



Louisiana Department of Transportation and Development

2019 Federal NHS Transportation Asset Management Plan

Statement of Adoption

Louisiana Revised Statutes 36:501 through 36:509 grants broad authority to the Secretary of the Department of Transportation and Development in establishing transportation policy for the State of Louisiana. Under this authority, I hereby adopt the 2019 Federal NHS Transportation Asset Management Plan as the official state asset management plan for the State of Louisiana on the 27th day of June 2019.

for 

Shawn Wilson, Ph.D.

Secretary

Department of Transportation and Development

Table of Contents

Table of Contents	1
List of Tables.....	6
List of Figures	7
1.0 Introduction.....	1-1
1.1 Federal Funding Match Shortfall	1-1
1.2 Transportation Asset Management.....	1-1
Federal Legislation	1-1
Focused Intent on Preservation.....	1-2
LADOTD’s Support for Asset Management	1-2
1.3 Terms And Definitions.....	1-3
1.4 Map-21 Requirements	1-3
Federal Legislation & Performance Requirements.....	1-3
Mandated Pavement Data Quality Management Program	1-4
1.5 Guiding Principles of LADOTD’s Asset Management Program	1-4
1.6 TAMP Requirements	1-5
1.7 TAMP Structure.....	1-6
1.8 TAMP Oversight and Management	1-8
1.9 Initial Scope of the TAMP	1-9
2.0 Asset Management Structure, Plans, and Tools	2-1
2.1 Introduction	2-1
2.2 Asset Management Business Structure	2-1
2.3 TAM Relationship to Other Business Plans.....	2-4
Existing Business Plans	2-5
Interaction of TAMP and Other Plans	2-12
2.4 TAM Tools	2-12
3.0 Asset Inventory and Traffic Volumes.....	3-1
3.1 Introduction	3-1
Federal Requirement.....	3-1
Budget and Analysis Categories (Asset Classes)	3-1
3.2 Pavement System Summary.....	3-2
Pavement Asset Classes	3-2
Data Snapshots	3-2

Terms used for Pavement Analysis	3-3
Inventory of State Maintained Pavements	3-3
Pavement Treatment Age.....	3-6
3.3 Bridge System Summary	3-7
State Maintained Bridge Inventory.....	3-7
Age of Bridges	3-8
3.4 Addressing Large Outlier Bridges	3-10
3.5 System Travel Demand (Traffic Volumes).....	3-12
Urban – Rural Travel Demand Trends	3-12
Travel Demand Trends	3-12
Travel Demand by Pavement Category (Asset Class)	3-13
Summary of Travel Demand Analysis Conclusions	3-14
3.6 Ongoing System Asset Inventory Reduction	3-15
Addressing Regional Highway System Issues	3-15
4.0 Asset Condition Measures & Data	4-1
4.1 Introduction	4-1
4.2 Pavement Performance Measures	4-1
Federal Performance Metrics	4-1
Federal Condition Assessment Criteria	4-2
Pavement Management System (PMS) Condition Metrics.....	4-2
PMS Condition Assessment Criteria.....	4-3
Federal and PMS Differences.....	4-4
4.3 Pavement Data Collection	4-5
Federal Data Collection	4-5
Local NHS Pavement Information and Assumptions	4-6
4.4 Assessing Historical Federal Performance	4-7
Missing Historical Federal Data	4-7
4.5 Bridge Condition Data	4-8
Bridge Condition Data Collection.....	4-8
Bridge Performance Measures	4-8
5.0 Targets, Performance and GAP Analysis.....	5-1
5.1 Introduction	5-1
5.2 Federal Funding Match	5-1
5.3 Method for Setting Performance Targets	5-1
5.4 Federal Pavement Performance Penalty	5-2

5.5	Desired State of Good Repair (DSGR) Requirement.....	5-3
5.6	Gap Analysis Requirements.....	5-4
5.7	Pavement Desired State of Good Repair Defined	5-4
5.8	Pavement DSGR Assessment and GAP Analysis.....	5-4
5.9	Federal Performance Target Requirements	5-6
5.10	Projecting Federal Pavement Performance	5-6
	Issues with Pavement Data for Federal Targets	5-6
	Other Target Setting Factors.....	5-8
5.11	2018 Federal NHS Pavement Targets.....	5-9
	2019 Federal NHS Pavement Data Update.....	5-9
5.12	Federal Bridge Performance Penalty	5-10
5.13	Bridge Desired State of Good Repair Defined	5-11
5.14	Bridge DSGR Assessment and GAP Analysis.....	5-12
	Alternative Strategies for Closing Identified GAPs	5-14
5.15	Projecting Federal Bridge Performance	5-17
	Bridge Target Setting Factors.....	5-17
5.16	2018 Federal NHS Bridge Targets	5-19
6.0	Life Cycle Planning	6-1
6.1	Introduction	6-1
	Worst First to Preservation First.....	6-1
6.2	Life Cycle Planning Concept.....	6-2
6.3	Consequences of Delayed Pavement Preservation Treatments.....	6-4
	Actual Consequences of Delayed Bridge Preservation	6-5
	Consequences of Delayed Preservation on Maintenance Costs	6-5
6.4	Life Cycle Planning Methodology	6-6
6.5	Mandated Management Systems.....	6-8
6.6	Pavement Life Cycle Planning.....	6-10
	Life Cycle Planning Analysis	6-10
	Pavement Preservation Program.....	6-11
	Pavement Project Selection Process	6-11
	Pavement Condition Deterioration Modeling.....	6-12
	Pavement Treatments (Work Types)	6-13
	Pavement LCP Strategies	6-16
	Analysis of Historical Pavement Projects	6-17
	Analysis of Pavement Maintenance Activities	6-17

6.7 Bridge Life Cycle Planning	6-18
Life Cycle Planning Analysis	6-18
Bridge Preservation Program (PRBR)	6-19
Bridge Project Selection Process	6-20
Bridge Condition Deterioration Modeling	6-22
Bridge LCP Strategies	6-23
Bridge Treatments (Work Types)	6-25
Analysis of Historical Bridge Projects	6-27
Analysis of Bridge Maintenance Activities	6-28
Large NHS Bridge Rehabilitation Projects	6-29
7.0 Risk Management Analysis	7-1
7.1 Introduction	7-1
Risk Management Concepts	7-1
Existing Risk Management at LADOTD	7-1
Risk Management Analysis Requirements	7-3
7.2 Levels of Risk Management	7-3
7.3 Risk Methodology	7-5
Initial Risk Assessment	7-5
2019 Updated Risk Assessment	7-6
Top-Rated Risks	7-6
7.4 2019 Risk Registers	7-7
7.5 Risk Mitigation and Monitoring Plan	7-9
7.6 Facilities in the State Repeatedly Damaged By Emergency Events	7-14
Part 667 Methodology	7-15
Part 667 Active Program	7-16
Roadway Flood Mitigation Program	7-17
7.7 Three R's - Redundancy, Robustness, Resiliency	7-19
Three R's	7-20
3 R Practices	7-20
7.8 Role of Risk Management in the Asset Management Process	7-21
7.9 Future Risk Register Updates	7-21
8.0 Financial Plan and Asset Valuation	8-1
8.1 Introduction 8-1	
Financial Plan Concepts	8-1
Financial Plan Development	8-1

8.2 Financial Plan	8-2
Methodology.....	8-2
8.3 Overall Financial Resources.....	8-3
Funding Sources	8-3
8.4 Overall Budget Allocation Process.....	8-4
Confusion about State & Federal Funding Use Flexibility.....	8-4
Funding Uses	8-5
8.5 Historical Funding Levels.....	8-6
8.6 Projected Funding Levels.....	8-9
Capacity Budget Eliminated.....	8-9
Federal Funding Match.....	8-9
8.7 TAMP Relevant Funding	8-10
8.8 Asset Valuation	8-11
GASB 34	8-11
Asset Valuation Method.....	8-11
Pavement Asset Valuation	8-11
Bridge Asset Valuation	8-12
9.0 Investment Strategies	9-1
9.1 Introduction	9-1
Investment Strategy Concepts.....	9-1
Federal Funding Match.....	9-1
Investment Strategy Requirements	9-2
9.2 Overall Investment Strategies	9-2
9.3 Investment Strategy Program Development	9-3
9.4 Investment Scenario Approach	9-4
Defining Investment Scenarios	9-4
9.5 LADOTD Investment Scenarios	9-5
11 th Hour Bridge Investment Scenario Analysis Update	9-7
Investment Strategies Accomplish 23 CFR 515.9(f) Requirements	9-8
Complexities of Transportation Projects.....	9-9
Project Selection	9-9
10.0 Asset Management Enhancements	10-1
10.1 Introduction	10-1
10.2 Asset Management Organizational Efforts	10-1
TAMP Maturity Analysis	10-1

10.3 Additional Planned Enhancements.....	10-3
Consistency Determination & FHWA TAMP Work Types	10-3
Cross-Asset Resource Allocation Analysis	10-3
Bridge Management System.....	10-4
Maintenance Management System	10-4
Additional Asset Classes	10-4
Data Improvement Strategies.....	10-5
Risk Management Strategies	10-6
Policy and Procedural Support	10-7
Life Cycle Planning Strategies	10-7
Communication Plan	10-7
10.4 TAMP Update Process	10-8
11.0 Appendices	11-1
11.1 Terms And Definitions.....	11-1
Terms & Definitions.....	11-1
11.2 LADOTD Revenue and Budget Allocation Descriptions	11-3
Revenue	11-3
Expenditures	11-3
11.3 LADOTD Transportation Trust Fund Distribution	11-5
11.4 LADOTD Pavement Treatment Details.....	11-6
Additional Explanation of Pavement Treatments (Work Types) Including Non-PMS Activities	11-6
11.5 LADOTD 10 Year Pavement & Bridge Projected Budget.....	11-10
11.6 LADOTD State FY 19-20 Budget Partition (2 pages).....	11-11

List of Tables

Table 3.1 State Pavement Asset Inventory	3-4
Table 3.2 Changes in Average NHS Pavement Treatment Age.....	3-7
Table 3.3 State Bridge Asset Inventory	3-8
Table 5.1 2018 Federal NHS Pavement Targets.....	5-9
Table 5.2 Interstate Pavement Conditions.....	5-9
Table 5.3 Non-Interstate NHS Pavement Conditions.....	5-9
Table 5.4 Local NHS Pavement Conditions.....	5-10
Table 5.5 NHS Deck Area by NBI Ratings.....	5-18
Table 5.6 2018 Federal NHS Bridge Targets.....	5-19

Table 6.1 Average In-House Pavement Surface Maintenance Costs	6-6
Table 6.2 Mandated Management System Requirements	6-9
Table 6.3 FHWA Pavement Work Type Crosswalk Details.....	6-14
Table 6.4 Asphalt Pavement Treatment (Work Types) Descriptions and Costs	6-15
Table 6.5 Composite Pavement Treatment (Work Types) Descriptions and Costs.....	6-15
Table 6.6 Jointed Concrete Pavement Treatment (Work Types) Descriptions and Costs.....	6-15
Table 6.7 Continuously Reinforced Concrete Pavement Treatment (Work Types) Descriptions and Costs.....	6-15
Table 6.8 FMIS Pavement Expenditures by Federal TAMP Work Type	6-17
Table 6.9 Pavement MMS Maintenance Expenditures.....	6-18
Table 6.10 Bridge Life Cycle Strategy Example	6-24
Table 6.11 FHWA Bridge Work Type Crosswalk Details	6-25
Table 6.12 FMIS Bridge Expenditures by Federal TAMP Work Type	6-27
Table 6.13 Summary of Bridge Maintenance Activities for SFY 2018	6-28
Table 6.14 NHS Bridge Projects Greater Than \$10 Million.....	6-29
Table 7.1 2019 Departmental Level Risk Register	7-7
Table 7.2 2019 Program Level Risk Register	7-8
Table 7.3 2019 Project Level Risk Register	7-9
Table 7.4 Departmental Level Risk Mitigation & Monitoring Plan.....	7-11
Table 7.5 Program Level Risk Mitigation & Monitoring Plan	7-12
Table 7.6 Project Level Risk Mitigation & Monitoring Plan	7-13
Table 8.1 Historical Budget Recap.....	8-8
Table 8.2 10-Year Preservation Budget Projections	8-10
Table 8.3 Interstate Asset Valuation.....	8-12
Table 8.4 Non-Interstate NHS Asset Valuation.....	8-12
Table 8.5 NHS Bridge Asset Valuation.....	8-13

List of Figures

Figure 2.1 LADOTD Asset Management Organization Chart	2-2
Figure 2.2 Asset Management Support Structure	2-3
Figure 2.3 Interrelationship Between TAMP and other DOT Plans	2-12
Figure 3.1 Percent PMS Analysis Lane-Miles by Asset Class	3-4
Figure 3.2 Percent Federal Analysis Lane-Miles by Asset Class.....	3-5
Figure 3.3 Percent of PMS Interstate Analysis Lane Mileage	3-5

Figure 3.4 PMS Non-Interstate NHS Lane Mileage 3-6

Figure 3.5 Percent of Federal Interstate Analysis Mileage..... 3-6

Figure 3.6 Percent of Non-Interstate NHS Analysis Lane Mileage..... 3-6

Figure 3.7 Count of Bridges Built By Decade (State Maintained)..... 3-9

Figure 3.8 Deck Area of Bridges Built By Decade (State Maintained) 3-10

Figure 3.9 VMT Urban & Rural Trends 3-13

Figure 3.10 Percent VMT for State Maintained System..... 3-14

Figure 5.1 Good & Fair Projections by Pavement Condition Index 5-6

Figure 5.2 Initial Federal Good, Fair, Poor to PPI Logistic Curve 5-7

Figure 5.3 SD Condition for Historical (green) & Forecasted (blue) NHS Bridge 5-15

Figure 5.4 Good, Fair & Poor Conditions for Historical & Forecasted NHS Bridge 5-16

Figure 6.1 Life Cycle Cost and Preservation Intervals 6-4

Figure 6.2 Proactive Preservation vs. No Preservation..... 6-8

Figure 7.1 Levels of Risk..... 7-4

Figure 7.2 Risk Matrix..... 7-5

Figure 7.3 Flood Mitigation Project Selection 7-19

Figure 8.1 LADOTD SFY 2017-2018 Funding Sources (millions)..... 8-3

Figure 8.2 LADOTD SFY 2017-2018 Funding Uses (millions)..... 8-6

Figure 8.3 Projected Budget Partition Percentages 8-9

1.0 Introduction

Asset Management principles have been discussed worldwide by transportation agencies since the late 1990's. One of the earliest and still one of the most relevant definitions of Asset Management was provided by The American Public Works Association Asset Management Task Force in 1998 as,

“...a methodology needed by those who are responsible for efficiently allocating generally insufficient funds amongst valid and competing needs.”¹

With LADOTD's projected funding availability, this definition certainly still holds true.

1.1 FEDERAL FUNDING MATCH SHORTFALL

Federal Match Shortfalls. The use of federal funds requires a state DOT to provide a matching amount of funds. LADOTD had recently been using toll credits to meet the federal match requirement, but toll credits are no longer available. The existing state funds are either obligated or insufficient to meet the federal funding match.

This dire federal funding match shortfall situation has been stated often and repeatedly to the member of the Legislature for a number of years and the day of reckoning is now upon us.

The Legislature now must somehow provide appropriate funding for federal match; however, if the Legislature does not provide the federal matching funds, LADOTD will not accomplish the DSGR or achieve the performance targets, and will experience a penalty assessment in the very near future.

This situation will only be further exasperated if the Federal government follows through on the predicted substantial increase in federal funding for transportation assets.

1.2 TRANSPORTATION ASSET MANAGEMENT

Federal Legislation

The 1956 Eisenhower Interstate System (Federal-Aid Highway Act of 1956) and the German Autobahn have both proven that world class transportation systems foster economic growth, international and domestic commerce, and tourism.

¹ FHWA Office of Asset Management, Asset Management Primer, December 1999

Congressional leaders understand that these world class systems cannot be allowed to fall out of a “State of Good Repair”, so in 1991 it began to take a series of progressive legislative steps designed to facilitate the ongoing transformation of policy, planning and asset management necessary to improve the accountability required to sustain the immensely valuable National Highway System (NHS).

(ISTEA) 1991 - Intermodal Surface Transportation Efficiency Act

o *National Highway System (NHS) Established*

(TEA-21) 1998 - Transportation Equity Act for the 21st Century

o *FHWA Office of Asset Management Created*

(SAFETEA-LU) 2005 - Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

(MAP-21) 2012 - Moving Ahead for Progress in the 21st Century Act

(FAST Act) 2015- Fixing America’s Surface Transportation

Focused Intent on Preservation

This Transportation Asset Management Plan (TAMP) is a performance-based document, not a needs document. This document is focused on NHS Pavement and Bridge asset performance assessments and outcomes. Capacity needs are not considered or discussed in this document..

Preservation First Strategy. With the introduction of MAP-21, there is a focused intent to eliminate the historical “Worst First” practice of asset replacement with a strategy of “Preservation First” for all Interstate and NHS road and bridge assets. Like most states, Louisiana has historically leaned toward the “Worst First” approach.

There is a significant amount of literature that very clearly establishes and substantiates the fact that a “Preservation First” strategy is the most cost-effective strategy for pavement and bridge assets. This strategy effectively results in a spending approach that uses limited available funding on many more assets, essentially preserving these asset in as close to their current condition as possible, a state of good repair, and not spending the money replacing a small number of assets in far worse condition.

LADOTD’s Support for Asset Management

LADOTD strongly embraces the concept and principles of Asset Management along with the Congressional legislation and the direction that it provides. In fact, LADOTD believes that it justifies the ongoing efforts to move asset preservation to the forefront, increasing the opportunity to maximize the functional life of assets and providing the means to minimize risks and improve the long term sustainability of Louisiana’s pavements and bridges.

Asset management means a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the life cycle of the assets at minimum practicable cost.

23 CFR Part 515.5

The mission of LADOTD is to plan, design, build and sustain a safe and reliable multimodal transportation and infrastructure system that enhances mobility and economic opportunity.

While LADOTD endeavors to provide a world class transportation system to the state of Louisiana; these Congressional mandates, and the required development of this TAMP, along with sufficient funding, will enhance that effort.

1.3 TERMS AND DEFINITIONS

Please see Appendix 11.1 for an extensive list of terms and definitions relevant to this document.

1.4 MAP-21 REQUIREMENTS

Federal Legislation & Performance Requirements

Recent Congressional legislation made a concerted effort to define how federal transportation funds are allocated, with a major concentrated focus on asset preservation and sustainability. This legislation provides certain mandates that are designed to transform the framework for making investments in the federal transportation infrastructure, while seeking to maximize preservation strategies.

This legislation further codifies how the FHWA will hold State DOTs accountable as they move towards a performance-based highway asset management program, with additional life cycle planning requirements, as well as requiring a new documented focus on risk management.

Penalty Assessments. Penalty assessments, for failure to comply with minimum pavement and bridge standards for the National Highway System (NHS) or failure to develop and implement a Transportation Asset Management Plan (TAMP), are now part of the FHWA's arsenal to mandate compliance and adherence to these laws.

The impact of these penalty assessments would be a loss of significant available funding for the remaining non-NHS state maintained federal aid eligible pavements and bridges due to the mandated redistribution of these funds to NHS assets as long as those NHS assets do not meet the minimum federal NHS requirements.

23 USC 150 (b)(2) identifies one of the national goals is **“to maintain the highway infrastructure asset system in a state of good repair”** for the NHS. A state of good repair is defined by the FHWA as “a condition in which the existing physical assets, both individually and as a system (a) are functioning as designed within their useful service life, (b) are sustained through regular maintenance and replacement programs.”

The following passages summarize the legislative requirements.

“The cornerstone of MAP-21’s highway program transformation is the transition to a performance and outcome-based program. States will invest resources in projects to achieve individual targets that collectively will make progress toward national goals.”²

Throughout this document, specific legislation will be identified to aid in the understanding of why certain aspects of asset management are included in this document.

Mandated Pavement Data Quality Management Program

To further reinforce the mandate for data driven decisions for all aspects of Asset Management, **23 CFR Part 490.319(c)** mandated that State DOTs implement a Pavement Data Quality Management (DQM) Program by May 20, 2018. Compliance with this mandate was not only subject to FHWA approval, it is an ongoing requirement for the FHWA’s consistency determination and has a number of documented requirements.

LADOTD has collected digital pavement data for over 20 years using contracted ARAN vehicles, once again placing LADOTD in an early adopter leadership position with respect to all other DOTs. Evidence of LADOTD’s elevated leadership status for “data quality assurance” among all state DOTs is found in the FHWA produced 2013 document titled “Practical Guide for Quality Management of Pavement Condition Data Collection”. LADOTD’s data quality assurance and data quality control procedures were frequently referenced throughout that entire document with a synopsis showcasing LADOTD’s “best of breed” model operation found in that document’s “Appendix D. Case Study— Louisiana DOTD”.

DQM Program Compliance. LADOTD achieved compliance with this federal mandate, by updating existing documents, protocols and procedures to addresses all of the appropriate DQM Program requirements.

1.5 GUIDING PRINCIPLES OF LADOTD’S ASSET MANAGEMENT PROGRAM

Investing limited funding resources in the right place, at the right time, to produce the most cost effective life cycle performance for the given investment is the basis for the MAP-21 narrative and is certainly the goal of LADOTD’s asset management philosophy.

The goals of transportation asset management (TAM) are to:

- Build, preserve, and operate facilities more cost-effectively with improved asset performance. Assets must be managed throughout their lifecycles and for the long-term (considering growth forecasts and changes in user expectations).
- Deliver to an agency’s customers the best value for the public tax dollar spent. Maximize the benefits delivered by the network while the costs of providing, maintaining and using the network are minimized.

² FHWA Office of Policy and Governmental Affairs, Moving Ahead for Progress in the 21st Century Act (MAP-21): A Summary of Highway Provisions, July 17, 2012

-
- Enhance the credibility and accountability of the transportation agency to its governing executive and legislative bodies. Deliver agreed levels of service through financial programs and using effective management and reporting systems.

LADOTD has certainly been using, and has clearly embraced, asset management principles for over 20 years. This is evidenced by the Department's very early adoption of and consequently mature pavement management system and bridge management system. LADOTD has also implemented a maintenance management system that is interfaced with the statewide LAGOV financial management system.

With this further impetus from Congressional legislation, LADOTD's existing TAM strategy is propelled forward with a greater urgency. Based on the new TAMP business model, LADOTD's ongoing efforts will continue to migrate towards integration of the interdisciplinary requirements of the Pavement, Bridge, Safety and Maintenance Management Systems, which will allow for the ongoing movement towards an overall holistic approach being applied to asset management issues. LADOTD will continue to pursue additional technology solutions, enhancements or replacement of existing technology solutions and progressive updates and modifications to Department policies, objectives and practices to ensure that this ongoing effort is finally achieved.

1.6 TAMP REQUIREMENTS

Congressional legislation requires that each state department of transportation (DOT) develop a risk-based Transportation Asset Management Plan (TAMP) to improve and preserve the condition of assets on the federal National Highway System (NHS), that contain the following elements:

- A summary listing of the pavement and bridge assets on the National Highway System in the State, including a description of the condition of those assets
- Asset management objectives and measures
- Performance gap identification
- Life cycle cost and risk management analysis
- A financial plan
- Investment strategies

This document represents the Federal TAMP requirement. It explains the roles, responsibilities, and processes related to establishing and executing transportation asset management activities at LADOTD. The plan covers the breadth of asset management practices at LADOTD.

It documents the objectives for LADOTD's asset management, the current condition and operation of the transportation assets including management challenges and potential 10-year end conditions. A description of how LADOTD manages its assets throughout their

lifecycle, an analysis of key risks and their possible mitigation strategies and a summary of expected funding is included in this TAMP. The TAMP provides a discussion of how assets are managed, followed by investment strategies for achieving condition and performance targets. Finally, this Federal TAMP concludes with a plan for improving the State's asset management process in the future.

The TAMP will be reviewed and updated regularly to meet the ongoing required recertification mandate. Following the principles of continuous improvement, a feedback loop from observed performance to planning and programming decisions will ensure that decisions are supported by sound information.

This approach is already evident as this 2nd version of the Louisiana TAMP has resulted in a number of changes directly related to findings observed in the initial draft TAMP. A prime example is the creation of a new separate Non-Interstate NHS budget category, along with the move of the project selection process for these pavements from the District offices to a headquarters project selection team, which mirrors the existing Interstate process.

Sustainability Defined. It is important to note here that LADOTD has historically defined the term "Preservation of an Asset" as all possible treatments for an asset, from the lowest level such as chip seals or minor repairs all the way to full replacement of an asset. Since national definitions of preservation generally refer to minor betterments or repairs, LADOTD has adopted the national definition of "Preservation" and will now use the term "Sustainability" to represent all possible treatments, including replacement, for an asset.

1.7 TAMP STRUCTURE

In order to meet these requirements, this TAMP is presented as follows:

- **Chapter 2 - Asset Management Structure, Plans, and Tools.** This chapter summarizes LADOTD's organizational processes supporting asset management, the relationship between the TAMP and other business plans, and provides an overview of the existing information systems and tools that support TAM.
- **Chapter 3 – Asset Inventory and Traffic Volumes.** This chapter summarizes the inventory, condition and age of the State maintained pavements and bridges, as well as the locally owned NHS pavements and bridges. The chapter explains the issues with large outlier bridges and examines overall travel demand, or traffic volumes, on the state system. Finally, this chapter reviews LADOTD's efforts to reduce the size of the excessively large regional highway system.
- **Chapter 4 – Asset Condition Measures & Data.** This chapter identified both the Federal and Pavement Management System (PMS) pavement performance metrics and assessment criteria and then outlines the difference between the approaches. Next the chapter outlines how the new pavement data to support the Federal analysis is being acquired and how historical pavement data deficiencies prevent the historical federal condition assessment for that data.

In the final part of the pavement section of this chapter, an attempt is made to correlate the pavement performance index (PPI) which the PMS can project, with the Federal Good, Fair and Poor measures, which the PMS cannot project. This initial attempt to project future Federal conditions is required to project federally mandated 2-year and 4-year targets.

The bridge section of this chapter identifies that there are no significant issues or differences between the Federal requirements and the current Bridge Management System approach. It also explains that the term “Structurally Deficient” does not mean a bridge is unsafe to use! Bridges that are considered unsafe for any reason are immediately closed until they can be repaired or replaced.

- **Chapter 5 – Targets, Performance and GAP Analysis.** It is noted once again that this document is a performance-based document, not a needs document. This document is focused on NHS Pavement and Bridge asset performance assessments and outcomes. Capacity needs are not considered or discussed in this document.

Initially this chapter clearly identifies that LADOTD no longer has funding available to meet the federal funding match requirements that only the Legislature can provide.

The methodology for setting performance targets is reviewed followed by different sections that identify the federal performance penalty assessments that occur with failure to achieve minimum federally defined pavement and bridge conditions. The Desired State of Good Repair (DSGR) is formally defined and a GAP analysis is identified for the DSGR. A discussion of federal performance targets follows along with issues identified with projecting targets. The DSGR, GAP analysis and performance targets are all federally mandated. The mandated targets are then identified.

- **Chapter 6 - Life Cycle Planning.** This chapter defined the concepts of worst first and preservation first and then introduces the concepts of life cycle planning (LCP). Next it presents a synopsis of the consequences of delayed preservation on both project costs and maintenance costs followed by an explanation of the LCP methodology.

It defines the Pavement and Bridge Management System requirements followed by the LCP requirements. LADOTD’s approach for achieving these requirements follows with discussion of analysis methods, preservation programs, project selection processes and deterioration modeling methods.

This section then describes LADOTD’s LCP strategies and defines work type crosswalks for the new TAMP work types, along with the current pavement and bridge project work types. A summary of historical project expenditures based on these new work types is provide along with a summary of the current state fiscal year’s maintenance activity expenditures. Finally, a summary of very large bridge projects is provided to acquaint the reader with the extreme costs associated with very large bridges in Louisiana.

- **Chapter 7 - Risk Management Analysis.** This chapter reviews the various concepts of risk management, the federal requirements of risk management, and LADOTD's current implementation of risk management, including 23 CFR Part 667 requirements.

Future efforts relating to risk management include incorporating Redundancy, Robustness, and Resiliency into project management along with using risk registers throughout the asset management process, when setting the budgets, prioritizing projects and revising asset management guidance. The approach for future risk register updates is also defined.

- **Chapter 8 – Financial Plan and Asset Valuation.** This chapter introduces the concepts and the federal requirements for the financial plan. Throughout this chapter, efforts are made to clear up the confusion about the lack of State and Federal funding flexibility and to identify the real dollars available for pavements and bridges.

The financial plan methodology is provided along with a summary of the funding sources and uses. The section examines historical funding and projected funding along with the outcomes of those projected funds. Finally, it identifies the value of the NHS pavement and bridge assets.

- **Chapter 9 - Investment Strategies.** This chapter introduces the concept of investment strategies and identifies that without federal matching funds provided by the Legislature, federal performance targets cannot be achieved and penalty assessments will occur.

This section then identifies requirements along with the current investment strategy methodology employed by LADOTD. It further explains how investment scenarios were evaluated to generate funding allocations that attempt to achieve the desired state of good repair, preserve the condition of NHS assets, achieve NHS asset condition targets and achieve the national goals of 23 U.S.C. 150(b).

- **Chapter 10 –Asset Management Enhancements.** This chapter defines the future improvement LADOTD will be pursuing for improving asset management going forward. It also discusses the future TAMP update cycles.

1.8 TAMP OVERSIGHT AND MANAGEMENT

To facilitate this ongoing effort, LADOTD again took a national lead in Asset Management endeavors by creating a full time Asset Management Engineer (AME) located in the Office of Planning. The AME has a primary responsibility for developing, implementing, maintaining and updating the TAMP including coordinating or conducting all activities necessary to maintain compliance with Congressional asset management legislation.

With active participation by the Secretary's Executive Staff, as identified via the Asset Management Business Structure detailed in Section 2.1, and the engagement of all divisions of LADOTD, the successful TAMP is owned by the Department and not by a particular division or group in the Department.

1.9 INITIAL SCOPE OF THE TAMP

LADOTD's 2018 TAMP focuses on the mandatory NHS pavement and bridge assets and will consider addressing additional assets in subsequent future versions of the TAMP. The desire is to start with the two infrastructure assets of highest budgetary significance and then consider a future systematic expansion to include additional assets over time. This 2018 TAMP meets this minimum NHS pavement and bridge asset system requirements under **23 USC 119**. It addresses pavement and bridge assets as follows:

- Pavements: National Highway System (NHS)
- Bridges: National Highway System (NHS)

While there is the potential consideration of adding other NHS right-of-way assets into future asset management planning cycles, it is appropriate to note that the comprehensive data requirements to support such inclusions are currently insufficient with respect to asset management functionality. LADOTD existing limited data sets for signals, intelligent transportation system equipment, sign trusses, guard rails, cable barriers, crash attenuators, sound walls, shoulders, high mast lighting and signs will require significant improvement to meet the comprehensive requirements that will allow for the addition of these other assets into future TAMPs.

The Executive Champion and TAM Steering Committee will also have to factor in the significant expense of both data gathering and ongoing maintenance of data sets as they consider setting priorities for adding additional assets into the TAMP.

2.0 Asset Management Structure, Plans, and Tools

2.1 INTRODUCTION

This section summarizes LADOTD's organizational processes supporting asset management, the relationship between the TAMP and other business plans, and provides an overview of the existing information systems and tools that support TAM.

2.2 ASSET MANAGEMENT BUSINESS STRUCTURE

LADOTD has been using asset management principles throughout the years as evidenced by the mature Pavement Management System (PMS), Bridge Management System (BMS) and Maintenance Management System (MMS). Prior to the 2012 emphasis on developing a TAMP, there were many in the Department that believed asset management was simply another term for maintenance management; however, the Departmental culture has changed and now there is widespread understanding of the definition of TAM and the value that it can bring to the Department in managing assets to ensure that funds are spent efficiently and effectively.

The TAMP is considered a business plan describing stewardship responsibilities for highway infrastructure. This TAMP is owned by the Department and not by a particular division or group in the Department. It tells the story of the services the agency delivers to its customers and how it utilizes and manages the assets it has under its control for this purpose.

Asset Management Engineer. The TAMP is managed by the Asset Management Engineer (AME). The comprehensive role of this position is as follows:

The AME serves as LADOTD's statewide expert in matters pertaining to asset management. This involves developing, implementing, and maintaining a comprehensive asset management plan. The AME works with the managers of the Department's pavement management, bridge management and maintenance management systems to facilitate compliance with federal asset management rules. The AME uses data driven decision making processes that examines both financial and technical issues and considers asset condition, performance and risk factors to facilitate the best maintenance and improvement investments. The AME will stay abreast of changes in technology associated with asset data inventories and management systems.

The AME leads the development and implementation of the risk-based TAMP. The position coordinates among the Department's Pavement, Bridge and Maintenance Management Engineers and conducts analyses and prepares reports on current and

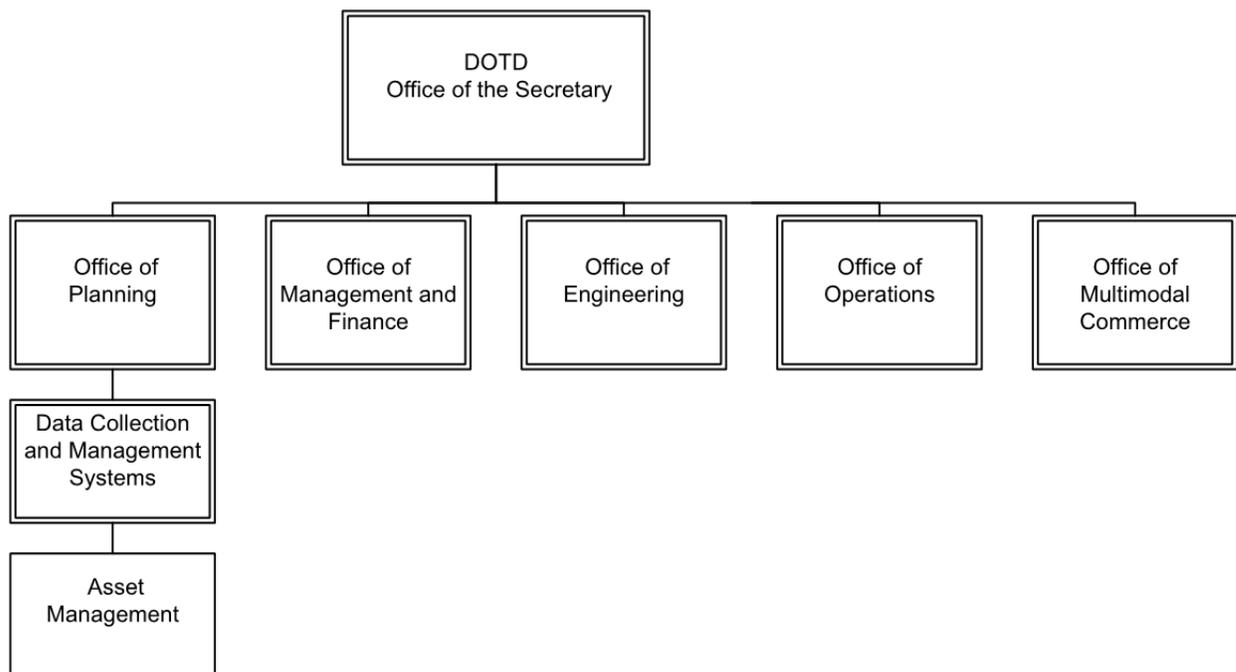
future asset conditions. A primary function includes working closely with Department personnel from the Executive Staff, LADOTD Districts, Design, Construction, Maintenance, Research, Budget and Finance, and Information Technology sections, as well as the Federal Highway Administration to ensure quality data availability and analysis capabilities.

The AME also recommends strategic planning preservation goals in regard to infrastructure quality, and implements directives in accordance with planning and organizational goals. Expertise is provided in the area of management system principles so as to properly correlate appropriate inventory, condition states, deterioration rates, treatment points and types and treatment costs. These analyses and reports provide strategies to optimize asset condition at the network level within a predefined budget. Data analysis and reports are also prepared for setting LADOTD’s long-term, network level asset condition goals.

The AME coordinates the scheduled updates of the Risk Management Plan and works with Quality and Continuous Improvement Program (QCIP) section to ensure that policies and procedures are updated to reflect the most recent TAMP related changes, especially with respect to project selection and risk management changes.

Organizational Structure. The responsibility for the management of the TAMP is located in the Data Collection and Management Systems Section, which is under the Office of Planning. The AME reports to the Section Administrator who in turn reports directly to the Deputy Assistant Secretary. The organizational chart is show in Figure 2.1 below.

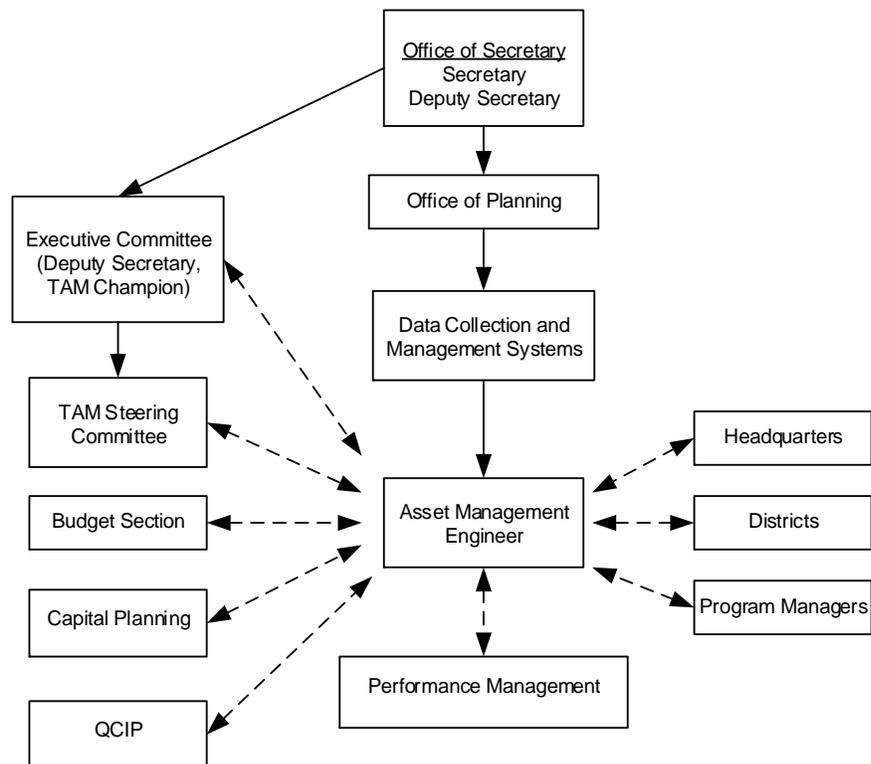
Figure 2.1 LADOTD Asset Management Organization Chart



LADOTD decided to locate the TAMP responsibilities in the Office of Planning because of the TAMP’s relationship to the other Departmental plans, most of which are developed and managed by the Office of Planning. The Statewide Transportation Improvement Program (STIP) and the annual Highway Priority Program of projects are overseen by this office as well. Furthermore, it was logical to locate the TAMP responsibilities in the Data Collection and Analysis Section due to the fact that much of the TAMP depends on data and analysis from the road and bridge management systems, which are a responsibility of this section. In addition, the management of the road and bridge location reference system and GIS activities are also in this section.

Asset Management Support Structure. The AME position has no subordinates. Since TAMP management is a primary duty of this position and asset management is carried out throughout the Department (transportation planners, budget director, program managers, strategic planners, operations), the AME performs various data and technical analyses, identifies trends, identifies policy and procedural gaps and makes various TAM related recommendations to the TAM Steering Committee. That is, the AME works with the different parts of the organization and as necessary elevates relevant issues to a higher authority to seek support and resolution. In addition to the direct chain of command, the AME has other support resources such as the TAM Steering Committee and the Executive Asset Management Champion, who has direct access to the Secretary as shown below.

Figure 2.2 Asset Management Support Structure



As mentioned above, the AME is supported by the Executive Champion, currently the Deputy Secretary, and the TAM Steering Committee. The TAM Steering Committee is comprised of representatives from across LADOTD and functions as a review board whose recommendations are taken to the Executive Committee made up of the Secretary and the Division Heads, which includes the Executive Champion.

The Executive Champion, or Deputy Secretary, is also the TAM Steering Committee Chairman. Members of the TAM Steering Committee are the Chief Engineer, the Assistant Secretary, Office of Operations and the Assistant Secretary, Office of Planning.

Quality and Continuous Improvement Program (QCIP). The QCIP section is poised to assist the AME in ensuring that policies and procedures are updated to reflect the most recent TAMP related changes.

To illustrate the importance LADOTD places on the policy and procedural driven approach based on appropriate data, LADOTD instituted a “Change Management Program” in October 2004. This program is charged with supporting the Department’s goal to institutionalize an organizational culture of change with a mission to lead, facilitate, support, and enable continuous quality improvements in the Department.

The section responsible for the program was renamed the Quality and Continuous Improvement Program (QCIP) to more appropriately identify their ongoing responsibilities. QCIP’s role has expanded to include strategic planning for the Department, and other various support roles. QCIP will play a major role in addressing the ongoing needs of the TAMP with respect to updating policies and procedures to reflect the appropriate changes especially with respect to risk management.

As an example of a QCIP success story, following LADOTD’s initial Design Build project, QCIP conducted a final project Strengths, Weaknesses/Limitations, Opportunities and Threats (SWOT) analysis. This is a structured method used to evaluate the strengths, weaknesses, opportunities, and threats involved in a project. As a result of the QCIP analysis, Design Build projects have substantially improved and now have the Life Cycle Cost Analysis concept as a fundamental part of the process to overcome the inappropriate premise of Design Build that focuses on immediate savings in time and initial costs at the expense of the long-term life cycle costs.

2.3 TAM RELATIONSHIP TO OTHER BUSINESS PLANS

For many years, LADOTD has been a Department that embraces the concepts of written policies and procedures to maintain consistency and transparency. A number of plans, manuals, guides, memorandums, policy statements, standard operating procedures and design standards, along with Engineering Directives and Standards, exist to ensure adherence to this cultural philosophy.

The TAMP is a document that doesn’t replace these plans, but coordinates with these plans and tells the story of the Department in relation to its mission. The TAMP, combined with

the existing plan strategies and goals, guides LADOTD in its effort to most effectively manage its transportation assets. The various plans are referred to throughout the TAMP.

Existing Business Plans

The TAMP draws from several pre-existing LADOTD plans. These plans include:

1. The Louisiana Statewide Transportation Plan (STP) (originally developed in 1996, updated in 2003, 2008, and 2015)
2. Statewide Transportation Improvement Plan (STIP)
3. Highway Safety Improvement Program (HSIP) Infrastructure Project Selection Guide for State Routes (September 2017)
4. Louisiana Freight Mobility Plan (December 2017)
5. 2018-2022 Five Year Strategic Plan
6. Continuity of Operations Plan (COOP)
7. The Highway Project Selection Process
8. Annual Highway Priority Program (HPP)
9. Annual Highway Budget Partitions
10. Annual Operations Budget

A description of each of these plans follows:

Louisiana Statewide Transportation Plan (STP)

The 2015 Louisiana Statewide Transportation Plan (STP) documents a long-range multimodal transportation strategy to meet the goals and objectives for the State's transportation and infrastructure system. The goals for Louisiana's transportation system are:

- **Goal 1 Infrastructure Preservation and Maintenance:** Preserve Louisiana's multimodal infrastructure in a state-of-good-repair through timely maintenance of existing infrastructure.
- **Goal 2 Safety:** Provide safe and secure travel conditions across all transportation modes through physical infrastructure improvements, operational controls, programs, and public education and awareness.
- **Goal 3 Economic Competitiveness:** Provide a transportation system that fosters diverse economic and job growth, international and domestic commerce, and tourism.
- **Goal 4 Community Development and Enhancement:** Provide support for community transportation planning, infrastructure, and services.

- **Goal 5 Environmental Stewardship:** Ensure transportation policies and investments are sensitive to Louisiana’s environment, history and culture.

Statewide Transportation Improvement Plan (STIP)

The purpose of the State Transportation Improvement Program (STIP) is to provide for a fiscally sound, set (1-4 years) capital improvement plan for the state’s surface transportation program. The STIP is not just a document, but is part of a fully integrated process for transportation planning and transportation project selection. The STIP is updated as needed to document the results of the project selection process.

The STIP has been developed through a coordinated and cooperative process by the Louisiana Department of Transportation and Development (LADOTD) involving citizens, elected officials, Tribal governments, other state and federal agencies, each of Louisiana’s eleven metropolitan planning organizations (MPO), and other interested organizations.

The STIP establishes schedules for a variety of projects, including:

- Highways and bridges;
- Bicycle and pedestrian facilities;
- Highway safety;
- Congestion mitigation and air quality improvement;
- Railroad crossing safety;
- Highway operations and motorist services;
- Public transportation; and
- Capacity Expansion, etc.

Louisiana operates under a federal fiscal year (October 1 - September 30) and our STIP must be approved by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). This multi-year and multi-modal program identifies the transportation projects that have been through an inclusive and ongoing public involvement process.

Highway Safety Improvement Program Infrastructure Project Selection Guide for State Routes (HSIP)

The Highway Safety Improvement Program (HSIP) is a core Federal-aid program with the goal to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including locally owned public roads and public roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on crash performance which is outlined in the Strategic Highway Safety Plan (SHSP).

Implementation and management of the HSIP includes many components that can be categorized as safety planning or infrastructure focused:

- Strategic Highway Safety Plan (SHSP)
- Louisiana Center for Transportation Safety (LCTS)
- Highway Safety Research Group (HSRG)
- Traffic Records Coordinating Committee (TRCC)
- State Highway Safety Program
- Local Road Safety Program (LRSP)
- Safe Routes to Public Places Program (SRTPPP)

Louisiana Freight Mobility Plan

The Louisiana Freight Mobility Plan is designed to meet the requirements of the FAST Act of 2015. Prior to the FAST Act, the State had fulfilled the recommendations of the previous MAP-21 legislation through its proactive freight planning programs.

This plan is intended to serve the unique needs of the LADOTD and its partners to improve freight transportation by identifying needs, recommending policies, and devising implementation strategies. The Plan considers highway, rail, aviation, and port and waterway needs. The Plan also describes the pipeline system, but does not provide investment or policy recommendations for it.

The Plan has a long-term, 25-year perspective on needs and issues including projects in the current Highway Priority Program (HPP), the current Statewide Transportation Improvement Program (STIP), future STIPs by reference, mega projects and other mode specific needs. There is a large gap between the available funding for freight projects and the need. This underscores the importance of project selection processes and programs that address the most important modal needs, provide the greatest return on investment, and that, whenever possible, promote cost-sharing among partners and beneficiaries.

Five Year Strategic Plan

LADOTD recently published its latest five year strategic plan, effective through June 2022. The plan continues to adapt and evolve to meet new federal and state policy changes and requirements that govern transportation spending. The plan is updated, along with all state agencies, on a cycle determined by the Division of Administration and currently outlines:

- Department goals
- Strengths, weaknesses, opportunities, and threats
- Strategic objectives for the Department and the associated performance indicators
- Processes to monitor and evaluate performance

Continuity of Operations Plan (COOP)

LADOTD has essential functions that must be performed rapidly and efficiently in a disaster or emergency involving state owned transportation infrastructure in the State of Louisiana. If the normal key staff and facilities are not available, LADOTD's Continuity of Operations Plan (COOP) ensures that LADOTD's essential functions can still be performed using alternate facilities, equipment, communications, and staffing. The COOP also includes assisting local governments in the movement of citizens, pets, and critical supplies during emergencies.

The LADOTD Secretary or Secretary's designated representative directs implementation of the COOP which establishes policy and guidance for the execution of essential functions. Available key leaders and staff responsible for these essential functions will work with COOP participants to implement the COOP in whole or in part depending on the situation. The COOP utilizes LADOTD alternate resources (personnel, facilities, equipment, etc.) that are immediately available and under the direct administration and management of LADOTD. Procedures are activated for alerting, notifying, activating, and deploying personnel; identifying the essential functions; establishing the alternate facilities; and identifying personnel with authority and knowledge of these functions. Personnel and resources are then relocated to an alternate facility capable of supporting operations.

COOP plan testing, and maintenance is essential to ensure that the LADOTD maintains a high level of readiness to achieve operational status no later than 12 hours after COOP implementation, and to sustain LADOTD operations for up to 30 days after a catastrophic event. If the COOP is extended past 30 days, a temporary relocation plan for non-essential functions may be activated to support normal operations. The COOP is vital to prevent disruption of LADOTD's essential functions when primary LADOTD personnel or resources are unavailable due to disaster or emergency.

The Highway Project Selection Process

The Highway Project Selection Process Manual presents the standard operating procedure that LADOTD's Office of Planning uses for the Highway Project Selection Process. It includes the steps and tasks for identification, prioritization, and selection of highway projects on the various asset classes in the State. It has been updated to address requirements of federal and State legislation, including Congressional legislation requirements.

The manual currently identifies four categories of highway projects.

- System Preservation
- Traffic Safety
- Capacity Expansion
- System Operation

Interstate and Non-Interstate NHS Pavements. The process for selecting pavement sustainability projects entails using the output from the Pavement Management System (PMS). With the projected budget, the PMS recommends pavement treatments, or work types, ranging from chip seal, microsurfacing, overlays including total pavement replacement by analyzing pavement condition data using appropriate Life Cycle strategies imbedded within the PMS. The output is forwarded to the Pavement Preservation Selection Team often still referred to as the Project Selection Team (PST). While other asset classes are managed by allocating funds to the Districts by formula, funding for Interstate and Non-Interstate NHS highway pavement sustainability projects, due to the magnitude of the costs, are allocated directly to projects by the PST.

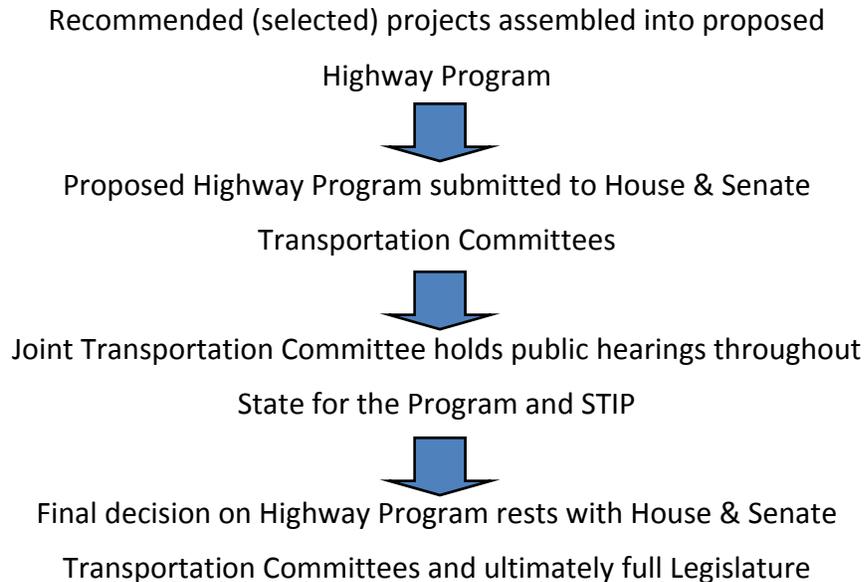
The DOTD District personnel will receive the PMS list of Interstate and Non-Interstate project recommendations from the PST and with due consideration given to the Statewide Transportation Plan, will gather any input from the public, state and local elected officials, Metropolitan Planning Organizations (MPO), Rural Consultation Process, regional/local planning officials, other state agencies and federal agencies.

The PST will then select the Interstate and Non-Interstate NHS projects from the PMS recommendations, with significant input from the District Administrators.

State Legislation. In accordance with State law RS 48:229.1, the project selection teams consider the following factors in prioritizing projects for selection:

- (1) The condition of the roads, streets, and structures making up the state highway system and the relative urgency of the improvements considering in their order of general needs. For purposes of this Paragraph, "condition" shall include but not be limited to the state of repair of the existing roadway and shoulder surfaces, structures and drainage, and other factors of the roadway, such as signs, signals, markings, and barriers.
- (2) The type and volume of traffic on a particular segment of roadway, highway, or bridge.
- (3) The crash records for a particular segment of roadway, highway, or bridge.
- (4) The technical difficulties in the preparation of plans and the procurement of rights-of-way for a particular segment of roadway, highway, or bridge.
- (5) Whether unforeseeable emergencies such as floods have created an immediate need for improvement or reconstruction.
- (6) Whether capacity improvements are warranted due to population or traffic volume increases in specific geographic areas.
- (7) Whether or not the highway or bridge is or will be on an evacuation route utilized to evacuate large populations due to catastrophic events such as hurricanes or flooding.
- (8) Whether the improvement to or addition of a highway or bridge will benefit the economic development potential of the state.

When each of the project selection teams has completed their project selection list, the final steps, shown below, are taken to determine the highway program.



Annual Highway Priority Program (HPP)

The Annual Highway Priority Program (HPP) identifies projects that are scheduled for construction letting during the year and projects which are in various stages of planning and development. The Legislative Joint Transportation, Highway, and Public Works Committee along with the Office of Planning presents the program to the public in each of the nine Districts to receive comments on the program and to take requests for future projects. The Legislative Joint Transportation, Highway, and Public Works Committee then approves the program to be included into HB2 and the program is distributed to the entire legislature for approval and Governor's signature.

Annual Highway Budget Partitions

LADOTD utilizes a technique for partitioning its capital budget into categories based on a combination of historical funding levels and needs. The Annual Highway Budget Partitions detail funding levels on transportation system projects that relate to several areas, including:

- Preservation/Sustainability
- Operations/Motorist Services
- Safety
- Capacity
- Miscellaneous

A copy of the SFY 19-20 budget partition, as shown in the Appendix 11.6 “LADOTD State FY 19-20 Budget Partition,” also identifies the funding sources (e.g. federal or state funds, bonds, tolls, etc.).

The TAMP relevant budget partition sub-partitions include the following:

Preservation/Sustainability

- Non-Interstate Pavement
- Non-Interstate Pavement (NHS)
- Non-Interstate Pavement (Non-Federal Aid)
- Contract Maintenance (Road)
- Interstate Pavement
- Bridge (On System)
- Bridge (On System) -NHS
- Bridge (Interstate)

Operations

- Movable Bridge Preventive Maintenance

Annual Operations Budget

LADOTD Operations operating budget includes statewide personnel services, non-capital professional services, operating services, travel, supplies, equipment acquisitions, and interagency transfers (IT), Insurance, etc. Expenditures for maintenance and operational activities on roads and bridges are managed by the Maintenance Management System (MMS) Agile Assets which is integrated with the LAGOV Financial Management System.

The MMS tracks all repairs and maintenance performed with in-house forces. The MMS is fully configured and capable of managing planned preventive maintenance activities and the Department is in the process of implementing the MMS Level-of-Service functionality, which will be used to assess maintenance activities performed by in-house forces, within the existing operating budget.

The operating budgets for the nine Districts and the HQ statewide maintenance sections are determined from the overall operations budget with a distribution based partly on historical budget levels and specific requests. From the District operating budgets, the expenditure of funding for both the routine (reactive) repairs and preventative (proactive) maintenance of roads and bridges is determined by knowledgeable staff, with a focus based on appropriate priorities (safety, functionality, etc.).

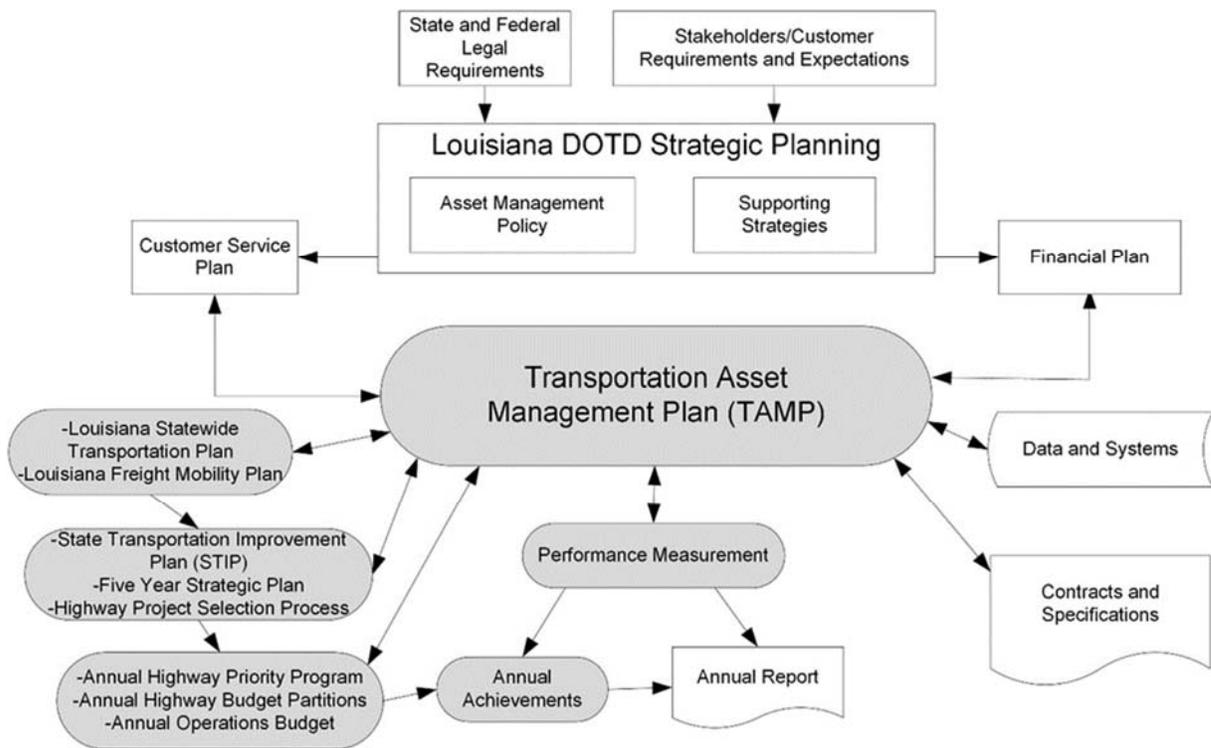
A key component of this effort requires the necessary adjustments relating to the immediate daily needs, of all highway and bridge assets, encountered by the district

operations. The long-term lack of funding, manpower, and equipment resources severely impact the ability to perform proactive preservation activities. As funding is continually delayed the inevitable further decline in conditions results in increasing daily reactive maintenance efforts, further exasperating any chance of performing proactive preventive maintenance. See the chapter 5 section titled “Consequences of Delayed Preservation on Maintenance Costs” where the impact of this issue is quantified in terms of real dollars.

Interaction of TAMP and Other Plans

The diagram in Figure 2.3 below is a modified version of the original found in the AASHTO Transportation Asset Management Guide, A Focus on Implementation. It depicts the interrelationships between the TAMP and the other plans in LADOTD. The TAMP is a document which brings all of these together into a single plan which tells the story of the agency in relation to its mission.

Figure 2.3 Interrelationship Between TAMP and other DOT Plans



2.4 TAM TOOLS

Over the years, LADOTD has developed or procured a number of data systems and software solutions to support the Department’s long time TAM objectives. These data systems comply with **23 CFR 515.7(g)** requiring that State DOT uses the best available data for development of the TAMP. LADOTD’s early initial focus on pavement and bridge assets resulted in implementation of the following major systems:

- **dTIMS (Deighton Total Infrastructure Management System) CT** – comprehensive asset management software used for pavement management analysis. This solution is the long-term Pavement Management System (PMS) and is a 3rd party product provided by Deighton.
- **LAGOV MMS** – the comprehensive asset management software used as a Maintenance Management System (MMS) for transportation assets. Implemented as part of the LAGOV project, it has multiple interfaces to the financial management system SAP, which contains the Fleet and Facilities modules. This 3rd party solution is provided by AgileAssets.
- **TAHI (Highway Inventory Database)** – the custom, home grown, mainframe highway inventory database used to track various highway data requirements.
- **HPMS (Highway Performance Monitoring System)** - is the FHWA national level highway information system, started in 1978, that includes data on the extent, condition, performance, use and operating characteristics of the nation's highways. An updated version of HPMS is the MAP-21 pavement data reporting system for State DOTs.
- **TAND (Highway Needs Database)** – the custom, home grown, mainframe highway needs database used to track various details relating to the needs analysis of pavements.
- **AASHTOWare™ PONTIS/ BrM** – the Bridge Management System (BMS) software provided by the American Association of State Highway and Transportation Officials (AASHTO). Initially designed for component (superstructure, substructure, deck) level analysis. Currently being upgraded to the next version called AASHTOWare™ Bridge Management software (BrM), which is designed for element level (girders, decks, piles, etc.) analysis.
- **PONTIS Bridge Inspection Solution/InspectTech** – the custom application for field devices used to capture both National Bridge Inventory (NBI) component inspection data and element inspection data for PONTIS. It is being phased out and replaced by InspectTech which is the bridge inspection solution provided by the AASHTOWare™ BrM developer. Upgrades to BrM and InspectTech will allow for the synchronization of bridge inspection data.
- **NBIAS (National Bridge Investment Analysis System)** – A model used by the FHWA to analyze the outcome of future investments with respect to performance conditions of bridges and structures. It will be used until the BrM solution is fully functional.
- **NBI (National Bridge Inventory)** - the long-term federal bridge data reporting system for State DOTs in support of the National Bridge Inspection Standards (NBIS). This solution currently requires State DOTs to submit both component inspection

- data and element inspection data. Most bridges are inspected on 2-year cycles, but in special cases, bridges could be inspected as often as every 6 months.
- **Scorecard** – a custom internal application designed to track performance measures for individual sections including strategic performance measures.
 - **Enterprise GIS** – a linear referencing (map based) system solution that has allowed LADOTD to integrate data from multiple linear referencing system (LRS) networks to get a comprehensive view of roadway data. This GIS based software solution allows for location measures associated with data in different standalone silo systems to be kept current and synchronized via edits made to the linear referencing system (LRS) solution. This data interoperability and data sharing across business units, eliminates the need for duplicate data in various data silos, and consequently eliminates data inconsistencies. This solution was implemented in February 2017, linking several critical standalone silo systems, and will continue to be integrated with other data systems.
 - **ARAN (Automated Road Analyzer)** – a state of the art, multi-function data collection vehicle (DCV) provided by Fugro Roadware. The DCV utilizes the latest 3D technology and advanced cameras to capture pavement data/images used for pavement condition analysis in the PMS, and right-of-way images used for asset inventory data capture, i.e. guardrail, signs, etc. The change to the higher resolution 3D technology captures smaller cracks, captures the depth of a crack originating on the pavement surface, eliminates overstating of width determinations for damp cracks, and allows for 24-hour data collection improving the opportunity to eliminate low speed issues for IRI data capture in high traffic volume urban areas.
 - **iVision** - a Fugro Roadware web application that offers synchronized viewing of ARAN collected pavement management data while allowing user to view synchronized right-of-way video log, pavement images, and the users customized choice of collected pavement management and condition data.
 - **LAGOV** – the financial management system and project management system built using SAP. LAGOV provides fleet and facilities asset management functionality and also provides AgileAssets with data for personnel and fleet resources along with costing for work orders.

3.0 Asset Inventory and Traffic Volumes

3.1 INTRODUCTION

LADOTD’s TAMP addresses the federally required pavement and bridge assets on the National Highway System (NHS). The remaining state maintained pavements and bridges are included in the TAMP for reference and information purposes but are not made part of this asset management plan at this time.

In addition to the LADOTD maintained NHS pavements and bridges, a limited number of NHS pavements and bridges are also owned by Local Entities and the Greater New Orleans Expressway Commission, commonly referred to as “The Causeway Commission.” All of these NHS assets require a statewide view of the system in order to maintain and improve asset condition and to meet national and state performance goals.

This chapter summarizes the inventory, condition and age of the State maintained pavements and bridges, as well as the locally owned NHS pavements and bridges. The chapter explains the issues with large outlier bridges and examines overall travel demand, or traffic volumes, on the state system. Finally, this chapter reviews LADOTD’s efforts to reduce the size of the excessively large regional highway system.

Federal Requirement

23 CFR 119 requires that a state’s TAMP must include the NHS pavements and bridges, including a description of asset condition. **23 CFR 515.5** defines “NHS pavements and bridges” as

“Interstate System pavements (inclusion of ramps that are not part of the roadway normally traveled by through traffic is optional); NHS pavements (excluding the Interstate System) (inclusion of ramps that are not part of the roadway normally traveled by through traffic is optional); and NHS bridges carrying the NHS (including bridges that are part of the ramps connecting to the NHS).”

Budget and Analysis Categories (Asset Classes)

LADOTD maintains over 16,000 center line miles of roadway and just fewer than 8,000 bridges. For budgeting and analysis purposes, State owned pavement and bridge assets, along with the locally owned NHS, are now classified using the following categories, or Asset Classes:

Interstate - Interstate Highway System, part of the National Highway System, maintained by LADOTD, does not include Local NHS

Non-Interstate NHS - Non-Interstate National Highway System, maintained by LADOTD, does not include Local NHS

Local NHS - Local National Highway System, maintained by local governments within metropolitan areas or The Causeway Commission (not part of LADOTD budget)

SHS (included for informational purposes, not analysis purposes) - Statewide Highway System, maintained by LADOTD, Non-National Highway System, largely Federal Aid Eligible System

RHS (included for informational purposes, not analysis purposes) - Regional Highway System, maintained by LADOTD, Non-National Highway System, largely Non-Federal Aid Eligible System

3.2 PAVEMENT SYSTEM SUMMARY

Pavement Asset Classes

Asset Classes and Sub-Groups. Interstates and Non-Interstate NHS pavements make up the relevant TAMP pavement asset classes while asset sub-groups are made up of the pavement types of Asphalt, Composite Pavements, Jointed Concrete Pavement and Continuously Reinforced Concrete Pavements.

Note the federal assessment is based on only three pavement sub-groups, Asphalt, Jointed Concrete and Continuously Reinforced Concrete Pavements, with composite pavements combined in the Asphalt sub-group.

Data Snapshots

PMS Data Snapshot. LADOTD captures and updates Pavement Management System (PMS) data on a 2-year cycle. The data analysis included in the rest of this document is based on the current snapshot of pavement data for calendar years 2017 & 2018. This is the 1st calendar based 2-year cycle as all previous efforts were based on fiscal year cycles. This cycle adjustment was made to support the federal data collection and delivery deadlines.

Federal Data Snapshot. The federal data analysis is based on the most recent, 2018 and 2019, Highway Performance Monitoring System (HPMS) submittals and represent inventory data captured in the 2017 and 2018 calendar years respectively. The federal data is updated on a yearly basis to meet the federal requirement, with the Interstate data submittal required by April 15th and the remaining data submittal required by June 15th.

This TAMP analysis was performed before the 2019 submittal dates occurred, and before the FHWA accepted the data as correct, but the 2019 submittal data provided important insights for this effort.

LADOTD has elected to implement separate data collection and analysis efforts for PMS data and Federal Analysis data for a number of reasons more fully described in chapter 4.

Terms used for Pavement Analysis

Primary Direction of Travel. This is a designation of the original pavement inventory data capture direction dating back to the earliest paper-based pavement data collection efforts. The primary direction is generally from west to east or south to north, and matches the mile post system on the interstate.

Lane Mile. A lane mile is a measure of the total length of traveled pavement surface for an individual continuous travel lane. Travel lanes do not include turn lanes.

Centerline Mile. A centerline mile is a measure of the total length (in miles) of pavement, as measured along the roadway centerline. This is actually determined by the length of the primary direction of travel. It does not consider the number of travel lanes.

Federal Analysis Lane Miles. Federal analysis evaluations are based on the surface analysis of the far-right side travel lanes, in the primary direction of travel, and are reported in 0.100-mile pavement sections represented by the pavement type that comprises the majority of the length of each 0.100-mile section.

For federal reporting purposes, Federal Analysis Lane Miles are determined by multiplying the primary direction of travel length (in miles) times the total number of travel lanes in both directions for each 0.100-mile section of pavement.

PMS Analysis Lane Miles. The PMS Analysis Lane Miles represent the pavement surface analysis area used by the PMS. These PMS Analysis Lane Miles are comprised of data for either the far-right travel lanes in the primary direction of travel on undivided roadways, or the far-right travel lanes in both directions on divided roadways.

On divided highways, pavement sections are sometimes different in the alternate direction. For undivided highways, data analysis has proven that the extra cost to capture pavement condition data in both directions did not provide measurable gains in PMS analysis outcomes or benefits.

PMS pavement treatment recommendations are based on variable segments lengths of homogeneous, or matching, pavement sections.

Inventory of State Maintained Pavements

Pavement Asset Inventory. The asset inventory Table 3.1 provides the details for all state maintained pavement categories, or Asset Classes, and the non-state maintained Local NHS.

LADOTD has an extensive amount of total mileage that are actually bridge decks. These bridge deck segments are included for centerline mileage reporting; however, they should always be excluded from both the PMS and Federal Analysis efforts.

The SHS and RHS are included for informational purposes.

Table 3.1 State Pavement Asset Inventory

Asset Class	*Center Line Miles			**PMS Analysis Lane Miles			~Federal Analysis Lane Miles		
	Pavements	Bridges	Total	Pavements	Bridges	Total	Pavements	Bridges	Total
Interstate	695	240	935	1,390	479	1,870	2,946	1,059	4,005
Non-Interstate NHS	1,874	226	2,100	2,897	368	3,266	6,279	786	7,065
^Local NHS	65	26	91	n/a	n/a	n/a	260	105	365
SHS			6,667			6,773	n/a	n/a	n/a
RHS			6,765			6,874	n/a	n/a	n/a
Totals			16,557			18,782			11,435

* = Center Line mileage includes bridge decks, gravel and brick surfaces; however, this mileage is excluded for both PMS & Federal Analysis

** = PMS mileage represents the primary direction of travel for all undivided roadways and both directions for multi-lane divided roadways

~ = Federal mileage represents the primary direction of travel times the number of through lanes for both directions

^ = Per certified mileage as of August 2017

Percentage of Lane Miles by Asset Class. Figure 3.1 shows the breakdown of PMS analysis lane-mileage by asset classes, or highway categories. Figure 3.2 shows a similar breakdown by Federal analysis lane-mileage.

Both figures exclude mileage comprised of bridge decks, brick pavements and gravel pavements.

Figure 3.1 Percent PMS Analysis Lane-Miles by Asset Class

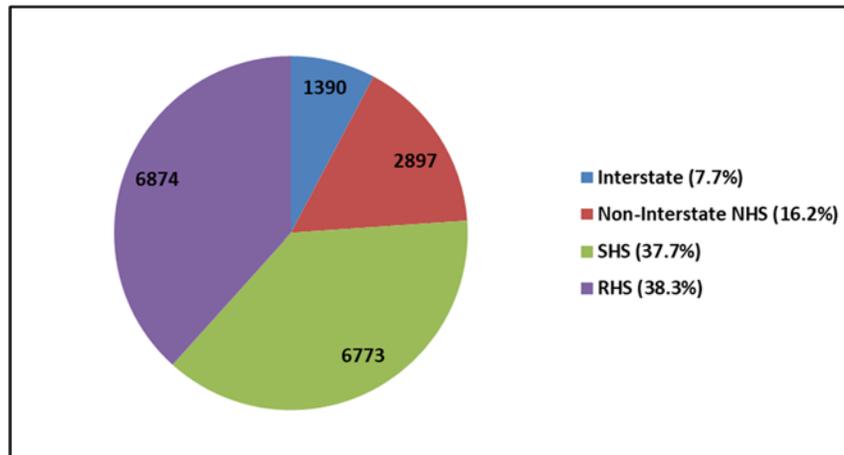
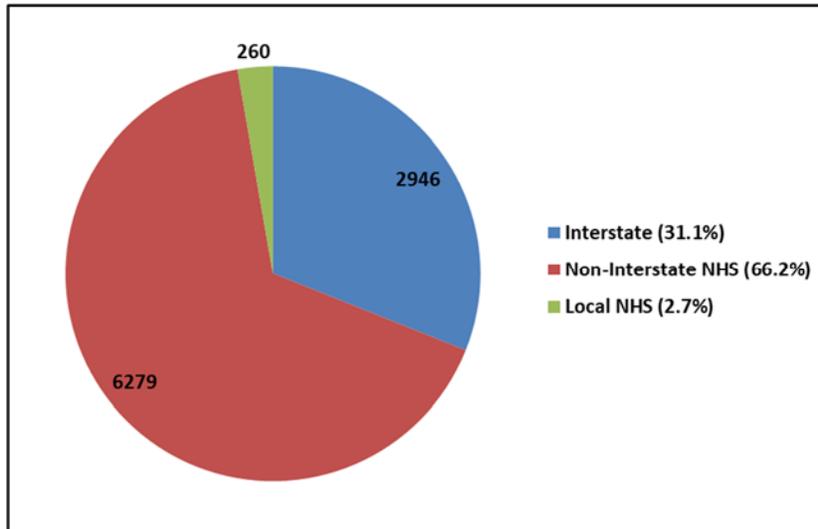


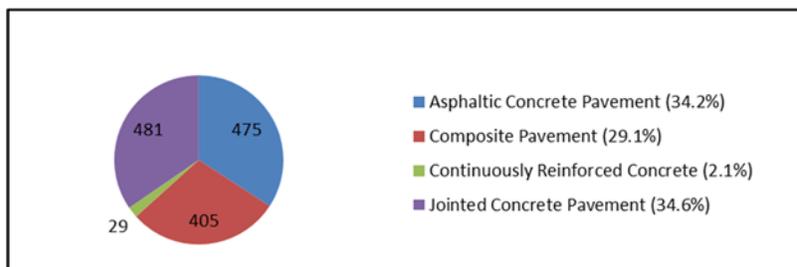
Figure 3.2 Percent Federal Analysis Lane-Miles by Asset Class



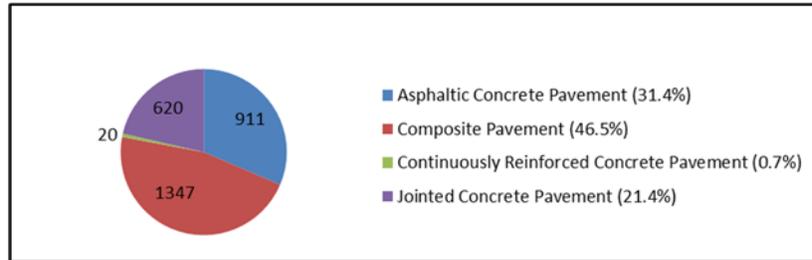
Percentage of PMS Analysis Lane Miles by Asset Sub-Group. LADOTD’s PMS manages pavements using four different pavement types, or asset sub-groups, including (ASP) Asphaltic Concrete Pavements, (COM) Composite Pavements, (JCP) Jointed Concrete Pavements and (CRCP) Continuously Reinforced Concrete Pavements.

The pie charts found in Figures 3.3 and 3.4 identify the current breakdown of the PMS pavement inventory by pavement type, or asset sub-groups, for the identified Asset Class.

Figure 3.3 Percent of PMS Interstate Analysis Lane Mileage By Asset Sub-Group



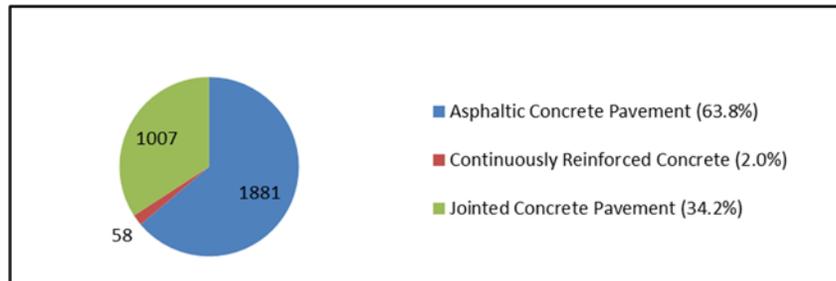
**Figure 3.4 PMS Non-Interstate NHS Lane Mileage
By Asset Sub-Group**



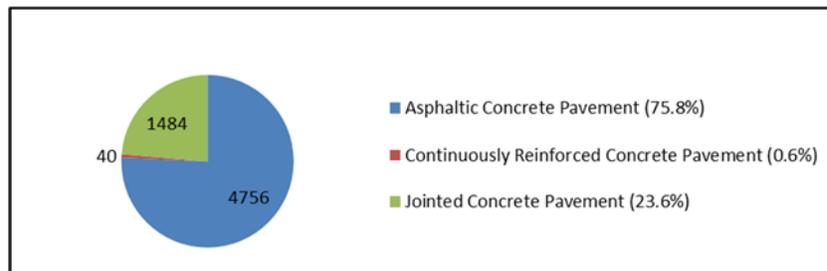
Percentage of Federal Analysis Lane Miles by Asset Sub-Group. Since the method of determining mileage for PMS and Federal Analysis are different, as noted earlier in this chapter, combining these PMS ASP and COM percentages shown below will not produce the Federal ASP percentage.

The pie charts found in Figures 3.5 and 3.6 below identify the current breakdown of the Federal Analysis pavement inventory by pavement type, or asset sub-groups, for the identified Asset Class.

**Figure 3.5 Percent of Federal Interstate Analysis Mileage
By Asset Sub-Group**



**Figure 3.6 Percent of Non-Interstate NHS Analysis Lane Mileage
By Asset Sub-Group**



Pavement Treatment Age

The average pavement treatment age, based solely on the most recent pavement treatment and not the length of the pavement's existence, is shown in Table 3.2.

Maintenance activities and minor preservation treatments, such as chip seals, crack sealing, etc. do not reset the pavement age, but clearly extend the service life of pavements as inferred by the extended average age of pavements shown here. Pavement treatments that reset the pavement age also reset the various pavement condition indexes identified in the following section.

The analysis shows that the average pavement treatment age has increased over the most recent 2-year cycles and has continued to increase in the current cycle. This negative trend is a direct reflection on the past limited funding available for pavement treatments. The Interstate and Non-Interstate NHS budgets initiated by the investment strategy analysis performed for the TAMP effort should positively impact this negative trend as these increased funding levels are implemented.

Table 3.2 Changes in Average NHS Pavement Treatment Age

Asset Class	*Average Age Previous 2 Cycles		*Average Age Current Cycle
	Interstate	16.8	17.3
Non-Interstate NHS	16.7	17.3	18.9

* = Age is based on last pavement treatment reset, not time since original pavement construction

3.3 BRIDGE SYSTEM SUMMARY

Asset Classes and Sub-Groups. NHS Bridges, including Local NHS bridges, make up the TAMP relevant asset classes while asset sub-groups are made up of the bridge types of Prestressed Concrete, Slab Concrete, Movable, etc.

Note that LADOTD does not own Local NHS bridges, nor provide funding for those bridges, and cannot perform the TAMP analysis on those assets. Also, the TAMP analysis is based only on the state maintained NHS bridge asset class with the Non-NHS bridges included for informational and reference purposes only.

Federal Network Level Bridge Analysis. Unlike the federal pavement requirements, the federal bridge network level requirements closely mirror the historical project level aspects of the component (superstructure, substructure, deck) level condition ratings and at this time can be easily addressed without complications with either the BMS or NBIAS.

State Maintained Bridge Inventory

The bridge data analysis, found in the 2018 TAMP, is based on the submittal of the federally required 2018 National Bridge Inventory (NBI) and represents inventory data collected during the 2017 calendar year. Table 3.3 identifies the TAMP relevant bridge inventory information.

The FHWA defines a bridge as a structure having an opening measured along the center of the roadway of more than 20 feet. In the 2018 NBI data, 7,878 total state maintained and Local NHS structures, representing 161,644,752 square feet of deck, met that bridge criteria. This is an extremely large amount of deck area to maintain and as a national reference, only three (3) states, California, Texas and Florida, are responsible for more bridge deck area than Louisiana.

The 3,045 NHS bridges (Interstate, Non-Interstate NHS and Local NHS) represent 80.1 percent of the combined state maintained and Local NHS bridge deck area. That equals 129,528,374 square feet of NHS deck area.

It is important to note that the Local NHS bridges include the twin 23-mile-long spans of the Lake Pontchartrain causeway toll facility. These spans comprise 7,934,283 square feet of deck area or 93.9% of the total Local NHS deck area. These two structures alone represent more deck area than the entire Regional Highway System (RHS) which has 6,982,028 square feet of deck area on 1595 bridges.

Table 3.3 State Bridge Asset Inventory

Asset Class	Bridge Count	Bridge Deck Area	% Total Deck Area
State NHS	3001	121,082,618	74.9%
Local NHS	44	8,445,756	5.2%
State Owned Non-NHS	4833	32,116,378	19.9%
Totals	7878	161,644,752	

Represents 2018 NBI Submittal

Age of Bridges

Based on the 2018 NBI data, Figure 3.7 below shows the count of state maintained bridges, built by decade, that are still in service. Figure 3.8 shows the deck area for the same bridges.

With respect to asset management responsibilities, the information provided by a count of bridges built by decade shouldn't be compared to the information provided by the deck area of bridges built by decade. For instance, in the decade of the 60's, 536 Interstate bridges added nearly 15.6 million square feet of deck area while 992 Non-NHS bridges added only 4.5 million square feet of deck area. The deck area information clearly provides a far more accurate picture of these responsibilities.

The data shows that 57.4% of all state maintained bridge deck area is already over 40 years old and 70.5% of all state maintained bridge deck area is over 30 years old. This statistic along clearly sends the message that a significant asset management impact, with respect to increasing cost to maintain these aging assets, is upon us.

While the National Highway System (NHS) was not established until 1991 by the Intermodal Surface Transportation Efficiency Act (ISTEA), the NHS was created by designating existing roadways as NHS highways, along with their existing bridges, so in reality, over 900 State and Local NHS bridges were built prior to 1991.

Figure 3.7 Count of Bridges Built By Decade (State Maintained)

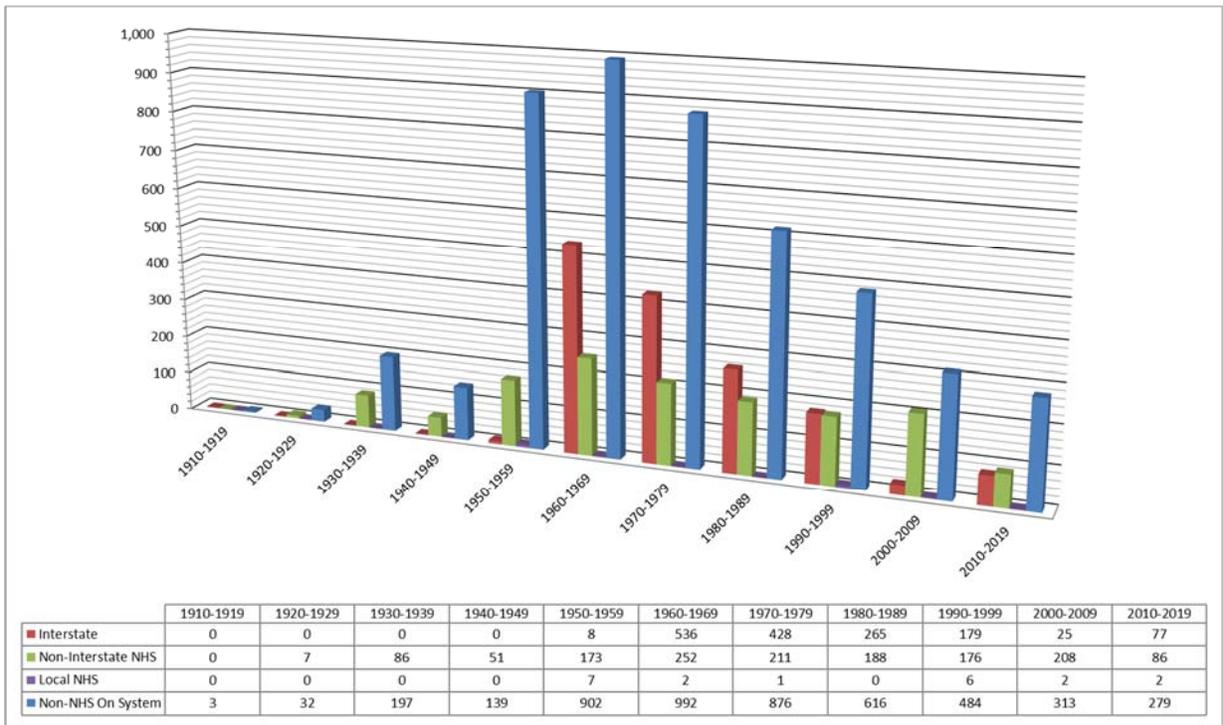
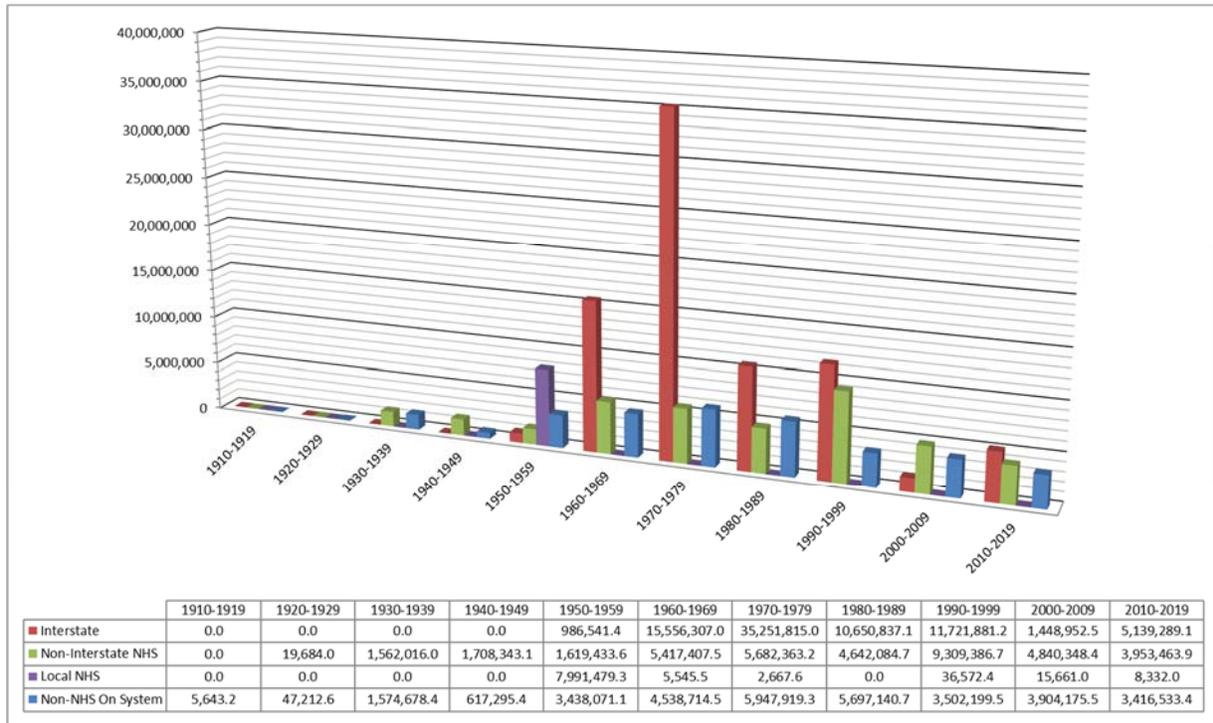


Figure 3.8 Deck Area of Bridges Built By Decade (State Maintained)



3.4 ADDRESSING LARGE OUTLIER BRIDGES

Outlier Bridge Inventory. Of the 7878 NHS, Local NHS and Non-NHS state maintained bridges in the 2018 NBI bridge data, 123 have a deck area exceeding 175,000 square feet.

The 107 NHS and Local NHS bridges, while representing only 3.6% of the total 3045 NHS bridges, comprise 57.7% of the total NHS bridge deck area.

> 175,000 deck area	Count	Deck Area
NHS	105	66,840,791.6
Local NHS	2	7,934,283.0
Non-NHS	16	4,697,179.2
Total	123	79,472,253.8

The July 2012 FHWA report, HEP-12-046, “Asset Sustainability Index: A Proposed Measure for Long-Term Performance” introduces the concept of infrastructure assets defined as “Outliers”. The following excerpt is taken from the report.

“These outliers could include the maintenance, preservation and repair/replacement costs of items such as aged, high-cost unique bridges, or the repair of pavements in very high-volume highways, or the replacement of structures under very-high traffic

volumes. These types of assets can have much higher-than-average costs that skew the basic unit costs used in these calculations.”

“One typical way to address this issue is to separately categorize and plan for these high cost facilities as a separate class of assets. States have grouped their unique and high-cost bridges and planned for them separately. Each such unique structure generally requires a more detailed engineering analysis to determine its preservation needs and costs for a long horizon, such as 10 years. By categorizing these structures and assessing them individually a more accurate planning estimate for their investment can be developed.”

Outlier Bridge Funding. LADOTD clearly recognizes the issues that these critical large outlier bridges pose, but with the ongoing fiscal limitations, funding is simply not available to immediately deal with this looming and expensive problem.

Worst 1st vs Preservation. LADOTD will make every attempt to avoid a worst 1st approach going forward; however, the outcome of both historically limited funding, along with the significant deck area of outlier bridges, has placed LADOTD in a precarious position.

The preservation needs of these very large traffic volume, critical infrastructure bridges, continue to mount and simply cannot be ignored. They will continue to consume all necessary funding to maintain their functional purpose in a safe and effective manner. Thus, the concept of allowing a few assets to continue to decline while spending available funding on preservation of many assets simply cannot be applied in these extraordinary cases.

Recent Outlier Expenditures. It should be noted that in the past few years, a few large critical infrastructure outlier bridges, have consumed significant available preservation funding. Details of these projects can be found in Chapter 6.

This is not a problem that sneaks up on LADOTD staff; it is an ongoing problem that is caused by the advancing age of these bridges and long-term limited funding. In many cases, these projects require multiple phases, spaced out over a number of years, simply to cobble the funds necessary to accomplish the required work. Clearly this increases the overall project cost, but it is a necessary operational approach when funding is simply not available in a single year. LADOTD simply cannot spend all available funding in a given year on a single project.

This matter is further exasperated when large outlier bridges are damaged by outside agents, causing a scramble to provide immediate funding to repair these structures. Table 6.14 identifies the \$11.7 million necessary in 2011 to repair the damaged I-10 Mississippi River Bridge Pier and the \$26.3 million needed in 2012 to repair the damaged I-210 Pier in Lake Charles. The final cost of the 2018 Sunshine Bridge damage, caused by a crane on the river barge, has not yet been assessed.

Future Outlier Funding. The future NHS bridge funding allocation, determine by the investment scenario analysis efforts outlined in this document, should improve available

funding for this issue, but it will not be an overall remedy. Significant additional funding to address this ongoing long-term issue is required.

When long term funding issues are resolved, LADOTD will make every attempt possible to provide additional dedicated funding for these outlier bridges. Until then, each of the NHS outlier bridge assets will have the potential to impact LADOTD's ability to continue achieving NHS bridge performance targets as well as their desired state of good repair and federal performance goals.

3.5 SYSTEM TRAVEL DEMAND (TRAFFIC VOLUMES)

Federal Requirement. 23 CFR 515.7(b) identifies that "State DOT should include future changes in demand." Changes in traffic volumes are the primary method of analyzing travel demand for State DOTs pavements and bridges. The FHWA publishes yearly highway statistics, often delayed by at least a year due to compilation efforts, and this section analyzes that data to gain an understanding of the changing patterns of traffic in Louisiana. The following sections summarize the past trends in travel demands in an attempt to gain an understanding of potential future travel demand.

Urban – Rural Travel Demand Trends

In the most recently available 2016 Federal Highway Statistics³, Louisiana's State maintained highway system experienced 40.144 billion vehicle miles of travel (VMT) while the overall total statewide traffic volume, including all local roads, was 49.156 billion VMT.

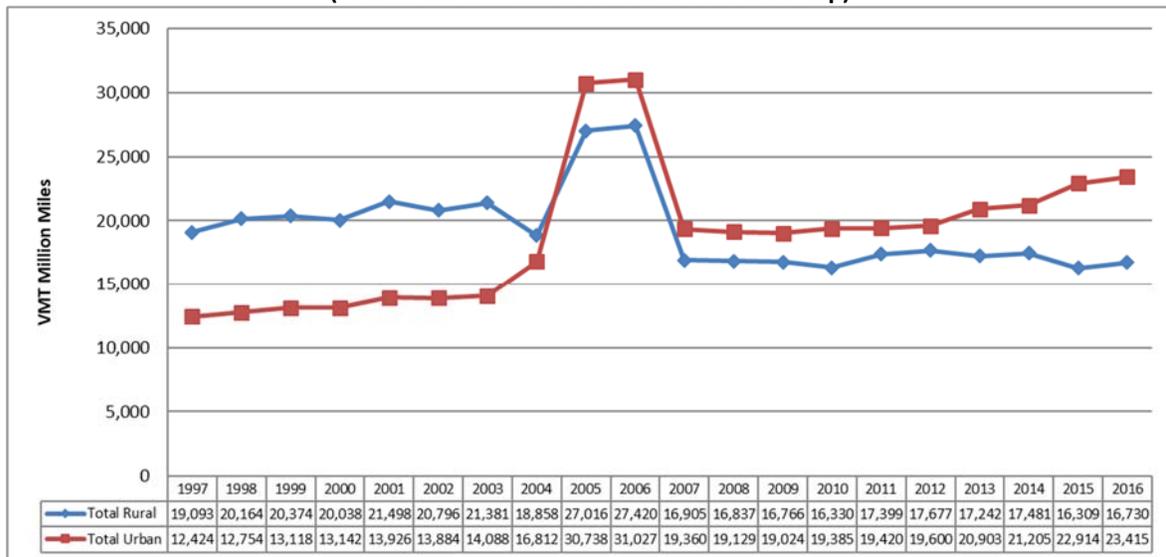
Since 2007, the overall statewide system, including all local roads, reflected a ten (10) year traffic volume growth of slightly more than 8.3% while the state maintained system saw a traffic volume increase of 10.7%. Note: the VMT data used in this section was corrected to the federal HM-50 Ownership tables to ensure accurate reporting of VMT values for appropriate pavement categories.

Travel Demand Trends

Urban Growth with Rural Decline. Much of America has seen a surge in urban growth with an equivalent reduction in rural growth. In Figure 3.9 below, the 2005 and 2006 traffic volume spikes, caused by Hurricanes Katrina and Rita, very clearly mark the turning point when urban traffic growth began to outpace the rural traffic growth in Louisiana. Urban traffic volumes have been trending steadily upward since 1997, while rural traffic volumes have never returned to pre-Katrina/Rita levels.

³ VM2 "5.4.1. Vehicle-miles of travel, by functional system", September 18, 2017, <https://www.fhwa.dot.gov/policyinformation/statistics/2016/>

Figure 3.9 VMT Urban & Rural Trends
(Million miles - corrected to HM-50 Ownership)



Travel Demand by Pavement Category (Asset Class)

Figure 3.10 is provided below to identify travel demand by asset class or pavement category. This data is very revealing with respect to how the general public uses the state highway system.

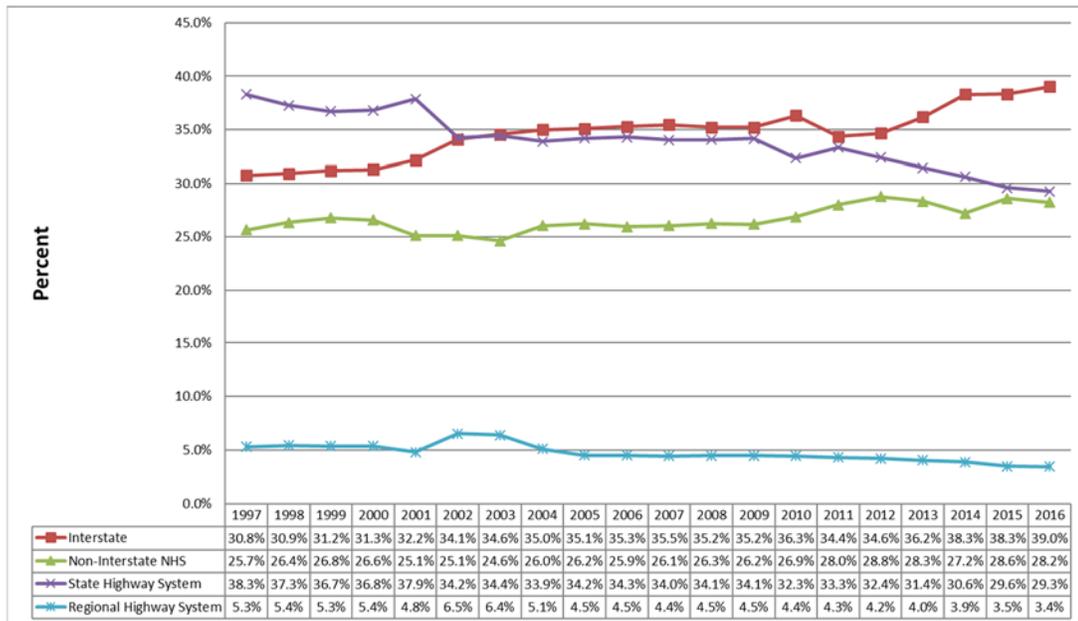
Interstate Travel Demand. As one would expect, over the previous 10 years, Interstate traffic volume has increased by 2.81 billion VMT or 21.9% of the state maintained total VMT. The urban component was the most significant part of the increase, comprising 83.4% of the Interstate increase.

While the Interstate represents only 9.0% of the total lane mileage on the state maintained network, over the past 10 years it carried an average of 36.4% of the traffic volume with the 2016 VMT total reaching 39.0% or 15.67 billion VMT on the state maintained system.

Non-Interstate NHS Travel Demand. Likewise, over the previous 10 years, Non-Interstate NHS traffic volumes have increased 1.887 billion VMT or 20.0%. The growing urban trend continued with the urban component comprising 67.8% of the Non-Interstate NHS increase.

The Non-Interstate NHS represents 18.1% of the state maintained lane miles, carried a 10-year average of 27.5% of the traffic volume, and carried 28.2% or 11.338 billion VMT in 2016.

**Figure 3.10 Percent VMT for State Maintained System
(by federal reporting year)**



State Highway System (SHS) Travel Demand. In contrast, over the previous 10 years, SHS traffic volumes have decreased 0.59 billion VMT or 29.3%. The urban component actually increased by 0.222 billion VMT but the rural component decreased by 0.812 billion VMT, resulting in the net loss and again highlighting the urban growth phenomenon.

The SHS represents 32.8% of the state maintained lane miles, carried a 10-year average of 32.1% of the traffic volume, and carried 29.3% or 11.754 billion VMT in 2016. While the Non-Interstate NHS and the SHS are currently very similar in traffic demand, the Non-Interstate VMT is experiencing a slow and steady increase, the SHS, since 2011, has experienced a recent rapid decline.

Regional Highway System (RHS) Travel Demand. In stark contrast, the RHS, which represents minor collectors and state maintained local roads of a mostly rural composition, represents 39.1% of the total lane mileage on the state maintained network, but in 2016 carried only 3.4% of the total state maintained traffic volume, constantly trending downward from a high of 6.5% in 2002. This is clearly another indicator of the declining component of rural statewide traffic demand.

Summary of Travel Demand Analysis Conclusions

The travel demand analysis shows that since Hurricanes Katrina and Rita, traffic increases continue in urban areas while the rural traffic is in constant decline.

Most significantly, the Governor Huey P. Long era created Regional Highway System (RHS) can no longer be supported without significant additional funding going forward. The RHS

represents a very significant 39.1% of the total lane mileage on the state maintained network but carries the consistently declining and very marginal 3.4% of the total state maintained highway traffic volume.

3.6 ONGOING SYSTEM ASSET INVENTORY REDUCTION

The cyclical economic downturns over the past few decades have clearly sent the message that the past concept of infrastructure expansion, as a primary tool for future economic development and prosperity, is no longer sustainable. This approach must give way to an understanding that the overall life cycle cost of an asset is the focal aspect of asset management and is the only sustainable methodology going forward.

LADOTD recognized these hard facts years ago and has led to ongoing efforts to change the culture and inform stakeholders of this move away from capacity projects towards a focus on preservation along with a reduction in the Regional Highway System inventory. This life cycle planning based approach is further substantiated by the federal requirements of this TAMP.

Addressing Regional Highway System Issues

Beginning with Governor Huey P. Long, and continued by those that followed him, a significant number of local roads were converted to state maintained roads. As a result, LADOTD maintains, with current funding, an unsustainable 27 percent of the public road mileage in Louisiana, while the national average is approximately 19 percent. Once again, the unsustainability of this system is borne out by the fact that the RHS represents 39.1% of the total state maintained lane mileage but carries only 4.9% of the total state maintained VMT.

The Legislature and the general public must understand that these assets will always be the last to receive the very limited available funding, and generally do not receive any preservation funding, and only limited maintenance repair funding, during times of funding constraints. This is clearly manifested in the declining condition of these assets.

Road Transfer Program. One of the most innovative efforts in the country to reduce this unsustainable percentage of public roads in Louisiana is the Road Transfer Program (RTP) described in the April 2013 policy document “Right-Sizing the State Highway System: A Voluntary Road Transfer Program.” The goal of the RTP is to right-size the overall State Highway System to achieve the national average of 19 percent state ownership of public road mileage.

LADOTD has identified approximately 5000 miles of State roads that do not comply with the State's highway network responsibilities. The program involves transferring ownership of these roads to local governments. This opportunity is viewed as a way to reduce the size of LADOTD regional assets while rectifying the inequities in the distribution of State highway miles among parishes, and empowering local governments through the right-sizing of the State highway system.

Participation in the program is voluntary. Roads are repaired prior to transfer and the receiving local governments are credited for 40 years of routine and capital maintenance, which can be applied to any highway capital project(s). The program has so far appealed to those parishes and municipalities that have the capacity for additional day-to-day road maintenance, but lack the resources for capital improvements.

Status of RHS Reduction. As of April 2019, LADOTD has transferred 100.17 centerline miles of Regional Highway System routes, along with the 18 bridges on those roadways, to local governments. Additionally, LADOTD has cooperative endeavor agreement contracts in place to transfer 189.10 additional centerline miles as soon as repairs are completed on these pavements. LADOTD is negotiating to transfer another 84.04 miles through this program.

4.0 Asset Condition Measures & Data

4.1 INTRODUCTION

This chapter identified both the Federal and Pavement Management System (PMS) pavement performance metrics and assessment criteria and then outlines the difference between the approaches. Next the chapter outlines how the new pavement data to support the Federal analysis is being acquired and how historical pavement data deficiencies prevent the historical federal condition assessment for that data.

In the final part of the pavement section of this chapter, an attempt is made to correlate the pavement performance index (PPI) which the PMS can project, with the Federal Good, Fair and Poor measures, which the PMS cannot project. This initial attempt to project future Federal conditions is required to project federally mandated 2-year and 4-year targets.

The bridge section of this chapter identifies that there are no significant issues or differences between the Federal requirements and the current Bridge Management System approach. It also explains that the term “Structurally Deficient” does not mean a bridge is unsafe to use! Bridges that are considered unsafe for any reason are immediately closed until they can be repaired or replaced.

4.2 PAVEMENT PERFORMANCE MEASURES

Federal Performance Metrics

The FHWA has selected four pavement performance metrics to determine the network level pavement condition of the NHS pavements. The pavement data, supporting these measures, will be reported to the Highway Performance Monitoring System (HPMS). The four 23 CFR Part 490 measures are calculated using quantitative data based on the following metrics:

- **Pavement roughness**, an indicator of discomfort experienced by road users traveling over the pavement, is measured using the International Roughness Index (IRI).
- **Rutting** is quantified for asphalt pavement by measuring the depth of ruts along the wheel path. Rutting is commonly caused by a combination of high volume traffic and heavy vehicles.
- **Cracking** is measured in terms of the percentage of cracked pavement surface. Cracks can be caused or accelerated by excessive loading, poor drainage, frost heaves or temperature changes, construction flaws or simple from an aging surface.

- **Faulting** is quantified for jointed concrete pavements. Faulting occurs when adjacent pavement slabs are misaligned. It can be caused by slab settlement due to loading, curling, and warping.

Federal Condition Assessment Criteria

Federal Condition Criteria and Ranges. The data collection of the federal IRI, Rutting, Faulting and Cracking Percent pavement condition metrics identified here will be captured in the right most lane of travel in the primary direction on pavements.

In order to accurately extrapolate the data across the lanes, and to

eliminate inappropriate data on bridge structures, the federal requirements specifically identify that state DOTs shall report three HPMS inventory data elements; Through Lanes which identifies the number of lanes designated for through-traffic, Surface Type which designates the pavement surface type on a given section, and Structure Type which identifies the bridges and tunnels. These historically reported inventory elements now gain additional quality control significance as reporting errors for these items could impact a state DOT’s ability to make significant progress toward achieving targets.

Federal Pavement Sections. An individual 0.100-mile section is rated as being in good overall condition if all of the metrics are rated as good, and poor when two or more are rated as poor. All other combinations are rated as fair. The lane miles in good, fair and poor condition are tabulated for all sections to determine the overall percentage of pavement in good, fair and poor condition.

Federal Pavement Condition Criteria 23 CFR Part 490.313(b)			
Metric	Good	Fair	Poor
IRI (inches/mile)	<95	95 - 170	>170
Cracking (%)			
- Asphalt	<5	5 - 20	>20
- Jointed Concrete	<5	5 - 15	>15
- Continuously Reinforced Concrete	<5	5 - 10	>10
Rutting Asphalt (inches)	<0.20	0.20-0.40	>0.40
Faulting Jointed Concrete (inches)	<0.10	0.10-0.15	>0.15

Pavement Management System (PMS) Condition Metrics

Since 1995, LADOTD has been collecting project level pavement condition data on a variety of pavement distress types, or metrics. The condition metrics listed below form the basis for the Pavement Management System to assess current and projected pavement conditions.

- **Rutting** – the longitudinal depressions in the wheel paths of an asphalt pavement surface.
- **Faulting** – the vertical misalignment of pavement joints, in the right wheel path, on jointed concrete pavements.

- **International Roughness Index (IRI)** – the most commonly used worldwide pavement roughness measure of surface deviations associated with vehicle dynamics and ride quality.
- **Longitudinal Cracking** – the cracks in pavements that are predominantly parallel to the direction of traffic and are not defined as Fatigue Cracks.
- **Transverse Cracking** - the cracks in pavements that are predominantly perpendicular to the direction of traffic and are not defined as Fatigue Cracks.
- **Fatigue (Alligator) Cracking** - the cracking located in both 36 inch wheel paths on Asphalt Pavements (ASP) only.
- **Patching** - An area of pavement surface that has been repaired, with the addition of new material to correct an irregularity in the pavement surface, that has not been performed as part of the original construction.
- **Texture** - Macro texture is a property related to friction, that is relatively inexpensive to collect, and is used to identify potential locations for pavement skid resistance testing. This measure is captured for the Safety Section and is not currently used by the PMS for condition assessment or condition forecasts but is informally used by the PMS engineer as a reference check in assessment outcomes.
- **Friction** – the measure is captured on an as needed basis using a pavement skid resistance testing system fully identified in ASTM E274. This measure is captured for the Safety Section and is not currently used by the PMS for condition assessment or condition forecasts but is informally used by the PMS engineer as a reference check in assessment outcomes.

PMS Condition Assessment Criteria

Pavement Condition Assessment Indexing. Pavement management systems require an equitable analysis of the various pavement condition data. For instance, cracking and patching, are each captured with low, medium and high severity levels, representing different non-compatible data ranges and values. There are also units of measure issues between various pavement condition measures.

To address these different pavement distress data ranges, values and units of measure, various pavement condition indexes were created and calculated for the various distresses. These indexes, shown below, are based on a scale from 1 to 100, with 100 being perfect. Various combinations of these pavement condition indexes are then used to generate a composite pavement performance index for the four different pavement types, or asset sub-groups, identified earlier.

- Alligator Cracking Index
- Random Cracking Index
- Patching Index

- Rutting Index
- Roughness Index
- Transverse Cracking Index
- Longitudinal Cracking Index

PMS uses all of these pavement condition index data to assess the overall condition of these asset sub-groups via an overall pavement performance index (PPI) and then uses this information to identify the optimum pavement treatments.

For instance, on flexible (Asphalt) pavements, various treatment triggers are based on Alligator, Random, Patching, Rutting, and Roughness indexes. These treatment trigger values will also vary depending on the different asset classes or highway systems. In other words, treatment triggers are not the same for Interstates and other state maintained highway systems.

PMS Pavement Sections. LADOTD analyzes homogeneous pavement sections to assess the overall condition of various pavements and then uses this information to identify the optimum pavement treatments for each homogenous segment of roadway.

Federal and PMS Differences

PMS Project Level and Federal Network Level Analysis. The Federal assessment of pavements is a network level assessment and is used to identify the overall performance of pavements for the different NHS asset classes.

The LADOTD PMS assessment is a project level assessment and is used to identify the optimal project treatments, or work types, necessary to maintain or improve the asset conditions.

The different approaches are incompatible and there are a number of different reasons LADOTD's PMS implementation simply cannot adopt the federal data in project treatment analysis and selection.

Other PMS and Federal Differences Enumerated. While LADOTD's PMS analysis uses the same descriptive metrics, IRI, Cracking, Faulting and Rutting required by the FHWA, the federal data capture and reporting requirements are somewhat different from those employed for PMS activities.

Cracking Extent and Severity. First and foremost, while both approaches require cracking extents, or linear measure of cracking, the PMS effort additionally incorporates crack width severity to aid in determining the pavement various treatment selections such as a chip seal for low severity cracks and an overlay for high severity cracks. The PMS effort also evaluates cracking both inside and outside of the wheel path, whereas the federal analysis is confined to the wheel path.

Asset Sub-Groups Differences. The federal assessment also joins Composite Pavements, generally comprised of an asphalt overlay on an older concrete pavement, into the asset

sub-class with Asphalt pavements, or basically what is the visible surface of the pavement. For a network level approach, this is completely reasonable and acceptable.

For a project management approach, these different pavement types, or asset sub-classes, are separated in the PMS and use a completely different combination of index values to assess and project their conditions. Often these two different pavement types have different deterioration modalities that generate different treatment requirements.

Wheel Path Dimension Differences. Additionally, the federal “wheel path” dimension was designated as 39 inches wide. LADOTD has historically used a “wheel path” dimension of 36 inches in the PMS analysis. Any potential switch in wheel path dimensions would require a complete change not only in the current PMS methodologies but also a reanalysis of historical data to ensure that both historical pavement performance index data and historical deterioration curve data would be reasonably similar, and not rendered useless for future efforts.

Section Length Differences. A final difference between the federal analysis and the PMS analysis is based on the use of homogeneous, or matching pavement sections within the PMS verses the requirement for 0.100 mile pavement sections for the federal analysis. This difference is impactful on two separate levels.

First, the current analysis of interstate pavements is based on 521 homogeneous Interstate pavement segments. While the software solution should theoretically run any number of pavement sections, multiple attempts to run the analysis on the over 7,000 tenth (0.100) mile Interstate sections, could never be completed before the dedicated computer crashed or the PMS solution stopped due to internal limitations. Some might suggest getting a more powerful computer; however, the second level of impact eliminates the need to do this.

The second level of impact is that contracted project work could never be assigned based on 0.100 mile segments. The contractor mobilization cost alone would completely overwhelm and supersede any potential benefit from working on the poor or fair condition 0.100 miles segments spread around a given area.

4.3 PAVEMENT DATA COLLECTION

Federal Data Collection

Federal Data Collection Requirements. The mandated timeline for data collection of these 23 CFR Part 490 metrics began on January 1, 2018. Federal condition data must be captured prior to December 31st of a given year to be considered valid data.

LADOTD preemptively captured this federal data, prior to the 2018 timeline requirement, in an attempt to gain an early start on resolving the potential issues that could arise in performing a new data collection, data quality assurance, and data analysis. LADOTD also shifted all future data collection cycles to begin in the month of January to allow for as much time as possible to capture this very important data.

Federal Interstate condition data must be captured every year, while Non-Interstate NHS data can be captured every other year. Currently, LADOTD captures federal data, for both Interstate and Non-Interstate NHS, on a yearly basis and intends to continue to do so for the foreseeable future.

Federal Pavement Condition Reporting Option. 23 CFR Part 490.309 (1)(iii), allows the state to choose if they want to capture and report the network level federal Interstate pavement data metrics (IRI, rutting, faulting, and Cracking Percent) in both directions.

LADOTD currently captures PMS condition data in both directions if the pavement is an Interstate or a multi-lane divided Non-Interstate NHS pavement. Only the primary direction is captured for undivided Non-Interstate NHS pavements. LADOTD also captures the federal condition data in the same manner.

An analysis of the data reveals no significant differences in the data for opposing directions, so the HPMS submittal currently provides only the primary direction of travel, eliminating the need to capture both directions for undivided Non-Interstate NHS pavements.

Local NHS Pavement Information and Assumptions

Local Data Federal Requirement. In **23 CFR 515.7(f)** we find that “The processes established by State DOTs shall include a provision for the State DOT to obtain necessary data from other NHS owners in a collaborative and coordinated effort.”

Approach for Local NHS Pavement Data. To ensure data collection on the Local NHS pavements is captured in the same manner as other NHS pavements, LADOTD has agreed to extend, and manage, the existing pavement data capture effort to include the Local NHS pavement data for the Louisiana MPOs. LADOTD will provide both the required federal data and the PMS data to the Local NHS owners and also use this data to generate the required Local NHS data analysis.

Local NHS Update. In 2012, the FHWA moved all existing “principal arterials” into the NHS classification. This initially resulted in an increase of the total mileage the non-State maintained NHS (Local NHS) system.

This change led to a comprehensive review of the existing and “enhanced” Local NHS which resulted in a number of “principal arterials” being reclassified as Local “minor arterials”, and subsequently removed from the NHS classification in some MPO areas. Other MPOs are still considering this option but have not yet completed this effort.

For the remaining Local NHS roadways, LADOTD has created a new separate analysis category called “Local National Highway System” or Local NHS. As these Local NHS roadways are not owned by LADOTD, there is no budget category for them; therefore, PMS and BMS forecasts cannot be performed for these assets.

Local NHS Pavement Assumptions. As noted earlier, LADOTD has inspection and inventory data for all pavements within the state, including those on the Local NHS but does not currently have data for the Local NHS pavements. Until LADOTD captures 3 cycles of

pavement data for the Local NHS system, LADOTD will assume that Local NHS will perform similar to the Non-Interstate NHS. For the remainder of this document, this assumption will be a matter of record and readers should assume the Non-Interstate NHS data analysis, charts, tables and figures represent the Local NHS system as well.

4.4 ASSESSING HISTORICAL FEDERAL PERFORMANCE

Federal Data Requirements. The requirement of **23 CFR 515.7(g)** is that State DOTs shall use the best available data to develop their asset management plans.

We note that recent updates to the FHWA's HPMS data submittal requirements, with respect to the federal measure and legislation, has for the first time been completely formalized to eliminate the extensive individual state interpretations in historical submittals.

For instance, previously states could calculate cracking percentage in any way the state felt was appropriate. A state could use the entire lane, or some various wheel path dimension to make the calculation. These adjustments and new formally defined calculation methods will ensure consistently comparable nationwide future data submittals.

This section provides details with regards to pavement data collection with regards to this updated federal requirement.

Missing Historical Federal Data

Historical Federal Data Issues. LADOTD has been collecting pavement condition data since 1995 for a variety of pavement distress conditions; however, it does not have historical data relevant to the Federal measures for faulting or cracking.

Faulting Issue. There is simply no historical faulting data available based on the federal faulting condition measures. The federal Poor faulting condition measure begins at 0.15 inches. LADOTD never required the data collection vendor to keep the faulting data below a 0.2 inch threshold, based on the fact that joint repair treatment projects were triggered in the PMS for joints exceeding faulting thresholds of 0.4 inches.

Cracking Issue. While the Federal cracking data might technically be made available if LADOTD's data collection vendor provides the conversion of the raw historical data into the Federal measures. LADOTD decided not to pursue this course of action for several cost-related reasons:

First, the costly conversion of historical 2D data could be incompatible with the new 3D data being captured.

Second, LADOTD did not want to complicate the transition from 2D to 3D data already underway. This proved to be prophetic as the very complex analysis and conversion was still ongoing months after completion of the data collection effort.

Third, the cracking conversion would have been costly. LADOTD uses a 36-inch wheel path in the PMS analysis while the Federal cracking measure calls for a 39-inch wheel path. In addition, the Composite pavements would have to be completely reanalyzed using the new federal Asphalt protocols, so the conversion would not be a trivial effort and the significant cost would have been difficult to justify.

Fourth, with the missing faulting measures, the data would still be incomplete with respect to determining how effective LADOTD was historically with respect to the new Federal measures.

Finally, as noted in the previous section, the issue only becomes relevant if LADOTD is approaching the penalty situation of not maintaining the Interstate pavement in excess of the minimum threshold of 5% in poor condition. The PMS analysis at the time of the decision clearly indicated that LADOTD would not threaten the minimum threshold in the foreseeable future.

4.5 BRIDGE CONDITION DATA

Federal Data Requirements. The requirement of **23 CFR 515.7(g)** is that State DOTs shall use the best available data to develop their asset management plans.

Local Data Federal Requirement. In **23 CFR 515.7(f)** we find that “The processes established by State DOTs shall include a provision for the State DOT to obtain necessary data from other NHS owners in a collaborative and coordinated effort.”

Bridge Condition Data Collection

Federal NBI Bridge Inspections and Reporting. LADOTD is responsible for federal mandated inspections on all bridges in Louisiana, including Local NHS bridges. Bridge inspections capture both the federal National Bridge Inventory (NBI) component (superstructure, substructure, deck) level data along with the FHWA recently expanded data collection and reporting requirements that include element (girders, decks, piles, etc.) level data.

For consistency and accuracy, LADOTD chose to capture component level and element level data via inspection efforts rather than to use the BMS to provide for a software conversion from the component items to the element items.

LADOTD is fully compliant with both of these data requirements.

Bridge Performance Measures

Federal Requirement. In **23 CFR Part 490.411(a)** the FHWA identified that State DOTs will maintain bridges so that the percentage of the deck area of bridges classified as Structurally Deficient does not exceed 10.0 percent.

According to 23 CFR Part 490.411(b) , beginning with calendar year 2018 and thereafter, a bridge will be classified as structurally deficient when one of its NBI Items, 58 - Deck, 59 -

Superstructure, 60 - Substructure, or 62 - Culverts, is 4 or less, which is considered to be in poor condition..

It is most important for the public to understand that the term “Structurally Deficient” does not mean a bridge is unsafe to use!

Closing Unsafe Bridges. Bridges that are considered unsafe for any reason are immediately closed until they can be repaired or replaced. If funding for extensive repairs or replacement does not appear to be available in a reasonable time, complete removal of these unsafe bridges may be the correct option.

LADOTD Bridge Performance Measure. LADOTD adopted the performance measure of percent of structurally deficient bridges by deck area after the Katrina/Rita hurricane events in Louisiana significantly impacted bridges.

LADOTD is fully compliant with this structurally deficient bridge requirement.

5.0 Targets, Performance and GAP Analysis

5.1 INTRODUCTION

It is noted once again that this document is a performance-based document, not a needs document. This document is focused on NHS Pavement and Bridge asset performance assessments and outcomes. Capacity needs are not considered or discussed in this document.

Initially this chapter clearly identifies that LADOTD no longer has funding available to meet the federal funding match requirements that only the Legislature can provide.

The methodology for setting performance targets is reviewed followed by different sections that identify the federal performance penalty assessments that occur with failure to achieve minimum federally defined pavement and bridge conditions. The Desired State of Good Repair (DSGR) is formally defined and a GAP analysis is identified for the DSGR. A discussion of federal performance targets follows along with issues identified with projecting targets. The DSGR, GAP analysis and performance targets are all federally mandated. The mandated targets are then identified.

5.2 FEDERAL FUNDING MATCH

Federal Match Shortfalls. The use of federal funds requires a state to provide a matching amount of funds. LADOTD had recently been using toll credits to meet the federal match requirement, but toll credits are no longer available. The existing state funds are either obligated or insufficient to meet the federal funding match.

This analysis assumes that the Legislature will provide appropriate funding for federal match; however, if the Legislature does not provide the federal matching funds, LADOTD will not accomplish the DSGR or achieve the performance targets, and will experience a penalty assessment in the near future.

5.3 METHOD FOR SETTING PERFORMANCE TARGETS

LADOTD's strategic plan, effective through June 2022, sets forth agency performance targets including performance targets for all pavement and bridge conditions. This strategic effort is a responsibility of the Executive Committee and is updated, along with all state agencies, on a cycle determined by the Division of Administration. LADOTD cannot act

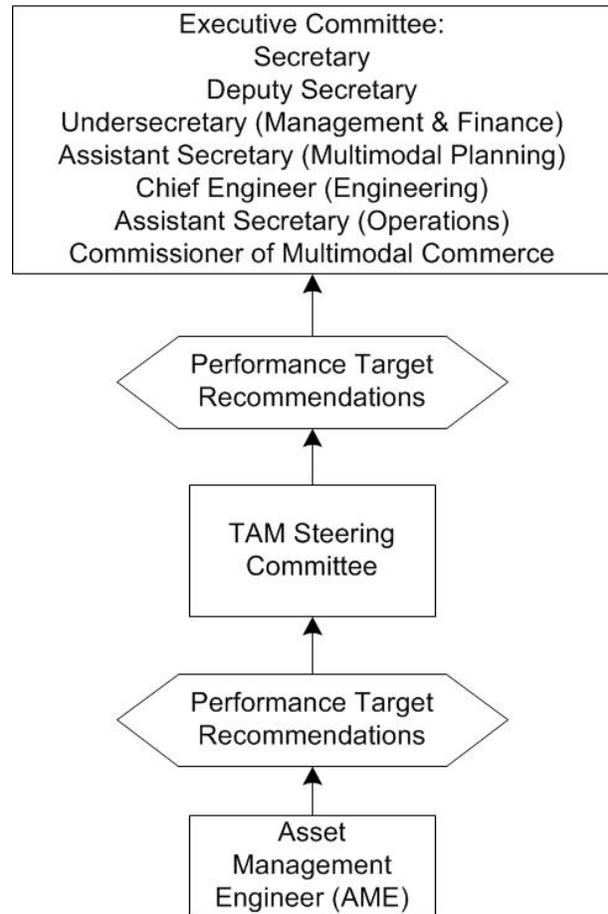
independently of this DOA administered cycle. This past strategic plan target setting methodology, with respect to pavement and bridge conditions, relied strictly on historical performance.

Going forward, approved NHS pavement and bridge performance targets will drive the agencies TAMP related asset management efforts and, at a later date, will become part of the Strategic Plan when that update cycle is performed.

Target Setting Methodology. As shown in the flow chart, the Asset Management Engineer (AME) will identify provisional data driven performance targets, for NHS pavements and bridges, that will represent investment strategy forecasts based on life cycle centered analysis.

The AME will recommend these provisional performance targets to the TAM Steering Committee, led by the Executive Champion. The TAM Steering committee will evaluate the AME provisional recommendations and then make its final recommendations to the Executive Committee.

All final performance targets will continue to be approved by the Executive Committee which is comprised of the Secretary, the Deputy Secretary, the Undersecretary of Management and Finance, the Assistant Secretary of Planning, the Chief Engineer, the Assistant Secretary of Operations, and the Commissioner of Multimodal Commerce.



5.4 FEDERAL PAVEMENT PERFORMANCE PENALTY

It is the intent of LADOTD to ensure that every possible step is taken to avoid a pavement penalty assessment.

The funding outcome of a penalty assessment is that other federal aid eligible State Highway System (SHS) routes will lose a significant source of funding as these funds would be mandated to be spent on the NHS pavement assets until compliance with the minimum requirements is once again obtained. It should also be noted that in a penalty situation,

Regional Highway System (RHS) funding would also then be diverted to the SHS to replace the NHS reassigned SHS funding within legal constraints

Federal Requirement. 23 CFR Part 490.315(a) establishes that the percentage of lane-miles of Interstate System in Poor condition shall not exceed 5.0 percent.

Federal Requirement. 23 CFR Part 490.317(a) establishes the penalty for exceeding the 5.0 percent minimum.

(1) Obligate, from the amounts apportioned to the State DOT under 23 U.S.C. 104(b)(1) (for the NHPP), an amount that is not less than the amount of funds apportioned to the State for Federal fiscal year 2009 under the Interstate Maintenance program for the purposes described in 23 U.S.C. 119 (as in effect on the day before the date of enactment of the MAP-21), except that for each year after Federal fiscal year 2013, the amount required to be obligated under this clause shall be increased by 2 percent over the amount required to be obligated in the previous fiscal year; and"

(2) Transfer, from the amounts apportioned to the State DOT under 23 U.S.C. 104(b)(2) (for the Surface Transportation Block Grant Program (STBGP)) (other than amounts sub-allocated to metropolitan areas and other areas of the State under 23 U.S.C. 133(d)) to the apportionment of the State under 23 U.S.C. 104(b)(1), an amount equal to 10 percent of the amount of funds apportioned to the State for fiscal year 2009 under the Interstate Maintenance program for the purposes described in 23 U.S.C. 119 (as in effect on the day before the date of enactment of the MAP-21).

2019 Pavement Penalty Assessment Calculation. In 2013, the relevant apportioned funding was \$92.2 million to Louisiana. So, increasing that total by 2% compounded annually since 2009 yields a 2019 NHPP obligation total of \$112.4 million. The additional transfer of \$9.2 million from the federal Surface Transportation Block Grant Program (STBGP) would create the 2019 total penalty of \$121.6 million if it would be assessed. Note that the 2% compounding total never goes away, so this total would increase each year going forward should LADOTD incur a future penalty assessment.

5.5 DESIRED STATE OF GOOD REPAIR (DSGR) REQUIREMENT

Federal Requirement. 23 CFR 515.9(d)(1) identifies the minimum content for the TAMP asset management objectives with respect to achieving and sustaining the "State of Good Repair":

- Asset management objectives. The objectives should align with the State DOT's mission. The objectives must be consistent with the purpose of asset management, which is to achieve and sustain the desired state of good repair over the life cycle of the assets at a minimum practicable cost.

5.6 GAP ANALYSIS REQUIREMENTS

Federal Requirement. 23 CFR 515.7(a). The TAMP must describe a methodology, with regard to the physical condition of the assets, for:

- Identifying gaps affecting the State DOT targets for the condition of NHS pavements and bridges as established pursuant to **23 U.S.C.150(d)**.
- Identifying deficiencies hindering progress toward achieving and sustaining the desired state of good repair (as defined by the State DOT).
- Developing alternative strategies that will close or address the identified gaps.

The TAMP must describe a methodology for analyzing gaps in the performance of the NHS that affect NHS bridges and pavements regardless of their physical condition, that will:

- Identify gaps in the effectiveness of the NHS in providing safe and efficient movement of people and goods. **(23 CFR 515.7(a)(2))**.
- Identify strategies to close or address the identified gaps affecting the physical assets. **(23 CFR 515.7(a)(3))**.

5.7 PAVEMENT DESIRED STATE OF GOOD REPAIR DEFINED

DSGR Defined. LADOTD defines the desired state of good repair as maintaining NHS pavements at or near the current condition state over the life cycle of the asset.

Pavements. Using the Pavement Performance Index (PPI), the goal of the DSGR is to not allow the Good percentage to decrease nor the Poor percentage to increase, based on values determined by the 2017 actual measured PPI. Current Performance is based on the 2018 PPI values.

5.8 PAVEMENT DSGR ASSESSMENT AND GAP ANALYSIS

DSGR Methodology. LADOTD performed the PPI based GAP assessment, detailed in chapter 9, “Investment Strategies”, for the DSGR over the 10-year TAMP analysis period. The analysis of existing funding levels identified that the 10-year DSGR outcome would be extremely deficient with significant GAPS for both Interstate and Non-Interstate NHS pavements.

As a result, LADOTD investigated a number of investment scenarios to identify the proper funding necessary to achieve the DSGR.

Interstate DSGR Outcome. This investment strategy analysis led to the Interstate pavement funding recommendations of \$33 million per year.

This investment strategy analysis effort afforded LADOTD with a preemptive opportunity to remedy the DSGR performance gap issues found with the existing funding level, allowing LADOTD to maintain these pavements at or near their current condition for the 10-year analysis period.

Interstate Pavements	Good	Fair	Poor
Desired State of Good Repair	56.9%	40.7%	2.4%
Current Performance	65.1%	33.6%	1.3%
Current Performance Gap	-8.2%		-1.1%
10-Year Projected Performance	63.5%	33.4%	3.1%
10-Year Projected Performance Gap	-6.6%		0.7%

These projections assume federal matching funds will be available.

LADOTD considers the 10-year GAP of less than 1% to be marginal.

Non-Interstate NHS DSGR Outcome. This investment strategy analysis led to the pavement funding recommendations of \$83 million per year for Non-Interstate NHS.

Again, LADOTD was able to preemptively remedy the DSGR performance gap issues found with the existing funding level, allowing LADOTD to maintain these pavements at or near their current condition for the 10-year analysis period.

Non-Interstate NHS Pavements	Good	Fair	Poor
Desired State of Good Repair	44.59%	47.13%	8.28%
Current Performance	56.10%	39.83%	4.08%
Current Performance Gap	-11.51%		-4.21%
10-Year Projected Performance	84.78%	12.68%	2.54%
10-Year Projected Performance Gap	-40.19%		-5.74%

These projections assume federal matching funds will be available.

NHS Pavement Forecast. As shown in Figure 5.1, pavement condition projections indicate a steady condition state for Interstate pavements, with only a 0.7% difference from 2017 to 2028.

Non-Interstate NHS pavements show a marked improvement in condition state from 2017 to 2028, while remaining in a steady state condition from 2019 forward.

Figure 5.1 Good & Fair Projections by Pavement Condition Index



5.9 FEDERAL PERFORMANCE TARGET REQUIREMENTS

Federal Requirement. 23 CFR Part 490.105(e)(4)(iii) requires that State DOTs shall establish 2-year targets that reflect the anticipated condition/performance level at the midpoint of each 4-year performance period for the condition of pavements on the Interstate System, the condition of pavements on the NHS (excluding the Interstate) and for the condition of bridges on the NHS.

Federal Exception. 23 CFR 490.105(e)(7) for the first performance period only, October 1, 2018, baseline condition and 2-year targets are not required for the Pavements on the Interstate System measures.

Additionally, **23 CFR Part 490.105(e)(4)(iv)** requires that State DOTs shall establish 4-year targets that reflect the anticipated condition/performance level at the end of each performance period for the same measures.

5.10 PROJECTING FEDERAL PAVEMENT PERFORMANCE

Issues with Pavement Data for Federal Targets

Pavement Data Timing Quirk. Federal targets are required to be based on the new performance measures; unfortunately, the new data necessary to predict those targets wasn't required to be collected until calendar year 2018. This unique timing quirk creates an interesting predicament for setting federal performance targets.

Since LADOTD cannot implement the federal pavement performance metrics in the PMS, there is not a current way to definitively predict future performance based on federal criteria. Furthermore, at the time of this update effort, LADOTD only has just completed its second federal performance metric data collection, so two (2) data points are not sufficient to predict future performance.

Initial Methodology for Projecting Federal Performance. This only becomes a truly relevant issue if LADOTD experiences a pavement penalty assessment based on the federal performance assessment. This however does present a problem with projecting 2- and 4-year targets based on federal performance measures.

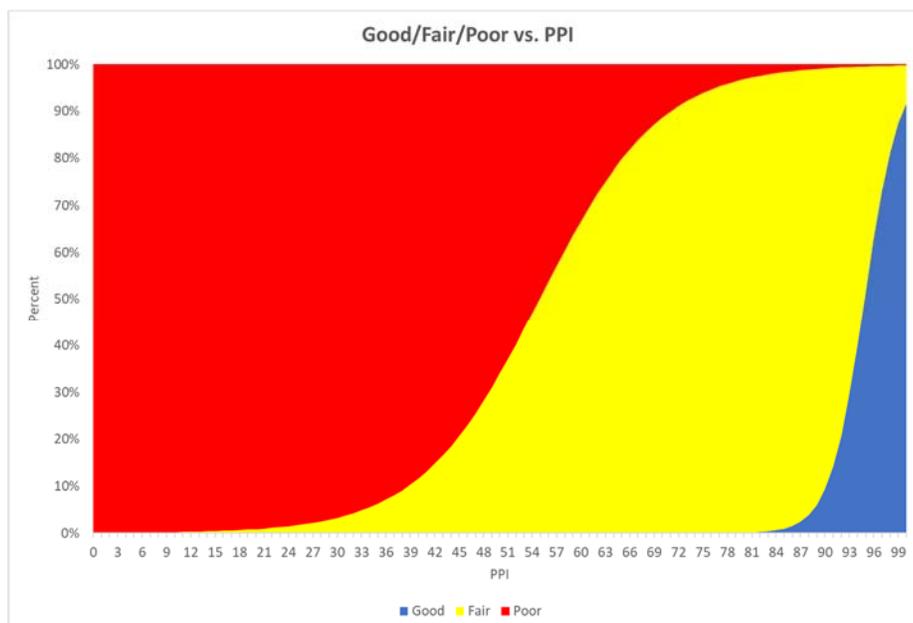
The PMS does predict pavement performance index (PPI) values, so using the federal pavement data collected, an initial effort to compare the PPI with federal good, fair and poor values has been performed.

Using a least squares regression, coefficients were identified to plot a logistic curve. For each PPI data point, the effort compares the difference between the PPI good, fair and poor values and the actual measured federal good, fair and poor values and then squares those related values. The best approach minimizes the sum of the squares. Figure 5.2 identifies the initial effort. The goal of the effort is to generate a model that allows you to take any future projected PPI value and identify the percentage chance of good, fair and poor for that predicted PPI value.

If the model is a good fit, the curves are more vertical and a limited number of poor values would exceed beyond the lower range of PPI values. The initial LADOTD results do not provide a very comfortable fit due to the wide range of PPI values in relation to the federal good, fair and poor values. As additional federal performance data is collected, the model should improve.

At some point, as more years of federal performance data has been accumulated, actual performance curves can be developed to better predict federal performance measures.

Figure 5.2 Initial Federal Good, Fair, Poor to PPI Logistic Curve



Other Target Setting Factors

External Factors. The 2-day FHWA led National Highway Institute course 138012, Effective Target Setting for Transportation Performance Management, identifies a number of external factors outside the agency’s control that affect target setting.

External Target Setting Factors	
Traffic	Modal Shares
Weather	Zones of Disadvantaged Populations
Gas Prices	Land Use Characteristics
Economy	Peer Agency Targets
Legislative Requirements	Vehicle Characteristics
Population	Driver Behavior
Vehicle Registration	Politics
Demographic Shifts	

Identified External Factors and Unknowns. Currently a group of significant external factors, outside the agency’s control, are affecting target setting. These external factors include, the statewide budget deficit of the past few years, the loss of buying power due to the inflation eroded Transportation Trust Fund dollars, a political climate that does not suggest immediate additional funding and most importantly, if the Legislature does not provide the federal matching funds, LADOTD simply cannot achieve the performance targets identified here, and will experience a penalty assessment in the near future. LADOTD has made the reasonable assumption that the current projected funding levels, while currently valid, might actually be strained even further in the future.

Missing Data. As previously noted, LADOTD was unable to convert historical data into federal data, and is struggling to find a correlation between the Federal performance measures, which can’t be projected, and the Pavement Performance Index measures which can be projected. LADOTD was also required to identify and submit these 2018 federal NHS pavement targets, based on the new performance measures, with only one (1) set of data available at that time.

Federal Data Requirements. The requirement of 23 CFR 515.7(g) is that State DOTs shall use the best available data to develop their asset management plans.

Conservative Targets. With the significant number of potentially impactful financial external factors, and a complete lack of data to base these mandated targets on, LADOTD took a very conservative approach with the initial Interstate pavement federal targets.

Future Target Adjustment. Per **23 CFR Part 490.105(e)(6)**, State DOTs may adjust an established 4-year target in the Mid Performance Period Progress Report, which is due on October 1, 2020. It is a given that LADOTD will make pavement target adjustments when that opportunity arises.

Federal Target Exception. **23 CFR 490.105(e)(7)** for the first performance period only, October 1, 2018, baseline condition and 2-year targets are not required for the Pavements on the Interstate System.

5.11 2018 FEDERAL NHS PAVEMENT TARGETS

The following represents the NHS pavement targets that were submitted for the 2018 target deadline. Note, the FHWA calculated and provided the Baseline values.

Based on all the factors enumerated here, LADOTD took the approach that declining targets would be the proper choice. Should federal match funding not be secured, then even these conservative declining targets will not be achieved.

Table 5.1 2018 Federal NHS Pavement Targets

2018 Federal Measure Pavement Targets			
Interstate	2018 Baseline	2-Year	4-Year
Good	n/a	n/a	10%
Poor	n/a	n/a	4%
Non-Interstate NHS	2018 Baseline	2-Year	4-Year
Good	17.8%	16%	14%
Poor	9.9%	10%	12%

2019 Federal NHS Pavement Data Update

2019 Data Update. LADOTD has now captured a second set of federal NHS pavement performance data. The following state maintained NHS pavement tables show a trend in a positive direction with respect to Good Interstate pavement conditions, but is at this point trending in a negative direction for Poor Interstate pavement conditions, based on the new federal measures.

Table 5.2 Interstate Pavement Conditions
(2018 HPMS Mileage, Primary Direction, based on New Federal Performance Measures, Estimated by LADOTD)

% by Condition Measure	Federal Baseline	*2018 All Fed Measures	^2019 All Fed Measures
Good	None	16.5	21.0
Poor	None	1.1	1.7

* = 2018 HPMS submittal, data captured in 2017

^ = 2019 HPMS submittal, data captured in 2018, not yet submitted at the time of this analysis

Table 5.3 Non-Interstate NHS Pavement Conditions
(2018 HPMS Mileage, Primary Direction, based on New Federal Performance Measures, Estimated by LADOTD)

% by Condition Measure	Federal Baseline	*2018 All Fed Measures	^2019 All Fed Measures
Good	None	18.4	18.8
Poor	None	10.2	12.3

* = 2018 HPMS submittal, data captured in 2017

^ = 2019 HPMS submittal, data captured in 2018, not yet submitted at the time of this analysis

Local NHS Pavement Data. To ensure data collection on the Local NHS pavements is captured in the same manner as other NHS pavements, LADOTD performs the data capture effort and provides the Local NHS pavement data to their respective Louisiana MPOs.

A positive trend is observed for Good Local NHS pavement along with a positive trend for Poor Local NHS pavements.

Table 5.4 Local NHS Pavement Conditions
(2018 HPMS Mileage, Primary Direction, based on New Federal Performance Measures, Estimated by LADOTD)

% by Condition Measure	Federal Baseline	*2018 All Fed Measures	^2019 All Fed Measures
Good	None	1.9	2.9
Poor	None	25.3	20.6

* = 2018 HPMS submittal, data captured in 2017

^ = 2019 HPMS submittal, data captured in 2018, not yet submitted at the time of this analysis

5.12 FEDERAL BRIDGE PERFORMANCE PENALTY

It is the intent of LADOTD to ensure that LADOTD takes every possible step to avoid a penalty assessment.

Federal Requirement. 23 CFR Part 490.413(a) defines the penalty for exceeding 10.0 percent of total deck area structurally deficient on NHS bridges for a consecutive 3-year period as:

- (1) During the fiscal year following the determination, the State DOT shall obligate and set aside in an amount equal to 50 percent of funds apportioned to such State for fiscal year 2009 to carry out 23 U.S.C. 144 (as in effect the day before enactment of MAP-21) from amounts apportioned to a State for a fiscal year under 23 U.S.C. 104(b)(1) only for eligible projects on bridges on the NHS.
- (2) The set-aside and obligation requirement for bridges on the NHS in a State in paragraph (a) of this section for a fiscal year shall remain in effect for each subsequent fiscal year until such time as less than 10 percent of the total deck area of bridges in the State on the NHS is located on bridges that have been classified as Structurally Deficient as determined by FHWA.

2018 Bridge Penalty Assessment Calculation. In 2009, the 23 USC 144 Bridge Program apportioned approximately \$201 million to Louisiana, so 50% of that total would result in an approximately \$101 million penalty. 23 USC 104(b)(1) is the National Highway Performance Program (NHPP), so this means that a minimum of approximately \$101 million of NHPP funds would have to be set aside for eligible bridge projects on the NHS, in the year following the determination that Louisiana was not maintaining the minimum level bridge condition for (3) three consecutive years. This penalty would continue until the NHS bridge

percentage of Structurally Deficient Deck Area, or Poor Condition level, was below 10 percent.

Penalty Assessment Time Frame. It is important to note that the penalty is assessed after exceeding the 10.0 percent structurally deficient deck area for (3) three consecutive years. This 3-year time was based on a number of factors including the lag time in both planning and performing bridge preservation work.

The impact of a penalty assessment effectively removes LADOTD's flexibility to apply these funds to other Federal Aid eligible SHS bridges redirecting the penalty level of funds to NHS bridges only.

Current Penalty Determination. Per 23 CFR 490.413(b), the FHWA made the first bridge penalty determination by October 1, 2016, and will annually compute the percentage of NHS bridges classified as Structurally Deficient/Poor Condition.

This annual determination will be based on all NHS bridges, which includes Local NHS bridges. This creates an interesting dilemma since LADOTD currently has no ability to intervene on behalf of any Local NHS bridges either through providing funding or bridge management analysis. This means LADOTD cannot project future conditions for these bridges, so the condition of these bridges could impact future penalty assessments.

The computed percentage value includes both State and Local NHS structurally deficient/poor condition bridges. The national FHWA office officially determine these values to be 7.9% in 2014, 7.5% in 2015 and 8.1% in 2016. Unofficially, the local FHWA office has identified these values to be approximately 6.5% in 2017 and 6.7% in 2018. So LADOTD is not currently in a penalty situation.

Since LADOTD can only maintain and manage state maintained NHS bridges, LADOTD has calculated that for same five years, 8.6%, 8.6%, 8.6%, 8.6% and 7.2% of the state maintained NHS bridges were structurally deficient. So, it appears that the condition of the Local NHS bridges, particularly the Pontchartrain Causeway Bridge, is currently aiding the overall condition of the NHS bridges in Louisiana. These years represent the data captured in the preceding year.

5.13 BRIDGE DESIRED STATE OF GOOD REPAIR DEFINED

DSGR Defined. LADOTD defines the desired state of good repair as maintaining NHS bridges at or near the current condition state over the life cycle of the asset. The goal of the DSGR is to not allow the Good percentage to decrease nor the Poor percentage to increase, based on values determined by the 2017 NBI submittal year ratings for Good and Poor.

Bridge Management System 11th Hour Substitute (NBIAS). Since the BrM BMS implementation is not yet complete, LADOTD acquired analysis data using the National Bridge Investment Analysis System (NBIAS), which is a solution used by the FHWA, to analyze the outcome of future investments with respect to performance conditions of bridges and structures. This data analysis was performed by a contractor and was

completed in June 2019 just as this TAMP document was being finalized. This new analysis has significantly impacted the TAMP and that impact is noted within the TAMP where appropriate.

5.14 BRIDGE DSGR ASSESSMENT AND GAP ANALYSIS

DSGR Methodology. The following is based on an update using the NBIAS BMS analysis. As noted in detail in chapter 9 “Investment Strategies”, this outcome is significantly different from the AASHTOWare™ PONTIS analysis.

Due to the slow deterioration of bridges, a 20-year analysis period was used. The bridge GAP assessment is reported for both a 10-year TAMP analysis period and a 20-year analysis period. The initial DSGR values are 2017 Good and Poor NBI values.

A DSGR Good GAP will occur when the Good values decrease from the 2017 DSGR Good condition and DSGR Poor GAP will occur when the Poor values increase from the 2017 DSGR Poor condition. In both cases, a negative value indicates no GAP and a positive value indicate a GAP exists.

NBIAS Bridge DSGR Outcome. This investment strategy analysis, using the previous BMS PONTIS, led to the NHS bridge funding recommendations of \$101 million per year, with an actual NHS bridge budget of \$134 million set to begin in SFY 2020-21.

This investment strategy analysis effort initially appeared to have afforded LADOTD with a preemptive opportunity to remedy the DSGR performance gap issues found with the existing funding level; however, the NBIAS analysis does not agree with that earlier conclusion.

The new NBIAS analysis now shows these earlier PONTIS projections were incorrect. The annual budget of \$134 million will not allow LADOTD to achieve the DSGR with respect to Poor conditions in either the 10 year or 20 year analysis. This funding level does allow LADOTD to achieve the DSGR with respect to Good conditions.

NHS Bridges	Good	Fair	Poor
Desired State of Good Repair	47.9%	43.5%	8.6%
Current Performance	47.8%	44.9%	7.2%
Current Performance Gap	0.1%		-1.4%
10-Year Projected Performance	67.4%	18.2%	14.4%
10-Year Projected Performance Gap	-19.5%		5.8%
20-Year Projected Performance	70.0%	16.6%	13.4%
20-Year Projected Performance Gap	-22.1%		4.8%

Excludes Local NHS Bridges

It must be noted that Figure 5.4 indicates that a large swing occurs between Good and Fair condition NHS bridge in the ensuing years prior to the 10 year DSGR performance assessment, with Good condition bridges reaching single digits, or 9.6%, in 2021. As these new funding levels are applied over the ensuing years, the Good conditions do rebound to a satisfactory level. In contrast, the

PONTIS analysis allowed the Good conditions to remain in single digits for the foreseeable future, while impacting the Poor condition bridges in a positive manner. While impacting the Poor condition bridges may seem appropriate, in limited funding situations, based on proven Life Cycle planning methodology, a superior LCP outcome would focus on maintaining as many assets as possible in Good and Fair condition.

These projections assume federal matching funds will be available.

DSGR Poor Outcome Causes. As noted earlier, large outlier bridges can potentially have a significant impact on bridge conditions; however, in this particular case, large outlier bridges are not primarily responsible for this increasing percentage of Poor condition NHS bridges. This large spike in Figure 5.3 can be attributed to the advanced age of a significant number of bridges, as shown earlier in Figure 3.7 “Count of Bridges Built by Decade” and Figure 3.8 “Deck Area of Bridges Built by Decade.”

New Assets from 2019 Legislative Session. It is also important to note that if a bridge currently exists, it is clearly an important asset that needed to be built at its current location. This is also obviously the case for the latest round of new pavements and bridges authorized in the 2019 legislative session that are designed to alleviate major issues and congestion.

However, the point missed by many is that there is now going to be a significant additional ongoing cost of maintaining these assets that seems to be largely ignored. While it is clearly admirable to reduce the cost of government, from both a taxpayer and political perspective, not providing appropriate funding to maintain existing assets is clearly not in Louisiana’s best interest with respect to the fiduciary responsibility of maintaining the long term value of these multi-billion dollar assets.

Downsizing. For those who insist that LADOTD cut cost in some manner, it must be explained that the only method available to management is to cut staff resources or to reduce materials and services used to maintain assets, which will only lead to a further reduction in asset condition. All other expenditures are mandated by either state or federal legislative requirements.

Downsizing
In the mid 1980’s, LADOTD had over 7,500 employees.
Currently LADOTD has just over 4,000 employees.

We note here that LADOTD has been one of the very few Louisiana state government agencies that has downsized over the years. The mantra of “doing more with less” has been the mandatory operating approach for a significant number of years, as LADOTD has reduced the work force from a high of over 7,500 employees in the mid 1980’s to currently just over 4,000 employees. There is simply nothing left to cut.

Alternative Strategies for Closing Identified GAPS

More Funding. NBIAS has projected that an immediate actual annual budget requirement of over \$160 million, after preconstruction and CE&I costs have been consumed, will be necessary to prevent LADOTD from entering into a long term bridge penalty assessment. That level of funding would require a significant infusion of additional funds from the legislature.

New National Funding Trend. We note once again, LADOTD is operating with the budget confines originally established in 1984. The recent national trend identifies that a significant number of state legislatures have been fiscally prudent by increasing funding for pavement and bridge assets to ensure appropriate budgets are available to maintain these existing multi-billion dollar investments.

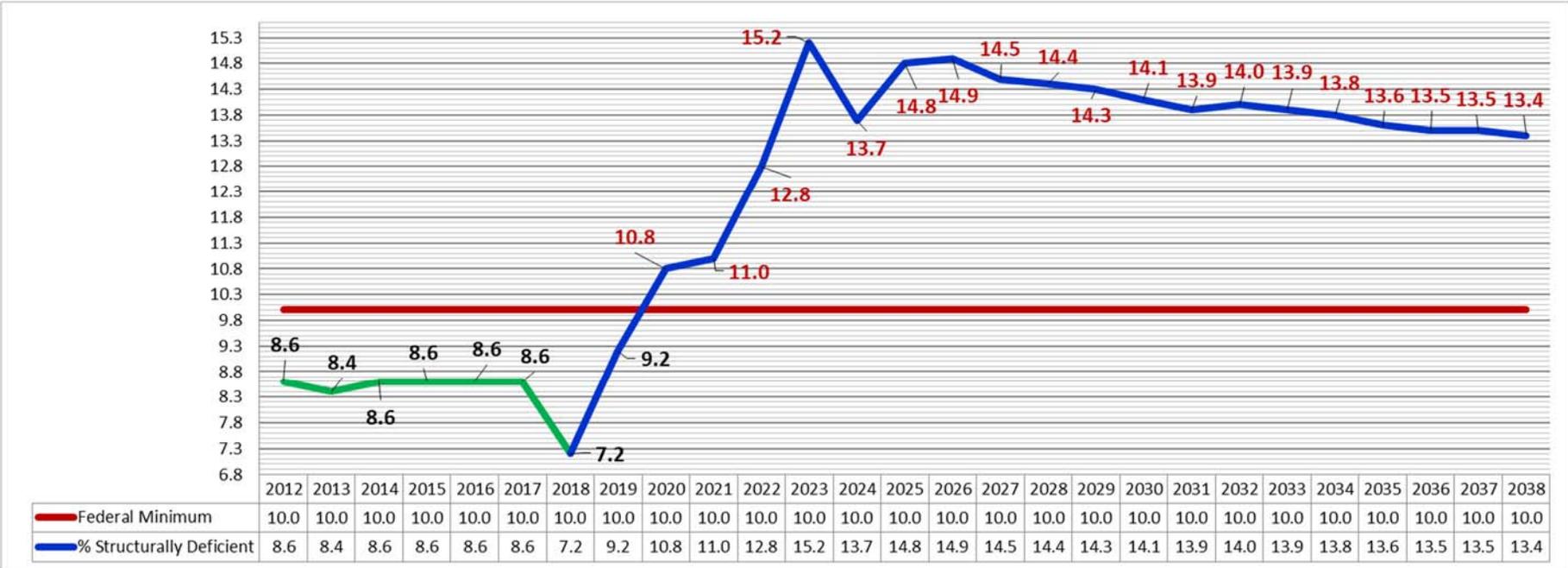
Public/Private Partnerships (Toll Bridges). In some states Toll Authorities take over vast stretches of roads and bridges. Again, this is simply a way to provide more funding. In nearly every case, the Toll Authority is lauded for the accomplishments the DOT could not achieve; however, in every case, significant additional funds are available to the Toll Authorities that were never available to the DOT. Tolls are nothing more than taxes applied to the specific asset user.

The Legislature has proven that tolls are going to be removed at the earliest opportunity (Sunshine Bridge, Crescent City Connection), forcing the entire operating and maintenance cost back onto LADOTD without providing the additional funds to accomplish these requirements.

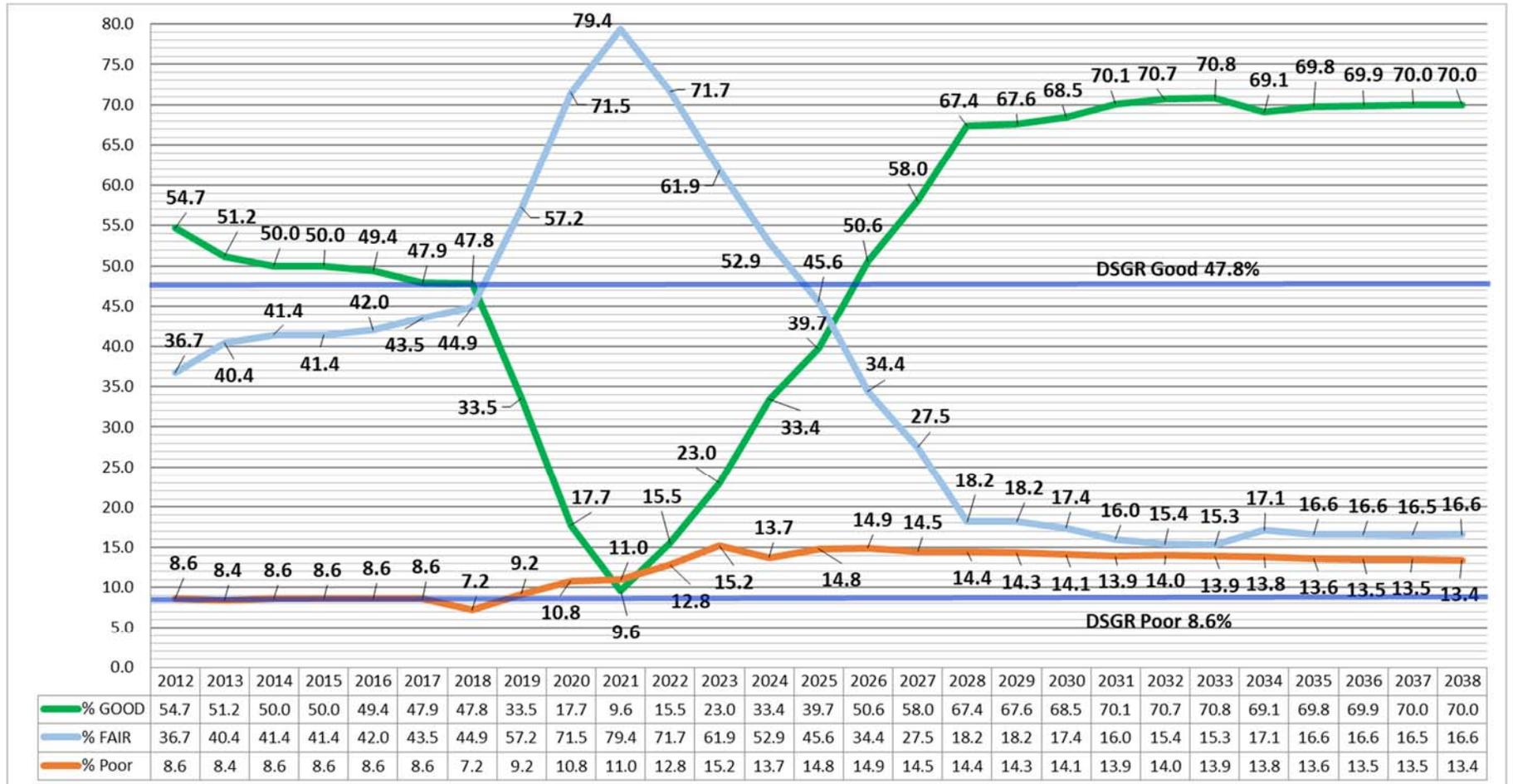
Redirection of Funding. LADOTD would have to redirect even more funding to the NHS bridge assets requiring the budgets for other state maintained bridges to be further decimated resulting in an ever increasing number of bridge closures across the state.

NHS Bridge Closures. The only other alternative will be to close more and more NHS bridges as the conditions deteriorate into unsafe situations. While this approach does meet the requirement for safe movement of people and goods, the efficient requirement is most likely defeated.

**Figure 5.3 SD Condition for Historical (green) & Forecasted (blue) NHS Bridge (based on deck area)
(Excluding Local NHS Bridges)**



**Figure 5.4 Good, Fair & Poor Conditions for Historical & Forecasted NHS Bridge
(Excluding Local NHS Bridges)**



5.15 PROJECTING FEDERAL BRIDGE PERFORMANCE

Methodology. In contrast to pavement, LADOTD can review historical bridge performance and also reasonably predict bridge performance based on the federal measure for the NHS bridge asset class.

Bridge inspections identify values for Deck, Substructure and Superstructure or Culverts based on a 0-9 rating scale where 9 represents a rating of excellent condition while 0 represents a failed condition. Again, any structure or culvert greater than 20 feet in length along the roadway is considered an NBI bridge.

If all 3 measures are in the Good range, the bridge is in Good condition. If any measure is in the Poor range, the bridge is in Poor condition and considered Structurally Deficient. All other bridges are in Fair condition. For the individual culvert measure, the value directly determines the condition.

Bridge Target Setting Factors

NBI Rating Analysis. It is important to understand how the national bridge inventory inspection (NBI) ratings values are assigned to bridges.

Good Ratings. To be classified in overall Good condition, bridges are required to have each of the deck, substructure and super structure components within the NBI ratings ranges of 9 to 7. A value of 9 is only possible for a new bridge, not for a rehabilitated bridge. Values of 8 are also very difficult to accomplish and maintain for bridges without very significant funding, so a value of 7 is the normal value for a bridge in Good condition.

In almost all cases, rehabilitated bridges end up with ratings no higher than 7. In Table 5.5, we find the 2018 deck area volumes confirm this analysis and identify currently that 42.2% of all NHS bridges are rated at a Good condition of 7.

Fair Ratings. Fair values range from 6 to 5, and an overall Fair condition assignment is given to a bridge when it has only a single component, either the deck, substructure or super structure rated with a value of 6 or 5.

Federal Bridge Condition Criteria - 23 CFR Part 490.409(b)	
Metric	Range
Good	9 - 7
Fair	6 - 5
Poor	4 - 0

Applies to Deck, Substructure, Superstructure and Culvert NBI Items

A bridge can often move relatively quickly from 7 (Good) to 6 (Fair) due to this single component rating process. Again, in Table 5.5 we find that 38.1% of the bridges in Fair condition are rated at 6, with only 6.8% rated at 5.

High Good Percentage of Outlier Bridges. The current elevated 47.8% of Good NHS bridges are attributed to the results of the recent I-10 Twin Span emergency replacement, other Katrina/Rita damaged bridge emergency replacements, the new LA 1 bridge from Leesville to Port Fourchon, the US 90 Huey P. Long rehab project, the replacement and widening of most of the I-12 bridges between Baton Rouge and Hammond in preparation for future pavement widening, and recent TIMED program projects, specifically the John James Audubon Bridge.

Each of these efforts resulted in the rehabilitation, replacement or new construction for a significant amount of NHS bridge deck area. However, this elevated percentage Good NHS bridges is dramatically dropping to 9.6% by 2021, but will rebound from that point as the new projected funding increases begin to take effect, assuming federal match funding is available.

Table 5.5 NHS Deck Area by NBI Ratings

***2018 NHS Deck Area by NBI Rating**

NBI Rating	0	1	2	3	4	5	6	7	8	9	Grand Total
Good								51,125,036	6,723,181	45,503	57,893,720
Fair						8,234,123	46,188,018				54,422,141
Poor	1,653		80,208	3,906,135	4,778,761						8,766,757
Grand Total	1,653	0	80,208	3,906,135	4,778,761	8,234,123	46,188,018	51,125,036	6,723,181	45,503	121,082,618
Percentage Of Total	0.0%	0.0%	0.1%	3.2%	3.9%	6.8%	38.1%	42.2%	5.6%	0.0%	100.0%

* = 2018 NBI Data represents 2017 Bridge Conditions; Does Not include Local NHS

Identified External Factors and Unknowns. Currently a group of significant external factors, outside the agency’s control, are affecting target setting. These external factors include, the statewide budget deficit of the past few years, the loss of buying power due to the inflation eroded Transportation Trust Fund dollars, a political climate that does not suggest immediate additional funding and most importantly, if the Legislature does not provide the federal matching funds, LADOTD simply cannot achieve the performance targets identified here, and will experience a penalty assessment in the near future. LADOTD has made the reasonable assumption that the current projected funding levels, while currently valid, might actually be strained even further in the future.

11th Hour NBIAS NHS Bridge Forecast. As shown in Figure 5.3, NBIAS projections identify that the projected budget of \$134 million per year will breach the 10% performance threshold in 2020 and will not return below that value for the entire 20 year analysis period. This will force LADOTD into a bridge penalty assessment, noting once again these values only represent State NHS bridges, not Local NHS bridges. With the Local NHS bridges added in, the actual percentages will be affected, but there is no current method for projecting Local NHS bridge conditions. It is hoped that the Local NHS bridge conditions will continue to aid in improving the overall NHS bridge conditions.

5.16 2018 FEDERAL NHS BRIDGE TARGETS

The following represents the NHS Bridge targets that were submitted for the 2018 target deadline. Note, the FHWA calculated and provided the Baseline values.

Based on the external factors enumerated here, LADOTD took the approach that declining targets would be the proper choice. Should federal match funding not be secured, then even these conservative declining targets will not be achieved.

Table 5.6 2018 Federal NHS Bridge Targets

2018 Federal Measure Bridge Targets			
NHS Bridges	2018 Baseline	2-Year	4-Year
Good	44.8%	35.0%	30.0%
Poor	6.7%	9.9%	9.9%

NBIAS 2 Year and 4 Year Federal Performance Targets. It is also noted that Figure 5.4 now indicates that neither the Good or Poor federal performance targets will be achieved for NHS bridges. Apparently, what was initially considered to be conservative targets weren't conservative enough.

LADOTD has redirected as much funding as possible to positively impact this significant and growing need; however, unless significant additional funding becomes available, this negative trend cannot be alleviated.

6.0 Life Cycle Planning

6.1 INTRODUCTION

This chapter defined the concepts of worst first and preservation first and then introduces the concepts of life cycle planning (LCP). Next it presents a synopsis of the consequences of delayed preservation on both project costs and maintenance costs followed by an explanation of the LCP methodology.

It defines the Pavement and Bridge Management System requirements followed by the LCP requirements. LADOTD's approach for achieving these requirements follows with discussion of analysis methods, preservation programs, project selection processes and deterioration modeling methods.

This section then describes LADOTD's LCP strategies and defines work type crosswalks for the new TAMP work types, along with the current pavement and bridge project work types. A summary of historical project expenditures based on these new work types is provide along with a summary of the current state fiscal year's maintenance activity expenditures. Finally, a summary of very large bridge projects is provided to acquaint the reader with the extreme costs associated with very large bridges in Louisiana.

Worst First to Preservation First

One of the primary goals of MAP-21 is to drive treatment strategies away from a "Worst First" towards a "Preservation First" approach. There is a significant amount of literature that very clearly establishes and substantiates the fact that a "Preservation First" strategy is the most cost-effective strategy for pavement and bridge assets. In fact, over the life of an asset, various research efforts have documented that well-timed preservation activities can cut life cycle costs by as much as one-half when compared to a policy where no preservation is performed.

A "Worst First" treatment strategy involves spending most of the available funding on the worst conditioned assets in an effort to revive the nearly extinguished asset. This usually amounts to a replacement or major rehabilitation of the asset. The outcome of this approach is that a very limited number of assets are improved, while a large number of assets continue to decline in condition.

A "Preservation First" strategy effectively results in a spending approach that uses the very limited available funding on many more assets, essentially preserving these assets in as close to their current condition as possible, and not spending the money replacing a small number of assets in far worse condition.

One of the tools to accomplish this is Life Cycle Planning (LCP). LCP is a relatively new network level approach, that is an adaptation of the existing basic principles of the project level life cycle cost analysis (LCCA) approach.

6.2 LIFE CYCLE PLANNING CONCEPT

Federal Requirement. The definition of life cycle planning (LCP), identified in **23 CFR Part 515**, is:

“Life cycle planning means a process to estimate the cost of managing an asset class, or asset sub-group over its whole life with consideration for minimizing cost while preserving or improving the condition.”

The basic, underlying principle of LCP is that timely investments in an asset, via the best sequence of maintenance, preservation, and rehabilitation treatments, result in an improved overall condition, a longer life span, and lower long-term costs. An optimum mix of treatments is best determined by advanced pavement and bridge management systems, using predictive modeling along with a fundamental understanding of the costs, benefits, and service life extensions for different treatment types. LCP also instills a focus on a proactive preservation approach and works to eliminate a reactive, fix it after the fact, maintenance approach to maintaining assets.

Life Cycle Planning at LADOTD. Like many State DOTs, LADOTD in the past engaged in a “Worst First” strategy. Despite that fact, LCP has also been intuitively practiced at LADOTD, even if not been formally applied on an agency-wide basis or in a policy driven manner.

For instance, LADOTD currently designates a very limited number of bridge replacement types as older bridges types are removed from service and replaced. Historically, bridges were designed in a one-off manner, with very few bridges using the same design. That led to LADOTD currently having a total of sixty-four (64) different types of bridges on the state maintained system.

The construction of the Interstate system was the beginning of the end for that practice. The Interstate bridge designs changed the focus to both longevity and the minimization of maintenance requirements. From that point on, these repeatable LCP type strategies became imbedded at LADOTD. Currently, LADOTD considers only seven (7) different generalized replacement bridge types. Fully 95% of replacements are very low maintenance prestressed concrete girders or slab span bridges.

LCP has also replaced historical construction decisions that only consider the immediate costs of a project, with the more impactful decisions that consider the long-term maintenance, preservation and operations cost, eliminating those historical decisions that would rarely provide the best value for an asset.

Following that rationale, consider the fact that LADOTD currently builds most of the small fixed bridges using concrete and does not use timber anymore, even though the initial cost of a timber bridge would be a fraction of a concrete bridge cost. It is well known that

timber bridges experience truck load limit issues, wear out quickly, and require almost continuous maintenance. To reach the life span of a simple, but initially much more expensive concrete bridge, there would be a need to rebuild the timber bridge a number of times.

LCP factors in all the down time, user detour and delay costs, material cost, labor cost, replacement cost, life expectancy, etc. to help determine that the prestressed or slab span concrete bridges are the superior long-term LCP cost benefit choice over timber bridges. In this case, sound agency project decisions embrace the LCP concept.

While this simple bridge example illustrates the concept, in reality, the decisions are not always that simple, plus they need to be applied against many asset choices via an in-depth analysis.

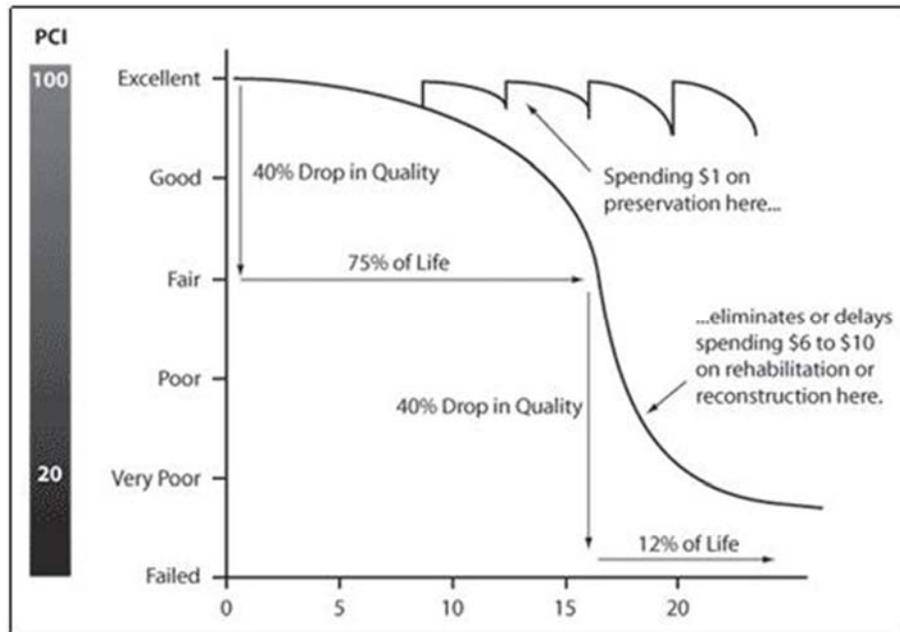
LCP Embraces Preservation over Worst 1st. Figure 6.1 below, from the well-known Galehouse research investigations, shows that optimal expenditures, early in the life of a pavement asset, are relatively inexpensive and will maintain the asset at, or near, excellent condition while effectively extending the life of the asset significantly, with the most efficient life cycle cost. By the same token, the “do nothing” approach does not even allow the asset to reach its expected life as it encounters the consequence of very rapid deterioration. A worst 1st approach would focus on addressing these end of life assets before applying preservation dollars on Good and Fair condition assets.

It should also be noted that these less expensive pavement preservation treatments have a “limited window of application opportunity”. These treatments are only effective if applied in the appropriate deterioration timeframe. Applying treatments past their appropriate opportunity window is counterproductive and is generally a waste of money; and as such, they become completely inefficient in terms of the asset’s life cycle costs.

To illustrate this, we examine the proper time to apply the relatively inexpensive chip seal on an asphalt pavement. Proper timing requires this treatment to be applied when small cracks are beginning to show up on the pavement surface. These smaller cracks should be sealed to both prevent water infiltration and further deterioration into larger cracks which will require a more expensive overlay treatment. When a chip seal is delayed, and the cracks get larger, the chip seal is no longer an effective treatment. Applying a chip seal on these larger cracks is often a bad investment.

Figure 6.1 Life Cycle Cost and Preservation Intervals

Source: Principles of Pavement Preservation, Galehouse, et al. 2003



6.3 CONSEQUENCES OF DELAYED PAVEMENT PRESERVATION TREATMENTS

As noted above, preservation treatment benefits assume proper treatment selection and application within the appropriate time or condition range for the treatment. Preservation treatment delays are primarily caused by a lack of, or limited funding and the lack of human resources due to the long-term downsizing of the state workforce, both of which can result in delays in project scheduling.

External Factors. In other special cases, external factors, such as recent repeated heavy loads from overweight truck traffic, including operation of agricultural, logging, wet trash removal and fracking vehicles, can cause rapid and abnormal deterioration to localized pavements.

The PMS analysis data collection effort captures NHS pavement condition data on two-year cycles, and in these cases, the PMS condition data lags the current pavement conditions.

When damage occurs as a result of these special cases, an upgrade of the prescribed PMS preservation treatment is often required. Refer to the earlier discussion that treatments have a limited window of application. A district may be required to completely scrap a treatment when the extra funding required for the more comprehensive treatment is not available.

Research Findings. NCHRP Report 859 quantified the consequence of delayed maintenance or preservation, clearly identifying that the result are degraded pavement conditions, more advanced and costly treatments, and a reduction in Level of Service (LOS). In addition,

NCHRP Report 859 adds the following additional consequences for delayed maintenance or preservation:

“... highway assets that perform below the expected LOS have been perceived to generate user discomfort, increase exposure to accidents, increase fuel usage, and increase damage to vehicles (Setyawan et al. 2015). Environmentally, air pollution increases with greater traffic congestion. Furthermore, poorer pavement condition can affect vehicle fuel emissions (e.g., CO, CO₂, HC, NO_x) (Chang et al. 2016). Also, without proper maintenance, materials deterioration also can affect the environment negatively (Setyawan et al. 2015).”

Actual Consequences of Delayed Bridge Preservation

Delayed Preservation, Huey P. Long - O.K. Allen Bridge in North Baton Rouge. One of the best examples of the consequences of delay preservation leading to more extensive damage and escalated costs can be found in the project to restore the condition of the US 190 bridge in north Baton Rouge.

This bridge was opened in August of 1940 and cost \$8.4 million to construct. The rail and highway bridge structures, including the railroad viaduct structures, which are owned by LADOTD, are subject to an original 1930s right of use agreements with both the Kansas City Southern Railway Company and the Union Pacific Railroad Company which was renegotiated with UP(1945) and KCS(1947).

This bridge had last been painted in the mid-1960s and in the early 1980s needed relatively minor repairs and painting. Efforts began in the 1980s to secure an update to the cost share agreement with KCS and UP to perform the work. At that time the cost estimate was \$30 million dollars to repair and paint the bridge. Due to the downturn in the national economy in the mid-1980s, funding became an issue for all parties and an agreement could not be reached.

Efforts to perform this work continued at various times over the years to no avail and the structure continued to deteriorate. As the delays continued, the deterioration was progressing to the point where the bridge would eventually receive a load rating restriction that could have prevented the railroads from fully using the bridge.

An October 2012 Cooperative Endeavor Agreement (CEA) provided for rehabilitation of the bridge and viaducts. The project was just recently completed and as a consequence of the delayed bridge preservation, the final cost had escalated to \$130 million.

Consequences of Delayed Preservation on Maintenance Costs

Delayed Preservation Increases Maintenance Costs. In more every day terms, using the department’s Maintenance Management System, maintenance executives analyzed maintenance data and have established the actual cost of pavement maintenance activities based on condition.

Table 6.1 below very clearly shows there are significant increases in maintenance cost when pavements move from Good to Fair and then Poor condition. These cost increases very obviously illustrate the importance of having appropriate funding levels and staff resources to preserve pavements in a Desired State of Good Repair on NHS pavements, as required by federal legislation.

Table 6.1 Average In-House Pavement Surface Maintenance Costs (FY 2014 to FY 2016)

PAVEMENT TYPE	CONDITION	AVG COST/MILE/YEAR
Interstate	Good	\$1,308
	Fair	\$1,608
Non-Interstate NHS	Good	\$1,326
	Fair	\$2,109
	Poor	\$3,789

6.4 LIFE CYCLE PLANNING METHODOLOGY

LCP Methodology. This chapter details LADOTD’s life cycle planning efforts for the NHS pavement and bridge assets. LADOTD’s existing LCP strategies and practices are based on the long-term use of the PMS that processes data collected biennially to generate projected conditions and the BMS that processes the annual NBI inspection data to generate projected condition ratings.

Both management systems use sophisticated deterministic deterioration modeling, based on strategies developed over years of condition data collection and treatment history data, to identify future conditions for any number of various funding options. Using a number of defined treatments, or work types, programmed into the management systems, the actual project treatment recommendations focus on providing the most appropriate life cycle cost over the analysis period.

The condition outcomes of these different scenarios are then evaluated against both federal and state condition targets, to identify appropriate issues and gaps that will prevent the agency from reaching those targets, and providing a preemptive opportunity to remedy these issues and gaps going forward.

Federal Requirement. In response to **23 CFR 515.7(b)**, requiring “A State DOT shall establish a process for conducting life cycle planning for an asset class or asset sub-group at the network level”.

Asset Classes. Interstates and Non-Interstate NHS pavements make up the TAMP pavement asset classes.

State maintained NHS bridges make up the TAMP bridge asset class.

LADOTD has included, for informational purposes only, the SHS and RHS pavement asset classes and the Non-NHS bridge asset class in the TAMP.

Asset Sub-Groups. With respect to asset sub-groups, the LADOTD PMS performs analyses for the (4) four pavement types of Asphalt, Composite, Jointed Concrete and Continuously Reinforced Concrete.

Note the federal performance assessment is based on only (3) three pavement sub-groups, Asphalt, Jointed Concrete and Continuously Reinforced Concrete, with composite pavements included in the Asphalt sub-group.

For bridges, the asset sub-groups include mostly different types of concrete bridges, steel bridges, movable bridges and a few other types of bridges.

Local NHS Pavement Condition Data. Pavement condition data has not been historically captured by the Causeway Commission or Local MPOs. That changed recently with the new LADOTD data collection contract designed to capture pavement inventory data on the Local NHS for both the MPOs and the Causeway Commission. Both the data capture and data processing will be performed by the same team, allowing for data quality and accuracy.

Local NHS Bridge Inspection Data. LADOTD now obtains bridge inspections data from the Causeway Commission and has always performed all statewide bridge inspections, including those for the Local MPOs.

Local NHS Asset Assumptions. For the current analysis, LADOTD makes the assumption that the Causeway Commission will use toll revenues to continue to maintain their NHS pavement and bridge assets in their current steady state condition.

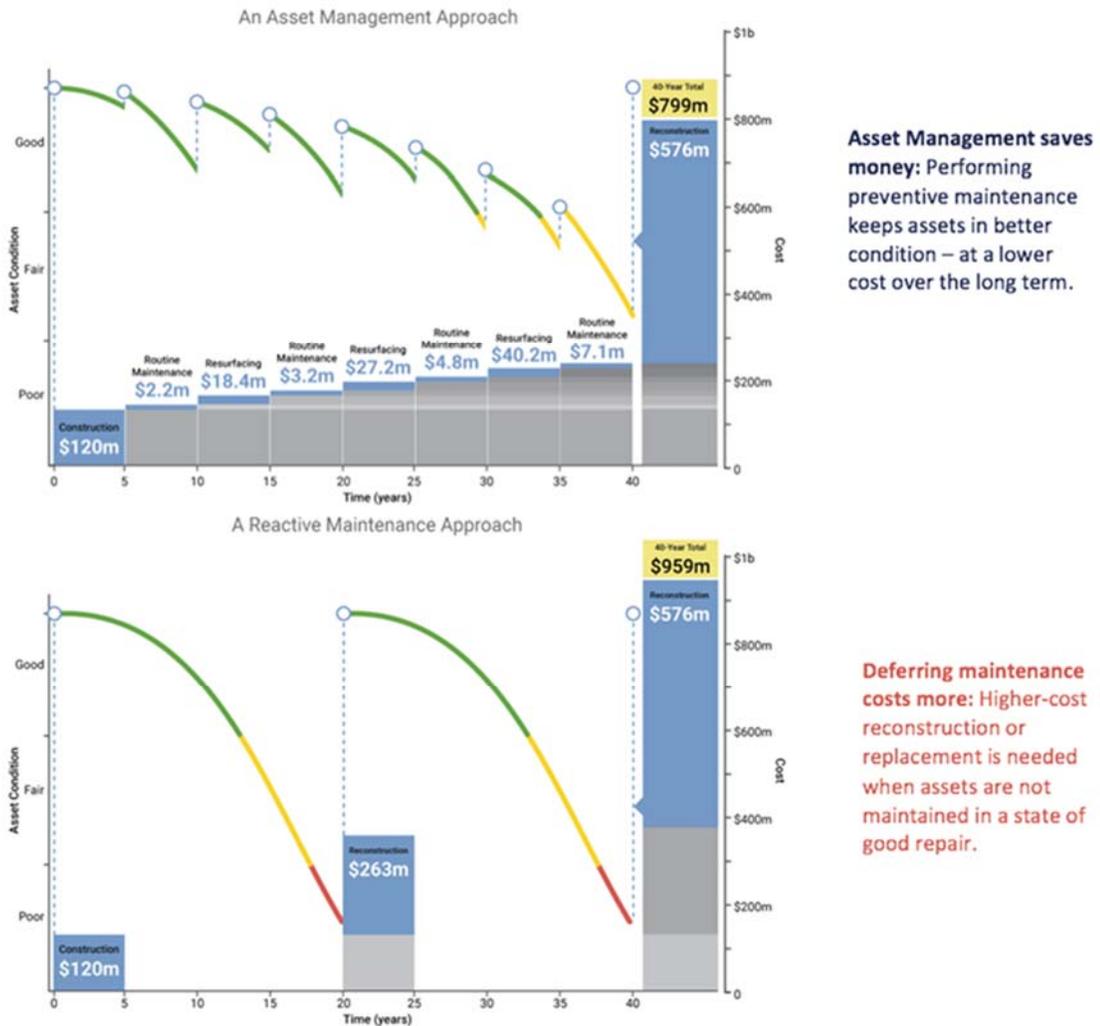
LADOTD also makes the assumption that the Local NHS pavement and bridges will respond in the same manner as the LADOTD Non-Interstate NHS assets. These assumptions will remain in effect until appropriate data becomes available, from the asset owners, to analyze these assets separately.

Excluded Asset Sub-Groups. Using this assumptive approach, LADOTD will not exclude any asset sub-groups in the overall pavement analyses. For the bridge analysis, culverts that are classified as bridges are excluded. Culverts have exceeding long lives and do not negatively impact the agencies life cycle analysis.

Management Strategies. Typical management strategies will be identified in this chapter as well. As identified before, LCP helps an agency to move from a “Worst First” approach to a “Preservation First” approach. Figure 6.2 below clearly shows the life cycle cost benefit of moving to a “Preservation First” approach.

Figure 6.2 Proactive Preservation vs. No Preservation

Source: RIDOT – based on an analysis published by TXDOT, compiled for Caltrans by Spy Pond Partners



6.5 MANDATED MANAGEMENT SYSTEMS

23 CFR 515.17 mandates that State DOTs implement both Pavement and Bridge Management Systems. Essentially, Congressional legislation now mandates data driven decisions for all aspects of Asset Management. Table 6.2 is provided to summarize how LADOTD addresses these requirements.

Overall Management Systems Concept. This federal mandated concept of “Management Systems” refers to the overall comprehensive process used to make data driven, life cycle based, project selection decisions, and does not refer to the individual software pavement and bridge management solutions.

Table 6.2 Mandated Management System Requirements

23 CFR 515.17 Requirements	PMS	BMS
Collecting, processing, storing, and updating inventory and condition data for all NHS pavement and bridge assets	A data collection contractor collects, processes, stores and updates pavement condition data meeting the HPMS requirements	LADOTD Inspection Crews collect data consistent with NBI bridge and element-level requirements BrM processes, stores and updates data consistent with NBI bridge and element-level requirements
Forecasting deterioration	dTIMS predicts change in pavement performance index (PPI) by pavement section	NBIAS predicts change in condition by bridge deck, substructure and superstructure elements
Determining the benefit-cost over the life cycle of assets to evaluate alternative actions (including no action decisions)	dTIMS identifies the most cost-effective treatments	NBIAS identifies the most cost-effective treatments for each bridge element over its life cycle
Identifying short- and long-term budget needs for managing condition	dTIMS identifies budget needs in its simulation model	NBIAS identifies budget needs in its simulation model
Determining the strategies for identifying potential projects that maximize overall program benefits within the financial constraints	dTIMS identifies the most cost-effective projects within constraints in its simulation	NBIAS identifies the most cost-effective projects within constraints in its simulation NBI data analysis identifies bridges that are Good approaching Fair & Fair approaching Poor
	Input from District Staff	Input from District Staff
Recommending programs and implementation schedules to manage condition within policy and budget constraints	dTIMS recommends programs and program years within constraints in its simulation	NBIAS recommends programs and program years within constraints in its simulation
	Project Selection Staff analyze all data and options to select projects for program	Project Selection Staff analyze all data and options to select projects for program

Pavement Management System (PMS). LADOTD implemented Deighton’s dTIMS Pavement Management System (PMS) in 1991. This very mature PMS was implemented to analyze the now over 20 years of pavement data which has been captured using Automatic Road Analyzer (ARAN) vehicles. The pavement condition data that is collected is then analyzed to forecast long-term and short-term funding needs, evaluate existing conditions, prioritize treatments along with projects, accumulate historical data to evaluate performance, and supply the research section with such data.

The PMS allows LADOTD to evaluate a series of budget scenarios to determine the ability of each budget scenario to achieve targets and desired states of good repair. It is also used to aid in identifying the most appropriate LCP strategies that will improve the performance,

planning, design, construction, rehabilitation and maintenance of all State maintained highways.

To meet LADOTD's goal of optimizing the use of available funding, the PMS performs a comprehensive life cycle benefit-cost analysis to identify the most appropriate treatments to use for the available funding. It then performs a heuristic optimization analysis based on a 20-year analysis period with a 10-year treatment period for deterministic deterioration modeling. This approach allows LADOTD to maximize benefits within funding constraints.

Bridge Management System (BMS). LADOTD implemented the AASHTO PONTIS Bridge Management System in 1994 and is currently in the process of updating to the newer AASHTO BrM BMS.

BrM is now used to store the federal National Bridge Inspection Standards (NBIS) inspection data for bridge inspections along with the bridge inventory data. When this solution is completed, it will be expected to manage potential treatments, or work types that will be used on bridges and to provide life cycle cost analysis and benefit/cost analysis via deterministic deterioration modeling for various analysis efforts to categorize bridge health indexes, risk indexes, etc.

Bridge Management System 11th Hour Substitute (NBIAS). Since the BrM BMS implementation is not yet complete, LADOTD acquired analysis data using the National Bridge Investment Analysis System (NBIAS), which is a solution used by the FHWA, to analyze the outcome of future investments with respect to performance conditions of bridges and structures. This data analysis was performed by a contractor and was completed in June 2019 just as this TAMP document was being finalized.

6.6 PAVEMENT LIFE CYCLE PLANNING

Life Cycle Planning Analysis

Federal Requirement. We find in **23 CFR 515.7(b)(1)** that a life cycle planning process shall, at a minimum, include the following:

“Incorporating the State DOT targets for asset condition for each asset class or asset sub-group into the analysis.”

Life Cycle Planning Analysis. The Pavement Management System (PMS) is the heart of pavement LCP at LADOTD and was established to analyze pavement condition data for use in improving the performance, planning, design, construction, rehabilitation and maintenance of the State highway network. The PMS is fundamentally a comprehensive life cycle cost and deterioration modeling tool designed to meet LADOTD's goal of optimizing the use of available funding. Data collected on the highway network, pavement conditions and highway inventory are analyzed to forecast long-term and short-term funding needs, evaluate existing conditions, accumulate historical data to evaluate performance, prioritize projects, and supply research with such data.

The PMS also allows LADOTD to evaluate a series of budget scenarios to determine the ability of each budget scenario to achieve targets and the desired state of good repair. Finally, the PMS is used to analyze the actual projected budget for the analysis period to determine if those targets and desired state of good repair will actually be achieved.

Asset Classes. Interstates and Non-Interstate NHS pavements make up the TAMP pavement asset classes.

Asset Sub-Groups. With respect to asset sub-groups, the LADOTD PMS performs analyses for the (4) four pavement types of Asphalt, Composite, Jointed Concrete and Continuously Reinforced Concrete.

Note the federal performance assessment is based on only (3) three pavement sub-groups, Asphalt, Jointed Concrete and Continuously Reinforced Concrete, with composite pavements included in the Asphalt sub-group.

Pavement Preservation Program

The FHWA approved the 2013 LADOTD policy document, “Selection of Treatments and Projects for Pavement Preservation”, which outlines the adoption of a LCP approach for use in the Preservation/Rehabilitation/Replacement Program (PPR) and specifically the Pavement Preservation (Road Preventive Maintenance) (PRR-PM) ancillary program.

Please note that this policy document focuses only on a small part of the pavement preservation budget partition but is included here primarily to reference the existence of this germane LCP policy document. This document also states that the Highway Project Selection Process Manual is expanded to include, via this policy document, data driven processes to select pavement preservation projects and treatments to ensure selections are cost effective and meet the goals of the program.

Pavement Project Selection Process

TAMP Related Adjustment. To facilitate the TAMP effort, LADOTD has created a separate budget category for the Non-Interstate NHS pavements. Further, the treatment selection process for the Non-Interstate NHS pavements was moved away from the Districts to Headquarters, to match the current Interstate project selection process. The size and cost of these projects were the major determining factors in this decision.

This major operational change provides for the opportunity to more practically facilitate all of the federal NHS asset requirements necessary for a compliant TAMP and for future consistency determinations.

Interstate and Non-Interstate NHS Project Selection. The PMS analysis produces a list of prioritized pavements and their recommended treatments, to be applied within the next five-year period. This list is provided to each District annually for their review and comments. Included in the package is the information used in the project identification along with current and past distresses for comparison.

In cases where the District's identify the need for a treatment contrary to the PMS recommendation, the District must justify and document the issues relevant to the situation.

When this does occur, it is generally due to the difference between the time of the data collection cycle and the current field conditions. PMS data could be up to two years old and actual field conditions could have significantly changed due to any number of factors noted earlier. Also as noted before, the PMS uses fixed, or deterministic deterioration methodology that in some cases simply does not match the actual pavement deterioration. The documented factors that could justify an engineering judgment override of the PMS recommendation are as follows:

- Other funding sources included in project, for example safety, emergency relief (ER), drainage, etc.
- One treatment selection vs. various PMS recommendations for the project length
 - In this case, the project length exceeds the homogeneous section length of the PMS recommendation or includes multiple sections. The project level scope is adapted to meet the needs of multiple PMS sections.
- Variations in observed data vs. PMS data (PMS data can be up to 2 years old and may not reflect conditions as they currently exist)
- Maintenance Costs
- Physical constraints (curb & gutter, numerous driveway entrances, overpasses, etc.)
- Environmental issues (geographic location, residential areas, high traffic, % trucks very high, etc.)
- Land usage change

The Preservation Selection Committee, as defined in the “Highway Project Selection Process Manual”, makes the final Interstate and Non-Interstate NHS project selections.

Pavement Condition Deterioration Modeling

Federal Requirement. 23 CFR 515.7 (b)(2) requires that a life cycle planning process shall, at a minimum, include the following:

“Identification of deterioration models for each asset class or asset sub-group”

Pavement Deterioration Modeling. LADOTD uses dTIMS® CT software, developed by Deighton Associate, for comprehensive life cycle cost analysis of our pavement network. Using the most current pavement condition data available, the dTIMS® CT's data analysis will forecast future expenses for each asset, establish priorities, and investigate the various array of strategies or treatments based on defined budgets or resources.

The LADOTD implementation of dTIMS® CT utilizes a heuristic optimization analysis based on a 20 year analysis period with a 10 year treatment period for deterioration modeling.

Given a discount rate and inflation rate, dTIMS® CT optimizes pavement strategies using an Incremental Benefit Cost Ratio technique to compare different potential network strategies. This is accomplished via a comprehensive analysis of the various pavement condition indexes, and their use as triggers, identifying the most timely preservation or rehabilitation treatments that enhance and maximize potential life cycle cost benefits.

dTIMS® CT sorts all strategies in descending order of incremental benefit cost for each pavement segment. Strategies are selected from this order based on whether funding is available for each year to cover the yearly cost of the particular strategy intended for the particular road segment. The available budget is then reduced in the respective category by the annual yearly costs of the treatments for the selected strategy. The optimization process continues whereby a strategy replaces another if the subsequent strategy provides superior benefit and the budget remains available. The analysis progresses until all strategies are exhausted or funding is depleted. These recommended treatments are only valid for a fixed time span since the pavement deterioration continues over time. dTIMS® CT can be configured to apply this analysis to either asset groups or asset sub-groups.

Most of the extensive pavement distress data, used in dTIMS® CT, is currently collected by a data collection vendor, over a two-year cycle using the ARAN multi-function data collection vehicle. The Interstate and Non-Interstate NHS pavement data is currently captured every year.

Pavement Treatments (Work Types)

Federal Requirement. 23 CFR 515.7 (b)(3). A life cycle planning process shall, at a minimum, include the following:

“Potential work types across the whole life of each asset class or asset sub-group with their relative unit cost”

Work Types and Treatments. The newly minted FHWA TAMP work types are identified in Table 6.3 along with their matching counterparts within the existing federal Fiscal Management Information System (FMIS) work types and the appropriate pavement treatments used by LADOTD.

Table 6.3 FHWA Pavement Work Type Crosswalk Details

FHWA Work Type	FMIS Work Type	LADOTD Pavement Treatment
Initial Construction	01-New Construction Roadway	Not a Pavement Program Treatment Type
Maintenance	Not Eligible Federal Funded Activities	Seal Joints & Cracks
		Polymer Surface Treatment
Preservation	05-4R Maintenance Resurfacing	Microsurfacing
		Thin Overlay
		Medium Overlay
		In Place Stabilization
Rehabilitation	06-4R Maintenance Restoration/Rehabilitation	Structural Overlay
		Minor Rehab
		Major Rehab
Reconstruction	03-4R Reconstruction - Added Capacity / 04-4R Reconstruction - No Added Capacity/ 07-4R Relocation	Rubblize and Overlay
		Reconstruction
		Unbonded Concrete Overlay

Pavement Treatment Types. The following Tables 6.4 through 6.7 identify the PMS pavement treatment options for Asphalt Pavements, Composite Pavements, Jointed Concrete Pavements and Continuously Reinforced Concrete Pavements. The PMS actual pavement treatment (work types in **23 CFR 515.7(b)**) unit costs found in the following tables are averages determined from the LADOTD Item Number “Unit Bid Prices”.

It is important for the reader to see the real consequences, of the actual escalating costs, when limited funding requires LADOTD to defer preservation activities. An investment in a timely lower cost treatment produces a real benefit to the pavement, in the form of reduced distresses and a reduction in the rate of pavement condition deterioration.

Please note, from the national perspective, Microsurfacing includes “crack sealing” activities, but for LADOTD almost all “crack sealing” actions are performed as maintenance operations, not with capital expenditures that the following information portrays.

All maintenance operations are managed by the LAGOV Maintenance Management System. See Appendix 11.4 “LADOTD Pavement Treatment Details” which includes a list of non-PMS pavement treatment work types. This appendix also includes a “TAMP only” table of the MMS activity codes.

Table 6.4 Asphalt Pavement Treatment (Work Types) Descriptions and Costs

ASPHALT PAVEMENT TREATMENT DESCRIPTION	COST PER MILE FOR 2 LANES	COST PER MILE FOR EXTRA LANES
*Microsurfacing - Arterial/Collector	67,000	31,000
Polymer Surface Treatment - Collector	72,000	29,000
Thin Overlay - Collector	184,000	76,000
Thin Overlay - Interstate/Arterial	229,000	106,000
Medium Overlay - Collector	334,000	140,000
Medium Overlay - Interstate/Arterial	452,000	172,000
In Place Stabilization - Collector	469,000	187,000
Structural Overlay - Arterial	851,000	255,000
Structural Overlay - Interstate	1,053,000	311,000

* Microsurfacing not currently used on Interstate

Table 6.5 Composite Pavement Treatment (Work Types) Descriptions and Costs

COMPOSITE PAVEMENT TREATMENT DESCRIPTION	COST PER MILE FOR 2 LANES	COST PER MILE FOR EXTRA LANES
*Microsurfacing - Arterial/Collector	67,000	31,000
Thin Overlay - All	215,000	99,000
Medium Overlay - All	466,000	179,000
Structural Overlay - Arterial/Collector (Curb & Gutter)	360,000	166,000
Structural Overlay - Arterial/Collector (Non-Curb & Gutter)	752,000	261,000
Structural Overlay - Interstate	752,000	261,000
~Rubblize and Overlay - Arterial/Collector	676,000	132,000

* Microsurfacing not currently used on Interstate

~ Only used on Non-curb & Gutter applications

Table 6.6 Jointed Concrete Pavement Treatment (Work Types) Descriptions and Costs

JOINTED CONCRETE PAVEMENT TREATMENT DESCRIPTION	COST PER MILE FOR 2 LANES	COST PER MILE FOR EXTRA LANES
*Seal Joints and Cracks - Arterial/Collector	15,000	7,000
Minor Rehab - All	108,000	50,000
Major Rehab - All	335,000	157,000
~Rubblize and Overlay - Arterial/Collector	887,000	248,000
~Rubblize and Overlay - Interstate	1,088,000	304,000
Reconstruct - Interstate (Non-Curb)	2,047,114	1,028,156
Reconstruct - Interstate (Curb)	4,823,000	1,132,000

* Seal Joints and Cracks not currently used on Interstate

~ Only used on Non-curb & Gutter applications

Table 6.7 Continuously Reinforced Concrete Pavement Treatment (Work Types) Descriptions and Costs

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT TREATMENT DESCRIPTION	COST PER MILE FOR 2 LANES	COST PER MILE FOR EXTRA LANES
Minor Rehab - All	609,000	197,000
Major Rehab - All	2,257,000	204,000
Reconstruction or Unbonded Concrete Overlay - All (Non- Curb)	2,047,114	1,028,156
Reconstruction or Unbonded Concrete Overlay - All (Curb)	4,823,000	1,132,000

Pavement LCP Strategies

Federal Requirement. 23 CFR 515.7 (b)(4). A life cycle planning process shall, at a minimum, include the following:

“A strategy for managing each asset class or asset sub-group by minimizing its life cycle costs while achieving the State DOT targets for asset condition for NHS pavements and bridges under 23 U.S.C. 150(d).”

LCP Strategy Defined. FHWA’s interim guidance on using lifecycle planning to support asset management defines a life cycle planning strategy as

“a collection of treatments that represent the entire life of an asset class or sub-group.”

Pavement Life Cycle Strategies. LADOTD has the pavement life cycle strategy of deploying the right treatment, at the right time, to gain the maximum possible life, at the most economical cost, from a pavement. Treating pavement assets long before they reach a poor condition shortens the impact to the motoring public, yields a higher level of pavement condition over time and also improves the image of the state.

The ultimate goal of asset management would be to continue to use the various treatments to extend the use of the asset indefinitely. Following initial construction of the pavement, ongoing treatments would be applied at various times to renew the surface. Early on some type of crack sealing and minor repairs would occur, these could be repeated prior to a more advanced treatment being required such as a minor overlay or minor rehab depending on the asset sub-group. Crack sealing and minor repairs might then be applied again. As time goes on, medium or structural overlays, or major rehab options would need to be employed. Eventually a structural replacement would be required and the cycle would start all over again.

The PMS identifies the actual collection of treatments, or strategies, for an asset class (Interstate or Non-Interstate NHS) and an asset sub-group (Asphalt, Composite, Jointed Concrete, Continuously Reinforced Concrete), to be employed in any given year while maximizing the life cycle cost benefit decisions in the process. Again, the current collection of treatments is identified above in Tables 6.4 through 6.7.

The PMS performs this treatment analysis separately for each homogeneous pavement section made of the same pavement asset sub-group or surface type. This analysis involves identifying the current pavement condition which then uses different condition index trigger points for each asset class to identify the appropriate treatments for these asset classes.

For instance, if we consider the Asphalt pavement sub-group, five (5) condition indexes, Alligator, Random, Patch, Rut and Roughness, are used to trigger various treatments (work types). These various triggered treatments are generally different for different asset classes. For instance, LADOTD does not use the same condition index trigger points or even trigger

the same treatments (work types) for low volume rural pavements as it does for Interstate pavements.

In summary, the PMS fully meets the federal strategy requirements identified in this section.

Analysis of Historical Pavement Projects

In Table 6.8, we identify the historical breakdown, by new Federal TAMP Work Type, extracted from the federal Fiscal Management Information System (FMIS). This data includes all federally funded pavement assets, not just NHS assets.

This table clearly demonstrates that over the time since 2010, LADOTD has applied the highest total expenditures to Preservation and Rehabilitation funding. Reconstruction funding, which rivals Preservation funding, indicates that a significant number of pavement assets had reached the end of their useful life condition.

Table 6.8 FMIS Pavement Expenditures by Federal TAMP Work Type

Project Year	Initial Construction	~Maintenance	Preservation	Rehabilitation	Reconstruction
2010	31,570,444	0	11,793,333	1,596,896	15,417,866
2011	4,498,885	0	318,434,767	45,006,731	169,659,566
2012	65,996,242	0	306,908,222	63,713,687	292,487,913
2013	43,431,335	0	384,518,103	22,232,616	584,376,461
2014	163,347,206	0	321,826,707	181,415,085	352,467,200
2015	3,171,999	0	460,156,400	538,718,147	299,543,052
2016	27,638,199	0	584,732,722	219,800,654	643,275,502
2017	16,926,973	0	806,388,385	149,799,562	364,400,318
2018	8,962,967	0	528,496,903	301,673,318	367,682,554
Grand Total	365,544,251	0	3,723,255,543	1,523,956,695	3,089,310,432

Excludes Local NHS assets, includes all Fed Aid Eligible assets

Federal Fiscal Management Information System (FMIS) authorized projects total costs

~ = FMIS Maintenance Work Types Crosswalk to FHWA TAMP Preservation Work Types, Not Maintenance Work Types

Analysis of Pavement Maintenance Activities

In Table 6.9, we identify the LAGOV Maintenance Management System TAMP pavement maintenance activities from July 1, 2018 to June 5, 2019. This includes the count of pavement related work orders and total expenditures which include all labor, material and equipment costs. This analysis is for all state pavements and is not specific to Interstate or Non-Interstate NHS pavements.

To date, for SFY 2018, LADOTD has completed 8,186 pavement related maintenance work orders with a total expenditure of \$21,702,823.

LAGOV MMS Totals. It is also noted that thus far in SFY 2018, LADOTD completed a total of 101,814 work orders with a total expenditure of \$109,779,408. These work orders include

Road Maintenance, Bridge & Structure Maintenance, Traffic Services, River Crossing Operations, State Forces Construction and Miscellaneous Maintenance activities.

Table 6.9 Pavement MMS Maintenance Expenditures

SFY 2018 Pavement Maintenance	Count	Expenditures
400-00 CRACK SEALING - HAND METHOD (LF - Linear Foot)	157	\$504,541
400-01 CRACK SEALING - MACHINE METHOD (LF - Linear Foot)	30	\$72,462
400-02 POTHOLE PATCHING - HAND METHOD (EA - Each)	4,704	\$6,289,497
400-03 POTHOLE PATCHING - MACHINE METHOD (EA - Each)	775	\$1,851,463
400-04 FULL DEPTH PATCHING (YD2 - Square Yard)	481	\$2,229,212
400-05 LEVELING - HAND METHOD (YD2 - Square Yard)	256	\$692,559
400-06 LEVELING MOTOR GRADER (LF - Linear Foot)	79	\$472,657
400-07 LEVELING HOT MIX OVERLAY (MI - Mile)	336	\$4,949,732
400-08 CHIP SEAL (YD2 - Square Yard)	0	\$0
400-09 LEVELING PAVER SPOT PATCHING (LF - Linear Foot)	230	\$1,095,330
400-10 GRINDING BUMPS (EA - Each)	343	\$992,564
400-11 SCARIFYING & REMIXING (MI - Mile)	0	\$0
400-12 MIXING MATERAIL WITH STABILIZER (YD2 - Square Yard)	0	\$0
400-13 CURB REPAIR - ASPHALT (LF - Linear Foot)	5	\$4,255
400-14 MILL OUT PATCHING - ASPHALT LEVELING/PATCHING (MI - Mile)	156	\$842,748
400-15 MILL OUT (YD3 - Cubic Yard)	96	\$334,714
400-20 BLEED THROUGH REPAIR (LF - Linear Foot)	1	\$746
400-99 OTHER BITUMINOUS SURFACE MAINTENANCE (H - Hours)	14	\$41,708
410-00 PATCHING SURFACE - HAND METHOD (YD2 - Square Yard)	14	\$21,240
410-01 PATCHING SURFACE - MACHINE METHOD (YD2 - Square Yard)	10	\$50,205
410-02 MINOR SURFACE PATCHING - RAPID SET MATERIAL (YD2 - Square Yard)	14	\$17,362
410-03 PRE-MIX PATCHING (HAND METHOD) (EA - Each)	4	\$19,651
410-04 PRE-MIX PATCHING MACHINE METHOD (MOTOR GRADER/ASPHALT PAVER) (YD2 - Square Yard)	15	\$231,575
410-06 BLOWUP REPAIRS (EA - Each)	42	\$103,337
410-07 ROADWAY JOINT REPAIR (LF - Linear Foot)	4	\$5,843
410-08 EXPANSION JOINT REPAIR (LF - Linear Foot)	1	\$79
410-09 CURB REPAIR - CONCRETE (LF - Linear Foot)	8	\$18,359
410-99 OTHER CONCRETE SURFACE MAINTENANCE (H - Hours)	23	\$34,718
420-00 AGGREGATE SURFACE ROAD MAINTENANCE (MI - Mile)	281	\$580,922
425-00 MUD JACKING (EA - Each)	107	\$245,344
620-08 BASE & SURFACE CONSTRUCTION (LF - Linear Foot)	0	\$0
Grand Totals	8,186	\$21,702,823

Source: LADOTD MMS, July 1, 2018 to June 5, 2019

6.7 BRIDGE LIFE CYCLE PLANNING

Life Cycle Planning Analysis

Federal Requirement. 23 CFR 515.7(b)(1) A life cycle planning process shall, at a minimum, include the following:

“Incorporating the State DOT targets for asset condition for each asset class or asset sub-group into the analysis.”

LADOTD Life Cycle Planning Analysis. Similar to the PMS, the BMS is the heart of bridge LCP at LADOTD. When a new bridge is built, the State commits itself not only to the initial construction costs, but also to the future costs to maintain that bridge. In many cases the future costs will exceed the initial construction cost during the life of a bridge asset.

The BMS analyzes each bridge to predict needs for that bridge. Then the BMS identifies the most appropriate repair treatment at the right time, which provides the lowest lifecycle cost over time. While LADOTD is transitioning to the new AASHTO BrM BMS, the continued use of the AASHTO PONTIS BMS will allow LADOTD to remain fully compliant with this requirement.

The BMS is also a comprehensive life cycle cost and deterioration modeling tool supporting LADOTD's goal of optimizing the use of available funding. Bridge data are analyzed to forecast long-term and short-term funding needs, evaluate existing conditions, accumulate historical data to evaluate performance, prioritize projects, and supply research efforts.

The BMS also allows LADOTD to evaluate a series of budget scenarios to determine the ability of each budget scenario to achieve targets and the desired state of good repair. Finally, the BMS is used to analyze the actual projected budget for the analysis period to determine if those targets and desired state of good repair will actually be achieved.

Asset Classes. State maintained NHS bridges make up the TAMP bridge asset class.

Asset Sub-Groups. For bridges, the asset sub-groups include mostly different types of concrete bridges, steel bridges, movable bridges and a few other types of bridges.

Louisiana LCP Bridge Issues. A benefit of LCP is that it identifies bridges that are not yet structurally deficient and supports the planning of relatively inexpensive projects that can prevent those bridges from entering a state of deficiency, which thus extends their lives. This approach can be used to address more bridges, which more significantly reduces the number of deficient bridges. In the long-term, this saves money and keeps the inventory in better condition.

It appears that "Common Sense" must also prevail in this matter. If an agency has received insufficient funding for any significant period of time, the agency must defer preservation strategies for some structures. In the case of Louisiana, this problem is further exasperated by not only a significant number of very large bridges, but also, a high number of bridges in general. In this case, LADOTD must balance between preservation strategies as much as practically possible, but can never eliminate major rehabilitation and replacement projects, which could be rightly considered "worst first" projects. These "worst first" projects will be required because there are many critical bridge structures that can absolutely never be completely removed from service.

Bridge Preservation Program (PRBR)

The Bridge Preservation Program was implemented to preserve structurally sound crossings at existing on-system structure locations. It has the primary goals of making data driven project selections while improving the condition ratings and load capacities for existing structures. PRBR has a number of established objectives designed to guide this effort.

The Bridge Preservation Program predates the TAMP requirements and is another example of the existence of a germane LCP approach.

Bridge Project Selection Process

Bridge Project Selection Methodology. The following steps are used by the Bridge Preservation Project Selection Team in the selection of bridge projects for inclusion in the Highway Program:

1. The Bridge Design Section and Planning Section work together to identify projected funding for the eight-year Bridge Program. The appropriate program investment is determined to fulfill program needs.
2. A network analysis is performed based on the core elements for various projected outcomes using the Bridge Management System (BMS). Previously programmed structures are removed to perform the network analysis which queries data for selected criteria in order to determine a potential candidate list for repair, preventive maintenance, and rehabilitation, and replacement projects. The analysis is based on a specified bridge element list and criteria for each type of project, which is set by the Program Manager.
3. The candidate selection focuses on the following:
 - Removing Structurally Deficient Bridges from Enhanced NHS routes to meet MAP-21 performance goals.
 - Repair, Preventive Maintenance and Rehabilitation projects that will improve or extend the service life of the structures.
 - Return structurally deficient structures to a non-deficient condition.
 - Remove posted bridges from established truck routes.
 - Remove deficient timber bridges.
4. The potential candidate list is distributed to the Districts and Bridge Maintenance Section requesting the following:
 - A District priority list of candidate structures based on the potential candidate list provided, Legislative and MPO input, and other needs not identified within the potential candidate list.
 - Stage 0 Structural Site Survey forms prepared for candidate structures to be considered for action.
 - Prioritization of recommended candidate structures.
5. The District submits a prioritized list of structures for consideration, and a Stage 0 Structural Site Survey form for each structure.
6. The Program Manager prepares a list of projects composed of structures recommended by the Districts. A Stage 0 Parametric Cost Estimate is then prepared for each project. Additional work and structures may be added to projects to complete a section of roadway or complete a scope of work.

7. The Program Manager prepares a short list of proposed projects based on available funding. The short list is re-evaluated by the Bridge Management Unit to validate the recommendations by the Program Manager.
8. A meeting is held with the Bridge Preservation Project Selection Committee to discuss and select the final list of projects for the Bridge Preservation On-System Program, and the Bridge Preventive Maintenance Program which includes Historic Bridges.
9. Once the final selections are made, a transmittal of the final selections is sent back to the Districts to inform them which projects are being proposed for inclusion in the Highway Bridge Program.
10. The Program Manager orders project numbers and estimates funding requirements for the various phases of work to be performed on the project. This information is submitted to the Planning Section for inclusion in the Preliminary Highway Program. The Preliminary Highway Program for the upcoming fiscal year is submitted to the Joint Transportation Committee. The Preliminary Highway Program is used to present the program to the public during the annual October Road Show.
11. During the Legislative Session, the Highway Program is submitted to the Joint Transportation Committee for review and approval with changes from the Preliminary Highway Program noted. Approval of this document solidifies our program commitments to the Legislature.
12. Once projects are selected by the Bridge Preservation Project Selection Committee, the Project Manager assigned to the project may refine the alignment or concept, and then completes the other documentation. The Stage 0 Feasibility Study is submitted to the Program Manager for review and approval to move to Stage 3 Design.

Projects with (EA) Environmental Assessment or (EIS) Environmental Impact Statement are usually selected after a more detailed Stage 0 Feasibility Study is conducted. Often these projects will continue through Stage 1 Environmental before they are added to the Highway Program.

Supporting Documentation. Additional details on the Bridge Preservation Project Selection Process including the Bridge Preservation Off-System Program, and the Local Public Agency (LPA) can be found in the current edition of the “LADOTD Bridge Design and Evaluation Manual.”

BMS Project Selection Alternative. Due to transitional state of the BMS update, the BMS is not currently used to support bridge project selection activities.

In the interim, the historical deck, substructure and superstructure NBI ratings has been identified for all NHS bridges. This data is formatted to aid in identifying bridges that would be best served by directing preservation funding that would allow these bridges to remain in a state of good repair.

When the BMS update is complete, the Bridge Management Unit will be able to assist the Project Selection Committee by generating a BMS network analysis for potential programmed bridge projects to assist in identifying recommended treatments.

Bridge Condition Deterioration Modeling

Federal Requirement. 23 CFR 515.7(b)(2). Deterioration models are required for TAMP assets. A life cycle planning process shall, at a minimum, include the following:

“Identification of deterioration models for each asset class or asset sub-group, provided that identification of deterioration models for assets other than NHS pavements and bridges is optional”

Bridge Deterioration Modeling. LADOTD currently uses two different systems to meet FHWA’s requirements for a BMS. The AASHTO BrM is used for maintaining inventory and inspection data. The FHWA National Bridge Investment Analysis System (NBIAS) solution is used to model bridge investment needs.

Note, FHWA uses NBIAS data to predict future bridge investment needs and performance for the biennial Conditions and Performance Report, which FHWA and the Federal Transit Administration provide to Congress on the status of the transportation infrastructure.

The basis of LCP is a deterioration model. NBIAS contains deterministic deterioration models for each structural element on a bridge, including the bridge deck, superstructure elements such as girders and beams, and substructure elements such as columns and pier walls. The condition of each element is described using a set of condition levels, and a deterioration model is specified by describing the likelihood of transition from one condition state to another in a given year. The deterioration models in NBIAS are specified for nine different climate zones and were assembled by FHWA from element model provided by different states. These models were in turn developed through a combination of historical analysis and expert judgment.

Deterministic Model. In the deterministic model method, the deterioration would automatically implement a drop of some fixed amount over a period of time, for instance one (1) decimal point drop per year, so a bridge deck rating of 7 would programmatically drop to a 6.4 in six (6) years, which would automatically round to six (6) for rating purposes. As with all modeling efforts, using medians, averages and fixed deteriorations will generally predict the deterioration of bridge groupings, but won’t always match reality for individual bridges. Different items, or sub-groups of bridge assets deteriorate at different rates and those deteriorations are not straight lines as more deterioration occurs as bridges age. A number of potential circumstances contribute to deterioration of individual bridges such as growth in truck traffic volumes for a particular bridge, potential scour issues, structural issues, age, dated designs, etc. With this in mind, along with the negative consequences of projecting deterioration incorrectly, expert engineering judgment automatically leans to the conservative side when developing these deterioration estimates. This results in projected deteriorations that are often higher than that which actually occurs.

NBIAS Methodology. Once the bridge inventory has been established, NBIAS predicts maintenance, repair, and rehabilitation needs along with functional improvement investment needs. It then simulates allocation of a given budget to the bridge inventory over time with the objective of maximizing user benefits and minimizing agency costs. When performing an analysis, NBIAS executes a series of simulations with different annual budgets. NBIAS presents its results through a series of reports and interactive views that allow for interpolating results between different budget scenarios.

Bridge LCP Strategies

Federal Requirement. 23 CFR 515.7(b)(4). A life cycle planning process shall, at a minimum, include the following:

“A strategy for managing each asset class or asset sub-group by minimizing its life cycle costs while achieving the State DOT targets for asset condition for NHS pavements and bridges under 23 U.S.C. 150(d).”

LCP Strategy Defined. FHWA’s interim guidance on using lifecycle planning to support asset management defines a lifecycle planning strategy as

“a collection of treatments that represent the entire life of an asset class or sub-group.”

Life Cycle Strategies. Similar to pavements, LADOTD has the bridge life cycle strategy of deploying the right treatment, at the right time, to gain the maximum possible life, at the most economical cost.

NBIAS 1st Step. The NBIAS LCP approach first determines what treatments are most cost effective for each individual bridge element by solving a linear optimization to determine the treatments that, if performed, will minimize life cycle costs of maintaining the bridge element over time.

Table 6.10 shows an example of a life cycle strategy developed using this approach, in this case for reinforced concrete superstructure element. The different condition states that the element may be in are identified, with State 1 being the best state and 4 the worst. The feasible treatment actions are identified for each condition state, including the “do nothing” action in which treatment is deferred.

Next a transition probability identifies how likely a treatment action will transition to other condition states over a one-year period. The unit cost for each treatment action is identified, along with the discounted life cycle cost (“long-term cost”) of performing the treatment, assuming that future recommended treatments will be performed.

The final column indicates which treatments are optimal in each condition state. This example identifies the optimal strategy of Do Nothing for the element in State 1 or 2, Clean and Patch in State 3, and Rehabilitate in State 4.

Table 6.10 Bridge Life Cycle Strategy Example

Example of Life Cycle Strategy for a Reinforced Concrete Superstructure Element									
State	Action	Probability of Transition to State					Unit Cost (\$)	Long-Term Cost (\$)	Optimal?
		1	2	3	4	Fail			
1	Do Nothing	92%	8%	0%	0%	0%	0.00	87.84	Y
2	Do Nothing	0%	98%	2%	0%	0%	0.00	161.48	Y
	Clean & Patch	86%	14%	0%	0%	0%	584.25	677.31	
3	Do Nothing	0%	0%	87%	13%	0%	0.00	984.32	
	Clean & Patch	53%	38%	10%	0%	0%	725.77	910.05	Y
4	Do Nothing	0%	0%	0%	87%	13%	0.00	2,127.88	
	Rehabilitate	33%	41%	17%	9%	0%	1,620.42	2,026.86	Y
	Replace	100%	0%	0%	0%	0%	3,953.51	4,035.60	

The benefit of performing a recommended treatment is that, in the long term, it saves money relative to deferring action. This example identifies a State 3 savings from performing the Clean and Patch treatment when recommended relative to deferring action is \$74.27, based on the difference between the long-term cost of Do Nothing and Clean and Patch. This cost savings is used to prioritize what treatments to perform when there are insufficient funds for performing the recommended treatments.

NBIAS 2nd Step. The NBIAS program simulation model is now used to determine what work should actually be performed in a given year considering the available budget, the optimal element-level life cycle strategy, and options for replacing or making functional improvements to a bridge. The objective of this model is to maximize total agency cost savings and user benefits, given a budget and other constraints.

In this model, multiple project alternatives are considered for each bridge, including doing nothing, performing the recommended element-level preservation work, and making a functional improvement to the bridge. Functional improvements considered by the system include widening existing lanes and shoulders, raising the bridge, strengthening the bridge, or replacing the bridge. The functional improvements yield savings through improving bridge conditions and also yield additional user benefits. Widening existing lanes and shoulder is predicted to reduce crash costs, while raising or strengthening a bridge is predicted to save truck travel time and operating costs through reducing detours. Replacing a bridge potentially yields all of these benefits.

To determine what work to perform given a limited budget, NBIAS uses the incremental benefit cost heuristic (IBC), to determine the best set of projects to perform to maximize benefits subject to a budget constraint. With this approach the incremental benefit cost ratio (IBCR) for each project alternative for a bridge is calculated by comparing the alternative to the next-cheapest alternative, dividing the difference in benefit by the difference in cost between the alternatives. Prior to performing the IBCR calculation,

inefficient alternatives are filtered out. The remaining alternatives thus form the “efficient frontier” of feasible project alternatives.

When simulating allocation of funds, NBIAS orders the list of alternatives in decreasing order of IBCR, combining results for all bridges, and then selects projects until funds are expended. The selection of alternatives is influenced by available funds and when limited funds are the issue, either lower level preservation actions, or a Do Nothing action are selected over rehab or higher actions. The process of generating and selecting alternatives is repeated for each year of the analysis period. The end result of the model is a simulated set of project alternatives that maximizes overall agency and user benefits given the available budget.

Bridge Treatments (Work Types)

Federal Requirement. 23 CFR 515.7(b)(3). A life cycle planning process shall, at a minimum, include the following:

“Potential work types across the whole life of each asset class or asset sub-group with their relative unit cost”

Work Types and Treatments. The newly minted FHWA TAMP work types are identified in Table 6.11 along with their matching counterparts within the existing federal Fiscal Management Information System (FMIS) work types and the bridge treatments used by LADOTD.

Table 6.11 FHWA Bridge Work Type Crosswalk Details

FHWA Work Type	FMIS Work Type	LADOTD Bridge Treatment
Initial Construction	08-Bridge New Construction	Not a Bridge Program Treatment Type
Maintenance	Not Eligible Federal Funded Activities	Maintenance Activities in Maintenance Management System
Preservation	40-Special Bridge; 47-Bridge Preventive Maintenance; 48-Bridge Protection; 59-Bridge Deck Resurfacing	Repair/Restore specific elements; Address localized, isolated element conditions; Painting (structural steel); Deck (overlay, sealing, surface improvements); Scour Mitigation (rap, slope stabilization, helper bent); Cleaning, Refurbishing, or Replacing limit life service elements (joint material, bearings, protective coating)
Rehabilitation	13-Bridge Rehabilitation - Added Capacity; 14-Bridge Rehabilitation - No Added Capacity	Extends Service Life, Improves NBI Condition Rating, Improves and/or Removes Load Posting Restrictions Address Overall Structural Conditions; Re-Decking (total replacement); Widening (only in conjunction w/ roadway widening project); Painting (structural steel) with Major Structural Steel Repairs; Scour Mitigation with Major Substructure or Other Major Bridge Work
Reconstruction	10-Bridge Replacement - Added Capacity; 11-Bridge Replacement - No Added Capacity	Remove and Replace Existing Structure; Remove Existing Structure (no replacement structure); Replace Existing Structure (only in conjunction w/ roadway widening project)

Primary BRPR Bridge Improvement Types. The following outlines the various bridge treatments or work types used for the BRPR program.

Replacement. This completely removes and replaces an existing structure with a new structure that functionally serves the same purpose at or near the location of an existing structure. A new structure may have additional width and/or length to meet current design requirements, but cannot provide additional capacity with PRBR funds.

Rehabilitation. This comprehensively addresses the overall condition of a structure, which is typically in fair or poor condition. The purpose is to significantly extend the service life, improve the condition rating, and/or improve the load posting of an existing structure. When the Rehabilitation improvement type is used, often many other improvement types are part of the rehabilitation effort as noted in Additional Bridge Improvement Types below.

Repair. This is limited to localized, isolated conditions on a structure, which may be in any condition state. The purpose of a repair is to restore specific elements to an improved condition state. Though it may affect the overall condition rating or load rating of a structure, its purpose is not to comprehensively address the overall needs of a structure.

Preventative Maintenance. This is used when cleaning, refurbishing, or replacing limited service life elements such as joints, bearings, and protective coatings. The purpose of preventative maintenance is to prevent the accelerated deterioration of a structure due to the poor condition of limited service life elements.

Removal. This results in the removal but not the replacement an existing structure. The purpose of a removal is to demolish an existing structure and replace it with something that does not meet the CFR §650.305 definition of a bridge. Using funds to reconstruct an interchange, stream crossing, rail crossing, etc., or to restore a site to natural conditions as necessary after the removal of an existing structure is consistent with the mission of the PRBR; therefore, PRBR funds may be used for those activities.

Additional Bridge Improvement Types. The following bridge improvement types don't apply to the PRBR program, but are provided as appropriate for TAMP related treatments.

New Structure. This provides new lane capacity for a crossing that does not currently exist. It is not consistent with the mission of the PRBR; therefore, typically, PRBR funds should not be used for this purpose.

Widening. Widening is not currently an available option in the LAGOV project management system and would typically not be appropriate for PRBR projects. Widening of an existing structure to provide additional lane capacity for a crossing is not consistent with the mission of the PRBR; therefore, typically, PRBR funds should not be used for this purpose. However, in conjunction with a widening project, Bridge Improvement Types that are consistent with the mission of the PRBR may be performed; in such a case, PRBR funds may be used for those activities.

Painting. Painting is no longer identified as a separate Bridge Improvement Type for the purposes of program level tracking. Cleaning and painting may be performed under a Preventative Maintenance, Repair, or Rehabilitation Bridge Improvement Type.

Re-Decking. Bridge Re-Decking has not been identified as a separate Bridge Improvement Type for the purposes of program level tracking. Bridge re-decking may be performed under a Rehabilitation Bridge Improvement Type.

Scour Mitigation. Scour Mitigation is no longer identified as a separate Bridge Improvement Type for the purposes of program level tracking. Scour mitigation would typically be performed under a Preventative Maintenance, Repair, or Rehabilitation Bridge Improvement Type.

Analysis of Historical Bridge Projects

In Table 6.12, we identify the historical breakdown, by new Federal TAMP Work Type, extracted from the federal Fiscal Management Information System (FMIS). This data includes all federally funded bridge assets, not just NHS assets.

This table clearly demonstrates that over the time since 2010, LADOTD has applied the highest total expenditures to Rehabilitation and Reconstruction funding. The Reconstruction most likely coincides with the advanced age of bridges, as shown earlier in Figure 3.7 “Count of Bridges Built by Decade” and Figure 3.8 “Deck Area of Bridges Built by Decade”; however, the very significant Rehabilitation effort could also be partly due to underfunding for Preservation activities over the life cycle of these assets, again a consequence of a past “Worst 1st” approach.

Table 6.12 FMIS Bridge Expenditures by Federal TAMP Work Type

Project Year	Initial Construction	~Maintenance	Preservation	Rehabilitation	Reconstruction
2010	0	0	0	671,313	2,950,140
2011	0	0	5,212,873	88,226,814	247,203,537
2012	0	0	8,031,159	187,934,519	197,681,270
2013	0	0	14,147,952	234,079,035	634,908,320
2014	6,945,433	0	17,250,030	147,744,424	105,648,999
2015	0	0	0	1,017,255,592	138,297,726
2016	0	0	22,495,949	1,505,504,242	226,560,017
2017	0	0	276,045,449	883,497,416	58,506,239
2018	0	0	18,199,906	248,636,716	300,021,603
Grand Total	6,945,433	0	361,383,317	4,313,550,072	1,911,777,850

Excludes Local NHS assets, includes all Fed Aid Eligible assets

Federal Fiscal Management Information System (FMIS) authorized projects total costs

~ = FMIS Maintenance Work Types Crosswalk to FHWA TAMP Preservation Work Types, Not Maintenance Work Types

Analysis of Bridge Maintenance Activities

In Table 6.13 we identify the LAGOV Maintenance Management System bridge maintenance activities from July 1, 2018 to June 5, 2019. This includes the count of bridge related work orders and total expenditures which include all labor, material and equipment costs. This analysis is for all state bridges and is not specific to NHS bridges.

To date, for SFY 2018, LADOTD has completed 4,637 bridge related maintenance work orders with a total expenditure of \$8,509,174.

LAGOV MMS Totals. It is also noted that thus far in SFY 2018, LADOTD completed a total of 101,814 work orders with a total expenditure of \$109,779,408. These work orders include Road Maintenance, Bridge & Structure Maintenance, Traffic Services, River Crossing Operations, State Forces Construction and Miscellaneous Maintenance activities.

Table 6.13 Summary of Bridge Maintenance Activities for SFY 2018

SFY 2018 Structures Maintenance	Count	Expenditures
460-00 PAINTING BRIDGE (FT2 - Square Foot)	7	\$2,695
460-01 SPOT PAINTING BRIDGE (TOUCH UP) (FT2 - Square Foot)	154	\$84,562
460-02 BRIDGE JOINT REPAIR (LF - Linear Foot)	70	\$132,218
460-03 MOVABLE BRIDGE LUBRICATION (EA - Each)	630	\$319,502
460-04 MOVABLE BRIDGE REPAIR - MECHANICAL (EA - Each)	456	\$426,878
460-05 MOVABLE BRIDGE REPAIR - ELECTRICAL (EA - Each)	929	\$600,880
460-99 OTHER BRIDGE MAINTENANCE (H - Hours)	154	\$439,672
465-00 CLEAN STRUCTURAL MEMBERS (EA - Each)	12	\$14,186
465-01 CLEAN DECK & DRAIN (LF - Linear Foot)	477	\$616,785
465-03 STRINGER MAINTENANCE (LF - Linear Foot)	56	\$135,995
465-04 PILE REPAIR - TIMBER (EA - Each)	249	\$934,535
465-05 CHANNEL REPAIR & PROTECTION (FT2 - Square Foot)	13	\$122,232
465-06 FENDER REPAIR (LF - Linear Foot)	9	\$35,487
465-07 BRIDGE DECK REPAIR (YD2 - Square Yard)	94	\$121,535
465-08 GUARDRAIL REPAIR (LF - Linear Foot)	272	\$476,053
465-09 CRASH ATTENUATOR REPAIR (EA - Each)	3	\$15,402
465-10 TUNNEL REPAIR - MECHANICAL (EA - Each)	48	\$44,439
465-11 TUNNEL REPAIR - ELECTRICAL (EA - Each)	81	\$44,575
465-12 TUNNEL MAINTENANCE/CLEANING (EA - Each)	86	\$158,127
465-17 REMOVE DRIFT (EA - Each)	250	\$626,978
465-18 REPAIR / REPLACE BRIDGE CAP (EA - Each)	87	\$467,410
465-19 REPAIR / REPLACE TIMBER DECK (FT2 - Square Foot)	32	\$174,065
465-20 REPAIR / REPLACE ABUTMENT AND OR REVETMENT (FT2 - Square Foot)	48	\$211,427
465-21 STRUCTURAL CONCRETE REPAIR (FT2 - Square Foot)	11	\$8,146
465-25 BRIDGE TENDER HOUSE REPAIR (EA - Each)	223	\$137,536
465-30 PILE REPAIR - STEEL (EA - Each)	46	\$218,609
465-31 PILE REPAIR - CONCRETE (EA - Each)	0	\$0
465-32 PILE DRIVING (EA - Each)	38	\$133,053
465-99 OTHER STRUCTURE MAINTENANCE (H - Hours)	65	\$101,487
470-99 OTHER FOUNDATION REPAIR (H - Hours)	21	\$38,450
620-04 BRIDGES (OVER 20' LENGTH) CONSTRUCTION (LF - Linear Foot)	16	\$1,666,255
Grand Totals	4,637	\$8,509,174

Includes: Bridges & Tunnels

Source: LADOTD MMS, July 2018 to June 5, 2019

Large NHS Bridge Rehabilitation Projects

Large Project Analysis. In Table 6.14, we investigate a little further to identify the projects that have captured the lion share of the funding totals since 2009. This very clearly illustrates that major critical NHS bridges will still require a worst 1st approach when it is appropriate to do so. These critical bridges simply must remain in service.

What this does identify is that a very significant increase in funding has been required for some time, and will continue to be required, to maintain the aging bridge infrastructure.

LADOTD's administration has responded to the federal requirements, and potential penalties, with a renewed vigor by significantly redirecting funding levels to address NHS bridge needs going forward; however, as previously noted these funds will not stop most NHS bridges from falling into the Poor condition range. It is very important to also note that the significant addition of funds for NHS bridges will result in significant underfunding of Non-NHS bridges, unless additional funding is provided by the Legislature.

Table 6.14 NHS Bridge Projects Greater Than \$10 Million

Year	NHS BRIDGE PROJECTS GREATER THAN \$10 M	Project Cost	NHS \$ Totals for Year
2009	OUACHITA RIVER-LOUISVILLE BRIDGE REHAB, PHASE 1 (LEA JOYNER - US 80 BRIDGE)	11,630,263	37,774,712
2010	I-20 ELEVATED SECTION (WEST APPROACH) REPLACEMENT	14,074,060	46,809,877
2010	I-20 MISS.RIVER BR AT VICKSBURG BR. MODIFICATIONS FOR 24"MOV	13,927,581	
2011	I-10 MISSISSIPPI RIVER BRIDGE AT BATON ROUGE PIER REPAIR	11,686,693	24,210,394
2012	I-210 PIER PROTECTION REPAIR	26,344,959	83,185,891
2012	MCCAIN CREEK BRIDGE REPLACEMENT	12,153,813	
2013	OUACHITA RIVER-LOUISVILLE BRIDGE REHAB, PHASE 2 (LEA JOYNER - US 80 BRIDGE)	14,965,522	54,356,628
2013	US 190 MORGANZA FLOODWAY BRIDGE REPAIRS	10,326,025	
2014	No Projects > \$10 M	0	10,684,267
2015	MISSISSIPPI RIVER BRIDGE(LULING) CABLE STAY REPLACEMENT	49,751,812	10,684,267
2016	LA 70: Mississippi River Bridge (Sunshine) - Phase II	29,858,405	57,493,740

7.0 Risk Management Analysis

7.1 INTRODUCTION

This chapter reviews the various concepts of risk management, the federal requirements of risk management, and LADOTD’s current implementation of risk management, including 23 CFR Part 667 requirements.

Future efforts relating to risk management include incorporating Redundancy, Robustness, and Resiliency into project management along with using risk registers throughout the asset management process, when setting the budgets, prioritizing projects and revising asset management guidance. The approach for future risk register updates is also defined.

Risk Management Concepts

The international standard ISO 31000 defines risk as “the effects of uncertainty on objectives.” In its simplest form, risk is anything that could be an obstacle to the achievement of goals and objectives. However, risks are more than just threats. Risks can be anything that may impede an objective or create a new opportunity. These risks may include, but are not limited to:

Threats

Variability

Change

Uncertainty

Opportunity

Risks may include, but are not limited to threats to transportation assets, variability in forecasted travel behavior, changes in rules and regulations, uncertainty of extreme weather conditions, and opportunity for increased or decreased financial support for assets.

These risks can affect many aspects from budget allocations to retrofitting the design of a bridge for extreme weather threat mitigation. All levels of risks should be considered throughout the process in order to manage an agency’s assets with the most efficient and effective strategies and methods.

While risk management is a relatively new formal requirement for the TAMP, as a general rule, risk management is a common formal management method used worldwide in nearly every field of business.

Existing Risk Management at LADOTD

LADOTD is no exception to this general rule, with a number of formal risk controls in place in a number of different areas. Risk management is one of the compelling factors that led to

the implementation of pavement and bridge management systems and is a primary reason for conducting National Bridge Inventory (NBI) bridge safety inspections.

Continuity of Operations Plan (COOP). LADOTD has essential functions that must be performed rapidly and efficiently in a disaster or emergency involving state owned transportation infrastructure in the State of Louisiana. If the normal key staff and facilities are not available, LADOTD's Continuity of Operations Plan (COOP) ensures that LADOTD's essential functions can still be performed using alternate facilities, equipment, communications, and staffing. The COOP also includes assisting local governments in the movement of citizens, pets, and critical supplies during emergencies.

Project Risk Management. LADOTD has implemented a number of procedures, measures and software solutions to manage project risk. This ranges from digital design standards and the software solutions to validate project design compliance with these standards, to software solutions that provide the ability for the review of existing project item bids against historical and predicted bid item costs. Tools are also in place to evaluate contractor bids to identify if potential any anomalies.

Operational Risk Management. Maintenance superintendents are required to ride all the roads in their jurisdiction, at a minimum of every (2) two weeks, to inspect for any safety related or condition situations that warrant action. These could include activities such as replacing missing or damaged signs, pothole repair, guardrail or crash attenuator damage, shoulder edge drop-offs, and many other potential issues. In fact, field crews carry a supply of stop signs in their vehicles to immediately replace missing or damage signs when they are encountered. To support ongoing maintenance risk management effort, LADOTD replaced an old home-grown work order management system with a comprehensive third-party Maintenance Management System.

With respect to guard rail and crash attenuator repairs, LADOTD has contracts in place to allow for immediate notification and rapid response to repair or replace these critical safety features.

Procedural Risk Management. Other examples of risk management would include the Approved Materials List, various design manuals, the maintenance manual, and pavement condition protocols that support the pavement data collection QA/QC program, etc.

Emergency Operations Risk Management. Prior to hurricane Katrina, LADOTD had created a dedicated Emergency Operations Section. Currently, all Emergency Ops staff members of this section are FEMA (Department of Homeland Security) trained and certified via National Incident Management System (NIMS), Incident Command System (ICS) and other FEMA specialty courses as appropriate. All other staff that are or may be engaged in response or recovery activities are also required to have certain FEMA/DHS course certifications as well. This staff is qualified to manage all aspects of emergency operations management and response for LADOTD.

Emergency Operations Preparedness. LADOTD, along with many other Louisiana state agencies, conducted numerous simulated hurricane risk management exercises in order to

gain expertise to allow for the most efficient management of the emergency requirements of large scale events. This led to the most efficient possible evacuation of the New Orleans residents, who chose to leave the city prior to hurricane Katrina's arrival. It included numerous risk management contracts that were activated to allow for contracted evacuation buses, Amtrak trains, and other support services.

As an example of adapting to risk requirements, contra flow traffic control measures were in place for Hurricane's Katrina and Rita, essentially a lesson learned from an earlier New Orleans evacuation effort of a minor storm that turned away and did not hit the city.

Another example of a lesson learned was the creation of evacuation assistance options that allowed pet owners to take their pets along with them. LADOTD came to the realization that many pet owners simply would not evacuate if they were required to leave their pets behind.

Risk Management Analysis Requirements

Federal Requirement. (23 CFR 515.7(c)).The TAMP must describe a methodology for:

- **Identifying risks that can affect the condition of NHS pavements and bridges, and the performance of the NHS, including the risks listed in 23 CFR 515.7(c)(1).**
- **Assessing the identified risks in terms of the likelihood of their occurrence and their impact and consequence if they do occur.**

The State DOT's process must include methods to explain how the risks were identified and describe what issues were considered for risk identification. The process must also include the following good practice elements:

- **Evaluating and prioritizing the identified risks.**
- **Developing a mitigation plan for addressing the top priority risks that involve potentially negative consequences.**
- **Developing an approach for monitoring top priority risks.**
- **Including in the analysis, and considering, a summary of the results of the 23 CFR Part 667 evaluations of facilities in the State repeatedly damaged by emergency events, including at a minimum the results relating to NHS pavements and bridges.**

7.2 LEVELS OF RISK MANAGEMENT

LADOTD has identified formal risk registers for (3) three levels of risk including Department Level risks, Program Level risk and Project Level risk. Figure 7.1 below identifies the concepts behind these three risk levels.

Figure 7.1 Levels of Risk



Department Level. Department level risks affect the achievement of the Department’s strategic objectives and are represented by items such as funding issues or changes in regulatory policies. The resulting changes in design standards required after Hurricanes Katrina and Rita is an example of risk mitigation effort for risk level. Executives must manage departmental risks in a manner that optimizes the success of the organization. The mitigation actions, or strategies to manage these risk, would best be accomplished by optimizing strategic level policies, procedures and management methods.

Program Level. Program level risks affect the different funded programs in the Department such as the pavement or bridge preservation program or the safety program. These risks could include funding, lack of personnel for program delivery, or rapid deterioration of the pavement or bridge asset. The mitigation actions, or strategies to manage these risks, would best be accomplished by optimizing the programs efficiency and effectiveness.

Project Level. Project level risks are generally unique to a specific project. In addition to the project examples provided in the introduction section of this chapter, further examples of project level risks include environmental clearance issues, geotechnical issues, right-of-way acquisition delays or outside interference in proper project selection. The mitigation actions, or strategies to manage these risks would be accomplished via continuing efforts to optimize the projects efficiency and effectiveness.

7.3 RISK METHODOLOGY

Initial Risk Assessment

The TAMP requirements identify that an extensive, integrated, formal risk management program is required at LADOTD. To address the initial formal risk management program requirements, a FHWA contractor led a series of Risk Management Workshops in 2014 that resulted in the February 2015 Pilot Draft TAMP. LADOTD was one of the FHWA’s (3) three DOT’s chosen to develop pilot TAMPs. The workshops included stakeholders from throughout the Department and local FHWA.

The Department’s initial risk registers were developed via the following steps:

- **Risk Education** – Participants separated into working groups for the three risk levels (Department, Program, and Project). A brief training exercise followed with working groups being informed about the concept of risk registers including how to create them and how they will be used by the Department.
- **Risk Identification** – Additional workshops were held with the three working groups to identify the potential risks for their assigned risk level. The workshop participants also determined the proper description for each risk and identified possible causes of each risk.
- **Risk Analysis** - Workshop participants then assessed the relative likelihood of occurrence and impact of each risk, using a risk matrix similar to the one in Figure 7.2, to evaluate each risk in terms of a risk rating consequence scale of “low impact” to “critical.”

Figure 7.2 Risk Matrix

Risk Matrix with Impact and Likelihood Definitions			Likelihood of Occurrence				
			Rare	Unlikely	Likely	Very Likely	Almost Certain
			Less than once every 10 years	Once in more than 3 years but less than 10 years	Once between 1 - 3 years	Once a year	Several Times a year
Impact	Catastrophic	Potential for multiple deaths & injuries, substantial public & private costs	Medium	Medium	High	Critical	Critical
	Major	Potential for multiple injuries, substantial public or private costs and/or foils agency objectives	Low	Medium	High	High	Critical
	Moderate	Potential for injury, property damage, increased agency costs and/or impedes agency objectives	Low	Low	Medium	High	High
	Minor	Potential for moderate agency cost and impact to agency objectives	Low	Low	Low	Medium	Medium
	Insignificant	Potential impact low and manageable with normal agency practices	Low	Low	Low	Low	Low
			Risk Rating				

- **Risk Evaluation, Risk Mitigation, and Risk Finalization** - A smaller core team then reviewed each risk register. The core team combined risks, when the same risks were duplicated in multiple categories (Department, Program, and/or Project Level) and then also finalized the risk rating consequence for each risk.

The core team also reviewed the proposed mitigation actions, or strategies to manage the risks identified by each team, to determine if mitigation strategies could impact and reduce other risks. Finally, the team performed a prioritization of the risks and finalized the risk registers.

2019 Updated Risk Assessment

Update Methodology. In early 2019, LADOTD conducted another risk management workshop to review and update these initial risk registers and to gain compliance with the final federal requirements.

This update effort included a consideration of current and projected infrastructure conditions, along with potential funding issues, environment issues and geotechnical issues. In addition, staffing issues and potential loss of expertise were considered. Finally, changes in assets due to other programs (e.g., freight, safety, congestion) and other factors (e.g., climate change, extreme weather) were considered.

Over the course of this update workshop, participants revised the risk registers including identifying additional risk not originally considered and identifying risk that could be removed from consideration.

For all new risks, a qualitative risk assessment, based on likelihood of occurrence and the potential risk impact was conducted in order to identify the potential consequence should the risk occur. This risk assessment was based on the risk matrix shown above in Figure 7.2. The participants then identified the proposed mitigation actions/ strategies to manage the new risk.

Next, the participants reviewed existing risks to determine if the past assessment still held true. When updates to impact and likelihood were made, new risk ratings were assessed. Next, the existing proposed mitigation actions/strategies to manage the risk were reevaluated and adjusted as necessary.

Top-Rated Risks

Update Methodology. The participants then used the proposed mitigation actions to aid in further identifying the Risk Mitigation Plan details for the risk rated as Critical or High. The mitigation plan efforts identified the Risk owners, the first step to take to begin to mitigate the risk and where appropriate, a projected implementation date.

Following this effort, the team identified the necessary information to generate a Risk Monitor Plan for these top-rated risks. Potential methods to accomplish the monitoring effort along with the frequency of monitoring the risk and who would perform the monitoring effort were established.

7.4 2019 RISK REGISTERS

Tables 7.1 through 7.3 below are LADOTD's updated risk registers with the top priority risk identified. Note that the Risk Numbers are not in a sequential order due to the fact that this is not the first risk assessment and the risk ratings for these risks have been updated.

Table 7.1 2019 Departmental Level Risk Register

Risk #	Risk Description	Impact	Likelihood	Risk Rating
D4	Insufficient match for federal funds	Major	Certain	Critical
D2	Loss of experienced staff	Major	Almost Certain	Critical
D6	Bridge Closures	Major	Almost Certain	Critical
D1	Lack of operating funding	Major	Very Likely	High
D5	Weather events (Hurricanes, Floods, Ice Storms, etc.)	Moderate	Almost Certain	High
D7	Adverse legislative actions to priority programs	Major	Likely	High
D12	Very large bridge becomes Structurally Deficient	Major	Likely	High
D13	23 CFR part 667 Repeated Damage to pavement or structures due to Emergency Events (ER funding)	Major	Unlikely	Medium
D14	Penalty Assessment due to Certification / Recertification Issue	Major	Unlikely	Medium
D15	Penalty Assessment due to Consistency Determination Issue	Major	Unlikely	Medium
D16	Non-compliant Pavement data leads to funding penalty	Major	Unlikely	Medium
D3	Cut in federal funding	Major	Unlikely	Medium
D8	Negative public opinion	Moderate	Likely	Medium
D9	Changes in regulatory policy	Moderate	Likely	Medium
D17	Non-compliant Bridge data leads to funding penalty <i>Special Note: Projected Bridge funding will exceed penalty assessment so Risk Rating remains Low even if penalty assessment occurs.</i>	Moderate	Unlikely	Low
D10	Continuity of operations	Major	Rare	Low
D11	Terrorist/criminal acts	Catastrophic	Rare	Low

Table 7.2 2019 Program Level Risk Register

Risk #	Risk Description	Impact	Likelihood	Risk Rating
PM2	Increased truck weights increase deterioration rates of existing infrastructure.	Catastrophic	Almost Certain	Critical
PM1	Lack of reliable traffic loading data decreases confidence and effectiveness of pavement design	Major	Likely	High
PM4	Public demand for low construction impacts increases costs and decreases quality	Moderate	Almost Certain	High
PM5	Lack of experienced personnel for program delivery	Moderate	Very Likely	High
PM10	Political pressure for suboptimal projects	Moderate	Almost Certain	High
PM3	Unexpected sustained revenue decreases	Major (pavement) Catastrophic (bridge)	Unlikely	Medium (pavement), Medium (bridge)
PM6	Emerging technologies improve efficiencies	Moderate	Likely	Medium
PM7	Diversion of work force to other activities (e.g., storm response)	Minor	Very Likely	Medium
PM9	Unexpected revenue increase in program level that cannot be covered by projects on the shelf	Moderate	Unlikely	Low
PM8	Increased lane miles increases long term preservation costs	Moderate	Unlikely	Low

Table 7.3 2019 Project Level Risk Register

Risk #	Risk Description	Impact	Likelihood	Risk Rating
PJ1	Railroad Agreement (or lack thereof) can delay project	Major	Almost certain	Critical
PJ15	IT System Ownership causes insufficient support	Major	Almost Certain	Critical
PJ2	Scope creep on projects that increase cost	Major	Very Likely	High
PJ3	Contractor quality	Major	Very Likely	High
PJ5	Lack of experience of project delivery staff	Major	Very Likely	High
PJ6	ROW acquisition problem or delay	Major	Likely	High
PJ7	Utility relocation problem or delay	Major	Likely	High
PJ8	Environmental document and permitting delays	Major	Likely	High
PJ14	Lack of DBE Subcontractor availability increase cost	Moderate	Very Likely	High
PJ4	Public Involvement delays/kills the project	Major	Unlikely	Medium
PJ9	Overworked project delivery staff decreases efficiency	Moderate	Likely	Medium
PJ10	Large change orders increase cost	Moderate	Likely	Medium
PJ11	Lack of contractor availability increase cost	Major	Unlikely	Medium
PJ12	Lack of control of Design-Build projects (quality issue)	Moderate	Unlikely	Low
PJ13	Low estimates	Minor	Unlikely	Low

7.5 RISK MITIGATION AND MONITORING PLAN

Risk Mitigation Plan. Agencies are now required to develop a Risk Mitigation Plan for the top-rated risk identified in the risk registers. This involves identifying either the mitigation actions or strategies to manage the risk, identifying the risk owner, providing for an implementation date and identifying the initial step to get these actions, or strategies, started.

Methodology. During the 2019 risk workshop, participants reviewed and updated the proposed mitigation actions, or strategies to manage the risks. They then identified the owners of the individual risks, identified a realistic implementation date for these actions and strategies, and identified the first step required to initiate the mitigation plan.

Risk Monitoring Plan. Also, agencies are now required to monitor the top-rated risk identified in the risk registers. LADOTD began this workshop activity by identifying the method used to accomplish the monitoring effort, this includes, but is not limited to, taking corrective actions, performing data analysis, using various legal activities, conducting meetings, updated or new policy/procedural changes, reports, etc.

Methodology. Next participants defined the frequency the individual would be monitored and who would be responsible for the monitoring activity.

The mitigation and monitoring results are show below in Tables 7.4 through 7.6.

Table 7.4 Departmental Level Risk Mitigation & Monitoring Plan

2019 Top Priority Risks			Department Level Mitigation Plan				Monitoring Top Priority Risks		
Risk #	Risk Description	Risk Rating	Mitigation Action or Strategy to Manage Risks	Owner(s)	Projected Implementation Date	First Step	Method To Accomplish	Frequency	Who Performs
D4	Insufficient match for federal funds	Critical	Restructure State highway program to allow for maximum funding for match to the federal program.	Executive Staff	As Necessary	Annual Finance Forecast & Analysis	Policy - Update	As Necessary	Statewide Planning
			Cut the following programs:						
			-Port and Flood Control						
			-Parish Transportation Fund						
			-LADOTD Operating Budget						
Apply for General Obligation bonds and State General Fund monies to offset reductions.									
			Possible reduction in the level of service.						
D2	Loss of experienced staff	Critical	Continue succession planning strategies to keep productive employees and focus on recruiting to attract new employees.	HR	Ongoing	Maintain Current Actions	Procedure - Update	Ongoing	Section Head/DA
			Continue to cross train employees for the ability to continue delivering services when key employees retire or resign.	Section Head/DA	Ongoing	Maintain Current Actions	Training	Ongoing	Section Head/DA
			Continue to employ the workforce development program and structured training to advance the ability of our workforce.	Curriculum Council	Ongoing	Maintain Current Actions	Training	Ongoing	Section Head/DA
			Outsource when necessary to fill void of reduced staff.	Section Head/DA	Ongoing	Maintain Current Actions	Contracting	As Necessary	Section Head/DA
D6	Bridge Closures	Critical	Continue to strictly control the issuance of truck permits to control overweight trucks.	Truck Permits	Ongoing	Maintain Current Actions	Procedure - Existing	Ongoing	Truck Permits
			Focus funding on bridge preservation.	Bridge Project Selection Team	Annually	Data Analysis	Procedure - Existing	Ongoing	Bridge Project Selection Team
			Continue to operate a comprehensive bridge inspection program.	Section 51	Ongoing	Maintain Current Actions	Procedure - Existing	Ongoing	District Inspectors
D1	Lack of operating funding	High	Educate elected officials on funding needs.	Secretary	Continuously/Annually	Maintain Current Actions	Meeting(s)	Ongoing	Secretary
			Employ strategic thinking and continuous improvement for efficiency within the Department.	Executive Staff	Continuously	Maintain Current Actions	Meeting(s) / Procedure - Update	Ongoing	QCIP
			Elimination of low priority services.	Executive Staff	As Necessary	Annual Budget Review	Corrective Action(s)	As Necessary	Executive Staff
			Possible reduction of staff.	Executive Staff	As Necessary	Annual Budget Review	Other	As Necessary	Executive Staff
D5	Weather events	High	Implement design standard changes and infrastructure hardening to mitigate possible damages and improve resiliency.	Chief Engineer	As Necessary	Post Event Assessment to Identify Need	Policy & Procedure - Existing	As Necessary	Design Sections
	(Hurricanes, Floods, Ice Storms, etc.)		Dedicated and fully functional emergency preparedness program & staff while maintaining comprehensive disaster recovery plan.	Assistant Secretary of Operations	Continuously	Maintain Current Actions	Procedure - Existing	Ongoing	Emergency Operations
			Fully support to the local levee districts and flood control programs.	Public Works	As Necessary	Event Based	Procedure - Existing	As Necessary	HQ & District Staff
D7	Adverse legislative actions to priority programs	High	Continue to implement a transparent project selection process.	Assistant Secretary of Planning	Annual	Maintain Current Actions	Procedure - Existing	Annually	Transportation Planning Section
			Encourage the continence of strong statutory controls.	Secretary	Continuously	Maintain Current Actions	Meeting(s)	Ongoing	Secretary
			Continue active liaison efforts and legislative education/outreach.	Secretary	Continuously	Maintain Current Actions	Meeting(s)	Ongoing	Legislative Liaison/Secretary
D12	Very large bridge becomes Structurally Deficient	High	Repair with emergency action	Executive Staff	As Necessary	Determine Corrective Action	Allocate Funds	As Necessary	Office of Engineering

Table 7.5 Program Level Risk Mitigation & Monitoring Plan

2019 Top Priority Risks			Program Level Mitigation Plan				Monitoring Top Priority Risks		
Risk #	Risk Description	Risk Rating	Mitigation Action or Strategy to Manage Risks	Owner(s)	Projected Implementation Date	First Step	Method To Accomplish	Frequency	Who Performs
PM2	Increased truck weights increase deterioration rates of existing infrastructure.	Critical	The Department shall aggressively communicate implications to infrastructure.	Secretary	Ongoing	Maintain Current Actions	Meeting(s) / Multi-Media Options	Continuously	Secretary
			Educate legislature on impact to the pavement and bridge system.	Secretary	Ongoing	Maintain Current Actions	Meeting(s) / Multi-Media Options	Continuously	Secretary
PM1	Lack of reliable traffic loading data decreases confidence and effectiveness of pavement design	High	Collect permanent WIM data at 20 locations across the State which will determine regional loading factors that can be used for design.	Assistant Secretary Planning	Early Mid 2019	Advertise Consulting Contract	Contracting	Annually	Section 21 Data Collection
PM4	Public demand for low construction impacts increases costs and decreases quality	High	Educate legislature and public on the cost impacts of mitigating construction project schedules in order to minimize impacts to users.	Secretary	Ongoing	Maintain Current Actions	Meeting(s) / Multi-Media Options	Ongoing	Secretary / Public Information Office
PMS	Lack of experienced personnel for program delivery	High	Continue succession planning strategies to keep productive employees and focus on recruiting to attract new employees.	HR	Ongoing	Maintain Current Actions	Procedure - Update	Ongoing	Section Head/DA
			Continue to cross train employees for the ability to continue delivering services when key employees retire or resign.	Section Head/DA	Ongoing	Maintain Current Actions	Training	Ongoing	Section Head/DA
			Continue to employ the workforce development program and structured training to advance the ability of our workforce.	Curriculum Council	Ongoing	Maintain Current Actions	Training	Ongoing	Section Head/DA
			Possible outsourcing needed to fill void of reduced staff.	Section Head/DA	Ongoing	Maintain Current Actions	Contracting	As Necessary	Section Head/DA
PM10	Political pressure for suboptimal projects	High	Educate legislature on impact to infrastructure level of service.	Secretary	Ongoing	Maintain Current Actions	Meeting(s) / Multi-Media Options	Ongoing	Secretary
			Educate legislature about Federal Laws, Requirements, etc.	Secretary	Ongoing	Maintain Current Actions	Meeting(s) / Multi-Media Options	Ongoing	Secretary
			Enforce statute that requires project selection to follow the annual highway priority process.	Assistant Secretary Planning	Ongoing	Maintain Current Actions	Procedure - Existing	As Necessary	Assistant Secretary Planning

Table 7.6 Project Level Risk Mitigation & Monitoring Plan

2019 Top Priority Risks			Project Level Mitigation Plan				Monitoring Top Priority Risks		
Risk #	Risk Description	Risk Rating	Mitigation Action or Strategy to Manage Risks	Owner(s)	Projected Implementation Date	First Step	Method To Accomplish	Frequency	Who Performs
PJ1	Railroad Agreement (or lack thereof) can delay project	Critical	Start working with railroad early.	Project Managers	As Necessary	Maintain Current Actions	Procedure - Existing	As Necessary	Railroad Agreements Engineer
			Work on developing better relationships with the railroad companies.	Commissioner of Multimodal Commerce	Ongoing	Maintain Current Actions	Meeting(s)	Ongoing	Freight and Passenger Rail Director
PJ15	IT System Ownership causes insufficient support	Critical	Regain control of critical DOTD systems	Undersecretary	Ongoing	Identify Critical Systems	Meeting(s) / Multi-Media Options	As Necessary	Undersecretary
PJ2	Scope creep on projects that increase cost	High	Improved scoping skills of the project managers.	Curriculum Council	Ongoing	Maintain Current Actions	Training	As Necessary	LTRC
			Continue to improve communication among groups within the department.	Project Managers	Ongoing	Maintain Current Actions	Meeting(s)	Ongoing	Project Managers
			Enforcement of existing policies.	Project Managers	Ongoing	Maintain Current Actions	Policy - Enforcement	As Necessary	Project Managers
PJ3	Contractor quality	High	Continue to improve enforcement of specifications.	HQ Construction & Project Managers	Ongoing	Maintain Current Actions	Policy - Enforcement	As Necessary	Project Engineers
PJ5	Lack of experience of project delivery staff	High	Continue succession planning strategies to keep productive employees and focus on recruiting to attract new employees.	HR	Ongoing	Maintain Current Actions	Procedure - Update	Ongoing	Section Head/DA
			Continue to cross-train employees for the ability to continue delivering services when key employees retire or resign.	Section Head/DA	Ongoing	Maintain Current Actions	Training	Ongoing	Section Head/DA
			Continue to employ the workforce development program and structured training to advance the ability of our workforce.	Curriculum Council	Ongoing	Maintain Current Actions	Training	Ongoing	Section Head/DA
			Possible outsourcing needed to fill void of reduced staff.	Section Head/DA	Ongoing	Maintain Current Actions	Contracting	As Necessary	Section Head/DA
PJ6	ROW acquisition problem or delay	High	Start working with Right-of-Way section earlier.	Project Managers	As Necessary	Access Need	Procedure - Existing	As Necessary	Real Estate Section
PJ7	Utility relocation problem or delay	High	Work with utility companies early to try and mitigate any issue.	Project Managers	As Necessary	Access Need	Procedure - Existing	As Necessary	Road Design Utility Unit
PJ8	Environmental document and permitting delays	High	Start working with environmental section earlier.	Project Managers	As Necessary	Access Need	Procedure - Existing	As Necessary	Environmental Section
PJ14	Lack of DBE Subcontractor availability increase cost	High	Recruit new DBE Subcontractors	Compliance Section	Ongoing	Continue Recruitment	Meeting(s) / Multi-Media Options	Ongoing	Compliance Section

7.6 FACILITIES IN THE STATE REPEATEDLY DAMAGED BY EMERGENCY EVENTS

Federal Requirement. 23 CFR Part 667.1. Each State, acting through its department of transportation (State DOT), shall conduct statewide evaluations to determine if there are reasonable alternatives to roads, highways, and bridges that have required repair and reconstruction activities on two or more occasions due to emergency events.

Reasonable alternatives include options that could partially or fully achieve the following:

- (1) Reduce the need for Federal funds to be expended on emergency repair and reconstruction activities;
- (2) Better protect public safety and health and the human and natural environment; and
- (3) Meet transportation needs as described in the relevant and applicable Federal, State, local, and tribal plans and programs. Relevant and applicable plans and programs include the Long-Range Statewide Transportation Plan, Statewide Transportation Improvement Plan (STIP), Metropolitan Transportation Plan(s), and Transportation Improvement Program(s) (TIP) that are developed under part 450 of this title.

Definition. Repair and reconstruction means work on a road, highway, or bridge that has one or more reconstruction elements. The term includes permanent repairs such as restoring pavement surfaces, reconstructing damaged bridges and culverts, and replacing highway appurtenances, but excludes emergency repairs as defined in 23 CFR 668.103.

23 CFR Part 667.5 Data time period, availability, and sources:

- (a) The beginning date for every evaluation under this part shall be January 1, 1997. The end date must be no earlier than December 31 of the year preceding the date on which the evaluation is due for completion. Evaluations should cover a longer period if useful data is reasonably available. Subject to the timing provisions in § 667.7, evaluations must include any road, highway, or bridge that, on or after January 1, 1997, required repair and reconstruction on two or more occasions due to emergency events.
- (b) State DOTs must use reasonable efforts to obtain the data needed for the evaluation. If the State DOT determines the necessary data for the evaluation is unavailable, the State DOT must document in the evaluation the lack of available data for that facility.
- (c) A State DOT may use whatever sources and types of data it determines are useful to the evaluation. Available data sources include reports or other information required to receive emergency repair funds under title 23, other sources used to apply for Federal or nonfederal funding, and State or local records pertaining to damage sustained and/or funding sought.

23 CFR Part 667.7 Timing of evaluations:

(a) Not later than November 23, 2018, the State DOT must complete the statewide evaluation for all NHS roads, highways and bridges. The State DOT shall update the evaluation after every emergency event to the extent needed to add any roads, highways, or bridges subject to this paragraph that were affected by the event. The State DOT shall review and update the entire evaluation at least every 4 years. In establishing its evaluation cycle, the State DOT should consider how the evaluation can best inform the State DOT's preparation of its asset management plan and STIP.

(b) Beginning on November 23, 2020, for all roads, highways, and bridges not included in the evaluation prepared under paragraph (a) of this section, the State DOT must prepare an evaluation that conforms with this part for the affected portion of the road, highway, or bridge prior to including any project relating to such facility in its STIP.

23 CFR Part 667.9 Consideration of evaluations:

(a) The State DOT shall consider the results of an evaluation prepared under this part when developing projects. State DOTs and metropolitan planning organizations are encouraged to include consideration of the evaluations during the development of transportation plans and programs, including TIPs and STIPs, and during the environmental review process under part 771 of this title. Nothing in this section prohibits State DOTs from proceeding with emergency repairs to restore functionality of the system, or from receiving emergency repair funding under part 668 of this title.

(b) The FHWA will periodically review the State DOT's compliance under this part, including evaluation performance, consideration of evaluation results during project development, and overall results achieved. Nothing in this paragraph limits FHWA's ability to consider the results of the evaluations when relevant to an FHWA decision, including when making a planning finding under 23 U.S.C. 134(g)(8), making decisions during the environmental review process under part 771 of this title, or when approving funding. The State DOT must make evaluations required under this part available to FHWA upon request.

Part 667 Methodology

Initial Methodology. LADOTD's initial effort to provide for this requirement involved seeking assistance from the local office of the FHWA to analyze Fiscal Management Information System (FMIS) data to identify projects that would include highways or bridges that have required repair and reconstruction activities on two or more occasions due to emergency events. These projects would use federal emergency relief (ER) funds. LADOTD assumed that this was the best available data to meet this requirement.

While a number of projects existed that used federal ER funds, no FMIS projects meeting this "repeatedly damaged" requirement were found. It was understood that LADOTD would monitor these assets going forward to ensure efforts were made to prevent a "repeat" event from happening if possible.

Methodology Update. LADOTD recently came to a new understanding of this requirement, noting that it also included state declared emergencies, not just federal declared emergencies. Additionally, after November 23, 2020, LADOTD must prepare an evaluation for all STIP road, highway, and bridge projects, which will basically add the Federal Emergency Management Agency (FEMA) non-federal aid covered roads and bridges. LADOTD also notes the additional federal requirements listed above.

Ongoing Investigation. As a result, an investigation to identify all potential state maintained pavements and bridges that could have also been included in these additional criteria. This involved investigating all potential data, maps, 511 calls, declarations of emergency, etc. to produce the best available data for a more comprehensive assessment.

This investigation led to the discovery of project management tracking spreadsheets based on FHWA Detailed Damage Inspection Reports (DDIRs) created by the Maintenance Division. These working spreadsheets tracks both emergency and permanent repairs and covers both the March 2016 and August 2016 flood events. This Maintenance Division effort does not extend back to Hurricanes Katrina, Rita or Gustav.

The Part 667 effort to assess DDIRs for those storms will take considerable time based on both the naming convention used and the fact that the DDIRs are scanned pdf versions of the original paper DDIRs. The current understanding of this effort indicates that every one of the thousands of DDIRs will need to be reviewed to determine if they should be included in the Part 667 analysis. Dedicated staff resources to accomplish this task are currently not available, so this part-time effort could take considerable time to accomplish.

The outcome of this ongoing investigation, when finalized, will be reported to the TAM Steering Committee and the Executive Champion. This effort could result in additional policy and procedure updates, as well as potential risk management updates.

Part 667 Tracking Solution. The initial tracking effort is based on spreadsheets, but it is the desire that LADOTD will be able to create a “Part 667” tracking solution within the department’s Enterprise GIS solution. If this effort can be successfully implemented in this manner, the Enterprise GIS solution will provide easy access to all staff required to evaluate these assets in the development of transportation plans and programs, including TIPs and STIPs, and during the environmental review process under 23 CFR Part 771. An implementation of this type will ensure that LADOTD remains compliant with all Part 667 requirement going forward.

Part 667 Active Program

It is noted that, while the part 667 requirement is for the agency to conduct statewide evaluations to determine if there are reasonable alternatives to roads, highways, and bridges that have required repair and reconstruction activities on two or more occasions due to emergency events, flooding is almost always the predominate emergency event in Louisiana.

As a consequence of this, LADOTD has active Roadway Flood Mitigation Program in place.

Roadway Flood Mitigation Program

In addition to the project management tracking spreadsheets mentioned above, LADOTD already has a Roadway Flood Mitigation Program in place.

“The purpose of the Roadway Flooding Program is to alleviate roadway flooding through practical and cost-effective solutions to minimize any adverse effect on the roadway, traveling public, local population and environment. It should reduce future risks in all of these areas as well.”

While this existing program does not fully meet all of the requirements of Part 667, it does provide a substantial starting point in addressing “reasonable alternatives to roads, highways, and bridges” damaged due to emergency events.

This program is funded out of the Capital budget.

Roadway Flood Mitigation Program. Any time flooding occurs on a section of highway, the road is subject to closure. This can result in significant adverse economic and social impacts (disrupting commerce and daily life). Further, safety concerns also arise during these occurrences, particularly in times of emergency such as hurricane evacuation. Roadway drainage projects are intended to alleviate roadway flooding. Examples of projects qualifying for the program are roadway flooding due to undersized cross drain pipes and roadway overtopping due to inadequate roadway grade.

These projects are distinguished from periodic routine maintenance of roadside drainage systems (i.e., ditches, etc.) which will be addressed as part of pavement preservation projects or by state forces.

Projects not covered by the Program include projects consisting: solely of cleaning existing drainage structures, solely of measuring problems with existing structures (video, etc) and replacement of worn out or damaged drainage structures where flooding does not occur.

Roadway Flood Mitigation Project Selection. The process for selecting roadway drainage projects is illustrated in Figure 7.3. The process starts near the end of the fiscal year when the Districts are asked to provide potential projects for the Roadway Flooding Program. Input may come from various sources including, but not limited to, District maintenance personnel, local municipalities, complaints from citizens and known areas of repeated or extreme flooding.

Project Selection. The Project Selection Team is comprised of the Traffic Engineering Division Administrator, the Transportation Planning Administrator, the Road Design Engineering Administrator, and the Roadway Flooding Program Manager.

The principal performance indicator selected for roadway drainage projects is user costs per year, primarily the costs associated with increased travel in detouring around a closed section of highway, although some safety benefits may also be applicable. In making the final selection of projects, the Program Selection Criteria listed below will be considered.

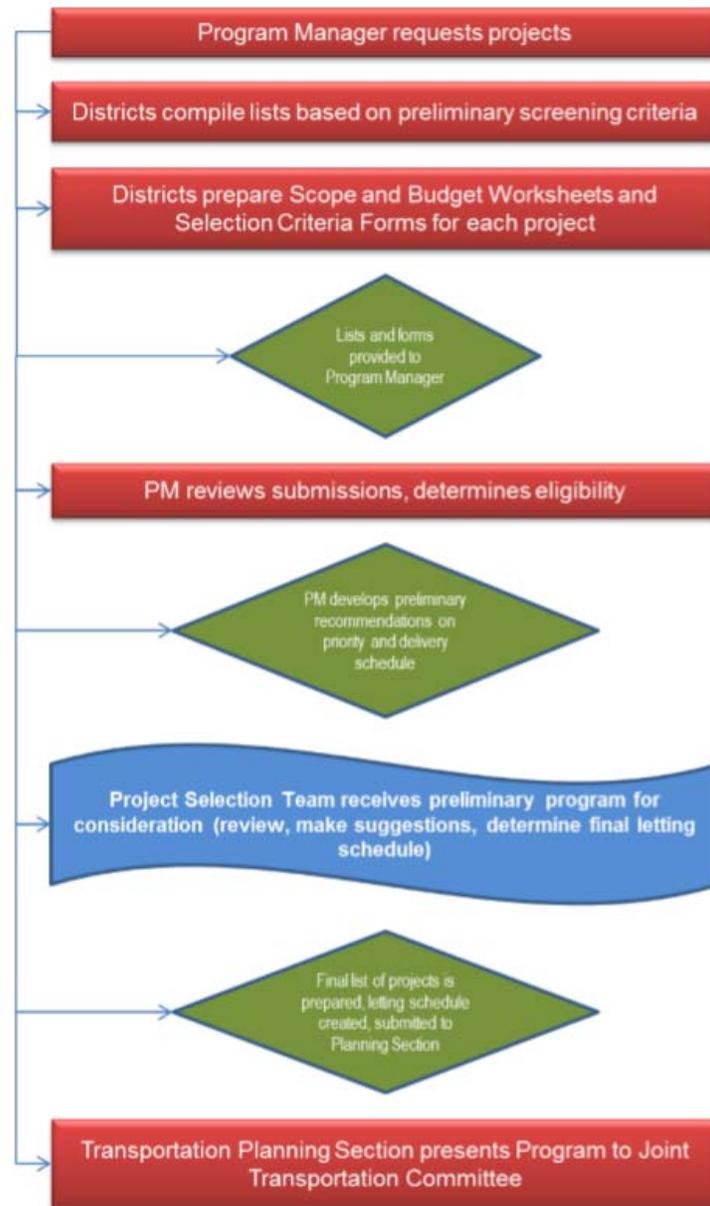
Program Selection Criteria. Some of the factors considered when selecting projects include:

- Flooding
 - Frequency (average number of years between flood events)
 - Depth (inches and location)
 - Duration of flooding or road closure (average hours per event)
 - Detour length (miles)
 - ADT
- Damage to roadway (description of damage)
 - Existing
 - Potential
- Disruption in emergency services and/or critical facilities made inaccessible (list types of facilities)
 - Disruption in emergency services may occur due to the road being impassible because of flooding. In some cases, rural communities may be cut off from fire, police or ambulance for a period of time.
 - Access to facilities along the roadway that need to be operational during or after a major storm event may be blocked due to flooding. These facilities may include, but are not limited to, hospitals, schools, shelters, oil refineries, major ports, air fields, mechanical bridge stations, navigable waterway control structure stations and floodgate stations.
- Property Damage
 - The Project Selection Team has the ultimate responsibility for selecting projects. The final list of projects is forwarded by the Program Manager to the Highway Program Engineer in the LADOTD Highway Programs Section with copies sent to the LADOTD Districts and MPOs.

Finalizing the Project List. Once a list of potential projects is compiled, the cause of the flooding is identified and a preliminary determination is made regarding whether or not each situation qualifies for the Program and whether it falls within the budget constraints of the program.

The list of projects is finalized, in priority order, based on the Program's selection criteria. For each project, a completed Scope and Budget Worksheet and Selection Criteria Form are also developed.

Figure 7.3 Flood Mitigation Project Selection



7.7 THREE R'S - REDUNDANCY, ROBUSTNESS, RESILIENCY

Asset Management is not a complete answer to addressing the threats to physical transportation assets but it can serve as an important component of the Three R's, particularly in making assets robust and agencies' asset-repair practices resilient in times of crisis.

An agency may not be able to plan for every threat; however, by creating a transportation network that includes redundancy, robustness and resiliency, the agency will be more able to cope with a wide and unpredictable range of threats. This general preparedness has been called an “all hazards” approach that suggests that planning for one kind of hazard or threat can increase an agency’s or a community’s ability to deal with others.

LADOTD intends to make every effort to implement the Three R’s going forward as the TAM effort matures under the ongoing TAMP implementation. This will be especially true for critical at-risk bridge structures.

Three R’s⁴

Redundancy can be defined as duplicative or excess capacity that can be used in times of emergency. Adding redundant highway capacity generally falls outside the practice of asset management. However, sound management of the assets on detour and emergency evacuation routes increases a highway system’s redundancy.

Robustness can be defined as the capacity to cope with stress or uncertainty. Asset management focuses upon optimizing the conditions of assets with available revenues. Well-maintained assets generally are better able to withstand the stresses of storm events and other disasters better than weakened and poorly maintained ones.

Resiliency has been defined as the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events. Enhanced resilience allows better anticipation of disasters, better planning to reduce disaster losses and faster recovery after an event.

A risk-based asset management program contributes strongly to all three, particularly robustness and resiliency.

3 R Practices

1. Providing accurate inventories of assets and their condition assists with identifying which assets are at risk for given types of events such as floods, hurricanes, or earthquakes.
2. Sound maintenance practices within an asset management regime “hardens” assets. Well maintained drainage structures are better able to withstand floods. Sound high-mast lights and overhead signs are more wind-resistant. Bridges with well-maintained wing walls, bank protection and scour protection are more robust during high water. Pavements with cleaned under drains and catch basins drain more quickly and perform longer.
3. The hierarchal prioritization of critical assets conducted in a risk-based asset management program provides priorities for asset repair after events.
4. Asset management staffs become competent at asset management scenario planning, which is critical when developing a post-event recovery plan.
5. Sound asset inventories and good unit-cost data assist with estimating recovery costs.

⁴ Report 5: Managing External Threats Through Risk-Based Asset Management; FHWA March 2013

6. Asset mapping and GIS capability assists with identifying assets and prioritizing their coordination with evacuation planning.
7. Complete and accurate inventories of traffic control devices, signs, guardrail and culverts allows the faster development of contract plans immediately after a flood or hurricane. Contractors can be instructed to restore the assets that existed before the event.
8. Risk-management capability provides not only critical before-event prioritization but also is useful in post-event recovery allocation of resources.

7.8 ROLE OF RISK MANAGEMENT IN THE ASSET MANAGEMENT PROCESS

All three of LADOTD's risk registers will be used throughout the asset management process, when setting the budgets, prioritizing projects and revising asset management guidance. The following describes how each of the risk registers will be used in the process:

- **Department and Program Level Risks** – The Executive Staff meets once a year to set the Department's goals and objectives and to set the funding appropriations for the various programs. During this meeting, the Departmental risks, which are the global level risks, are considered when setting the funding levels for the various programs in a manner that the Department can most effectively meet our asset performance targets.
- **Project Level Risks** – As per the Department's Highway Project Selection Process Manual, there are project selection committees for each of the funded programs. These selection committees meet once each year to prioritize the projects for the next year's program of projects. During this meeting, the project selection committees will review the Project Level risks and then consider these risks when prioritizing the projects so that the program will efficiently and effectively appropriate the funding to meet the Department's performance targets.

Existing policies and procedures will be adjusted, and if necessary, new policies will be generated to support this requirement. The roles of the risk management and risk registers will help the Department become more efficient in managing transportation assets.

7.9 FUTURE RISK REGISTER UPDATES

In the first quarter of each calendar year, LADOTD's Asset Management Engineer will conduct workshops to identify any changes needed in the working risk registers via the procedures outlined in the Risk Methodology section of this chapter. Over the course of these future workshops, participants will review and update the existing risks, identify and process any new risks and remove risks that no longer apply.

8.0 Financial Plan and Asset Valuation

8.1 INTRODUCTION

This chapter introduces the concepts and the federal requirements for the financial plan. Throughout this chapter, efforts are made to clear up the confusion about the lack of State and Federal funding flexibility and to identify the real dollars available for pavements and bridges.

The financial plan methodology is provided along with a summary of the funding sources and uses. The section examines historical funding and projected funding along with the outcomes of those projected funds. Finally, it identifies the value of the NHS pavement and bridge assets.

Financial Plan Concepts

A financial plan provides the link between an agency's strategic objectives and the improvement programs that identify projects. The federally required 10-year TAMP financial plan has elevated the importance of the financial plan and strengthened the link between the financial plan and the improvement programs for physical assets such as pavements and bridges. In addition, individuals involved in asset management are now more aware of the need for long-term financial planning and its impact on agency goals and funding allocations.

For LADOTD, the overall investment strategies, used to generate the financial plan, must tie into LADOTD's mission to provide a safe and reliable multimodal transportation and infrastructure system that enhances mobility and economic opportunity. With regard to LADOTD's primary asset classes included in this TAMP (roadways and bridges), this means the investment strategies must enhance quality of life and economic growth by enabling individuals and businesses to efficiently and effectively travel the State's system of roads and bridges in a safe manner. In doing so, LADOTD will accomplish its mission. Chapter 9, "Investment Strategies", details the efforts used to identify the NHS asset budgets.

The financial components in the TAMP also provide an opportunity for the agency to convey to outside stakeholders that it is being accountable in managing assets effectively using preservation strategies that help to maintain asset conditions.

Financial Plan Development

Federal Requirement. 23 CFR 515.7(d) requires the TAMP to describe a methodology for producing a financial plan that:

- Covers at least a 10-year period.

- Includes the estimated cost to implement the investment strategies by State fiscal year and work type.
- Includes the estimated funding levels that are expected to be reasonably available, by fiscal year, to address the costs of implementing the investment strategies, by work type.
- Identifies anticipated sources of available funding.
- Includes a summary asset valuation for the State’s NHS pavement and bridges, including the investment needed on an annual basis to maintain the asset value.

8.2 FINANCIAL PLAN

Methodology

LADOTD uses a number of financial strategies, documented in this chapter, to advise the future budget projections outlined in the budget partitions that are generated for the next 10 years. This 10-year plan allows for more precise needs-based analysis than is possible within the 30-year horizon of the Statewide Transportation Plan. Based on projected funding sources, and federally and state legislative constrained funding uses, LADOTD identifies the available funding that can be applied to pavements and bridges.

Using the PMS and BMS predictive capabilities, LADOTD is able to analyze any number of various long-term funding scenarios to identify the resulting effect on pavement and bridge condition. These analyses are informed by the various treatments, or work types, along with the associated costs to implement each work type. Life Cycle Planning (LCP) methodologies are employed to ensure that limited funding resources are used in the right place, at the right time, to produce the largest return for the given investment.

If there is insufficient funding to meet performance targets, a cross-asset resource allocation analysis strategy is performed. This cross-asset resource allocation strategy results in a funding mix change for one or more of the other pavement or bridge asset classifications, until there is a consensus that the adopted funding scenario will be the best solution to achieve the Department’s mission, and federal requirements, within the available budget.

In a significant funding shortfall, the strategy must then focus on doing everything possible to minimize the decline of assets into an unusable state. This is accomplished by completely eliminating capacity projects and focusing the very limited available funding on scenarios that attempt to keep critical assets, with the most traffic, functional and safe. For the lower traffic volume facilities, bridges become the point of focus as you can’t cross a closed bridge, while roads could unfortunately revert back to gravel and still be serviceable.

For the remainder of this chapter, the following financial plan elements are provided:

- Financial resources

- Budget allocation
- Historical funding levels for pavement and bridge
- Forecasted funding and condition levels for pavement and bridge
- Asset valuation methodology

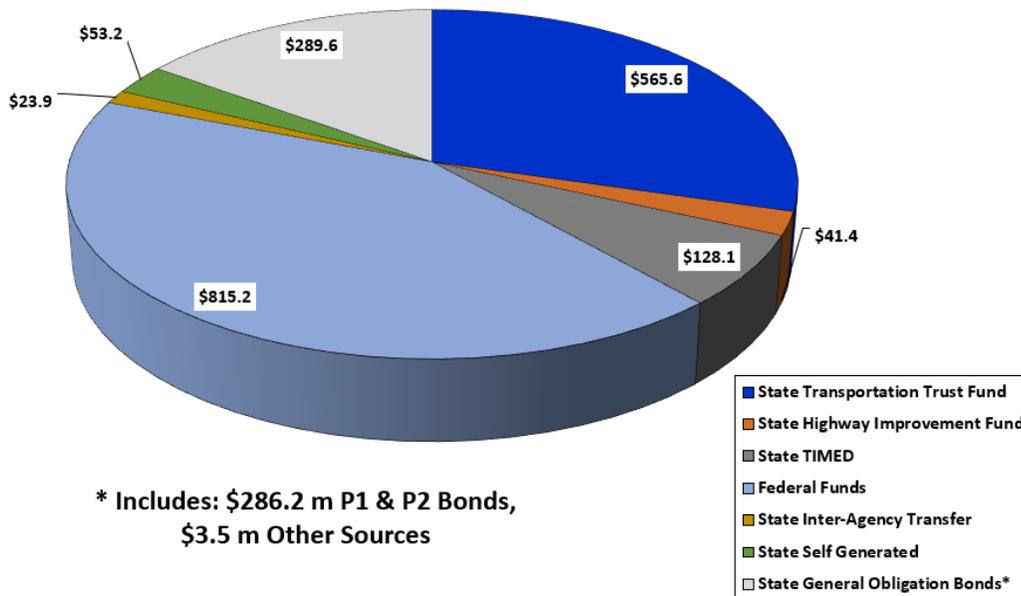
8.3 OVERALL FINANCIAL RESOURCES

The funding that LADOTD has available for pavement and bridge preservation is part of the overall annual funding allocation that it receives from the Congress and the State Legislature. There are many revenue sources that make up the overall annual operating and capital budgets. Figure 8.1 below shows the sources of the SFY 2017-2018 overall funding which totals \$1.9 billion.

Funding Sources

Funding Information. A detailed description of each funding source can be found in the Appendix 11.2, “LADOTD Revenue and Budget Allocation Descriptions” while the projected pavement and bridge funding for the next ten years is included in the Appendix 11.5, “LADOTD 10 Year Pavement & Bridge Projected Budget.”

Figure 8.1 LADOTD SFY 2017-2018 Funding Sources (millions)
 All data from HB1(Act 3-2017) & HB2(Act 4-2017)
 Except \$0.04 TTF from TTF Distribution Spreadsheet 9/9/2017



8.4 OVERALL BUDGET ALLOCATION PROCESS

The Financial Plan Development Process begins with a forecast of federal and state funding. The Statewide Transportation Plan includes a 30 year revenue forecast based on four scenarios which are level funding, reduced federal funding, moderate growth and robust growth.

The TAMP ten-year financial plan utilizes some of the assumptions in the Statewide Transportation Plan financial forecast, but first starts off by utilizing the five year State forecast from the State Revenue Estimating Conference. This group is composed of the President of the Senate, Speaker of the House, Commissioner of Administration and an economist from Louisiana State University (LSU). The Legislative Fiscal Office economist and the Division of Administration economist both present their five year forecasts to the Conference members at meetings conducted a minimum of twice per year and the selected forecast becomes the official forecast revenue for the State as well as the TAMP.

Once the revenue forecasts for the next ten years are agreed upon by LADOTD's Executive Committee, LADOTD's Budget Office goes through an iterative process whereby the funding needed for the operating budget (personnel services, professional and consulting contracts, supplies, equipment, etc.) is funded first and then the remaining amount is deemed available for the other programs and the constitutionally permitted uses of the Transportation Trust Fund (TTF). The resulting document is the TTF Distribution Worksheet which is maintained by LADOTD's Budget Director.

The current TTF Distribution Worksheet identifies the actual revenues and expenditures for SFY 2015-16, SFY 2016-17 and SFY 2017-18, the projected revenues and expenditures for the current SFY 2018-19 and the requested revenues and expenditures for SFY 2019-20 and SFY 2020-21. A copy can be found in the Appendix 11.3, "LADOTD Transportation Trust Fund Distribution."

The capital program for highways and bridges is called the Highway Priority Program. The funding available for the Highway Priority Program, determined by the previous step combined with a projection of federal funds, is partitioned into categories and subcategories based on the different types of assets and/or needs of the system. This effort is performed by the Transportation Planning Section in the Office of Planning with Executive Committee oversight and uses inputs from the pavement and bridge management systems to model budget impacts on systems. This document is called the Budget Partition and is maintained by the Office of Planning. The Budget Partition for SFY 19-20 can be found in the Appendix 11.6, "LADOTD State FY 19-20 Budget Partition."

Confusion about State & Federal Funding Use Flexibility

Legislative & Federal Mandates. There is often confusion, when the total funding dollar amount is discussed, as the general public believes that LADOTD can do what it wants with the funding. That couldn't be further from the truth.

Not only does LADOTD have legislatively mandated Aviation, Port, and Flood Control funding responsibilities, along with Safety Program responsibilities, Federal programs require that a large percentage of federal funding be allocated to the Non-Discretionary programs such as Transportation Alternatives Projects, projects in Urban Areas, Congestion Mitigation/Air Quality, Federal Earmarks, and more.

It must be noted that a significant portion of the Federal Funding dollars are simply not available for pavements and bridges. The actual available Pavement and Bridge funding is reviewed later in this chapter.

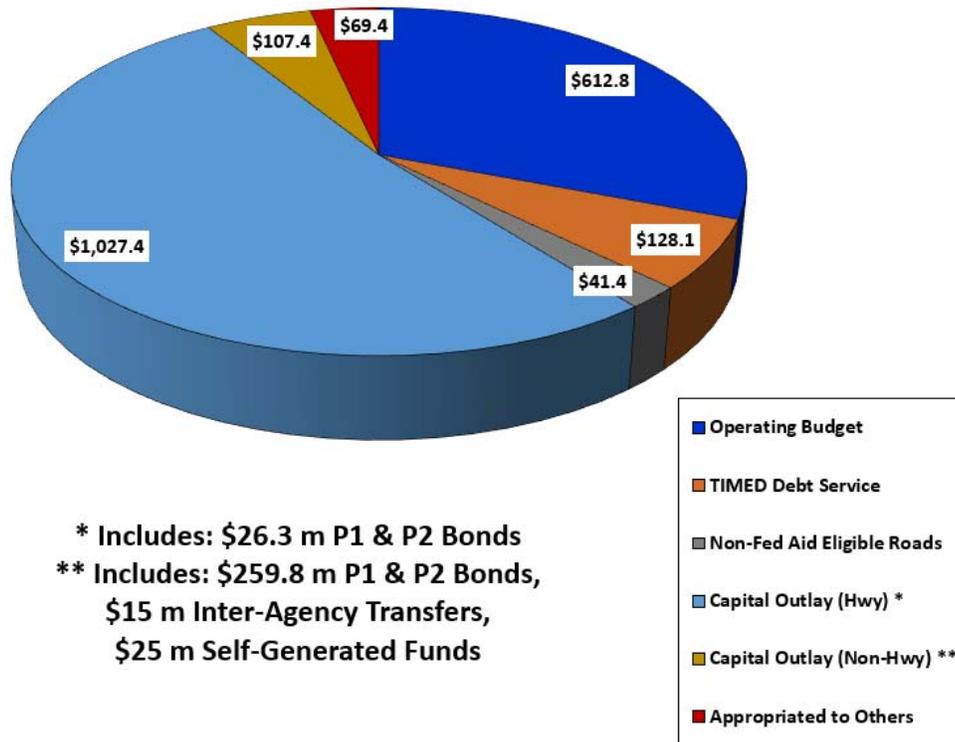
Funding Uses

Funding Breakdown. The funding levels available for pavement and bridges are broken down into the four classifications of highways. The funding levels are set based on available funding, historical funding levels, and goals of the Statewide Transportation Plan, TAMP requirements, investment strategies and performance targets. Once the budget partitions are set and the capital funding available for the different subcategories of the Budget Partition are known, the projects in the annual Highway Priority Program are determined using the process set forth in LADOTD's Highway Project Selection Process Manual.

The allocation of these funds for SFY 2017-2018 is shown in Figure 8.2. A detailed description of each budget allocation can be found in the Appendix 11.2 "LADOTD Revenue and Budget Allocation Descriptions."

It should be noted that, "Appropriated to Others" provides \$23 million to the State Highway Improvement Fund debt service and \$46.4 million to the Parish Transportation Fund.

Figure 8.2 LADOTD SFY 2017-2018 Funding Uses (millions)
 All data from HB1(Act 3-2017) & HB2(Act 4-2017)
 Or TTF Distribution Spreadsheet 9/9/2017



8.5 HISTORICAL FUNDING LEVELS

In Table 8.1 we find the historical expenditures, or “Budget Recap”, for the previous six fiscal years and see the various funding amounts, along with the percentage each of these represent in the total budget partition funding. These totals include preconstruction and CE&I costs, but not indirect costs. The green highlighted sub-partitions, included in Table 8.1, are the items relevant to the TAMP.

LCP Approach. For a number of years, LADOTD has been moving toward a sustainable life cycle planning approach (preservation, rehabilitation & reconstruction) with capacity projects receiving only very limited funding.

Historical Analysis. The overall percentage of expenditures for the Sustainability budget partition (which includes preservation, rehabilitation and replacement of assets) has averaged 52.8% of the total budget partition for the past six years, with a high of 58.8% in SFY 2012-13 and a low of 43.4% in SFY 2016-17.

For the past six years, Operations has averaged 7.3% of the total budget, Safety 7.4% and Non-Discretionary 25.9%.

The Capacity budget has averaged 6.6%, with the most recent SFY 2017-18 recap year representing the low expenditure mark of 1.4%. Without substantial funding increases, capacity projects will be limited to those receiving special appropriations.

Mandated & Non-Discretionary Funding. As mentioned earlier, not only does LADOTD have legislatively mandated Aviation, Port, and Flood Control funding responsibilities, along with Safety responsibilities, a percentage of federal funding is allocated to Non-Discretionary programs via federal requirements, so a significant portion of the Federal Funding dollars are simply not available for pavements and bridges. The funding totals and percentage of the total budget are detailed in Table 8.1.

**Table 8.1 Historical Budget Recap
(by state fiscal year)**

Budget Recap TAMP Specific Sub-Categories	SFY 12-13		SFY 13-14		SFY 14-15		SFY 15-16		SFY 16-17		SFY 17-18	
	Budget (Millions)	% of Grand Total										
Sustainability Program Totals	346.4	58.8%	471.7	46.5%	495.9	53.8%	318.7	56.8%	382.8	43.4%	352.7	57.4%
Non-Interstate - Pavements - Fed Aid Eligible	133.6	22.7%	26.5	2.6%	39.2	4.3%	59.6	10.6%	63.6	7.2%	67.8	11.0%
Non-Interstate - Pavements - NHS (4)											2.0	0.3%
Non-Interstate - Pavements - Non-Fed Aid (1)	94.4	16.0%	136.7	13.5%	198.5	21.6%	33.6	6.0%	68.3	7.7%	42.0	6.8%
Road Preventive Maintenance	9.8	1.7%	11.0	1.1%	10.5	1.1%	8.8	1.6%	7.6	0.9%	8.6	1.4%
Interstate - Pavement	48.3	8.2%	85.3	8.4%	80.9	8.8%	84.0	15.0%	91.4	10.4%	90.0	14.7%
Bridge - On-System	44.7	7.6%	197.5	19.4%	93.8	10.2%	81.6	14.5%	139.2	15.8%	93.3	15.2%
Bridge Preventive Maintenance	0.9	0.2%	2.1	0.2%	49.6	5.4%	34.9	6.2%	4.3	0.5%	36.3	5.9%
*Bridge - Off System (Not TAMP Relevant) (2)	14.6	2.5%	12.5	1.2%	23.3	2.5%	16.1	2.9%	8.3	0.9%	14.8	2.4%
Operations Total	54.5	9.3%	41.0	4.0%	77.7	8.4%	49.8	8.9%	46.1	5.2%	50.7	8.3%
Roadway Flooding	6.2	1.1%	4.3	0.4%	4.3	0.5%	3.3	0.6%	5.2	0.6%	4.0	0.7%
Movable Bridge Rehab / Preventive Maintenance	1.1	0.2%	1.0	0.1%	0.0	0.0%	0.3	0.1%	1.7	0.2%	2.0	0.3%
Safety Program Total (2)	34.9	5.9%	69.2	6.8%	59.4	6.5%	50.8	9.1%	50.8	5.8%	63.2	10.3%
Capacity Program Total	43.0	7.3%	29.7	2.9%	21.5	2.3%	32.8	5.8%	173.0	19.6%	8.8	1.4%
**Non-Discretionary Program Total (2) (3)	110.3	18.7%	403.9	39.8%	266.4	28.9%	108.9	19.4%	229.1	26.0%	138.9	22.6%
Grand Total	589.1		1015.5		920.9		561.0		881.8		614.3	

* Included to show all preservation totals

** Non-Discretionary Program: TIMED Debt Service, Transportation Alternatives Projects, Urban System, Congestion Mitigation/Air Quality, Federal Earmarks, Road Transfers, Intermodal Connectors, etc.

(1) - Includes SHIF Bonds in years 13-14 & 14-15; (2) - Does not include local match; (3) - Does not include Planning, Training, or Research

(4) - Starting in SFY 2018-2019 the program was split into non-interstate on the NHS system (PR NH) and non-interstate on the STP system (PR NI), the 2.0 mil is included in the 67.8 mil

8.6 PROJECTED FUNDING LEVELS

The projected funding levels going forward have been significantly impacted by the investment strategy analysis, outlined in chapter 9 “Investment Strategies”.

In Figure 8.3, we see LADOTD’s continuing trend of focusing as much future funding as possible on the Sustainability part of the Budget Partition, with respect to the other budget categories.

Capacity Budget Eliminated

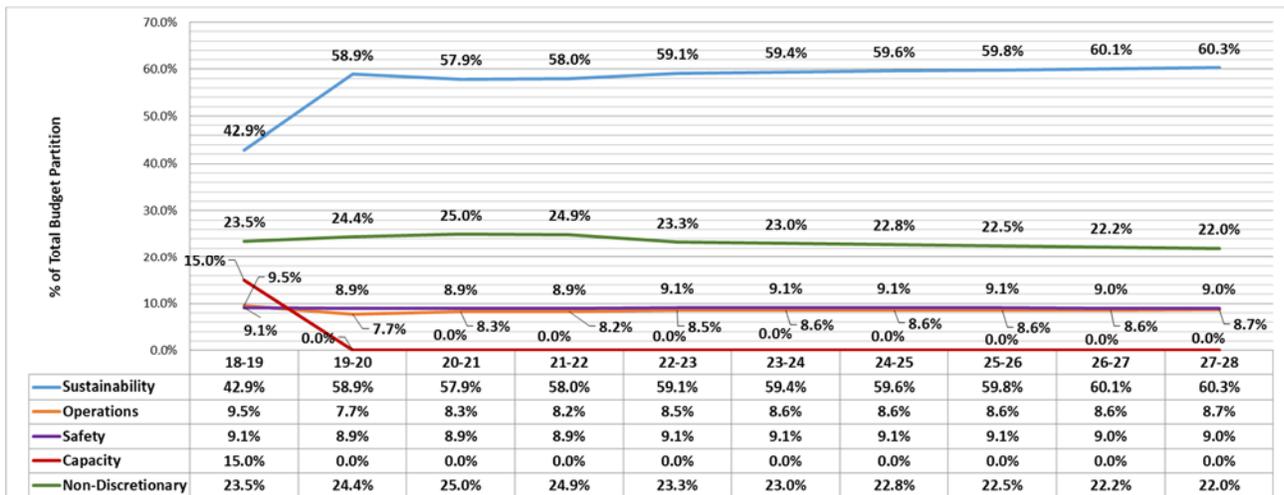
Fiduciary Responsibility. LADOTD’s clear fiduciary responsibility is to maintain the existing assets in the best condition possible. With that in mind, and without a significant increase in funding, beginning in SFY 2019-2020, the Capacity budget is no longer sustainable.

Federal Funding Match

Federal Match Shortfalls. The use of federal funds requires a state to provide a matching amount of funds. LADOTD had recently been using toll credits to meet the federal match requirement, but toll credits are no longer available. The existing state funds are either obligated or insufficient to meet the federal funding match.

These projected budget percentages are based on the assumption that the Legislature will provide appropriate funding for federal match; however, if the Legislature does not provide the federal matching funds, this budget projection will not be possible.

**Figure 8.3 Projected Budget Partition Percentages
(percent by state fiscal year)**



8.7 TAMP RELEVANT FUNDING

TAMP Pavement Funding Levels. Table 8.2 below provides the projected Preservation funding over the 10-year TAMP analysis period. The funding was determined by investment strategy analysis efforts, as further described in Chapter 9 “Investment Strategies”.

Beginning in SFY 2020-21, the budgets, shown in Table 8.2 below, provide for steady state funding on Interstate and Non-Interstate NHS pavements allowing LADOTD to retain its desired state of good repair for these asset classes. These funding levels will also allow LADOTD to achieve the federal performance targets for both pavement asset classes as well as remain above minimum Interstate pavement standards, remaining outside of a penalty assessment for Interstate pavements.

Interstate pavement funding levels are set at \$35 million in SFY 2020-21 and beginning in SFY 2023-24, will increase by 2% per year. Non-Interstate NHS funding pavement levels are set at \$90 million in SFY 2020-21 and beginning in SFY 2022-23, will increased by 2% per year.

TAMP Bridge Funding Levels. LADOTD recognizes that bridges are the most critical infrastructure items in the statewide transportation network and funding levels have been adjusted is support of that determination.

Investment strategy analysis efforts, chapter 9 “Investment Strategies”, have also identified funding levels required to maintain NHS bridges in a steady state condition, or desired state of good repair and allow LADOTD to achieve both the federal performance targets as well as remain above minimum NHS bridge standards, remaining outside of a penalty assessment for NHS bridges.

Table 8.2 illustrates that projected funding levels for NHS Bridges. NHS Bridge funding are set at \$134 million starting in SFY 2020-21, \$134 million and beginning in SFY 2022-23 will increased by 2% per year.

This significantly increased NHS bridge funding level actually exceeds the potential NHS bridge penalty assessment of approximately \$101 million.

Table 8.2 10-Year Preservation Budget Projections
(millions)

Budget Line Item	Current	*10-Year Preservation Budget Projection									
	SFY 18-19	SFY 19-20	SFY 20-21	SFY 21-22	SFY 22-23	SFY 23-24	SFY 24-25	SFY 25-26	SFY 26-27	SFY 27-28	SFY 28-29
Interstate Pavement	84.2	36.6	35	35	35	35.7	36.4	37.1	37.8	38.6	39.4
Non-Interstate NHS Pavement	15.5	38.4	90	90	91.8	93.7	95.6	97.5	99.4	101.5	103.6
Non-Interstate SHS Pavement	55.2	46.5	67	67	67	68.2	69.5	71	72.4	73.8	75.3
Non-Interstate RHS Pavement	47	47	31.9	32.2	32.5	32.8	33.2	33.4	33.7	38.6	39.4
Bridge Preservation (On System) NHS	129.4	150.1	134	134	136.7	139.4	142.2	145	147.9	150.9	153.9
Bridge Preservation (On System) SHS & RHS			97	97	97	98.9	100.9	102.9	105	107.1	109.2
Bridge Preservation (Off System)	12	20.2	12	12	12	12	12	12	12	12	12

* Does Not Include Preconstruction and (CE&I) Construction, Engineering, Inspection Totals

8.8 ASSET VALUATION

GASB 34

For financial reporting, LADOTD calculates asset value based on the standard depreciation approach described in GASB Statement 34. This calculation is performed at an aggregate level using historic cost data and assuming straight-line depreciation.

The GASB 34 calculation, though performed in a manner consistent with financial reporting requirements, is of extremely limited value in asset management when a straight-line depreciation approach is used.

NCHRP Report 608, published in 2008, reviews transportation agency experience implementing GASB Statement 34 and concludes that absent significant changes to the calculation approach, asset valuation results developed based on the GASB 34 standard approach are unlikely to play substantial role in asset management and decision making. That report identifies a number of reasons for this conclusion. It also states that “GASB 34 was created to address financial reporting only; GASB never intended that its accounting standards would determine asset management policies and procedures.”

NCHRP Report 898 chapter 6 “Asset Valuation” further supports this conclusion.

Asset Valuation Method

While a number of options can be used to determine asset valuation, LADOTD has decided, at this time, to use the asset replacement cost to identify the value of the TAMP NHS assets.

Pavement Asset Valuation

Interstate Pavement Replacement Costs. The PMS replacement treatments, or work types, for Interstate pavements are a structural overlay on Asphalt pavements, a structural treatment on Composite pavements, a reconstruction for both curb and non-curb on Continuously Reinforced pavements and a reconstruction for both curb and non-curb on Jointed Concrete pavements.

The cost of these treatments, or work types, used by the PMS are identified in the “Pavement Treatments (Work Types)” section of Chapter 5. There are different costs associated with curb and non-curb projects, so these values are averaged to determine the value to use in this calculation.

An average cost per lane mile is identified for each treatment and then multiplied by the total number of lane miles for that pavement type. Table 8.3 identifies the valuation for each Interstate pavement type along with a total Interstate pavement valuation of \$1.28 billion dollars.

Table 8.3 Interstate Asset Valuation

Pavement Type	Replacement Cost
Asphaltic Concrete Pavement	\$250,169,108
Composite Pavement	\$152,276,992
Continuously Reinforced Concrete Pavement	\$50,631,023
Jointed Concrete Pavement	\$825,494,005
Total Replacement Costs	\$1,278,571,128

Based on 2017-2018 PMS data cycle

Non-Interstate NHS Pavement Replacement Costs. The PMS replacement treatments, or work types, for Non-Interstate NHS pavements are a structural overlay on Asphalt pavements, a rubblize and overlay treatment on Composite pavements, a reconstruction for both curb and non-curb on Continuously Reinforced pavements and a rubblize and overlay on Jointed Concrete pavements.

The cost of these treatments, or work types, used by the PMS are identified in the “Pavement Treatments (Work Types)” section of Chapter 5. There are different costs associated with curb and non-curb projects, so these values are averaged to determine the value to use in this calculation.

An average cost per lane mile was identified for each treatment and then multiplied by the total number of lane miles for that pavement type. Table 8.4 identifies the valuation for each Non-Interstate NHS pavement type along with a total Non-Interstate NHS pavement valuation of \$1.15 billion dollars.

Table 8.4 Non-Interstate NHS Asset Valuation

Pavement Type	Replacement Cost
Asphaltic Concrete Pavement	\$387,447,961
Composite Pavement	\$455,234,962
Continuously Reinforced Concrete Pavement	\$33,663,559
Jointed Concrete Pavement	\$275,103,937
Total Replacement Costs	\$1,151,450,418

Based on 2017-2018 PMS data cycle

Bridge Asset Valuation

As noted above, LADOTD has decided to use the asset replacement cost to identify the value of the TAMP assets.

Historically, as noted in Chapter 5, bridges were designed in a one-off manner, with a limited number of bridges using the same design. As a result, LADOTD has a total of sixty-

five (65) different types of bridges on the state maintained system. Currently, LADOTD considers seven (7) different generalized bridge types when replacing these bridges, with 90% of all replacements consisting of prestressed concrete girders or slab span bridges.

Bridge Replacement Costs. LADOTD maintains the replacement type and replacement cost in the BMS for each existing bridge on the state maintained system. Table 8.5 summarizes the seven (7) replacement types and the asset valuation for those bridges that they would replace. The total replacement cost for NHS bridges, excluding Local NHS bridges, would be \$36.4 billion dollars, clearly identifying that bridge assets comprise the most valuable asset maintained by LADOTD.

Table 8.5 NHS Bridge Asset Valuation

NHS Bridge Asset Valuation	
Bridge Replacement Type	Replacement Cost
Large Plate Girders	\$335,675,394
Movable	\$3,009,276,923
Plate Girders	\$8,246,076,965
Prestressed Concrete Girders	\$19,022,034,901
Heat-Curved Rolled Beams	\$154,235,680
Slab Span	\$465,106,081
Cable Stayed	\$5,150,014,024
Total Replacement Costs	\$36,382,419,968

Represents 2018 NBI Submittal; Excludes Local NHS Bridges

9.0 Investment Strategies

9.1 INTRODUCTION

This chapter introduces the concept of investment strategies and identifies that without federal matching funds provided by the Legislature, federal performance targets cannot be achieved and penalty assessments will occur.

This section then identifies requirements along with the current investment strategy methodology employed by LADOTD. It further explains how investment scenarios were evaluated to generate funding allocations that attempt to achieve the desired state of good repair, preserve the condition of NHS assets, achieve NHS asset condition targets and achieve the national goals of 23 U.S.C. 150(b).

Investment Strategy Concepts

The FHWA defines an investment approach as “a set of strategies that result from evaluating various levels of funding to achieve state DOT targets for asset condition and system performance effectiveness at a minimum practicable cost while managing risk” (Moving Ahead for Progress in the 21st Century Act 2016).

Investment strategies begin with a thorough understanding of projected funding and with estimates of the preservation and renewal activities that can be accomplished within funding constraints. The development of various investment strategies for an organization is an iterative process that is best served using the predictive capabilities of the pavement and bridge management systems. The outcome of investment strategies will lead to identifying if performance targets will be met.

Comprehensive investment strategies are directly influenced by life cycle planning, gap analysis and risk analysis. The strategies also consider changes in factors such as growth trends, technology, design and construction.

In the 2019 NCHRP Research Report 898, “A Guide to Developing Financial Plans and Performance Measures for Transportation Asset Management”, we find guidance on how to finalize a financial plan and its investment strategies in Chapter 5, “Investment Strategies and Scenarios”.

Federal Funding Match

Federal Match Shortfalls. The use of federal funds requires a state to provide a matching amount of funds. LADOTD had recently been using toll credits to meet the federal match requirement, but toll credits are no longer available. The existing state funds are either obligated or insufficient to meet the federal funding match.

This analysis assumes that the Legislature will provide appropriate state funding for federal match; however, if the Legislature does not provide the federal matching funds, LADOTD will not accomplish the DSGR or achieve the performance targets, and will experience a penalty assessment in the near future.

Investment Strategy Requirements

Federal Requirement. 23 CFR 515.7(e). A State DOT shall establish a process for developing investment strategies meeting the requirements in **23 CFR 515.9(f)**. This process must result in a description of how the investment strategies are influenced, at a minimum, by the following:

- (1) Performance gap analysis required under 23 CFR 515.7 (a);**
- (2) Life cycle planning for asset classes or asset sub-groups resulting from the process required under 23 CFR 515.7 (b);**
- (3) Risk management analysis resulting from the process required under 23 CFR 515.7 (c); and**
- (4) Anticipated available funding and estimated cost of expected future work types associated with various candidate strategies based on the financial plan required by 23 CFR 515.7(d).**

Per **23 CFR 515.9(f)**, an asset management plan shall discuss how the plan's investment strategies collectively would make or support progress toward:

- (1) Achieving and sustaining a desired state of good repair over the life cycle of the assets,**
- (2) Improving or preserving the condition of the assets and the performance of the NHS relating to physical assets,**
- (3) Achieving the State DOT targets for asset condition and performance of the NHS in accordance with 23 U.S.C. 150(d), and**
- (4) Achieving the national goals identified in 23 U.S.C. 150(b).**

9.2 OVERALL INVESTMENT STRATEGIES

In Louisiana, the annual Highway Budget Partitions provides the projected funding for the investment strategies that serve as the link to the agency's tactical plans that are represented in the annual Highway Priority Program. The Office of Planning projects highway budget partitions out for ten years.

LADOTD incorporates several overall strategies, including life cycle planning strategies, into its process when allocating funding for pavements and bridges including:

- Preservation funding will be the primary funding focus for various asset classes with the focus on minimizing the "worst first" strategy. Note "worst first" strategies

cannot be totally eliminated as some assets simply cannot be removed from the system.

- Interstate and Non-Interstate NHS pavements now have their own funding categories to better manage asset condition and aid in addressing performance gaps. Project selection for these asset classes now both match the existing Interstate project selection process.
- Capacity funding will be relegated to non-traditional means such as Grant Anticipation Revenue Vehicles (GARVEE) bonds, State General Obligation bonds, State General Fund Surplus, federal INFRA grants, federal BUILD grants, and specifically where new lanes are needed to maintain traffic while the existing asset is reconstructed.
- Perform risk management assessments, including 23 CFR Part 667 repeat damage from emergency event evaluations, for asset classes.
- Maximize the life cycle performance of asset classes, via cross-asset resource allocation analysis, on a priority basis with the goals of achieving the desired state of good repair for asset classes and addressing performance gaps.
- Perform iterative PMS and BMS analysis using various budget scenarios on the different asset sub-groups to identify the most compelling funding for each asset class using actual treatments (work types in 23 CFR 515.7(b)).
- Select the most opportune “cross-asset resource allocation” budget for each asset class based on various priorities outlined here.
 - Allocate funding to various bridge asset classes in the following order, NHS bridges, SHS bridges, RHS bridges.
 - Allocate funding to various pavement asset classes in the following order, Interstates, Non-Interstate NHS, SHS and RHS.
 - On all assets, bridges take the priority over pavements for funding when funding constraints are encountered. The concept here is that gravel roads can be used, but closed bridges cannot.
 - Provide sufficient funding to NHS assets to remain penalty free with respect to targets for asset condition and performance of the NHS in accordance with 23 U.S.C. 150(d).
- Identify and address performance gaps due to insufficient funding or other reasons.

9.3 INVESTMENT STRATEGY PROGRAM DEVELOPMENT

Annually, LADOTD’s Secretary and the Executive Committee meet to review the investment strategies that have been, and will be, used to update the annual budget partitions that are

projected for the next ten years. The process includes a review of the following information:

- Past performance of the system
- Pavement and bridge needs
- Available funding
- Policies and procedures supporting a life cycle based asset management approach
- Asset inventories
- Pavement and bridge investment funding scenario forecasts
- Level of service targets

Using this information and considering the recommendations of the Asset Management Engineer and the TAM Steering Committee, the Secretary and the Executive Committee will consider whether or not to adjust the investment strategies. The final set of investment strategies are communicated to LADOTD's personnel via the annual Highway Budget Partitions and the project selections within the annual Highway Priority Program.

9.4 INVESTMENT SCENARIO APPROACH

NCHRP Report 898 provides guidance in developing life cycle focused investment scenarios to define how to allocate asset management funds to the identified uses. The remainder of this section, based on the guidance found in that report, describes how to finalize a financial plan and its investment strategies, which requires defining a set of scenarios and detailing projected spending by year for asset management-related uses.

When a list of funding sources and uses has been identified, as well as the 10-year forecast for revenues and non-asset management uses, investment scenarios can then be investigated to evaluate investment scenarios in compliance with 23 CFR 515.7 and 515.9 requirements.

Defining Investment Scenarios

Beginning with the current available funding for asset management activities, the question must next be how could that change in the future? The federal requirements for state DOT TAMPs call for the development of at least the following three scenarios.

Scenario 1: Funding that is estimated to be reasonably available. 23 CFR 515.7(d)(1) states that the financial plan process shall produce, "The estimated funding levels that are expected to be reasonably available, by fiscal year, to address the costs of future work types". So, the initial funding scenario is based on expected funding levels.

Scenario 2: Funding required to achieve federal performance targets. Based on the NHS pavement and bridge targets, this funding scenario provides the funding levels necessary to achieve those targets.

Scenario 3: Funding required to maintain asset value. 23 CFR 515.7(d)(4), requires that the financial plan process shall produce, “An estimate of the value of the agency’s NHS pavement and bridge assets and the needed investment on an annual basis to maintain the value of these assets”. So, this funding scenario identifies the necessary funding to maintain the asset value of the pavement and bridge assets.

NCHRP Report 898 also identifies the following additional scenarios for consideration.

Current funding level. This scenario assumes that funding levels will stay the same indefinitely without inflation adjustments. This usually results in the decline of the asset as assets age and deterioration increases while costs continue to rise. In many cases, this will equate to Scenario 1 described above.

Funding required to maintain current asset conditions and performance. This scenario describes the funding required to maintain the status quo. As most state DOTs have a backlog of investment needs, maintaining current asset conditions is generally a less ambitious goal than achieving aspirational targets. In many cases this scenario may be the same as the scenario to maintain asset value.

Alternative funding levels. If there is a great deal of uncertainty in future funding levels, it may be a good idea to have scenarios that outline a variety of funding levels. When using a management system, this scenario provides a great approach to identify the necessary funding required to achieve Scenario 2 and 3 above.

This particular alternative funding level scenario was used by LADOTD to identify the appropriate funding levels for the investment analysis.

Consideration of selected risks. When uncertainty exists regarding specific risks, then it may be important to test the impact of selected risks. For instance, an agency may wish to test a scenario in which asset deterioration rates are accelerated due to a reduction of funds, or a no funds scenario. This can be used to show the very quick demise of assets not properly maintained.

9.5 LADOTD INVESTMENT SCENARIOS

Historical Approach. In the past, LADOTD set budgets based on historical levels and adjusted those levels based on explicit needs of assets facing critical issues or mandates. This approach often aided and abetted the “worst-first” approach.

Updated Approach. This analysis began with a dTIMS and an AASHTOWare™ PONTIS evaluation of the outcome of the previous budget level, using the estimated cost of expected future work types to assess future conditions of pavement and bridge asset. Then using the processes described below, funding was adjusted to achieve each of the goals of

steady state funding, or desired state of good repair, state performance targets and federal goals. The final outcome is a proposed budget that maximizes the life cycle of the various NHS asset classes.

Initial Current Funding Scenario Evaluations. Starting with the previous budget allocations, the management systems were used to assess the future conditions of the pavement and bridge assets.

It was immediately apparent that these previous funding levels could not achieve the pavement or bridge condition targets and would result in significant performance gaps, as well as condition states above the minimum Interstate Pavement or NHS Bridge requirements, leading to future penalty assessments. The existing budget allocations could not maximize the life of these assets.

Alternative Funding Scenario Evaluations. Following that realization, a number of different funding scenarios were then evaluated against both federal goals, state condition targets and steady state or state of good repair goals, to identify appropriate issues and performance gaps that could prevent LADOTD from reaching those targets.

Interstate. Using the PMS, a starting projected Interstate funding of \$55 million was employed and incremented downward by \$5 million to \$30 million. This resulted in the evaluation of (7) seven different investigative funding scenarios and led to the conclusion that a funding scenario of \$33 million per year would lead to steady state funding, or desired state of good repair funding, for Interstate pavements over the 10-year analysis cycle. That funding level would also allow LADOTD to achieve both the federal performance targets as well as remain above minimum Interstate pavement standards, remaining outside of a penalty assessment for Interstate pavements.

SFY 2020-21 TAMP Budgets (millions)		
Asset Class	^Budget Totals	Management System Analysis Funding
*NHS Pavements		
Interstate	35	33
Non-Interstate NHS	90	83
*NHS Bridges		
State NHS	134	101

^ = Includes Preconstruction and Construction, Engineering, Inspection (CE&I) totals

* = Excludes Local NHS Pavements & Bridges

The actual Interstate budget of \$35 million is set in SFY 2020-21 and beginning in 2023 will increase by 2% per year, noting that this is the actual available total including Preconstruction and Construction, Engineering, Inspection (CE&I) funding. This budget allocation will succeed in achieving the maximum life cycle for these assets.

Non-Interstate NHS. A similar funding scenario analysis for Non-Interstate NHS pavements led to the conclusion that a final funding scenario of \$83 million per year would lead to

steady state funding, or desired state of good repair funding over the 10-year analysis cycle and achieve federal performance targets for Non-Interstate NHS pavements. There is no penalty assessment for Non-Interstate NHS pavements.

The actual Non-Interstate NHS budget of \$90 million is set in SFY 2020-21 and will be increased at 2% per year, again noting that this is the actual available total including Preconstruction and CE&I funding. This budget allocation will succeed in achieving the maximum life cycle for these assets.

NHS Bridges BMS Funding Scenario Issues. This TAMP has documented that LADOTD is migrating from the former AASHTOWare™ PONTIS to the new AASHTOWare™ BrM solution. Since the BrM solution was not fully implemented, this initial funding scenario analysis was performed using the AASHTOWare™ PONTIS solution.

We once again note that LADOTD contractually obtained analysis data using National Bridge Investment Analysis System (NBIAS) in June 2019 to ensure full compliance with the federal management systems requirement.

PONTIS Funding Scenario Conclusions. For NHS bridges, a funding scenario analysis approach similar to pavements was evaluated; however, a 20-year analysis period was used due to the slow deterioration of bridges. This PONTIS based analysis led to a funding recommendation of \$101 million that appeared to lead to steady state funding, or desired state of good repair funding and appeared to allow LADOTD to achieve both the federal performance targets as well as remain above minimum NHS bridge standards, remaining outside of a penalty assessment for NHS bridges.

The actual NHS bridge budget of \$134 million is set in SFY 2020-21 and will be increased at 2% per year, again noting that this is the actual available total including Preconstruction and CE&I funding. Based on the PONTIS analysis, this budget allocation appeared to succeed in achieving the maximum life cycle for these assets as well as maintaining the DSGR and meeting the minimum bridge condition levels to avoid a penalty assessment.

11th Hour Bridge Investment Scenario Analysis Update

LADOTD acquired analysis data using the National Bridge Investment Analysis System (NBIAS), which is a solution used by the FHWA, to analyze the outcome of future investments with respect to performance conditions of bridges and structures. This data analysis was performed by a contractor and was completed in June 2019 just as this TAMP document was being finalized.

NBIAS Funding Scenario Conclusions. Using National Bridge Investment Analysis System (NBIAS) LADOTD endeavored to confirm that the bridge budget of \$134 million did indeed achieve the requirements stated above. Budget projections from \$20 million to \$200 million, with \$20 million increments, were analyzed. Unfortunately, the outcome of this analysis paints a completely different picture with respect to funding recommendations.

The 11th hour NBIAS conclusion is that the NHS bridge budget of \$134 million will achieve steady state funding, or (DSGR) desired state of good repair funding with respect to bridges in Good condition; however, it will not achieve a DSGR for Poor Condition Bridges.

This funding level will also not allow LADOTD to achieve either the Good or Poor federal 2-year or 4-year performance targets, nor remain above minimum NHS bridge standards, thus incurring a penalty assessment for NHS bridges.

NBIAS Life Cycle Cost Conclusion. It appears from this very limited assessment, that PONTIS was allowing Good condition bridges to significantly drop, and remain in single digits for the entire analysis period, while at the same time keeping Poor condition bridges below the 10% federal threshold. This could identify a possible lean towards a “worst 1st” approach.

NBIAS on the other hand appears to focus on a more appropriate LCP approach by improving the Good condition bridges over the long term (see Figure 5.4) while allowing the Poor condition bridges to increase to a high of 15.2% in 2023 (see Figure 5.3) then remaining relatively constant with a gradual decrease to 13.4% by 2038.

NBIAS also projects that an immediate actual annual budget requirement of over \$212 million, including preconstruction and CE&I costs, will be necessary to prevent LADOTD from entering into a long term bridge penalty assessment. That level of funding would require a significant infusion of additional funds.

Investment Strategies Accomplish 23 CFR 515.9(f) Requirements

Funding Scenario Outcome. Based on these extensive funding evaluations, LADOTD was afforded a preemptive opportunity to set pavement budget levels that not only achieved the funding required to achieve federal performance targets (scenario 2) but also the funding required to maintain asset value, which is LADOTD’s defined state of good repair. (scenario 3). As clearly stated above, LADOTD believed the same had been accomplished for NHS bridges; however, the NBIAS analysis appears to provide a more appropriate LCP approach over the PONTIS analysis.

The position is also being taken that this funding will be reasonably available (scenario 1) as long as the Legislature is able to provide sufficient state funds to make the required federal match.

This updated investment strategy approach will continue to be the approach going forward with respect to NHS pavement and bridge assets. This methodology was also used for Non-NHS pavement and bridge assets as shown in the Final 2019 TAMP Budget table.

In future years LADOTD will also work to integrate the TAMP with the Highway Safety Improvement Program (HSIP) and the Louisiana Freight Mobility Plan to further coordinate project selection strategies ensuring that there are no gaps in the effectiveness of the NHS in providing safe and efficient movement of people and goods.

Complexities of Transportation Projects

Implications on Scenario Planning. NCHRP Report 898 clearly identifies that there is a complexity to transportation projects that is difficult to convey. Often generalized explanations lead to an over simplified understanding by many who have not had the experience of dealing with these project efforts. As such, the following is copied from the report for reference.

“Transportation projects are often complex undertakings. The reality is that they often involve multiple types of work on multiple physical assets over a period of months or years. Paying for these projects often utilizes multiple funds or revenue streams, and the decisions concerning when and how to fund a project may need to be adjusted over the life of a project, particularly if the project budget fluctuates. While transportation agency staff are accustomed to this complexity, it is important not to take this for granted in defining scenarios and determining how best to allocate resources. At a minimum the inherent complexity of transportation projects has the following implications on scenario planning:

- Humans, not management systems, drive transportation projects and make final decisions concerning project timing and funding.
- A significant amount of effort is involved in project development. Thus, it is imperative that guidance related to asset management practice, such as an agency’s preferred life cycle strategies for maintaining assets, be incorporated early in the development stage to avoid rework and/or suboptimal decisions.
- Given the effort involved in developing projects, it may be difficult to justify the effort to define a large number of candidate projects that are unlikely to be funded simply to support scenario analysis.”

Project Selection

NHS Pavements. With respect to Interstate and Non-Interstate NHS pavements, the primary source of information for future project selection will be the recommendations created through this effort using the PMS.

The recent adoption of the headquarters-based Interstate project selection methodology for the Non-Interstate NHS project selection will ensure that a consistent TAM LCP based approach will be used going forward for these two asset classes.

NHS Bridges. With respect to NHS bridges, the historical and projected bridge NBI condition data will be used as a guiding source of information for future project selections. The intent will be to focus on keeping fair bridges in fair condition and good bridges in good condition.

This will allow project selection efforts to ensure a more TAM LCP based approach going forward, which will help to ensure that the “looming wave of aging bridge assets” will be addressed in the most appropriate manner with the limited available funds.

As bridge management system capabilities are enhanced, future evaluations will determine if these improvements can be incorporated into bridge project selection efforts.

It is noted here that the initial process used to define the NHS bridge budget going forward actually resulted in a budget allocation that exceeds the defined penalty funding assessment.

10.0 Asset Management Enhancements

10.1 INTRODUCTION

Asset management is never complete so the TAMP is essentially an ongoing Asset Management Process improvement program. As such LADOTD will endeavor to make continual improvements in all areas that the TAMP touches to further enhance asset management.

The initial Pilot TAMP of 2015, and the 2018 TAMP identified a number of potential enhancements to LADOTD tools and business processes that could substantially improve the effectiveness of the asset management process. Many of these tools and business processes were modified or implemented since then and the steps taken to make those changes have yielded clear benefits over the ensuing years.

The updated investment strategies in chapter 9, based on guidance from 2019 NCHRP Research Report 898, replace the initial descriptive efforts which were a summary of many of the asset management enhancements that were a direct result of this continuous asset management improvement process. All of these prior descriptive investment strategies were a direct result of the TAMP related asset management improvement process.

The ongoing effort to make continuous improvements in asset management related endeavors is enhanced by a directional road map, pun intended, going forward. The following sections provide for some of that direction.

10.2 ASSET MANAGEMENT ORGANIZATIONAL EFFORTS

TAMP Maturity Analysis

Initial Maturity Analysis. As part of the pilot TAMP effort, LADOTD conducted a Transportation Asset Management Self-Assessment Survey using the approach outlined in the Transportation Asset Management Guide (NCHRP Project 20-24(11)). The survey was designed to answer four primary questions.

- How does policy guidance benefit from improved asset management practices?
- Do resource allocation decisions reflect good practices in asset management?
- Are appropriate program delivery processes that reflect industry good practices, being implemented?
- Do information resources effectively support asset management policies and decisions?

In summary, 55 questions were scored by staff and management across the agency with answers based on Strongly Disagree, Disagree, Agree, and Strongly Agree. The results are summarized below with the percent showing the average combined score of Agree and Strongly Agree.

- 11 Policy Guidance questions – 80.0% average (agree & strongly agree)
- 13 Resource Allocation Decision questions – 82.1% average (agree & strongly agree)
- 11 Program Delivery questions – 84.0% average (agree & strongly agree)
- 20 Information Resource questions – 80.1% average (agree & strongly agree)

The survey results very clearly reflect the outcome one would expect from an agency that long ago established a cultural philosophy that focuses on a policy and procedural driven transportation asset management (TAM) approach based on appropriate data. While there may have been some confusion with regard to the actual status of TAM, there was no confusion that efforts to continue to enhance and improve the concepts outlined were accepted and expected by the respondents.

Maturity Analysis Update. Since the initial survey, efforts by AASHTO have provided a more comprehensive and detailed self-assessment analysis process and NCHRP research project 08-90A Phase 1 has developed a TAMP Maturity GAP analysis spreadsheet tool to aid in the performance of this analysis.

The tool breaks down the analysis into six major areas each with a number of elements and criteria supporting the analysis effort.

- Policy Guidance
- Planning and Programming
- Program Delivery
- Information and Analysis
- Life Cycle Management and TAM
- Legislative Compliance

Future TAM Maturity Analysis. Going forward, LADOTD will once again conduct a Maturity Analysis to both assess the knowledge of the current staff, many have retired since the initial survey, and to identify gaps that could lead to improvements in every phase of asset management.

The TAMP Maturity GAP analysis process will then be used to create the step by step methodology to expand and enhance LADOTD's TAMP maturity level. It will essentially form the basis of the TAMP Improvement Plan.

The maturity GAP analysis cycle will be repeated as necessary with the intention of performing the analysis every three to five years just prior to the strategic planning effort.

10.3 ADDITIONAL PLANNED ENHANCEMENTS

In addition to the investment strategies outlined in chapter 9, this section summarizes LADOTD's plans for future improvements related to the asset management program and the TAMP.

Consistency Determination & FHWA TAMP Work Types

In addition to the TAMP certification requirement, each year the FHWA will conduct a consistency determination. This is a basic analysis the FHWA uses to determine if a State DOT has implemented an asset management plan. Failure to achieve either an initial TAMP certification or the ongoing yearly consistency determination will result in a federal 515.15(a) penalty assessment applied to the entire year.

515.15 (a) Penalties. "...the maximum Federal share for National Highway Performance Program projects and activities carried out by the State in that fiscal year shall be reduced to 65 percent for that fiscal year."

The FHWA has identified (5) five newly minted work types including Initial Construction, Maintenance, Preservation, Rehabilitation and Reconstruction. Agencies are required to project budgets and report project expenditures with respect to these work types.

LADOTD current budget information, budget projections and the project management system do not use or easily match these work types. With the assistance of the Local FHWA office, crosswalk tables have been developed that identify the relevant federal Fiscal Management Information System (FMIS) work types as well as the relevant LADOTD treatments for both pavements and bridges.

In an effort to allow the consistency determination compliance to be easily documented, LADOTD will endeavor to incorporate these new work types in a manner that facilitates the TAMP requirements, with respect to matching these work types to projected budget categories. FMIS data will be the data source for work type expenditures.

Cross-Asset Resource Allocation Analysis

LADOTD's long term asset management goal is to accomplish comprehensive cross-asset resource allocation between pavements, bridge, maintenance, safety and freight requirements.

The intent of cross-asset resource allocation analysis is to allow maximum benefit to be gained, at the most appropriate spending levels, across various asset types, while incorporating various requirements including life cycle planning and risk management.

LADOTD actually performed a limited cross-asset resource allocation analysis, based on investment strategies, in developing the funding allocations to support the state of good repair, or steady state funding for Interstate pavements, Non-Interstate NHS pavements and NHS bridges outlined in this TAMP.

The 2015 NCHRP Report 806, “Guide to Cross-Asset Resource Allocation and the Impact on Transportation System Performance” provides the most comprehensive summary of requirements and opportunities to accomplish this cross-asset resource allocation analysis goal. Going forward, LADOTD will endeavor to implement the detailed concepts outlined in NCHRP Report 806. This will not be a trivial effort and will require enhancements and improvements to both data and management systems.

Bridge Management System

As identified throughout this TAMP, LADOTD is currently migrating away from the older AASHTO PONTIS BMS solution and is currently implementing the AASHTOWare™ Bridge Management software (BrM). BrM is designed to consider not only life cycle cost, but also mobility, safety, risk and other performance concerns. In the interim, LADOTD has gained access to (NBIAS) the National Bridge Investment Analysis System to perform the required TAMP analyses for bridges. NBIAS will continue to be used for analysis purposes until LADOTD is satisfied with the comprehensive nature of the new BMS. If that proves to be untenable, LADOTD will seek to implement a replacement BMS that does provide all the necessary comprehensive functionality desired for BMS analysis.

Maintenance Management System

LADOTD has implemented a set of “level of service” and “maintenance performance indexes” within its (MMS) LAGOV Maintenance Management System, one of the “TAM Tools” identified in chapter 2.4. This effort introduced performance measures with the intent to improve field staff performance. It also provides more detailed maintenance information, as noted in chapter 6 “Consequences of Delayed Preservation on Maintenance Costs” for LCP efforts.

The data used to generate the relevant TAMP pavement and bridge maintenance activities from July 1, 2018 to June 5, 2019 found in chapter 6, “Analysis of Pavement Maintenance Activities” and “Analysis of Bridge Maintenance Activities” are provided via the MMS.

The next step will be to determine how to incorporate the relevant TAM related maintenance activities that support pavement and bridge preservation into the overall cross-asset resource allocation strategies. All of these efforts will inevitably help to maintain the condition of LADOTD assets in a state of good repair

Additional Asset Classes

LADOTD’s AME will coordinate the investigation into which asset classes could be added to the future TAMP efforts. The non-NHS pavements and bridges will be considered along with culverts, signals, intelligent transportation system equipment, sign trusses, guard rails, cable barriers, crash attenuators, sound walls, shoulders, high mast lighting, dams and signs.

Data Improvement Strategies

Federal Requirement. 23 CFR 515.7(g) requires the use of the best available data and bridge and pavement management systems to develop the TAMP.

LADOTD Data Strategy. LADOTD understands the value of good data and is continually working to ensure that all TAMP related data is both accurate and timely. Data quality assurance is a never-ending effort that requires diligent focus and perseverance.

LADOTD will continue to investigate state of the art, emerging field data collection solutions in an effort to significantly expand and improve, in a cost effective manner, the asset inventory data collection and associated inspection capabilities. The goal will always be to significantly increase the available capabilities for inventory and inspection without requiring extensive technical skills of available staff.

Data Process and Practice Guidance. The FHWA Office of Safety under contract DTFH61-10-D-0002 prepared a Roadway Data Improvement Program (RDIP) report for LADOTD designed to help improve the quality of their roadway data to better support safety and other engineering initiatives. The RDIP focused on the process and practices used by LADOTD for collecting, managing, and utilizing roadway data. While this investigation was specific to improving safety related data, safety data often overlaps into other areas so the RDIP included a review of transportation asset related data as well.

As a result of the RDIP report and the TAMP requirements, LADOTD has made significant TAM data improvements with respect to:

- **Roadway Data Collection** – LADOTD has implemented the most advanced pavement data collection technology, including new 3D data collection, in the most recent data collection contract, adjusted the data collection cycles to the calendar year instead of the fiscal year to aid in meeting NHS pavement data capture deadlines. This new contract allowed LADOTD to capture the new Federal performance measures a full year ahead of the required deadline to do so.
- **Data Analysis Tools and Uses** – LADOTD is currently updating the Bridge Management System and is also investigating commercial 3rd party Safety Management solutions; the new 3D pavement data has allowed for a further reduction in manual pavement condition data ratings and analysis; LADOTD has also instituted a process that identifies JCP pavement joints prior to processing faulting data which has provided for very significant improvement in data accuracy.
- **Data Sharing and Integration** – LADOTD has implemented an Enterprise GIS solution to provide both greater and easier access to data. LADOTD will continue to integrate additional existing solutions, or move these solutions into the Enterprise GIS solution. This effort is now eliminating data silos and redundant data.
- **Data Management and Governance** – LADOTD has comprehensively documented and formalized it's Pavement Data Quality Assurance and Quality Control Program

which was nationally recognized as a leading benchmark effort for other states to emulate in the FHWA's 2013 "Practical Guide for Quality Management of Pavement Condition Data Collection."

Local NHS Pavement Data Collection. To ensure data collection for the Local NHS pavements is captured in the same manner as other NHS pavements, LADOTD has extended the existing pavement data capture and condition analysis effort to include the Local NHS pavement data for the Louisiana MPOs.

LADOTD has not previously captured pavement data for the Local NHS routes and will include both the required federal data and the pavement distress data so that data can be included in LADOTD's PMS. After (3) three data cycles have been captured LADOTD, will be able to create deterioration curves, which with appropriate funding identified by the Local NHS owners, could then be used to identify future valid performance targets.

Emerging Technology. LADOTD intends to leverage emerging technology going forward to improve the asset management process. For instance, existing field crews could be trained to inspect culverts, embankments, slopes, and retaining walls, while using handheld technology tools, such as iPads or cell phones, that facility condition data capture beneficial to the asset management process. This same approach can be applied to other assets such as guide rails, attenuators, etc. This could include using drone technology to enhance the safety of bridge inspectors performing the mandated bridge inspections.

Future Data Strategies. LADOTD will continue to further these data improvement strategies going forward. This will include ongoing strategic identification; collection sharing/repurposing; coordination; updating knowledge, information, and data needed for policy; and costs, risks, performance, and other forms of analysis that support data resiliency efforts.

Risk Management Strategies

As a result of the TAMP, LADOTD has instituted a Risk Management Program and will begin to modify the Interstate and Non-Interstate NHS pavement and bridge project selection procedures to ensure that Risk Assessment will be used throughout the asset management process, when setting the budgets, prioritizing projects and revising asset management guidance.

As LADOTD advances its competency in Risk Management, additional policy and procedural changes could be implemented to further embed risk management as a fundamental operational function of LADOTD. This includes the ongoing effort to both capture and use data in support of the Part 667 requirements.

Expand Risk Assessment of Structures. LADOTD has identified the most critical at-risk bridge structures and developed a short document outlining the approach that was used in the process.

As part of the Risk Management program, LADOTD intends to review this analysis procedure, and to formally incorporate the three R's, Redundancy, Robustness and Resiliency into the risk analysis process for these bridges going forward.

Policy and Procedural Support

The AME, with the assistance of (QCIP) Quality and Continuous Improvement Program and the Executive Champion/Committee, will update all appropriate policies and procedures as necessary to ensure that all TAMP related requirements will be implemented throughout LADOTD. This includes, but is not limited to, setting of investment strategies and budgets, LCP based prioritization and selection of projects and implementation of risk management.

A list of existing project management, life cycle planning, risk management and asset management related policies will be identified and each existing policy will be reviewed for TAMP compliance. It is expected that the TAMP compliance review process will be accomplished within 1 year of the May 2019 final TAMP publication. Then the required policy updates, and development of any identified new policies, will occur over the remaining 3-year time frame, with completion expected to occur prior to the required 4-year TAMP update.

Life Cycle Planning Strategies

LADOTD will continue to work to further implement the life cycle strategy of deploying the right treatment, at the right time, to gain the maximum possible life, at the most economical cost, for pavement and bridge assets. The ultimate goal is to use the most effective treatments to renew and extend the use of the asset as long as possible at the most economical life cycle cost.

Communication Plan

LADOTD will work to further enhance its existing communication strategy by making the best use of the TAMP data and analysis results to communicate the implications of asset management decisions to stakeholders and the public. In particular, these asset management capabilities will enable Department officials to be more proactive in providing detailed information to the State Legislature and other external stakeholders to optimize funding and foster a clear understanding of the linkage between funding and performance.

LADOTD plans to develop an "Executive Summary" TAMP document upon completion of the FHWA review and acceptance of this TAMP. This document will focus on the most important concepts for the state legislature and the general public and will make use of as many graphical tools as possible to convey these concepts. The LADOTD Communications Director and his staff will provide significant assistance in developing both this plan and the Executive Summary.

10.4 TAMP UPDATE PROCESS

Transportation asset management, and the processes, procedures and details outlined in the TAMP, clearly show that a sustained and ongoing effort will be required by LADOTD.

The maturity GAP analysis cycle, or some similar effort, will be repeated as necessary with the intention of performing the analysis every three to five years just prior to the strategic planning effort.

With this in mind, LADOTD intends to update the TAMP in conjunction with the strategic planning effort, or no less than the mandated 4 year update requirement. This planned schedule will certainly be modified if appropriate reasons to do so become evident.

The update cycles will be concurrent with the work outlined in the TAMP, meaning that the actual work of TAM will continue non-stop for the foreseeable future, with the TAMP providing the roadmap to success.

11.0 Appendices

11.1 TERMS AND DEFINITIONS

TERMS & DEFINITIONS

AME – Asset Management Engineer; LADOTD’s full time staff person primarily responsible for implementing, maintaining and updating the TAMP

ARRA - American Recovery and Reinvestment Act of 2009 funding; one-time federal stimulus funding

BMS - Bridge Management System

COOP - Continuity of Operations Plan, ensures that LADOTD's essential functions can still be performed after a disaster

DQM - Data Quality Management

DSGR - Desired State of Good Repair, a new federal designation of asset condition

FAST ACT - Fixing America’s Surface Transportation; the federal law issued in 2015

FHWA – Federal Highway Administration

GARVEE - Grant Anticipation Revenue Vehicles bonds

HPP - Annual Highway Priority Program, identifies projects that are scheduled for construction letting during the year and projects which are in various stages of planning and preparation

HSIP - Highway Safety Improvement Program, a core Federal-aid program with the goal to achieve a significant reduction in traffic fatalities and serious injuries on all public roads

HSIP – Highway Safety Improvement Program; the federally mandated safety program

LADOTD – the Louisiana Department of Transportation and Development

LCCA - Life Cycle Cost Analysis, performed on individual projects

LCP - Life Cycle Planning, the general concepts of LCCA performed on a system basis

MAP-21 - Moving Ahead for Progress in the 21st Century Act; the federal law issued in 2012

MMS - Maintenance Management System

MPO – Metropolitan Planning Organization; a federally mandated and federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities

NBI - National Bridge Inventory federal bridge inspection and data reporting requirements

NHPP –National Highway Performance Program; a FHWA funding category

NHS - National Highway System; created by the ISTEA legislation, encompasses both the Interstate and Non-Interstate System sometimes referred to as National Highways of Significance which are both federal aid eligible.

PMS - Pavement Management System

QCIP - Quality and Continuous Improvement Program

STIP - Statewide Transportation Improvement Plan, provide a fiscally sound, capital improvement plan for the state’s surface transportation program

STP - Statewide Transportation Plan, documents a long-range multimodal transportation strategy to meet the goals and objectives for the State’s transportation and infrastructure system

TAM – Transportation Asset Management

TAMP – Federal NHS Transportation Asset Management Plan; a NHS highway and bridge asset management plan mandated by the MAP-21 and FAST Act legislation

TIMED - Transportation Infrastructure Model for Economic Development; a 1989 voter approved, constitutionally dedicated set of projects, created from the collection of a 4 cent per gallon motor fuel excise tax.

TTF - State Transportation Trust Fund; a 1984 voter approved, dedicated transportation fund, created from the collection of a 16 cent per gallon motor fuel excise tax.

VMT – Vehicle Miles of Travel

11.2 LADOTD REVENUE AND BUDGET ALLOCATION DESCRIPTIONS

The TTF distribution table that follows in the Appendix 11.3, “LADOTD Transportation Trust Fund Distribution” identifies the financial plan for State revenue. The table includes the projection of the revenues as well as the budgeted expenditures. The TTF distribution table includes the past two completed years, the current year, and the requested budget for three future years. A description of the contents of the TTF Distribution line items is as follows:

Revenue

- State Transportation Trust Fund (TTF) - This includes the 16 cent per gallon motor fuel excise tax. The State constitutionally permitted uses of TTF include: the construction and maintenance of the state owned highways; the Port Priority Program; the Flood Control Program; the Parish Transportation Fund; transit; and State police for traffic control. The amount used for programs other than the construction and maintenance of the state highway system cannot exceed 20%.
- Transportation Infrastructure Model for Economic Development (TIMED) TTF - This includes the collections from the 4 cent per gallon motor fuel excise tax. This revenue stream is now dedicated to debt service for the 16 projects listed in the constitution.
- Vehicle License Tax – This is generated from vehicle registration fees.
- Aviation Fuels – This is a sales tax on these fuels
- Interest, Fees and Fines – This includes toll revenue from Statewide ferries, oversized/overweight truck permits, overweight truck fines, outdoor advertising/junk yard sign permits, and right of way permits.
- Transfer from DS1 – bonds paid off by CCCD – state highway fund # 2
- State Highway Improvement Fund (SHIF): This includes the registration fees collected on trucks and trailers that operate in the State. The revenue can only be used for projects on the State owned system that are not eligible for federal funds.
- Undesignated Fund Balance from prior years: These are obligated funds for multi-year projects that are carried over into the next fiscal budget from a prior year.
- Interagency Transfers from Office Motor Vehicles: This was previously known as the Debt Recovery Fund.

Expenditures

- Regular Operating – State funding allocated to the operating budget

- Aviation Operating – State aviation tax revenue allocated to the aviation operating budget
- Highway Program – Matching funds current year – match required for current year FHWA funding
- Highway Program – Matching funds out year – match required for designated FHWA funding on multi-year projects
- Highway Program – State funded and other – State funding on projects not funded with FHWA funds
- Take up projects – funds available for miscellaneous close-out items.
- Retainer Contracts – funds for contracts that span many projects and are Statewide in nature
- Hot Mix, Pipe, Bridge Materials – funds for materials used in capital projects handled by district personnel
- Secretary Emergency Fund – funds for emergency projects such as critical movable bridge mechanism failure, culvert failure, etc.
- Transportation Infrastructure Model for Economic Development (TIMED) Program - \$0.04 tax – Debt service on TIMED program bonds paid from \$0.04 tax
- TIMED Debt Service – paid from \$0.016 cent tax – debt service on TIMED program bonds paid from \$0.16 tax
- Non-Fed Eligible (NFA) Roads – funding from the State Highway Improvement Fund (SHIF) (registration fees on trucks and trailers) on assets that cannot receive federal funding
- Off System Bridges – funding for state bridges that are maintained by various local authorities
- Flood Control Program – funding for the Flood Control Program.
- Port Priority Program – funding for the Port Priority Program
- Airport Priority Program – Aviation fuel sales tax funding for the Aviation Priority Program
- Facilities Major Repair – funding for major repairs to LADOTD buildings, pump stations, etc.
- Ferry Repairs – funding for capital repairs to ferries
- Deficit Reduction – this was a mid-year budget cut exercised to help balance the state budget
- State Police – funding for State Police for traffic control purposes
- Capital Outlay Parish Transportation – funding for the Parish Transportation Fund (parish road fund, transit fund and off-system bridges match program)

11.3 LADOTD TRANSPORTATION TRUST FUND DISTRIBUTION

TTF DISTRIBUTION (Updated 10/19/17 bca)

	1.7%	2.2%	1.2%	2.36%	1.44%	1.89%
REVENUES	FY 15-16	FY 16-17 REC 05/16/17 Actual	FY 17-18 REC 05/16/17 EOB	FY 18-19 REC 05/16/17 REQUESTED	FY 19-20 REC 05/16/17 REQUESTED	FY 20-21 REC 05/16/17 REQUESTED
16¢ Tax	497.8	507.9	512.3	526.4	535.1	546.9
4¢ Tax (TIMED)	123.4	127.0	128.1	131.6	133.8	136.7
Vehicle License Tax	50.7	53.0	54.6	54.9	55.2	55.4
Aviation Fuels	29.8	29.8	29.8	29.8	29.8	29.8
Interest, Fees, and Fines	27.8	27.6	29.5	29.5	29.5	29.5
Transfer from DS1 (bonds paid off by CCCD - State Hwy Fund #2)	5.3	5.3	5.6	5.7	5.7	5.7
TOTAL TTF	734.8	750.6	759.9	777.9	789.1	804.0
Highway Improvement Fund	35.7	58.8	41.4	25.6	31.9	32.2
Undesignated Fund Balance from prior years	33.7	8.9	22.9	0.0	0.0	0.0
IAT from OMV (prev. Debt Recovery Fund)	0.0					
TOTAL REVENUE	804.2	818.3	824.2	803.5	821.0	836.2
EXPENDITURES						
Operating						
Regular Operating ⁺³	358.9	375.2	409.1	414.6	420.5	428.5
Aviation Operating	1.3	1.3	1.5	1.6	1.6	1.7
TOTAL OPERATING	360.2	376.4	410.6	416.2	422.2	430.2
Capital Outlay - Highways						
Highway Program - Matching Funds Current Yr	38.2	54.7	71.7	73.4	74.5	75.9
Highway Program - Matching Funds Out Yrs		15.5		0.0	0.0	0.0
Highway Program - State Funded & other	0.0	5.0	5.0	5.0	5.0	5.0
Take Up Projects	0.0	1.0	1.0	1.0	1.0	1.0
Retainer Contracts	0.0	1.0	1.0	1.0	1.0	1.0
Hot Mix, Pipe, Bridge Materials	0.0	5.0	5.0	5.0	5.0	5.0
Secretary Emergency Fund	3.5	3.5	3.5	3.5	3.5	3.5
TIMED						
TIMED Program - 4¢ tax	123.4	127.0	128.1	131.6	133.8	136.7
TIMED Debt Service - paid from 16¢ tax	20.1	20.0	17.3	15.7	15.6	14.2
Capital Outlay - NFA Roads/Off Sys Bridges						
Non-Fed Eligible (NFA) Roads	35.7	58.8	41.4	25.6	31.9	32.2
Off System Bridges	0.0					
Capital Outlay - Non-Highways						
Flood Control Program	8.9	9.9	9.9	9.9	9.9	9.9
Port Priority Program	19.7	39.4	39.4	39.4	39.4	39.4
Airport Priority Program	28.4	28.4	28.2	28.2	28.2	28.1
Facilities Major Repair	2.0	2.0	2.0	2.0	2.0	2.0
Ferry Repairs	1.5	1.5	1.5	1.5	1.5	1.5
TOTAL CAPITAL OUTLAY	281.4	372.6	355.1	342.8	352.2	355.4
STO Adjustment						
Deficit Reduction (Mid Year Cut)	64.1					
STATE POLICE	43.2	0.0	0.0	0.0	0.0	0.0
Capital Outlay - Parish Transportation	46.4	46.4	46.4	46.4	46.4	46.4
TOTAL EXPENDITURES	795.3	795.5	812.0	805.4	820.8	832.0
Undesignated Fund Balance at FYE ⁺³	8.9	22.8	12.2	(2.0)	0.2	4.2

Toll Credits for FY17 programmed @ \$43.8M; FY18 programmed @ \$41.5M; FY19 programmed @ \$20.1M

11.4 LADOTD PAVEMENT TREATMENT DETAILS

Additional Explanation of Pavement Treatments (Work Types) Including Non-PMS Activities

This section is included to provide a more descriptive explanation of the information chapter 6. It also provides a few details of maintenance activities provided by district, or contract, staff that are tracked by the Maintenance Management System (MMS).

A copy of the MMS Activity Codes, containing only TAMP related activity codes, is included below.

Emergency Repair

This describes work activities generally necessary to return a pavement back to a minimum level of service following a significant event. These treatments could be performed by department or contract forces and are tracked by the MMS. Examples could include:

- Concrete Blowups
- Road Washouts

Corrective Maintenance

This is maintenance performed once a deficiency occurs in the pavement. These treatments are typically performed by Department forces and are tracked by the MMS. Examples could include:

- Pothole Filling
- Spall Repair

Pavement Preservation

This is a defined program employing a network level, long-term life cycle cost strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life and improve pavement surface conditions. Pavement Preservation activities would not be classified as structural enhancements.

Routine Maintenance

This is defined as repair work typically performed by Department forces that is planned and carried out on a scheduled basis to maintain the pavement in serviceable condition. These treatments are tracked by the MMS. Examples could include:

- Spot Leveling
- Pothole Patching

- Bump Grinding
- Machine Leveling

Preventive Maintenance

This maintenance is a planned strategy of cost-effective, non-structural treatments to existing pavements that preserve the current condition and retard future deteriorations. These could be performed by department or contract forces. When performed by department forces, these treatments are tracked in the MMS. Examples could include:

- Micro-Surfacing – includes Single or Multiple Course Micro Surfacing, Thin Asphaltic Concrete (<1.5”), or an Open Grade Friction Course
- Polymer Surface Treatment – includes Single or Multiple Lift Chip Seal, Slurry Seal, Cape Seal, Fog Seal, or Ultrathin Hot Mix Asphaltic Concrete Wearing Course (e.g. NovaChip®)
- Joint Resealing
- Crack Sealing
- Ultra-Thin Overlay (<1.5”)
- Thin Overlays (>1.5” and <2”)

Light Minor Rehabilitation

This consists of non-structural improvements or repairs made to existing pavement sections to address pavement distresses. When performed by department forces, these treatments are tracked in the MMS. These could be performed by department or contract forces. Examples could include:

- PCC Pavement Patching
- Asphaltic Pavement Patching
- Asphaltic Concrete Single Lift Overlays (≤ 2 ”)
- Pavement Grooving/Grinding
- Load Transfer Restoration

Minor Rehabilitation

This consist of single lift Overlays (≤ 2 ”), with cold planed and/or patching pavement preparation, and are not qualified as structural overlays. These are typically performed by contract forces. Examples could include:

- Patching with Single Lift Overlay (≤ 2 ”)
- Cold Plane with Single Lift Overlay (≤ 2 ”)

Major Rehabilitation

This consists of structural enhancements that improve the load carrying capacity and extend the service life of the existing pavement. These pavements would generally be designed for a minimum of 10-15 years design life within the existing crown. These are typically performed by contract forces. Examples could include:

- Rubbilization & Overlay
- Bonded Concrete Overlay
- Whitetopping
- Single or Multi Lift Asphaltic Concrete Overlay– includes Medium Overlays (>2" to 4") or Structural Overlays (>4")
- In-Place Recycling
- In Place Stabilization - Base Rehabilitation (stabilized or treated) and Overlay ($\geq 2''$)
- Geometric Changes to Alignment
- Addition and/or Lengthening of Turn Lanes and Ramps

Replacement

This is the replacement of the entire existing pavement structure by the placement of an equivalent or increased pavement structure generally within the existing crown. These pavements would typically be designed for a 20-year life. These are typically performed by contract forces. Examples could include:

- Concrete Pavement Reconstruction
- Full Depth Asphaltic Concrete Pavement

TAMP Related LAGOV MMS Activity Codes								
Road Maintenance					Bridge & Structure Maintenance			State Force Construction
Bituminous Surface		Concrete Surface	Aggregate Surface	Miscellaneous				
400-00 Crack Sealing - Hand Method (LF)	400-09 Leveling Spot Surface (LN FT Per Lane)	410-00 Patching Surface - Hand Method (SQ YD)	420-00 Aggregate Surface Road Maintenance (Miles)	425-00 Mud Jacking (EACH)	460-00 Painting Bridge (SQ FT)	465-03 Stringer Maintenance (LN FT)	465-17 Remove Drift (EACH)	620-04 Bridges Over 20' Length Construction (LN FT)
400-01 Crack Sealing - Machine Method (LF)	400-10 Grinding Bumps (EACH)	410-01 Patching Surface - Machine Method (SQ YD)			460-01 Spot Painting Bridge - Touch Up (SQ FT)	465-04 Pile Repair-Timber (EACH)	465-18 Repair / Replace Bridge Cap Each	620-08 Base & Surface Construction (LF)
400-02 Pothole Patching - Hand Method (EACH)	400-11 Scarifying & Remixing (MILE)	410-02 Minor Surface Patching - Rapid Set Material (SQ YD)			460-02 Bridge Joint Repair (LF)	465-05 Channel Repair & Protection (SQ FT)	465-19 Repair / Replace Timber Deck (SQ FT)	
400-03 Pothole Patching - Machine Method (EACH)	400-12 Mixing Material with Stabilizer (SQ YD)	410-03 Pre-Mix Patching - Hand Method (EACH)			460-03 Movable Bridge Lubrication (EACH)	465-06 Fender Repair (LN FT)	465-20 Repair / Replace Abutment and/or Revetment (SQ FT)	
400-04 Full Depth Patching (SQ YD)	400-13 Curb Repair - Asphalt (LF)	410-04 Pre-Mix Patching - Hand Method (EACH)			460-04 Movable Bridge Repair - Mechanical (EACH)	465-07 Bridge Deck Repair (SQ YD)	465-21 Structural Concrete Repair (SQ FT)	
400-05 Leveling - Hand Method (SQ YD)	400-14 Mill Out Patching (leveling/Patching) Asphalt (MILE)	410-04 Pre-Mix Patching Motor Grader/ Asphalt Paver (SQ YD)			460-05 Movable Bridge Repair - Electrical (EACH)	465-08 Guardrail Repair (LF)	465-25 Bridge Tender House Repair (EACH)	
400-06 Leveling Motor Grader (LN FT)	400-15 Mill Out (CY)	410-06 Blowup Repair (Each)			460-99 Other Bridge Maintenance (Hour)	465-09 Crash Protection Repair (EACH)	465-30 Pile Repair - Steel Each	
400-07 Leveling Hot Mix Overlay (LANE MILE)	400-20 Bleed Through Repair (LN FT)	410-07 Roadway Joint Repair (LF)			465-00 Clean Structural Members (EACH)	465-10 Tunnel Repair - Mechanical (EACH)	465-31 Pile Repair - Concrete (EACH)	
400-08 Chip Seal (SQ YD)	400-99 Other Bituminous Surface Maintenance	410-08 Expansion Joint Repair (LF)			465-01 Clean Deck & Drain (LF)	465-11 Tunnel Repair - Electrical (EACH)	465-32 Pile Driving (EACH)	
		410-09 Curb Repair - Concrete (LF)				465-12 Tunnel Maintenance / Cleaning (EACH)	465-99 Other Structure Maintenance (Hours)	
		410-99 Other Concrete Surface Maintenance (Hours)					470-99 Other Foundation Repair (Hours)	

11.5 LADOTD 10 YEAR PAVEMENT & BRIDGE PROJECTED BUDGET

(millions)

Budget Line Item	2018 Budget*	10-Year Preservation Budget Projection*									
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Interstate Pavement	84.2	36.6	35	35	35	35.7	36.4	37.1	37.8	38.6	39.4
Non-Interstate NHS Pavement	15.5	38.4	90	90	91.8	93.7	95.6	97.5	99.4	101.5	103.6
Non-Interstate SHS Pavement	55.2	46.5	67	67	67	68.2	69.5	71	72.4	73.8	75.3
Non-Interstate RHS Pavement	47	47	31.9	32.2	32.5	32.8	33.2	33.4	33.7	38.6	39.4
Bridge Preservation (On System) NHS	129.4	150.1	134	134	136.7	139.4	142.2	145	147.9	150.9	153.9
Bridge Preservation (On System) SHS & RHS			97	97	97	98.9	100.9	102.9	105	107.1	109.2
Bridge Preservation (Off System)	12	20.2	12	12	12	12	12	12	12	12	12

* Does Not Include Preconstruction and (CE&I) Construction, Engineering, Inspection Totals

11.6 LADOTD STATE FY 19-20 BUDGET PARTITION (2 PAGES)

THIS IS NOT AN ACCOUNTING DOCUMENT. IT IS TO BE USED FOR PROGRAMMING PURPOSES ONLY.
 BUDGET PARTITION FY 19-20 (JUNE 2018)

SUB-CATEGORY	LETTINGS						CONTINGENCY/CONSTRUCTION ENGINEERING					ENGR, R/W, UTIL							GRAND TOTAL				
	FED FUNDS	STATE FUNDS	NFA	BONDS/ OTHER STATE FUNDS	TOLLS / LOCAL	SUB-TOTAL	FED FUNDS	STATE FUNDS	NFA	BONDS/ OTHER STATE FUNDS	SUB-TOTAL	FEDERAL FUNDS					STATE FUNDS	NFA		BONDS/ OTHER STATE FUNDS	TOLLS / LOCAL	SUB-TOTAL	
												ENGR	R/W	UTIL	IND.	SUB-TOT FEDERAL							
PRESERVATION/ SUSTAINABILITY	NON-INTERSTATE (PAVEMENT) (NHS)	50.6	10.4		2.2	63.2	4.0	0.8		0.2	5.0					5.8	5.8				5.8	74.0	
	NON-INTERSTATE PAVEMENT (SHS)	37.4	9.3			46.7	3.0	0.7		3.7					4.3	4.3					4.3	54.7	
	NON-INTERSTATE PAVEMENT (NFA)	10.9		27.4		38.3	0.9		2.2		3.1				1.3	1.3					1.3	42.7	
	CONTRACT MAINTENANCE (ROAD)	6.0	1.5			7.5	0.5	0.1			0.6				0.7	0.7					0.7	8.8	
	INTERSTATE PAVEMENT ¹	67.1	8.9			76.0	5.4	0.7			6.1				7.7	7.7					7.7	89.8	
	BRIDGE (INTERSTATE)	16.8	1.9			18.7	1.3	0.2			1.5	4.8	2.8	1.5	2.9	12.0	1.0					13.0	33.2
	BRIDGE (ON SYSTEM) - NHS	26.7	6.1		0.6	33.4	2.1	0.5		0.0	2.6				3.1	3.1					3.1	39.1	
	BRIDGE (ON SYSTEM) ²	63.0	15.7			78.7	5.0	1.3			6.3	4.8	2.8	1.5	8.2	17.3	2.3					19.6	104.6
	BRIDGE (OFF SYSTEM) ³	10.4				2.6	13.0	0.8			0.8	0.8			1.3	2.1					0.4	2.5	16.3
	PPPIGARVEE CONSTRUCTION	86.2			155.0	38.8	280.0	6.9			6.9				9.9	9.9					9.9	296.8	
GARVEE PROGRAM	28.7				28.7	0.0				0.0				0.0	0.0					0.0	28.7		
	SUB-TOTAL	403.8	53.8	27.4	157.8	41.4	684.2	29.9	4.3	2.2	0.2	36.6	10.4	5.6	3.0	45.2	64.2	3.3	0.0	0.0	0.4	67.9	788.7
OPERATIONS/ MOTORIST SERVICES	ITS (REGULAR)	9.6	1.4			11.0	0.8	0.1		0.9	0.9			1.2	2.1	0.2					2.3	14.2	
	TRAFFIC CONTROL DEVICES	14.8	0.0			14.8	1.2	0.0		1.2				1.7	1.7						1.7	17.7	
	INTERSTATE LIGHTING	1.7	0.2			1.9	0.1	0.0		0.1				0.2	0.2						0.2	2.2	
	TSM	5.9	1.5			7.4	0.5	0.1		0.6				0.7	0.7						0.7	8.7	
	ROADWAY FLOODING	2.6	0.6	0.5		3.7	0.2	0.0	0.0	0.2				0.3	0.3						0.3	4.2	
	WEIGH STATIONS	0.0	0.0			0.0	0.0	0.0			0.0	0.2			0.2	0.1					0.3	0.3	
	REST AREAS	0.0	0.0			0.0	0.0	0.0			0.0	0.2			0.2	0.1					0.3	0.3	
	MOVABLE BRIDGE PM	1.5	0.4			1.9	0.1	0.0		0.1				0.2	0.2						0.2	2.2	
	FERRIES/MAJOR REPAIRS	0.0	3.2			3.2	0.0	0.3		0.3				0.0	0.0						0.0	3.5	
	ACCESS MANAGEMENT	6.3	1.6			8.1	0.5	0.1		0.6	1.0			0.9	1.9	0.3					2.2	10.9	
ADA COMPLIANCE	0.0	0.0			0.0	0.0	0.0			0.0	1.0			0.1	1.1	0.3				1.4	1.4		
	SUB-TOTAL	42.6	8.9	0.5	0.0	52.0	3.4	0.6	0.0	0.0	4.0	3.3	0.0	0.0	5.3	8.6	1.0	0.0	0.0	0.0	9.6	65.6	
SAFETY	HWY. PROGRAM	34.7	1.8			36.5	2.8	0.1		2.9	1.0	0.8	0.8	4.3	6.9	0.1					7.0	46.4	
	LOCAL ROAD SAFETY	2.6				0.3	2.9	0.2		0.2	0.2			0.0	0.2					0.0	0.2	3.3	
	SAFE ROUTES TO PUBLIC PLACES	0.0				0.0	0.0			0.0				0.0	0.0						0.0	0.0	
	RR GRADE SEPARATIONS	13.9			1.5	15.4	1.1			0.1	1.2			1.6	1.6						1.6	18.2	
	RR CROSSING UPGRADES	8.2				0.4	8.6	0.7			0.7	0.1		1.0	1.1						1.1	10.4	
	SUB-TOTAL	59.4	1.8	0.0	1.5	0.7	63.4	4.8	0.1	0.0	0.1	5.0	1.3	0.8	0.8	6.9	9.9	0.1	0.0	0.0	9.9	78.3	
CAPACITY	REGULAR PROGRAM					0.0	0.0	0.0		0.0				0.0	0.0						0.0	0.0	
	CORRIDOR/INTERSTATE UPGRADE					0.0	0.0	0.0		0.0				0.0	0.0						0.0	0.0	
	SUB-TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MISC.	FED ENHANCEMENT PROJECTS	3.5				0.9	4.4	0.3		0.3				0.4	0.4					0.1	0.5	5.2	
	FEDERAL TRAILS	1.3				0.3	1.6	0.1		0.1				0.1	0.1						0.1	1.8	
	URBAN SYSTEMS	54.2	3.8			9.8	67.8	4.3	0.3	4.6	2.0	7.5	0.5	7.3	17.3	9.0				2.5	19.8	92.2	
	CMAQ (URBAN TRANSIT, FLEET CONVERSION)	4.7				1.2	5.9	0.4		0.4				0.5	0.5					0.2	0.7	7.0	
	DEMAND MANAGEMENT	0.4				0.1	0.5	0.0		0.0				0.0	0.0						0.0	0.5	
	INTERMODAL CONNECTORS ⁴	12.1	3.0		2.5	15.1	1.6	0.2		0.2	1.4			1.4	1.4						1.4	17.9	
	FED EARMARKS (DEMO, ETC.) ⁵	5.0				1.3	6.3	0.4		0.4				0.6	0.6						0.6	7.3	
	TIMED PROGRAM	0.0				0.0	0.0			0.0	18.4			2.0	20.4	4.6					25.0	25.0	
	TOLLS, LOCAL, OTHER ⁶	9.7	2.6			12.3	0.8	0.2		1.0				1.1	1.1						1.1	14.4	
	ROAD TRANSFER	12.0	3.0	5.5		20.5	1.0	0.2	0.4	1.6				1.4	1.4	2.0					3.4	25.5	
	SECRETARY'S EMERGENCY FUND	0.0	3.2			3.2	0.0	0.3		0.3				0.0	0.0						0.0	3.5	
	TIMED DEBT SERVICE	0.0				0.0	0.0			0.0				0.0	0.0	21.7					21.7	21.7	
	TAKE UP PROJECTS	0.0				0.0	0.0			0.0				0.0	0.0	1.0					1.0	1.0	
	STATE FUNDED RETAINER CONTRACTS	0.0				0.0	0.0			0.0				0.0	0.0	0.0					0.0	0.0	
	HOT MIX, PIPE, BRIDGE MATERIALS	0.0				0.0	0.0			0.0				0.0	0.0	5.0					5.0	5.0	
URBAN TRANSIT	0.0				0.0	0.0			0.0				0.0	0.0						0.0	0.0		
A/C CONVERSION	0.0				0.0	0.0			0.0				0.0	0.0						0.0	0.0		
PLANNING TRAINING, RESEARCH	0.0				0.0	0.0			0.0	30.0			0.0	30.0						30.0	30.0		
	SUB-TOTAL	102.9	15.6	5.5	2.5	13.6	137.6	8.3	1.2	0.4	0.2	10.1	50.4	7.5	0.5	14.8	73.2	34.3	0.0	0.0	2.8	110.3	258.0
	GRAND TOTAL	608.7	80.1	33.4	161.8	55.7	937.2	46.4	6.2	2.6	0.5	55.7	65.4	13.9	4.3	72.2	155.8	38.7	0.0	0.0	3.2	197.7	1190.6

Louisiana DOTD Transportation Asset Management Plan

REGULAR FEDERAL: \$ 804.9	\$ 804.9 Reg. Program ²	REQ. TTF \$ 85.3	\$ 40.3 Available Match (TTF) as of 4/12/18 REC forecast	TOLLS/LOCAL: \$ 58.9
FEDERAL DEMO FUNDS: \$ 6.0	\$ 6.0 DEMO	NFA: \$ 36.0	\$ 36.0 NFA fund	*BONDS/OTHER STATE FUNDS: \$ 162.3
TOTAL FEDERAL: \$ 810.9	Total Available: \$ 810.9	\$ 8.5	\$ 8.5 Ferries/Major Facility Repairs & Ancillary Highway Components (Other)	
		\$ 31.2	\$ 31.2 Debt Service, Sec. Emergency Fund, Take Up Projects, State Funded Retainer Contracts & Hot Mix/Pipe/Bridge Materials	
		TOTAL: \$ 161.0		
		Total Available: \$ 116.0		
		Total Available - Total Required \$ (45.0)		
				TOLL CREDITS USED: \$ -

¹Partial letting cost of H.003184 is included in total PR-4 lettings; project will be cash managed over two years

²Includes \$3 million for inspections & \$3 million for preventative maintenance

³Partial letting cost for H.005967 is shown; project will be cash managed over two years

⁴Includes funding for Ancillary Highway Components

⁵Available Regular Federal Funds includes \$45 million for INFRA Grant Award & assumes \$25 million additional obligation limitation will be received as a result of August Redistribution

⁶Other State Funds include: State Surplus and Unclaimed Property Funds (state cash)