

Internal Audit Report



Bridge Inspection Program

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2023



SOUTH CAROLINA OFFICE OF THE STATE AUDITOR

1. Executive Summary

Objective

Management's objectives for the Bridge Inspection Program are to effectively assess and monitor the safety and health of South Carolina's bridges, comply with Federal Highway Administration (FHWA) National Bridge Inspection Standards and other applicable laws and regulations, and provide accurate and reliable data to support sound asset management of South Carolina's bridge inventory. Our objective is to provide assurance that internal controls are adequately designed and operating effectively to manage risks that may hinder the achievement of Management's objectives.

Background

The Bridge Maintenance Office (BMO) operates within the South Carolina Department of Transportation (SCDOT) Engineering Division. BMO is responsible for inspecting and load rating all publicly-owned bridges that are in service, but is also responsible for managing and maintaining bridges owned by the State of South Carolina.

The results of a 2015 peer review of the SCDOT Bridge Inspection Program, along with the results of an annual FHWA National Bridge Inspection Program compliance review for calendar year 2017, led to a recent overhaul of the Bridge Inspection Program that included:

- issuance of comprehensive Bridge Load Rating and Bridge Inspection Guidance Documents in 2019 and 2020, respectively;
- procurement of consultants to perform the load rating process and ensure every publicly-owned bridge located in South Carolina (approximately 9,400 bridges) was load rated before the end of calendar year 2021;
- procurement of consultants to perform inspections of interstate and other select bridges to ensure all bridges were inspected within the appropriate timeframes; and
- development and implementation of Quality Control and Quality Assurance procedures for the bridge inspection and load rating processes.

BMO was previously within the State Director of Maintenance Office, which was responsible for a multitude of activities including but not limited to Road Maintenance, Supply and Equipment, and the State Sign Shop. In December 2022, Senior Management created a third Chief Engineer and moved BMO under the new Chief Engineer for Bridges to more directly link BMO to Senior Management.

Conclusion

In our opinion, controls are partially adequate in design and operating effectiveness for reducing some risks within the Agency's risk appetite. Risk exposure is determined to be Medium-High.

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2. Forward

Authorization

The South Carolina Office of the State Auditor established the Internal Audit Services division (IAS) pursuant to SC Code Section 57-1-360 as revised by Act 275 of the 2016 legislative session. IAS is an independent, objective assurance and consulting function designed to add value and improve the operations of the South Carolina Department of Transportation (SCDOT). IAS helps SCDOT to achieve its objectives by bringing a systematic, disciplined approach to evaluating the effectiveness of risk management, internal control, and governance processes and by advising on best practices.

Statement of Independence

To ensure independence, IAS reports administratively and functionally to the State Auditor while working collaboratively with SCDOT leadership in developing an audit plan that appropriately aligns with SCDOT's mission and business objectives and reflects business risks and other priorities.

Report Distribution

This report is intended for the information and use of the SCDOT Commission, SCDOT leadership, the Chairman of the Senate Transportation Committee, the Chairman of the Senate Finance Committee, the Chairman of the House of Representatives Education and Public Works Committee, and the Chairman of the House of Representatives Ways and Means Committee. However, this report is a matter of public record and its distribution is not limited.

Acknowledgement

We wish to thank members of management and staff in the Bridge Maintenance Office and District staff for their cooperation in assessing risks and developing actions to improve internal controls and enhance operating performance.

Performed By

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Manager

and

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Reviewer

Mark LaBruyere, CPA, CIA
Director of Internal Audit Services



3. Internal Auditor's Report

March 10, 2023

Ms. Christy A. Hall, Secretary of Transportation
and
Members of the Commission
South Carolina Department of Transportation
Columbia, South Carolina

We have completed risk and control assessment of the South Carolina Department of Transportation's (SCDOT's) Bridge Inspection Program. The objective of this assessment was to contribute to the improvement of risk management by evaluating SCDOT's exposure to risks and the controls designed by Management to manage those risks. Our engagement included two aspects:

- Facilitation of Management's assessment of risks associated with the Bridge Inspection Program.
- Independent assessment of the design and effectiveness of internal controls to determine whether those controls effectively manage the identified risks to an acceptable level.

We planned and performed the engagement with due professional care in order to obtain sufficient, appropriate evidence to provide a reasonable basis for our observations and recommendations. Our observations, recommendations, and management's action plans were discussed with management.

George L. Kennedy, III, CPA
State Auditor

4. Engagement Overview

Background

The Bridge Maintenance Office (BMO) operates within the South Carolina Department of Transportation (SCDOT) Engineering Division. BMO is responsible for inspecting and load rating all publicly-owned bridges that are in service, but is also responsible for managing and maintaining bridges owned by the State of South Carolina.

In 2015, SCDOT requested a peer review of SCDOT's Bridge Inspection Program to evaluate the program's policies, procedures, and standard operating practices and the results of the peer review identified 18 opportunities for improvement. Shortly thereafter, an annual Federal Highway Administration (FHWA) National Bridge Inspection Program (NBIP) compliance review for calendar year 2017 found SCDOT to be conditionally compliant for 13 of the 23 National Bridge Inspection Standards (NBIS) metrics. SCDOT was required to develop and successfully implement a Plan of Corrective Action for each of the 13 NBIS metrics by the end of calendar year 2021. The results of the peer review and NBIP compliance review led to a total overhaul of the Bridge Inspection Program that included:

- issuance of comprehensive Bridge Load Rating and Bridge Inspection Guidance Documents in 2019 and 2020, respectively;
- procurement of consultants to perform the load rating process and ensure every publicly-owned bridge located in South Carolina (approximately 9,400 bridges) was load rated before the end of calendar year 2021;
- procurement of consultants to perform inspections of interstate and other select bridges to ensure all bridges were inspected within the appropriate timeframes;
- development and implementation of Quality Control and Quality Assurance procedures for the bridge inspection and load rating processes; and
- creation of a bridge document database that contains bridge inspection, load rating, and other pertinent documentation for every South Carolina bridge.

BMO was previously within the State Director of Maintenance Office, which was responsible for a multitude of activities including but not limited to Road Maintenance, Supply and Equipment, and the State Sign Shop. In December 2022, Senior Management created a third Chief Engineer and moved BMO under the new Chief Engineer for Bridges to more directly link BMO to Senior Management.

Objective

Management's objectives for the Bridge Inspection Program are to effectively assess and monitor the safety and health of South Carolina's bridges, comply with FHWA NBIS and other applicable laws and regulations, and provide accurate and reliable data to support sound asset management of South Carolina's bridge inventory.

Our objective is to provide assurance that internal controls are adequately designed and operating effectively to manage risks that may hinder the achievement of Management's objectives for the Bridge Inspection Program.

Scope

The Bridge Inspection Program is comprised of three processes involving multiple stakeholders as follows:

1. Bridge Inspection
2. Bridge Load Rating
3. Bridge Posting

Our scope included all of the above processes for the period of October 1, 2020 – February 28, 2022. It should be noted that the beginning of the review period corresponds with the implementation of the Bridge Inspection Guidance Document and is only one year after the implementation of the Bridge Load Rating Guidance Document. Additionally, the number of bridge posting recommendations generated during the initial implementation of the revised bridge load rating process was significantly higher than what would occur under normal circumstances. In an attempt to limit unnecessary impacts to mobility, BMO pursued further measures, such as materials testing and research, to substantiate bridge posting recommendations prior to execution.

Methodology

For the processes included in the engagement scope, we performed the following procedures:

1. We facilitated Management's completion of a process outline that documents the steps in the process and the individuals responsible for those steps.
2. We facilitated Management's completion of a risk and control matrix used to:
 - a. identify risks which threaten process objectives,
 - b. score the risks as to their consequence and likelihood of occurrence using the risk scoring matrix in Appendix B,
 - c. determine if controls are adequately designed to manage the risks to within the Agency's risk appetite, and
 - d. propose design improvements to controls when risks are not managed to within the Agency's risk appetite.
3. We evaluated Management's assessment to determine if it was reasonable and comprehensive.
4. We tested controls intended to manage risks with inherent risk scores of 9 and above [scale of 1 (low) to 25 (high)] to determine if controls are designed adequately and operating effectively. Our testing included inquiry, observation, and inspection of documentation to determine if controls are operating effectively.
5. We developed observations for controls determined to be inadequate in design and/or ineffective in operation.
6. We collaborated with management to develop action plans to improve control design and/or operating effectiveness for the identified control deficiencies.

7. While our engagement primarily focused on risk management, we identified a matter that represents an opportunity for process improvement.
8. We collaborated with Management to develop an action plan for the identified opportunity for process improvement.

5. Conclusion

Bridge Inspection Program Controls

In our opinion, controls are partially adequate in design and operating effectiveness for reducing some risks within the Agency's risk appetite. Risk exposure is determined to be Medium-High. Our recommendations to improve control design and/or operating effectiveness are described in the Observations section.

While our engagement was primarily focused on risk management, we identified a matter that represents an opportunity for process improvement. This matter is detailed in the Performance Opportunity Section.

Development of Management Action Plans

We facilitated Management's development of action plans for each observation and performance opportunity to improve control design and operating effectiveness with practical, cost-effective solutions. These improvements, if effectively implemented, are expected to reduce the overall risk exposure to an acceptable level (i.e. within the Agency's risk appetite).

We will follow up with Management on the implementation of the proposed actions on an ongoing basis and provide SCDOT leadership with periodic reports on the status of management action plans and whether those actions are effectively and timely implemented to reduce risk exposure to an acceptable level.

Observations

| Observation 5.1 Accuracy and Reliability of Bridge Posting Data | Risk Exposure Medium-High |
|--|--|
| Division: Bridge Maintenance | |
| Control Assessed: Control 1 – Bridge Maintenance Office (BMO) Posting Approval | |
| Control Description: Control 1 – Weight limit recommendations made by the Load Rating Engineer via a Bridge Signing/Posting Form are reviewed and approved by the State Bridge Maintenance Engineer (SBME) or Designee. | |
| Process Affected: (See process descriptions in Appendix A) Process 3 – Bridge Posting | |
| Observation: <p>The process for communicating, documenting, and monitoring postings is highly manual and fragmented. There is currently no centralized process in place for monitoring the posting process statewide from start to finish. The managing consultant for load ratings compiles all of the posting recommendations into a spreadsheet and meets with key BMO personnel to discuss the recommendations. The managing consultant uses the same spreadsheet to track the status of a bridge's most recent posting recommendations through the point of the SBME's posting decision; the managing consultant does not track the communication of posting recommendations to the Districts or the installation/inspection of posted weight limit signs.</p> <p>It is very difficult to garner a complete picture of a bridge's posting status (if a bridge is posted and at what weight limits the bridge is posted, any pending posting recommendations made by Load Rating Engineers, and any posting decisions made by the SBME that have not yet been communicated to and/or implemented by the District); four different information systems along with the managing consultant's spreadsheet have to be consulted in order to do so and a complete picture only exists if all the necessary updates are made by the managing consultant, BMO, and the Districts in a timely manner. The following issues related to the documentation of the posting process were identified:</p> <ul style="list-style-type: none"> • Copies of Bridge Signing/Posting Forms with the SBME's final decision and approval had to be requested from the managing consultant for 18 of the 25 items tested because the finalized form had not been uploaded to the bridge documentation database, ProjectWise, at the time of the request. • For six of the items tested, the District deviated from the Bridge Signing/Posting Form approved by the SBME and failed to properly and clearly document the final posting outcome. In one of the instances, the District decided not to post at all because construction of a replacement bridge was underway and nearing completion. All other instances involved the District deciding to post at lower weight limits. SCDOT Technical Note 10 allows Districts to post at lower weight limits than what is approved by BMO, but the decision must be documented via a separate Bridge Signing/Posting Form that is signed by the District Engineering Administrator and the posting form must be uploaded to ProjectWise. In all six instances, it was unclear what the District ultimately decided based on how the posting was documented and the District failed to complete a posting form in accordance with Technical Note 10 and upload it to ProjectWise. | |

- 13 of the 25 items tested had at least one duplicate bridge deficiency, or bridge maintenance order, in HMMS for installing weight limit signs in accordance with an email sent by BMO. A bridge deficiency was considered a duplicate if it corresponded to the same exact posting recommendations as a previously created bridge deficiency.
- Testwork also revealed that the most reliable way to determine if a bridge is posted and at what weight limits is to consult the pictures of installed weight limits signs taken during special bridge inspections that are required for every posting with the purpose of verifying that posting signs were properly and accurately made and installed. However, due to many factors including the current workload of a District’s bridge inspection team, it can take up to several months for these special bridge inspections to be performed and documented.

Recommendation 1:

We recommend that BMO develop a comprehensive method for monitoring the entire posting process for each bridge that accounts for previous and current posting recommendations made by a Load Rating Engineer.

Recommendation 2:

We recommend that BMO take measures to prevent duplicate bridge maintenance orders and ensure documentation for postings is properly recorded and stored.

Recommendation 3:

We recommend that BMO ensure weight limit restriction data for posted bridges is available and easily accessible to the necessary parties.

Recommendation 4:

We recommend that BMO streamline the process of verifying posting sign installations.

Management Action Plan (MAP) 5.1a

As a temporary measure, BMO is using a revised spreadsheet to more comprehensively track the posting process and send routine updates to the Districts. BMO will later use the Bridge Maintenance (BrM) software system on or before December 29, 2023 to track postings and automate certain communications to the Districts, including reminders of when posting sign installations must be completed.

BMO is also revising the Load Rating Guidance Document (LRGD) to outline a step-by-step process for load restricting a bridge, including how the posting process is tracked. BMO will issue policy via a Technical Note by April 28, 2023 to address this prior to the issuance of the revised LRGD on or before May 31, 2024.

To further ensure the posting process is properly monitored, BMO is developing a staff restructuring plan that will reorganize and/or add staff to help track the posting process.

| | |
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| MAP Owner: | Deputy Secretary for Engineering, Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | June 28, 2024 |

Management Action Plan (MAP) 5.1b

The revised LRGD will include a guideline requiring staff to verify that a bridge maintenance order does not already exist to ensure duplicates are not created. It will also include strengthened documentation requirements for postings. BMO will issue policy via a Technical Note by April 28, 2023 to address these items prior to the issuance of the revised LRGD.

Furthermore, the Bridge Maintenance Quality Engineer is now reviewing all posting documentation submitted by the Districts to ensure these submissions are accurate and complete. Lastly, the implementation of BrM as well as staff training will further strengthen compliance with documentation requirements for postings.

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|-----------------|----------------------------|
| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | May 31, 2024 |

Management Action Plan (MAP) 5.1c

BMO will collect data on weight-restricted bridges as BrM is implemented and will incorporate fields for this data in the next version of the Roadway Information Management System (RIMS).

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| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | December 29, 2023 |

Management Action Plan (MAP) 5.1d

BMO no longer requires a formal, special bridge inspection to verify posting sign installations, but is still requiring the Districts to provide pictures of the posted signs after installation. As a result, some Districts are now electing to use sign crews to take these pictures immediately after the signs have been installed. Districts that have chosen to continue using bridge inspectors to verify and take pictures of posting sign installations are now completing this task within five to ten business days after being notified that the signs have been installed. BMO is revising the Bridge Inspection Guidance Document (BIGD) to specify requirements for verifying posting sign installations, including how long a District has to provide pictures of the installed posting signs. A Technical Note will be issued by December 29, 2023 to address this policy prior to the issuance of the BIGD.

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| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | December 31, 2024 |

| Observation 5.2 Bridge Posting Timeliness and Approval | | Risk Exposure |
|--|--|----------------------|
| | | Medium-High |
| Division: Bridge Maintenance | | |
| Controls Assessed: Control 1 – Bridge Maintenance Office (BMO) Posting Approval Control 2 – Posting Policy in the Bridge Load Rating Guidance Document | | |
| Controls Descriptions: Control 1 – Weight limit recommendations made by the Load Rating Engineer via a Bridge Signing/Posting Form are reviewed and approved by the State Bridge Maintenance Engineer (SBME) or Designee. Control 2 – When a bridge posting is required, the posting signs shall be installed within 30 days upon the SBME’s or Designee’s approval of the Bridge Signing/Posting Form. | | |
| Process Affected: (See process descriptions in Appendix A) Process 3 – Bridge Posting | | |
| Observation: <p>Of the Bridge Signing/Posting Forms selected for testing that were also approved for posting by BMO, approximately 47% resulted in weight limit signs that were not installed within 30 days from the date the Bridge Signing/Posting Form was approved by the SBME. BMO does not have controls in place that are designed specifically to mitigate the risk of an untimely bridge posting, but BMO’s ability to effectively implement controls to mitigate that risk may be limited because the District sign crews responsible for installing bridge posting signs do not report to BMO.</p> <p>It was also observed that approximately 18% of the Bridge Signing/Posting Forms selected for testing that were approved for posting resulted in weight limit signs that were posted prior to the SBME's approval of the Bridge Signing/Posting Form. Based on discussions with BMO, there can be situations in which it is necessary or appropriate for a District to post a bridge prior to receiving the SBME's approval, but this is not reflected in SCDOT policy.</p> <p>Recommendation 1: We recommend that SCDOT reorganize or expand current staffing to allow each District to have a bridge crew that specializes in managing, maintaining, and inspecting bridges and reports directly or indirectly to BMO.</p> <p>Recommendation 2: We recommend that BMO consider developing a policy and procedure that delineates when and how a District can elect to proceed with a posting prior to the SBME's approval of the Bridge Signing/Posting Form.</p> | | |
| Management Action Plan (MAP) 5.2a | | |
| BMO is currently developing a restructuring plan to reorganize and/or add bridge maintenance staff at Headquarters and in the Districts. BMO intends to have the restructuring plan fully developed and approved within the next three months and to complete implementation of the plan within a year after its approval. | | |
| MAP Owners: | Deputy Secretary for Engineering, Chief Engineer for Bridges | |
| Division: | Bridge Maintenance Office | |
| Scheduled Date: | June 28, 2024 | |

Management Action Plan (MAP) 5.2b

BMO is currently revising the Load Rating Guidance Document (LRGD) and will incorporate a policy and procedures specifying when and how a District can elect to post before and without the SBME's approval. The revised LRGD will also include policy to prevent the Districts from receiving posting recommendations that have not yet been reviewed by the SBME. BMO will issue policy via a Technical Note by April 28, 2023 to address these items prior to the issuance of the revised LRGD.

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| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | May 31, 2024 |

Observation 5.3
Bridge Inspection Quality Control Measures

Risk Exposure

Medium

Division: Bridge Maintenance

Controls Assessed:

- Control 1 – Field Review
- Control 2 – Independent Inspection

Controls Descriptions:

Control 1 – Every SCDOT Bridge Inspection Team Leader (BITL) that actively performs bridge inspections is required to be formally observed and reviewed in the field at least twice per year. Additionally, every consultant firm that is contracted to perform bridge inspections is required to be evaluated in the field by the Bridge Maintenance Quality Engineer or Designee at least once per calendar year.

Control 2 – Every SCDOT BITL that actively performs bridge inspections is required to have their work reviewed twice annually via an independent inspection that uses actual field conditions to evaluate the details and conclusions of a previously completed bridge inspection report.

Process Affected: (See process descriptions in Appendix A)

- Process 1 – Bridge Inspection

Observation:

Of the 16 SCDOT BITLs that actively performed bridge inspections as a BITL during calendar year 2021, three received no field reviews and six received only one field review. However, two of the three BITLs that had no field reviews did not actively perform bridge inspections as a BITL the entire calendar year (one of the BITLs started late in the year and another BITL stopped late in the year). Furthermore, one of the six BITLs that only had one field review did receive a second field review in January 2022 and, because the “per year” requirement is not clearly defined, it could be argued that the frequency requirement was still met as the BITL would have received two field reviews within a one-year timeframe.

Additionally, as of August 7, 2022, no independent inspections had been performed and/or documented for any SCDOT BITL.

Finally, none of the bridge inspection consultant firms received a field review during 2021 because the Bridge Maintenance Office (BMO) decided that an independent inspection would be performed in lieu of a field review for every consultant firm at least once per calendar year and that the independent inspection of the consultant firm would be performed by a different consultant firm rather than by SCDOT. All of the bridge inspection consultant firms received an independent inspection that was performed by a different consultant firm during 2021, but BMO did not modify SCDOT policy to reflect the implemented changes.

Recommendation 1:

We recommend that BMO develop a procedure for monitoring and communicating each District’s annual progress towards the required minimum number of field reviews and independent inspections.

Recommendation 2:

We recommend that BMO expand current SCDOT policy to clearly define what is meant by the “twice per year” field review requirement and specify what is required for SCDOT BITLs that start or stop actively performing bridge inspections mid-year. We also recommend that BMO update SCDOT policy to remove the field review requirement for consultant bridge inspectors and add

an independent inspection requirement for consultant bridge inspectors that specifies how many independent inspections should be performed each year and how the independent inspections should be documented.

Management Action Plan (MAP) 5.3a

The Bridge Maintenance Quality Engineer (BMQE) is currently monitoring and communicating with the Districts to ensure annual requirements for field reviews and independent inspections are met. Once implemented, the Bridge Maintenance (BrM) software system will track field reviews and independent inspections for each SCDOT BITL and will notify SCDOT BITLs and District Bridge Inspection Supervisors of upcoming due dates for these items.

BMO is also developing a staff restructuring plan that will reorganize and/or add staff to further support the monitoring and communication performed by the BMQE and/or BrM.

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| MAP Owner: | Deputy Secretary for Engineering, Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | June 28, 2024 |

Management Action Plan (MAP) 5.3b

The Bridge Inspection Guidance Document (BIGD) is being updated to a) clarify the frequency requirements for field reviews of SCDOT BITLs, b) require independent inspections instead of field reviews for consultant bridge inspectors, and c) have a standard form for independent inspections of consultant bridge inspectors. BMO will issue policy via a Technical Note by April 28, 2023 to address these items prior to the issuance of the revised BIGD.

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| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | December 31, 2024 |

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|--|----------------------------|---------------|
| Observation 5.4 Quality Control Reviews of Bridge Load Ratings | | Risk Exposure |
| | | Medium |
| Division: Bridge Maintenance | | |
| Control Assessed: Control 1 – Quality Control (QC) Review | | |
| Control Description: Control 1 – Every load rating receives an independent, documented QC Review. | | |
| Process Affected: (See process descriptions in Appendix A) Process 2 – Bridge Load Rating | | |
| Observation: Issues related to the QC Review were identified for eight of the 50 bridge load ratings tested, including: <ul style="list-style-type: none"> • Two Load Rating QC Review Checklists were missing the QC Engineer's signature. • The electronic signature date on four Load Rating QC Review Checklists did not agree to the signature date typed on the checklist or on the Load Rating Summary Form (LRSF). • One QC Review Checklist was signed electronically approximately six months after the LRSF was signed/sealed and the checklist was completed by a different QC Engineer than the one listed on the LRSF. • One LRSF contained a minor error that the QC Review failed to detect and correct. <p>Due to the issues identified, we were unable to verify that the QC Reviews are being completed properly, effectively, and at the appropriate point in the load rating process.</p> | | |
| Recommendation: We recommend that the Bridge Maintenance Office (BMO) revise the Bridge Load Rating Guidance Document to specify at what point in the load rating process the QC Review should be completed and when the QC Review Checklist should be signed by the QC Engineer. We also recommend that BMO revise the QC Review Checklist to be more detailed and/or require more inputs from the QC Engineer. | | |
| Management Action Plan (MAP) 5.4 | | |
| BMO is currently revising the Load Rating Guidance Document (LRGD) and will incorporate these specific timelines. In lieu of changing the QC Review Checklist, BMO will include a requirement in the revised LRGD specifying that QC Engineers must attach their QC review comments to the checklist. BMO will issue policy via a Technical Note by April 28, 2023 to address both of these items prior to the issuance of the revised LRGD. | | |
| MAP Owner: | Chief Engineer for Bridges | |
| Division: | Bridge Maintenance Office | |
| Scheduled Date: | May 31, 2024 | |

Performance Opportunity

While our engagement was focused primarily on risk management, we identified a matter that that represents an opportunity for improving performance.

Performance Opportunity 5.5 Bridge Posting Policy

Division: Bridge Maintenance

Process Affected: (See process descriptions in Appendix A)
Process 3 – Bridge Posting

Observation:

SCDOT policy requires the State Bridge Maintenance Engineer (SBME) to approve Bridge Signing/Posting Forms within ten business days upon receipt, but the Bridge Maintenance Office (BMO) does not document when posting forms are received. As such, IAS was unable to determine for certain when the SBME received the posting forms selected for testing, but we used the date the posting form was uploaded to ProjectWise to obtain an idea of how quickly the posting forms were being reviewed and approved. Based on the upload date, 21 of the 25 posting forms tested were not approved within ten business days. We did not determine the amount of business days in between, but we noted that the number of calendar days that passed between the date the posting form was uploaded to ProjectWise and the date the posting form was approved ranged from 61 - 499 and averaged 296.4. Many of the approval delays were due to the need to conduct further testing or research before the SBME could determine if posting was truly necessary, but this was not formally documented.

IAS also noted two instances in which the SBME decided to place a bridge on posting watch until more testing or research could be done that could potentially eliminate the need to post, but the SBME's decision and approval were not documented on either of the associated Bridge Signing/Posting Forms in ProjectWise. SCDOT does not have a formal policy or procedure that addresses bridges placed on posting watch.

Recommendation 1:

We recommend that BMO a) consider expanding the current policy to allow for exceptions or to create different timeframe requirements for different weight-limit restrictions and b) begin documenting when posting forms are received.

Recommendation 2:

We recommend that BMO develop a policy and procedure that specifies how to communicate and document bridges that are placed on posting watch and consider including in that policy a restriction on how long a bridge can be on posting watch.

Management Action Plan (MAP) 5.5a

In response to a new federal requirement, BMO is currently revising posting policies and procedures in the Load Rating Guidance Document (LRGD) to ensure posting forms are reviewed and approved within three months from the date it was determined that a load rating was needed. These revisions will include different timeframe requirements to cover both expedited postings and necessary delays. BMO will issue policy via a Technical Note by April 28, 2023 to address the new federal requirements and necessary posting delays prior to the issuance of the revised LRGD. Due to the additional research required, policy addressing expedited postings will be issued in a subsequent Technical Note by December 29, 2023.

BMO will also begin documenting when posting forms are received, which will be considered the date that the load rating Quality Assurance Reviews are complete, on or before April 28, 2023.

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| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | May 31, 2024 |

Management Action Plan (MAP) 5.5b

BMO has ceased the practice of placing bridges on posting watch and is currently working through bridges that were previously placed on posting watch to remove that identifier. All bridges currently on the list will be posted or placed on increased frequency inspections.

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| MAP Owner: | Chief Engineer for Bridges |
| Division: | Bridge Maintenance Office |
| Scheduled Date: | September 29, 2023 |

Appendix A - Process Descriptions

Process 1 Bridge Inspection

Every publicly-owned bridge in South Carolina must be routinely inspected at least once every two years, with some bridges receiving additional inspections of varying types at varying frequencies and/or in unique circumstances. Bridge inspections are performed by contracted consultants or SCDOT District bridge inspection teams. All bridges are inspected in accordance with the Federal Highway Administration's National Bridge Inspection Standards (NBIS).

Bridge inspections are documented using a bridge inspection report that contains general bridge inventory data, condition ratings, inspector comments, critical findings, repair recommendations, and photographs taken of the bridge during the inspection. Every bridge inspection report receives an independent Quality Control (QC) review and is subject to being randomly selected for a high-level Quality Assurance (QA) review that is only performed on a sample of bridge inspection reports.

Process 2 Bridge Load Rating

A bridge load rating analysis determines the live load capacity of a bridge using bridge plans and information gathered from bridge inspections and/or site assessments. Load ratings are used for issuing oversize/overweight permits and in determining if a bridge weight limit posting is required. Every publicly-owned bridge in South Carolina must be load rated in accordance with NBIS and all load ratings are performed by contracted consultants.

Load ratings must be performed or supervised by a professional engineer licensed in the State of South Carolina and are finalized by completing a Load Rating Summary Form that is signed and sealed by the Load Rating Engineer or Engineer of Record. Every load rating receives an independent QC review by a licensed professional engineer and is subject to being randomly selected for a high-level QA review that is only performed on a sample of load ratings.

Process 3 Bridge Posting

Bridge postings inform the public of a bridge's weight limit capacity and alert drivers not to cross the bridge if their vehicle exceeds the capacity posted. Appropriate weight limit postings are critical for bridge preservation and public safety. Bridges are recommended for posting by the Load Rating Engineer if the load rating determines that the bridge's maximum legal load exceeds the bridge's safe load capacity.

Posting recommendations are documented using a Bridge Signing/Posting Form that is submitted to the Bridge Maintenance Office for review and approval by the State Bridge Maintenance Engineer or Designee. If the bridge is approved for posting, the District is notified of the need to post via email. Bridge posting signs are installed by District sign crews and installed signs are required to be inspected by District bridge inspection teams.

Appendix B - Risk Scoring Matrix

Risk significance is rated on a scale of 1 (lowest) to 25 (highest) and is the product of the risk consequence score (1 to 5) multiplied by the risk likelihood score (1 to 5). The following matrix provides a color scale corresponding to risk significance scores.

| | | | | | | |
|-------------------|----------------------------|--------------------|----------------|-------------------|-------------------|-------------------|
| Likelihood | Frequent or Almost Certain | 3-4 Low | 9-13 Medium | 14-17 Med-High | 18-21 High | 22-25 Extreme |
| | Likely | 3-4 Low | 5-8 Med-Low | 9-13 Medium | 14-17 Med-High | 18-21 High |
| | Possible | 3-4 Low | 5-8 Med-Low | 5-8 Med-Low | 9-13 Medium | 14-17 Med-High |
| | Unlikely | 1-2 Minimal | 3-4 Low | 5-8 Med-Low | 5-8 Med-Low | 9-13 Medium |
| | Rare | 1-2 Minimal | 1-2 Minimal | 3-4 Low | 3-4 Low | 3-4 Low |
| | | Incidental | Minor | Moderate | Major | Extreme |
| | | Consequence | | | | |

Appendix C - Risk Appetite

Risk appetite is defined as the amount of risk the Agency is willing to accept in the pursuit of its objectives. Management's goal is to manage risks to within the appetite where mitigation is cost-beneficial and practical. Management has set the Agency's risk appetite by risk type using scoring methodology consistent with the Risk Scoring Matrix shown in Appendix B. Risk appetites by risk type are as follows:

| RISK TYPE | EXAMPLES | RISK APPETITE SCORE 1 = Minimal Risk 25 = Extreme Risk (See Scoring Matrix in Appendix B) |
|---------------------|---|--|
| Safety | Employee and Public Well-Being | 2 |
| Ethical | Fraud, Abuse, Mismanagement, Conflict of Interest | 2 |
| Financial | Funding, Liquidity, Credit, Reporting | 4 |
| Strategic | Resources not Aligned, Unclear Objectives | 4 |
| Reputational | Unintentional Unwanted Headlines | 4 |
| Operational | Delays, Cost Overruns, Waste, Inefficiency | 6 |
| Regulatory | Non-Compliance | 6 |
| Legal | Lawsuits | 10 |