# Asset Management Guide for Local Agency Bridges in Michigan

*sponsored by* **Michigan Transportation Asset Management Council**

*prepared by* **TranSystems Corporation**

**May, 2011**

MICHIGAN TRANSPORTATION ASSET MANAGEMENT COUNCIL

# Table of Contents

## 1.0 Introduction

1.1 Format ..... 1
1.2 Purpose ..... 1
1.3 Using this Guide ..... 1
1.4 Definitions / Acronyms ..... 2
1.5 Asset Management in Michigan ..... 2
1.6 Role of the Michigan Transportation Asset Management Council (TAMC) ..... 3

## 2.0 Bridge Asset Management in Michigan

2.1 Bridge Management System ..... 4
2.2 Bridge Preservation through Preventive Maintenance ..... 4
2.3 Michigan's Systematic Plan to Preserve Bridges ..... 5
2.3.1. Elements of Michigan's Systematic Plan ..... 5
2.4 Funding Bridge Preservation ..... 7

## 3.0 MDOT Local Agency Program

3.1 Overview ..... 8
3.2 Local Bridge Advisory Board ..... 8
3.3 Regional Bridge Council ..... 8
3.4 Michigan's Local Bridge Program Strategy ..... 9
3.5 Call for Applications ..... 9
3.6 Application Process ..... 9

## 4.0 Bridge Condition Assessment

4.1 The National Bridge Inventory ..... 10
4.2 Bridge Safety Inspections ..... 11
4.3 Bridge Condition and Appraisal ..... 11
4.3.1 Condition Ratings ..... 12
4.3.2 Appraisals ..... 13
4.3.3. MDOT Inspection Data Collection ..... 13
4.3.4 Structurally Deficient Bridges ..... 14
4.3.5. Functionally Obsolete Bridges ..... 14
4.3.6. Closed Bridges ..... 14
4.3.7. Sufficiency Rating ..... 15
4.4 Michigan Bridge Inspection System ..... 15
4.5 Michigan Bridge Reporting System ..... 15
4.6 Michigan's Bridge Management System ..... 16
4.7 Reporting Condition Data ..... 16
4.8 Inspector Recommendations ..... 17
4.9 Structure Evaluation ..... 17
4.10 Relating Bridge Condition and Performance to Maintenance ..... 18

## 5.0 Developing an Optimum Bridge Preservation Strategy


5.1 Types of Potential Fixes ..... 19
5.1.1 Structural Improvement ..... 19
5.1.2 Preventive Maintenance ..... 20
5.1.3 Bridge Maintenance Technical Guidance ..... 21
5.2 Cost Estimating ..... 21
5.2.1 Deterioration Models ..... 21
5.2.2 Costing Deferred Maintenance ..... 21
5.2.3 In-House Costs vs. Contract Costs ..... 22
5.2.4 Life Cycle Cost Analysis ..... 23
5.3 Concept of a Mix of Fixes ..... 23
5.4 Developing a Local Bridge Preservation Plan ..... 23
5.4.1. Risk Assessment ..... 24
5.4.2. Prioritization of Repairs ..... 25
5.4.3. Sample Local Bridge Preservation Plan ..... 26


## Appendix


A. Application Process Flow Chart ..... A-1
B. Act 51 Flow Chart ..... B-1
C. Sample Local Bridge Preservation Plan ..... C-1


## Cover Photos

Upper Left……..Thornapple River Drive over Thornapple River, Ada Township, Kent County
Upper Right……East Delhi Road over Huron River, Washtenaw County
Lower Left……..Lincoln Avenue over Cheboygan River, City of Cheboygan
Lower Right……CR 510 over Dead River, Marquette County

# 1.0 Introduction

## 1.1 Format

This *Asset Management Guide for Local Agency Bridges in Michigan* is presented in two-column format. The left column contains the Guide's text. Applicable references and other supporting material are contained in the right column with links to the source documents and information sources.

## 1.2 Purpose

Maintaining bridges in good condition has proven to extend service life and to be more cost effective than allowing deterioration to progress, resulting in the need for more extensive and costly rehabilitation or replacement projects. By developing and implementing a comprehensive bridge preservation plan, a local agency can better identify its needs, prioritize its actions, and allocate available funds appropriately.

This *Asset Management Guide for Local Agency Bridges in Michigan* is intended to provide:

- Assistance in understanding bridge management and bridge preservation;
- Guidance to decision makers and county bridge or highway engineers in the planning, developing, programming, and implementing of effective and efficient capital programs and maintenance actions to preserve the bridges under their jurisdiction;
- Information to assist local agencies (1) in understanding their bridge network, (2) in the preparation and implementation of a bridge preservation plan, and (3) to support applications for funding under Michigan's Local Bridge Program.

## 1.3 Using this Guide

This Guide provides specific information related to the management of bridge assets, and is intended to be a complementary document to the *Asset Management Guide for Local Agencies in Michigan,* the primary resource for the management of transportation facilities in Michigan. In developing that document, Michigan's Transportation Asset Management Council (TAMC) recast asset management guidance developed at the national level for state DOTs into a form intended to be useful for local agencies in Michigan.

Michigan also has substantial other resources to assist local

## 1.0 References

Michigan Public Acts of 2002, Act 51
http://www.legislature.mi.gov/(S(dohasyvvbci5czyrkb3tcgz2))/mileg.aspx?page=GetObject&objectname=mcl-act-51-of-1951

2011 Call for Applications Letter
http://www.michigan.gov/documents/mdot/mdot_Call_for_Applications_267051_7.pdf

MDOT *Asset Management Guide for Local Agencies in Michigan*
http://mcgiweb6.mcgi.state.mi.us/mitrp/Council/AssetManagementPlans.aspx

agencies in guiding their asset management practices. This Guide provides useful links to that information and to resource material available from transportation agencies such as FHWA, AASHTO, and others. Users of this Guide are encouraged to consult these resources in the development of their bridge asset management plans.

## 1.4 Definitions / Acronyms

This Guide employs a number of terms commonly used in: the inspection, evaluation, and maintenance of bridges; asset management plans; capital programming and funding; resource management; and the administration of Michigan's Local Bridge Program. Links to references containing definitions of these terms are provided in the right hand column, as are the common acronyms used in the Guide. The user is encouraged to review the cited references in order to better understand and implement the principles and procedures described in the Guide.

In May 2006, AASHTO, the American Association of State Highway Transportation Officials initiated the ***Transportation System Preservation Technical Services Program (TSP·2).*** The program, dedicated to the preservation of infrastructure investment was initiated as a clearinghouse to disseminate information on enhancing the performance and extending the useful life of the highway infrastructure, both pavements and bridges, thru efficient and effective preservation measures. The TSP2 website contains the working definition of *bridge preservation.*

Bridge preservation starts with obtaining timely information on bridge conditions; then, developing and implementing a planned strategy to maintain and extend the useful life of the bridge network. A preservation strategy is composed of various preventive maintenance activities and treatments. Applied at the proper time, preventive maintenance activities extend the service life of the bridge in a cost-effective manner. The definition of critical terms used in the management of bridge assets are discussed in Section 2.2.

## 1.5 Asset Management in Michigan

In Michigan, asset management is defined as *"an ongoing process of maintaining, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment"* per Act 499 of the Michigan Public Acts of 2002, Section 9(a)(1)(a).

Act 499 encourages all agencies that spend state transportation funds on roads and bridges to implement an asset management approach under the leadership and oversight of the TAMC.

### Definitions

FHWA Asset Management Overview
http://www.fhwa.dot.gov/asset/if08008/amo_09.cfm

Transportation System Preservation Technical Services Program (TSP·2)
http://www.tsp2.org

### Acronyms

AASHTO – American Association of State Highway and Transportation Officials
ADT – Average Daily Traffic
ADTT - Average Daily Truck Traffic
BCFS – Bridge Condition Forecasting System
BIR – Bridge Inspection Report
BMS – Bridge Management System
BSIR – Bridge Safety Inspection Report
CRAM – County Road Association of Michigan
CPM – Capital Preventive Maintenance
FHWA – U. S. Dept of Transportation, Federal Highway Administration
LBAB – Local Bridge Advisory Board
LBF – Local Bridge Fund
LBP – Local Bridge Program
LTAP – Michigan Local Technical Assistance Program
LCCA – Life Cycle Cost Analysis
MDOT – Michigan Department of Transportation
MBIS – Michigan Bridge Inspection System
MBRS – Michigan Bridge Reporting System
MML – Michigan Municipal League
MTF – Michigan Transportation Fund
MPO – Metropolitan Planning Organization
NBI – National Bridge Inventory
NBIS – National Bridge Inspection Standards
NCHRP - National Cooperative Highway Research Program
RBC – Regional Bridge Council
RSL – Remaining Service Life

## 1.6 Role of the Michigan Transportation Asset Management Council (TAMC)

Created by Act 499 of the Michigan Public Acts of 2002, the TAMC's stated mission is to: *advise the State Transportation Commission on a statewide asset management strategy & the necessary procedures & analytical tools to implement such a strategy on Michigan's highway system in a cost-effective, efficient manner.*

In order to apply the principles of asset management to the process of allocating transportation resources, TAMC developed the following high level strategic process which could be applied to a variety of infrastructure types:

- Assess current condition
- Create a "mix of fixes", estimate costs and funding levels
- Predict future condition, develop performance measures and targets
- Conduct tradeoff analysis, indentify candidate projects
- Set Priorities, develop a multi-year program
- Report results

This Guide is intended to assist local agencies in applying this process to the development of a preservation plan for bridges under their jurisdiction and to provide background material on bridge preservation.

SAFETEA-LU – Safe, Accountable, Flexible, and Efficient Transportation Equity Act Legacy for Users
SI – Structural Improvement
SIA – Structure Inventory and Appraisal
STIP – Statewide Transportation Improvement Program
TAMC – Michigan Transportation Asset Management Council
TEDF – Transportation Economic Development Fund
TIP – Transportation Improvement Program
TMS – Transportation Management System

TAMC Website Link
http://mcgiweb6.mcgi.state.mi.us/mitrp/Council/Default_Council.aspx

# 2.0 Bridge Asset Management in Michigan

## 2.1 Bridge Management System

A Bridge Management System (BMS) is defined as a collection of interacting processes designed to assist decision makers in the selection of cost-effective bridge preservation, rehabilitation, and improvement strategies and actions to improve the efficiency and safety of, and protect the investment in a network of bridges (23 CFR 500.107) Code of Federal Regulations.

Michigan has a system-wide process for transportation asset management of highway bridges. For local agencies this process is administered through the local bridge program by the Local Bridge Advisory Board and seven Regional Councils. The Transportation Asset Management Council supports the state's BMS by providing technical assistance and guidance, and by publishing annual asset management reports, communicating infrastructure needs, and implementing asset management principles.

## 2.2 Bridge Preservation through Preventive Maintenance

The Federal-aid to Highways Program allows States to use Highway Bridge Program (HBP) funds to improve the condition of highway bridges through replacement, rehabilitation, and preservation activities identified using an approved systematic process. Bridge preservation and preventive maintenance are terms that are used interchangeably.

**Bridge preservation** is defined by FHWA as: *Actions or strategies that prevent, delay, or reduce deterioration of bridges or bridge elements; restore the function of existing bridges; keep bridges in good condition; and extend their useful life. Preservation actions may be preventive or condition-driven.*

**Preventive Maintenance** is recognized as a cost effective way to preserve the investment in and service life of bridges. AASHTO defines preventive maintenance as: *A planned strategy of cost-effective treatment to an existing roadway system and its appurtenances that preserves the system, retards future deterioration and maintains or improves the functional condition of the system without increasing structural capacity.*

An effective bridge preservation program: 1) employs long-term network strategies and practices that are aimed to preserve the condition of bridges and extends their useful life; 2) has sustained and adequate funding sources; 3) ensure that the appropriate treatments are applied at the appropriate time.

## 2.0 References

FHWA Bridge Asset Management
http://www.fhwa.dot.gov/bridge/management/index.cfm

AASHTO *Transportation Asset Management Guide*
http://www.fhwa.dot.gov/crt/lifecycle/asset.cfm

AASHTO *Guidelines for Bridge Management Systems*
https://bookstore.transportation.org/Item_details.aspx?id=343

Some agencies employ a program of scheduled maintenance performed by in-house forces.

## 2.3 Michigan's Systematic Plan to Preserve Bridges

The FHWA defines a systematic process as *"a documented methodology regularly applied to repeatedly achieve a desired outcome or goal."* The plan must define a specific outcome or goal for the preventive maintenance program, and describe a systematic process to achieve that goal.

### 2.3.1 Elements of Michigan's Systematic Plan

The key elements of Michigan's systematic plan for preserving its trunk line bridges are described below. Similar items should be addressed in a local bridge preservation plan.

- *Identify the needs:* This first step describes the engineering criteria used to determine the agency's need for funding for bridge preventive maintenance. Michigan's Local Bridge Program identifies statewide and Regional needs by monitoring bridge condition by functional classification annually. The Transportation Asset Management Council also identifies needs and provides reports to the Michigan Legislature annually. Bridge owners must also identify needs in order to schedule and perform routine maintenance, and to submit projects for capital preventive maintenance, rehabilitation, and replacement projects.

  Michigan uses extended bridge condition data collection in the NBI format as well as Pontis data collection to manage bridges. Pontis is one of the tools available in the Michigan BMS. The Pontis inspection data, collected based on the AASHTO element level inspection system, is extremely useful when determining a preservation plan for bridges. Local agencies are encouraged to incorporate Pontis inspection and reporting into their local bridge inspection program.

- *Prioritize the needs:* Michigan has a prescriptive procedure that evaluates bridge condition using bridge inspection records and inventory data in MDOT's bridge management system. This information is made available to the Local Bridge Advisory Board, Regional Councils, and local agency bridge owners to be used to prioritize bridge replacement, rehabilitation, and preventive maintenance projects. Bridge owners are encouraged to use the concepts of asset management and BMS tools to develop bridge preventive maintenance programs. Maintaining bridges to remain in good or fair condition consistently proves to be a cost effective way to manage a bridge population and minimize

Strategic Investment Plan for Trunk Line Bridges
http://www.michigan.gov/documents/mdot/MDOT_StrategicInvestmentPlanForTrunklineBridges_339697_7.pdf

FHWA, *Guidance for Approval of a Bridge Management System and/or a Systematic Process*
http://www.fhwa.dot.gov/bridge/management/index.cfm

*A Systematic Process for Using Federal Aid to Support Bridge Preventive Maintenance*
Midwest Regional University Transportation Center
http://www.mrutc.org/research/0714/07-14_FR.pdf

MDOT *Long Range Transportation Plan, 2005-2030.*
http://www.michigan.gov/documents/mdot/MDOT_SLRP_techrept_Highwaybridge_177958_7.pdf

costly major rehabilitations. The Bridge Condition Forecasting System (BCFS) is an important tool in the BMS and is used by MDOT to develop preservation policies. Information on the BCFS is contained in MDOT's Long Range Transportation Plan, 2005-2030.

Reference: Bridge Condition Forecasting System (BCFS)
David A. Juntunen
Engineer of Bridge Operations
MDOT Construction & Technology Division
8885 Ricks Road
Lansing MI 48909
Phone (517) 322-5688
Juntunend@michigan.gov

- *Define the goal:* Bridge condition goals and objectives are an important part of a preservation plan as they provide targets by which strategies can be set and performance monitored. The TAMC encourages local agencies to establish goals that will improve and preserve their bridge network: such as; opening closed bridges, reducing the number of structurally deficient and functionally obsolete bridges, maintaining more of their bridges in good or fair condition, etc.

  MDOT's *Strategic Investment Plan for Trunk Line Bridges* contains specific goals for its bridges. The state of Michigan's public Dashboard contains five metrics to measure the state's economic progress. One of those key metrics is a progress monitor on the state's success in reducing the number of structurally deficient bridges in the network.

MDOT *Strategic Investment Plan for Trunk Line Bridges*
http://www.michigan.gov/documents/mdot/MDOT_StrategicInvestmentPlanForTrunklineBridges_339697_7.pdf

Michigan Dashboard
http://www.michigan.gov/documents/accountability/MichiganScorecard_V6_343176_7.pdf

- *Demonstrate cost-effectiveness:* Cost effectiveness of bridge preservation projects is best accomplished by monitoring bridge deterioration rates. MDOT has been doing preservation projects for many years and has accumulated data showing the effectiveness of many bridge preservation projects and activities for their highway bridges. MDOT's Bridge Deck Preservation Matrix provides repair options for bridge decks in various condition states and it provides estimates of fix life for the repair options.

MDOT Deck Evaluation Matrix
http://www.michigan.gov/documents/mdot/MDOT_BridgeDeckMatrix_182438_7.pdf

- *Identify and dedicate resources:* The Local Bridge Advisory Board dedicates funds to each of the seven Regional councils for replacement, rehabilitation, and preventive maintenance projects. Local agency bridge owners should estimate the resource requirements over time to preserve their bridges.

  Using the NBI condition ratings, bridge deterioration rate, project cost, expected inflation, and fix strategies, BCFS estimates the future condition of a bridge network. BCFS can compare a mix of fixes by modeling different percentages of preventive maintenance, rehabilitation, and replacement projects.

- *Annual reporting:* The TAMC annually tracks bridge condition and provides reports to the State Transportation Commission and Michigan Legislature.
  Bridge owners are encouraged to use the Michigan Bridge

TAMC Annual Report 2009
http://tamc.mcgi.state.mi.us/MITRP/Council/Default_Council.aspx

Reporting System to monitor bridge condition and needs over time. Annual reports showing bridge condition trends and needs are an important part of a local bridge preservation plan and are helpful in justifying funds to local agencies.

## 2.4 Funding Bridge Preservation

Under SAFETEA-LU, Michigan is eligible to use federal funds to support bridge preventive maintenance. MDOT has an FHWA approved systematic plan for the preventive maintenance program that ensures the activities are cost effective in extending the service life of bridges.

Through legislation enacted on October 1, 2004, Michigan created a Local Bridge Fund to be administered by the newly formed Local Bridge Advisory Board and seven regional Bridge Councils, giving control of the funding allocations to the local agencies. An application process was instituted for local agency funding at that time.

Michigan uses a combination of Federal HBP funds, MTF funds, and local bridge funds to implement the approved preservation plan. A typical Act 51 Flow Chart showing the sources and distribution of funds is presented in Appendix B.

Michigan Bridge Reporting System
http://www.michigan.gov/documents/mdot_Local_Bridge_Advisory_Board_Procedures_116599_7.pdf

Act 51 Primer
www.house.mi.gov/hfa/PDFs/act51.pdf

Act 51 Public Acts 1951
http://www.michigan.gov/documents/act51_18078_7.pdf

Federal Highway Bridge Program Funds
http://www.fhwa.dot.gov/bridge/hbrrp.htm
http://www.fhwa.dot.gov/preservation/100804.cfm

Federal Surface Transportation Program Funds
http://www.fhwa.dot.gov/safetealu/fundtables.htm

State Bridge Funds -MDOT 5 Year Plan
http://www.michigan.gov/mdot/0,1607,7-151-9621_14807_14810---,00.html

Transportation Fund
http://www.michigan.gov/mdot/0,1607,7-151-9622_11045_34388---,00.html

Maintenance Funds
http://www.michigan.gov/documents/MDOT_Maintenance_Funded_Project_Procedures_120509_7.pdf

State Economic Development Funds
http://connect.michigan.gov/portal/site/mdot/menuitem.be8896d05609f5da4640f0c778783859/

Local funds
http://www.micountyroads.org/PDF/Twp_funding.pdf

Muskegon County Road Commission Funding Brochure
http://www.muskegoncountyroads.org/brochures/fundingbrochure.pdf

Michigan TF2 Report on Funding
http://www.michigan.gov/documents/mdot/MDOTsec394_284447_7.pdf

# 3.0 MDOT Local Agency Program

## 3.1 Overview

By legislation in October, 2004, Michigan established a Local Bridge Program that includes a Local Bridge Fund to be administered by a Local Bridge Advisory Board (LBAB) and seven Regional Bridge Councils (RBC), giving control of the funding allocations to the local agencies. Funding from the Local Bridge Fund is allocated to each region based on available funds and weighted ratios provided in the legislation.

MDOT provides administrative support, technical assistance, and bridge inventory data. MDOT reviews submitted applications, performs project field inspections, determines the computer generated rating points, checks the plans and specifications for conformance to AASHTO guidelines, schedules and participates in all required meetings, and advertises and awards contracts for the bridge projects. MDOT representatives are non-voting members of both the LBAB and the RBCs.

## 3.2 Local Bridge Advisory Board

The LBAB is the state level committee that oversees the Local Bridge Program operations. The LBAB is responsible for, at a minimum, the "Large" bridge program, emergency situations involving local bridges, allocating percentages of funding to each region, and ensuring the RBCs are following established guidelines.

The LBAB allocates funding to each region by formula. The three elements in formula are: number of bridges, bridge deck area, and deficient bridge deck area.

## 3.3 Regional Bridge Council

An RBC is a regional committee that is charged with the responsibility of determining a 3-year bridge program that replaces, rehabilitates, and maintains the bridge inventory of their respective region. Each region's RBC evaluates and rates applications submitted by local agencies using the RBC Discretionary Rating Guide, and determines which bridge projects are to be funded each year based on the dollars allocated by the LBAB.

Projects are selected and programmed on a rolling three year basis; for example, projects that are selected based on the 2011 applications will be funded in 2014 as the 2011 thru 2013 programs have already been established. Each RBC's 3-year program is reviewed annually by the LBAB for concurrence.

## 3.0 References

Local Bridge Program Link
http://www.michigan.gov/mdot/0,1607,7-151-9625_25885_40558---,00.html

Guidelines of Local Bridge Program
http://www.michigan.gov/documents/mdot_Current_Call_Instructions_Guidelines_of_Local_Bridge_Program_116619_7.pdf

Overview of Local Bridge Program:
http://www.michigan.gov/documents/mdot_Overview_of_Local_Bridge_Program_116617_7.pdf

Local Bridge Advisory Board
www.michigan.gov/documents/mdot_Local_Bridge_Advisory_Board_Procedures_116599_7.pdf

Local Bridge Advisory Board Procedures:
http://www.michigan.gov/documents/mdot_Local_Bridge_Advisory_Board_Procedures_116620_7.pdf

Local Bridge Selection Process
http://www.michigan.gov/mdot/0,1607,7-151-9625_25885_40558_40560-113373--,00.html

Regional Bridge Councils
http://www.michigan.gov/mdot/0,1607,7-151-9625_25885_40558-113368--,00.html

Regional Bridge Council Procedures:
http://www.michigan.gov/documents/mdot_Regional_Bridge_Council_Procedures_116621_7.pdf

RBC Discretionary Rating Guidance
http://www.michigan.gov/documents/mdot/RBC-Discretionary_Rating_Guidance_344737_7.pdf

RBC Three Year Programs
http://www.michigan.gov/mdot/0,1607,7-151-9625_25885_40558_40560-131319--,00.html

## 3.4 Michigan's Local Bridge Program Strategy

The local bridge preservation strategy is established by the LBAB using MDOT's Bridge Condition Forecast System (BCFS). Certain funding is reserved for "large bridges" and local bridge emergencies. The LBAB then allocates funds to the regions in the major categories of work - replacement, rehabilitation, and preventive maintenance. The RBC's distribute the funds to the local agencies based on a review and rating of the applications for funding submitted by the local agencies. The LBAB evaluates the program results annually.

Local Bridge Funding Michigan
http://www.michigan.gov/documents/mdot_funding_information_per_Region_116635_7.pdf

## 3.5 Call for Applications

A copy of the Application Documents for the current year can be found on the Local Bridge Program website.

Local Bridge Program Link
http://www.michigan.gov/mdot/0,1607,7-151-9625_25885_40558---,00.html

## 3.6 Application Process

A copy of a Flow Chart describing the application process is contained in Appendix A.

Preparing Federal Aid Projects
http://www.michigan.gov/documents/mdot_fedaid_78422_7.pdf

# 4.0 Bridge Condition Assessment

The NBIS sets the national standards for the proper safety inspection and evaluation of all highway bridges. The NBIS regulations apply to all publicly owned highway bridges longer than twenty feet located on public roads. These same standards are applied to Michigan's local bridges.

As the inspection results are the foundation of bridge preservation planning, it is critical that each agency obtain complete and accurate data on the current condition of each bridge in its network. Inspection reporting includes the inspector's "work recommendations" which should initiate preventive maintenance actions.

## 4.1 The National Bridge Inventory

The National Bridge Inventory (NBI) is a database covering about 600,000 of the nation's bridges located on public roads, including Interstate Highways, U.S. highways, State and county roads, and publicly-accessible bridges on Federal lands. It presents a State by State summary of the number, location, and general condition of the highway bridges within each State.

The collection of NBI data is authorized by federal statute and implemented by regulation. The FHWA established National Bridge Inspection Standards (NBIS) for the safety inspection and evaluation of highway bridges; and each State is required to conduct periodic inspections of all bridges subject to the NBIS, prepare and maintain a current inventory of these structures, and report the data to the FHWA using the procedures and format outlined in the *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*.

After evaluation of the inspection data, the FHWA provides States with a list of bridges that are eligible for replacement or rehabilitation based on their *sufficiency rating* (Section 4.3.7). The FHWA uses the data to submit a required biannual report to Congress on the status of the Nation's bridges, to publish an Annual Materials Report on New Bridge Construction and Bridge Rehabilitation in the Federal Register, and to apportion funds for the Highway Bridge Program.

Use of the NBI data also enables FHWA to satisfy its requirements under law, which mandates the inventory, classification, cost estimates for replacement or rehabilitation, and assignment of replacement or rehabilitation priorities for all highway bridges on all public roads.

## 4.0 References

National Bridge Inspection Standards
http://www.fhwa.dot.gov/bridge/nbis.htm

NBIS Bridge Inspection Definitions
http://www.dot.state.mn.us/i35wbridge/pdfs/bridgenspectiondefs.pdf

MDOT Resources and Guides
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_24773---,00.html

FHWA, *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*
http://www.michigan.gov/documents/MDOT-Bridge-METRCSIA_87987_7.pdf

## 4.2 Bridge Safety Inspections

The FHWA bridge inspection program regulations were developed as a result of the Federal-Aid Highway Act of 1968 that required the Secretary of Transportation to establish the national bridge inspection standards. The primary purpose of the NBIS is to locate and evaluate existing bridge deficiencies to ensure the safety of the traveling public.

The 1968 Federal-Aid Highway Act directed the States to maintain an inventory of Federal-aid highway system bridges. The Federal-Aid Highway Act of 1970 limited the NBIS to bridges on the Federal-aid highway system. After the Surface Transportation Assistance Act of 1978 (STAA) was passed, NBIS requirements were extended to bridges greater than 20 feet on all public roads. The Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURRA) expanded bridge inspection programs to include special inspection procedures for fracture critical members and underwater inspection.

There are some 10,900 highway bridges in Michigan. MDOT is directly responsible for about 4,400 of them, and administers a biennial inspection program in compliance with NBIS requirements, collecting both NBI data and Pontis element level inspection data. The remaining 6,500 bridges are the responsibility of local agencies, which are required to perform biennial inspections of their bridges in accordance with NBIS. While it is not required that local agencies collect Pontis element level inspection data, MDOT encourages that local agencies do so, as this data is extremely useful when determining a preservation plan for their bridges.

AASHTO, *Manual for Bridge Evaluation*
https://bookstore.transportation.org/Item_details.aspx?id=1343

FHWA, *Guidelines for Installation, Maintenance, and Repair of Structural Supports for Highway Signs, Luminaires, and Traffic Signals*
http://www.fhwa.dot.gov/BRIDGE/signinspection.cfm

FHWA, *HEC 20 Stream Stability at Highway Structures*
http://www.fhwa.dot.gov/engineering/hydraulics/library_arc.cfm?pub_number=19&id=43

FHWA, Scour Publications
http://www.fhwa.dot.gov/engineering/hydraulics/library_sub.cfm?keyword=006

## 4.3 Bridge Condition and Appraisal

Bridge inspectors carefully inspect and evaluate the entire structure, and assign a numerical rating to each component of the bridge. There are two categories of ratings – condition ratings and appraisals.

Together these ratings define the current condition of the bridge, the extent and severity of deterioration, and its compliance with current standards. Deteriorated and/or substandard bridges can be further classified as “structurally deficient” or “functionally obsolete”. In addition, an all-encompassing “sufficiency rating” is compiled to assess the overall utility of the bridge. The sufficiency rating is used as a method of determining the eligibility of bridge projects for federal funding.

AASHTO, *Guide for Commonly Recognized (CoRe) Elements*,
https://bookstore.transportation.org/Item_details.aspx?id=1574

*Michigan Structure Inventory and Appraisal Coding Guide*
www.michigan.gov/documents/MDOT-Bridge-SIAMANUAL-2_87989_7.pdf

### 4.3.1 Condition Ratings

Condition ratings are used to describe the existing condition of in-place bridge components compared to their original as-built condition. Evaluation is done for the components of the deck, superstructure, and substructure components of a bridge. The condition evaluation of channels and channel protection and culverts are also included. The ratings range from 0 to 9 as follows:

| Code | Description |
|---|---|
| **N** | **NOT APPLICABLE** |
| **9** | **EXCELLENT CONDITION** |
| **8** | **VERY GOOD CONDITION** - no problems noted. |
| **7** | **GOOD CONDITION** - some minor problems. |
| **6** | **SATISFACTORY CONDITION** – structural elements show some minor deterioration. |
| **5** | **FAIR CONDITION** - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour. |
| **4** | **POOR CONDITION** - advanced section loss, deterioration, spalling or scour. |
| **3** | **SERIOUS CONDITION** - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present. |
| **2** | **CRITICAL CONDITION** - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored, closing the bridge may be necessary until corrective action is taken. |
| **1** | **"IMMINENT" FAILURE CONDITION** - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service. |
| **0** | **FAILED CONDITION** - out of service - beyond corrective action. |

As culverts do not have distinct decks, superstructures, and substructures, separate component ratings are not given. Instead, a single “culvert rating” of 0 to 9 is assigned which takes into account the overall condition of the culvert.

### 4.3.2 Appraisals

Appraisal Ratings rate components in comparison to current standards. The items are used to evaluate a bridge in relation to the level of service which it provides on the highway system of which it is a part. The structure is compared to a new one which is built to current standards for that particular type of road. The appraisals also range from 0 to 9 as follows:

| Code | Description |
|---|---|
| N | Not Applicable |
| 9 | Superior to present desirable criteria |
| 8 | Equal to present desirable criteria |
| 7 | Better than present minimum criteria |
| 6 | Equal to present minimum criteria |
| 5 | Somewhat better than minimum adequacy to tolerate being left in place as is |
| 4 | Meets minimum tolerable limits to be left in place as is |
| 3 | Basically intolerable requiring high priority of corrective action |
| 2 | Basically intolerable requiring high priority of replacement |
| 1 | *(This value of rating code not used)* |
| 0 | Bridge closed |

Michigan *Structure Inventory and Appraisal Coding Guide*
http://www.michigan.gov/documents/MDOT-Bridge-SIAMANUAL-2_87989_7.pdf

### 4.3.3. MDOT Inspection Data Collection

The proper assessment of the condition of bridge elements is the cornerstone of sound bridge management. Element level inspection methods have been adopted by MDOT, and these detailed condition assessments provide the raw inspection information used in the bridge management system's expanded performance measures, deterioration forecasting, and bridge evaluation.

MDOT collects extended bridge condition data in the NBI format to manage bridges as well Pontis data which is based upon the AASHTO element based inspection system. In addition to the standard NBI ratings, MDOT inspectors record data for 21 elements. MDOT stresses that the inspectors provide detailed comments describing the bridge condition.

Pontis inspection data describes the extent and severity of deterioration observed in the inspection of each element, using condition states numbered from 1 to 5, with condition state 1

MDOT *Pontis Bridge Inspection Manual*
http://www.michigan.gov/documents/mdot/MDOT_PontisManual_2007_195365_7.pdf

MDOT Pontis Worksheet
http://www.michigan.gov/documents/CoreElements_WorkRecommendations_149456_7.pdf

representing the least deteriorated (almost new) condition and condition state 5 representing the most severely deteriorated conditions. The MDOT *Pontis Bridge Inspection Manual* defines the level of deterioration for each condition state for every element comprising the total bridge. As materials and function are different for each element, the description of the defects for each condition state varies from element to element.

Bridge element level inspection consists of performing a field inspection and recording quantities of the element that have observed defects that correlate to the severity of the defects defined in the particular condition state definition of the *Pontis Bridge Inspection Manual*. The inspector records the appropriate percentage of the total quantity in each condition state. Pontis element level inspection data can be used in advanced bridge management applications.

### 4.3.4 Structurally Deficient Bridges

Bridges are considered to be "structurally deficient" if the physical condition of any of the major structural components – deck, superstructure, substructure – are rated as "poor" or below (a numerical rating of 4 or less) or if the appraisal ratings for the structure or waterway adequacy are rated as requiring a high priority for replacement (a numerical rating of 2 or less). A culvert is considered structurally deficient if the overall culvert rating is poor or below (4 or less).

MDOT definitions of 'Structurally deficient' and 'Functionally Obsolete'
http://www.michigan.gov/mdot/0,1607,7-151-9618_47418-173622--,00.html

MDOT List of Structurally Deficient Local Agency Bridges
http://www.michigan.gov/documents/mdot_condition_state_data_116631_7.pdf

Michigan Dashboard –Structurally Deficient Bridges
http://www.michigan.gov/documents/accountability/MichiganScorecard_V6_343176_7.pdf

### 4.3.5. Functionally Obsolete Bridges

A bridge is considered "functionally obsolete" if the structural evaluation, deck geometry, under-clearances, approach roadway alignment, or waterway adequacy is rated as "intolerable requiring high priority of corrective action" (a numerical rating of 3 or less. A functionally obsolete bridge may or may not be able to carry all legal loads, but its configuration impairs its ability to carry traffic safely or pass high water.

Information on functionally obsolete bridges can be obtained through MDOT's Michigan Bridge Reporting System (MBRS), See Sect 4.5.

### 4.3.6. Closed Bridges

At any given time, a number of local agency bridges around the state of Michigan are closed pending funding for major rehabilitation or replacement. These closed crossings can cause considerable inconvenience to the travelling public by extending travel times, creating troublesome detours, and increasing traffic volumes on available routes.

Some local bridges remain closed for years. While closed the bridge remains on the NBI and remains eligible for federal funding. Bridges which have been closed for over five years will be removed from inventory unless the agency provides documentation of progress being made for the replacement or rehabilitation of the bridge.

One of the goals of a local agency bridge asset management plan is to program preventive maintenance and repairs to avoid the progressive deterioration of bridges to the point where an expensive rehabilitation or replacement project is necessary. In this way potential problems can be addressed before a critical condition develops that may require closing a bridge.

Information on closed bridges can be obtained through MDOT's Michigan Bridge Reporting System (MBRS), See Sect 4.5.

### 4.3.7. Sufficiency Rating

Federal Sufficiency Rating for Local Bridges
http://www.michigan.gov/documents/mdot_Local_Bridge_Data_for_FSR_and__Call_for_Applications_148254_7.pdf

The sufficiency rating is an important component of determining federal eligibility. The sufficiency rating formula combines structural adequacy (55%), serviceability and functional obsolescence (30%), and essentiality for public use (15%) to obtain a numerical percentage between 0 and 100. The rating is indicative of the bridge's sufficiency to remain in service, where a score of 100 represents a completely sufficient structure and 0 represents a completely insufficient structure.

The primary use of the sufficiency rating is to determine eligibility for federal bridge funds. A sufficiency rating below 80 qualifies a bridge for funding for rehabilitation, while a sufficiency rating below 50 qualifies a bridge for replacement funds.

The sufficiency rating is not the best indicator of the relative safety of a bridge. The sufficiency rating formula and its components can be found in Appendix B of the MDOT *Michigan Structure Inventory and Appraisal Coding Guide.*

## 4.4 Michigan Bridge Inspection System

Michigan Bridge Inspection System
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_26077---,00.html

The MDOT Michigan Bridge Inspection System (MBIS) is an Internet-based application for the collection and retrieval of National Bridge Inspection System (NBIS) and inventory data. This web site allows bridge owners or inspectors to complete the required forms online or download them to their computer and complete them remote from an Internet connection.

## 4.5 Michigan Bridge Reporting System

Michigan Bridge Reporting System
http://www.michigan.gov/documents/mdot_Local_Bridge_Advisory_Board_Procedures_116599_7.pdf

The MDOT Michigan Bridge Reporting System (MBRS) is a tool allowing bridge owners and inspectors to retrieve bridge inspection information and standardized bridge reports, including

network summaries, bridge condition reports, and Federal Highway Bridge Program (HBP) eligibility, Inspection Schedules, Scour Critical Structures, Load Rating Needs, Work Recommendations, and Ad-Hoc Reports.

## 4.6 Michigan's Bridge Management System

Michigan Bridge Management System
http://www.michigan.gov/documents/bridge_16549_7.pdf

As one of the components of Michigan's Transportation Management System (TMS), the MDOT run Bridge Management System (BMS) is the decision-support tool responsible for managing the inspection, analysis, and maintenance of the numerous components that make up a bridge.

The BMS includes data on the more than 10,900 bridges in Michigan. As such, the BMS provides complete coverage of all bridges in Michigan, not just those for which MDOT has responsibility, and supports the regional and local agencies bridge asset management efforts.

Within the BMS, bridge information is organized into three packages: Inventory – structure and route data; Inspection – record of field examinations and findings; and Work – Maintenance recommendations. Users are able to access each of these packages to monitor or manage data on bridges and their components.

MDOT's BMS includes a bridge management software tool called Pontis which was developed under an FHWA contract during the early 1990's, and became an AASHTO product in 1994. Pontis is a data application relying on the collected condition and cost data of individual bridge elements. This data can be useful to provide asset management at the element level.

The system is designed to support the bridge inspection process, recommend a bridge preservation policy, predict future bridge conditions, and recommend actions to perform on one or more bridges to derive the most agency and user benefit from a specified budget. The key features of *Pontis* include:

- Recording bridge inventory and inspection data
- Scenario modeling, including deterioration prediction models
- Various bridge improvement options, including maintenance, repair, and rehabilitation.
- Economic models to identify and prioritize capital improvements
- Development of an optimal preservation strategy

## 4.7 Reporting Condition Data

Pontis CoRe Element Report
http://www.michigan.gov/documents/CoreElements_WorkRecommendations_149456_7.pdf

MDOT's BMS produces three reports to assure a proper level of

decision support to the user:

- National Bridge Inventory Bridge Inspection: Information on bridge conditions
- *Pontis* Bridge Inspection: Information on extent and severity of bridge element deterioration
- Structure Inventory & Appraisal: Information on location, dimensions, material, design, capacity, condition, etc.

The first two reports describe the condition of the bridge at the time of the inspection. The NBI report uses the condition and appraisal evaluations described above, and the findings are presented in the MDOT Bridge Safety Inspection Report (BSIR). The Pontis report describes the extent and severity of the deterioration using the condition state levels described above, and the findings are presented on the Core Elements Inspection Form.

Bridge Safety Inspection Report
http://www.michigan.gov/documents/MDOT_bsir_blank_152574_7.pdf

This condition data is the basis for determining a preservation program for each bridge and for prioritizing actions within a bridge asset management plan. The importance of starting with complete and accurate inspection data and "work recommendations" cannot be overemphasized.

## 4.8 Inspector Recommendations

The bridge inspector is expected to assess and evaluate the condition of the bridge elements and recommend appropriate corrective action based on his judgment of the condition. These "Work Recommendations" are presented on the Bridge Inspection Report (BIR) Form.

MDOT List of Work Recommendations
http://www.michigan.gov/documents/CoreElements_WorkRecommendations_149456_7.pdf

In Michigan bridge inspectors using NBI terminology provide work recommendations at three levels of priority. The work is categorized as High, Medium, or Low priority. The bridge owner takes action based on the inspector's recommendations. MDOT's *Project Scoping Manual* for state trunk line bridges is a valuable resource for local agencies in understanding and implementing work recommendations.

The proper interpretation of the inspection condition data by the owning agency is the foundation for making informed maintenance – repair - replacement decisions in order to develop an optimum strategy for bridge preservation. The local agency should establish a set of metrics as a basis for prioritizing its actions with structural and safety issues taking precedence.

## 4.9 Structure Evaluation

The Michigan Structure Inventory & Appraisal (S.I.&A.) Sheet calculates a structure evaluation, Item 67, which is an overall

MDOT *Bridge Analysis Guide*
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_24773-132786--,00.html

assessment of the bridge. The appraisal takes into account the major structural deficiencies, and evaluates a bridge in relation to the level of service it provides, as compared with a new bridge built to current standards. Important factors considered in this appraisal are the bridge load rating and the condition ratings of the superstructure and substructure.

Condition ratings and appraisals are described in sections 4.3.1. and 4.3.2. The bridge load rating, in tons, denotes the safe sustained load capacity of a structure, determined in accordance with the MDOT *Bridge Analysis Guide,* the AASHTO *Manual for Bridge Evaluation,* and federal regulations.

Bridge elements having an NBI condition rating of 4 or less exhibit advanced deterioration. These structures are considered to be in poor condition and in need of repair or rehabilitation. If action is deferred and the deterioration is left to progress, the bridge elements will degrade to serious or critical condition.

Bridge elements having an NBI condition rating of 5 or 6 exhibit minor to moderate deterioration. These structures are considered to be sound and in fair condition, but need maintenance or minor repair, and are often good candidates for preventive maintenance.

Bridge elements having an NBI condition rating of 7 or higher exhibit only minor deterioration. These structures are considered to be in good condition, needing scheduled maintenance.

## 4.10 Relating Bridge Condition and Performance to Maintenance

Proper condition evaluation is an essential component of an asset management plan for bridge preservation. The appropriate response in addressing recorded condition deficiencies in bridge elements and the preventive measures taken to retard potential future degradation is important for the overall health of the local bridge network. A goal of preservation is to employ preventive and responsive maintenance to sustain the network in good condition longer and to extend the service life of the bridges.

An effective way to achieve this goal is to develop a local bridge preservation plan. A local agency goal is to maintain its bridges at an appraisal rating of 5 or better and a load capacity that meets the demands of the traffic using the route. It is suggested that the preservation plan improves poor bridges, provides a capital preventive maintenance program to maintain fair bridges in the same condition or better, and addresses its good bridges through a capital scheduled maintenance program. The combination of potential actions into an appropriate “mix of fixes” enables the local agency to develop an optimum bridge preservation strategy.

AASHTO, Manual for Bridge Evaluation (publication)
https://bookstore.transportation.org/Item_details.aspx?id=1343

FHWA *Bridge Load Rating for National Bridge Inventory*
http://www.fhwa.dot.gov/bridge/nbis/103006.cfm

VIRTIS software –Bridge Design and Load Rating Software
http://aashto.bakerprojects.com/virtis/VirtisOpisBrochure0303.pdf

MDOT VIRTIS Support
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768-244648--,00.html

MDOT Bridge Analysis Spreadsheets – Gusset plates
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768-201633--,00.html

# 5.0 Developing an Optimum Bridge Preservation Strategy

A local agency is encouraged to prepare a bridge preservation plan that includes a capital program designed to maximize the service life of bridges and to achieve optimal use of funding. The capital program may include structural improvements as well as preventive maintenance.

MDOT, through the RBC's and LBAB's, annually reviews applications for bridge replacements, rehabilitation and preventive maintenance projects and evaluates the needs based on the applications submitted by local agencies.

Once a local agency has assessed the condition of the bridges in its network, it must then determine the available fixes that will best preserve the system - *The Right fix in the Right Place at the Right Time.* A properly developed "mix of fixes" usually includes a combination of activities - structural improvements in the form of replacement and/or rehabilitation projects and both scheduled and preventive maintenance programs.

It is advisable to have both short and long-term objectives. Long-term objectives address the need for sustained investment in the bridge network thru capital preventive maintenance while near term objectives address facilities that currently are in poor condition.

MDOT has developed a Project Scoping Manual for state trunk line bridges for the purpose of more accurately and uniformly scoping projects. It serves as a valuable resource for local agencies in determining required fixes and in preparing their preservation plans.

## 5.1 Types of Potential Fixes

Many types of fixes are available to the local agency. The fixes described in the following sections are generally based on those actions delineated on the lists in MDOT's Local Bridge Program.

### 5.1.1 Structural Improvement

Structural Improvement includes any activity that preserves or improves the structural integrity of a bridge. These activities may be replacement or rehabilitation.

*Replacement* - Projects involving replacement of the entire bridge – substructure, superstructure, and deck, and associated approach work. This work is intended to improve the condition for the total bridge, deck, superstructure, and /or substructure elements from "poor" to "good"

*Rehabilitation* - Major work required to restore the structural

## 5.0 References

Project Scoping Manual
http://www.michigan.gov/mdot/0,1607,7-151-9622_11044_11367-243045--,00.html

Project Scoping Checklist
http://www.michigan.gov/documents/MDOT_Project_Scoping_120537_7.pdf

TR News (pp 26-30) - Michigan's Bridge Preservation Program
http://onlinepubs.trb.org/onlinepubs/trnews/trnews228.pdf

LTAP – *The Bridge* - Bridge Replacement by Agency Work Force
http://www.michiganltap.org/pubs/bridge/pdf/2008/bridge_21_4_web.pdf

integrity of a bridge as well as work necessary to correct major safety defects. This work is intended to improve ratings from "poor" or "fair" to "good" Some typical rehabilitation projects include:

- Full deck replacement (with or without painting of steel beams)
- Superstructure replacement
- Structure widening
- Demolition of existing bridge
- Superstructure repairs
- Bridge barrier replacement
- Extensive substructure repairs
- Steel repairs
- Concrete beam end repairs
- Geometric upgrades

### 5.1.2 Preventive Maintenance

Preventive Maintenance encompasses both routine scheduled maintenance and capital preventive maintenance.

Routine Scheduled Maintenance is a regularly scheduled activity that maintains serviceability and reduces the rate of deterioration of structural elements. In many instances, local agency forces are able to perform some or all of this work.

Capital Preventive Maintenance is a scheduled work activity that restores element integrity and supports serviceability. This work is intended to address the needs of elements rated "fair". Examples of preventive maintenance include:

- Painting only (full, zone, or spot painting)
- Pin and hanger replacement
- Superstructure washing
- Vegetation control
- Drainage system clean-out and repair
- Expansion or construction joint repair or replacement
- Concrete sealing
- Minor concrete patching and repair
- Concrete crack sealing
- Approach pavement relief joints
- Slope paving repair
- Drainage system repair (bridge deck drains and bridge approach downspouts)
- Scour countermeasures
- HMA overlay (with or without membrane)
- Deep or shallow deck overlay
- Epoxy overlay
- Temporary supports
- Guardrail beam installation or retrofit

MDOT Capital Scheduled Maintenance Manual
http://www.michigan.gov/documents/mdot_CSM_Manual04_89342_7.pdf

MDOT Deck Evaluation Matrix
http://www.michigan.gov/documents/mdot/MDOT_BridgeDeckMatrix_182438_7.pdf

AASHTO Center for Environmental Excellence – Bridge Maintenance - Best Practices
http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/7_1.aspx

### 5.1.3 Bridge Maintenance Technical Guidance

Capital scheduled maintenance activities maintain the existing serviceability, and reduce deterioration rates on bridges. CSM work activities sustain the current bridge condition longer, whether the current condition is good, fair, or poor. MDOT's *Capital Scheduled Maintenance Manual* (link provided in Section 5.1.2) provides a thorough description of various preventive maintenance actions.

## 5.2 Cost Estimating

MDOT's *Capital Scheduled Maintenance Cost Estimate Workbook* contains unit prices for various preventive maintenance actions. These values can be used to estimate the cost of alternative maintenance or rehabilitation actions and to evaluate relative costs in determining the optimum program in the preparation of a bridge asset management plan.

The MDOT *Bridge Repair Cost Estimate Worksheet* also provides useful guidance for estimating cost in scoping projects.

MDOT Capital Scheduled Maintenance Cost Estimate Workbook
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_24773---,00.html

MDOT Bridge Repair Cost Estimate Worksheet
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_24772---,00.html

Bridge Life Cycle Cost Analysis
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_483a.pdf

### 5.2.1 Deterioration Models

The objective of a bridge asset management plan is to determine the optimal preservation decisions in the current year and in future years based on the consequences of alternative actions on the future condition of the system using the data in MDOT's BMS.

Bridge deterioration models are an essential component of the bridge management system, and express a relationship between condition and time by predicting the future condition of the bridge components based on selected actions or inactions.

Bridge deterioration models use condition rating as the measure of bridge performance. Deterioration models predict the deterioration process as a decay of condition ratings over time, and are built based on expert opinion and inspection history.

### 5.2.2 Costing Deferred Maintenance

There are two components to consider when evaluating the cost of deferred maintenance. The first is the increased costs due to greater deterioration of the bridge or component and the need to perform more extensive repairs in the future. This must be compared to the benefit of using the available funding for another project within that time period.

Deterioration models can serve as a basis for determining the cost of deferring specific maintenance or repair actions. As the models establish a relationship between condition and time, the user can predict the future condition of a bridge element based on its current condition, and in this way determine the future increased repair work and associated cost resulting from deferral.

The benefits of a project can include safety, reduced agency or user costs, elimination of traffic congestion, reduction of travel time, better geometrics, improved surface rideability, and operational improvements by addition of traffic control devices,.

Deferring work is not a recommended strategy if the cost of deferral exceeds the benefits of the alternate project. As the difference becomes greater, the work becomes more urgent. This type of comparison and its results are factored into the prioritization decision process through the life cycle cost analysis module of a BMS.

### 5.2.3 In-House Costs vs. Contract Costs

Scheduled maintenance work and preventive maintenance work can be performed by either in-house maintenance crews or by contract. Most local agencies use a combination of the two.

An estimate of the cost of work to be performed by in-house crews should consider: both supervisory and crew labor expenses, including wages, benefits, and other payroll burdens; materials and supplies; equipment operating costs for owned equipment; equipment rental costs, as needed; and administrative costs. The local agency should keep a record of all maintenance work performed by in-house crews in the bridge file for future reference.

Work done by contract with private sector firms generally involves projects too large or too specialized to be done by in-house crews. Estimates of work to be performed by contract may be based on the unit price guide contained in MDOT's *Capital Scheduled Maintenance Cost Estimate Workbook*. The local agency's cost of contract administration and project support should be added to the estimated contract cost.

In its analysis the local agency should consider the potential cost benefits of collaborating with other agencies to combine resources and share the costs of work to be performed in-house or by contract.

The final estimated costs are used in the development of the prioritization plan within the bridge asset management plan.

### 5.2.4 Life Cycle Cost Analysis

The cost of a bridge is not a one-time expense. A bridge represents a long term, multi-year investment. After its initial planning, design, and construction, over its lifetime a bridge requires maintenance, repair, rehabilitation, and, ultimately, replacement.

The time period between construction and replacement is the service life of a bridge. The actions and events that influence the condition of the bridge during its service life comprise the life cycle. Bridge owners develop a bridge management strategy by making decisions about bridge materials, design, construction, maintenance, and repairs based on their expectations of costs and results.

Life Cycle Cost Analysis (LCCA) is a computational process for comparing initial and future costs to arrive at the most economical strategy for ensuring that the bridge will provide its intended service for its expected service life. LCCA is essentially a method for considering the economic efficiency of various alternate expenditures.

TRB National Cooperative Highway Research Program (NCHRP) *Report 483: Bridge Life-Cycle Cost Analysis*
http://www.trb.org/Main/Blurbs/Bridge_LifeCycle_Cost_Analysis_152577.aspx

## 5.3 Concept of a Mix of Fixes

In its asset management plan, TAMC has adopted the philosophy of "The Right Fix in the Right Place at the Right Time". This philosophy espouses a program of developing a mix of fixes that results in the optimum use of preservation funds.

By comparing maintenance, repair, and rehabilitation needs for each bridge, the cost of implementing various preservation actions or deferring work can be compared with the cost of completely replacing a bridge. Replacement of a bridge may be warranted if replacement is the most cost-effective means to satisfy the existing structural or functional needs. Alternatively, if the physical condition of the bridge has deteriorated to a point where the bridge is considered unsafe, bridge replacement may be determined to be the only feasible alternative.

A Bridge Preventive Maintenance Strategy developed by the Greater Buffalo-Niagara Regional Transportation Council for its bridges is accessible thru the referenced link.

MDOT Asset Management Guide for Local Agencies in Michigan
http://mcgiweb6.mcgi.state.mi.us/mitrp/Council/AssetManagementPlans.aspx

MDOT Strategic Investment Plan for Trunk line Bridges
http://www.michigan.gov/documents/mdot/MDOT_StrategicInvestmentPlanForTrunklineBridges_339697_7.pdf

Bridge Preventive Maintenance Strategy Greater Buffalo-Niagara Regional Transportation Council
http://www.gbnrtc.org/fileadmin/content/pdf/BPMS%20Local%20Bridges%20-%20FINAL(Approved)%20ReportJan07.pdf

## 5.4 Developing a Local Bridge Preservation Plan

Developing and implementing a local bridge preservation plan is a means of extending the useful service life of the agency's bridges and for using available funds more effectively.

The benefits of a preservation plan to a local agency include:

- an identification and understanding of the condition of the bridges in the network;
- a defined program of rehabilitation, replacement, and preventive maintenance designed to restore the functionality of degraded bridge elements;
- a program of regular maintenance to impede deterioration of sound bridges;
- dedicated local resources and an increased opportunity to obtain additional funding;
- optimal use of all available resources.

The preservation plan should address similar items as described for a systematic plan in Section 2.3.1. Some of the items suggested for inclusion in a local agency preservation plan include:

- Goal – a statement of the agency's purpose, describing future expected outcomes. Goals provide programmatic direction and focus on ends rather than means.
- Objectives –clear, specific, measurable, and time-limited statements of action which, when completed, will move towards achieving the goal.
- Performance Measures – the metrics by which the agency will evaluate the effectiveness of the plan
- Bridge Assets – a summary of the number, type, and condition state of the bridges in the network;
- Condition Analysis – an overall assessment of the current state of the bridge population;
- Risk Management – a recognition of the risks inherent in degraded bridges and a program to address them;
- Preservation Strategy - the overall actions to be taken by the agency to address preservation;
- Prioritization – agency's methodology used to rank projects for funding
- Implementation – how the agency will execute the plan;
- Cost Estimate – an annual review and updating of the actions programmed in the plan;
- Operations and Maintenance Plan – the annual activities scheduled in a five year program;
- Five Year Annual Cost Projection – a year-by-year, project-by-project schedule of costs;
- Funding Sources - a year-by-year source and allocation of funds for the five year program.

A sample plan for a local bridge owner following this format is discussed in Section 5.4.3. below.

### 5.4.1. Risk Assessment

As Local Bridge Program funds are being used for bridge preservation activities, a level of assurance is needed to confirm that the funds are being applied cost effectively to improve and preserve Michigan's bridges. Local agencies should attempt to prioritize their funding needs according to a risk-based methodology.

The potential risks associated with bridges can include personal injury, property damage, limited commercial access to a region, delays, congestion, and inconvenience arising from bridge collapse or element failure, closures, temporary outages, restricted load postings, or a reduced level of serviceability.

The local agency owner should recognize the potential risks related to each degraded bridge and assess the need for improvement based on impacts of action versus deferral when prioritizing repairs. Structural and safety issues should be given priority. For example, a beam end needing repair that reduces the load rating for a beam may need higher consideration than other repairs that have little or no impact on the bridge load carrying capacity.

### 5.4.2. Prioritization of Repairs

The local bridge owner seeks to optimize the use of available funding in the implementation of a preservation plan, and, therefore, must establish a priority order for the replacement, rehabilitation, and preventive maintenance actions proposed in the plan. Many factors may be used to rank the importance of projects, and the owner should establish a guideline to accomplish this end. Some of the factors which should be considered in developing a prioritization rating include:

- Condition – consider the NBI condition ratings for the deck, superstructure, and substructure for bridges and the culvert rating for culverts;
- Structural Adequacy – Is the bridge classified as "structurally deficient";
- Load Capacity – Is the load rating sufficient for the traffic routinely crossing the bridge;
- Operational Characteristics – Is the bridge classified as "functionally obsolete"? Do any of its inadequacies create a safety hazard?
- Importance – Is the bridge on a primary or secondary route? Is it a designated route for essential services, school buses, or emergency evacuation;
- Detour – Evaluate the distance, traffic volume, and delay time of the detour route;
- Cost – Compare the cost of the preservation action using current pricing with the projected cost of deferred action

Risk Based Methodology for bridge repairs
http://www.concretemonthly.com/newsflash/art.php?859

A Guide to Highway Vulnerability Assessment
http://www.google.com/#hl=en&sugexp=ldymls&xhr=t&q=http%3A%2F%2Fsecurity.transportation.org%2Fsites%2Fsecurity%2Fdocs%2Fguide-VA_FinalReport.pdf&cp=0&pf=p&sclient=psy&site=&source=hp&aq=f&aqi=&aql=&oq=http://security.transportation.org/sites/security/docs/guide-VA_FinalReport.pdf&pbx=1&fp=a09eab5fb0f14aaf

*PONTIS* Based Health Indicies for Bridge Priority Evaluation
(Define fix life for various repairs)
http://www.pwri.go.jp/eng/ujnr/tc/g/pdf/21/21-bf-2scherschligt.pdf

using deterioration modeling (Sect 5.2.2 and 5.3.3).

Each factor in the prioritization formula should be weighted at the discretion of the owner. For example, in the Genesee County Sample Preservation Plan discussed in 5.4.3, the County uses a prioritization formula that evaluates five factors and weights them as follows: condition – 30%; load capacity – 25%; traffic – 20%; safety – 15%; and detour – 10%. The total score is then compared to other proposed actions to establish a priority order.

### 5.4.3. Sample Local Bridge Preservation Plan

A bridge preservation plan has been developed for the Genesee County Road Commission for the bridges under its jurisdiction. The TAMC has included a copy of the document in Appendix C as a sample for other local agencies.

# Appendix A

# Application Process Flow Chart

Local Agency Programs Evaluates Condition State of Bridge Assets and Program Effectiveness. LAP Writes Legislatively Required Report.

December

Local Agency Programs Sends Out Request For Applications To All Local Agencies (includes bridge asset Condition State for Each Region and Federal Sufficiency Rating points)

February

MDOT's Bridge Management Unit Supplies LAP and LBAB with Bridge Inventory Data for Determination of Regional Funding Percentages. LBAB Determines Percentages and Estimated Regional Funding. LBAB Sends Info to RBCs & LAP.

April

Deadline for Bridge Applications to be Submitted to Local Agency Programs

May 1st

Local Agency Programs Reviews Applications For Completeness and Prepares the Applications for Field Reviews

May 1 - May 31 (4 weeks)

Local Agency Programs Staff Performs Field Reviews of Each Application and Creates Site Report. LAP Sends E-mail of Applications to MDOT's Bridge Management Unit. LAP Sends List of Apps to Regional Bridge Councils.

June 1 - August 20 (11 weeks)

MDOT's Bridge Management Unit Determines Formula Rating Points and Forwards to Local Agency Programs

July 1 - July 22 (3 weeks)

Local Agency Programs Checks All Reviews for Completeness.

August 21 - September 6 (2 week)

Local Agency Programs Creates Copies of All Applications and Sends to Each Region Along With Estimated Regional Funding Amounts

Sept 7 -Sept 20 (2 weeks)

Regional Bridge Council Members Review Completed Applications and Meet to Assign Discretionary Rating Points and Created / Update 3-Year Plan

Sept 21 - Oct 14 (3 weeks)

Regional Bridge Councils Submit Finished Rating Sheets and 3-Year Plans to Local Agency Programs

Oct 15 - Oct 22 (1 week)

Local Agency Programs Copies Final Rating Sheets and Distributes to LBAB

Oct 23 - Oct 30 (1 week)

LBAB Meets to Discuss Final Ratings and 3 Year Plans of Each Region. LBAB Submits Acceptable 3-Year Plan to Local Agency Programs

November

LBAB Notifies Regional Bridge Councils, MDOT, and Local Agencies of Approved Projects and the Updated 3-Year Bridge Program for Each Region

November

Approved Projects Move to the Bridge Design Phase.

LBAB: Local Bridge Advisory Board

LAP: MDOT's Local Agency Programs

LA: Local Agencies

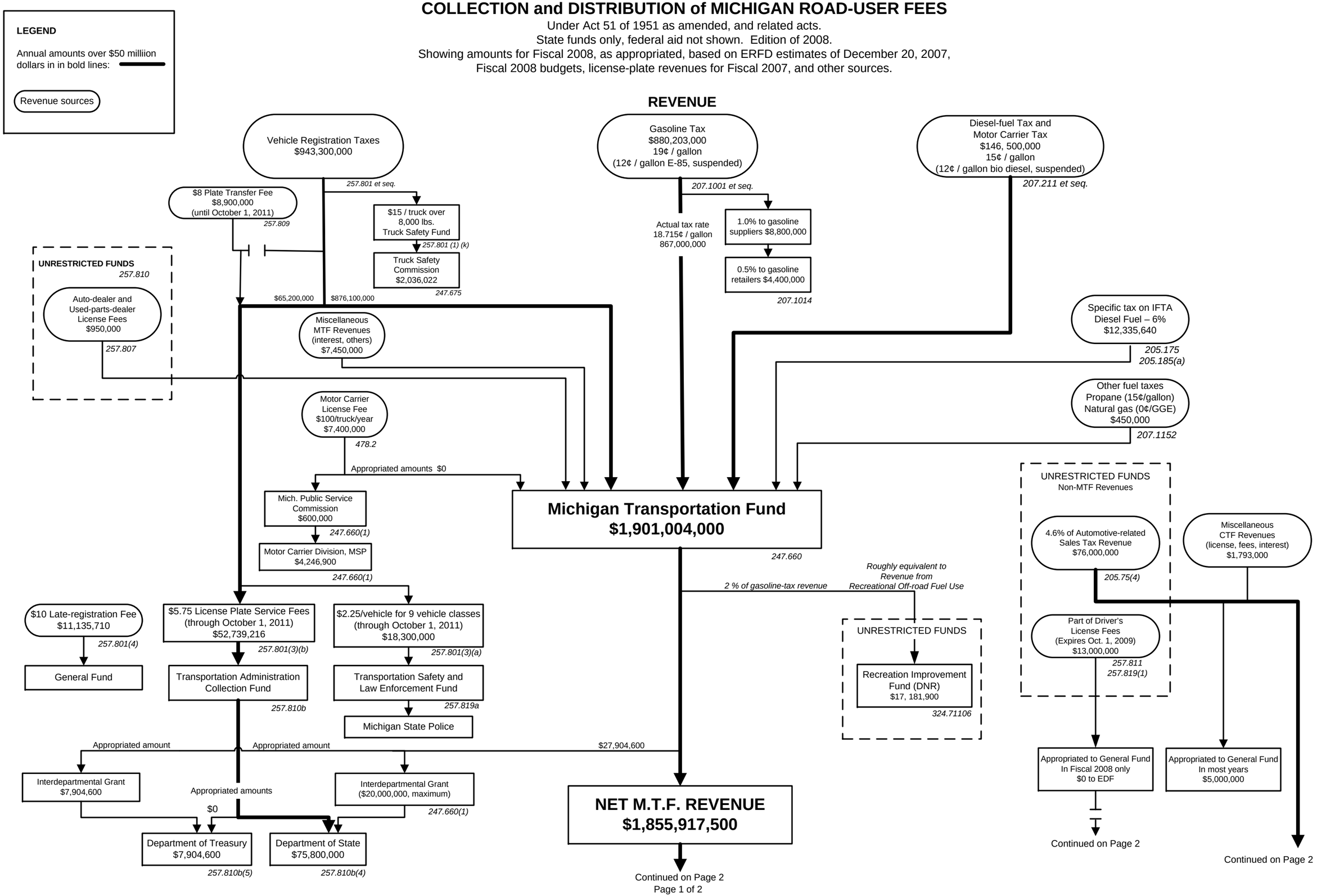
Revised: April 2011

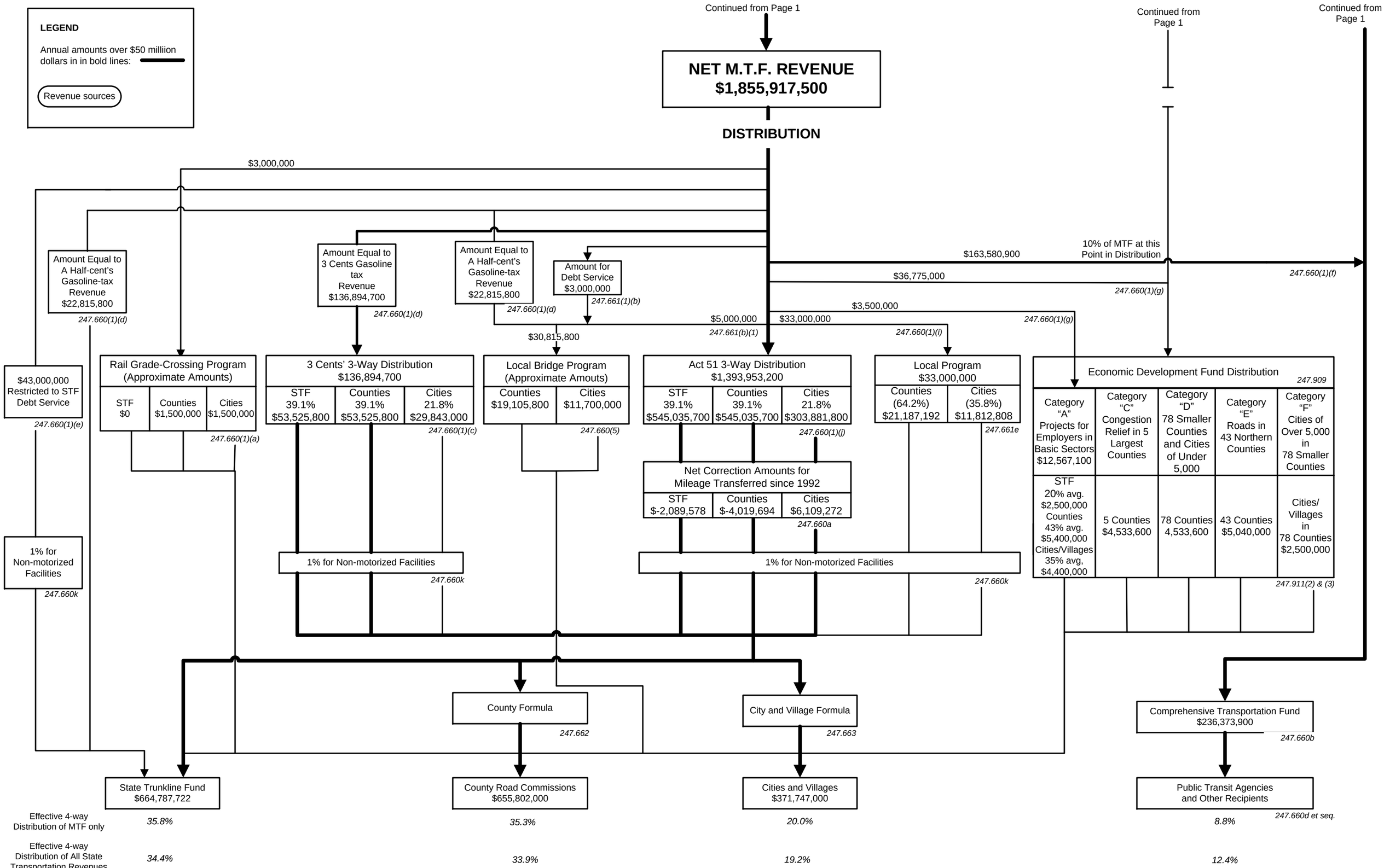
# Appendix B

# Act 51 Flow Chart

# COLLECTION and DISTRIBUTION of MICHIGAN ROAD-USER FEES

Under Act 51 of 1951 as amended, and related acts.
State funds only, federal aid not shown. Edition of 2008.
Showing amounts for Fiscal 2008, as appropriated, based on ERFD estimates of December 20, 2007,
Fiscal 2008 budgets, license-plate revenues for Fiscal 2007, and other sources.




LEGEND
Annual amounts over $50 milliion dollars in in bold lines:
Revenue sources
Continued from Page 1
NET M.T.F. REVENUE
$1,855,917,500
DISTRIBUTION
Continued from Page 1
Continued from Page 1
$3,000,000
Amount Equal to A Half-cent's Gasoline-tax Revenue $22,815,800
247.660(1)(d)
Amount Equal to 3 Cents Gasoline tax Revenue $136,894,700
247.660(1)(d)
Amount Equal to A Half-cent's Gasoline-tax Revenue $22,815,800
247.660(1)(d)
Amount for Debt Service $3,000,000
247.661(1)(b)
$163,580,900
10% of MTF at this Point in Distribution
247.660(1)(f)
$36,775,000
247.660(1)(g)
$3,500,000
247.660(1)(g)
$5,000,000
247.661(b)(1)
$33,000,000
247.660(1)(i)
$30,815,800
$43,000,000 Restricted to STF Debt Service
247.660(1)(e)
Rail Grade-Crossing Program (Approximate Amounts)
STF $0
Counties $1,500,000
Cities $1,500,000
247.660(1)(a)
3 Cents' 3-Way Distribution $136,894,700
STF 39.1% $53,525,800
Counties 39.1% $53,525,800
Cities 21.8% $29,843,000
247.660(1)(c)
Local Bridge Program (Approximate Amouts)
Counties $19,105,800
Cities $11,700,000
247.660(5)
Act 51 3-Way Distribution $1,393,953,200
STF 39.1% $545,035,700
Counties 39.1% $545,035,700
Cities 21.8% $303,881,800
247.660(1)(j)
Local Program $33,000,000
Counties (64.2%) $21,187,192
Cities (35.8%) $11,812,808
247.661e
Economic Development Fund Distribution
247.909
Category "A" Projects for Employers in Basic Sectors $12,567,100
Category "C" Congestion Relief in 5 Largest Counties
Category "D" 78 Smaller Counties and Cities of Under 5,000
Category "E" Roads in 43 Northern Counties
Category "F" Cities of Over 5,000 in 78 Smaller Counties
STF 20% avg. $2,500,000 Counties 43% avg. $5,400,000 Cities/Villages 35% avg, $4,400,000
5 Counties $4,533,600
78 Counties 4,533,600
43 Counties $5,040,000
Cities/ Villages in 78 Counties $2,500,000
247.911(2) & (3)
Net Correction Amounts for Mileage Transferred since 1992
STF $-2,089,578
Counties $-4,019,694
Cities $6,109,272
247.660a
1% for Non-motorized Facilities
247.660k
1% for Non-motorized Facilities
247.660k
1% for Non-motorized Facilities
247.660k
County Formula
247.662
City and Village Formula
247.663
Comprehensive Transportation Fund $236,373,900
247.660b
State Trunkline Fund $664,787,722
County Road Commissions $655,802,000
Cities and Villages $371,747,000
Public Transit Agencies and Other Recipients
247.660d et seq.
Effective 4-way Distribution of MTF only
35.8%
35.3%
20.0%
8.8%
Effective 4-way Distribution of All State Transportation Revenues
34.4%
33.9%
19.2%
12.4%

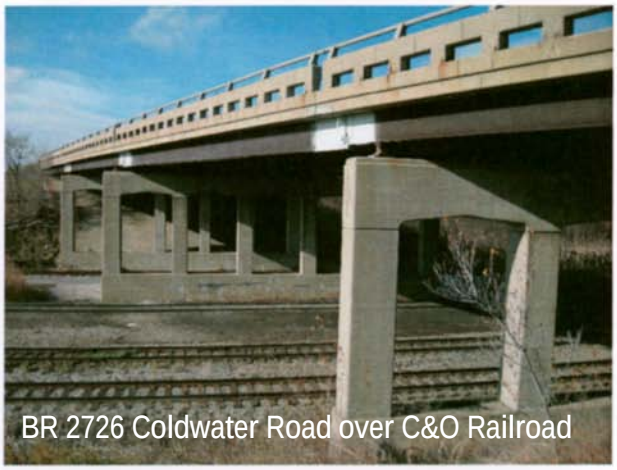
# Appendix C

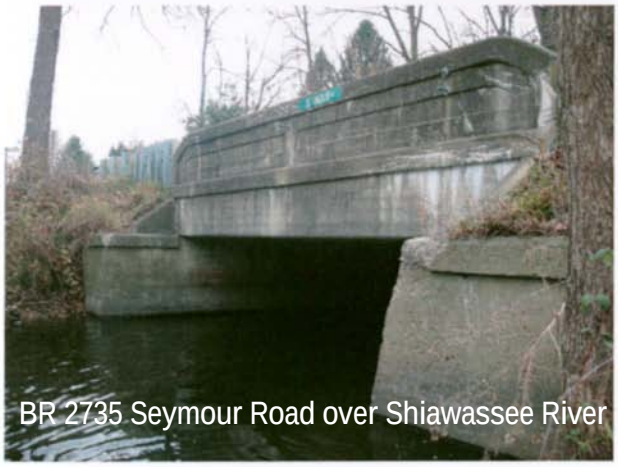
# Sample Local Bridge Asset Management Plan

# Genesee County Bridge Preservation Plan

# Preservation Plan for Genesee County Local Bridges

BR 2719 Atherton Road over Kearsley Creek


BR 2726 Coldwater Road over C&O Railroad


BR 2735 Seymour Road over Shiawassee River

BR 2745 Fenton Road over Swartz Creek

**May 2011**

MICHIGAN TRANSPORTATION ASSET MANAGEMENT COUNCIL

TranSystems

ROAD GENESEE COUNTY COMMISSION

# Preservation Plan for Genesee County Local Bridges

**Purpose:**

The Genesee County Road Commission (GCRC) seeks to implement a cost-effective program of preventive maintenance to maximize the useful service life of the local bridges under its jurisdiction.

The GCRC recognizes that limited funds are available for improving the bridge network. Preventive maintenance is a more effective use of these funds than the costly alternative of major rehabilitation or replacement, and we seek to identify those bridges that will benefit from a planned maintenance program.

**Goal:**

The goal of the program is the preservation of the County's bridge network.

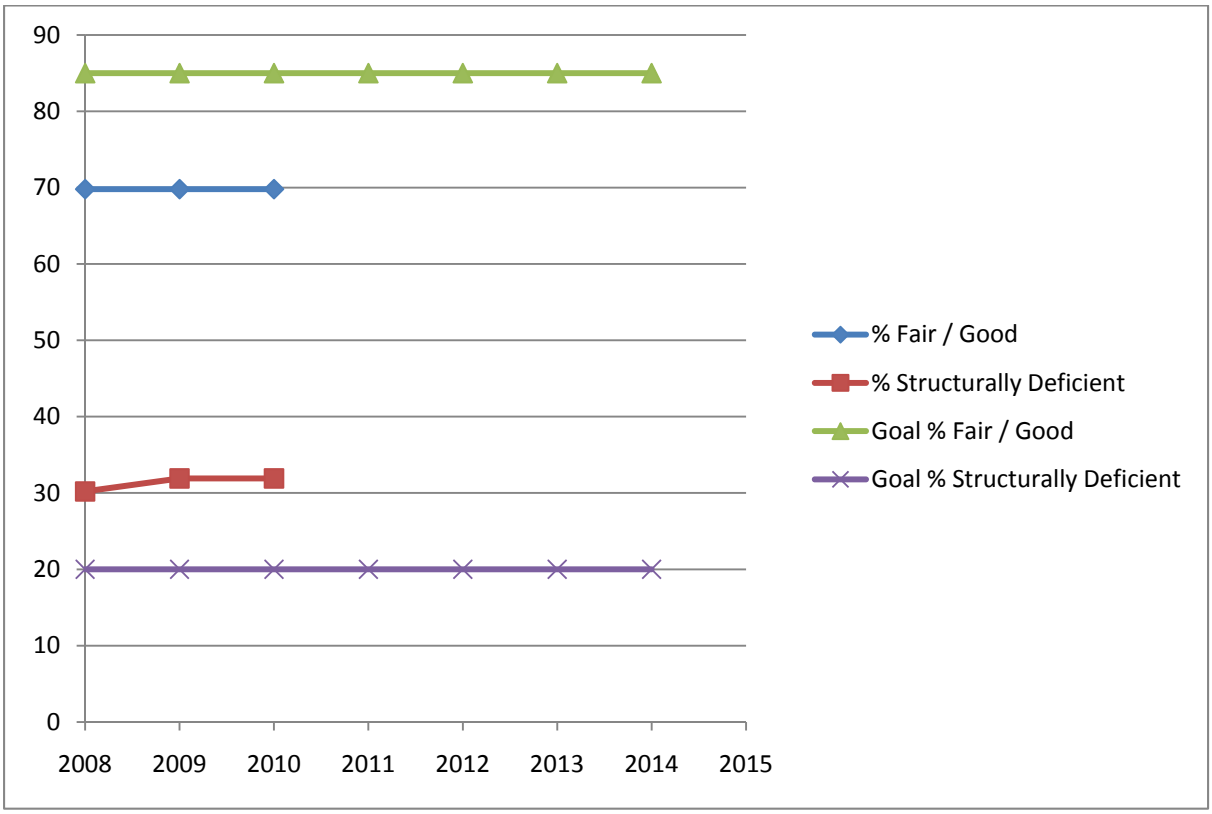
**Objectives:**

The GCRC's objectives in implementing the preservation plan include:

- Establishing the current condition of the bridges;
- Developing a "mix of fixes" that will:
  - Program regular scheduled maintenance actions to impede deterioration of bridges in good condition;
  - Implement selective corrective repairs or rehabilitation to degraded bridge elements to restore functionality;
  - Identify and program those eligible bridges in need of replacement;
- Identifying available funding sources;
  - Dedicated County resources;
  - Maximize opportunity to obtain other funding;
  - Support the County's application for funding under Michigan's Local Bridge Program;
- Prioritizing the programmed actions within available funding limitations;
- Having 85% of its bridges rated fair / good and less than 20% classified as structurally deficient or functionally obsolete within 10 years.

**Performance Measure:**

Several metrics will be used to assess the effectiveness of the preservation plan. GCRC will monitor and report the annual change in the number of its bridges rated fair/good (5 or higher) and the annual change in the number of structurally deficient and functionally obsolete bridges. A tracking graph will be used to monitor progress toward an objective of having 85% of the County's bridges rated fair / good and less than 20% classified as structurally deficient or functionally obsolete.




**Progress Tracking**

Also, the preservation plan is intended to extend the period of time that bridges remain in condition states good and fair, thereby increasing their useful service life and reducing future maintenance costs. Based on past inspection records and condition ratings, the GCRC will establish a baseline of past performance by determining the average period of time that a bridge remains in good or fair condition. The performance measure will be the increased average amount of time at the good or fair condition state after implementation of the preservation strategy when compared to the base line time before the implementation.

**Bridge Assets:**

Genesee County is responsible for 121 local bridges – 120 highway bridges and 1 railroad bridge. Detailed inventory data, condition ratings, and proposed preventive maintenance actions for each bridge are contained in the tables in Appendices A-1, A-2, and A-3. The bridge inventory data was obtained from the MDOT TMS System and the 2010 Condition data and maintenance actions are taken from the Inspector Summary Report Appendix B.

A summary and distribution of the bridge population is presented in the following table:

| Bridge Type | Number of Bridges | | | | | 2010 Condition | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Struct Defic. | Funct Obsol | Post ed | Clos ed | Poor | Fair | Good |
| **Concrete** | | | | | | | | |
| Slabs | 3 | 2 | 1 | -- | -- | -- | 3 | -- |
| Tee Beams | 30 | 11 | 3 | -- | -- | 7 | 22 | 1 |
| Box Beams | 1 | -- | -- | -- | -- | -- | 1 | -- |
| Arches | 1 | -- | -- | -- | -- | -- | -- | 1 |
| Culverts | 5 | -- | 1 | -- | -- | -- | 2 | 3 |
| **Steel** | | | | | | | | |
| Multi-Girder | 34 | 21 | 4 | 11 | -- | 20 | 13 | 1 |
| Multi-Girder / Composite | 5 | -- | -- | -- | -- | -- | 5 | -- |
| Culverts | 12 | -- | 2 | -- | -- | -- | 9 | 3 |
| **Prestressed Concrete** | | | | | | | | |
| Multi Girder | 22 | 4 | 1 | 1 | -- | 2 | 4 | 16 |
| Box Beam | 1 | -- | -- | -- | -- | -- | -- | 1 |
| Multi Girder / Composite | 3 | -- | 1 | -- | -- | -- | -- | 3 |
| **Timber** | | | | | | | | |
| Stringers | 4 | -- | -- | -- | -- | -- | 4 | -- |
| **Total SD/FO/PSTD** | | **38** | **14** | **12** | | | | |
| **Total** | **121** | | | | | **29** | **63** | **29** |
| **Percentage (%)** | | **31.4** | **11.6** | | | **24.0** | **52.0** | **24.0** |

**Condition Analysis:**

Of the GCRC's 121 structures, 40 are concrete bridges, 51 are steel bridges, 26 are prestressed concrete bridges, and 4 are timber bridges. The distribution of overall condition is: 29 (24.0%) are poor or lower; 63 (52.0%) are fair; and 29 (24.0%) are good. The GCRC bridge inventory includes 38 (31.4%) structurally deficient bridges and 14 (11.6%) functionally obsolete crossings.

Statewide, MDOT's statistics for local agency bridges show that 17% are poor, 34% are fair, and 49% are good, indicating that GCRC has a greater percentage of poor bridges compared to the statewide average for local agencies. Correspondingly, GCRC has 76% of its bridges in fair/good condition versus the statewide average of 83% for local agency bridges. Statewide, 17.4% of local agency bridges are classified as structurally deficient and 11.3% are functionally obsolete, compared to 31.4% and 11.6% of GCRC's bridges.

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

GCRC's objective in formulating this preservation plan is to have greater than 85% of the County's local bridges in fair to good condition and less than 20% classified as structurally deficient within 5 years.

**Risk Management:**

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

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

The GCRC addresses these risks by implementing a regular bridge inspection program and a preservation program of preventive maintenance.

GCRC administers the biennial inspection of its bridges in accordance with NBIS and MDOT requirements. The inspection reports document the condition of GCRC's bridges and are evaluated to identify new defects and monitor advancing deterioration. The summary inspection report identifies items needing follow-up special inspection actions and recommends bridge-by-bridge maintenance activities.

The preservation program identifies actions in the operations and maintenance plan that are preventive or are responsive to specific bridge conditions. The actions are prioritized to correct critical structural safety and traffic issues first, then to address other needs based on the operational importance of each bridge and the long term preservation of the network. The inspection results are used to modify and update the operations and maintenance plan annually.

**Preservation Strategy:**

GCRC's preservation plan employs a balanced "Mix of Fixes" strategy made up of Replacement, Rehabilitation (R&R), Preventive Maintenance, and Scheduled Maintenance. The aim of this plan is to address the structures of critical concern by targeting poor rated elements, and to improve the overall condition of the bridge network to good or fair condition.

> Replacement involves substantial changes to the existing structure, such as bridge deck replacement, superstructure replacement, or complete structure replacement, and is intended to improve critical or closed bridges to a good condition rating.
>
> Rehabilitation is undertaken to extend the service life of existing bridges. The work will restore deficient bridges to a condition of structural or functional adequacy, and may include upgrading geometric features. Rehabilitation actions are intended to improve the poor or fair condition bridges to fair or good condition.

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

The replacement, rehabilitation, and preventive maintenance projects are generally eligible for funding under the local bridge program and will be submitted with GCRC's annual applications.

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

The "Mix of Fixes" strategy combines long-term reconstruction or replacement fixes, medium-term rehabilitation fixes, and short-term preventive maintenance fixes with a regular program of scheduled maintenance. Implementing this balanced mixture, as described in the Operations and Maintenance Plan below, will increase the number of bridges improved each year and preserve the overall health of GCRC's bridge network.

**Implementation of the Strategy:**

GCRC's implementation of the preservation plan strategy begins with an annual review of the current condition of each of the County's bridges using the NBI inspection data contained on the MDOT Bridge Safety Inspection Report and the inspector's work recommendations contained on MDOT's Bridge Inspection Report. The inspection inventory and condition data are consolidated in spreadsheet format for GCRC's bridges in Appendix A-1. Preventive maintenance needs are determined for each bridge and the corresponding actions are identified and assembled on a spreadsheet, sorted by bridge material and type in Appendix A-2. Inspection follow-up actions are tabulated in Appendix A-3.

The preservation actions are selected in accordance with criteria contained in the table below. These criteria are based on MDOT's Project Scoping Manual, which is intended to address MDOT's trunk line bridges. GCRC has modified the selection criteria slightly to better address its local bridge network.

| Preservation Action | Bridge Selection Criteria | Expected Service Life |
|---|---|---|
| **Replacement** | | |
| Total Replacement | NBI Rating of 3 or less, or when cost of rehabilitation exceeds cost of replacement, or when bridge is scour critical with no countermeasures available | 70 yrs |
| Superstructure Replacement | NBI Rating for Superstructure of 4 or less, or when cost of rehabilitating superstructure & deck exceeds replacement cost. | 40 yrs |
| Deck Replacement<br><br>Epoxy Coated Steel<br>Black Steel | Use guidelines in MDOT's *Bridge Deck Preservation Matrix.*<br>NBI Rating of 4 or less for deck surface and deck bottom, or when deck replacement cost is competitive with rehabilitation. | <br><br>70 yrs<br>40 yrs |
| Substructure Replacement (Full or Partial) | NBI Rating of 4 or less for abutments, piers, or pier cap, or there is existence of open vertical cracks, signs of differential settlement, or presence of active movement, or bridge is scour critical with no countermeasures available. | 40 yrs |
| **Rehabilitation** | | |
| Concrete Deck Overlays<br>Deep<br>Shallow<br>HMA / Membrane<br>HMA Cap | Guidelines in MDOT's *Bridge Deck Preservation Matrix*<br><br>NBI Deck Rating < 5 for surface and > 5 for bottom<br>NBI Deck Rating < 5 for surface and > 4 for bottom<br>NBI Deck Rating < 5 for surface and > 4 for bottom<br>NBI Deck Rating < 5 for surface and < 4 for bottom | <br><br>25 yrs<br>12 yrs<br>8 yrs<br>3 yrs |
| Railing Retrofit / Replacement | NBI Deck Rating greater than 5, Railing / Barrier rated less than 5, or Safety Improvement is needed | |
| Steel Beam Repairs | When more than 25% section loss is present in an area of the beam that affects load carrying capacity, or to correct impact damage that impairs beam strength. | |
| Prestressed Concrete Beam Repairs | Repair ends of prestressed I-beams when more that 5% spalling is present, or repair areas to correct impact damage that impairs beam strength or exposes prestressing strands. | |
| Repair / Replace Culvert | NBI Rating of 4 or less for culvert or drainage outlet structure, or there is existence of open vertical cracks, signs of deformation, movement, or differential settlement. | |
| Repair / Replace Retaining Wall | NBI Rating of 4 or less for retaining wall, or there is existence of open vertical cracks, signs of differential settlement, or presence of active movement. | |

| | | |
|---|---|---|
| Pin and Hanger Replacement | NBI Rating for elements is 4 or lower. Presence of excessive section loss, severe pack rust, or out-of-plane distortion. | |
| Substructure Concrete Patching and Repair | NBI Rating for abutments or piers is 5 or 4 and less than 30% of the surface is spalled and delaminated, or in response to Inspector's work recommendation for substructure patching. | |
| **Preventive Maintenance** | | |
| Repair / Replace Deck Joint | Include when doing deep or shallow overlays, or when NBI Rating for joint is 4 or lower, or when joint is leaking heavily. | |
| Repair / Replace Steel Bearing | NBI Rating for girders and deck is 5 or higher and rating for bearings is 4 or lower. | |
| Complete Painting | NBI Rating for paint condition is 3 or lower, or in response to Inspector's work recommendation for complete painting | 15 yrs |
| Zone Painting | NBI Rating for paint condition is 5 or 4, or less than 15% of existing paint area has failed and remainder of paint system is in good or fair condition. | 10 yrs |
| HMA Overlay Cap without Membrane | NBI Rating of 3 or less for deck surface and deck bottom. Temporary holdover to improve rideability for a bridge in the 5 year plan for rehab / replacement. | 3 yrs |
| Concrete Deck Patching | Deck Surface Rating of 5, 6, or 7 with minor delamination and spalling, or in response to Inspector's work recommendation | 5 yrs |
| Channel Improvements | Removal of vegetation, debris, or sediment from channel and banks to improve channel flow, or in response to Inspector's work recommendation. | |
| Scour Countermeasures | Structure is categorized as scour critical and is not scheduled for replacement. NBI comments in abutment and pier ratings indicate presence of scour holes. | |
| **Scheduled Maintenance** | | |
| Superstructure Washing | When salt contaminated dirt and debris collected on superstructure is causing corrosion or deterioration by trapping moisture, or in response to Inspector's work recommendation. | 2 yrs |
| Vegetation Control | When vegetation traps moisture on structural elements or is growing from joints or cracks, or in response to Inspector's work recommendation for brush cut. | 1 yr |

| | | |
|---|---|---|
| Debris Removal | When vegetation, debris, or sediment accumulates on the structure or in the channel or in response to inspector's work recommendation. | 1 yr |
| Drainage System Clean-Out/ Repair | When drainage system is clogged with debris, or drainage elements are broken, deteriorated, or damaged. | 2 yrs |
| Spot Painting | For zinc based paint systems only, in response to Inspector's work recommendation. | 5 yrs |
| Seal Concrete Cracks / Joints | Concrete is in good or fair condition, and cracks extend to the depth of the reinforcement, or in response to Inspector's work recommendation | 5 yrs |
| Repair / Replace HMA Surface | HMA surface is in poor condition or in response to Inspector's work recommendation. | |
| Seal HMA Cracks / Joints | HMA surface is in good or fair condition, and cracks extend to the surface of the underlying slab or sub course, or in response to Inspector's work recommendation | |
| Minor Concrete Patching | Repair minor delaminations and spalling, or in response to Inspector's work recommendation. | |
| Timber Repairs | NBI Rating of 4 or less for timber members, or to repair extensive rot, checking, or insect infestation. | |
| Repair / Replace Guard Rail | Guard rail missing or damaged, or Safety Improvement is needed. | |
| Repave Approaches | HMA is in poor condition or in response to Inspector's work recommendation. | |
| Repair Slopes | NBI Rating is 5 or lower, or when slope is degraded or sloughed, or slope paving has significant areas of distress, failure, or has settled. | |
| Install Riprap | To protect surfaces when erosion threatens the stability of side slopes or channel banks. | |
| Miscellaneous Repairs | Uncategorized Repairs in response to Inspector's work recommendations. | |

**Cost Estimate:**

GCRC computes the estimated cost of each typical preservation action using unit prices in the latest Bridge Repair Cost Estimate spreadsheet contained in MDOT's Local Bridge Program Call for Projects. The cost of items of varying complexity, such as maintenance of traffic, staged construction, scour countermeasures, etc., are computed on a bridge-by-bridge basis. The cost estimates are reviewed and updated annually.

**Operations and Maintenance Plan – Annual Activities / 10 Year Program:**

A primary objective of GCRC's preservation plan is improvement of the 29 bridges rated poor (4) or lower to a rating of fair (5) or higher within 10 years thru a program of replacement, rehabilitation, and preventive maintenance actions. The work has been prioritized considering each individual bridge's needs, its importance, present cost of improvements, and impact (cost increase due to increased degradation) of deferral. The 5 year program incorporates comprehensive annual scheduled maintenance activities designed to preserve bridges currently rated fair (5) or higher with the objective of extending their useful service life. The bridge-by-bridge Maintenance Plan is presented in Appendix A-2.

**Project Prioritization Criteria**

Genesee County uses a prioritization formula that evaluates five factors and weights them as follows: condition – 30%; load capacity – 25%; traffic – 20%; safety – 15%; and detour – 10%. There are several components within each factor that are used to arrive at its score. Each project under consideration is scored and its total score is then compared with other proposed projects to establish a priority order.

**Five Year Annual Cost Projection:**

| Preservation Activity | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total |
|---|---|---|---|---|---|---|---|
| **Replacement** | | | | | | | |
| Bridge 2710 | 750,000 | | | | | | |
| Bridge 2723 | | 1,000,000 | | | | | |
| | | | | | | | |
| **Subtotal** | **750,000** | **1,000,000** | | | | | **1,750,000** |
| | | | | | | | |
| Bridge 2716 | | | | 660,000 | | | |
| Bridge 2804 | | | | 470,000 | | | |
| Bridge 2774 | | | | | 440,000 | | |
| | | | | | | | |
| **Subtotal** | | | | **1,130,000** | **440,000** | | **1,570,000** |
| | | | | | | | |
| Bridge 2709 | | | | | 420,000 | | |
| Bridge 2761 | | | | | 570,000 | | |
| Bridge 2803 | | | | | 385,000 | | |
| | | | | | | | |
| **Subtotal** | | | | | **1,375,000** | | **1,375,000** |
| | | | | | | | |
| **Rehabilitation** | | | | | | | |
| Bridge 2798 | | | 387,500 | | | | |
| Bridge 2717 | | | | 810,000 | | | |
| Bridge 2765 | | | | 260,000 | | | |
| Bridge 2815 | | **(a)** | | | | | |
| | | | | | | | |
| **Subtotal** | | **(a)** | **387,500** | **1,070,000** | | | **1,457,500** |
| | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Preventive Maintenance** | | | | | | | |
| Bridge 2737 | | | | 240,000 | | | |
| Bridge 2756 | | | | 260,000 | | | |
| Bridge 2728 | | | | | 350,000 | | |
| Bridge 2706 | | **(a)** | | | | | |
| Bridge 2742 | | **(a)** | | | | | |
| Bridge 2749 | | **(a)** | | | | | |
| Bridge 2766 | | **(a)** | | | | | |
| Bridge 2770 | | **(a)** | | | | | |
| Bridge 2772 | | **(a)** | | | | | |
| Bridge 2780 | | **(a)** | | | | | |
| Bridge 2786 | | **(a)** | | | | | |
| Bridge 2807 | | **(a)** | | | | | |
| Bridge 2817 | | **(a)** | | | | | |
| | | | | | | | |
| **Subtotal** | | **4,000,000** | | **500,000** | **350,000** | | **4,850,000** |
| | | | | | | | |
| **Scheduled Maintenance – Program using local in-house forces** | | | | | | | |
| | | | | | | | |
| **Annual Total** | **750,000** | **5,000,000** | **387,500** | **2,700,000** | **2,165,000** | | **11,002,500** |

**(a) Estimate in progress. Total cost for these bridges will be $4,000,000.**

**Identify Funding Sources:**

Projects for the replacement of bridges 2710 and 2723, and the rehabilitation of 2798 have been programmed and funded. The GCRC applied for MDOT local aid funding in 2011 for the replacement of bridges 2737 and 2756 in the 2014 program year. Other replacement and rehabilitation projects will be submitted for funding in subsequent program years. The preventive maintenance projects shown for 2012 will be funded through a County appropriation of $4,000,000 for bridge preservation. Projects submitted to the local aid program that are not selected for funding will be added to the County program. The scheduled maintenance and minor repairs will be performed by the County's in-house maintenance forces and funded thru the County's annual operating budget.

# Appendix A

# Inventory, Condition and Appraisal Tables

# Appendix A-1

## Genesee County Bridges - Inventory and Inspection Summary

| Inventory Data | | | | | | | | | | | | | Inspection Findings | | | | | | | | | | | | Appraisal | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Structure Number | Bridge ID | Facility Carried | P=Primary Rte S=Secondary Rte | Features Intersected | Structure Type Main Span (Item 43A - Material) | Structure Type Main Span (Item 43B) | Number of Main Spans (Item 45) | Total Str Length (Item 49) | Year Built (Item 27) | Year Reconstr (Item 106) | ADT (Item 29) | Year of ADT (Item 30) | Inspection Date (Item 90) | Operational Status (Item 41) | Deck Rating (Item 58) | Deck Bottom Rating (Item XX) | SuperStr Rating (Item 59) | Substr Rating (Item 60) | Channel Rating (Item 61) | Culvert Rating (Item 62) | Surface Rating (Item 58A) | Paint Rating (Item 59A) | Exp Joint Rating (Item XX) | Other Joints | Structure Evaluation | Structurally Deficient | Functionally Obsolete | Sufficiency Rating | Section Loss | Scour Critical (Item 113) |
| Concrete Slab Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2561 | 25225061000B033 | BRISTOL RD | P | CALL DRAIN | 1 | 01 | 1 | 24 | 1957 | | 17600 | 1995 | 11/23/2010 | A | 4 | 4 | 4 | 6 | 6 | N | 7 | N | N | | F | Y | N | 65.1 | N | 3 |
| 2562 | 25225061000B034 | BRISTOL RD | P | CALL DRAIN | 1 | 01 | 1 | 24 | 1941 | 1957 | 17600 | 1995 | 11/23/2010 | A | 4 | 4 | 4 | 6 | 6 | N | 7 | N | N | 6 | F | Y | N | 67.5 | N | 3 |
| 2784 | 25307H00018B010 | DYE ROAD | S | PIRNIE CREEK | 1 | 01 | 1 | 25.9 | 1930 | | 5290 | 2009 | 11/24/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 9 | N | N | 9 | F | N | Y | 79 | N | 3 |
| Concrete Tee Beam Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2703 | 25200005000B010 | SILVER LAKE ROAD | P | LOBDELL LAKE DAM | 1 | 04 | 1 | 34 | 1929 | | 8718 | 1998 | 11/16/2010 | A | 6 | 6 | 6 | 5 | 7 | N | 5 | N | N | 5 | F | N | Y | 50.8 | N | U |
| 2704 | 25200014000B010 | BALDWIN ROAD | P | SWARTZ CREEK | 1 | 04 | 1 | 30.8 | 1938 | | 7826 | 1998 | 11/18/2010 | A | 6 | 6 | 6 | 6 | 7 | N | 6 | N | N | 6 | F | N | Y | 71.3 | N | 3 |
| 2706 | 25200016000B010 | BALDWIN ROAD | P | THREAD RIVER | 1 | 04 | 1 | 26.9 | 1928 | | 4151 | 1998 | 11/19/2010 | A | 6 | 5 | 4 | 5 | 6 | N | 6 | N | N | 6 | F | Y | N | 46.3 | N | 3 |
| 2707 | 25200017000B010 | GRAND BLANC ROAD | P | JONES CREEK | 1 | 04 | 1 | 26.9 | 1928 | | 4714 | 1998 | 11/17/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 7 | N | N | 6 | F | N | N | 94.8 | N | 3 |
| 2708 | 25200017000B020 | GRAND BLANC ROAD | P | CARGILL CREEK | 1 | 04 | 1 | 23 | 1928 | | 4278 | 1998 | 11/17/2010 | A | 7 | 7 | 5 | 5 | 6 | N | 6 | N | N | 6 | F | N | N | 84.7 | N | 3 |
| 2727 | 25200081000B010 | MT MORRIS ROAD | P | BRENT CREEK | 1 | 04 | 1 | 23 | 1928 | | 3500 | 1998 | 12/1/2010 | A | 6 | 6 | 4 | 5 | 6 | N | 6 | N | N | N | P | Y | N | 49.6 | N | 3 |
| 2730 | 25200083000B010 | MT MORRIS ROAD | P | BRENT RUN | 1 | 04 | 1 | 26.9 | 1929 | | 8394 | 1998 | 12/1/2010 | A | 4 | 5 | 4 | 5 | 5 | N | 7 | N | N | N | P | Y | N | 55.3 | N | 3 |
| 2731 | 25200087000B010 | MT MORRIS ROAD | P | BUTTERNUT CREEK | 1 | 04 | 1 | 26.9 | 1927 | | 4443 | 1998 | 11/20/2010 | A | 6 | 6 | 6 | 6 | 6 | N | 6 | N | N | 5 | F | N | N | 96.7 | N | 3 |
| 2732 | 25200091000B010 | DODGE ROAD | P | BRENT RUN | 1 | 04 | 1 | 26.9 | 1926 | | 3482 | 1998 | 11/16/2010 | A | 6 | 6 | 6 | 5 | 5 | N | 6 | N | N | N | F | N | Y | 63.2 | N | 3 |
| 2733 | 25200100000B010 | DUFFIELD ROAD | P | JONES CREEK | 1 | 04 | 1 | 27.9 | 1925 | | 1706 | 1998 | 11/17/2010 | A | 5 | 6 | 4 | 5 | 5 | N | 6 | N | N | 5 | P | Y | N | 52.8 | N | 3 |
| 2735 | 25200105000B010 | SEYMOUR ROAD | P | SHIAWASSEE RIVER | 1 | 04 | 1 | 26.9 | 1930 | | 3188 | 1998 | 11/16/2010 | A | 6 | 6 | 5 | 5 | 6 | N | 8 | N | N | 8 | F | N | N | 67.8 | N | 3 |
| 2736 | 25200113000B010 | MORRISH ROAD | P | ALGER CREEK | 1 | 04 | 1 | 26.9 | 1928 | | 3498 | 1998 | 12/17/2008 | A | 6 | 6 | 5 | 4 | 6 | N | 6 | N | N | 6 | F | Y | N | 63.5 | N | 3 |
| 2738 | 25200121000B010 | ELMS ROAD | P | BRENT RUN | 1 | 04 | 1 | 26.9 | 1929 | | 3059 | 1998 | 11/16/2010 | A | 5 | 5 | 4 | 6 | 5 | N | 5 | N | N | 5 | P | Y | N | 50.7 | N | 3 |
| 2739 | 25200122000B010 | ELMS ROAD | P | PINE RUN | 1 | 04 | 1 | 31.8 | 1929 | | 1459 | 1998 | 11/16/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 6 | N | N | N | F | N | N | 93 | N | 3 |
| 2750 | 25200166000B010 | BELSAY ROAD | P | THREAD RIVER | 1 | 04 | 1 | 31.8 | 1928 | | 8518 | 1998 | 11/19/2010 | A | 6 | 6 | 4 | 6 | 7 | N | 8 | N | N | 8 | F | Y | N | 44.4 | N | 3 |
| 2766 | 25302H00005B010 | KIPP ROAD | S | KEARSLEY CREEK | 1 | 04 | 1 | 31.8 | 1938 | | 550 | 1997 | 11/19/2010 | A | 6 | 6 | 6 | 6 | 6 | N | 6 | N | N | 6 | F | N | N | 96.8 | N | 3 |
| 2768 | 25302H00008B010 | MCCANDLISH ROAD | S | THREAD RIVER | 1 | 04 | 1 | 30.8 | 1934 | | 434 | 1997 | 11/19/2010 | A | 7 | 7 | 7 | 7 | 7 | N | 6 | N | N | 6 | G | N | N | 97 | N | 3 |
| 2787 | 25308H00019B010 | NICHOLS ROAD | S | BRENT CREEK | 1 | 04 | 1 | 23 | 1926 | | 334 | 2009 | 12/2/2010 | A | 6 | 6 | 6 | 5 | 4 | N | 6 | N | N | N | F | N | N | 75.5 | N | 3 |
| 2790 | 25310H00006B010 | COOK ROAD | S | JONES CREEK | 1 | 04 | 1 | 32.8 | 1937 | | 135 | 1997 | 11/17/2010 | A | 6 | 5 | 6 | 6 | 6 | N | 6 | N | N | 6 | F | N | N | 92 | N | 3 |
| 2792 | 25310H00010B010 | REID ROAD | S | ALGER CREEK | 1 | 04 | 1 | 26.9 | 1930 | | 181 | 1997 | 11/17/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 4 | N | N | 5 | F | N | N | 97 | N | 3 |
| 2793 | 25310H00015B010 | NICHOLS ROAD | S | JONES CREEK | 1 | 04 | 1 | 32.8 | 1938 | | 238 | 1997 | 11/17/2010 | A | 6 | 5 | 6 | 6 | 6 | N | 5 | N | N | 6 | F | N | N | 97 | N | 3 |
| 2794 | 25313H00003B010 | FRANCES ROAD | S | ARMSTRONG DRAIN | 1 | 04 | 1 | 26.9 | 1925 | | 647 | 2009 | 12/2/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 5 | N | N | 4 | F | N | N | 83 | N | 3 |
| 2800 | 25313H00031B030 | MORRISH ROAD | S | BRENT RUN | 1 | 04 | 1 | 26.9 | 1930 | | 426 | 2009 | 12/2/2010 | A | 6 | 7 | 6 | 6 | 5 | N | 5 | N | N | 4 | F | N | N | 95 | N | 3 |
| 2801 | 25315H00002B010 | FRANCES ROAD | S | BRENT RUN | 1 | 04 | 1 | 26.9 | 1925 | | 364 | 2009 | 11/17/2010 | A | 6 | 6 | 6 | 6 | 4 | N | 5 | N | N | N | F | N | N | 80.9 | N | 3 |
| 2802 | 25315H00007B010 | COOK ROAD | S | SWARTZ CREEK | 1 | 04 | 1 | 30.8 | 1930 | | 542 | 2009 | 11/18/2010 | A | 5 | 5 | 4 | 6 | 6 | N | 5 | N | N | 5 | F | Y | N | 70.8 | N | 3 |
| 2808 | 25317H00033B010 | VASSAR ROAD | S | BUTTERNUT CREEK | 1 | 04 | 1 | 31.8 | 1930 | | 346 | 2009 | 11/17/2010 | A | 5 | 5 | 4 | 6 | 5 | N | 5 | N | N | 5 | P | Y | N | 62.8 | N | 3 |
| 2817 | 25318H00030B010 | LINDEN ROAD | P | BRENT RUN | 1 | 04 | 1 | 57.7 | 1931 | | 3150 | 1997 | 11/16/2010 | A | 5 | 5 | 5 | 3 | 4 | N | 6 | N | N | N | P | Y | N | 34.7 | N | 3 |
| 2818 | 25318H00038B010 | LINDEN ROAD | P | PINE RUN | 1 | 04 | 1 | 32.8 | 1929 | | 4095 | 1998 | 11/16/2010 | A | 6 | 6 | 6 | 6 | 6 | N | 7 | N | N | N | F | N | N | 81 | N | 3 |
| 2819 | 25318H00038B020 | JENNINGS ROAD | S | PINE RUN | 1 | 04 | 1 | 31.8 | 1937 | | 4394 | 2009 | 11/16/2010 | A | 6 | 6 | 5 | 5 | 6 | N | 5 | N | N | 5 | F | N | N | 70.1 | N | 3 |
| 12714 | 25200006000B010 | WILSON ROAD | S | BUTTERNUT CREEK | 1 | 04 | 1 | 26.9 | 1926 | | 628 | 1998 | 11/17/2010 | A | 4 | 5 | 4 | 4 | 5 | N | 6 | N | N | 5 | P | Y | N | 58.2 | N | 3 |
| Concrete Box Beam Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2742 | 25200130000B010 | MILL ROAD | P | FLINT RIVER | 1 | 05 | 5 | 225.1 | 1985 | | 7749 | 1998 | 11/24/2010 | A | 5 | N | 6 | 5 | 5 | N | 5 | N | 3 | 5 | F | N | N | 64.9 | N | 8 |
| Concrete Arch Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13384 | 25312H00005B010 | MOONSTONE DRIVE | S | THREAD CREEK | 1 | 11 | 3 | 132 | 2004 | | ? | ? | 11/19/2010 | A | N | 8 | 8 | 8 | 8 | N | 8 | N | N | N | G | N | N | 100 | N | 8 |
| Concrete Culverts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2560 | 25225061000B020 | BRISTOL RD | P | SWARTZ CR | 1 | 19 | 1 | 35.8 | 1999 | | 15247 | 2002 | 11/23/2010 | A | N | N | N | N | 7 | 7 | N | N | N | 8 | G | N | N | 72.3 | N | 7 |
| 12617 | 25200112000B010 | MCKINLEY ROAD | P | ARMSTRONG CREEK | 1 | 19 | 2 | 24.9 | 1930 | | 2150 | 1998 | 12/2/2010 | A | N | 6 | N | N | 4 | 6 | 6 | N | N | N | F | N | N | 99.4 | N | 3 |
| 12832 | 25315H00007B030 | COOK ROAD | S | DAWE DRAIN | 1 | 19 | 1 | 25.9 | 1998 | | 389 | 2009 | 11/18/2010 | A | N | | N | N | 7 | 7 | N | N | N | 7 | G | N | N | 99.9 | N | 8 |
| 12833 | 25200141000B010 | DETROIT STREET | P | HUGHES DRAIN | 1 | 19 | 2 | 24 | 1985 | | 2361 | 1998 | 12/1/2010 | A | N | N | N | N | 4 | 6 | N | N | N | 6 | F | N | Y | 78.4 | N | 8 |
| 13168 | 25200124000C010 | LINDEN CRK PARKWAY | S | HEWITT DRAIN | 1 | 19 | 1 | 42 | 2000 | | 77 | ? | 11/23/2010 | A | N | N | N | N | 6 | 7 | N | N | N | 7 | G | N | N | 100 | N | 8 |
| Steel Multi-Girder Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2709 | 25200018000B010 | GRAND BLANC ROAD | P | SWARTZ CREEK | 3 | 02 | 1 | 35.8 | 1936 | | 11165 | 1996 | 11/18/2010 | A | 6 | | 5 | 3 | 4 | N | 6 | 2 | N | 5 | P | Y | N | 39 | 1 | 3 |
| 2710 | 25200022000B010 | PERRY ROAD | P | THREAD RIVER | 3 | 02 | 1 | 44.9 | 1928 | | 5927 | 1998 | 11/19/2010 | P | 5 | 5 | 3 | 5 | 6 | N | 7 | 2 | N | 7 | P | Y | N | 23.6 | 1 | 3 |
| 2711 | 25200025000B010 | HILL ROAD | P | SWARTZ CREEK | 3 | 02 | 1 | 45.9 | 1966 | 1994 | 14005 | 1998 | 11/17/2010 | A | 6 | 7 | 7 | 7 | 7 | N | 6 | 6 | N | 6 | G | N | N | 83.2 | 3 | 3 |
| 2715 | 25200034000B010 | BRISTOL ROAD | P | W.BR.SWARTZCREEK | 3 | 02 | 1 | 40 | 1940 | 1966 | 25598 | 1998 | 11/23/2010 | A | 5 | 5 | 5 | 6 | 6 | N | 6 | 4 | 6 | 6 | F | N | N | 74 | 2 | 8 |
| 2716 | 25200035000B010 | BRISTOL ROAD | P | KEARSLEY CREEK | 3 | 02 | 1 | 40 | 1938 | | 3093 | 1998 | 11/22/2010 | P | 5 | 4 | 4 | 4 | 5 | N | 4 | 2 | 6 | N | P | Y | N | 33.6 | 1 | 3 |
| 2717 | 25200042000B010 | BALLENGER HIGHWAY | P | SWARTZ CREEK | 3 | 02 | 1 | 54.8 | 1928 | 1967 | 16525 | 1998 | 11/24/2010 | P | 5 | 5 | 4 | 6 | 6 | N | 5 | 3 | N | 5 | P | Y | N | 36.6 | 1 | 3 |
| 2721 | 25200053000B010 | BEECHER ROAD | P | MISTEGUAY CREEK | 3 | 02 | 1 | 34.8 | 1928 | | 1078 | 1998 | 12/1/2010 | A | 5 | 5 | 4 | 5 | 5 | N | 5 | 2 | N | 5 | P | Y | N | 57.5 | 1 | 3 |
| 2725 | 25200069000B010 | CARPENTER ROAD | P | FLINT RIVER | 3 | 02 | 2 | 130.9 | 1948 | | 6527 | 1998 | 11/20/2010 | A | 6 | 6 | 6 | 7 | 7 | N | 6 | 4 | 3 | 4 | F | N | Y | 78.6 | 2 | 3 |
| 2740 | 25200124000B010 | LINDEN ROAD | P | W.BR.SWARTZCREEK | 3 | 02 | 1 | 40 | 1935 | 1973 | 17390 | 1998 | 11/23/2010 | A | 6 | 5 | 4 | 5 | 6 | N | 7 | 2 | N | 6 | P | Y | N | 41 | 1 | 7 |
| 2741 | 25200124000X010 | GRAND TRUNK RR | P | LINDEN ROAD | 3 | 02 | 1 | 58.7 | 1936 | | N/A | N/A | 11/23/2010 | A | N | | 6 | 6 | N | N | 6 | 3 | N | N | F | N | N | | N | N |
| 2743 | 25200132000B010 | TORREY ROAD | P | SWARTZ CREEK | 3 | 02 | 1 | 34.8 | 1928 | | 5003 | 1998 | 11/18/2010 | A | 6 | 6 | 5 | 6 | 5 | N | 7 | 2 | N | 6 | F | N | Y | 61.9 | 1 | 3 |
| 2747 | 25200154000B010 | CENTER ROAD | P | THREAD RIVER | 3 | 02 | 1 | 44.9 | 1928 | | 9016 | 1998 | 11/18/2010 | A | 6 | 6 | 6 | 6 | 6 | N | 7 | 2 | N | 7 | F | N | Y | 65.4 | 2 | 3 |
| 2761 | 25301H00004B010 | LILLIE ROAD | S | S BR SHIAWASSEE RIVER | 3 | 02 | 2 | 61 | 1937 | | 102 | 2009 | 11/16/2010 | P | 5 | 5 | 3 | 5 | 6 | N | 3 | 2 | N | 5 | P | Y | N | 39.8 | 1 | 3 |
| 2763 | 25301H00027B010 | BIRD ROAD | S | SHIAWASSEE RIVER | 3 | 02 | 1 | 35.8 | 1936 | | 172 | 2009 | 11/16/2010 | A | 6 | 6 | 6 | 7 | 5 | N | 5 | 3 | N | 5 | F | N | N | 96.5 | 2 | 3 |
| 2764 | 25301H00028B010 | MCCASLIN ROAD | S | SHIAWASSEE RIVER | 3 | 02 | 1 | 44.9 | 1932 | | 1074 | 2009 | 11/16/2010 | A | 6 | 5 | 5 | 5 | 6 | N | 5 | 4 | N | 5 | F | N | N | 68.1 | 2 | 3 |
| 2765 | 25301H00030B010 | COLE ROAD | S | SHIAWASSEE RIVER | 3 | 02 | 1 | 35.8 | 1937 | | 108 | 2009 | 11/16/2010 | P | 3 | 3 | 5 | 6 | 6 | N | 3 | 2 | N | 5 | P | Y | N | 47.6 | 2 | 3 |
| 2770 | 25302H00013B010 | JORDAN ROAD | S | KEARSLEY CREEK | 3 | 02 | 1 | 41 | 1934 | | 179 | 2009 | 11/19/2010 | A | 4 | 4 | 5 | 6 | 6 | N | 4 | 3 | N | 4 | F | Y | N | 76.9 | 2 | 3 |
| 2772 | 25302H00032B010 | HENDERSON ROAD | S | KEARSLEY CREEK | 3 | 02 | 1 | 32.8 | 1937 | | 220 | 2005 | 11/19/2010 | R | 5 | 5 | 3 | 6 | 6 | N | 4 | 3 | N | 4 | P | Y | N | 48.8 | 0 | 3 |
| 2773 | 25304H00012B010 | CALKINS ROAD | S | MISTEGUAY CREEK | 3 | 02 | 1 | 36.7 | 1938 | | 96 | 2009 | 12/1/2010 | A | 4 | 4 | 5 | 5 | 5 | N | 4 | 3 | N | N | P | Y | N | 83 | 2 | 3 |
| 2774 | 25304H00016B010 | DUFFIELD ROAD | S | MISTEGUAY CREEK | 3 | 02 | 1 | 35.8 | 1939 | | 243 | 2009 | 12/1/2010 | P | 5 | 6 | 4 | 5 | 6 | N | 5 | 2 | N | N | P | Y | N | 40 | 0 | 3 |
| 2775 | 25304H00019B010 | NICHOLS ROAD | S | MISTEGUAY CREEK | 3 | 02 | 1 | 44.9 | 1930 | | 221 | 2009 | 12/1/2010 | A | 6 | 6 | 5 | 5 | 6 | N | 3 | 3 | N | N | F | N | N | 79 | 2 | 7 |
| 2776 | 25305H00009B010 | LIPPINCOTT BLVD | S | KEARSLEY CREEK | 3 | 02 | 1 | 41 | 1939 | | 3988 | 2009 | 11/22/2010 | A | 5 | 4 | 5 | 6 | 6 | N | 7 | 2 | N | 6 | F | N | N | 69.3 | 2 | 3 |
| 2778 | 25305H00020B010 | ATLAS ROAD | S | KEARSLEY CREEK | 3 | 02 | 1 | 41 | 1929 | | 375 | 2009 | 11/19/2010 | A | 6 | 6 | 6 | 6 | 6 | N | 5 | 3 | N | 6 | F | N | N | 97 | N | 3 |
| 2779 | 25305H00022B010 | ATLAS ROAD | S | KEARSLEY CREEK | 3 | 02 | 1 | 44.9 | 1928 | | 3209 | 2009 | 11/22/2010 | P | 5 | 5 | 5 | 5 | 6 | N | 7 | 2 | N | 6 | F | N | N | 59.1 | 2 | 3 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2780 | 25306H00013B010 | HOGAN ROAD | S | SHIAWASSEE RIVER | 3 | 02 | 1 | 35.8 | 1937 | | 610 | 2009 | 11/16/2010 | P | 4 | 4 | 5 | 6 | 6 | N | 5 | 2 | N | N | P | Y | N | 44.3 | 1 | 3 |
| 2781 | 25306H00033B010 | NORTH ROAD | P | SHIAWASSEE RIVER | 3 | 02 | 1 | 34.8 | 1928 | | 6210 | 1997 | 12/15/2008 | A | 6 | 6 | 6 | 6 | 6 | N | 6 | 3 | N | 6 | F | N | Y | 78 | 2 | 3 |
| 2782 | 25307H00003B010 | MAPLE AVE | S | SWARTZ CREEK | 3 | 02 | 1 | 41 | 1937 | | 297 | 2009 | 11/23/2010 | A | 4 | 4 | 5 | 5 | 6 | N | 6 | 3 | N | 5 | P | Y | N | 85.9 | 2 | 3 |
| 2797 | 25313H00026B010 | MCKINLEY ROAD | P | BRENT RUN | 3 | 02 | 1 | 34.8 | 1929 | | 1048 | 1998 | 12/3/2010 | A | 6 | 6 | 4 | 6 | 5 | N | 7 | 3 | N | 6 | P | Y | N | 52.5 | 1 | 3 |
| 2798 | 25313H00031B010 | MORRISH ROAD | S | ARMSTRONG DRAIN | 3 | 02 | 1 | 24.9 | 1938 | | 218 | 2009 | 12/2/2010 | P | 5 | 5 | 3 | 6 | 4 | N | 5 | 2 | N | N | P | Y | N | 39.8 | 0 | 3 |
| 2803 | 25315H00011B010 | REID ROAD | S | SWARTZ CREEK | 3 | 02 | 1 | 34.8 | 1929 | | 222 | 2009 | 11/18/2010 | B | 5 | 5 | 4 | 6 | 6 | N | 7 | 2 | N | 6 | P | Y | N | 62.9 | 1 | 3 |
| 2807 | 25317H00003B010 | FRANCES ROAD | S | BUTTERNUT CREEK | 3 | 02 | 1 | 42 | 1937 | | 533 | 2009 | 11/17/2010 | A | 5 | 5 | 4 | 6 | 6 | N | 6 | 2 | N | 5 | P | Y | N | 68.8 | 1 | 3 |
| 2813 | 25318H00020B010 | FARRAND ROAD | S | PINE RUN | 3 | 02 | 1 | 36.7 | 1938 | | 1631 | 2009 | 11/16/2010 | P | 4 | 4 | 3 | 4 | 5 | N | 5 | 3 | N | 5 | P | Y | N | 38.4 | 1 | 3 |
| 2814 | 25318H00023B010 | LAKE ROAD | S | PINE RUN | 3 | 02 | 1 | 35.8 | 1938 | | 629 | 2009 | 11/16/2010 | A | 6 | 6 | 4 | 5 | 6 | N | 7 | 3 | N | 6 | P | Y | N | 72.7 | 1 | 3 |
| 2815 | 25318H00028B010 | WILSON ROAD | S | BRENT RUN | 3 | 02 | 1 | 43 | 1938 | | 1795 | 2009 | 11/16/2010 | A | 3 | 3 | 4 | 5 | 5 | N | 5 | 2 | ? | 4 | P | Y | N | 55.3 | 1 | 3 |
| Steel Culverts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2722 | 25200056000B010 | LINDEN ROAD | P | CHAPMAN DRAIN | 3 | 19 | 2 | 23 | 1978 | | 24820 | 1998 | 11/24/2010 | A | N | N | N | N | 5 | 6 | N | | N | 7 | F | N | N | 93.4 | N | 8 |
| 2724 | 25200062000B010 | RICHFIELD RD | P | CULLEN-POWERS DRAIN | 3 | 19 | 2 | 21 | 1978 | | 8889 | 1998 | 11/17/2010 | A | N | N | N | N | 5 | 6 | N | | N | 6 | F | N | Y | 77.8 | N | 8 |
| 2745 | 25200144000B010 | FENTON ROAD | P | SWARTZ CREEK | 3 | 19 | 2 | 28 | 1981 | | 9552 | 1998 | 11/18/2010 | A | N | | N | N | 6 | 6 | N | | N | 7 | F | N | N | 75.2 | N | 3 |
| 2746 | 25200144000B020 | FENTON RD | P | SEAVER DRAIN | 3 | 19 | 2 | 22 | 1981 | | 11522 | 1998 | 11/18/2010 | A | N | | N | N | 5 | 6 | N | | N | 5 | F | N | N | 76.9 | N | 8 |
| 2753 | 25200172000B020 | IRISH ROAD | P | BLACK CREEK | 3 | 19 | 1 | 28.9 | 1984 | | 18175 | 1998 | 11/20/2010 | A | N | | N | N | 7 | 7 | N | | N | 7 | G | N | Y | 68.9 | N | 3 |
| 2755 | 25200181000B010 | LINDEN ROAD | P | HOWLAND DRAIN | 3 | 19 | 2 | 22 | 1985 | | 13646 | 1998 | 11/17/2010 | A | N | | N | N | 5 | 6 | N | | N | 7 | F | N | N | 75.2 | N | 8 |
| 2788 | 25308H00201B010 | STANLEY ROAD | S | FREEMAN DRAIN | 3 | 19 | 2 | 22 | 1977 | | 450 | 2009 | 12/1/2010 | A | N | N | N | N | 5 | 6 | N | | N | 7 | F | N | N | 95.9 | N | 8 |
| 2789 | 25308H00359B010 | MORRISH ROAD | P | MESSMORE AND CRONK DRAIN | 3 | 19 | 2 | 36 | 1986 | | 510 | 1997 | 12/1/2010 | A | N | N | N | N | 5 | 6 | N | | N | 7 | G | N | N | 99.9 | N | 3 |
| 2805 | 25315H00007B020 | COOK ROAD | S | INDIAN CREEK | 3 | 19 | 2 | 26.9 | 1979 | | 389 | 2009 | 11/18/2010 | A | N | | N | N | 6 | 7 | N | | N | 7 | G | N | N | 94.4 | N | 8 |
| 2809 | 25317H00057B010 | SCOTT ROAD | S | DRUDGE AND BUELL DRAIN | 3 | 19 | 2 | 24 | 1979 | | 253 | 1997 | 11/17/2010 | A | N | N | N | N | 5 | 5 | N | | N | 6 | F | N | N | 88.9 | N | 8 |
| 2810 | 25317H00201B010 | SCOTT ROAD | S | WILBUR DRAIN | 3 | 19 | 2 | 22 | 1988 | | 208 | 2009 | 11/17/2010 | A | N | N | N | N | 4 | 7 | N | | N | 7 | F | N | N | 99.9 | N | 8 |
| 12600 | 25200089000B010 | DODGE ROAD | P | ARMSTRONG CREEK | 3 | 19 | 2 | 34.8 | 1970 | | 1033 | 1998 | 12/2/2010 | A | N | N | N | N | 5 | 5 | N | | N | 6 | F | N | N | 87.7 | N | 8 |
| Steel Multi Girder Bridges / Composite Deck | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2726 | 25200074000R010 | COLDWATER ROAD | P | C & O RAILROAD | 3 | 32 | 4 | 253.9 | 1972 | | 5611 | 1998 | 11/20/2010 | A | 7 | 6 | 6 | 7 | N | N | 7 | 8 | 9 | 6 | F | N | N | 79 | 2 | N |
| 2728 | 25200082000B010 | MT MORRIS ROAD | P | FLINT RIVER | 3 | 32 | 5 | 350.1 | 1965 | | 8782 | 1998 | 12/2/2010 | A | 5 | 6 | 5 | 7 | 4 | N | 5 | 4 | 5 | 5 | F | N | N | 60.3 | 1 | 3 |
| 2737 | 25200119000B010 | ELMS ROAD | P | FLINT RIVER | 3 | 32 | 3 | 289 | 1967 | | 12914 | 1998 | 12/1/2010 | A | 7 | 5 | 6 | 7 | 5 | N | 9 | N | 8 | 9 | F | N | N | 71.7 | 2 | 3 |
| 2756 | 25200188000B010 | LINDEN RD | P | FLINT RIVER | 3 | 32 | 3 | 283.8 | 1974 | | 20359 | 1998 | 11/24/2010 | A | 6 | 6 | 5 | 7 | 5 | N | 7 | N | 4 | 5 | F | N | N | 81.3 | 2 | 3 |
| 2749 | 25200163000B010 | GENESEE ROAD | P | FLINT RIVER | 3 | 82 | 1 | 135.8 | 1970 | | 11172 | 1998 | 11/20/2010 | A | 6 | 6 | 6 | 6 | 7 | N | 5 | N | 4 | N | F | N | N | 71.8 | 2 | 3 |
| Prestressed Concrete Box Beam Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2705 | 25200015000R010 | BALDWIN ROAD | P | C & O RR (PERE MARQUETTE | 5 | 05 | 1 | 67 | 2007 | | 9630 | 2004 | 11/18/2010 | A | 8 | N | 9 | 8 | N | N | 8 | N | 8 | N | G | N | N | 96.6 | N | N |
| 2712 | 25200028000B010 | HILL ROAD | P | THREAD RIVER | 5 | 05 | 1 | 59.7 | 1995 | | 11532 | 1998 | 11/18/2010 | A | 7 | | 7 | 8 | 8 | N | 7 | N | 6 | N | G | N | N | 96.8 | N | 3 |
| 2719 | 25200046000B010 | ATHERTON ROAD | P | KEARSLEY CREEK | 5 | 05 | 1 | 72 | 2008 | | 3190 | 2006 | 11/22/2010 | A | 8 | | 8 | 8 | 7 | N | 8 | N | N | 7 | G | N | Y | 94.4 | N | 7 |
| 2720 | 25200049000B010 | LAPEER ROAD | P | KEARSLEY CREEK | 5 | 05 | 1 | 77.8 | 1992 | | 8074 | 1998 | 11/22/2010 | A | 7 | | 7 | 7 | 7 | N | 7 | N | 5 | N | G | Y | N | 88.9 | N | 8 |
| 2723 | 25200060000B010 | RICHFIELD ROAD | P | KEARSLEY CREEK | 5 | 05 | 1 | 59.7 | 1962 | | 17412 | 1998 | 11/20/2010 | A | 3 | | 4 | 6 | 6 | N | 3 | N | 5 | N | P | Y | N | 36.8 | N | 3 |
| 2729 | 25200082000B020 | MT MORRIS RD | P | ARMSTRONG CREEK | 5 | 05 | 1 | 24 | 1986 | | 8036 | 1998 | 12/2/2010 | A | 7 | N | 7 | 7 | 7 | N | 6 | N | N | | G | N | N | 96.7 | N | 3 |
| 2734 | 25200101000B010 | DUFFIELD ROAD | P | SHIAWASSEE RIVER | 5 | 05 | 1 | 44.5 | 1924 | 2010 | 1220 | 2010 | 11/16/2010 | A | 9 | 6 | 9 | 7 | 7 | N | N | N | N | N | G | Y | N | 34.7 | N | 3 |
| 2748 | 25200162000B010 | GENESEE ROAD | P | KEARSLEY CREEK | 5 | 05 | 1 | 59.7 | 1961 | | 12612 | 1998 | 11/20/2010 | A | 6 | | 6 | 6 | 6 | N | 9 | N | N | 7 | F | N | Y | 76.4 | N | 3 |
| 2752 | 25200172000B010 | IRISH ROAD | P | KEARSLEY CREEK | 5 | 05 | 1 | 50 | 2007 | | 12770 | 2005 | 11/22/2010 | A | 8 | | 9 | 9 | 7 | N | 8 | N | 9 | 9 | G | N | N | 76.1 | N | 5 |
| 2760 | 25301H00001B010 | LOVEJOY ROAD | S | S BR SHIAWASSEE RIVER | 5 | 05 | 1 | 77 | 2010 | | 115 | 1997 | 11/16/2010 | A | 9 | | 9 | 9 | 8 | N | N | N | N | N | G | Y | N | 39.9 | N | 0 |
| 2762 | 25301H00018B010 | MEIER ROAD | S | SHIAWASSEE RIVER | 5 | 05 | 1 | 89.9 | 1993 | | 63 | 2009 | 11/16/2010 | A | 7 | | 7 | 8 | 7 | N | 6 | N | N | 4 | G | N | N | 100 | N | 8 |
| 2767 | 25302H00007B010 | GREEN ROAD | S | KEARSLEY CREEK | 3 | 02 | 1 | 35.8 | 1938 | 2009 | 502 | 1997 | 11/19/2010 | A | 8 | 5 | 9 | 7 | 7 | N | 8 | N | 8 | N | G | N | N | 100 | N | 8 |
| 2769 | 25302H00009B010 | BURPEE ROAD | S | THREADCREEK | 5 | 05 | 1 | 74 | 2002 | | 410 | 2009 | 11/19/2010 | A | 8 | | 7 | 8 | 7 | N | 7 | N | 7 | N | G | N | N | 100 | N | 7 |
| 2783 | 25307H00014B010 | DYE ROAD | S | W.BR.SWARTZCREEK | 5 | 05 | 1 | 41 | 1938 | 1996 | 1736 | 2009 | 11/24/2010 | A | 7 | N | 7 | 5 | 6 | N | 7 | N | N | 6 | F | N | N | 84 | N | 3 |
| 2785 | 25307H00022B010 | CLAUDE AVE | S | SWARTZ CREEK | 5 | 05 | 1 | 59.7 | 1957 | | 18 | 1997 | 11/24/2010 | A | 7 | N | 7 | 7 | 5 | N | 7 | N | N | 5 | G | N | N | 92 | N | 3 |
| 2786 | 25307H00026B010 | TORREY ROAD | S | CALL CREEK | 5 | 05 | 1 | 27.9 | 1968 | | 2368 | 2009 | 11/23/2010 | A | 5 | N | 5 | 6 | 5 | N | 3 | N | N | 4 | F | N | N | 64 | N | 3 |
| 2791 | 25310H00008B010 | REID ROAD | S | JONES CREEK | 5 | 05 | 1 | 45.9 | 1962 | | 100 | 1998 | 11/17/2010 | A | 7 | | 6 | 6 | 5 | N | 6 | N | N | 6 | F | N | N | 91 | N | 3 |
| 2796 | 25313H00017B010 | WILLARD ROAD | S | PINE RUN CREEK | 5 | 05 | 1 | 45 | 2003 | | 167 | 2009 | 12/3/2010 | A | 8 | N | 7 | 8 | 6 | N | 8 | N | N | 7 | G | N | N | 100 | N | 5 |
| 2804 | 25315H00022B010 | JENNINGS ROAD | S | SWARTZ CREEK | 5 | 05 | 1 | 37.7 | 1900 | 1973 | 230 | 2009 | 11/17/2010 | P | 2 | N | 2 | 3 | 5 | N | 2 | N | N | 4 | P | Y | N | 23.9 | N | 3 |
| 2806 | 25316H00031B010 | OAK ROAD | S | FLINT RIVER | 5 | 05 | 2 | 170.4 | 2007 | | 368 | 2009 | 11/17/2010 | A | 8 | 8 | 8 | 8 | 7 | N | 8 | N | 8 | N | G | N | N | 99.9 | N | 5 |
| 2812 | 25318H00009B010 | WILSON ROAD | S | BENJAMIN RUN | 5 | 05 | 1 | 52 | 2008 | | 3741 | 2009 | 11/17/2010 | A | 8 | 8 | 8 | 8 | 7 | N | 8 | N | N | 8 | G | N | N | 79 | N | 5 |
| 2870 | 25310H00045B010 | RAUBINGER ROAD | S | SWARTZ CREEK | 5 | 05 | 1 | 42 | 2009 | | 1113 | 2008 | 11/20/2010 | A | 8 | 9 | 8 | 8 | 9 | N | 8 | N | 9 | 9 | G | N | N | 99.7 | N | 5 |
| Prestressed Concrete Box Beam Bridges - Single or Spread | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2777 | 25305H00014B010 | EAST COURT STREET | S | KEARSLEY CREEK | 5 | 06 | 1 | 41 | 2000 | | 3975 | 2009 | 11/20/2010 | A | 7 | | 7 | 8 | 7 | N | 7 | N | 6 | N | G | N | N | 98.1 | N | 8 |
| Prestressed Concrete Girder Bridges / Composite Deck | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2744 | 25200133000B010 | BALLENGER HIGHWAY | P | FLINT RIVER | 5 | 32 | 3 | 225.1 | 1994 | | 21426 | 1998 | 11/24/2010 | A | 7 | 7 | 7 | 7 | 6 | N | 7 | N | N | 6 | G | N | N | 86.7 | N | 3 |
| 2754 | 25200175000B010 | IRISH ROAD | P | FLINT RIVER | 5 | 32 | 2 | 160 | 2008 | | 5323 | 2008 | 11/17/2010 | A | 8 | 8 | 8 | 8 | 7 | N | 8 | N | 8 | N | G | N | N | 95.5 | N | 8 |
| 12825 | 25225061000R010 | BRISTOL RD | P | GTW RR | 5 | 32 | 1 | 171.6 | 1999 | | 15247 | 2002 | 11/23/2010 | A | 7 | N | 8 | 7 | N | N | 7 | N | 8 | N | G | N | Y | 96 | N | N |
| Timber Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2795 | 25313H00008B010 | WILSON ROAD | S | CENTRAL DRAIN | 7 | 71 | 1 | 25.9 | 1971 | | 215 | 2009 | 12/2/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 5 | N | N | N | F | N | N | 91.9 | N | 3 |
| 2799 | 25313H00031B020 | MORRISH ROAD | S | CENTRAL DRAIN | 7 | 71 | 1 | 25.9 | 1971 | | 219 | 2009 | 12/2/2010 | A | 6 | 6 | 6 | 6 | 4 | N | 5 | N | N | N | F | N | N | 91.9 | N | 3 |
| 2811 | 25318H00004B010 | BINGHAM ROAD | S | BENJAMIN RUN CREEK | 7 | 71 | 1 | 24 | 1973 | | 194 | 2009 | 11/17/2010 | A | 6 | 6 | 6 | 5 | 5 | N | 6 | N | N | 6 | F | N | N | 79.9 | N | 3 |
| 2816 | 25318H00029B010 | WEBSTER ROAD | S | PINE RUN | 7 | 71 | 1 | 25.9 | 1973 | | 608 | 2009 | 11/16/2010 | A | 6 | 6 | 6 | 6 | 5 | N | 7 | N | N | 6 | F | N | N | 94.8 | N | 3 |

# Appendix A-2

## Genesee County Bridges - Maintenance Plan

| Inventory Data | | | | | | | | | Replacement | | | | Rehabilitation | | | | | | | | | | | Proposed Preventive Maintenance | | | | | | | | | Proposed Scheduled Maintenance | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Structure Number (Item XX) | Facility Carried (Item 7) | Features Intersected (Item 6) | Structure Type Main Span (Item 43A - Material) | Structure Type Main Span (Item 43B) | Number of Main Spans (Item 45) | Total Str Length (Item 49) | Total Str Width (Item 52) | Total Str (sq ft) | Total | Super-structure | Deck | Sub-structure | Deep Overlay | Shallow Overlay | HMA Overlay w/ Membrane | HMA Cap | Replace / Retrofit Railing | Steel Beam Repairs | P/S Conc. Beam Repairs | Repair or Replace Culvert | Repair or Replace Retaining Wall | Geometric Upgrades | Patch Substr. Concrete | Repair or Replace Deck | Repair or Replace Steel Bearings | Complete Painting | Zone Painting | Epoxy Overlays | HMA Cap (without membrane | Concrete Deck Patching | Channel Improvements | Scour Counter Measures | Superstr Washing | Concrete Surface Washing | Vegetation Control | Debris Removal | Clean Drainage System | Spot Painting | Repair or Replace HMA Surface | Seal HMA Cracks/Joints | Seal Concrete Cracks/Joints | Minor Concrete Patching | Timber Repairs | Repair or Replace Guardrail | Repave Approaches | Repair Slopes | Install RipRap |
| Concrete | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2561 | BRISTOL RD | CALL DRAIN | 1 | 01 | 1 | 24 | 61 | 1,464 | | | | | | | | | X | | | | | | | | | | | | | X | | | | | X | | | | | | | | | | | | |
| 2562 | BRISTOL RD | CALL DRAIN | 1 | 01 | 1 | 24 | 54.8 | 1,315 | | | | | | | | | X | | | | | | | | | | | | | X | | | | | X | | | | | | | | | | | | |
| 2784 | DYE ROAD | PIRNIE CREEK | 1 | 01 | 1 | 25.9 | 31.5 | 816 | | | | | | | | | X | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| Concrete Tee Beam Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2703 | SILVER LAKE ROAD | LOBDELL LAKE DAM | 1 | 04 | 1 | 34 | 52.8 | 1,795 | | | | | | | | | X | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | X | | X |
| 2704 | BALDWIN ROAD | SWARTZ CREEK | 1 | 04 | 1 | 30.8 | 32.2 | 992 | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | X | | | | | | | | | | | |
| 2706 | BALDWIN ROAD | THREAD RIVER | 1 | 04 | 1 | 26.9 | 32.2 | 866 | | | | | | | X | | | | X | | | | X | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2707 | GRAND BLANC ROAD | JONES CREEK | 1 | 04 | 1 | 26.9 | 37.1 | 998 | | | | | | | | | | | X | | | | X | | | | | | | X | | | | | X | X | | | | | | | | | | | |
| 2708 | GRAND BLANC ROAD | CARGILL CREEK | 1 | 04 | 1 | 23 | 37.7 | 867 | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | X | | | | | | | |
| 2727 | MT MORRIS ROAD | BRENT CREEK | 1 | 04 | 1 | 23 | 38.1 | 876 | | | | | | | | | | | X | | | | X | | | | | | | X | | | | | | | | | | | | | | | | X | |
| 2730 | MT MORRIS ROAD | BRENT RUN | 1 | 04 | 1 | 26.9 | 38.1 | 1,025 | | | | | | | | | | | X | | | | X | | | | | | | | | | | | | | | | | | | | | | | | X |
| 2731 | MT MORRIS ROAD | BUTTERNUT CREEK | 1 | 04 | 1 | 26.9 | 37.7 | 1,014 | | | | | | | | | X | | X | | | | X | | | | | | | X | | | | | | | | | X | X | | | | | | | |
| 2732 | DODGE ROAD | BRENT RUN | 1 | 04 | 1 | 26.9 | 28.2 | 759 | | | | | | | | | X | | X | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| 2733 | DUFFIELD ROAD | JONES CREEK | 1 | 04 | 1 | 27.9 | 30.8 | 859 | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| 2735 | SEYMOUR ROAD | SHIAWASSEE RIVER | 1 | 04 | 1 | 26.9 | 31.5 | 847 | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2736 | MORRISH ROAD | ALGER CREEK | 1 | 04 | 1 | 26.9 | 38.4 | 1,033 | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | X | | | | | | | | | | | | |
| 2738 | ELMS ROAD | BRENT RUN | 1 | 04 | 1 | 26.9 | 32.2 | 866 | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | | X | | | | | | | |
| 2739 | ELMS ROAD | PINE RUN | 1 | 04 | 1 | 31.8 | 30.2 | 960 | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | | | |
| 2750 | BELSAY ROAD | THREAD RIVER | 1 | 04 | 1 | 31.8 | 31.8 | 1,011 | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | X | | | | | | | | | | | |
| 2766 | KIPP ROAD | KEARSLEY CREEK | 1 | 04 | 1 | 31.8 | 32.2 | 1,024 | | | | | | | X | | X | | X | | | | | | | | | | | X | | | | | | X | | | | | | | | | | | |
| 2768 | MCCANDLISH ROAD | THREAD RIVER | 1 | 04 | 1 | 30.8 | 32.2 | 992 | | | | | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2787 | NICHOLS ROAD | BRENT CREEK | 1 | 04 | 1 | 23 | 28.2 | 649 | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2790 | COOK ROAD | JONES CREEK | 1 | 04 | 1 | 32.8 | 32.2 | 1,056 | | | | | | | X | | X | | X | | | | | | | | | | | X | | | | | X | | | | | | | | | | | | |
| 2792 | REID ROAD | ALGER CREEK | 1 | 04 | 1 | 26.9 | 32.2 | 866 | | | | | | | X | | X | | X | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2793 | NICHOLS ROAD | JONES CREEK | 1 | 04 | 1 | 32.8 | 33.5 | 1,099 | | | | | | | X | | X | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| 2794 | FRANCES ROAD | ARMSTRONG DRAIN | 1 | 04 | 1 | 26.9 | 25.9 | 697 | | | | | | | | | X | | | | | | | | | | | | X | X | | | | | | | | | | | | | | | X | | |
| 2800 | MORRISH ROAD | BRENT RUN | 1 | 04 | 1 | 26.9 | 31.8 | 855 | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | X | |
| 2801 | FRANCES ROAD | BRENT RUN | 1 | 04 | 1 | 26.9 | 25.9 | 697 | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 2802 | COOK ROAD | SWARTZ CREEK | 1 | 04 | 1 | 30.8 | 37.7 | 1,161 | | | | | | | X | | X | | X | | | | X | | | | | | | X | | | | | | | | | | | | | | | | | |
| 2808 | VASSAR ROAD | BUTTERNUT CREEK | 1 | 04 | 1 | 31.8 | 32.5 | 1,034 | | | | | | | | | X | | X | | | | | | | | | | | X | | | | | | | | | | X | | | | | | | |
| 2817 | LINDEN ROAD | BRENT RUN | 1 | 04 | 1 | 57.7 | 31.8 | 1,835 | | | | | | | | | | | X | X | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2818 | LINDEN ROAD | PINE RUN | 1 | 04 | 1 | 32.8 | 32.2 | 1,056 | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2819 | JENNINGS ROAD | PINE RUN | 1 | 04 | 1 | 31.8 | 37.4 | 1,189 | | | | | | | | | | | X | | | | | | | | | | | | | | | | | X | | | | | | | | X | | X | |
| 12714 | WILSON ROAD | BUTTERNUT CREEK | 1 | 04 | 1 | 26.9 | 28.2 | 759 | | | | | | | | | | | X | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Concrete Box Beam Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2742 | MILL ROAD | FLINT RIVER | 1 | 05 | 5 | 225.1 | 66.6 | 14,992 | | | X | | | | | | | | | | | | X | X | | | | | | | | | | | | X | | | | | | | | | | | X |
| Concrete Arch Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13384 | MOONSTONE DRIVE | THREAD CREEK | 1 | 11 | 3 | 132 | 48 | 6,336 | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | |
| Concrete Culverts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2560 | BRISTOL RD | SWARTZ CR | 1 | 19 | 1 | 35.8 | 146 | 5,227 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | X | | | | | | | |
| 12617 | MCKINLEY ROAD | ARMSTRONG CREEK | 1 | 19 | 2 | 24.9 | 46 | 1,146 | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | X | | | |
| 12832 | COOK ROAD | DAWE DRAIN | 1 | 19 | 1 | 25.9 | 28.2 | 730 | | | | | | | | | | | X | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| 12833 | DETROIT STREET | HUGHES DRAIN | 1 | 19 | 2 | 24 | 26.2 | 629 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | | X | | | |
| 13168 | LINDEN CRK PARKWAY | HEWITT DRAIN | 1 | 19 | 1 | 42 | 29 | 1,218 | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X |
| Steel Multi-Girder Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2709 | GRAND BLANC ROAD | SWARTZ CREEK | 3 | 02 | 1 | 35.8 | 40 | 1,432 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 2710 | PERRY ROAD | THREAD RIVER | 3 | 02 | 1 | 44.9 | 40 | 1,796 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2711 | HILL ROAD | SWARTZ CREEK | 3 | 02 | 1 | 45.9 | 72.8 | 3,342 | | | | | | | | | | | | | | | | | | | | | | X | | | X | | | | X | | | | X | | | | | | |
| 2715 | BRISTOL ROAD | W.BR.SWARTZCREEK | 3 | 02 | 1 | 40 | 70.2 | 2,808 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| 2716 | BRISTOL ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 40 | 33.5 | 1,340 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2717 | BALLENGER HIGHWAY | SWARTZ CREEK | 3 | 02 | 1 | 54.8 | 59.4 | 3,255 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2721 | BEECHER ROAD | MISTEGUAY CREEK | 3 | 02 | 1 | 34.8 | 35.4 | 1,232 | | | | | | | | | X | X | | | | | | | | X | | | | X | | | X | | | | | | | X | | | | | | | |
| 2725 | CARPENTER ROAD | FLINT RIVER | 3 | 02 | 2 | 130.9 | 42.7 | 5,589 | | | | | | | | | | | | | | | | X | | | X | | | | | | X | | X | | | | | | | | | | | |
| 2740 | LINDEN ROAD | W.BR.SWARTZCREEK | 3 | 02 | 1 | 40 | 62.3 | 2,492 | | | | | | | | | | | | | | | | | | X | | | | X | | | X | | | | | | | | | | | | | |
| 2741 | GRAND TRUNK RR | LINDEN ROAD | 3 | 02 | 1 | 58.7 | 24 | 1,409 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2743 | TORREY ROAD | SWARTZ CREEK | 3 | 02 | 1 | 34.8 | 35.1 | 1,221 | | | | | | | | | X | | | | | | | | | X | | | | | | | X | | | | | | | | | | | | | X |
| 2747 | CENTER ROAD | THREAD RIVER | 3 | 02 | 1 | 44.9 | 35.4 | 1,589 | | | | | | | | | | | | | | | X | | | X | | | | X | | | X | | X | X | | | | | | | | | | X |
| 2761 | LILLIE ROAD | S BR SHIAWASSEE RIVER | 3 | 02 | 2 | 61 | 33.1 | 2,019 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X |
| 2763 | BIRD ROAD | SHIAWASSEE RIVER | 3 | 02 | 1 | 35.8 | 33.1 | 1,185 | | | | | | | | | X | | | | | | | | | X | | | X | | | | X | | | X | | | | | | | | | | | |
| 2764 | MCCASLIN ROAD | SHIAWASSEE RIVER | 3 | 02 | 1 | 44.9 | 29.9 | 1,343 | | | | | | | X | | X | | | | | | | | | | | | | X | | | | | X | | X | | | | | | | | X | | |
| 2765 | COLE ROAD | SHIAWASSEE RIVER | 3 | 02 | 1 | 35.8 | 33.1 | 1,185 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2770 | JORDAN ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 41 | 32.8 | 1,345 | | | | | | | X | | X | | | | | | X | | | X | | | | X | | | X | | | | | | | | | | | | | |
| 2772 | HENDERSON ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 32.8 | 30.8 | 1,010 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2773 | CALKINS ROAD | MISTEGUAY CREEK | 3 | 02 | 1 | 36.7 | 33.1 | 1,215 | | | | | | | X | | X | | | | | | | | | X | | | | | | | X | | | | | | | | | | | | | |
| 2774 | DUFFIELD ROAD | MISTEGUAY CREEK | 3 | 02 | 1 | 35.8 | 33.1 | 1,185 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2775 | NICHOLS ROAD | MISTEGUAY CREEK | 3 | 02 | 1 | 44.9 | 36.1 | 1,621 | | | | | | | X | | X | | | | | | | | | X | | | | X | | | X | | | | | | | | | | | | | |
| 2776 | LIPPINCOTT BLVD | KEARSLEY CREEK | 3 | 02 | 1 | 41 | 33.1 | 1,357 | | | | | | | | | | | | | | | X | | | X | | | | X | | | X | | X | | | | | | | | | X | | |
| 2778 | ATLAS ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 41 | 35.4 | 1,451 | | | | | | | X | | X | | | | | | | | | X | | | | | | | X | | | | | | | | | | | | | |
| 2779 | ATLAS ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 44.9 | 33.5 | 1,504 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2780 | HOGAN ROAD | SHIAWASSEE RIVER | 3 | 02 | 1 | 35.8 | 33.1 | 1,185 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2781 | NORTH ROAD | SHIAWASSEE RIVER | 3 | 02 | 1 | 34.8 | 35.4 | 1,232 | | | | | | | | | X | | | | | | | | | X | | | | X | | | X | | | | | | X | | | | | | | | |
| 2782 | MAPLE AVE | SWARTZ CREEK | 3 | 02 | 1 | 41 | 32.8 | 1,345 | | | | | | | | | | | | | | | X | X | | X | | | | X | | | X | | X | | | | | | | | | | | X |
| 2797 | MCKINLEY ROAD | BRENT RUN | 3 | 02 | 1 | 34.8 | 33.1 | 1,152 | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | |
| 2798 | MORRISH ROAD | ARMSTRONG DRAIN | 3 | 02 | 1 | 24.9 | 32.2 | 802 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2803 | REID ROAD | SWARTZ CREEK | 3 | 02 | 1 | 34.8 | 35.4 | 1,232 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 2807 | FRANCES ROAD | BUTTERNUT CREEK | 3 | 02 | 1 | 42 | 32.8 | 1,378 | | X | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2813 | FARRAND ROAD | PINE RUN | 3 | 02 | 1 | 36.7 | 33.5 | 1,229 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2814 | LAKE ROAD | PINE RUN | 3 | 02 | 1 | 35.8 | 33.5 | 1,199 | | | | | | | | | | | | | | | | | | X | | | | | | | X | | | | | | | | | | | | | |
| 2815 | WILSON ROAD | BRENT RUN | 3 | 02 | 1 | 43 | 33.1 | 1,423 | | X | | | | | | | | | | | | | | | | X | | | | | | | X | | | | | | | | | | | | | |
| Steel Culverts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2722 | LINDEN ROAD | CHAPMAN DRAIN | 3 | 19 | 2 | 23 | 89.9 | 2,068 | | | | | | | | | | | | | X | | | X | | | | | | | | | | | | X | | | | X | | | | X | | | X |
| 2724 | RICHFIELD RD | CULLEN-POWERS DRAIN | 3 | 19 | 2 | 21 | 79.7 | 1,674 | | | | | | | | | | | | X | | | | | | | | | | | | | | | X | X | | | | | | | | | | | X |
| 2745 | FENTON ROAD | SWARTZ CREEK | 3 | 19 | 2 | 28 | 52.5 | 1,470 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | X | | | | | | | |
| 2746 | FENTON RD | SEAVER DRAIN | 3 | 19 | 2 | 22 | 79.7 | 1,753 | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | X | | | | | | | |
| 2753 | IRISH ROAD | BLACK CREEK | 3 | 19 | 1 | 28.9 | 84 | 2,428 | | | | | | | | | | | | X | | | | | | | | | | | | | | | | X | | | | X | | | | | | | |
| 2755 | LINDEN ROAD | HOWLAND DRAIN | 3 | 19 | 2 | 22 | 79.7 | 1,753 | | | | | | | | | | | | | | | | | | | | | | | | X | | | | X | | | | X | | | | | | | X |
| 2788 | STANLEY ROAD | FREEMAN DRAIN | 3 | 19 | 2 | 22 | 59.7 | 1,313 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | X | | | | |
| 2789 | MORRISH ROAD | MESSMORE AND CRONK | 3 | 19 | 2 | 36 | 59.7 | 2,149 | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | X |
| 2805 | COOK ROAD | INDIAN CREEK | 3 | 19 | 2 | 26.9 | 59.7 | 1,606 | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2809 | SCOTT ROAD | DRUDGE AND BUELL DRAIN | 3 | 19 | 2 | 24 | 59.7 | 1,433 | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | X | | X |
| 2810 | SCOTT ROAD | WILBUR DRAIN | 3 | 19 | 2 | 22 | 59.7 | 1,313 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 12600 | DODGE ROAD | ARMSTRONG CREEK | 3 | 19 | 2 | 34.8 | 80 | 2,784 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | | X | | | |
| Steel Girder / Composite Deck Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2726 | COLDWATER ROAD | C & O RAILROAD | 3 | 32 | 4 | 253.9 | 64.3 | 16,326 | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | | | | | | | | | X | | | |
| 2728 | MT MORRIS ROAD | FLINT RIVER | 3 | 32 | 5 | 350.1 | 62 | 21,706 | | | | | | | | | X | | | | | | | X | | | X | | | | | | X | | X | | | | | | | | | | X | |
| 2737 | ELMS ROAD | FLINT RIVER | 3 | 32 | 3 | 289 | 62 | 17,918 | | | | | | | | | | | | | | | | | | X | | | | | | | | | X | | | | | | | | | | X | |
| 2756 | LINDEN RD | FLINT RIVER | 3 | 32 | 3 | 283.8 | 74.1 | 21,030 | | | | | | | | | X | | | | | | | X | | | | | | | | | | | | | | | | | X | | | | | X |
| Steel /Plate Girder Composite | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2749 | GENESEE ROAD | FLINT RIVER | 3 | 82 | 1 | 135.8 | 65 | 8,827 | | | | | | | | | X | | | | | | X | | X | | | | | X | | | | | | | | | | | | | | | | | |
| Prestressed Concrete Box Beam Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2705 | BALDWIN ROAD | C & O RR (PERE MARQUETTE | 5 | 05 | 1 | 67 | 84.5 | 5,662 | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | X |
| 2712 | HILL ROAD | THREAD RIVER | 5 | 05 | 1 | 59.7 | 65.9 | 3,934 | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | | | | | X | X | | | | | | |
| 2719 | ATHERTON ROAD | KEARSLEY CREEK | 5 | 05 | 1 | 72 | 43.6 | 3,139 | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | X | | | | | | | |
| 2720 | LAPEER ROAD | KEARSLEY CREEK | 5 | 05 | 1 | 77.8 | 43.6 | 3,392 | | | | | | | | | X | | X | | | | | | | | | | | | | | | | X | | | | | | | | | | | | |
| 2723 | RICHFIELD ROAD | KEARSLEY CREEK | 5 | 05 | 1 | 59.7 | 62 | 3,701 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2729 | MT MORRIS RD | ARMSTRONG CREEK | 5 | 05 | 1 | 24 | 42.7 | 1,025 | | | | | | | | | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2734 | DUFFIELD ROAD | SHIAWASSEE RIVER | 5 | 05 | 1 | 44.5 | 39.2 | 1,744 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2748 | GENESEE ROAD | KEARSLEY CREEK | 5 | 05 | 1 | 59.7 | 51.2 | 3,057 | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2752 | IRISH ROAD | KEARSLEY CREEK | 5 | 05 | 1 | 50 | 75 | 3,750 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | |
| 2760 | LOVEJOY ROAD | S BR SHIAWASSEE RIVER | 5 | 05 | 1 | 77 | 29.2 | 2,248 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2762 | MEIER ROAD | SHIAWASSEE RIVER | 5 | 05 | 1 | 89.9 | 30.8 | 2,769 | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | | X | | | | |
| 2767 | GREEN ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 35.8 | 33.1 | 1,185 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2769 | BURPEE ROAD | THREADCREEK | 5 | 05 | 1 | 74 | 34.5 | 2,553 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 2783 | DYE ROAD | W.BR.SWARTZCREEK | 5 | 05 | 1 | 41 | 33.1 | 1,357 | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | X | | | | X | X | X | | | | | X | |
| 2785 | CLAUDE AVE | SWARTZ CREEK | 5 | 05 | 1 | 59.7 | 33.5 | 2,000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 2786 | TORREY ROAD | CALL CREEK | 5 | 05 | 1 | 27.9 | 37.4 | 1,043 | | | | | | | X | | X | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | X |
| 2791 | REID ROAD | JONES CREEK | 5 | 05 | 1 | 45.9 | 28.9 | 1,327 | | | | | | | X | | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | X |
| 2796 | WILLARD ROAD | PINE RUN CREEK | 5 | 05 | 1 | 45 | 31.4 | 1,413 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | |
| 2804 | JENNINGS ROAD | SWARTZ CREEK | 5 | 05 | 1 | 37.7 | 16 | 603 | X | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 2806 | OAK ROAD | FLINT RIVER | 5 | 05 | 2 | 170.4 | 31.4 | 5,351 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 2812 | WILSON ROAD | BENJAMIN RUN | 5 | 05 | 1 | 52 | 37.6 | 1,955 | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | X |
| 2870 | RAUBINGER ROAD | SWARTZ CREEK | 5 | 05 | 1 | 42 | 37.6 | 1,579 | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | X | X | X | | | | | | |
| Prestressed Concrete Box Beam Bridges - Single or Spread | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2777 | EAST COURT STREET | KEARSLEY CREEK | 5 | 06 | 1 | 41 | 40.7 | 1,669 | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | |
| Prestressed Concrete/Composite Deck Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2744 | BALLENGER HIGHWAY | FLINT RIVER | 5 | 32 | 3 | 225.1 | 80.7 | 18,166 | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | | | X | | X |
| 2754 | IRISH ROAD | FLINT RIVER | 5 | 32 | 2 | 160 | 43.3 | 6,928 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| 12825 | BRISTOL RD | GTW RR | 5 | 32 | 1 | 171.6 | 128.9 | 22,119 | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Timber Bridges | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2795 | WILSON ROAD | CENTRAL DRAIN | 7 | 71 | 1 | 25.9 | 35.1 | 909 | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | | X |
| 2799 | MORRISH ROAD | CENTRAL DRAIN | 7 | 71 | 1 | 25.9 | 35.1 | 909 | | | | | | | | | X | | | | | | | | | | | | X | | | | | | | | X | X | | | X | | | | X | | | | |
| 2811 | BINGHAM ROAD | BENJAMIN RUN CREEK | 7 | 71 | 1 | 24 | 36.1 | 866 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | |
| 2816 | WEBSTER ROAD | PINE RUN | 7 | 71 | 1 | 25.9 | 35.4 | 917 | | | | | | | | | | | | X | | | X | | | | | | | | | | | | | | | X | | | | | | | | | | | |

# Appendix A-3

## Genesee County Bridges - Inspection Follow Up

| Inventory Data | | | | | | | | | Inspection Items | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Structure Number (Item XX) | Facility Carried (Item 7) | Features Intersected (Item 6) | Structure Type Main Span (Item 43A - Material) | Structure Type Main Span (Item 43B) | Number of Main Spans (Item 45) | Total Str Length (Item 49) | Total Str Width (Item 52) | Total Str (sq ft) | Initial Inspection | In Depth Steel Inpection | Pin and Hanger Inspection | Diving Inspection | Provide Monitoring | Review Scour Criticality | Load Rating | Update SIA |
| Concrete Culverts | | | | | | | | | | | | | | | | |
| 2560 | BRISTOL RD | SWARTZ CR | 1 | 19 | 1 | 35.8 | 146 | 5,227 | | | | | X | | | |
| Steel Multi-Girder Bridges | | | | | | | | | | | | | | | | |
| 2709 | GRAND BLANC ROAD | SWARTZ CREEK | 3 | 02 | 1 | 35.8 | 40 | 1,432 | | X | | | | | X | |
| 2711 | HILL ROAD | SWARTZ CREEK | 3 | 02 | 1 | 45.9 | 72.8 | 3,342 | | | | | | X | | |
| 2741 | GRAND TRUNK RR | LINDEN ROAD | 3 | 02 | 1 | 58.7 | 24 | 1,409 | | | | | | | | |
| 2797 | MCKINLEY ROAD | BRENT RUN | 3 | 02 | 1 | 34.8 | 33.1 | 1,152 | | X | | | | | X | |
| 2807 | FRANCES ROAD | BUTTERNUT CREEK | 3 | 02 | 1 | 42 | 32.8 | 1,378 | | X | | | | | X | |
| Steel Culverts | | | | | | | | | | | | | | | | |
| 2745 | FENTON ROAD | SWARTZ CREEK | 3 | 19 | 2 | 28 | 52.5 | 1,470 | | | | | X | | | |
| Steel Girder / Composite Deck Bridges | | | | | | | | | | | | | | | | |
| 2726 | COLDWATER ROAD | C & O RAILROAD | 3 | 32 | 4 | 253.9 | 64.3 | 16,326 | | | X | | | | | |
| 2728 | MT MORRIS ROAD | FLINT RIVER | 3 | 32 | 5 | 350.1 | 62 | 21,706 | | | X | | X | | | |
| 2737 | ELMS ROAD | FLINT RIVER | 3 | 32 | 3 | 289 | 62 | 17,918 | | | X | | | | | |
| 2756 | LINDEN RD | FLINT RIVER | 3 | 32 | 3 | 283.8 | 74.1 | 21,030 | | | X | | | | | |
| Steel /Plate Girder Composite | | | | | | | | | | | | | | | | |
| 2749 | GENESEE ROAD | FLINT RIVER | 3 | 82 | 1 | 135.8 | 65 | 8,827 | | | | X | | X | | |
| Prestressed Concrete Box Beam Bridges | | | | | | | | | | | | | | | | |
| 2712 | HILL ROAD | THREAD RIVER | 5 | 05 | 1 | 59.7 | 65.9 | 3,934 | | | | | | X | | |
| 2734 | DUFFIELD ROAD | SHIAWASSEE RIVER | 5 | 05 | 1 | 44.5 | 39.2 | 1,744 | X | | | | | | X | |
| 2760 | LOVEJOY ROAD | S BR SHIAWASSEE RIVER | 5 | 05 | 1 | 77 | 29.2 | 2,248 | X | | | | | | X | |
| 2767 | GREEN ROAD | KEARSLEY CREEK | 3 | 02 | 1 | 35.8 | 33.1 | 1,185 | | | | | | | | X |
| 2783 | DYE ROAD | W.BR.SWARTZCREEK | 5 | 05 | 1 | 41 | 33.1 | 1,357 | | | | | | X | | |
| 2806 | OAK ROAD | FLINT RIVER | 5 | 05 | 2 | 170.4 | 31.4 | 5,351 | | | | | | | | X |
| 2870 | RAUBINGER ROAD | SWARTZ CREEK | 5 | 05 | 1 | 42 | 37.6 | 1,579 | | | | | | | | X |
| Timber Bridges | | | | | | | | | | | | | | | | |
| 2811 | BINGHAM ROAD | BENJAMIN RUN CREEK | 7 | 71 | 1 | 24 | 36.1 | 866 | | | | | | | | X |

# Appendix B

# Inspection Summary Report

**Genesee County Road Commission**
**2010 Bridge Inspection Report**
**Summary of Additional Inspection Recommendations**

2703 Silver Lake Road over Lobdell Lake Dam: The structure is integral with the dam, which severely restricts access.

2709 Grand Blanc Road over Swartz Creek: Steel beams have progressed section loss. A detailed inspection is recommended to access and clean beams to better quantify deterioration. The load rating should be updated based on the results.

2719 Atherton Road over Kearsley Creek: The SI&A appears to contain the load rating for the previous structure and should be updated.

2726 Coldwater Road over C&O Railroad: The structure is 4-span steel beam with pin & hanger connections. The County should consider a periodic special fatigue sensitive inspection to access pin and hanger connections.

2728 Mt. Morris Road over the Flint River: The structure is a 5-span steel beam bridge with pin & hanger connections. The County should consider a periodic special fatigue sensitive inspection to access pin and hanger connections.

2734 Duffield Road over the Shiawassee River: The structure was under construction at the time of routine inspection. An initial inspection and load rating are recommended upon completion of construction.

2737 Elms Road over the Flint River: The structure is a 5-span steel beam bridge with pin & hanger connections. The County should consider a periodic special fatigue sensitive inspection to access pin and hanger connections.

2749 Genesee Road over the Flint River/Mott Lake: Depth of water limits inspection of abutments. An underwater inspection is required.

2760 Lovejoy Road over the S. Branch Shiawassee River: The structure was under construction at the time of routine inspection. An initial inspection and load rating are recommended upon completion of construction.

2767 Green Road over Kearsley Creek: SI&A form has information from previous structure and should be updated. The load rating appears to be current.

2797 McKinley Road over Brent Run: Steel beams have progressed section loss. A detailed inspection is recommended to access and clean beams to better quantify deterioration. The load rating should be updated based on the results.

2807 Frances Road over Butternut Creek: Steel Beams have progressed section loss. A detailed inspection is recommended to access and clean beams to better quantify deterioration. The load rating should be updated based on the results.

**Genesee County Road Commission**
**2010 Bridge Inspection Report**
**Executive Summary**

## General Recommendations

- A significant number of the County's structures are coded as scour critical. The County should implement action plans and work to make improvements to remove structures from the scour critical list as other improvements are made to the structures.

- Several structures have gravel and other debris building up on the shoulders. The County should periodically remove debris and vegetation as it can restrict drainage from the structure.

- Previous inspections were limited by weather, with inspectors indicating various components were not accessible to due snow and ice. It is recommended that the County work to perform the 2012 inspection cycle several months ahead of schedule (September or October) to provide better weather conditions for inspection.

- Many of the County's structures have deck drains that are either covered by HMA or plugged with debris. The County should periodically remove debris from drains to keep them functioning as intended. Extensions should be added to those structures that have not already been addressed.

## Argentine Township

2703 Silver Lake Road over Lobdell Lake Dam
**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair
**Description:** This structure is integral with the dam, spanning both the main dam and spillway. The main span is concrete tee beams and the spillway span appears to be solid slab. The structure has HMA wearing surface and concrete balustrade railings with a retrofit guardrail on one side.
**Recommendations:** The configuration of this structure prevents access to a majority of the structure. A special inspection is recommended, potentially in conjunction with the dam inspection, to access the structure. Install retrofit railings. Repair sink hole around casting in surface. Add riprap to mitigate slope erosion. Mill and resurface structure and approaches. Patch concrete railing.

2734 Duffield Road over the Shiawassee River
**Constructed:** 2010 **Reconstructed:** N/A **General Condition:** New
**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and integrated the previous abutments.
**Recommendations:** The structure was under construction at the time of routine inspection. An initial inspection and load rating are recommended upon completion of construction.

2735 Seymour Road over the Shiawassee River

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. The fascia beams are spalled.

**Recommendations:** Patch concrete beams. Remove trees. Remove channel debris and restore bed.

2760 Lovejoy Road over the S. Branch Shiawassee River

**Constructed:** 2010 **Reconstructed:** N/A **General Condition:** New

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and concrete barrier railings.

**Recommendations:** The structure was under construction at the time of routine inspection. An initial inspection and load rating are recommended upon completion of construction.

2761 Lillie Road over the S. Branch Shiawassee River

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a two span steel beam bridge with concrete deck, partially graveled surface and steel pipe railings. There are two failed railing sections. Beams have minor to moderate section loss. The deck is spalled on top and bottom surfaces.

**Recommendations:** Rehabilitate or replace the structure as funding is available. It may be possible to incorporate the existing abutments and eliminate the pier with a single span superstructure. In the meantime, address shoulder washout and remove gravel from the channel. Install retrofit railings. Remove channel debris.

2762 Meier Road over the Shiawassee River

**Constructed:** 1993 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a single span side-by-side concrete box beam bridge with HMA wearing surface and open concrete parapet railings. The HMA surface has moderate to severe block cracking and the box beam joints show evidence of leakage.

**Recommendations:** Mill and resurface the structure with waterproofing membrane. Repair damaged guardrail. Remove brush from around structure. Remove channel debris.

2763 Bird Road over the Shiawassee River

**Constructed:** 1936 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, gravel surface and steel pipe railings. Bottom flanges of beams are corroding and scattered elsewhere with limited section loss.

**Recommendations:** Install retrofit railings. Remove surface and channel debris. Consider installing HMA wearing surface. Clean and coat beams.

2764 McCaslin Road over the Shiawassee River

**Constructed:** 1932 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and steel pipe railings. Abutments are CMP piles with corrugated lagging. Failed slope protection piling remains. There are two failed sections of pipe railing. The deck is spalled around deck drains.

**Recommendations:** Install retrofit railings. Patch deck. Spot repair paint on steel beams. Remove trees and brush. Improve slope protection. Seal cracking or replace HMA surface with waterproofing membrane.

2765 Cole Road over the Shiawassee River

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck, partially graveled surface and steel pipe railings. Steel beams have corrosion and minor to moderate section loss. The deck top and bottom surface are spalled.

**Recommendations:** Rehabilitate or replace the structure as funding is available. Abutments appear to be in sufficient condition to salvage. In the meantime, install retrofit railings.

**Atlas Township**

2706 Baldwin Road over the Thread River

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. The concrete beams and abutments are spalled.

**Recommendations:** Remove brush. Seal cracking or replace HMA wearing surface with waterproofing membrane. Patch concrete beams and abutments. Remove timber pile remnants from channel.

2766 Kipp Road over Kearsley Creek

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, gravel surface and steel pipe railings. The bottom surface of deck and beams has scattered spalling.

**Recommendations:** Install retrofit railings. Install HMA wearing surface with waterproofing membrane. Remove channel debris. Patch concrete deck and beams.

2767 Green Road over Kearsley Creek

**Constructed:** 1938 **Reconstructed:** 2009 **General Condition:** Good/New

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings incorporating the previous abutments.

**Recommendations:** SI&A form has information from previous structure and should be updated. The load rating appears to be current.

2768 McClandish Road over the Thread River

**Constructed:** 1934 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a single span concrete tee beam bridge with concrete deck, gravel surface and solid concrete railings.

**Recommendations:** Install retrofit railings. Install HMA wearing surface with waterproofing membrane.

2769 Burpee Road over Thread Creek

**Constructed:** 2002 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings.

**Recommendations:** Remove brush. Remove sediment from beneath structure.

2770 Jordan Road over Kearsley Creek

**Constructed:** 1934 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck and steel pipe railings. The deck top surface is severely spalled with isolated spall on bottom. Beams have surface corrosion with minor section loss.

**Recommendations:** Install retrofit railings. Patch deck surface and install HMA wearing surface with waterproofing membrane. Clean and coat beams. Patch concrete abutments.

2772 Henderson Road over Kearsley Creek

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Poor

**Description:** This is a single span steel beam bridge with concrete deck, gravel surface and partially retrofitted railings. Abutments have scattered moderate cracking. Fascia beams are older riveted steel with moderate to severe surface corrosion and progressing section loss. Interior beams are better condition.

**Recommendations:** Rehabilitate or replace structure as funding allows. In the meantime, install retrofit railings.

**Clayton Township**

2721 Beecher Road over Misteguay Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and concrete balustrade railings. The beams have moderate section loss on bottom flange and scattered elsewhere.

**Recommendations:** Install retrofit railings. Clean and coat and evaluate repair of, steel beams. Seal cracking in HMA surface. Patch concrete deck.

2773 Calkins Road over Misteguay Creek

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck, partially graveled surface and guardrail-type railings. Abutments have moderate to severe cracking. Top of deck has severe spalling and scattered on bottom. Beams have surface corrosion and minor section loss at bearings.

**Recommendations:** Clean and coat beams. Install HMA wearing surface with waterproofing membrane. Consider installing retrofit railings.

2774 Duffield Road over Misteguay Creek

**Constructed:** 1939 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck, partially graveled surface and steel pipe railings. There is a section of failed pipe railing. Abutments have scattered moderate cracking. Beams have surface corrosion moderate section loss.

**Recommendations:** Rehabilitate or replace structure as funding allows. In the meantime, install retrofit railings and repair slope erosion threatening shoulder.

2775 Nichols Road over Misteguay Creek

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, partially graveled surface and concrete balustrade railings. The surface is severely spalled. The beams have corrosion with minor to moderate section loss.

**Recommendations:** Install retrofit railings. Clean and coat beams. Patch deck surface and install HMA wearing surface with waterproofing membrane.

**Davison Township**

2716 Bristol Road over Kearsley Creek

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck and wearing surface and retrofitted guardrail-type railings. The beams have surface corrosion with section loss, especially on sidewalk supports. The abutments have severe cracking and spalling at the corners.

**Recommendations:** Rehabilitate or replace structure as funding allows.

2719 Atherton Road over Kearsley Creek

**Constructed:** 2008 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. The HMA/concrete joints are opening.

**Recommendations:** The SI&A appears to contain the load rating for the previous structure and should be updated. Seal HMA/concrete joints.

2720 Lapeer Road over Kearsley Creek

**Constructed:** 1992 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. There is minor spalling on the box beam fascias.

**Recommendations:** Remove brush. Patch barrier railing at anchorage. Patch beams.

2752 Irish Road over Kearsley Creek

**Constructed:** 2007 **Reconstructed:** N/A **General Condition:** Good/New

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings.

**Recommendations:** Seal concrete/HMA joints.

2753 Irish Road over Black Creek

**Constructed:** 1984 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a corrugated steel plate arch culvert with one concrete headwall (one slope), curbed HMA pavement and Type B guardrail. One small isolated area of leakage with corrosion was noted.

**Recommendations:** Repair failed outlet culvert adjacent to structure. Seal cracking in HMA surface.

2776 Lippincott Blvd. over Kearsley Creek

**Constructed:** 1939 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted steel pipe railings. Beams have corrosion with minor to moderate section loss on fascia beams and minor on interior. Bottom surface of deck and abutment faces have scattered spalling.

**Recommendations:** Repair approach guardrail. Remove brush. Clean and coat steel beams. Patch concrete deck and abutments.

2777 East Court Street over Kearsley Creek

**Constructed:** 2000 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. A guardrail end has sustained collision damage. Brush is encroaching on the structure.

**Recommendations:** Remove brush. Repair approach guardrail.

2778 Atlas Road over Kearsley Creek

**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, gravel surface and concrete balustrade railings Beams have moderate surface corrosion with limited section loss. Abutment has isolated spalling.

**Recommendations:** Install retrofit railings. Install HMA wearing surface with waterproofing membrane. Clean and coat steel beams.

2779 Atlas Road over Kearsley Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair/Posted

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface, and retrofitted concrete balustrade railings. Retrofit railings were not aligned properly over brush blocks. Beams have moderate surface corrosion and minor section loss. Abutments have critical cracking at corners and suspected tie-back supports.

**Recommendations:** Replace structure as funding allows. In the meantime, adjust retrofit railings.

**Fenton Township**

2780 Hogan Road over the Shiawassee River

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck, partially graveled surface and steel pipe railings. There is a failed section of pipe railing. Beams have surface corrosion and minor section loss. Bottom surface of deck has scattered spalling. Abutments have scattered moderate cracking.

**Recommendations:** Rehabilitate or replace the structure as funding is available. In the meantime, install retrofit railings.

2781 North Road over the Shiawassee River

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and concrete balustrade railings. Railings are cracked and spalled. Concrete fascias are spalled along bottom flange of beams. Beams have surface corrosion and limited section loss.

**Recommendations:** Install retrofit railings. Clean and coat steel beams. Patch HMA surface and concrete deck.

**Flint Township**

2560 Bristol Road over Swartz Creek

**Constructed:** 1999 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span precast concrete arch culvert with precast/MSE headwalls, curbed HMA pavement and Type B guardrails. Moderate cracking was observed in the HMA surface and hairline-minor cracking in the precast.

**Recommendations:** Monitor the gap in the southeast headwall for soil migration. Seal cracking in HMA surface. Remove brush.

2561 Bristol Road over Call Drain

2562 **Constructed:** 1957 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck and retrofitted open parapet railings. There are scattered coating failures on the beams.

**Recommendations:** Patch concrete deck. Remove brush. Repair railing.

2715 Bristol Road over W. Brach Swartz Creek

**Constructed:** 1940 **Reconstructed:** 1966 **General Condition:** Fair

**Description:** This is a single span precast concrete arch culvert with precast/MSE headwalls, curbed HMA pavement and Type B guardrails. Moderate cracking was observed in the HMA surface and hairline-minor cracking in the precast.

**Recommendations:** Place additional riprap on banks and slopes.

2717 Ballenger Highway over Swartz Creek

**Constructed:** 1928 **Reconstructed:** 1967 **General Condition:** Fair/Posted

**Description:** This is a single span steel bean bridge with concrete deck and barrier railing retrofits over previous metal railings.

**Recommendations:** Rehabilitate or replace structure as funding allows. Abutments appear to be salvageable.

2722 Linden Road over Chapman Drain

**Constructed:** 1978 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a twin corrugate metal culvert structure with concrete pavement and Type B guardrails. The pavement has moderate to severe longitudinal and transverse cracking with cold patch.

**Recommendations:** Replace failing timber wall in southeast. Seal cracking or replace joints in concrete pavement. Remove sediment from culverts. Place riprap on slopes.

2740 Linden Road over W. Branch Swartz Creek

**Constructed:** 1935 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck and retrofitted open parapet railings. Beams have progressing paint failure with surface corrosion and minor to moderate section loss, primarily near bearings. The bottom surface of deck has scattered spalling.

**Recommendations:** Clean and coat beams. Patch concrete deck.

2741 Grand Trunk Railroad over Linden Road

**Constructed:** 1985 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span riveted steel girder railroad over bridge. Girders have surface corrosion throughout.

**Recommendations:** Coordinate with railroad on maintenance and repairs.

2742 Mill Road over the Flint River

**Constructed:** 1935 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a five span side-by-side concrete box beam bridge with concrete deck and open parapet railings. The joints are severely deteriorated. There is critical debris on the upstream side of the piers.

**Recommendations:** Replace joints. Evaluate deck improvement options. Remove channel debris. Patch piers and abutments. Place riprap on slopes/banks.

2744 Ballenger Highway over the Flint River

**Constructed:** 1994 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a three span concrete I beam bridge with concrete deck and barrier railings between lanes and sidewalks. The approach slabs and HMA are severely deteriorated.

**Recommendations:** Remove brush. Remove channel debris. Patch railings. Repair or replace approach slabs and HMA pavement. Place riprap on slopes. Replace settled sidewalk.

2756 Linden Road over the Flint River

**Constructed:** 1974 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a three span (weathering) steel beam bridge with concrete deck and open parapet railings. There is minor section loss on beams at piers. There is heavy channel debris on piers.

**Recommendations:** Remove channel debris. Consider installing retrofit railings. Seal approach cracking. Replace joints. Repair grouted riprap.

2782 Maple Avenue over Swartz Creek

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck and retrofitted pipe railings. The bottom deck surface has scattered spalling. Interior beams have surface corrosion and minor section loss at bearings, minor to moderate section loss on fascia beams. Abutments have moderate to severe cracking and spalling.

**Recommendations:** Patch deck and abutments. Clean and coat beams. Repair joints. Remove brush. Place riprap on slopes.

2783 Dye Road over W. Branch Swartz Creek

**Constructed:** 1938 **Reconstructed:** 1996 **General Condition:** Fair/Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. New superstructure was constructed on original abutments. Abutments have surface spalling.

**Recommendations:** Review whether bridge is scour critical after 1996 reconstruction. Remove brush. Seal concrete/HMA joints and cracking in approaches. Repair curb spall and repair slope undermining curb. Patch abutments.

2784 Dye Road over Pirnie Creek

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span solid slab beam bridge with HMA wearing surface and solid concrete railings and approach guardrail (3 of 4 quadrants). Railings are short. HMA surface is new. Bottom surface of slab has honeycombing and spalling.

**Recommendations:** Consider installing retrofit railings. Patch bottom of slab.

2785 Claude Avenue over Swartz Creek

**Constructed:** 1957 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a single span side-by-side box beam bridge with concrete deck and steel panel railings. The structure is on end of dead end road with gate on south side.

**Recommendations:** Repair gates and consider additional signage. Remove channel debris.

2786 Torrey Road over Call Creek

**Constructed:** 1968 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span side-by-side box beam bridge with concrete deck and steel railings. The surface has widespread spalling with cold patch and ponding. There is cracking and delamination along the box beam joints

**Recommendations:** Install retrofit railings. Patch deck and install HMA wearing surface with waterproofing membrane. Place riprap on slopes.

12825 Bristol Road over GTW Railroad

**Constructed:** 1999 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span concrete I beam bridge with MSE walls, concrete deck and aesthetic parapet-type railings. The railings and sidewalks have minor to moderate map cracking. The structure crosses the railroad at a sharp skew.

**Recommendations:** Retrofit the south deck extension for better drainage.

13168 Linden Creek Parkway over Hewitt Drain

**Constructed:** 2000 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span precast concrete arch culvert with precast headwalls and wingwalls, curbed HMA pavement and guardrail-type railings.

**Recommendations:** Seal cracking in HMA pavement. Remove sediment from beneath structure. Place riprap beneath structure.

**Flushing Township**

2727 Mt. Morris Road over Brent Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span concrete tee beam bridge with HMA wearing surface and retrofitted solid concrete railings. Deck and beams are spalled, primarily at deck drains. Abutments are spalled on corners.

**Recommendations:** Patch deck, beams and abutments. Repair slope erosion and re-grade shoulders.

2728 Mt. Morris Road over the Flint River

**Constructed:** 1965 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a five span steel beam bridge with concrete deck and 3-tube railings. Beams have scattered surface corrosion, focused at joints with minor section loss. There is a large amount of channel debris.

**Recommendations:** Perform zone cleaning and coating on beams. Install retrofit railings. Remove channel debris. Repair expansion joints. Repair slope protection. Monitor scour at upstream end of west pier. Consider periodic special fatigue sensitive inspection focusing on pin and hanger connections.

2729 Mt. Morris Road over Armstrong Creek

**Constructed:** 1986 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a single span precast double tee culvert with concrete wingwalls, HMA pavement and Type B guardrail. The precast and abutments have scattered spalling.

**Recommendations:** Repair guardrail. Re-grade shoulders. Restore slopes. Patch precast.

2787 Nichols Road over Brent Creek

**Constructed:** 1926 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck and gravel surface. Beams have isolated honeycombing. Abutments have cracking and scaling in corners and an isolated severe crack.

**Recommendations:** Patch beams. Install retrofit railings. Install HMA wearing surface with waterproofing membrane.

2788 Stanley Road over Freeman Drain

**Constructed:** 1977 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a twin corrugated metal culvert structure with broken concrete headwalls, HMA pavement and Type B guardrails. Approach pavement is severely deteriorated and settling. There is a small area of bulging in the culvert (possibly a guardrail post).

**Recommendations:** Replace HMA pavement and guardrails.

2789 Morrish Road over Messmore and Cronk Drain

**Constructed:** 1986 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a twin corrugated metal arch culvert structure with grout bag headwalls, HMA pavement and Type B guardrails. There is a large amount of sediment in the north culvert.

**Recommendations:** Remove sediment from culverts. Place riprap on slopes.

**Forest Township**

12714 Wilson Road over Butternut Creek

**Constructed:** 1926 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railings with approach guardrails. The railings have severe scaling on interior faces. The abutment have corner spalling and scattered minor to moderate to severe cracking and spalling. Interior have scattered delamination and spalling. Fascia beams are spalled.

**Recommendations:** Patch beams and abutments.

**Gaines Township**

2707 Grand Blanc Road over Jones Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. The concrete deck and beams are spalled, primarily at deck drains.

**Recommendations:** Patch beams and deck. Patch abutment. Remove channel debris. Remove trees and brush.

2708 Grand Blanc Road over Cargill Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. The concrete deck and beams are spalled, primarily at deck drains. The abutments have scattered moderate to severe cracking.

**Recommendations:** Patch beams and deck. Seal cracking in HMA surface.

2733 Duffield Road over Jones Creek

**Constructed:** 1925 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railings. The railing faces and abutment corners are severely scaled. The beams are spalled, primarily fascia beams.

**Recommendations:** Install retrofit railings. Seal cracking or mill and replace HMA wearing surface with waterproofing membrane. Patch concrete beams. Place riprap on slopes.

2736 Morrish Road over Alger Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and steel pipe railings. The beams are spalled, primarily fascia beams at deck drains.

**Recommendations:** Install retrofit railings. Mill and replace HMA wearing surface with waterproofing membrane. Remove brush. Patch concrete beams.

2790 Cook Road over Jones Creek

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, gravel surface and solid concrete railings. There is delamination and spalling on the deck and beams.

**Recommendations:** Install retrofit railings. Place HMA wearing surface with waterproofing membrane. Patch concrete beams and deck. Remove brush.

2791 Reid Road over Jones Creek

**Constructed:** 1962 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck, gravel surface and three-tube railings. Concrete slope protection appears to be undermined slightly. There is evidence of leakage with migration of fines and isolated spalling along box beam joints.

**Recommendations:** Install retrofit railings. Place HMA wearing surface with waterproofing membrane. Place riprap beneath structure. Remove brush.

2792 Reid Road over Alger Creek

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, gravel surface and solid concrete railings. There are potholes with ponding in the surface. There is scattered moderate to severe cracking in the abutments. The fascia beams have limited spalling.

**Recommendations:** Install retrofit railings. Place HMA wearing surface with waterproofing membrane. Remove brush. Remove channel debris. Patch beams.

2793 Nichols Road over Jones Creek

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, gravel surface and steel pipe railings. The abutments have scattered moderate to severe cracking. Beams have isolated spalling.

**Recommendations:** Install retrofit railings. Place HMA wearing surface with waterproofing membrane. Cut culvert outlets back to current bank. Place riprap on slopes.

2870 Raubinger Road over Swartz Creek

**Constructed:** 2009 **Reconstructed:** N/A **General Condition:** New

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. There is honeycombing on the deck fascia. The HMA/concrete joints are opening.

**Recommendations:** Patch honeycombing on deck fascia. Seal HMA/concrete joints. Review/correct item 64M of the SI&A.

**Genesee Township**

2723 Richfield Road over Kearsley Creek

**Constructed:** 1962 **Reconstructed:** N/A **General Condition:** Poor

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and three-tube railings. The deck has extensive patching with re-spall. The beams have scattered severe spalling to prestressing strands. The abutments have severe to critical cracking and delamination at corners.

**Recommendations:** Structure is funded for rehabilitation improvements in fiscal year 2012.

2725 Carpenter Road over the Flint River

**Constructed:** 1948 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a two span steel beam bridge with concrete deck, HMA wearing surface and retrofitted steel panel railings. The beams have scattered coating loss and surface corrosion, concentrated near bearings with minor section loss. The joints are severely deteriorated.

**Recommendations:** Remove brush from slopes. Replace expansion joint. Perform zone cleaning and coating of beam ends.

2726 Coldwater Road over C&O Railroad

**Constructed:** 1972 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a four span (weathering) steel beam bridge with pin and hanger connections, concrete deck and open concrete parapet railings. Expansion joints were recently replaced with pin & hanger improvements.

**Recommendations:** Repair damage tube railing and patch concrete posts. Consider retrofit of railings to close gaps at joints. Repair approach guardrail. Remove brush from slopes. Consider periodic special fatigue sensitive inspection focusing on pin and hanger connections.

2731 Mt. Morris Road over Butternut Creek

**Constructed:** 1927 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railing with approach guardrail. The railing faces and abutment corners have severe surface scaling. The deck and beams are spalled at deck drains.

**Recommendations:** Patch/seal cracking in HMA surface. Patch concrete railings, beams, deck and abutments.

2748 Genesee Road over Kearsley Creek

**Constructed:** 1961 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a single span side-by-side box beam bridge with HMA wearing surface and retrofitted guardrail-type railings. The post tensioning pocket grout is spalling. Wearing surface and retrofit railings were recently installed.

**Recommendations:** Remove debris and trash from channel. Remove brush from structure. Patch post tensioning pocket grout and beams.

2749 Genesee Road over the Flint River/Mott Lake

**Constructed:** 1970 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span arched (weathering) steel beam bridge with concrete deck and barrier railings. The deck has scattered areas of spalling and previous patching. Bearings are leaning outward. There is scattered moderate to severe cracking in the abutments.

**Recommendations:** Depth of water limits inspection of abutments. An underwater inspection is required. Realign bearings. Patch concrete deck, railings and abutments. Repair heaved joint cover plate in sidewalk. Review whether structure is actually scour critical.

**Grand Blanc Township**

2705 Baldwin Road over C&O Railroad

**Constructed:** 2007 **Reconstructed:** N/A **General Condition:** Good/New

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. The surface has early map cracking and there are minor issues with the MSE walls.

**Recommendations:** Repair slope and tipped MSE section on end of return wall.

2710 Perry Road over the Thread River

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted concrete balustrade railings. The beams have progressing section loss. The abutments have scattered moderate to severe cracking. Up to 2 feet footing exposure was detected.

**Recommendations:** Rehabilitate or replace structure as funding allows.

2712 Hill Road over the Thread River

**Constructed:** 1995 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. The deck has hairline map and longitudinal cracking throughout and minor longitudinal cracking on the bottom flanges of beams.

**Recommendations:** Review whether structure is actually scour critical (constructed 1995). Remove brush. Repair approach guardrail. Seal HMA/concrete joints.

2746 Fenton Road over Seaver Drain

**Constructed:** 1981 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a twin multi-plate culvert structure with curbed HMA pavement and Type B guardrail. There is an area of minor bulging in the culvert wall.

**Recommendations:** Remove sediment from culverts. Seal cracking in HMA surface.

2747 Center Road over the Thread River

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted concrete balustrade railings. There is an area of severe spalling on the abutment corner. The concrete fascias are severely spalled. Beams have surface corrosion and minor section loss.

**Recommendations:** Remove brush. Patch concrete deck, fascias and abutments. Clean and coat beams. Remove channel debris and sedimentation. Place riprap on slopes.

2750 Belsay Road over the Thread River

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. There is isolated spalling on the bottom surface of deck and spalling on beams, primarily fascias and near abutments.

**Recommendations:** Remove channel debris and trash. Patch concrete beams and deck.

13384 Moonstone Drive over Thread Creek

**Constructed:** 2004 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a three span precast concrete arch culvert structure with concrete headwalls and wingwalls, curbed HMA surface and Type B guardrail. There are several sink holes near catch basins in the approach. Slope erosion is undermining the sidewalk. The precast has hairline cracking.

**Recommendations:** Repair sink holes around catch basins. Restore slope undermining sidewalk.

**Montrose Township**

2794 Frances Road over Armstrong Drain
**Constructed:** 1925 **Reconstructed:** N/A **General Condition:** Fair
**Description:** This is a single span concrete tee beam bridge with concrete deck and solid concrete railings with approach guardrail. The concrete/HMA joints are severely deteriorated. The deck surface has moderate scaling. The bottom surface is spalled around deck drains.
**Recommendations:** Install retrofit railings. Resurface approaches and place wearing surface on the structure. Pack the deck.

2795 Wilson Road over Central Drain
**Constructed:** 1971 **Reconstructed:** N/A **General Condition:** Fair
**Description:** This is a single span timber bridge with timber panel deck, gravel surface and guardrail-type railings. The abutment lagging is being undermined.
**Recommendations:** Install retrofit railings. Consider installing HMA wearing surface. Place riprap to protect abutment lagging.

2796 Willard Road over Pine Run Creek
**Constructed:** 2003 **Reconstructed:** N/A **General Condition:** Good
**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. There is hairline longitudinal cracking in the fascia beams.
**Recommendations:** Repair broken guardrail post in northeast.

2797 McKinley Road over Brent Run
**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair/Poor
**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted concrete balustrade railings. The fascia beams have severe section loss. Interior beams have minor to moderate loss at bearings and surface corrosion elsewhere.
**Recommendations:** Repair damaged guardrail. A detailed inspection of beams and updated load rating is recommended. Clean and coat beams or replace beams depending on capacity (operating rating indicates 77 tons).

2798 Morrish Road over Armstrong Drain
**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Poor/Posted
**Description:** This is a single span steel beam bridge with concrete deck, gravel surface and steel pipe railings. The beams have severe to critical section loss with holes cut in several webs.
**Recommendations:** Structure is scheduled for rehabilitation improvements in fiscal year 2013.

2799 Morrish Road over Central Drain
**Constructed:** 1971 **Reconstructed:** N/A **General Condition:** Fair
**Description:** This is a single span timber bridge with timber deck panels, gravel surface and guardrail-type railings. The channel is attacking the south abutment.
**Recommendations:** Install retrofit railings. Consider installation of HMA wearing surface. Adjust hardware on spreader beam. Repair southwest pile cap. Remove tree and brush growth. Remove channel debris.

2800 Morrish Road over Brent Run

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. The HMA surface is severely deteriorated.

**Recommendations:** Mill and resurface structure and approaches. Re-grade shoulders. Restore slope erosion.

12600 Dodge Road over Armstrong Creek

**Constructed:** 1970 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a twin corrugated metal culvert structure with HMA pavement and (low) Type B guardrails. There is a large amount of channel debris on the structure. The culvert pipes have minor deformation and minor surface corrosion along the waterline and scattered joints.

**Recommendations:** Remove channel debris. Adjust guardrail to meet height criteria. Remove trees and brush.

12617 McKinley Road over Armstrong Creek

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a two span concrete box culvert with HMA pavement, concrete wingwalls and (low) Type B guardrails. There is an isolated area of delamination on the soffit. The wingwalls have scattered cracking and spalling. The pier end has moderate abrasion..

**Recommendations:** Remove sediment. Adjust guardrails. Remove fencing from channel.

**Mt. Morris Township**

2730 Mt. Morris Road over Brent Run

**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railing with approach guardrail. The railing faces have severe surface spalling/scaling. The fascia beams and abutment corners are spalled.

**Recommendations:** Patch beams and abutments. Place riprap on banks.

2737 Elms Road over the Flint River

**Constructed:** 1967 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a three span steel girder bridge with concrete deck and retrofitted 3-tube railings. A new concrete wearing surface was recently constructed. The bottom surface of deck has scattered spalling.

**Recommendations:** Remove brush. Repair slope paving. Patch deck. Consider periodic special fatigue sensitive inspection focusing on pin and hanger connections.

12833 Detroit Street over Hughes Drain

**Constructed:** 1985 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a two span precast concrete box culvert structure with concrete headwalls and wingwalls, HMA surface and Type B guardrails. There is minor spalling around I and along joints between precast sections. The north culvert is mostly blocked with brush and sediment buildup.

**Recommendations:** Remove brush and sediment. Repair or replace guardrails. Seal cracking in HMA surface.

**Mundy Township**

2704 Baldwin Road over Swartz Creek

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railing. The deck and beams are spalled, primarily near deck drains.

**Recommendations:** Remove channel debris. Patch concrete beams and deck.

2709 Grand Blanc Road over Swartz Creek

**Constructed:** 1936 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted concrete balustrade railing. The beams have progressing section loss and the abutments have severe to critical cracking and spalling (likely beyond salvage).

**Recommendations:** Replace the structure as funding is available. In the meantime, consider a special inspection to access beams, measure section loss and update load rating. Remove channel debris.

2711 Hill Road over Swartz Creek

**Constructed:** 1966 **Reconstructed:** 1994 **General Condition:** Good

**Description:** This is a single span steel beam bridge with concrete deck with concrete barrier railings. There are spot failures of beam pain with surface corrosion. The concrete deck is deteriorating at the joints.

**Recommendations:** Seal/patch cracking and spalling at joints. Perform spot cleaning and coating on beams. Replace the joint seal between vehicular and pedestrian sections of the deck. Review whether structure is still scour critical after 1994 reconstruction.

2743 Torrey Road over Swartz Creek

**Constructed:** 1928 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface, and concrete balustrade railings with short approach guardrail sections. The railings and concrete fascias are spalled. Beams have surface corrosion and minor section loss.

**Recommendations:** Install retrofit railings. Clean and coat beams. Install riprap beneath structure.

2745 Fenton Road over Swartz Creek

**Constructed:** 1981 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a twin multi-plate culvert structure with curbed HMA pavement and Type B guardrail. The upstream side has a concrete headwall. There is an isolated area of severe bulging inside the culvert pipe.

**Recommendations:** Remove brush from slopes. Monitor bulging on interior of culvert. Remove sediment from upstream channel. Seal cracking in HMA surface.

2755 Linden Road over Howland Drain

**Constructed:** 1985 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a twin multi-plate culvert structure with curbed HMA pavement. The upstream side has a concrete headwall and Type B guardrail. The downstream end of the culverts is perched ~18".

**Recommendations:** Place riprap on slopes. Restore channel bed. Seal cracking in HMA surface.

2802 Cook Road over Swartz Creek

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railings. The fascia beams and deck are spalling at deck drains. The abutment corners are spalling.

**Recommendations:** Install retrofit railings. Patch concrete beams, deck and abutments. Mill and replace HMA wearing surface with waterproofing membrane.

2803 Reid Road over Swartz Creek

**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and balustrade railings. A large section of railing has failed from progressed spalling. There is a large amount of debris beneath the structure. Fascia beams have moderate section loss. Interior beams have moderate loss at bearings, minor elsewhere.

**Recommendations:** Install posting signage (currently coded 40/48/57). Rehabilitate or replace the structure as funding is available. In the meantime, install retrofit railings. Remove channel debris.

2804 Jennings Road over Swartz Creek

**Constructed:** 1900 **Reconstructed:** 1973 **General Condition:** Critical/Posted

**Description:** This is a single lane, single span side-by-side concrete box beam bridge with partially graveled surface and guardrail-type railings. The tops of box beams are severely spalled with repair plate on east side. Beams have severe spalling along joints with failed strands. Abutments are severely abraded.

**Recommendations:** Replace the structure as funding is available. In the meantime, install retrofit railings. Remove channel debris.

2805 Cook Road over Indian Creek

**Constructed:** 1979 **Reconstructed:** N/A **General Condition:** Fair/Good

**Description:** This is a twin multi-plate culvert structure with gravel surface. The culverts have minor surface corrosion at the waterline. There is a large amount of sediment in the west pipe.

**Recommendations:** Remove trees and brush. Remove sediment from pipes. Evaluate the need for railings.

12832 Cook Road over Dawe Drain

**Constructed:** 1998 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span precast concrete arched box culvert with gravel surface and backed Type B guardrail over structure. There is minor spalling and scaling on the precast.

**Recommendations:** Consider installing HMA wearing surface. Patch spalling on precast.

**Richfield Township**

2724 Richfield Road over Cullen-Powers Drain

**Constructed:** 1978 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a twin corrugate metal pipe culvert structure with stone/grout bag headwalls, curbed HMA pavement and Type B guardrails. There are several offset joints and heavy debris in west pipe.

**Recommendations:** Remove sediment and brush/trees. Repair headwalls and place additional riprap.

2754 Irish Road over the Flint River

**Constructed:** 2008 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a two span concrete I beam bridge with concrete deck and barrier railings.

**Recommendations:** Remove channel debris from pier.

2806 Oak Road over the Flint River

**Constructed:** 2007 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a two span side-by-side concrete box beam bridge with concrete deck and barrier railings. There is hairline cracking in the deck surface.

**Recommendations:** Remove channel debris from pier. Review the coding in the load rating area of the SI&A form.

**Thetford Township**

2807 Frances Road over Butternut Creek

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and steel pipe railings. The deck is severely spalled. The beams have moderate to severe section loss.

**Recommendations:** Install retrofit railings. A detailed inspection of the beams with updated load rating is recommended.

2808 Vassar Road over Butternut Creek

**Constructed:** 1930 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span concrete tee beam bridge with HMA wearing surface and solid concrete railings. Beams and deck are spalled at deck drains.

**Recommendations:** Install retrofit railings (repair damaged area). Seal cracking in surface. Patch beams and deck.

2809 Scott Road over Drudge and Buell Drain

**Constructed:** 1979 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a twin corrugated metal culvert structure with HMA pavement and Type B guardrails. There is a large amount of debris on the upstream end. There is minor surface corrosion of the culverts at the waterline. The culvert pipes have minor deformation and offset joints.

**Recommendations:** Remove channel debris. Repair slope washouts. Place riprap around culvert ends.

2810 Scott Road over Wilbur Drain

**Constructed:** 1988 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a twin corrugated metal culvert structure with HMA pavement and Type B guardrails. There is a large amount of brush and sediment around culvert ends.

**Recommendations:** Remove brush and sediment. Remove channel debris.

**Vienna Township**

2732 Dodge Road over Brent Run

**Constructed:** 1926 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railings with discontinuous approach guardrail. The fascia beams and abutment corners are spalled.

**Recommendations:** Install retrofit railings. Patch beams and abutments.

2738 Elms Road over Brent Run

**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railings with approach guardrail.. The beams, primarily fascia, and deck are spalled.

**Recommendations:** Seal cracking in HMA surface. Patch concrete beams and deck.

2739 Elms Road over Pine Run

**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. The fascia beams are spalled and there is cracking in the HMA wearing surface.

**Recommendations:** Seal cracking in HMA surface. Patch concrete beams.

2801 Frances Road over Brent Run

**Constructed:** 1925 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, gravel surface and solid concrete railings with approach guardrail. The deck and beams have scattered minor spalling.

**Recommendations:** Remove channel debris. Install HMA wearing surface with waterproofing membrane.

2811 Bingham Road over Benjamin Run Creek

**Constructed:** 1973 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span timber structure with timber deck panels, HMA wearing surface and guardrail-type railings. Abutment lagging is being undermined.

**Recommendations:** Repair guardrail. Review load rating area of SI&A form (77 tons coded).

2812 Wilson Road over Benjamin Run

**Constructed:** 2008 **Reconstructed:** N/A **General Condition:** Good

**Description:** This is a single span side-by-side concrete box beam bridge with concrete deck and barrier railings. The approach guardrail has minor collision damage.

**Recommendations:** Remove brush and trees. Install retrofit railings. Place riprap to protect abutment lagging.

2813 Farrand Road over Pine Run

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Poor/Posted

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted steel pipe railing. The HMA approach pavement is failing. Approach slopes are very steep and eroding. Beams have severe corrosion and section loss. Deck has scattered spalling. Abutments have scattered moderate to severe cracking.

**Recommendations:** Rehabilitate or replace structure as funding allows.

2814 Lake Road over Pine Run

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Fair/Poor

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted steel pipe railing. Beams have areas of moderate section loss but scattered surface corrosion elsewhere. Abutment has isolated moderate cracking.

**Recommendations:** Clean and coat steel beams.

2815 Wilson Road over Brent Run

**Constructed:** 1938 **Reconstructed:** N/A **General Condition:** Poor/Critical

**Description:** This is a single span steel beam bridge with concrete deck, HMA wearing surface and retrofitted steel pipe railing. The north railing is failed from severe collision damage. The deck has several steel plates to mitigate severe spalling. The beams have minor to moderate section.

**Recommendations:** Replace deck and railings. Clean and coat beams.

2816 Webster Road over Pine Run

**Constructed:** 1973 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span timber structure with timber deck panels, HMA wearing surface and retrofitted guardrail-type railings. There are several downed trees in the channel.

**Recommendations:** Remove channel debris. Repair northeast wingwall.

2817 Linden Road over Brent Run

**Constructed:** 1931 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted solid concrete railings. There are two large cross culverts adjacent to structure. Abutments have moderate to severe cracking (critical in southeast) and surface spalling/scaling. Fascia beams are spalled.

**Recommendations:** Remove channel debris. Repair northeast wingwall. Patch beams. Remove trees and brush.

2818 Linden Road over Pine Run

**Constructed:** 1929 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and solid concrete railings.

**Recommendations:** Install retrofit railings.

2819 Linden Road over Pine Run

**Constructed:** 1937 **Reconstructed:** N/A **General Condition:** Fair

**Description:** This is a single span concrete tee beam bridge with concrete deck, HMA wearing surface and retrofitted pipe railings. The abutments have scattered moderate cracking. The fascia beams are spalled.

**Recommendations:** Remove channel debris. Patch beams. Repair guardrail terminals in northwest and southeast. Repair slope washouts.

MICHIGAN TRANSPORTATION ASSET MANAGEMENT COUNCIL

To view the ***Asset Management Guide for Local Agency Bridges in Michigan***, visit our website at:

**www. michigan.gov/tamc**

Brian Sanada – Asset Management Coordinator

Phone: 517-373-2220

Email: sanadab@michigan.gov