INTERNAL AUDIT REPORT

2020

QUALITY ASSURANCE ON DESIGN PLANS

An Assessment of:

- ☑ Risks
- ☑ Control Design Adequacy
- ☑ Control Operating Effectiveness

SOUTH CAROLINA OFFICE OF THE STATE AUDITOR

INTERNAL AUDIT SERVICES

March 5, 2020

1 EXECUTIVE SUMMARY

QUALITY ASSURANCE ON DESIGN PLANS

OBJECTIVE:

- To facilitate Management's assessment of risks that threaten the achievement of its objectives for the Quality Assurance on Design Plans activity
- To assess the adequacy of the design and operating effectiveness of internal controls to manage the activity's risks to an acceptable level.

BACKGROUND:

- The Preconstruction Support Office provides quality assurance reviews of project concepts, design criteria, design plans, and specifications at various project development phases.
- Its customers include SCDOT design staff, SCDOT program managers and external design firms and other third parties for projects administered by non-SCDOT entities.
- The intent of the reviews is to verify that ongoing quality control occurs and that designs and specifications achieve statewide consistency for promoting safety, optimizing cost, reducing liability, and managing risks associated with projects.

CONCLUSION:

In our opinion, existing internal controls are operating effectively. However, those controls by themselves are insufficient for reducing some risks to within the Agency's risk appetite. Our recommendations to improve control design are described in the Observations section beginning on page 9.

EXECUTIVE SUMMARY Continued

INTERNAL CONTROL OBSERVATIONS:

1. Quality Assurance Compliance Comments	Risk Exposure:	Medium
Quality assurance reviewers do not consistently cite policy and/or design standards in their comments on compliance. This may reduce the clarity, comprehensiveness, and intent of the reviewer's comments potentially resulting in increased project time and/or cost.		
(See detailed Observation 5.1 on page 11)		

2. Quality Control Checklists	Risk Exposure:	Medium
The intent of quality assurance reviews is to verify that consistent and ongoing quality control has been applied in the process of developing project design plans. Evidence of quality control in the design plan submissions is inconsistent and not always clearly identifiable to the reviewer.		
(See detailed Observation 5.2 on page 12)		

3. Risk-Based Quality Assurance Checklists	Risk Exposure:	Medium
Quality assurance reviews are designed to include all compliance items associated with a project design plan regardless of the cost of potential noncompliance. This can result in spending time on compliance issues that delay a project's schedule where the cost of such delay exceeds the cost of non-compliance.		
(See detailed Observation 5.3 on page 13)		

4. Incremental Reviews of Design Plans	Risk Exposure:	Medium
Currently, full reviews are performed on the interim design submittals although the plans are developed in specific design phases with unique requirements for each milestone. This can result in duplication of effort.		
(See detailed Observation 5.4 on page 14)		

EXECUTIVE SUMMARY Continued

PERFORMANCE OPPORTUNITIES:

While our engagement was primarily focused on risk management, we have identified other matters that represent opportunities for process improvement. These matters are detailed in the Performance Opportunities section beginning on page 13.

1. Consolidation of Design Manuals
SCDOT communicates design standards through a variety of materials (design manuals, design memorandums, and bulletins) which can cause designers confusion and be time-consuming to navigate. This can negatively affect quality, schedules, and budgets.
(Detailed in Performance Opportunity 6.1 on page 15)

2. Non-Bridge Structure Guidance
Guidance for non-bridge structures is spread throughout the various manuals and bulletins making compliance by designers and review by quality assurance staff time-consuming.
(Detailed in Performance Opportunity 6.2 on page 17)

3. Efficient Access to Reference Documents
Reference documents for design guidelines are in either manual or electronic formats. Staff in each of SCDOT's Regional Production Groups share manual documents. This hinders internal design staff from efficiently accessing guidelines that can negatively affect schedules and budgets.
(Detailed in Performance Opportunity 6.3 on page 18)

4. Communication of Quality Assurance Comments
The comment matrix heavily relies on a reviewer's ability to articulate an engineering message in written words without the benefit of a visual aid. This often results in confusion and misunderstandings that take time and additional resources to resolve.
(Detailed in Performance Opportunity 6.4 on page 20)
5. Link Common Comments to Improvement and Training

EXECUTIVE SUMMARY Continued

Opportunities to improve training, clarify policy manuals, provide more effective quality control guidance, and reduce rework are not being fully realized because quality assurance comments cannot be effectively organized, monitored and analyzed in the comment matrix.
(Detailed in Performance Opportunity 6.5 on page 23)

Management Action Plans are included in Section 5 following each detailed Observation and Performance Opportunity as referenced above.

CONTENTS

2 FOREWORD

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.

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ACKNOWLEDGEMENT

We wish to thank members of management and staff in the Preconstruction Support Office for their cooperation in sharing their knowledge and experience and developing actions to improve internal control and enhance operating performance. Additionally, we would like to thank members of the American Council of Engineering Companies of South Carolina for joining with internal staff in a working committee that provided input to the report recommendations and management action plans.

3 INTERNAL AUDITOR'S REPORT

March 5, 2020

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

We have completed a risk and control assessment of the South Carolina Department of Transportation's (SCDOT) Quality Assurance on Design Plans activity. 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 the following aspects:

- Facilitation of Management's assessment of risks
- Independent assessment of the design and effectiveness of internal controls established by the Preconstruction Support Office to determine whether those controls, if operating effectively, are adequately designed to 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 conclusions.

While our engagement was primarily focused on risk management, we have identified other matters that may represent opportunities for process improvement. These matters are detailed in the *Performance Opportunities* section on page 15.

George L. Kennedy, III

George L. Kennedy, III, CPA
State Auditor

4 ENGAGEMENT OVERVIEW

4.1 BACKGROUND

SCDOT's Preconstruction Support Office provides quality assurance reviews of project concepts, design criteria, design plans, and specifications at various project development phases. Its customers include SCDOT design staff, SCDOT program managers and external design firms and other third parties for projects administered by non-SCDOT entities. Some examples of non-SCDOT entities are municipalities, counties and design firms for private sector businesses.

The intent of these reviews is to verify that:

- Consistent and ongoing quality control has been applied by both internal and external designers in the process of developing project design plans
- Statewide consistency with designs and specifications has been achieved as directed by *Preconstruction Advisory Memorandum 4: Preconstruction Quality Assurance Review Policy.*

The operational goals of the unit are as follows:

1) Enhance safety
2) Minimize change orders
3) Manage tort liability
4) Mitigate risk associated with project development and construction of projects.

4.2 OBJECTIVES

Management's strategic objective of the Quality Assurance activity is to support SCDOT in its mission to deliver quality projects in a timely manner in accordance with SCDOT and industry standards.

Our objective was to facilitate Management's assessment of risks that threaten the achievement of its objectives and to assess the effectiveness of controls designed to manage those risks to an acceptable level.

4.3 SCOPE

Preconstruction support is organized into the following four engineering disciplines:

- Roadways
- Structural
- Geotechnical
- Hydraulic

In collaboration with the Preconstruction Support Office, we determined that the scope should include all four disciplines as each provides assurance over plans and designs that are significant to the activity.

4.4 METHODOLOGY

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

1. We facilitated Management's completion of a process outline that documented 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.

   As shown on the Risk Scoring Matrix in Appendix B, 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). Risk appetite is the amount of risk exposure Management is willing to accept in pursuit of its objectives. Executive Management has set various risk appetites by risk type as shown in Appendix C. Risks scoring below Management's risk appetite require no further risk management. Controls determined to be inadequate in design result in risk exposure to the Agency if risk scores exceed risk appetite.

3. We observed the discussion by key process owners and other subject matter experts performing the steps in procedure two above.

4. We evaluated Management's assessment to determine if it was reasonable and comprehensive.

5. We tested key 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, inspection of documentation, and re-performance of process steps to determine if key controls are operating effectively. We tested controls for risks with inherent scores of 9 and above.

6. We developed observations for controls determined to be inadequate in design and/or ineffective in operation.

7. We collaborated with management to develop action plans to improve control design and/or operating effectiveness.

8. While our engagement was primarily focused on risk management, we have identified other matters that represent opportunities for process improvement.

9. We collaborated with Management to develop action plans for improving performance.

4.5 CONCLUSION

In our opinion, existing internal controls are operating effectively. However, those controls by themselves are insufficient for reducing some risks to within the Agency's risk appetite. Our recommendations to improve control design are described in the Observations section on page 11.

While our engagement was primarily focused on risk management, we have identified other matters that represent opportunities for process improvement. These matters are detailed in the Performance Opportunities section on page 15.

4.6 DEVELOPMENT OF MANAGEMENT ACTION PLANS

We facilitated Management's development of action plans for each observation to improve control design 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.

5 OBSERVATIONS

Observation 5.1 **Quality Assurance Compliance Comments**	**Risk Exposure** **Medium**
Division: Preconstruction – Preconstruction Support	
Controls Assessed: None – This observation addresses risks in which no associated controls were identified.	
Control Descriptions: Not Applicable	
Processes Affected: (See process descriptions in Appendix A on page referenced below) Process 3 – Direct Quality Assurance Activities (Page 25)	
Observation: Quality assurance reviewers do not consistently cite policy and/or design standards in their comments on compliance. This may reduce the clarity, comprehensiveness, and intent of the reviewer's comments potentially resulting in increased project time and/or cost. **Recommendation:** A reference to authoritative guidance should be provided in conjunction with the comment. Using objective criteria should improve the communication and understanding between the quality assurance reviewer and designer and make comment recommendations less subjective.	
Management Action Plan (MAP) 5.1	
Revise the quality assurance review process to require all compliance comments include a reference to a documented policy, procedure, and/or standard. All compliance comments will clearly reference the policy, procedure, and/or standard that serves as the basis for the comment. All compliance comments will require a written response from the designer.	
MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction
Scheduled Date:	April 30, 2021

Observation 5.2
Quality Control Checklists

Risk Exposure

Medium

Division: Preconstruction – Preconstruction Support

Controls Assessed: None – This observation addresses risks in which no associated controls were identified.

Control Descriptions: Not Applicable

Processes Affected: (See process descriptions in Appendix A on page referenced below)
Process 3 – Direct Quality Assurance Activities (Page 25)

Observation: The intent of quality assurance reviews is to verify that consistent and ongoing quality control has been applied in the process of developing project design plans. Evidence of quality control in the design plan submissions is inconsistent and not always clearly identifiable to the reviewer.

Recommendation: Create quality control checklists for each discipline and review type. Internal and external designers should be required to submit them along with each set of design plans. Checklists should be designed to address the type of review performed and the design discipline involved.

Management Action Plan (MAP) 5.2

Create a quality control checklist for each design discipline to assist with managing risk and minimizing errors and omissions. This will also streamline the quality assurance review by focusing only on moderate to high risk compliance issues. The designer will electronically submit a signed copy of the quality control checklist along with the request to review a set of plans.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction
Scheduled Date:	October 31, 2020

Observation 5.3
Risk-Based Quality Assurance Checklists

Risk Exposure

Medium

Division: Preconstruction – Preconstruction Support

Controls Assessed: None – This observation addresses risks in which no associated controls were identified.

Control Descriptions: Not Applicable

Processes Affected: (See process descriptions in Appendix A on page referenced below)
Process 3 – Direct Quality Assurance Activities (Page 25)

Observation: Quality assurance reviews are designed to include all compliance items associated with a project design plan regardless of the cost of potential noncompliance. This can result in spending time on compliance issues that delay a project's schedule where the cost of such delay exceeds the cost of non-compliance.

Recommendation: Establish a risk-based approach for scoping the quality assurance reviews for each design discipline and review type. Revise the review checklists to focus on moderate- to high-risk compliance standards. To mitigate the removal of low-risk compliance standards, spot-check designer-submitted quality control checklists for compliance with those standards.

Management Action Plan (MAP) 5.3

Create quality assurance checklist for all disciplines to focus only on moderate- to high-risk compliance issues.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction
Scheduled Date:	January 31, 2021

Observation 5.4 Incremental Reviews of Design Plans	Risk Exposure Medium

Division: Preconstruction – Preconstruction Support

Controls Assessed: None – This observation addresses risks in which no associated controls were identified.

Control Descriptions: Not Applicable

Processes Affected: (See process descriptions in Appendix A on page referenced below)
Process 2 – Development of Quality Assurance Guidelines (Page 25)

Observation: Currently, full reviews are performed on the interim design submittals although the plans are developed in specific design phases with unique requirements for each milestone. This can result in duplication of effort.

Recommendation: For each discipline, evaluate each review type to define stages of design for submission of plans for review. Incremental stage reviews can help in mitigating project risks earlier in the design process and reduce reworking of design plans. Management should implement a systematic quality assurance process for tracking each design type. This will allow designers to be aware of the submittals required and the items reviewed during each submittal.

Management Action Plan (MAP) 5.4

Revise the current quality assurance review process to define the timing and scope of each review that is specific to each milestone in lieu of performing a full review on every submittal. This minimizes the opportunity for reviewers to inadvertently comment on an issue that was previously closed.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction
Scheduled Date:	April 30, 2021

6 PERFORMANCE OPPORTUNITIES

While our engagement was focused primarily on risk management, we identified opportunities for improving performance by convening a working group that would gather feedback from all parties involved in the quality assurance process. This included the quality assurance reviewers, the internal designers, and members of the ACEC (American Council of Engineering Companies) who provided the external designers' perspective.

The working group identified the following performance opportunities, performed a root cause analysis for each, and developed a corresponding action plan aimed at improving the quality assurance process.

Performance Opportunity 6.1
Consolidation of Design Manuals

Process Affected: (See process description in Appendix A on page referenced below)
Process 1 – Development and Maintenance of Design Guidelines (Page 25)

SCDOT communicates design standards through a variety of materials (design manuals, design memorandums, and bulletins) which can cause designers confusion and be time-consuming to navigate. This can negatively affect quality, schedules, and budgets.

Recommendation: Establish a process to: 1) routinely consolidate an updated manual that incorporates ongoing updates from design memorandums and design bulletins, 2) promote effective communication of the intent of the manuals, memorandums, and bulletins and how each should be used, and 3) cross-reference manuals, memorandums, and bulletins so that the reader can track standards that were clarified, changed, or deleted.

Management Action Plan (MAP) 6.1A

Establish Update Procedure

Establish a procedure to issue Design Bulletins, specific for each design discipline, as interim updates to the design manual throughout the year. The Design Bulletins will contain information that supersedes the content of the manuals to ensure content is up to date with the current state of practice. Design Bulletins work in tandem with manuals to ensure designers have a clear understanding of the applicable design guidance.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	April 30, 2021

Management Action Plan (MAP) 6.1B	
Establish Annual Steering Committee Establish an annual steering committee for each design discipline to update all manuals by incorporating Design Bulletins from the previous year. This will create a new publication that contains all updated information specified in the Design Bulletins and other information deemed appropriate by the steering committee.	
MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	April 30, 2021

Performance Opportunity 6.2
Non-Bridge Structure Guidance

Process Affected: (See process description in Appendix A on page referenced below)
Process 1 – Development and Maintenance of Design Guidelines (Page 25)

Guidance for non-bridge structures is spread throughout the various manuals and bulletins making compliance by designers and review by quality assurance staff time-consuming.

Recommendation: Guidance for non-bridge structures should be incorporated in manuals for related disciplines or combined in stand-alone reference sources where logical.

Management Action Plan (MAP) 6.2A

Non-Bridge Structure Guidance

Revise the Bridge Design Manual to include design guidance and design references for box culverts, sound barrier walls, and retaining walls. Point the designer to other SCDOT manuals as needed.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	December 31, 2023

Management Action Plan (MAP) 6.2B

Structural Design Manual

Rename the Bridge Design Manual to the Structural Design Manual to ensure the user is aware that it does not only address bridges.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	December 31, 2023

Management Action Plan (MAP) 6.2C

Standalone Retaining Wall Document

Create a standalone document to address retaining wall design because geotechnical and structural considerations make them unique.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	December 31, 2023

Performance Opportunity 6.3
Increased Access to Reference Documents

Process Affected: (See process description in Appendix A on page referenced below)
Process 1 – Development and Maintenance of Design Guidelines (Page 25)

Reference documents for design guidelines are in either manual or electronic formats. Staff in each of SCDOT's Regional Production Groups share manual documents. This hinders internal design staff from efficiently accessing guidelines that can negatively affect schedules and budgets.

Recommendation: Consolidate reference documents in electronic format for convenient and simultaneous access.

Management Action Plan (MAP) 6.3A

Master List of Design Publications

Create and maintain a master list of all design publications that apply to SCDOT projects. This master list will be updated and previous versions will be archived.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	January 31, 2021

Management Action Plan (MAP) 6.3B

Post Master List

Post this list on the internet and intranet. Provide hyperlinks to reference material. Copyrighted content will need to be purchased by the user.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	January 31, 2021

Management Action Plan (MAP) 6.3C

Design Bulletin for New AASHTO Publications

Advise internal staff and consultants when new AASHTO publications are ready for adoption. This will be accomplished by issuing a Design Bulletin to memorialize the date of adoption and ensure our state manuals complement the new AASHTO publications.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	Completed during Audit

Management Action Plan (MAP) 6.3D	
Engage AASHTO Leadership Engage AASHTO leadership to determine if DOT access to publications can be improved by providing more readily-available access to electronic versions of AASHTO publications. The current process requires individual purchases by each user. A site license fee would be a better method of providing access to multiple users within the Department.	
MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	November 30, 2020 (contingent on planned date for AASHTO Annual Meeting)

Performance Opportunity 6.4
Communication of Quality Assurance Comments

Process Affected: (See process description in Appendix A on page referenced below)
Process 3 – Direct Quality Assurance Activities (Page 25)

The comment matrix heavily relies on a reviewer's ability to articulate an engineering message in written words without the benefit of a visual aid. This often results in confusion and misunderstandings that take time and additional resources to resolve.

Recommendation:

The working group developed several recommendations to improve the overall comment process:

- Separate recommendations from compliance comments
- Link comment matrix to design plans
- Improve comment resolution process
- Identify individual reviewer
- Eliminate conflicting comments from other SCDOT divisions
- Retain a comments list within design review software

Management Action Plan (MAP) 6.4A

Separate Recommendations from Compliance Comments

Revise the quality assurance review process to separate recommendations from compliance requirements. Recommendations may include best practices or alternative solutions that are not substantiated by written policy or procedure and are not required to ensure compliance; however, the comments may benefit the Department by improving risk management and/or enhancing contextual sensitivity.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	April 30, 2021

Management Action Plan (MAP) 6.4B

Link Comment Matrix to Plans

Implement Bluebeam Revu software to provide quality assurance review comments that are visually linked to a specific location in the plan set.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	April 30, 2021

Management Action Plan (MAP) 6.4C

Improve Comment Resolution Process

1. Establish a process to clearly identify all comments as either "Compliance" or "Recommendation". Compliance comments will be linked to a documented policy or procedure and will require a written response. Recommendations will not require a written response.

2. Establish a process to conduct a meeting between the Department reviewer and the designer if resolution is not achieved after two (2) iterations of comments/responses for compliance issues.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	April 30, 2021

Management Action Plan (MAP) 6.4D

Identify Individual Reviewer

Implement Bluebeam Revu software to ensure the author of all comments is identifiable. This will facilitate enhanced communication between the reviewer and the designer.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	April 30, 2021

Management Action Plan (MAP) 6.4E

Conflicting Comments from Other SCDOT divisions

Implement Bluebeam Revu software to provide quality assurance review comments that are visually linked to a specific location in the plan set. This will allow multiple reviewers to visually see comments from their counterparts in other areas of the Department as part of a shared review with one digital set of plans, resulting in the ability for multiple Divisions to cross-reference comments and minimize conflicts.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	January 31, 2021

Management Action Plan (MAP) 6.4F	
Retain Comments List within Design Review Software Implement Bluebeam Revu software to provide quality assurance review comments that are visually linked to a specific location in the plan set. This will allow multiple reviewers to visually see comments from their counterparts in other areas of the Department as part of a shared review with one digital set of plans, resulting in the ability for multiple Divisions to cross-reference comments and minimize conflicts.	
MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	January 31, 2021

Performance Opportunity 6.5
Link Common Comments to Improvement and Training

Process Affected: (See process description in Appendix A on page referenced below)
Process 3 – Direct Quality Assurance Activities (Page 25)

Opportunities to improve training, clarify policy manuals, provide more effective quality control guidance, and reduce rework are not being fully realized because quality assurance comments cannot be effectively organized, monitored and analyzed in the comment matrix.

Recommendation: Leverage management's implementation of design review software to effectively track and understand key quality assurance topics for the purpose of improvement and training. Systematically, analyze quality assurance comment data from the design review software to produce information that can be used to provide clarity and understanding of key quality assurance issues. Results of the analysis could, among other things, target trainings, clarifications to policy manuals, or changes in quality control guidance.

Management Action Plan (MAP) 6.5A

Generate List of Common Quality Assurance Items Regularly

Establish a procedure for all design disciplines to routinely review quality assurance review comments to improve policies, procedures, and manuals.

The timing of this action is scheduled after the implementation of the revised quality assurance review process. This will allow adequate data collection to begin analysis for improvements.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	August 31, 2021

Management Action Plan (MAP) 6.5B

Targeted Training

1. Establish a process for all design disciplines to routinely assess quality assurance review comments to identify targeted training needs based upon common areas of non-compliance.

The timing of this action is scheduled after the implementation of the revised quality assurance review process. This will allow adequate data collection to begin analysis for improvements.

MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support

Scheduled Date:	August 31, 2021
Management Action Plan (MAP) 6.5C	
Quality Assurance Compliance Training Create and host a training class for Program Managers and Design Managers that will enhance their understanding of quality assurance compliance issues.	
MAP Owner:	Preconstruction Support Engineer
Division:	Preconstruction Support
Scheduled Date:	9/30/2021

APPENDIX A PROCESS DESCRIPTIONS

Process 1 Development and Maintenance of Design Guidelines

The Preconstruction Support Office develops and maintains design guidelines at or beyond acceptable national industry standards. Based on the state's geography and other factors, SCDOT makes adjustments to those guidelines. Functional leaders are tasked with updating SCDOT guidelines when changes to the industry standards occur and in communicating with internal and external stakeholders.

Process 2 Development of Quality Assurance Guidelines

The Preconstruction Support Office provides quality assurance reviews of project concepts, design criteria, design plans, and specifications at various project development phases. The intent of these reviews is to verify that consistent and ongoing quality control has occurred and that statewide consistency with designs and specifications has been achieved. Quality assurance reviews are performed by the Preconstruction Support Office and do not take the place of quality control practices performed by the Regional Production Groups and their consultants.

Process 3 Direct Quality Assurance Activities

This process directs plans, specifications, and other submittals culminating in approval to stakeholders:

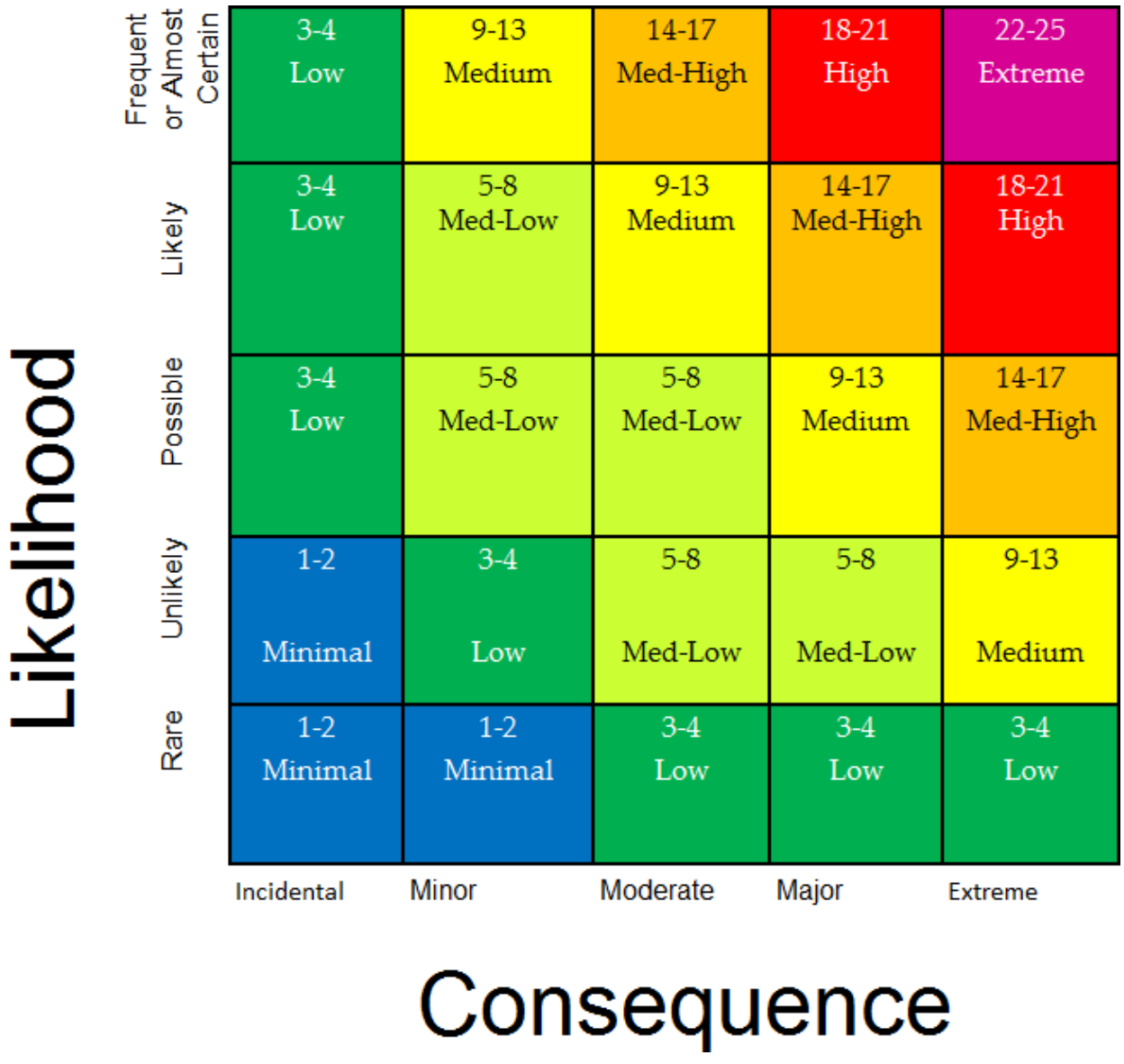
- Receipt of submittals
- Review of submittals by the Preconstruction division according to design guidelines.
- Communication by the Preconstruction Support Office of corrective actions required for acceptance
- Resubmittal of plans and specifications if deemed necessary
- Communication of approval to stakeholder

Direct quality assurance activities have the potential to catch design inconsistencies or other issues that could result in delays or change orders that could prove costly during the construction phase. At the same time, delays associated with the quality assurance process can result in delaying the development of a project beyond dates deemed critical to project stakeholders.

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.



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