Agency Name	Department of Transportation
Audit Name	Bridge Maintenance
Audit Period	September 2016
Status Report Date	March 18, 2022

Summary of Audit Observations/Findings					
Number	Observation Title	Status [place X in status column]			
		Unresolved	Partially Resolved	Substantially Resolved	Fully Resolved
1	Develop and Implement a Comprehensive Bridge Management Program			X	
2	Improve Asset Management Integration into Management and Culture			X	
3	Improve Assignment of Bridge Asset Management Roles and Responsibilities			X	
4	Improve Planning			X	
5	Improve Bridge Asset Management Gap Analysis Practices			X	
6	Improve Bridge Asset Risk Management Practices				X
7	Establish Bridge Performance Management Standards				X
8	Evaluate Performance and Outcomes			X	
9	Improve Cost Projections and Conduct Lifecycle Cost Analyses			X	
10	Formalize Disinvestment Decision Processes		X		
11	Improve Resource Allocation Effectiveness				X
12	Improve Maintenance Project Management		X		
13	Improve Management of Maintenance Efficiency			X	
14	Improve Information Governance			X	
15	Comply with Statutory Red List Requirements to List Structurally Deficient Bridges				X

16	Include Only Bridges on the Red List				X
17	Improve Compliance with Red List Reporting and Inspection Requirements				X
18	Improve Bridge Condition Categorization and Reporting				X
19	Improve Data Quality and Controls			X	
20	Improve Records Management		X		

Observation 1: Develop and Implement a Comprehensive Bridge Management Program

Summary of Finding: We recommend DOT management:
- formalize and implement a time-phased plan with milestones for implementing a comprehensive bridge program with a unified BMS;
- develop a BOBM mission statement, goals, and objectives focused on clearly defined maintenance and preservation terms;
- evaluate the propriety of the BOBD mission, goals, and objectives and practice, and revise them as warranted;
- expand on the Bridge Strategy to include the entire bridge inventory and its subgroups; and
- consider simplifying and coordinating the tier system between highways and bridges.

Current Status: Substantially Resolved

- Working with the vendor to configure an Asset Analytics and Forecasting System (AAFS) in alignment with enhancement actions identified in the [Asset Management Plan for Pavements and Bridges on the National Highways System (2019)](#) regarding the Bridge Management System (BMS). Initial buildout for the National Highway System is complete and expansion to include all bridges is expected to be completed in 2022.
- The Bridge Management Committee continues to work on a broad time-phased plan for the overall bridge management program.
- Updated the Bridge Working Group charter to provide roles and responsibilities.
- Updated Bureau of Bridge Design (BOBD) and Bureau of Bridge Maintenance (BOBM) mission statements, located on external Bridge Design web page.
  https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/index.htm.
- Identified and updated BOBM and BOBD goals in the FY20-21 budget.
- Completed and posted to the Bridge Design web page the following documents: Recommended Investment Strategy, Recommended Network Funding, Roadway Tier Definitions, and Definitions of Program Strategies and Terms.
  https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm.
- Reviewed and documented Bridge Tiers in the State Red List Ranking Process.

Observation 2: Improve Asset Management Integration into Management and Culture

Summary of Finding: We recommend DOT management:
- develop, formalize, and implement a time-phased asset management change strategy to migrate towards data-based, preservation-focused decision-making;
- timely adopt preservation and data-driven decision-making practices;
- ensure key TAM concepts are integrated into Department culture, including collection and use of key data; and
- utilize its TAM governance architecture to fully implement asset management.

Current Status: Substantially Resolved

- The Department adopted a Strategic Plan for Asset Management in 2017 and continues to work toward enhanced communication and training.
- Created a governance structure for asset management department-wide through an enacted Management Strategy Policy.
- Finalized the [Asset Management Plan for Pavements and Bridges on the National Highways System (2019)](#), certified by the Federal Highway Administration (FHWA).
- Created by charter a Bridge Management Committee to create policies for overall bridge management, including preservation and data-driven decision-making practices.

Observation 3: Improve Assignment of Bridge Asset Management Roles and Responsibilities

Summary of Finding: We recommend DOT management:
- evaluate its organizational structure, assigned duties and responsibilities, and delegations;
- comply with statute and formally delegate authority and responsibility;
- designate a bridge asset management lead and obligate other organizational units to provide necessary support to achieve bridge management goals and objectives;
- charter the BWG, formalizing membership, procedures, and practices;
- formalize EOR procedures and practices, assign one or more EORs to bridge projects, and ensure professional obligations of EORs are consistently met and relevant documentation is dated, signed, stamped, and permanently retained;
- formalize responsible charge procedures and practices, assign one or more engineers to be in responsible charge of federal-aid bridge projects, and ensure adherence with relevant federal requirements;
- formalize roles in governing documents, and update job descriptions and class specifications to reflect the current operating environment; and
- develop management controls to ensure effective delegations of roles and responsibilities, monitor and assess effectiveness, and revise policy, procedure, and practices as necessary.

Current Status: Substantially Resolved

- The Department created by charter a Bridge Management Committee, formalizing membership, procedures, and practices.
- Created governance structure for asset management department-wide through enacted Management Strategy Policy.
- Created an overarching Asset Management Policy.
- Updated the Bridge Administrator's and the Bridge Section Chief's supplemental job descriptions to include roles and responsibilities associated under the Bridge Management Committee.
- Revised the Principal Engineer's supplemental job description to define Engineer of Record for Bridge Maintenance Projects.
- Developed an Engineer of Record Policy and Procedure, which details the delegation of authority clarifying the roles of the Engineer of Record, Responsible Charge, and establishes

procedures to monitor compliance and assess effectiveness. These documents are currently in final draft form for release in calendar year 2022.

Observation 4: Improve Planning

Summary of Finding: We recommend DOT management:
- revise the Implementation Plan and schedule;
- set milestones for developing and publishing a strategic plan, a TAM plan, and bridge asset management plans and procedures;
- timely develop and publish plans and bridge asset management procedures; and
- institutionalize annual Implementation Plan reviews, revising it when necessary.

We recommend BOBM management:
- formalize maintenance and preservation planning processes and practices;
- incorporate asset management fundamentals, such as benefit-cost, lifecycle cost, and tradeoff analyses, into planning processes to help optimize resource utilization;
- collect and retain planning and scheduling data and information to enable data-based decision-making and facilitate longitudinal evaluation of productivity; and
- monitor planning practices, revising them as needed to ensure continuous process quality improvement.

We also recommend DOT management develop and implement a review process to ensure annual and two-week repair task lists fully support maintenance and preservation strategies.

Current Status: Substantially Resolved

- The Department developed an Implementation Plan for Asset Management and incorporated into Workgroup and Committee charters.
- Finalized the [Asset Management Plan for Pavements and Bridges on the National Highways System (2019)](), certified by FHWA.
- Reviewed and finalized recommended investment schedules for all major bridge types based on expert elicitation for expected outcomes and historical project costs. https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/bridgeprogramrecommendedinvestmentstrategy.pdf.
- Continued efforts toward enhanced work planning and tracking with the implementation of a new Work Order, Fleet, and Inventory (WOFI) system.

Observation 5: Improve Bridge Asset Management Gap Analysis Practices

Summary of Finding: We recommend DOT management:
- institutionalize gap analysis at the strategic, tactical, and operational levels;
- timely complete scheduled gap analyses;

- conduct gap analyses specific to bridge management, and maintenance and preservation activities;
- cyclically conduct gap analyses; and
- timely address issues identified in gap analyses and similar assessments.

Current Status: Substantially Resolved

- The Department developed performance measures, reported quarterly, specific to bridge management, including bridge washing, bridge sealing, bridge inspection, bridge rehabilitation, and bridge preservation.
- Routine review of quarterly performance measures with senior management in order to identify and address any gaps.
- Continued work to improve the strategic planning process via system enhancements from the WOFI system and the AAFS.

Observation 6: Improve Bridge Asset Risk Management Practices

Summary of Finding: We recommend DOT management:
- institutionalize and formalize risk management practices at the strategic, tactical, and operational levels;
- cyclically identify risks, conduct and record risk assessments, develop and implement controls, and evaluate effectiveness; and
- develop policies and procedures for risk management activities.

Current Status: Fully Resolved

- The Department finalized the [Asset Management Plan for Pavements and Bridges on the National Highways System (2019)](#), certified by FHWA. The Plan requires update at least every 4 years, with compliance certified by FHWA annually.
- The Department already has substantial risk management programs relating to the bridge network which may not have been fully recognized during the audit process, including:
    - Inspection of all bridges by trained personnel as part of a regularly certified FHWA program.
    - Programs to monitor particular elements of the bridge network, such as haunch details, which proactively identify any special maintenance needs.
    - Programs to ensure that vehicles can safely navigate the bridge network including clearance and weight posting as well as online Oversize/Overweight permitting.
    - The incorporation of risk criteria in the prioritization process for bridge rehabilitation, replacement, preservation, and maintenance.

Observation 7: Establish Bridge Performance Management Standards

Summary of Finding: We recommend DOT management:
- establish an asset performance management system with standards and defined processes aligned with the DOT's vision and strategies;
- implement the system within the timeframe specified in the formal implementation schedule;
- define bridge performance measures, including maintenance and preservation; and
- formalize processes to facilitate efficient and effective data retrieval and reporting.

Current Status: Fully Resolved

- The Department finalized the Asset Management Plan for Pavements and Bridges on the National Highways System (2019), certified by FHWA.
- Developed an Implementation Plan for Asset Management and incorporated into Workgroup and Committee charters.
- Developed performance measures, reported quarterly, specific to bridge management, including bridge washing, bridge sealing, bridge inspection, bridge rehabilitation, and bridge preservation.

Observation 8: Evaluate Performance and Outcomes

Summary of Finding: We recommend DOT management:
- develop maintenance and preservation outputs, outcomes, and performance measures;
- establish bridge levels of service and bridge condition performance standards;
- integrate performance measurement and evaluation throughout the organization;
- formalize internal reporting formats and processes; and
- routinely monitor, evaluate, and report on performance.

We recommend BOBM management implement and regularly track typical maintenance and preservation, rehabilitation, and reconstruction cycles for all bridges, regardless of construction date, to maximize the State's investment and facilitate performance evaluation and monitoring.

Current Status: Substantially Resolved

- The Department finalized the Asset Management Plan for Pavements and Bridges on the National Highways System (2019), certified by FHWA.
- Monitoring, evaluating, and reporting on performance will be incorporated in the new WOFI System.
- Developed performance measures, reported quarterly, specific to bridge management, including bridge washing, bridge sealing, bridge inspection, bridge rehabilitation, and bridge preservation.

- Created a Bridge Activity Database to track major work performed on an asset by either Bridge Maintenance or the Capital Program. Prior bridge work for a majority of the State owned bridge assets have been populated in the database.
- Continued tracking of maintenance activities in the Managing Assets for Transportation System (MATS).
- Activities performed by both Bridge Design and Bridge Maintenance are reported via the Annual Report of NHDOT Bridge Condition and Bridge Program.

Observation 9: Improve Cost Projections and Conduct Lifecycle Cost Analyses

Summary of Finding: We recommend DOT management:
- collect comprehensive cost and condition data, including life expectancy, deterioration, and the effects of maintenance and preservation activities on bridge performance;
- estimate and incorporate bridge user benefits;
- revise, standardize, validate, and assess cost estimation practices for bridge maintenance and preservation projects;
- establish, validate, publish, and periodically assess a formal backlog calculation methodology, amending it as needed to ensure continued validity; and
- adopt LCCA for bridge maintenance and preservation project and treatment decision-making.

Current Status: Substantially Resolved

- The Department created a Bridge Activity Database, which is being populated with construction project activities and major maintenance activities performed on individual bridges.
- Continued work to improve the information available for lifecycle cost analyses (LCCAs) via system enhancements from WOFI and the AAFS.
- Documented cost estimate procedures in the draft Bridge Maintenance Manual and the Asset Engineer is in the process of developing standardized estimating and tracking procedures.
- Continued work toward improved cost estimating for projects and network-level decisions by developing and formalizing a cost estimating procedure for bridge projects advanced by the Division of Project Development. The NHDOT Bridge Program, Developing Construction Cost Estimates for Bridge Projects, guideline has been streamlined and updated. It is currently in the review process for final acceptance.
- Members of the Estimate Review Committee are in the process of finalizing a Department-wide Cost Estimating Guideline, to provide direction to NHDOT employees and others in the methodology of cost estimating and for developing, documenting, reviewing and updating construction cost estimates throughout the project development process. The document is approximately 90% complete. The NHDOT Bridge Program construction cost estimating guideline, as well as the Highway Program cost estimating guide documents, are Appendices to this Department-wide Cost Estimating Guideline.

- Continued efforts toward documenting the appropriate level of LCCA across bridge project types.
- Refining and formalizing an estimate of the backlog of bridge network needs via system enhancements from the AAFS.

Observation 10: Formalize Disinvestment Decision Processes

Summary of Finding: We recommend DOT management:
- formalize disinvestment strategies;
- formalize procedures, practices, and definitions regulating disinvestment decisions, including wait-for-red-list and keep-in-service designations;
- consistently make and maintain records detailing disinvestment-related decisions; and
- implement a systemic, timely, consistent method for evaluating bridges for disinvestment and allocate resources accordingly.

We also recommend the DOT discontinue entering into agreements obligating the State to future expenditures without LCCAs to inform all decision-makers of projects' full costs.

Current Status: Partially Resolved

- The Department adopted Bridge Strategy incorporates a discussion of redundant bridges as documented under the Definitions of Program Strategies and Terms on BOBD web page.
- The Bridge Management Committee is working on the documentation of disinvestment policies and procedures for review and approval.
- Documenting each decision to no longer preserve a bridge as part of the annual priority list development and ranking and pursuing further enhancements in this process.
- Continued work toward establishing processes and conducting LCCAs to better understand and communicate the true cost of the mitigation measure at the project level.

Observation 11: Improve Resource Allocation Effectiveness

Summary of Finding: We recommend DOT management improve the effectiveness of its bridge maintenance and preservation management controls. The DOT should conform to statute by:
- discontinuing non-bridge work using BOBM assets and funds appropriated for bridge maintenance; and
- referring building construction, reconstruction, alteration, and maintenance to the DAS.

Current Status: Fully Resolved

- Changes to RSA 21-I:80 were passed by the Legislature, effective 9/27/19. The legislation provides "The commissioner may grant other agencies an exclusion for specific projects whose estimated cost is not more than $500,000 if he or she concludes to do so is in the best interests

of the state. Such projects may be done on a force account basis, by contracts awarded through competitive bidding, by short term rental of construction equipment, or by any combination of these methods." The Department established a directive, which was adopted on May 4, 2020 for the construction, reconstruction, alteration or maintenance of a DOT Building with cost exceeding $25,000 to comply with the RSA.

- As part of the budget process, clarified the mission and goals of the BOBM to include other work essential to operations.

Observation 12: Improve Maintenance Project Management

Summary of Finding: We recommend DOT management improve bridge maintenance and preservation project management practices. This should include formal policy, practice, and procedures based on existing DOT standards and encompassing:

- planning and scheduling,
- designs and specifications,
- quality,
- documentation,
- monitoring,
- change control, and
- auditing and evaluating performance.

The DOT may benefit from defining the difference between:

- a "project," warranting higher-order practices and documentation such as pre-execution planning (e.g., drawings, estimates, quality assurance plans), progress tracking, and close-out documentation (e.g., quality test results, as-built drawings); and
- "tasks," requiring less extensive documentation and tracking of effort.

This would require the DOT to seek legislative changes to redefine "project."

Current Status: Partially Resolved

- The draft Bridge Maintenance Manual formalizes the scheduling procedures and processes, and coordination requirements with other bureaus.
- Yearly schedules are submitted for review and approval by the Director and Assistant Commissioner.
- Continued work toward refining and formalizing maintenance work management as work orders via the WOFI System.
- Maintenance projects and tasks are defined in the draft Bridge Maintenance Manual.
- Project design, testing, and inspection are defined in the draft Bridge Maintenance Manual.

Observation 13: Improve Management of Maintenance Efficiency

Summary of Finding: We recommend DOT management establish goals and objectives for overhead, efficiency, and productivity, as well as develop a time-phased plan to optimize maintenance and preservation activities.

We recommend BOBM management:
- collect quality data and conduct analyses to facilitate decisions;
- continuously evaluate performance and make improvements;
- formalize procedures on task and project overhead and productivity;
- formalize procedures and goals for crews to efficiently and effectively allocate assets and resources statewide, including efficiently using crews across regions to ensure the highest priorities are completed; and
- manage to goals, increasing productivity and reducing overhead.

Current Status: Substantially Resolved

- The Department continues to work toward improving the collection and use of data via system enhancements from the WOFI system and the AAFS.
- The BOBM Asset Engineer is working on standardizing reporting and tracking of performance and goals.
- The draft Bridge Maintenance Manual formalizes the decision process, performance criteria, and overhead allocation.
- Continue to improve processes around planning and monitoring efficiency.
- The Bridge Management Committee continues to work on a broad time-phased plan for the overall bridge management program.

Observation 14: Improve Information Governance

Summary of Finding: We recommend DOT management:
- expand upon existing plans and implement a comprehensive information governance structure with a data business plan;
- incorporate data governance and knowledge management policy, procedure, and practices; and develop and adhere to an expedited schedule with timelines and milestones for its implementation.

Current Status: Substantially Resolved

- The Department continues improving information governance via system enhancements from the WOFI system and the AAFS. The Department also continues to enhance information governance through unified data snapshots across systems like Bridge Management (BrM) and Geographic Information System (GIS), routine meetings of the BMS Development Committee, and other related efforts.

- Developed a bridge activity log of all major bridge activities to centralize data and information.
- Developed a number of documents that standardize definitions, policies, procedures and related items, including the draft Bridge Maintenance Manual, policies of the Standard Operating System, and documents published on the Bridge Design webpage.

Observation 15: Comply with Statutory Red List Requirements to List Structurally Deficient Bridges

Summary of Finding: We recommend DOT management:
- discontinue using legacy inspection criteria to add bridges to the Red List;
- formally adopt a quantitative, objective definition of structurally deficient in administrative rule, seeking rule-making authority if warranted; and
- comply with statute by including all structurally deficient bridges on, and removing non-structurally deficient bridges from, the Red List.

Current Status: Fully Resolved

- Completed and posted the 2018 State and Municipal Red List to the BOBD web page by 2/25/2019 and 3/11/2019 respectively ahead of the April 1st deadline. https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm.
- New definition of Red List bridges is per RSA 234:25-a modified by Chapter 227:4-6, Laws of 2017 (SB 38).

Observation 16: Include Only Bridges on the Red List

Summary of Finding: We recommend DOT management seek clarification of the statutory definition of a bridge should it be too narrow to encompass the current scope of the transportation network.

We also recommend DOT management include only bridges on, and remove all non-bridge structures from, the Red List.

Current Status: Fully Resolved

- New definition of Red List bridges is per RSA 234:25-a modified by Chapter 227:4-6, Laws of 2017 (SB 38) that narrows the definition of a "Red List Bridge" to include only structurally deficient bridges (one or more major elements in poor or worse condition), thereby eliminating tonnage posted bridges in fair-or-better condition from the Red List.

Observation 17: Improve Compliance with Red List Reporting and Inspection Requirements

Summary of Finding: We recommend DOT management comply with statutory Red List reporting requirements and:
- number and prioritize the Red List relative to the need for repair or replacement of red-listed State bridges;
- submit a complete Red List report to statutorily-designated recipients by February 1 annually, or request a statutory amendment requiring an April 1 submission date; and
- evaluate the need for statutory authority to inspect non-red-listed bridges more frequently than once every two years.

Current Status: Fully Resolved

- Completed and posted the 2018 State and Municipal Red List to the BOBD web page by 2/25/2019 and 3/11/2019 respectively.
  https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm.
- Amendments to statutory authority for reporting date to April 1st per RSA 234:25-b, II modified by Chapter 227:6, Laws of 2017 (SB 38).

Observation 18: Improve Bridge Condition Categorization and Reporting

Summary of Finding: We recommend DOT management simplify and document processes for categorizing bridges by condition, and integrate all bridge subgroups into the Bridge Strategy.

Current Status: Fully Resolved

- 2018 Annual Report – NHDOT Bridge Condition and Bridge Program document on BOBD external web page https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm.
- Documented standard definitions for condition categorization via the NHDOT Bridge Program Definitions of Program Strategies and Terms: https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/definitionsofprogramstrategiesandterms.pdf.

Observation 19: Improve Data Quality and Controls

Summary of Finding: We recommend DOT management assign responsibility for:
- developing, implementing, and training staff on data policies and procedures;
- validating data to ensure accuracy; and
- remediating errors.

We also recommend DOT management consider a formal review of general and application controls over bridge-related data systems and monitor controls to facilitate continuous improvement.

Current Status: Substantially Resolved

- The Department's Management Strategy Policy includes chartered Work Groups with a focus on data and system management (Data & Systems and Inventory).
- Improved data management (migrating certain data to Oracle snapshots).
- Worked collaboratively to reconcile minor differences amongst various bridge data sets.
- The draft Bridge Maintenance Manual includes guidance for upkeep of activity logs and record keeping.
- The BOBM Asset Engineer is working to develop data validation procedures and is looking at data error warnings in development of the WOFI System.
- The chartered BMS Development Committee meets regularly to review the movement and integrity of data between systems like BrM, the Activity Log, and GIS.

Observation 20: Improve Records Management

Summary of Finding: We recommend DOT management comply with statute and:
- implement and operate an economical, efficient, and effective records management program;
- make and maintain records containing adequate and proper documentation of its organization, functions, policies, decisions, procedures, and transactions;
- retain all records made or received; and
- dispose of records not having a permanent or historical value according to the relevant retention schedule.

We further recommend DOT management:
- formalize a record retention schedule, and related practices and procedures;
- centralize and consolidate bridge records, unifying stewardship within a single organizational unit;
- define what a complete bridge record constitutes;
- ensure transaction lifecycles and significant events are promptly, completely, and accurately recorded;
- ensure complete records are available to support decision-making, benchmarking, and performance measurement; and
- assess effectiveness and efficiency of the program, improving upon it as necessary.

Current Status: Partially Resolved

- The Department, working with the Department of Information Technology, is in the process of implementing SharePoint to improve document management in 2022.
- Created a Task Force to develop a formal records retention policy.
- Created a bridge activity database and currently populating it with construction project activities and major maintenance activities performed on individual bridges.

- The Management Strategy Policy includes chartered Work Groups with a focus on data and system management (Data & Systems and Inventory).
- Created by charter a Bridge Management Committee.
- Identified bridge performance measures, reported on a quarterly basis.