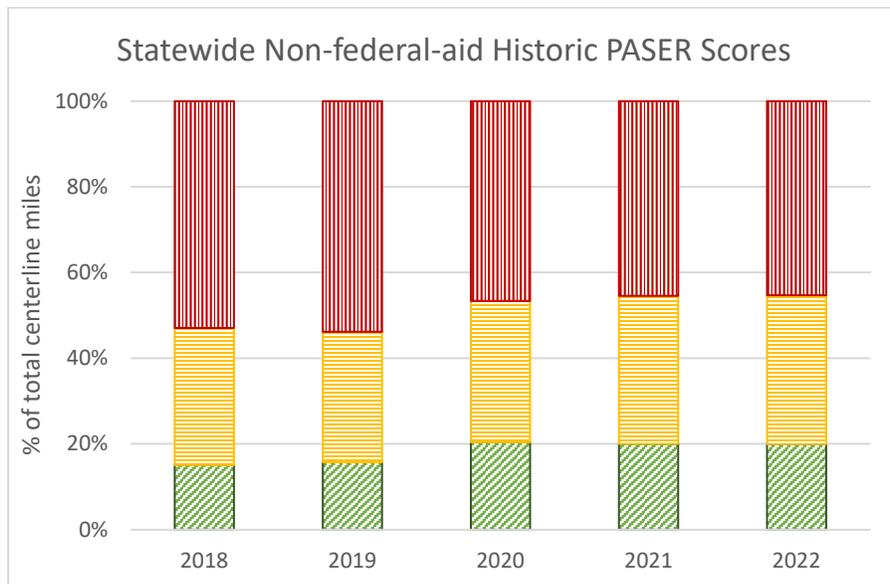


Figure 18: Historical statewide paved city minor road network condition trend

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. City of Livonia DPW 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.

Goals for Paved City Major Roads

The overall goal for City of Livonia DPW’s paved city major road network is to maintain road conditions network-wide from 2023 levels. The baseline condition for this goal is illustrated in Figure 19.

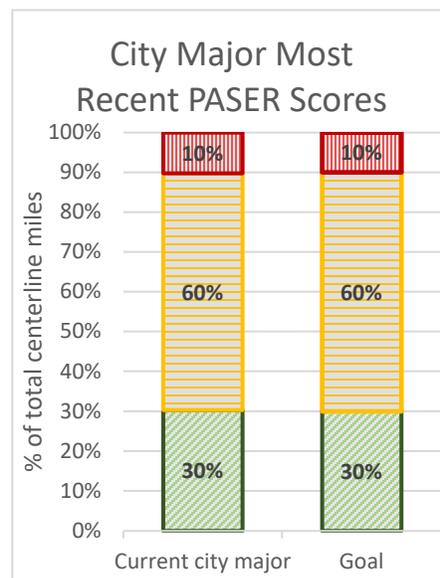


Figure 19: The city of Livonia’s current city major road network condition by percentage of good/fair/poor

The City of Livonia’s network-level pavement condition strategy for paved city major roads stated in their 2020 Pavement Asset Management Plan was:

1. Prevent its good and fair (PASER 10 - 5) paved city major from becoming poor (PASER 4 - 1).
2. Move 5% percent of paved city major roads into the good category.

The City of Livonia has achieved these goals as the percentage of poor roads has decreased. The City has also increased the percentage of roads in the good category by 10%. Their new goal is to maintain the percentage of roads in the good/fair/poor categories and continue to prevent roads in the good/fair category from becoming poor.

Goals for Paved City Minor Roads

The overall goal for the City of Livonia’s paved city minor road network is to maintain road conditions network-wide from 2023 levels. The baseline condition for this goal is illustrated in Figure 20.

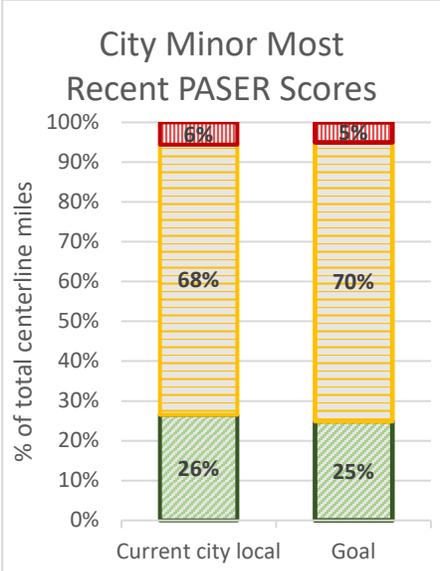


Figure 20: The City of Livonia current paved city minor road network condition by percentage of good/fair/poor

City of Livonia DPW’s network-level pavement condition strategy for paved city minor roads from their 2020 Pavement Asset Management Plan was:

1. Prevent its good and fair (PASER 10 - 5) paved city minor roads from becoming poor (PASER 4 - 1).
2. Keep its city minor roads at approximately the same condition.

The City of Livonia has met these goals as they have prevented its good and fair roads from becoming poor due to the large number of road improvement projects. The City has positively increased the condition of city minor roads from 2020 through their annual Road Program. The City’s new goal is to maintain the minor road condition.

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, City of Livonia DPW 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.

City of Livonia DPW 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 City of Livonia DPW's financial resources can be found in the 2. *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 *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 community 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 Type¹

Fix Type	Life Extension (in years)*			
	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 B-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

City of Livonia DPW 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 21.

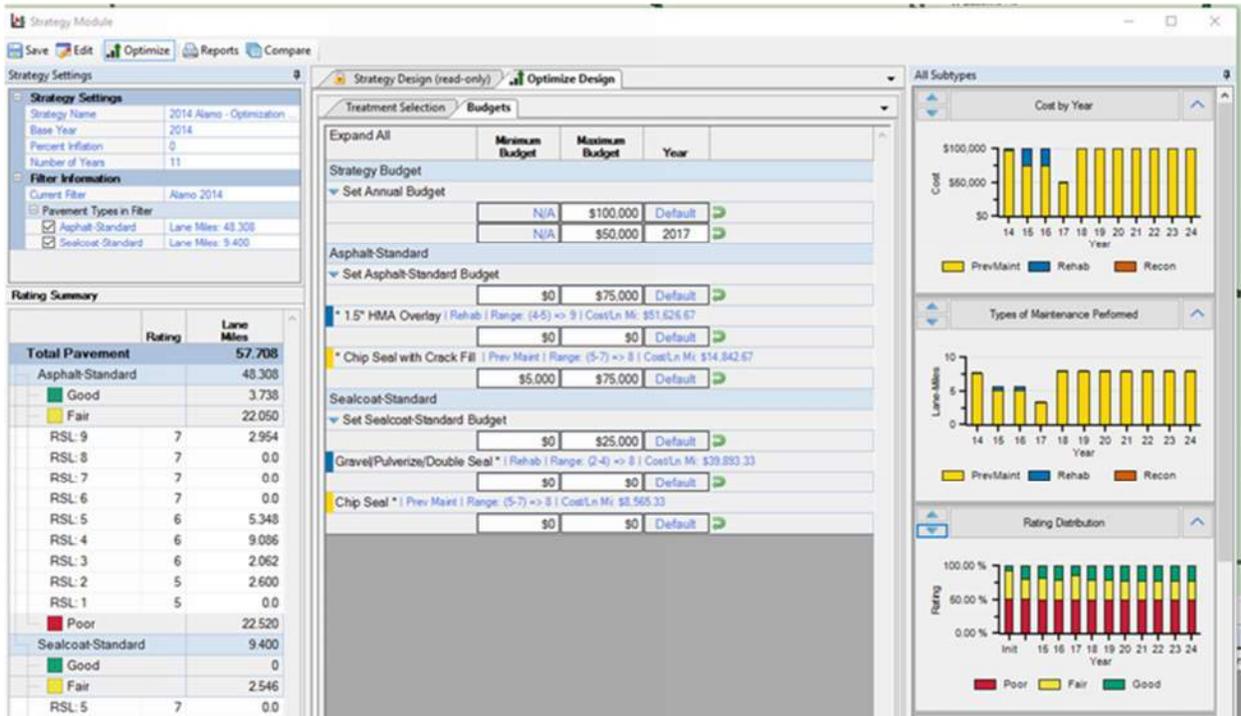


Figure 21: Example pavement condition forecast model in the software program Roadsoft.

Paved City Major Roads

Table 2 illustrates the network-level model inputs for Roadsoft on the paved city major road network. The treatments outlined in Table 2 are the annual average treatment volume of planned projects. See Appendix A of this plan for details on planned projects.

Table 2: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for City of Livonia’s Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved City Major Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger-Reset
Asphalt: Mill & Overlay	1.50	20	3, 4-9
Asphalt: Pulverize & Overlay	---	20	3, 4-9
Concrete: Reconstruction	0.50	30	1, 2, 3-10
Concrete: Full Depth / Slab Replacement	0.50	25	1, 2, 3-10

Results from the Roadsoft network condition model for the city major roads are shown in Figure 22. The City of Livonia’s planned projects from its currently available budget allow the City of Livonia to head in the direction of reaching its pavement condition goals given the planned financial investment for the next three years.

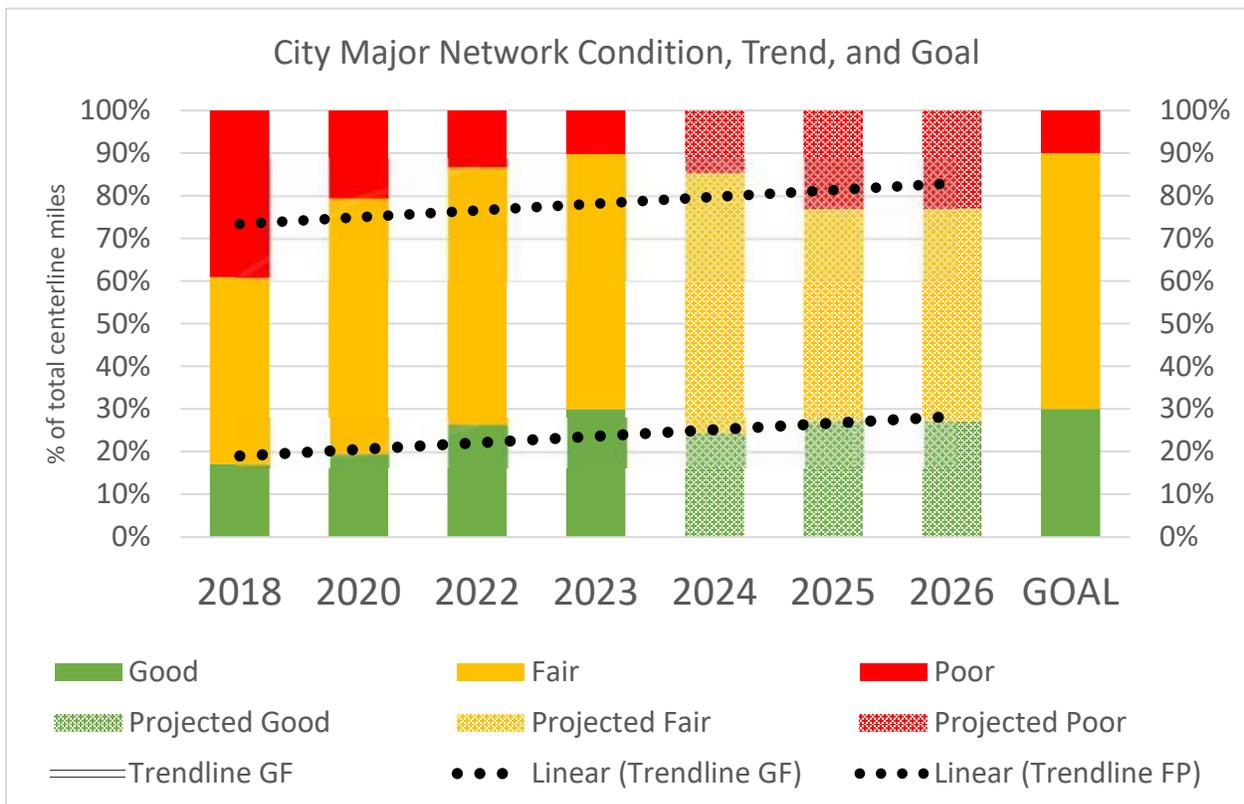


Figure 22: Forecast good/fair/poor changes to City of Livonia DPW network condition from planned projects on the city major road network.

The City of Livonia plans to focus on maintaining their road conditions and preventing good/fair roads from becoming poor.

Paved City Minor Road

A screenshot of Roadsoft’s pavement condition model and the associated output is shown in Figure 23.

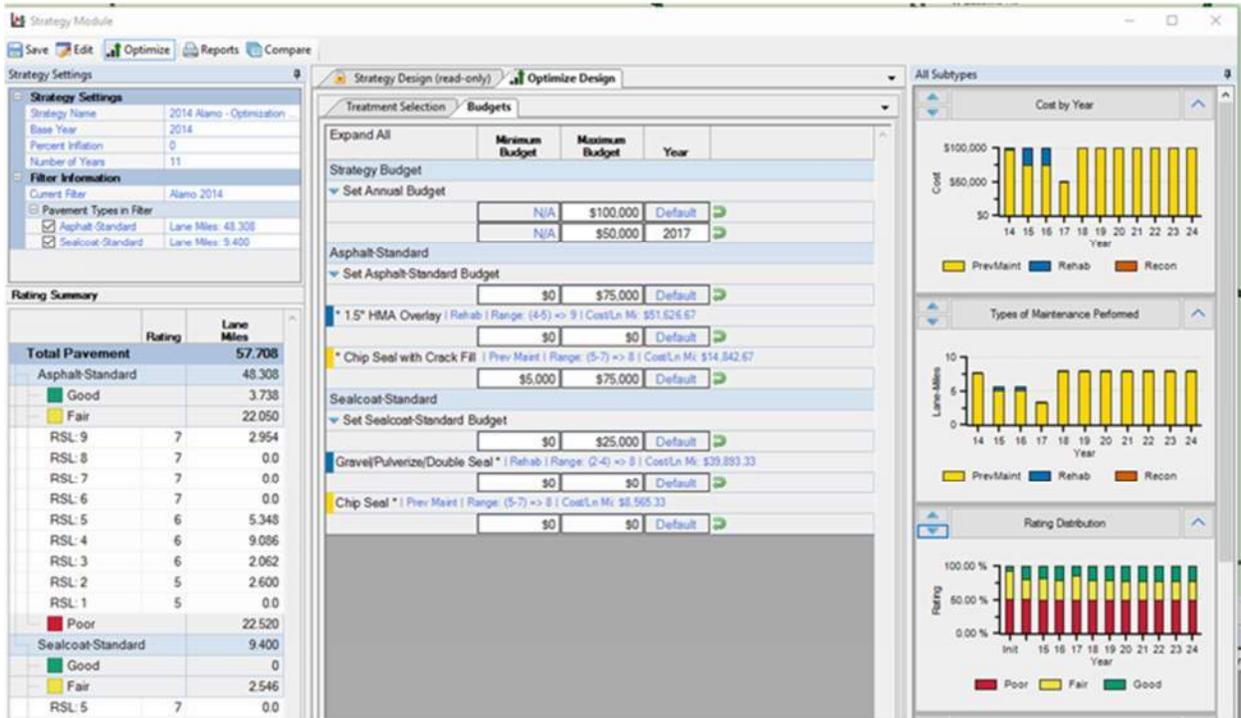


Figure 23: Example pavement condition forecast model in the software program Roadsoft.

Table 3 illustrates the network-level model inputs for Roadsoft on the paved city minor road network. Other pavement types in this network were neglected due to their small numbers relative to HMA and concrete pavements. The treatments outlined in Table 3 are the annual average treatment volume of planned projects. Details on planned projects are included in Appendix A.

Table 3: Roadsoft Modelled Trends, Planned Projects, and Gap Analysis for City of Livonia’s Road Assets—Modelled Trends: Roadsoft Annual Work Program for the Paved City Minor Road Network Forecast

Treatment Name	Annual Miles of Treatment	Years of Life	Trigger-Reset
Asphalt: Mill & Overlay	1.75	20	3, 4-9
Asphalt: Pulverize & Overlay	2.50	20	3, 4-9
Concrete: Reconstruction	2.25	30	1, 2, 3-10
Concrete: Full Depth / Slab Replacement	1.00	25	1, 2, 3-10

Results from the Roadsoft network condition model for the paved city minor roads are shown in Figure 24. The City of Livonia DPW’s planned projects from its currently available budget allows the City of Livonia to head in the direction of reaching its pavement condition goal given the planned investment for the next three years.

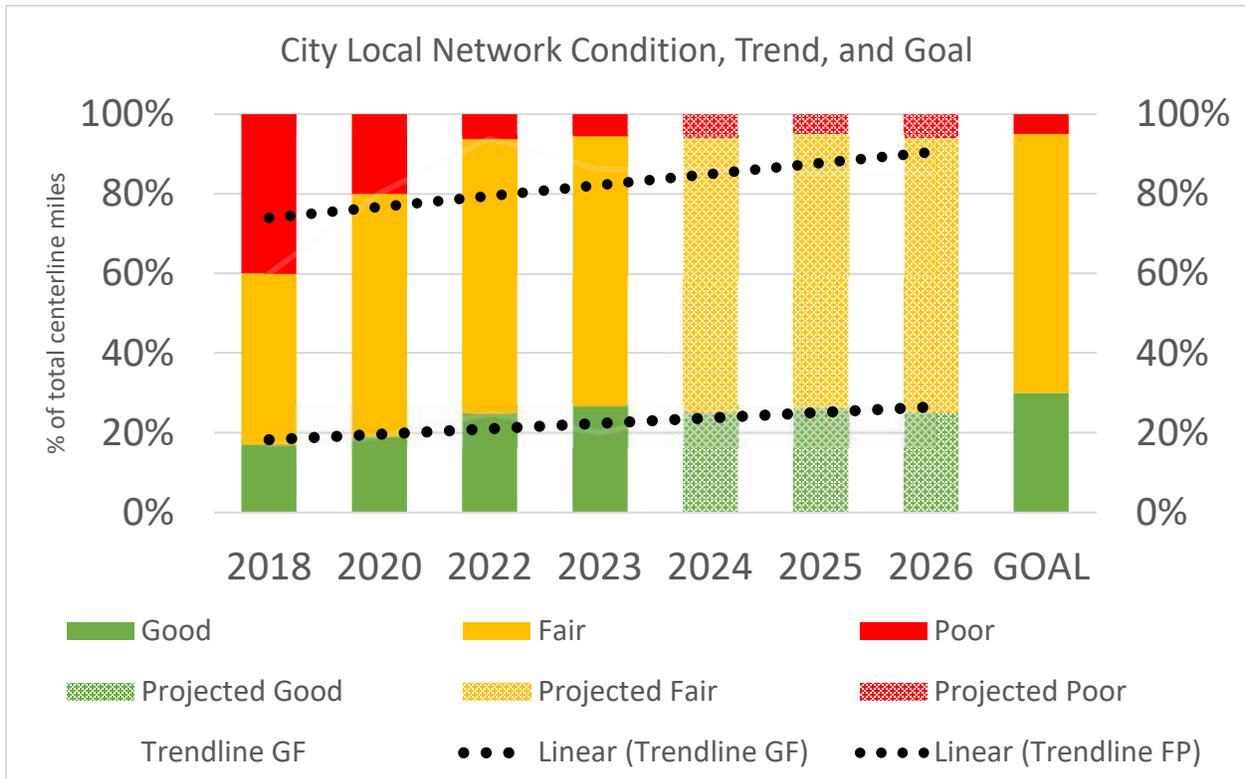


Figure 24: Forecast good/fair/poor changes to City of Livonia DPW network condition from planned projects on the paved city minor road network.

The goal from the 2020 Pavement Asset Management Plan was to improve the poor-rated roads over the next three years to increase the percentage of roads with a good or fair rating. The City of Livonia has met this goal as a number of the poorly rated roads have been rehabilitated or reconstructed in the past three years. The City’s new goal is to prevent their good/fair roads from becoming poor and continue to improve the poor roads.

Planned Projects

The City of Livonia plans construction and maintenance projects one year in advance. A yearly planning threshold is required due to the time necessary to plan, design, and finance construction and maintenance projects on the paved city major 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 City of Livonia DPW to alter initial plans. Project planning information is used to predict the future condition of the road networks that City of Livonia DPW 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.

The City of Livonia uses PASER ratings which are collected every two years to determine roads in need of improvement. The City staff visit selected streets to field verify that the streets selected by PASER ratings match the needs of the community. A combination of rehabilitation, reconstruction and maintenance streets are chosen and located regionally within one another in the community.

For 2024, City of Livonia DPW plans to do the following projects:

Paved City Major and Minor Projects

City of Livonia DPW is currently planning the construction and maintenance projects listed in Appendix A for the paved city major and city minor road networks. The total cost of the planned projects for their 2024 Road Repair Program is approximately \$10.2 million. The approximate spending for each type of project is \$4.1 million for asphalt rehabilitation, \$4.5 million for concrete reconstruction and \$1.6 million for concrete slab replacement. Additionally, the City has received \$1.3 million from Wayne County FAC funds to complete West Chicago from Harrison to Inkster Road.

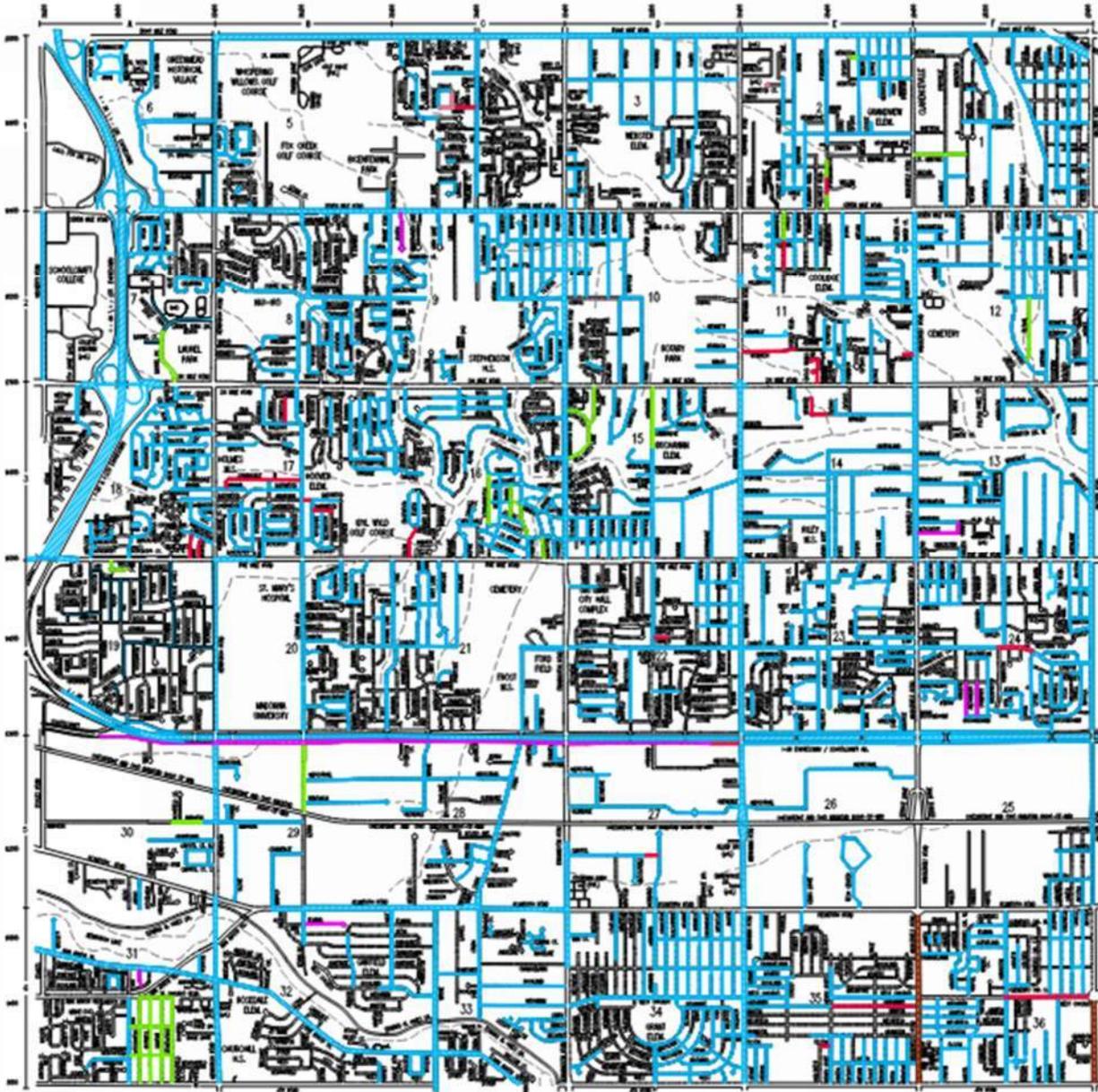


Figure 25. City of Livonia's 2024 Road Program with proposed asphalt projects in green, proposed concrete projects in red and proposed slab replacement projects in magenta. Previously completed road projects are shown in blue.

A detailed list of these proposed road projects can be found in Appendix A.

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. City of Livonia DPW 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 by request submitted to our agency contact.

City of Livonia DPW has a total budget for pavement asset management of approximately \$10 million per year. This budget is used to improve both the city major and city minor networks. This budget is used for a mixture of rehabilitation, reconstruction and maintenance projects within the City of Livonia.

3. RISK OF FAILURE ANALYSIS

Transportation infrastructure is designed to be resilient. The system of interconnecting roads and bridges maintained by City of Livonia DPW 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 25 illustrates the key transportation links in City of Livonia DPW'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 which are presented in Figure 25:

- Newburgh Road at I-96
- Portions of Schoolcraft Road along I-96
- Newburgh Road Bridge located between Ann Arbor Road and Edward Hines Drive

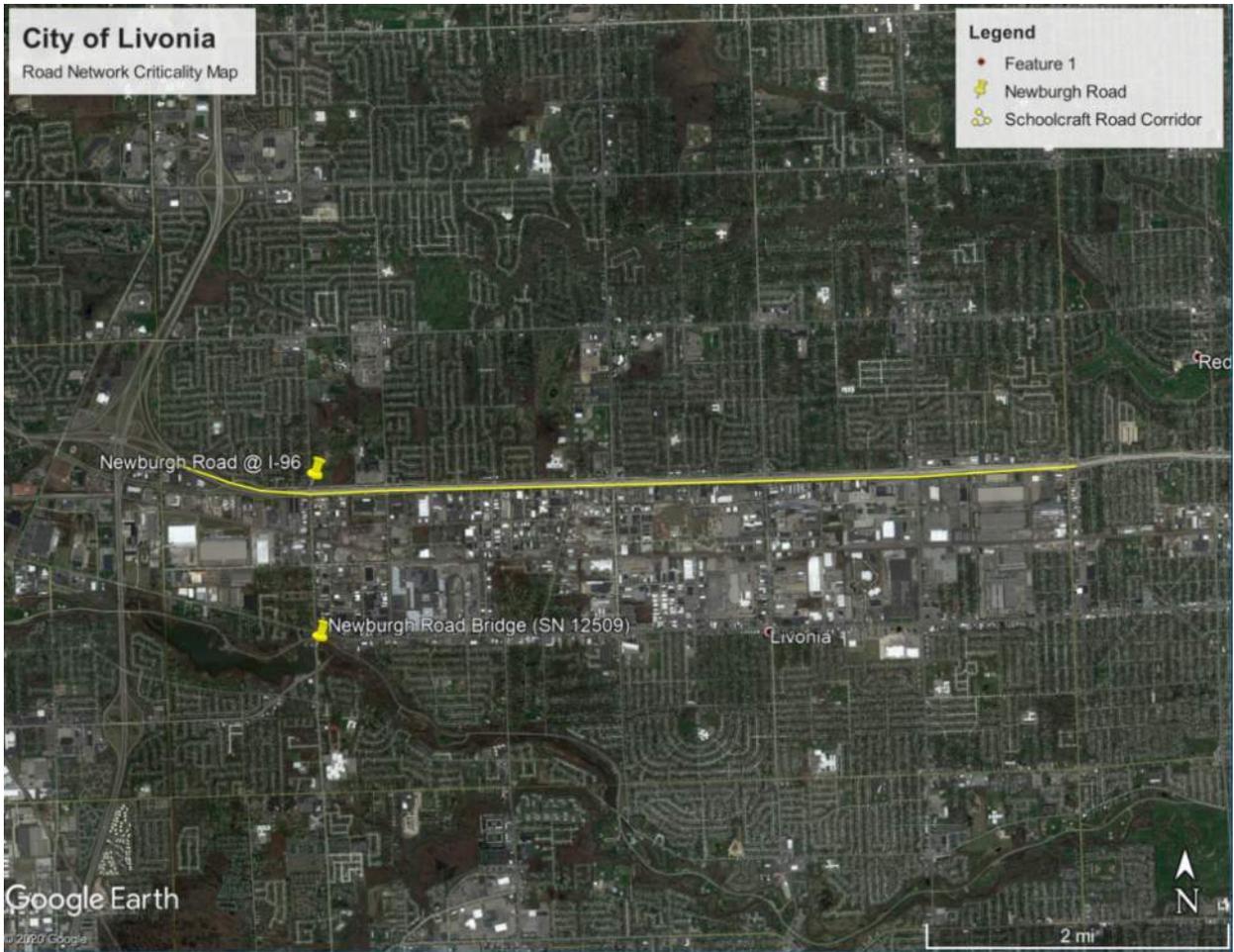


Figure 25: Key transportation links in City of Livonia DPW's road network

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. City of Livonia DPW communicates with both public and private infrastructure owners to coordinate work in the following ways:

City of Livonia DPW maintains drinking water, sanitary and storm sewer assets in addition to transportation assets. City of Livonia DPW follows an asset management process for all of its assets by coordinating the upgrade, maintenance, and operation of all major assets.

Planned projects for subsurface infrastructure that City of Livonia DPW owns are listed in the following asset management plans: drinking water distribution system asset management plan, wastewater collection system asset management plan, storm sewer system asset management plan. These three subsurface utility plans are coordinated with the transportation infrastructure plans to maximize value and minimize service disruptions and cost to the public.

City of Livonia DPW takes advantage of coordinated infrastructure work to reduce cost and maximize value using the following policies:

- Roads which are in poor condition that have a subsurface infrastructure project planned which will destroy more than half the lane width will be rehabilitated or reconstructed full width using transportation funds to repair the balance of the road width.
- Subsurface infrastructure projects which will cause damage to pavements in good condition will be delayed as long as possible, or will consider methods that do not require pavement cuts.

- Subsurface utility projects will be coordinated to allow all under pavement assets to be upgraded in the same project regardless of ownership.
- Road reconstruction projects will not be completed until agency owned sub surface utilities are upgraded to have at least a 40 years of remaining service life.

Annually, City of Livonia convenes a Citizen's Road Advisory Committee in October. This public meeting allows input on locations to consider for road repairs on City jurisdiction roads. Local business owners and residents from all of the major and local road are provided notice for the meeting and are invited to attend. An attempt is made to coordinate the schedule of the event to allow the majority of infrastructure owners to attend.

City of Livonia provides all attendees of the infrastructure planning summit with a list of all planned road projects for the next three years that include new pavement structure. Infrastructure owners are encouraged to discuss planned projects that would disrupt transportation services or cause damage to pavements. Projects which may cause damage to pavements in good or fair condition are discussed and mitigation measures are proposed to minimize the impact to pavements. Mitigation measures could include rescheduling and coordinating projects to maximize value and minimize disruptions and cost to the public.

APPENDIX A: 2024 PAVED CITY MAJOR AND MINOR ROAD PLANNED PROJECTS

Road Reconstruction:

Street Name	From	To
Kenwood Ct	#30947 Kenwood Ct	Dead End
Purlingbrook Rd	#19321 Purlingbrook Rd	#19385 Purlingbrook Rd
Navin Ave	Laurel Ave	Gill Rd
Bobrich Ave	Merriman Rd	Sunset Blvd
Bobrich Ave	Middlebelt Rd	Dead End
Cross Winds Ct	Cross Winds Rd	Dead End
Cross Winds Rd	Six Mile Rd	Dead End
Sunset Blvd	Pickford Ave	Clarita Ave
Munger Ave	#30400 Munger Ave	Dead End
Ellen Dr	Five Mile Rd	Roycroft Ave
Comstock Dr	Mallory Dr	Whitcom Dr
Ladywood Rd	Levan Rd	Woodside Dr
Sherwood Dr	Woodside Dr	Park Ln
Sunnydale Ave	Myrna Ave	Levan Rd
Huff Ave	Five Mile Rd	Lancaster Ave
Richfield Ave	Five Mile Rd	Lancaster Ave
Oakley Ave	Hubbard Rd	#32240 Oakley Ave
Lyndon Ave	Harrison Rd (West)	Lyons Ave
Alexander Ave	Buckingham Ave	Meadowlark Ave
Sunbury Ave	Buckingham Ave	Meadowlark Ave
Capitol Ave	#32432 Capitol Ave	Hubbard Ave
Hathaway Ave	Henry Ruff Rd	Middlebelt Rd
Olson Ave	Henry Ruff Rd	Hillcrest Ave
West Chicago Ave*	Harrison Ave	Inkster Rd

*MDOT LAP Project

Road Rehabilitation:

Street Name	From	To
St. Martins Ave	Middlebelt Rd	Weyher Ave
Morlock Ave	Oporto Ave	Melvin Ave
Purlingbrook Rd	#19385 Purlingbrook Rd	St. Martins Ave

Purlingbrook Rd	Seven Mile Rd	#19321 Purlingbrook Rd
Laurel Park Dr	Six Mile Rd	#17841 Laurel Park Dr
Sunset Blvd	Clarita Ave	Seven Mile Rd
Floral Ave	Lathers Dr	Curtis Ave
Hubbard Rd	#16360 Hubbard Rd	Six Mile Rd
Bell Creek Lane	6 Mile Road	Farmington Road
Bloomfield Avenue	Farmington Road	Bell Creek Lane
Edington Rd	Five Mile Rd	Roycroft Ave
Southampton Rd	Roycroft Ave	Oakdale Ave
Stamford Rd	Roycroft Ave	Rayburn Ave
Whitby Rd	Dorais Ave	Hampshire Rd
Tuscany Ct	Five Mile Rd	Dead End
Levan Rd	CSX Railroad Tracks	Schoolcraft Rd
Amrhein Rd	#37521 Amrhein Rd	#38101 Amrhein Rd
Butwell St	Joy Rd	West Chicago Blvd
Houghton Ave	Joy Rd	West Chicago Blvd
Lamont St	Joy Rd	West Chicago Blvd
Minton Ave	Hix Rd	Stonehouse Ave
Northfield Ave	Hix Rd	Stonehouse Ave
Stonehouse Ave	Joy Rd	West Chicago Blvd
West Chicago Blvd	Houghton Ave	Stonehouse Ave

Road Maintenance:

Street Name	From	To
Navin Ave	Riverside Dr	Laurel Ave
Laurel Ave	Navin Ave	Fargo St
Aspen Dr	Seven Mile Rd	Dead End
Garden Ave	Roycroft Ave	Rayburn Ave
Roycroft Ave	Middlebelt Rd	Garden Ave
Schoolcraft Rd	Farmington Rd	Merriman Rd
Schoolcraft Rd	Yale	Farmington Rd
Schoolcraft Rd	Newburgh Rd	Yale Ave
Schoolcraft Rd	#38881 Schoolcraft Rd	Newburgh Rd
Houghton Ave	Richland Ave	Ann Arbor Tr.
Elmira Ave	Levan Rd	Dead End

APPENDIX B

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.

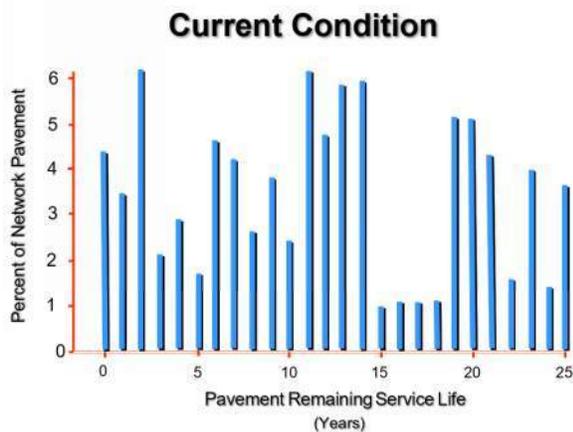


Figure 1 – Current Condition

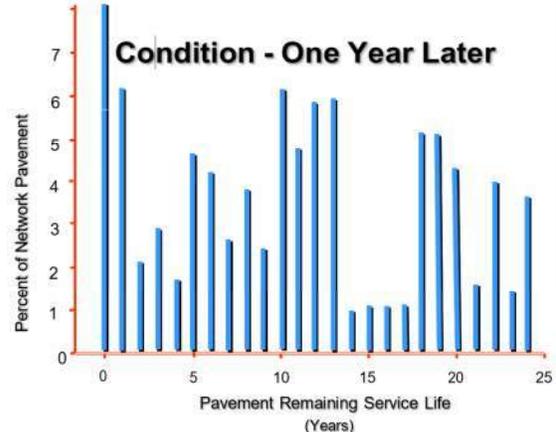


Figure 2 – Condition 1-Year Later

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.

<p>Agency Highway Network = 4,356 lane miles</p> <p style="text-align: center;"><i>Each year the network will lose</i></p> <p style="text-align: center;"><u>4,356 lane-mile-years</u></p> <p>Agency Highway Network = 4,356 lane miles</p> <p style="text-align: center;"><i>Each year the network will lose</i></p> <p style="text-align: center;"><u>4,356 lane-mile-years</u></p>
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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

<u>Programmed Activity</u>	<u>Lane-Mile-Years</u>	<u>Cost Savings</u>
Reconstruction <i>31 lane miles</i> (40 lane miles)	<i>820</i> (1,090)	\$5,004,990
Rehabilitation <i>77 lane miles</i> (82 lane miles)	<i>1,125</i> (1,200)	\$1,096,950
Pavement Preservation (84 lane-miles)	(412)	0
Total =	<i>2,357</i> (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 ($\leq 1.5''$), 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.

B. CULVERT ASSET MANAGEMENT PLAN SUPPLEMENT

Culverts are structures that lie underneath roads, enabling water to flow from one side of the roadway to the other (Figure B-1 and Figure B-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.

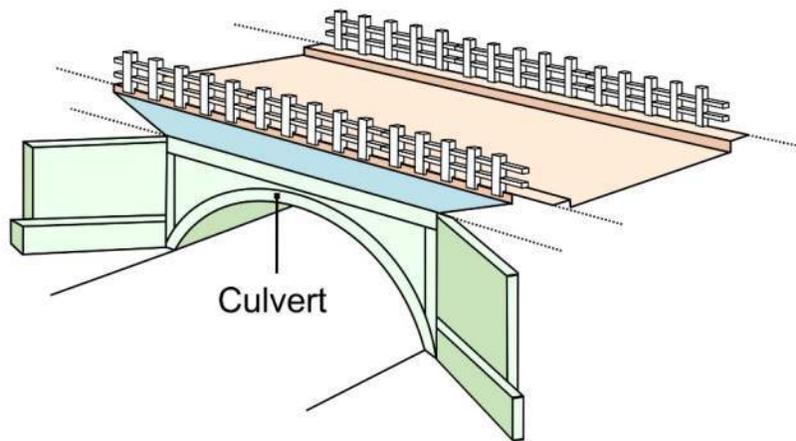


Figure B-1: Diagram of a culvert structure



Figure B-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.

C. TRAFFIC SIGNALS ASSET MANAGEMENT PLAN SUPPLEMENT

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 C-1) as a functioning unit and does not consider other electronic traffic control devices.



Figure C-1: Examples of traffic signal

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.

D. 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: 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.

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.

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*.

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.

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

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

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.

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.

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

⁸ Federal Highway Administration webpage <https://www.fhwa.dot.gov/>

⁹ Inventory-based Rating System for Gravel Roads: Training Manual

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.

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 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

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.

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

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

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.

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 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 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.

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

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

¹⁶ Inventory-based Rating System for Gravel Roads: Training Manual

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 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.

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

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.

¹⁷ <https://www.fhwa.dot.gov/bridge/nbis/>

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*.

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

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

¹⁹ Inventory-based Rating System for Gravel Roads: Training Manual

²⁰ Inventory-based Rating System for Gravel Roads: Training Manual

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 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.

²¹ Inventory-based Rating System for Gravel Roads: Training Manual

²² Inventory-based Rating System for Gravel Roads: Training Manual

²³ Inventory-based Rating System for Gravel Roads: Training Manual

²⁴ Inventory-based Rating System for Gravel Roads: Training Manual

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 route 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.

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

List of Acronyms

CPM: capital preventive maintenance

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

OFFICE OF THE CITY CLERK
CITY OF LIVONIA

The undersigned, Susan M. Nash, City Clerk of the City of Livonia, does hereby certify that at a Regular Meeting of the Council of the City of Livonia held October 2, 2023 in the Auditorium of City Hall, 33000 Civic Center Drive, Livonia, at which time and place the following members of the Council were present: Scott Bahr, Rob Donovic, Scott Morgan, Brandon McCullough, Kathleen McIntyre, Laura Toy, and Jim Jolly. Absent: None. The following resolution was made and adopted:

#310-20 WHEREAS, the City of Livonia believes quality roads are a vital part of any community; and

WHEREAS, the City of Livonia has a Citizens Advisory Committee on Roads that reviews and prioritizes City streets most in need of repair in utilizing asset management practices presented by the Department of Public Works and Engineering Department since 2002; and

WHEREAS, Public Act 325 of 2018 requires local road agencies responsible for 100 or more certified miles of road to include requirements for asset management plans to be submitted to the Transportation Asset Management Council (TAMC) by October 1st; and

NOW, THEREFORE, BE IT RESOLVED, that the Mayor and City Council hereby accept the asset management plan report with any minor necessary revisions to be accepted by TAMC and be submitted on a three (3) year cycle for compliance.

A copy of the resolution will be forwarded to TAMC. The report was submitted prior to the deadline.

A roll call vote was taken on the foregoing resolution with the following result:

AYES: Bahr, Donovic, Morgan, McCullough, McIntyre, Toy, and Jolly

NAYS: None

The President declared the resolution adopted.

IN WITNESS WHEREOF, the undersigned has hereunto affixed her signature on this 2nd day of October, 2023.



Susan M. Nash, City Clerk
City of Livonia, Wayne County, Michigan