MICHIGAN DEPARTMENT OF TRANSPORTATION

ASSET MANAGEMENT

2017

MDOT
Michigan Department of Transportation

A process to strategically manage our transportation system in a cost-effective and efficient manner.

The Michigan Department of Transportation (MDOT) is responsible for overseeing and maintaining an extensive infrastructure. Michigan's residents, elected leaders, businesses and visitors expect MDOT to manage state transportation assets in an effective, efficient and reliable manner. MDOT accomplishes this through a process known as asset management. The asset management process is predicated on the principles of stewardship of public resources, accountability to customers and partners, and continuous improvement. It is based on managing for results by focusing on performance. MDOT has followed an asset management process for more than 20 years to justify transportation funding, and to demonstrate to decision-makers that investments are delivered in the most cost-effective and efficient manner possible. This booklet provides a summary of current asset management practices at MDOT.

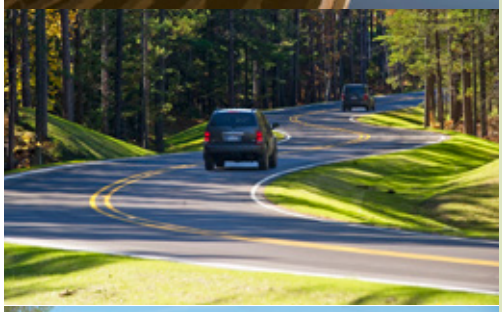
MDOT

Michigan Department of Transportation

ASSET MANAGEMENT
AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT)

MDOT is responsible for all I, US, and M routes throughout Michigan, which includes 9,668 route miles of roadways (trunkline), 4,773 bridges, and all adjacent infrastructure (i.e. carpool lots, rest areas, noise barriers).

MDOT is also responsible for 665 miles of state-owned railroad lines, four state-owned airports and four intercity/intermodal terminals.



MDOT takes an asset management approach to managing its diverse transportation investments. Asset management is a strategic approach to linking data, goals, investment strategies, programs, and projects into a systemic process to ensure achievement of a desired outcome. This process also includes monitoring results and making adjustments, as appropriate, with the overall goal of ensuring the state transportation system is managed in a cost-effective and efficient manner.

MDOT's approach consists of the following major elements:

- Goals and objectives are established.
- System inventory and condition data is collected.
- The condition data is analyzed and rates of deterioration are computed.
- Performance measures and standards are set or reaffirmed.
- Gaps in performance and risk factors are evaluated.
- Life cycle network analysis is developed using forecasting tools.
- Investment strategies are implemented through the development of programs, selection of projects, and institution of practices that fit into the investment strategies.
- The process and system is monitored and adjusted based on the outcome of the projects and programs that were implemented.

OVERALL ASSET MANAGEMENT PROCESS

DATA COLLECTION AND REPORTING

MDOT is involved in a continuous and extensive process of data collection and reporting to support asset management, while meeting state and federal requirements.

Bridge Inspections

MDOT employs more than 20 bridge inspectors who have specialized training, and regularly inspect the thousands of bridges and overpasses on the state trunkline system. These inspectors rate Michigan's bridges using the federally established National Bridge Inventory (NBI) with a 0 to 9 rating scale. A rating is given to each of a bridge's primary elements: deck, superstructure, and substructure. MDOT has posted bridge safety reports online since 2007. Only highway bridges longer than 20 feet in length are included; ratings for pedestrian, railroad and locally owned bridges are not included.

System Monitoring and Reporting

MDOT's Framework and System Monitoring team has two core reporting functions. The annual certification of Act 51 public road mileages and maps for 616 local road agencies, and the federal Highway Performance Monitoring System (HPMS) annual report. The Act 51 process consists of assisting Michigan cities, villages and counties in completing their annual Act 51 mileage certification process, a legal and auditable set of records used to distribute Michigan's road tax money through a formula. The HPMS annual report is a set of about 70 data items and the data source for several of the federal transportation performance measures.
The information reported in HPMS is necessary to maintain federal transportation funding eligibility for all of Michigan. This data is collected by MDOT, metropolitan planning areas, and regional planning organizations.

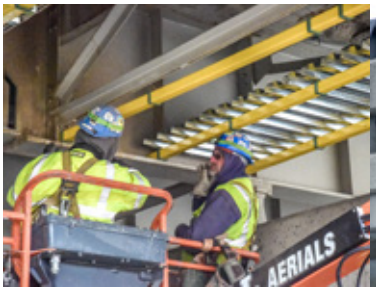
Pavement Surface Evaluation Rating (PASER)

MDOT has adopted PASER as the primary method to measure and monitor pavement conditions. The PASER rating is a visual analysis conducted by an engineer and rating team, and includes a 10-point scale: 8, 9, or 10 are categorized as "good," segments rated between 5 and 7 are classified as "fair," and segments rated 4 or less are considered to be in "poor" condition. Ratings are conducted every year for state trunkline.

Pavement Condition Collection on the Michigan National Highway System (NHS)*

MDOT uses a vendor contract to obtain surface cracking type/severity classification, International Roughness Index (IRI), joint fault height, and wheel path rutting metrics specifically for the NHS. Those data support the department's in-house trunkline condition monitoring, project selection, design analysis, and material/construction technique investigation. Additionally, the data (also covering non-trunkline NHS roads) are submitted to the Federal Highway Administration (FHWA) through the HPMS reporting process. For trunkline monitoring, MDOT analyzes project history and progression of cracking to estimate expected service life benefits for different pavement construction treatments using the concept of remaining service life (RSL).

** Michigan's National Highway System (NHS) is a network of strategic highways, including the interstate and other roads important to mobility and the national economy.*





DATA MANAGEMENT AND GIS

MDOT uses geographic information systems (GIS) to manage and map asset data to support decision-making department-wide.

MDOT GIS Services

MDOT's GIS team performs a wide range of tasks in the areas of spatial data management, analysis, mapping, and GIS training. This includes administration of the department's enterprise GIS databases and management of the Linear Referencing System (LRS). The LRS serves as the foundation for federal reporting requirements and the new Transportation Asset Management System (TAMS). Mapping of MDOT business data to support decision-making is also a core function. Through the creation of map services, staff and the public can access data through web and mobile applications.

Road Asset Inventory (RAI)

RAI is an annual initiative to collect and maintain lane miles for calculating maintenance funding distributions for MDOT regions. The RAI has expanded to also include the collection of additional attributes from the recently retired Sufficiency project. These include speed limit, road type, sidewalks, on-street parking, bike lanes, and lane function. This data collection project uses the latest GIS technology and is built on top of MDOT's LRS.

Online Mapping and Open Data

A large part of asset management relies on knowing where MDOT's assets are located. MDOT's GIS team maps asset data in print and through interactive online maps. MDOT maintains a public facing ArcGIS online portal for viewing data and maps on the web and to an open data portal where staff and the public can download data. Mapping MDOT's data promotes more informed decision-making by increasing awareness of the condition of assets in the field.

Transportation Asset Management System (TAMS)

TAMS is a GIS-based solution to aid in the management of MDOT's transportation assets. The system consists of two major components. First is a maintenance management system that accommodates work orders, condition inspections, and reporting on MDOT assets through an interactive mapping software. MDOT supports this software through data management and map service creation, and has worked to incorporate existing GIS data for four asset categories – lane miles, signs, guardrail, and culverts. This asset data is directly related to MDOT's LRS, which is the second component of the TAMS environment.

TAMS enables MDOT to effectively manage its complete LRS using roads and highways technology.

Public GIS Resources

- MDOT's ArcGIS Online Portal
  http://mdot.maps.arcgis.com
- MDOT's Open Data Portal
  http://gis.mdot.opendata.arcgis.com

GIS UNIT
Michigan Department of Transportation

PLANNING AND PERFORMANCE MANAGEMENT

MDOT oversees a comprehensive performance-based decision making process for the short and long-range planning of state transportation assets.

Transportation Asset Management Plan (TAMP)

All state departments of transportation are required to develop a risk-based TAMP mandated by the Moving Ahead for Progress in the 21st Century (MAP-21) legislation. MDOT's TAMP is being developed to describe the processes and policies affecting pavement and bridge performance for Michigan's portion of the NHS and state trunkline.

Assets included in TAMP:

MAP-21 requires that the TAMP address roads and bridges on the NHS.

Roads:

- Interstates
- Non-interstate NHS

Bridges

- NHS bridges

Performance Management

MDOT has used performance-based program development and asset management since 1997, when the STC established trunkline pavement and bridge goals. Performance data results used for tracking specific transportation-related goals and system condition reports of MDOT's trunkline system can both be viewed at:

http://www.michigan.gov/mdot/0,4616,7-151-68212_64050_64074_64091-295879--,00.html

Transportation Scorecard and System Condition Reports

Key TAMP Contents

- All roads and bridges on the NHS
- Asset management objectives and measures
- Performance gap assessment
- Life cycle cost considerations
- Financial plan
- Investment strategies

MDOT is developing both a TAMP process document and plan document, scheduled for completion in 2018 and 2019, respectively.

National Performance

MDOT is also responsible for implementing a national system for performance management. The framework was written into federal law in MAP-21, and will be implemented in all states over the coming years. It requires a uniform set of performance measures that all states must work with. In addition to performance measures that address safety and air quality, there are a number of measures focused on the condition of NHS bridges and pavements, and measures focused on the performance of the NHS.

Many of the elements required in the national performance management framework have long been employed by MDOT as part of a strategic approach to investment decision-making. The national framework holds the promise of further improving communications between decision-makers (particularly at the federal level), stakeholders and the traveling public.

HIGHWAY CALL FOR PROJECTS

The Highway Call for Projects is the core of MDOT's Highway preservation program development process.

MDOT's approach to the development and selection of highway projects is predominately based on the principles of asset management – projects that are the right fix at the right time on the right roadway. This includes reconstruction, resurfacing and preventative maintenance projects.

Highway Call for Projects (CFP)

The MDOT Highway Call for Projects (CFP) is an integrated annual, year-long process that includes coordination with numerous programs and requires a department-wide partnership effort. The CFP process ensures that progress towards department goals is being made, while providing an opportunity for program adjustments if deemed necessary.

MDOT's CFP mission is to identify, select, and approve highway preservation projects in alignment with the Michigan State Transportation Commission (STC) and MDOT goals, policies, and strategies.

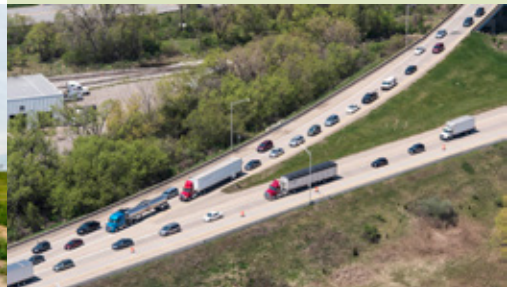
Investment and project selection direction is provided to each MDOT region in the CFP instructions for each program area. The MDOT regions and department program areas select specific candidate projects which adhere to these guidelines, as outlined in the CFP letter and instructions, and are consistent with the department's performance measures and approved region and statewide strategies.

Region and statewide program managers are required to develop and submit fix strategies for approval in advance of any project selection. Early strategy submittal, review and approval ensures support of the CFP mission.

Ultimately, the MDOT regions scope and select candidate projects based on region and statewide strategies and specific eligibility. The candidate projects are reviewed, and final executive approval is made by the department's Chief Operations Officer and Chief Administrative Officer.

Life Cycle Analysis

As a part of MDOT's efforts to apply a comprehensive asset management approach to its decision-making process, the department uses the Road Quality Forecasting System (RQFS) and the Bridge Condition Forecasting System (BCFS) models to do pavement and bridge life cycle analysis and condition forecasting. This forecasting aids in the creation of the department's pavement and bridge preservation initiatives. Using RQFS and BCFS, the department forecasts the future condition of MDOT's trunkline assets. This can be done using a variety of possible funding levels and improvement strategies. These models help to refine investment strategies in order to provide the best possible outcomes given condition of the asset and any financial constraints that may be in place.



AVIATION ASSET MANAGEMENT

Asset management is a centerpiece of MDOT's oversight of airport system planning in Michigan.

Michigan Aviation System Plan (MASP)

The aviation system in Michigan plays a crucial role in the state's transportation system and helps transport people and goods in a safe, timely, and efficient manner, supporting the national, state, and local economies. The 2017 Michigan Aviation System Plan (MASP) is a guide to prioritize and coordinate asset management, along with funding and development needs for airports and facilities in Michigan's aviation system.

Airport Development Facility Goals

In order to promote achievement of the overall system goals, the MASP consists of the following airport development facility goals. These goals focus on specific airport development items that enhance services and infrastructure available across the system. Within each of these goal areas, MDOT and airport sponsors conduct an infrastructure inventory and assessment that is compared to the system goals for the area where the airport is located.

- Primary runway system
- Lighting and visual aids
- Airport approach protection
- Pilot and aircraft services
- All-weather and year-round access
- Landside access needs

Pavement Condition Index

While all facility goals are critical to the safe operation of an airport, management of pavement condition is of paramount importance to MDOT and local airport sponsors. To continually maintain a condition status for primary runways, MDOT leads efforts to conduct Pavement Condition Index (PCI) inspections on a three-year rotational basis. Airport pavements are assigned a PCI value between 0 and 100 that indicates the present condition of airport pavement, with a higher value correlating to better pavement condition. As PCIs fall below 70, MDOT encourages local airport sponsors to examine opportunities to rehabilitate the pavement. By utilizing this asset management process, MDOT and airports have a quantifiable method of assessing the pavement in order to minimize very costly complete reconstruction projects, and to ensure not only the safety of the pavement but also the return on the taxpayers' investment for years to come.

Michigan Aviation System Plan

- The MASP represents a unique and valuable asset management tool for MDOT staff involved in state airport system planning and capital development.
- MASP's Eight System Goals:
  1. Serve Significant Population Centers
  2. Serve Significant Business Centers
  3. Serve Significant Tourism/ Convention Centers
  4. Provide Access to General Population
  5. Provide Adequate Land Area Coverage
  6. Provide Adequate Regional Capacity
  7. Serve Seasonally Isolated Areas
  8. National Plan for Integrated Airport System Inclusion

RAILROAD ASSET MANAGEMENT

Using asset management principles to determine future projects will become the focus for Michigan's railroad infrastructure. MDOT's Office of Rail is in the early stages of formalizing an asset management approach.

Formalizing Asset Management

Michigan's railroad network is a critical component of the state's transportation system, responsible for transporting freight and people in a safe, timely, and efficient manner, supporting the national, state, and, most importantly, local economies.

MDOT's Office of Rail is in the process of implementing formal asset management* processes. Formalizing asset management for the state-owned railroad assets will enable MDOT and the railroads to have a quantifiable and defendable method of assessing the conditions to maximize safety, speed and capacity. Furthermore, asset management will support MDOT's primary focus of being a more efficient and effective steward of the state's limited resources on behalf of all taxpayers.

Asset Management Approach

The following describes the methodology being used by MDOT's Office of Rail to establish asset management.

- Goals and objectives are established.

  Goals and objectives are being established for numerous state-owned assets, such as allowable train speeds or crossing roughness.
- System inventory and condition data is collected.

  MDOT is reviewing the data currently collected for rail assets, also pursuing methods to gather missing or unavailable data.
- The condition data is analyzed and rates of deterioration are computed.

  Rates of deterioration are being documented and/or developed concerning the most important assets.
- Performance measures and standards are set or reaffirmed.

  Railroad industry performance measures are basically safety first, while maximizing speed and capacity.
- Gaps in performance and risk factors are evaluated.

  Risk factors are being developed applicable to state-owned assets.
- Life cycle network analysis is developed using forecasting tools.

  The project selection process is continually monitored and adjusted based on the outcome of the projects and programs implemented.

**Note: Asset management is currently not mandated by the Federal Railroad Administration.*

Results-Focused

By monitoring conditions, MDOT will efficiently maintain all state-owned rail assets. Other noteworthy related activities include:

- Safety: MDOT's historical road crossing and grade separation programs are nationally recognized for their efficiency. Michigan never has a road-rail crossing on the state's high-crash location lists, meeting our first performance measure – Safety.
- Speed and Capacity:

  The Office of Rail continually reviews how to best utilize resources for projects to increase the speed (reducing slow orders) and increase track capacity in order to carry today's modern railcars (reducing bridge restrictions).

TRANSIT ASSET MANAGEMENT

Transit asset management is evolving in Michigan and across the country. MDOT serves a key role in the oversight and planning of Michigan's transit assets.

MDOT's Role in Asset Management

In October 2016, a Final Rule was released by the Federal Transit Administration (FTA) requiring all recipients of FTA funds to develop transit asset management (TAM) plans. The specifics of this rule, combined with how FTA funds are distributed, influences the role that MDOT serves in TAM versus individual transit agencies. Therefore, to understand the roles of MDOT and each local transit agency involved in TAM, transit providers are grouped in two categories.

Urban Transit Agencies

Twenty-one urban transit agencies in Michigan receive most or all of their federal funding directly from FTA. Each agency establishes their own asset management program and goals, and determines how they will invest their federal funds. They are also required to comply with all new federal TAM regulations. MDOT is not involved in this process or meeting any federal requirements.

Rural Transit Agencies

Fifty-seven transit agencies in Michigan rural areas receive all of their federal funding from MDOT. MDOT prepares an annual investment plan for use of the funds. For more than 20 years, MDOT has used asset management principles to guide its use of these federal funds. Specifically, MDOT has focused on the replacement of aging transit vehicles as the highest priority, with a goal of each rural agency having no more than 20 percent of its fleet beyond useful life, based on current service levels. Investment in other rural transit assets, such as equipment and facilities or new vehicles to expand service, is largely dependent on the availability of discretionary funding.

Federal Transit Asset Management Rule

Under the FTA TAM rule, all public transportation providers must set annual State of Good Repair (SGR) targets for revenue vehicles, service vehicles and facilities. Providers must also have a TAM plan in place by October 2018. A TAM plan must cover a period of at least four years and must be updated at a minimum of every four years.

The rule defines two tiers of providers:

- Tier I: Providers with 101 or more vehicles in revenue service and all operators of rail fixed-guideway systems. In Michigan, Tier I providers must develop their own SGR targets and develop an individual TAM plan. Many large urban agencies are Tier 1 providers.
- Tier II: Providers with 100 or fewer vehicles in revenue service. In Michigan, Tier II providers that are in smaller urban areas will prepare their own TAM plans, and those in rural areas will be part of a group TAM plan developed by MDOT.

The MDOT group TAM will be in place by October 2018. Also, as required by the federal rule, MDOT will set annual SGR targets for the assets within this group.


TRANSPORTATION ASSET MANAGEMENT COUNCIL (TAMC)

MDOT is a partner with the nationally recognized Michigan Transportation Asset Management Council (TAMC). TAMC is an independent body focused on objective data and the condition of the state's roads and bridges, and serves a resource for implementing asset management practices among Michigan's road agencies.

MDOT's Role

MDOT serves a significant role in supporting TAMC's mission through the following:

- Staff support to TAMC Full Council and all committees
- Manage Annual Work Program and Annual Report
- Oversee and support data reporting process
- Collect and monitor asset management plans
- Public functions, including conferences, meetings and events
- Manage state asset management conferences
- Manage contracts for technical support services
- PASER data analysis, forecasting and reporting
- Participate in the Statewide Pavement Management Advisory Council (SPMAC)

Michigan Transportation Asset Management Council

Public Act (PA) 499 of 2002 created the TAMC, stating:

"All public roads in Michigan will be managed using the principles of asset management."

TAMC

The council serves an advisory role to the Michigan State Transportation Commission (STC) regarding:

- Asset management process,
- Tools and education,
- Statewide asset management strategy, and
- Federal aid system condition.

The council is comprised of representatives from county road commissions, cities, a county commissioner, a township official, regional and metropolitan planning organizations, and state transportation department personnel. The Center for Shared Solutions (CSS) is the central data storage agency of the council.

For more information, go to www.michigan.gov/tamc.

TAMC legislation:
PA 499 of 2002,
PA 338 of 2006,
PA 199 of 2007,
PA 257 of 2010, and
PA 506 of 2012.

MDOT'S NATIONAL LEADERSHIP

MDOT is a member and partner nationally on the American Association of State Highway and Transportation Officials (AASHTO) subcommittee on Asset Management. MDOT's role is to serve in an advisory and leadership capacity to help improve the state-of-the-practice of asset management in state transportation departments across the nation. The subcommittee works to help states optimize resources by utilizing performance-based goals and measures for operation, preservation, and improvement of their transportation systems.

AASHTO
THE VOICE OF TRANSPORTATION

Transportation Research Board (TRB)

MDOT is also a leading partner with the TRB, a nonprofit organization that provides independent research to improve transportation across North America and the world. MDOT staff representatives serve TRB on panels, committees, and in leadership capacities.

21ST CENTURY INFRASTRUCTURE COMMISSION

21st CENTURY
MICHIGAN INFRASTRUCTURE COMMISSION

In March 2016, Gov. Rick Snyder created the 21st Century Infrastructure Commission, an advisory body of 27 members comprised of state and independent industry experts, including MDOT, charged with identifying strategic best practices to modernize the state's transportation, water and sewer, energy, and communications infrastructure over the next 30-50 years.

A final report in December 2016 outlined more than 100 recommendations to address the state's infrastructure challenges, including an investment in key modes of transportation including aviation, freight and passenger rail, and transit. MDOT leadership and staff serve the commission, offering guidance, consultation and staff resources.

More information about the commission is available at: www.michigan.gov/snyder/0,4668,7-277-61409_78737---,00.html.

Regional Pilot Program

In April 2017, Gov. Snyder created a Michigan infrastructure asset management pilot program to provide recommendations for implementing a comprehensive, statewide asset management system. The pilot, a recommendation of the 21st Century Infrastructure Commission, will be implemented in west and southeast Michigan. These regions will work jointly to develop recommendations on how to create a regional asset management process and system across asset classes - transportation, water, sewer and storm water.