System Development and Project Management for the Tracking Remedial Environmental Actions Data System (TREADS)

Department of Environmental Quality

November 2017
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This is our information systems audit of the Tracking Remedial and Environmental Actions Data System (TREADS) managed by the Waste Management and Remediation Division at the Department of Environmental Quality.

This report provides the legislature information about system development and project management of the new system. This report includes recommendations for creating and enforcing a system development framework with defined roles and responsibilities, improving technical risk mitigation, and improving communication and status reporting. A written response from the department is included at the end of the report.

We wish to express our appreciation to the Department of Environmental Quality and the Waste Management and Remediation Division personnel for their cooperation and assistance during the audit.

Respectfully submitted,

/s/ Angus Maciver

Angus Maciver
Legislative Auditor
CHAPTER I – INTRODUCTION AND BACKGROUND .......................................................... 1
  Introduction .............................................................................................................. 1
  Division’s Legacy Systems Need Replacing to Improve Reporting ....................... 1
  New System Will Manage Data for Various Departmental Programs ..................... 1
  Funding and Timeline for a New System ................................................................ 2
  Project Management and System Development Methodology Selected ................. 3
  Department Selects an Agile/Scrum Framework ..................................................... 4
  Audit Scope .............................................................................................................. 6
  Audit Objectives ...................................................................................................... 6
  Audit Methodologies .............................................................................................. 6
  Overall Conclusion .................................................................................................. 7
  Report Contents ...................................................................................................... 7

CHAPTER II – SIGNIFICANT IMPROVEMENTS NEEDED TO ALIGN WITH TREADS
DEVELOPMENT METHODOLOGY ........................................................................... 9
  Introduction .............................................................................................................. 9
  Department of Environmental Quality Reorganization ......................................... 9
  Department Conducted Transition Analysis for Internal Development ................ 13
  Hybrid Approach to Agile/Scrum Established as Framework .................................. 13
  Agile Values Reviewed, Compared to Department’s Overall System Development Process ... 14
    Department’s Hybrid Approach Does Not Meet Agile Values ............................ 14
    Risk Increases Without Defined System Development Framework ................. 15
  Agile Roles in TREADS Reviewed and Assessed ................................................... 17
    Importance of Roles and Responsibilities in System Development ................ 17
    Roles and Responsibility Documentation Lacks Enforcement ...................... 18
    Confusion Among TREADS Team Members Led to
    Non-Prioritized Work Completed ..................................................................... 18

CHAPTER III – MANAGING TREADS PROJECT RISKS ............................................ 21
  Introduction .............................................................................................................. 21
  Mitigating System Risk in User Stories and Product Backlog Is Important .............. 21
  TREADS Technical Risk Mitigation Reviewed ...................................................... 22
  Issues Faced if Technical Risk Unmitigated ......................................................... 22

CHAPTER IV – INTERNAL AND EXTERNAL COMMUNICATION
OF THE TREADS PROJECT ...................................................................................... 25
  Introduction .............................................................................................................. 25
  Communication Key to Project Management and System Development ................ 25
    TREADS Spans Multiple Department Bureaus .................................................... 25
    Project Participation and Meeting Attendance Needs Improvement ................ 26
    Department Not Following Project Communication Plan ................................ 28
  Multiple Factors Impact Project Success, Making Formal Communication Plan Vital .............................................................. 29
  Overall Communication and Steering Committee Engagement Needs Improvement ... 30
FIGURES AND TABLES

Figures
Figure 1  Agile/Scrum Framework Process........................................................................................................................................................... 5
Figure 2  Organizational Structure Prior to Reorganization of Department................................................................. 11
Figure 3  Organizational Structure After Reorganization of Department............................................................... 12
Figure 4  Overview of TREADS Team Members Interview Responses.......................................................... 16
Figure 5  TREADS Participation and Attendance Analysis............................................................................................................ 27
Figure 6  Example of Department’s Burndown Charts for Sprint 52 through Sprint 54 ...... 34
Figure 7  Example of Best Practice Burndown Chart................................................................................................. 35

Tables
Table 1  TREADS Budget and Implementation Date Overview ........................................................................................................ 3
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Jenny Chambers, Administrator, Waste Management and Remediation Division

Stephen Forrest, Chief Information Officer
The Tracking Remedial Environmental Actions Data System (TREADS) is currently in its third year of development. The Department of Environmental Quality has spent roughly 63 percent of the project’s current budget of $5.3 million, but in 2016 the department terminated its relationship with the original development contractor and moved to in-house development. The department faces challenges with system development processes and communication, specifically engagement and collaboration. The project currently lacks a defined project framework in which roles and responsibilities of the project team are clear. The department also has limited assurance that system development contains organized, deliberative, and cost-effective methodologies. While the department recently made efforts to improve TREADS development, additional steps are necessary to mitigate project risks to ensure system expectations are met.

Context

The Department of Environmental Quality’s Waste Management and Remediation Division investigates and oversees cleanup of environmentally contaminated sites. It oversees environmental protections related to solid waste and underground storage tanks, as well as issuance of permits and licenses. It prepares the appropriate environmental review documents to comply with the Montana Environmental Policy Act. The division is currently using legacy systems to manage its processes. Although these are currently functioning as needed, the various programs within the division do not have a centralized system for sharing, maintaining, and reporting environmental and financial data.

Due to the antiquated legacy systems, the department initiated the Remediation Information Management System project in 2012 and was approved for Long-Range Information Technology House Bill (HB) 10 funding during the 2013 Legislative Session for $1.8 million, which includes $700,000 from the General Fund, $1 million from a state special revenue fund, and $40,000 from federal funds. The Tracking Remedial Environmental Actions Data System (TREADS) includes common management of site and client data, full project data, activity support for participating programs, and integrated workflow management, document management, sample data management, and mapping capabilities. The new system will enable the department to better align with business processes and provide a more efficient approach to sharing, maintaining, and reporting data through a centralized system. The project spans six programs and one administratively attached board within the division and is currently expected to be implemented in June 2018.
The department is currently developing the custom system internally after the contract ended with the original design, develop, and implement (DDI) third party vendor. Since the department is spending considerable internal resources on the development of TREADS, this audit reviewed the system development and project management processes to help ensure TREADS will meet expectations of the system and end users. Specific areas of review included mitigation of business and technical risks and overall communication effectiveness and transparency. Conducting the audit while the system is being developed allows the department to make improvements to the process through the remainder of the project.

**Results**

Based on the audit work performed we determined the department is missing a clear and defined project framework. Audit work also found the department lacks assurance that system development contains organized, deliberative, and cost-effective methodologies. Without a framework based on best practices, team members cannot follow or adhere to project requirements, objectives, and goals. We found limited engagement and collaboration. TREADS team members had little understanding of the documented framework or their roles and responsibilities within TREADS. By defining and enforcing a project framework and roles and responsibilities, the department will have assurance the system development project is efficient and effective.

Although the department addressed business risk and applied specific design complications within development, we identified key technical risks were not being mitigated through sprint development. Although progress is being tracked at a high level, improvements can be made in overall progress reporting and communication of status to both internal and governmental stakeholders. Audit work also identified a lack of healthy culture necessary for a successful project. Overall, we developed six recommendations to address audit findings.

<table>
<thead>
<tr>
<th>Recommendation Concurrence</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Concur</td>
<td>6</td>
</tr>
<tr>
<td>Partially Concur</td>
<td>0</td>
</tr>
<tr>
<td>Do Not Concur</td>
<td>0</td>
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</tbody>
</table>

Source: Agency audit response included in final report.
Chapter I – Introduction and Background

Introduction

The Department of Environmental Quality’s (department) Waste Management and Remediation Division (division) investigates and oversees cleanup of environmentally contaminated sites. It oversees environmental protections related to solid waste and underground storage tanks, as well as issuance of permits and licenses. It prepares the appropriate environmental review documents to comply with the Montana Environmental Policy Act. This work includes coordination and preparation of environmental impact statements, ensuring methods and standards are consistent with department policy, and coordination with regulatory programs in the division, the department, and other state and federal agencies. The division conducts all facility inspections and reviews reports to determine compliance with permit conditions, laws, and regulations.

Division’s Legacy Systems Need Replacing to Improve Reporting

The division is currently using a legacy database to manage its processes. Although it is currently functioning as needed, the various programs within the division do not have a centralized system for sharing, maintaining, and reporting data. The department currently faces challenges with providing consistent and accurate public information reports to stakeholders. Data reported from the department can include environmental waste cleanup data, environmental samples, and financial data. Since the legacy database is not a viable enterprise solution, the division is in need of a more adaptable system that meets the needs of all programs within the division. Therefore, the department is working toward the development of a new information system. This system as a whole is referred to as TREADS (Tracking Remedial and Environmental Actions Data System). The overall replacement project is called the Remediation Information Management System (RIMS). It includes data management and sample data management solutions, which were included in the evaluation of development work completed by department.

New System Will Manage Data for Various Departmental Programs

TREADS will be a single point data entry (one system access point for data entry) web-based system that will support the division. The multiple programs the system will serve include Underground Storage Tank Section, Petroleum Tank Cleanup Section, Cleanup Protection Redevelopment Section, State Superfund Unit, Federal Superfund and Construction Services Bureau, Abandoned Mine Lands Section, and
the administratively attached Petroleum Tank Release Compensation Board. The system will manage data, environmental samples, and documentation as well as have an integrated spatial data system. TREADS is expected to align with the following objectives and system goals:

- Adaptable
- Modular
- Easy to Maintain
- Easy to Use
- Seamlessly Integrated
- Secure
- Improve Business Processes

**Funding and Timeline for a New System**

The department was approved for a new management information system in the 2013 Legislative Session through the Joint Appropriations Subcommittee on Long-Range Planning. It received $1.8 million in House Bill 10 funding. In 2014, the overall budget totaled $4.7 million with fund sources including General Fund, state special revenue, and federal special revenue. An implementation date of December 2016 was set. After funding was received, the department began searching for a vendor through the request-for-proposal process. A year later, the department awarded the contract to a design, develop, and implement (DDI) vendor and requested supplementary funding in the appropriation of $820,000 for additional functionality for the Underground Storage Tank Section and the Petroleum Tank Release Compensation Board.

The project kicked-off in the fall of 2014. In June 2015, the department reported to the Legislative Finance Committee (LFC) that the TREADS project had fallen behind due to DDI vendor scheduling issues; however, by September 2015 the project was reported as being back on track.

By March 2016, the department had spent 47 percent of its budget, but began encountering performance and personnel issues with the DDI vendor. The vendor believed it was meeting contractual deliverables and objectives. However, the department disagreed and eventually the contract was terminated in June 2016. The department decided to move the project to internal development. It was reported to LFC in June 2016 the updated budget added an additional $500,000, totaling $4.8 million with a new delivery date of December 2017. Finally, in May 2017, the budget increased to $5.3 million with a new delivery date of June 2018. Furthermore, additional funding was acquired for temporary development staff to assist in TREADS development. The department conducted a transition analysis and shifted resources to
internal development and implementation, where it continues to develop a custom system. The following table summarizes the funding and timeline changes made throughout the project up to this point.

<table>
<thead>
<tr>
<th>Date</th>
<th>Estimated Budget (millions)</th>
<th>Proposed System Implementation Date</th>
<th>Reason for Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 2013</td>
<td>$1.8</td>
<td>Not yet set</td>
<td></td>
</tr>
<tr>
<td>March 2014</td>
<td>$2.62</td>
<td>Not yet set</td>
<td>Added functionality for Petroleum Tank Release Compensation Board and the Underground Storage Tank Section</td>
</tr>
<tr>
<td>September 2014</td>
<td>$4.27</td>
<td>June 2016</td>
<td>DEQ staff time added (soft costs)</td>
</tr>
<tr>
<td>June 2016</td>
<td>$4.77</td>
<td>December 2017</td>
<td>Refined cost estimate of department and contracted staff time</td>
</tr>
<tr>
<td>December 2016</td>
<td>$5.34</td>
<td>June 2018</td>
<td>Soft cost increase due to department taking over project</td>
</tr>
</tbody>
</table>

Source: Compiled by the Legislative Audit Division using Legislative Finance Committee and department records.

**Project Management and System Development Methodology Selected**

Project management is the application of knowledge, skills, tools, and techniques to anticipate activities to meet the expected project requirements. Project management is accomplished through the appropriate application and integration of project management processes, which are categorized into the following process groups:

- **Initiating**: This process group includes the basic groundwork necessary to create the project and define the guidelines and criteria under which it will operate.
- **Planning**: This process group establishes stakeholder expectations and makes clear how the project will be managed.
- **Executing**: This phase is where the project’s technical work takes place.
- **Monitoring and Controlling**: This process group ensures that project deliverables are on time, on budget, and of acceptable quality.
- **Implementing**: This process is the final stage of the project where the system is implemented into a live environment, final details are submitted, and obligations are completed.
A development framework for an information system serves to organize, program, and supervise the process of developing an information system. There are different frameworks for information systems development. Development framework is composed of the process groups deployed in the development or investment of a specific software system. The framework must be used to structure, plan, and control the process. Many frameworks exist; however, there are two primary development frameworks that are recognized as being the most common.

1. Waterfall framework, which is seen as the traditional method.
2. Agile framework, which is seen as the newest type of framework used in system development.

While each framework has advantages and disadvantages, each one can result in successful system development.

**Department Selects an Agile/Scrum Framework**

Agile relates to a method of project management, used especially for software development. There are different development approaches to an agile framework, including kanban, extreme programming (XP), and scrum. Agile/scrum is a specific approach within the agile family. The original DDI vendor followed an agile/scrum framework. After that relationship ended, the department decided to continue using agile/scrum as the primary framework. The department had used an agile/scrum approach for smaller projects in the past; however, it had never used this framework on a large-scale system until TREADS.

An agile/scrum approach is a simplistic incremental framework that follows all process groups over a two- to three-week period. In other words, one piece of the system goes through Initiating, Planning, Executing, Monitoring/Controlling, and Implementing during a short period of time known as “sprints.”

Within an agile framework, the project phases are intended to be flexible and adaptable. Agile best practices emphasize the following core values:

- Individuals and interactions over processes and tools.
- Working products over comprehensive documentation.
- Customer collaboration over contract negotiations.
- Responding to change over following a plan.

The agile/scrum model is the most common form of agile development. According to best practices, the product owner (key business stakeholder) creates prioritized high-level requirements called a product backlog. Work is completed in iterations or
sprints, and each sprint is two to three weeks long with a piece of working product at the end of each sprint. Within these sprints are user stories. “User stories” are specific tasks that are assigned to the project team members. User stories are assigned story points, which are typically measured by the amount of time and effort it will take to complete the task. Once the task is completed and if time permits within the sprint, a team member moves to the next task. During sprint planning, the team pulls a small chunk from the product backlog and decides how to implement those pieces. Each day during the sprint, the team holds a daily standup meeting (daily scrum meeting) or a brief meeting to assess progress and retrospectives.

Another key player within an agile/scrum environment is the scrum master. This person keeps the team focused on the goal. At the end of the sprint, work completed should be ready to use by end users. Burndown/up charts are used to help measure ideal and remaining work (efforts) for the sprint. To present the new functionality, a sprint review and retrospective meeting occurs (product owner demonstration). The cycle begins again until a functioning system is implemented. When agile/scrum is operated effectively, it ensures stakeholders receive regular deliveries of a product they can use. The effectiveness of the agile/scrum approach largely depends on the team and the collaboration efforts between team members. The following figure is a visual representation of the agile/scrum framework.

![Figure 1: Agile/Scrum Framework Process](Source: C# Corner, Blog/Community for Developers, http://www.c-sharpcorner.com/UploadFile/d9c992/the-agile-scrum-framework/)
Audit Scope

This audit focused primarily on the department’s current design and development of TREADS and examined the department’s system development process, not the actual system. Therefore, this audit does not provide assurance over the specific system that will be implemented. Additionally, fieldwork began shortly after the relationship ended with the original DDI vendor and concluded at the end of May 2017, for a total of six months. Therefore, unless specifically noted, the audit focused on the department’s overall internal system development practices and internal communications during that point in time. We also looked at what and how the department was reporting project status to Department of Administration’s (DOA) State Information Technology Services Division (SITSD) and the Legislative Finance Committee (LFC).

This audit excludes the role of DOA SITSD oversight of projects as well as its review of reported costs and budget due to Information System and Performance Audits currently examining Governance over IT Spending and State Government Procurement and Contract Management.

Audit Objectives

Adopting a specific framework to organize and implement a new system is important to ensure the design, development, and testing of the system is completed accurately and efficiently. Audit planning identified risk in the department’s alignment with agile/scrum best practices and overall transparency surrounding the system. The three objectives developed were:

1. Determine whether Department of Environmental Quality’s development methodology aligns with best practices to ensure an effective system development process.
2. Determine if the Department of Environmental Quality is mitigating business and technical risk by implementing controls during sprint development.
3. Determine status of TREADS and how status is communicated and reported to internal and governmental stakeholders.

Audit Methodologies

Steps taken to conclude on our objectives included:

- Developed an assessment matrix using best practices to determine and rate the effectiveness in the department’s project management framework.
- Researched and compiled best practices and resources to apply in the evaluation of TREADS.
- Compiled, analyzed, reviewed seven TREADS releases, 21 sprints, and associated user stories to determine overall system health.
Interviewed 29 TREADS stakeholders, including product owners, subject matter experts, steering committee, technical team, and external government officials.

- Observed staff, processes, and interactions to assist in comparison to best practices and evaluation of system development.
- Identified, tested, reviewed, and evaluated the department’s documentation and collaboration applications.
- Observed various meetings including project status meetings, sprint planning meetings, product owner demonstrations, and steering committee meetings.

Overall Conclusion

Based on the audit work performed, we determined the department is missing a clear and defined project development framework for TREADS. Although the department addressed business risk and specific design challenges within sprint development, key technical risks were not being mitigated through sprint development. Although progress is being tracked at a basic level, improvements can be made in overall progress reporting and communication of progress to both internal and governmental stakeholders. We also determined improvements to the TREADS project work culture could increase the success of the project.

Since this is an audit of system development, the audit team communicated audit findings on an ongoing basis throughout the audit. Therefore, the department has begun taking steps to address audit recommendations discussed throughout the report.

Report Contents

The remainder of this report includes additional background and details of our findings, conclusions, and recommendations and is organized in the following manner:

- Chapter II addresses overall alignment with agile/scrum best practices, development industry standards, effectiveness and efficiency of current practices, and roles and responsibilities within the project.
- Chapter III explains and discusses the department’s mitigation of risk through sprint development, specifically in the area of technical risk.
- Chapter IV presents information regarding the department’s communication and project status reporting.
Chapter II – Significant Improvements Needed to Align With TREADS Development Methodology

Introduction

The first objective of our audit was to determine whether the Department of Environmental Quality’s (department) development methodology aligns with best practices to ensure an effective system development process. This chapter discusses details regarding agile/scrum best practices. It addresses needed improvements to ensure the Tracking Remedial and Environmental Actions Data System (TREADS) will strengthen department business processes and be delivered on time and within budget. We also discuss our comparison of team members’ roles and responsibilities within the department to best practices. This chapter also addresses potential project risks associated with internal development practices and the improvements the department will need to make to ensure internal resources are organized and effective for project development.

Prior to fieldwork beginning, the department underwent a reorganization and experienced turnover in several key staff positions. TREADS was currently underway when the reorganization occurred, which resulted in several staff in the project changing positions. Furthermore, during the reorganization the department also terminated its relationship with the design, develop, and implement (DDI) vendor and made the decision to move the project to internal resources and development.

Department of Environmental Quality Reorganization

In May 2015, the department began an “optimization project” to analyze opportunities for increasing the effectiveness of the department and its services. The guiding principles of organization optimization included: improve effectiveness, provide for resource capacity and flexibility, promote a culture of continuous improvement, foster employee and program innovation, improve stakeholder and customer services, integrate related work units and enhance communication, fully use staff expertise across the agency, and create ability to focus on outcomes without sacrificing the integrity of processes.

The department analyzed where programs intersect, how internal support services function across the organization, and what opportunities exist for programs to work more closely together in a more effective pursuit of the department’s mission. The result of this work was a major reorganization of several department functions. The reorganization grouped programs with similar functions (air, land, water), stakeholders,
and skill sets. The effective date of the reorganization was July 2015; however, pieces were still moving until March 2016, which was also the time the department began facing performance and personnel issues with the DDI vendor. Additionally, staff throughout Central Services Division and the Waste Management and Remediation Division shifted supervisors and managers. For example, one project manager of TREADS originally reported to the division administrator, but was moved and began reporting to the bureau chief for Contaminated Site Cleanup Bureau. Other changes specific to the TREADS project included:

- Remediation Division changed to Waste Management and Remediation Division.
- Office of Information Technology moved under Centralized Services Division.

The following figures (see pages 11 and 12) show the areas related to TREADS before and after the department-wide reorganization.
Figure 2
Organizational Structure Prior to Reorganization of Department

Source: Compiled by the Legislative Audit Division.
Figure 3
Organizational Structure After Reorganization of Department

Source: Compiled by Legislative Audit Division.
Department Conducted Transition Analysis for Internal Development

After ending the contract with the original DDI vendor in July 2016 due to a disagreement in achieved deliverables, the department conducted a transition analysis to evaluate the state of the project and identify any corrective action plans needed to complete the project internally. The document provided a list of alternatives to move forward. The project’s steering committee, which oversees the project, chose an alternative that included new system requirements and a system rebaseline. System or project requirements are statements that outline needed system capabilities and expectations. System rebaselining includes making significant database table changes or changes to its original structure. The changes also included workflow refactor (reorganization of the automation of data flow) and table consolidations to provide a new foundation for the system. The goal of the agreed-upon alternative allows workflow process to be more flexible and efficient. Workflows within a system allow steps of specific processes to be automated. The transition analysis predicted these changes would take an additional six sprints or twelve weeks. During fieldwork, it was discovered the department was still in the process of rebaselining the system six months after the rebaselining process began. The transition analysis also documented the department’s use of agile/scrum framework for the project’s official framework as well as the team members roles and responsibilities in the project.

Hybrid Approach to Agile/Scrum Established as Framework

Although project documentation outlines an agile/scrum approach to TREADS system development, the department emphasizes it is using a hybrid approach of agile/scrum. It believes this is the best approach for the development of TREADS. A hybrid approach is a mix between agile and waterfall. According to best practices, although a hybrid approach has been known to work in some cases, the core values of an agile approach must be present. For example, a successful approach to a hybrid method may include development of requirements but keeps the demand for constant delivery within a limited time frame, or iteration. Additionally, as long as the development team maintains good communication, effective cooperation, and a coordinated approach, a hybrid methodology may yield successful results.

Section 2-17-505, MCA, and industry standards require project development must be effective, efficient, organized, and deliberate. The framework chosen must fit and be appropriate for the size and objectives of the project. Agile/scrum does not follow a prescribed framework found in project management methodologies, such as waterfall, rather it is a value driven framework that focuses heavily on collaboration and functionality over documentation and contract negotiation like other frameworks.
Although agile/scrum is flexible in nature, not establishing a defined, industry recommended framework can significantly increase risks within a project, such as missing important system requirements or extending budgets or timelines.

**Agile Values Reviewed, Compared to Department’s Overall System Development Process**

Agile best practices emphasize the values surrounding individuals and interactions, working products, customer collaboration, and responding to change quickly. Through interviews with the TREADS team members, they indicated that a strict agile approach would not benefit the project. However, after we explained some of the values of an agile approach, it was clear the agile principles and values were not fully understood. Although the team members knew the basics of an agile approach, many staff members had limited knowledge and understanding of agile values, principles, and best practices. Furthermore, according to the department, the team received training in agile/scrum; however, since the break with the original DDI vendor, refresher training for the team did not occur. Although staff received initial agile/scrum training, they were not as entrenched in the development of TREADS due to the involvement of the DDI vendor, whereas now the project has moved to internal development, staff are required to have a more in-depth knowledge of the framework.

**Department’s Hybrid Approach Does Not Meet Agile Values**

Through observations of meetings and general interactions as well as interviews with all TREADS team members, it was apparent the department had not fully considered how a hybrid approach would best fit the department’s needs considering what agile best practices recommends for a successful project, specifically with taking a hybrid approach. The department’s use of a hybrid approach includes added use of waterfall elements, such as defined project or system requirements, and development of documentation. We reviewed the use of these elements and found them being used appropriately; however, where the department falls short in meeting hybrid approach best practices is continuous product backlog management (reviewing and prioritizing work tasks during each sprint’s planning discussions), collaboration, interaction, and producing a working product within each iterative cycle.

When we reviewed the product backlog, we discovered that the backlog had not been revisited since the break with the original DDI vendor. Backlog grooming is vital in an agile development framework and consists of the product owners and the project team reviewing items to ensure the project still contains appropriate items and the most important pieces of the system are prioritized. Activities that can occur during backlog grooming include removing user stories that are no longer relevant, creating new user stories based on new needs, and correcting user story time estimates based
on new information. For the TREADS project, backlog grooming becomes even more important since multiple product owners with differing priorities are involved.

Additionally, while the department uses defined project or system requirements, we found those requirements were not consistently being tied back to user stories and current functionality. Tying project requirements to user stories ensures that expectations are being met through sprint development. Due to the lack of product backlog grooming and tying project requirements to user stories, there is an unclear picture of what has been completed and what still needs to be accomplished.

We also determined that a working product was not produced at the end of each sprint. The current work completed showed that basic system functionality was not being produced and testing was not occurring on a consistent basis. After reviewing five releases or fifteen sprints, we found that roughly 48 percent of stories completed were focused on administrative tasks such as planning and meetings, whereas industry standards advise less focus on administrative tasks and more focus on producing a working product at the end of each sprint in order to meet customer needs.

During fieldwork, we addressed the various findings with the department. It was reiterated that because of the previously hired DDI vendor, the department did not want to go strictly agile. The department believed the hybrid approach effectively addressed the concerns previously identified with the vendor, including personnel and performance issues.

During the audit, the department began addressing the missing agile values and principles. This includes tying project requirements back to user stories and obtaining training on agile work/time estimations. It also hired a summer intern to assist in quality assurance and testing practices and produced a working product in the latest release of the system. However, without a clear framework, project management cannot be streamlined. Additionally, because the department is missing a defined framework, its expectations and enforcement are unclear.

**Risk Increases Without Defined System Development Framework**

Without a defined system development framework and without staff being knowledgeable and trained on the specific framework, project risk increases. The department has fallen behind schedule and it risks the objectives and goals of the system not being met on schedule and budget. An absence of defined development framework also provides unclear progress for system development and the team does not understand
or have a clear direction of the status of the project. Figure 4 summarizes responses from TREADS team members during interviews. We interviewed 27 TREADS team members and many had multiple concerns.

![Figure 4: Overview of TREADS Team Members Interview Responses](image)

Additionally, without a clear, defined, and accepted framework, the department risks undetected bugs, overall system issues, and potentially unusable functionality, which could possibly lead to user workarounds, contradicting the overall project objectives. An undefined framework can also provide misunderstood or missing project requirements and project objectives, which can result in users not getting a system they budgeted for and expected. Furthermore, without trained and knowledgeable staff on the defined framework, efforts lack coordination. Other effects of not having a defined and established framework with trained team members include:

- Unable to integrate with the department’s strategic IT plan, information architecture, and technology direction.
- Costly reworking.
- System security and confidentiality compromised.
RECOMMENDATION #1

We recommend the Department of Environmental Quality:

A. Establish and clearly define the development framework to be used in TREADS development.

B. Ensure all staff with a role in TREADS development are trained on the established development framework.

Agile Roles in TREADS Reviewed and Assessed

Agile best practices emphasize the values surrounding individuals and interactions, working products, customer collaboration, and responding to change quickly. Industry leaders also outline roles and responsibilities within an agile framework. An example is a product owner, or owner of the system, who is typically one person. Other roles include development team and scrum master, whose primary responsibility is to keep the project team on track. During the spring of 2017, we observed and interviewed the TREADS team members. We observed interactions, conversations, and overall engagement in the project. While gaining a better understanding of team members’ roles and responsibilities within an agile framework, we compared the department’s practices to industry best practices. Furthermore, we reviewed the overall approach to agile roles and responsibilities.

Although the department held required meetings and created tasks for team members using user stories, we observed that defined roles and responsibilities were not enforced or understood. In addition, through interviews with TREADS team members that included bureau chiefs, section supervisors, and technical staff, we discovered there was a lack of understanding of the various roles and responsibilities within the project, including their own. It is important for all TREADS team members, regardless of position in the department, to have a clear understanding of the agile values and principles for an organized approach to development and implementation. It also provides clear roles within the project to ensure deliberative work is accomplished.

Importance of Roles and Responsibilities in System Development

Roles, responsibilities, and accountability can be found throughout many project management industry standards. Although policy does not exist for project management framework, the State Information Technology Services Division (SITSD) encourages the adherence to the Project Management Body of Knowledge (PMBOK).
PMBOK is a collection of processes, best practices, terminologies, and guidelines that are accepted as standards within the project management industry. According to PMBOK, human resource planning is used to describe how roles and responsibilities, reporting relationships, and staffing management will be addressed and structured within a project. Effective human resource planning should consider and plan for the availability of or competition for scarce resources. Other projects may be competing for resources with the same skill sets, which could affect project costs, schedules, risks, quality, and other project areas.

**Roles and Responsibility Documentation Lacks Enforcement**

Department documentation provides several outlines of the TREADS team roles and responsibilities. The documentation initially provided clear direction of the expectations from each team member. However, staff turnover occurred and many team members either do not understand their roles and responsibilities or have other conflicting department work tasks that do not allow them to put the time and resources into their TREADS project responsibilities.

Through observations and interviews, many of the TREADS team members were unclear about their roles and responsibilities within the project. It was found that a staffing plan or human resource plan had not been maintained or enforced for the project team. Although the department had roles and responsibilities documented, these roles and responsibilities had not been updated consistently when staff turnover occurred and were not being enforced as outlined by industry standards.

**Confusion Among TREADS Team Members Led to Non-Prioritized Work Completed**

Staff were unclear about their role and responsibility within TREADS project because the department reorganized, but the uncertainty can also contribute to the loss of the DDI vendor, and the department taking over the project internally. Team members performed work that was supposed to be completed by other staff. For example, the project manager, without communicating to the team, completed user stories or delegated tasks detailing specific pieces of the system, which were originally assigned to technical staff. Although best practice indicates team members are encouraged to take stories from the backlog, regardless of who was assigned, staff become unclear on what is expected of them in a sprint without proper communication. Furthermore, by not communicating that tasks were completed by different staff, development of a specific feature risks not working cohesively with rest of system. Another example includes inconsistent testing conducted without input from product owners. In a typical waterfall approach, different levels of testing occur by the subject matter expert.
at each level. However, in an agile framework, testing is done by all team members at the same time. This allows for consistent transfer of information and clear expectations. Additionally, audit work found that temporary contracted support were performing a majority of the work. By allowing this to happen, the department risks losing key information as well as internal staff relying heavily on temporary staff to complete their tasks. Without a clear, updated, and enforced staffing plan, the communication of knowledge risks being lost and expectations missed.

Additionally, work tasks were completed that were not vetted through the steering committee or included as part of the transition analysis. Because there was not a clear understanding or enforcement of team members’ roles and responsibilities, work was completed without project management knowledge or approval. This increased the number of tasks in the backlog, which then caused additional work for the contracted authorized temporary development staff, inevitably costing the department additional resources to extend the temporary development staff contract.

The department did not have enforcement and accountability for the system development team, because there were not well-defined roles and responsibilities for each team member. There were also communication and coordination issues because the reporting structure was not clearly defined. These issues reduced the collaboration between team members, which resulted in the TREADS project not being developed as efficiently as it should. This issue became more elevated once the development team began to experience staff turnover and a department reorganization changed staff roles within the department. A formalized project-staffing plan defining the roles and responsibilities of system development staff and a required reporting structure could have improved the overall effectiveness of the system development team.

**RECOMMENDATION #2**

*We recommend the Department of Environmental Quality develop and enforce a TREADS project staffing plan that:*

A. *Clarifies and defines roles and responsibilities of all team members.*

B. *Establishes reporting and communication structure.*
Chapter III – Managing TREADS Project Risks

Introduction

The second objective of our audit was to determine whether the Department of Environmental Quality (department) is mitigating risk by implementing controls during sprint development. Sprint development is a set period of time during which specific work has to be completed and made ready for review. This chapter discusses details regarding risk mitigation and how the department applied risk mitigation through sprint development. Technical risk deals with unproven assumptions in emerging design that might significantly affect the ability to deliver the solution. Technical risk also deals with feasibility and means there is a proven solution that can be delivered within the time and cost constraints of the project. Technical risk includes security of the system, system performance, and automation of data integrity. Specific technical risk examples include user interface stability, data integrity controls, and network connectivity with other systems. By applying controls to address these specific technical risks, assurance is given that the new system is secure, accurate, and efficient.

Mitigating System Risk in User Stories and Product Backlog Is Important

The department took steps to address business risks; however, audit work found that technical risk had not been addressed or mitigated. Application of controls and monitoring of such risks includes applying specific language within a risk register (official log of both business and technical risks associated within the project), product backlog (maintained project requirements), during sprint development.

We compiled various best practices and standards from industry leaders in agile/scrum, specifically in mitigating risk in the selected framework. Best practices recommend applying technical risk through user stories and the project’s product backlog. It also highly recommends applying and addressing risk early and often, with a transparent and open dialogue.

Mitigating technical risk is important because if these risks are not addressed, the final system risks the possibility of security breaches, broken functionality, or limited performance expectations. Addressing these risks improves the chances of minimal issues after implementation. Additionally, the earlier the risks are addressed, there is more assurance the system will be implemented on time and on budget.
TREADS Technical Risk Mitigation Reviewed

Based on reviews, while the original design, develop, and implement (DDI) vendor was still contracted and developing TREADS, it made a consistent effort to address and mitigate technical risks during sprints and releases. During previous development efforts with the contracted vendor, the department, with vendor guidance, applied technical risk mitigation to sprint development. This included user stories assigned to security, segregation of duties, or network risks as well as screenshots of developed functionality to address technical risk such as role-based assignments and the path for assigning roles. The DDI vendor appeared to follow agile/scrum best practices and attempted to include end users (product owners, subject matter experts) into the development of processes and features. However, the department ended the contract in 2016 and ended the practices previously conducted by the vendor, including mitigating risk during sprint development.

Through review of user stories, sprints, and other documentation, we found that technical risk considerations had not been revisited or applied to the backlog since the break with the vendor. Additionally, while many technical risks surfaced from the shift to internal development and were discussed in various meetings, these risks had not been added to the project’s official risk register. Additionally, user stories are missing evidence that these considerations have been applied to sprint development or the product backlog. Furthermore, documentation regarding technical and security considerations has not been updated to reflect the break with the vendor or considerations on technical risks associated with limited code from the vendor.

The department has also not begun developing systematic reports such as error reports, audit of system changes, and data checks. This is scheduled for later on in the project but user stories or potential system problems or issues have not yet been created to address these system requirements in the product backlog. Therefore, the potential exists for these risks to be overlooked as the project reaches budget and timeline constraints.

Issues Faced if Technical Risk Unmitigated

Since the department did not have consistent and transparent technical risk mitigation through user stories and sprint development, problems with TREADS functionality and integration occurred. For example, the department’s transition analysis estimated an additional twelve weeks of work, but the work is at least six months behind schedule due to unintended technical complications such as integration of previous DDI source code and internal customized coding of new table and workflow structure. If technical risk is not mitigated, the department may create unpredicted functional and technical issues that can affect final implementation. There is also a
higher risk of missing important system controls such as access privileges and data checks. Additionally, without consistently and proactively considering technical risk and ensuring documentation is updated, the department risks encountering additional technical issues that may further delay the project.

The lack of transparency associated with technical risks gives management a less comprehensive picture of project status. While the department believes the project is not at the stage to begin addressing technical risks, best practices and industry standards indicate technical risk should be addressed throughout the project’s life cycle. We would expect to see technical risk being addressed in the project’s risk register, product backlog, and during sprint development, so these considerations not only remain on the department’s radar, but also provide a road map in case there is staff turnover.

Although the department began meeting to address the various technical risks, overall the department is missing consistent and transparent risk mitigation during sprint development. In order to mitigate risk most effectively, business and technical risk should be addressed early and often in the system development process.

**RECOMMENDATION #3**

We recommend the Department of Environmental Quality create consistent and transparent technical risk mitigation for TREADS by:

A. Adding technical risk mitigation to the project tasks and risk register.

B. Prioritizing technical risk mitigation during development.
Chapter IV – Internal and External Communication of the TREADS Project

Introduction

The third objective of our audit was to determine the status of the Tracking Remedial Environmental Actions Data System (TREADS) and how status is communicated and reported to internal and governmental stakeholders. This chapter discusses details regarding communications and how the Department of Environmental Quality (department) needs to make improvements to better ensure information it reports on the TREADS project is open and transparent. This chapter also discusses the department’s status reporting and how status is reported to executive management, the Department of Administration’s (DOA) State Information Technology Services Division (SITSD), and the Legislative Finance Committee (LFC).

Communication Key to Project Management and System Development

The Project Management Body of Knowledge (PMBOK) outlines several standards for all communication within a system development project. PMBOK is the entire collection of processes, best practices, terminologies, and guidelines that are accepted as standards within the project management industry. Although communication can come in many forms and avenues, effective and collaborative communication practices are required for any project to be successful. According to agile values, collaboration, individuals, customers, and interactions are vital to a successful project. All of these elements can be considered part of the larger communication structure within the project.

TREADS Spans Multiple Department Bureaus

Communication becomes even more important when a system spans across multiple internal stakeholders, which is the case with TREADS. The new system will support six programs and one administratively attached board within the Waste Management and Remediation Division (division). The goal of the system is to be able to share and maintain data in one centralized location for the division. Although data from each section is used for different purposes, the data will be able to be shared to serve the different purposes within the division; each program will have its own process template and customized workflow process for various purposes such as electronic submittal of forms and task lists.

The programs included in the project are:

- Underground Storage Tank Section
- Petroleum Tank Cleanup Section
It is also worth noting that although the Petroleum Tank Release Compensation Board (PTRCB) does not report directly to the division, it reports to an external board. PTRCB has additional financial and reporting requirements that will be specific to the board. Each program has a variety of staff members with different interests in the system and each has its own product owner and/or subject matter expert. Although requirements have been set for the project, it is important to have a decision-making body to prioritize not only at the bureau level but at the agency level, and to ensure requirements are met as well as resolve any conflicts that may arise. Due to the division-wide goals of being able to share data, communication between the seven programs is imperative to ensure needs are met, but yet a flexible enough system to serve as a division-wide tool. The following section discusses specific areas reviewed and improvements that can be made in the department’s internal communication and overall project success.

**Project Participation and Meeting**

**Attendance Needs Improvement**

Through observations of meetings and staff interactions, we determined that participation and collaboration were limited. Many meetings occurred during the observed 15 sprints. For each sprint, we tracked attendance for the product owner demonstration, project status, and sprint planning meetings. We grouped the 30 team members into five areas of expertise, including Project Managers (2 team members); IT Operations (5 team members); Subject Matter Experts (11 team members); Product Owners (7 team members); and Executive Management (5 team members). If a team member was excused from the meeting, we noted them as attended. Best practices call for full participation and attendance from all team members in order to meet effective collaboration and communication values. Therefore, we would anticipate 100 percent attendance from each group. As Figure 5 (see page 27) shows, only the project status meetings had 100 percent attendance by Project Managers, Subject Matter Experts, and Executive Management, whereas IT Operations and Product Owners only attended 27 percent and 93 percent, respectively.
Figure 5
TREADS Participation and Attendance Analysis

Sprint Planning Meeting Attendance

Project Manager | IT Operations | Subject Matter Experts | Product Owners | Executive Management

Project Status Meeting Attendance

Project Manager | IT Operations | Subject Matter Experts | Product Owners | Executive Management

Product Owner Demonstration Meeting Attendance

Project Manager | IT Operations | Subject Matter Experts | Product Owners | Executive Management

Source: Compiled by the Legislative Audit Division
As illustrated in the figure, many product owners did not actively participate in meetings and conversations. As part of our audit work, we reviewed and evaluated several sprints occurring over many months and we found attendance fell behind approximately halfway through the sprints we evaluated. Agile/scrum best practices and industry standards recommend consistent inclusion and participation in all project related meetings. This provides a collaborative and communicative environment in which successful projects can be attributed. Additionally, this environment provides an opportunity for project members to become cross-trained.

Our observations identified several other concerns:

- Meetings were often short and with limited communication and did not accomplish items that are expected in an agile framework.
- Team members were ill-mannered and disrespectful to each other during day-to-day conversations, and some meetings regarding TREADS conversations were lacking in professional and respectful communication.
- Key project staff often lacked engagement and interest in the project.

Due to the agile/scrum framework, professional and civil communication and collaboration are necessities. Projects with successful and effective communication practices have more transparency and the ability to correct issues in an efficient manner. This leads to better system implementation because all team members will be focused on meeting the needs and expectations of a final product. As can be seen by the participation in the meetings above, as well as our staff interviews and meeting observations, these pieces of agile values were not always present.

**Department Not Following Project Communication Plan**

The department created a communication plan at the beginning of the project, which has been updated once since ending the contract with the design, develop, and implement (DDI) vendor. The document outlines policies and procedures on internal and external communications regarding the project, however after reviewing the documentation and through meeting observations, we determined the department was not following their developed procedures.

The communication plan outlines review and approval of meeting minutes and documents, however we found these were not approved or in many cases not reviewed by necessary staff before the next meeting. Many times, topics previously discussed were brought up again because staff had either not attended the previous meeting and notes were not reviewed, or follow-up to the documents/discussions had not occurred.
Another example in the communication plan where the department was falling short included updating the Requirements Traceability Matrix (RTM) and the product backlog. The RTM is the initial set of system expectations or project requirements. These listed project requirements were used in the overall project decision package and outline all required pieces of the new system. The product backlog serves a similar purpose, however the product backlog is designed for an agile approach. Due to the hybrid approach the department is taking to agile, using both pieces is important in tracking progress and projections. It was discovered that the RTM was not being updated consistently or accurately based on current work, nor was the product backlog updated and maintained. Therefore, information communicated during meetings was not always transparent.

Although the department discussed implementing deliverables or milestones outlined in the communication plan, there is limited evidence this actually occurred despite the procedural requirement outlined in documentation. While the department discussed implementing these elements in future releases, milestones and deliverables have yet to be delivered. The shortage of clear priorities and set milestones/budgets also effects how much commitment is given to the project from TREADS team members. The effects of missing a collaborative and interactive culture/environment have led to disengaged TREADS team members, disorganization, and an overall absence of professional communication within the project.

**Multiple Factors Impact Project Success, Making Formal Communication Plan Vital**

While various changes attributed to confusion surrounding the project, including major department reorganization, loss of key staff, and severing ties with the original DDI vendor, ultimately the project team has not reestablished its communication plan since these events. This communication breakdown causes unclear priorities and input from management, limited management knowledge, and lack of understanding of project and project framework. This in turn can potentially cause inaccurate information to be shared with stakeholders, resulting in resources to not be allocated appropriately to meet users’ needs, schedule, and budget.

The department does not have effective and transparent internal communication practices. Because it does not follow or update its communication plan, staff and team members do not have a full understanding of overall department communications and team members do not fully understand the hybrid approach to agile/scrum values. These issues are occurring because the department’s communication plan has not been clearly aligned with TREADS development framework.
Recommendation #4

We recommend the Department of Environmental Quality update and align its communication plan with its TREADS development framework.

Overall Communication and Steering Committee

Engagement Needs Improvement

The department’s project communication plan also describes the purpose of the project’s steering committee. The steering committee serves as the final decision point for the project and is composed of product owners, the division administrator, and key technical staff such as the technical lead, project managers, chief information officer (CIO), and the chief security officer (CSO).

Engagement and Prioritization of TREADS

Varied Among Project Team

During fieldwork, we determined the TREADS steering committee did not meet on a consistent and ongoing basis from October 2016 to February 2017. Additionally, there was miscommunication and misdirection between the TREADS team, steering committee, and management. Many times management reiterated the project was a high priority, but when speaking with subject matter experts and technical staff, those priorities were not always enforced. Many team members had conflicting work that took priority.

Additionally, based on interviews with product owners and TREADS team members, as well as numerous observations of project-related meetings, we identified several challenges in internal communications. It was clear the challenges with rebaselining (changes to system’s foundation), even though they were discussed, were not fully understood by TREADS team members and executive management. We also identified miscommunication regarding the overall prioritization of the project and how product owners and the steering committee communicated priorities to the TREADS team.

It is shown through the risk register, the log of all project risks, that staffing resources are a risk. However, there is still a misrepresentation of priorities between management and project staff. Meaning the team keeps moving forward with current time estimates; however, team members work on other departmental priorities, impacting the project. This can be shown through evidence of user stories moved/deleted in a
sprint, attendance and participation, and daily communications. The breakdown in communication caused delays in schedule and overall transparency. There is a lack of a clear picture of what remains to be done in system development and what is complete. Without a clear picture, internal stakeholders do not have a thorough understanding of project health or have the ability to set department-wide priorities.

**Agile Values Focus on Communication and Collaboration**

In a traditional agile approach, there is typically only one product owner. However, because there are multiple product owners in this specific project, it is even more important the steering committee meets to ensure the project is on track, on budget, and that risks are mitigated. Additionally, because several programs have invested in the project, a decision-making group is required to determine priorities of the project at the agency level.

**Overall Improvements to Culture Need to Occur to Ensure Effective New System**

During the early part of our audit fieldwork, we identified technical difficulties with TREADS source code, personnel issues, competing legislative session priorities, and overall absence of engagement among staff. Once these findings were discussed with the department, the steering committee did begin holding regular twice-a-month meetings. However, through continuing observations of various meetings and interviews with staff, we observed staff members were still not effectively communicating with each other throughout the project, including steering committee meetings. While small project changes have occurred and were approved by the steering committee, the impediments and roadblocks faced by the project are left largely undiscussed by the committee due to limited collaboration and interaction between team members. Overall, the TREADS project has been adversely affected by an unhealthy organizational culture, which needs to be addressed directly at the departmental level. In particular, due to the existence of several product owners, it is important to have a decision-making body to prioritize the system’s needs and goals, so the department needs to focus its efforts in the role of the steering committee.

**Recommendation #5**

We recommend the Department of Environmental Quality establish, prioritize, and enforce a project culture of collaboration and interaction by ensuring TREADS steering committee takes an active, engaged, and consistent role in the project.
Following Best Practices Improves Governmental Reporting and Communication

Various laws and rules require certain information on state IT projects be reported. All business application systems funded through House Bill 10 in the 2013 Legislative Session must have had a plan approved by the state of Montana's CIO to determine if the implementation plan fits according to the department and state's needs. Additionally, rules require agencies to report progress of software and management. Agencies that receive House Bill 10 funding over $500,000 are required to report to the Legislative Finance Committee (LFC) per committee rules. Agencies are required to report status on costs, budgets, and overall system health through SITSD where the information is compiled and presented to LFC. Due to high value systems and agencies receiving tax dollars for the systems, LFC reviews and assesses risks of those systems. This not only holds the agency accountable for spending tax dollars, but also provides oversight of new information management systems developed throughout the state of Montana.

The department currently reports to the LFC as required. Due to the higher risk in developing a custom system as well as time and budget concerns, the CIO, and LFC have listed TREADS as medium risk over various stages of the project. The department reports it is 65 percent done with the project. The project managers clarified that the 65 percent refers to the design and development phase of the project, not the project as a whole. The department maintained the June 2018 implementation date, but decided to break up the implementation into two production releases. The department has yet to determine what these two releases will look like. Because of the length of time this system development project has currently taken, the number of changes in the schedule, and the overall high risk in developing custom systems, ensuring communication is clear and accurate while considering the documented agile/scrum framework is required.

Agile Best Practices Use Velocity Calculations and Burndown Charts

The department currently uses Gantt Charts (a chart in which a series of horizontal lines shows the amount of work done or completed in certain periods of time in relation to the amount planned) to provide a visual of progress and projection. However, these kinds of visual aids do not provide an accurate picture of progress in this type of project management framework. Velocity calculations are part of agile/scrum best practice tools and are readily available through the department's use of an issue tracking application. Within the application, multiple calculations exist to provide a way to communicate the overall health of the project. The calculations are done to measure the speed at which work is delivered in a sprint. The velocity rate is calculated to determine how
much value has been delivered thus far, when all user stories in the product backlog will be delivered, and how many story points will be delivered by a certain date. Story points are an assigned number based on the time and effort it will take to complete a task. The velocity calculations then produce a velocity chart. Because the department did not develop this calculation, we created a rough calculation based on current completed story points per each sprint. Our best-case scenario calculation provided an implementation date several months past the department’s projected implementation date of June 2018. This timeline was also validated by two external contractors hired by the department as part of the project.

Another effective estimation and planning tool used in an agile/scrum environment, which is readily available in the issue tracking application, is the burndown chart. Burndown charts display the remaining effort for a given period, usually within a sprint or release. The department uses burndown charts for sprints; however, we determined the department is not estimating story points and efforts effectively, therefore producing inaccurate calculations and not meeting deadlines for produced functionality. Figure 6 (see page 34) provides an example of Sprint 52 through Sprint 54 burndown charts. Although the example is a small sample of reviewed sprints, the burndown charts consistently did not meet industry best practices. During fieldwork, the department attended an estimation training to better align the charts to best practices, however we found improvements were not being made. The gray line represents the amount of work within the sprint (ideal effort), which is measured by the total story points assigned in a sprint. The red line shows the remaining work (effort) during the sprint. The shaded gray represents the non working days.
Figure 6
Example of Department’s Burndown Charts for Sprint 52 through Sprint 54

Sprint 52
(March 2, 2017 - March 16, 2017)

Sprint 53
(March 16, 2017 - March 30, 2017)

Sprint 54
(March 30, 2017 - April 14, 2017)

Source: Compiled by the Legislative Audit Division using department records.
While the department uses burndown charts, an effective and proper agile/scrum framework should reflect best practices, as shown in the figure below. The best practices figure shows the effort remaining in the sprint and the ideal effort hours closely aligning. If efforts and calculations had been managed effectively, the department’s burndown charts would better reflect best practices.

As discussed above, the department was not tracking progress and projections accurately. It uses a project management and issue tracking application, which provides several agile tools to assist in providing velocity calculations and various progress reports such as burndown charts and monitoring and control reports. Audit work found that these readily available tools to assist in schedule and budget calculations were not being used. This included the use of velocity charts, proper use of burndown charts, and overall estimation tools for the entire project. The department was aware the project was missing the usage of the readily available agile tools; however, staff lacked the necessary resources and knowledge of these tools. The department has since provided staff training on project budget and estimations in an agile project and is actively trying to improve overall estimations of story points and user stories.

Effects of Steering Committee Disengagement on External Communications

We found that milestones and deliverables had not been created, and communication on progress and projections was limited. This has been discussed several times during steering committee meetings; however, these calculations had not been delivered as of the end of audit fieldwork. The department tracks its progress and projections through Gantt Charts, but does not use a work rate ratio for calculation. Although Gantt Charts are effective tools for project management, when following an agile/
scrum approach, there are better, more accurate calculation tools that can be used in an agile framework. Furthermore, the department’s TREADS Gantt Charts provides inaccurate estimations and has limited transparency due to constantly moving implementation dates and undeveloped functionality.

The absence of consistently scheduled steering committee meetings created a lack of updated and current knowledge being communicated to executive management, eventually resulting in missing key information being communicated to governmental stakeholders. For example, when we met with Legislative Fiscal Division (LFD) staff it was discovered that the LFC was not aware that rebaselining was still occurring. Additionally, when interviewing the state CIO we discovered SITSD was not aware of the agile/scrum hybrid approach the department was taking or the turnover in key staff. We also determined meetings were not documented with the details needed to make a clear assessment of project issues with TREADS. Although the department aligns with required statutory reporting, improvements in transparency could be made if calculation tools and steering committee reporting occurred consistently and accurately.

Finally, the department decided to break the implementation into two production releases. As audit work continued, we found that functionality and other features of the system are being pushed further behind. Because of staff turnover and conflicting system needs between previous and existing staff, other programs with high investment dollars have yet to begin development. Since there will now be two production releases, it is also unclear if all project objectives and goals will be implemented according to the release date provided to LFC.

**Improvements to Project Budget and Timeline Estimates Need to Occur**

Although the department adheres to reporting processes and schedules required by SITSD and LFC, improvements can be made to ensure governmental and internal stakeholders understand the current progress the department is making with TREADS. Furthermore, the department should be using readily available tools to assist with estimating and communicating project status. Although the department uses Gantt Charts to provide visuals of progress and scheduled timeline, due to the nature of an agile/scrum project, providing constant and updated information based on current sprints, story points, and releases will better reflect timelines and progress.
RECOMMENDATION #6

We recommend the Department of Environmental Quality:

A. Develop calculation tools that reflect best practices for TREADS established framework.

B. Use developed tools to track time, establish deliverables and milestones, and project TREADS schedule and budget.

C. Use projections to better communicate TREADS status to internal and governmental stakeholders.
November 1, 2017

Mr. Angus Maciver
Legislative Auditor
Legislative Audit Division
PO Box 201705
Helena, MT 59620-1705

RE: TREADS Information Technology Audit #17DP-01

Dear Mr. Maciver,

Thank you for the opportunity to respond to the Information Technology Audit #17DP-01 for the Department of Environmental Quality. We have reviewed the recommendations contained in the report and provided our responses below.

**Recommendation #1**
We recommend the Department of Environmental Quality:
A.) Establish and clearly define the development framework to be used in TREADS development.
B.) Ensure all staff with a role in TREADS development are trained on the established development framework.

Response #1
A.) DEQ concurs with the Legislative Audit’s Division’s recommendation to have a clearly defined project framework. Throughout the project, we have defined and attempted to use a hybrid approach on the project. The goal was that software development was to follow an agile software development approach and general project management will follow best practices as prescribed in the Project Management Body of Knowledge. This has had some success, but has led to some confusion on roles and responsibilities and enforcement of the framework. By December 1, 2017, DEQ will update its documentation to provide more clarity where and how best practices are used for general management of the project and clearly define the development framework to be used.
B.) Once DEQ revises its framework, all staff with a role in TREADS will attend required training on the established project and software development framework.

**Recommendation #2**
We recommend the Department of Environmental Quality develop and enforces TREADS project staffing plan that:
A.) Clarifies and defines roles and responsibilities of all team members
B.) Established reporting and communication structure.
Response #2
A.) DEQ concurs with the Legislative Audit’s Division’s recommendations. There has been staff turnover and transition in the development of TREADS that have led to challenges. DEQ has made steps to address these concerns and we will be continuing with efforts to clearly define roles and responsibilities of all team members. Once DEQ revises its project management and software development framework (as discussed in Recommendation 1), we will evaluate roles and responsibilities of all team members and revise these where necessary. The estimated timeframe for this is by mid-November 2017.
B.) DEQ will ensure that there is a reporting and communication structure for project decision making, escalation of issues and concerns, and fully embracing a Steering Committee approach. The estimated timeframe for this is by mid-November 2017.

RECOMMENDATION #3
We recommend the Department of Environmental Quality create consistent and transparent technical risk mitigation for TREADS by:
A.) Adding technical risk management to the project tasks and risk register
B.) Prioritizing technical risk mitigation during development.

Response #3
A.) DEQ concurs and has informed all team members that they are responsible for identifying technical risk as part of the project’s risk management process. DEQ has been identifying technical risks since the beginning of the project and is working towards mitigating those risks.
B.) DEQ will incorporate additional guidance in our communication strategy for communicating and prioritizing those risks.

RECOMMENDATION #4
We recommend the Department of Environmental Quality update and align its communication plan with its TREADS Development framework.

Response #4
DEQ concurs with the Legislative Audit’s Division’s recommendations as stated in our response to recommendation #2.

RECOMMENDATION #5
We recommend the Department of Environmental Quality establish, prioritize, and enforce a project culture of collaboration and interaction by ensuring TREADS steering committee takes an active, engaged, and consistent role in the project.

Response #5
DEQ concurs with the Legislative Audit’s Division’s recommendations. DEQ will re-evaluate the structure, roles, responsibilities, and communication tools/process of the Steering Committee to better support a project culture of collaboration and interaction.
**RECOMMENDATION #6**

We recommend the Department of Environmental Quality:
A.) Develop calculation tools that reflect best practices for TREADS established framework.
B.) Use developed tools to track time, establish deliverables, and project TREADS schedule and budget.
C.) Use projections to better communicate TREADS status to internal and governmental stakeholders.

**Response # 6**

DEQ concurs with the Legislative Audit’s Division’s recommendations.
A.) DEQ will use and in some cases, continue to use calculation tools that best reflect the TREADS Project Management and Agile Software Development framework. For example, at the end of a two week sprint, a written status report will be submitted to the Steering Committee and Product Owners for review. Each report will include the following information:
   a. Summary of status for scope, budget, and schedule
   b. Summary of issues and risks impacting the scope, budget, or schedule, including project staffing and technical risks
   c. Work accomplished during the current iteration
   d. Work planned for the next iteration
   e. Status of delivery for each major deliverable in the project
   f. Sprint Burndown chart which shows the trend in completing project tasks
   g. Velocity chart to help determine team velocity and help with estimating what team can achieve in future sprints
   h. Updated Deliverables and Milestone chart showing the current status of the project.
B.) DEQ will use developed tools to track time, establish deliverables, and project TREADS schedule and budget.
C.) DEQ will use projections to better communicate TREADS status to internal and governmental stakeholders. With that said, DEQ is using the Legislative Finance Committees’ established reporting requirements for state projects which are based on Earned Value Management. Due to DEQ’s awareness of the heightened risk associated with the project, DEQ provided a supplemental report during the last LFC reporting period.

I want to thank you and your staff for the professionalism and fairness during the audit fieldwork and conferences. We appreciate the willingness of the auditors to discuss recommendations and respond to our questions. We always look upon the audit process as an opportunity to improve the department’s operations and performance.

Sincerely,

Tom Livers
Director
Department of Environmental Quality