

# LEGISLATIVE AUDIT DIVISION

Angus Maciver, Legislative Auditor  
Deborah F. Butler, Legal Counsel



Deputy Legislative Auditors:  
Cindy Jorgenson  
Joe Murray

## MEMORANDUM

**TO:** Legislative Audit Committee Members

**FROM:** Bill Hallinan, Information Systems Auditor

**CC:** Department of Environmental Quality:  
Shaun McGrath, Director  
George Mathieus, Deputy Director  
Peggy MacEwen, Administrator, Central Services Division  
Jenny Chambers, Administrator, Waste Management and Remediation Division  
Stephen Forrest, Chief Information Officer, Information Technology Services

**DATE:** October 2019

**RE:** Information Systems Audit Follow-Up (19SP-10): *System Development and Project Management for the Tracking Remedial Environmental Actions Data System (TREADS)* (orig. 17DP-01)

**ATTACHMENTS:** Original Information Systems Audit Summary

### Introduction

Our Information Systems audit report titled *System Development and Project Management for the Tracking Remedial Environmental Actions Data System (TREADS)* (17DP-01) was issued to the Legislative Audit Committee in November 2017. The audit included six recommendations to the Department of Environmental Quality (DEQ). We conducted follow-up work to assess implementation of the report recommendations. This memorandum summarizes the results of our follow-up work.

### **Overview**

Our audit presented information about the system development and project management of the TREADS system. The purpose of TREADS is to enable DEQ to better align business processes and provide a more efficient approach to sharing, maintaining, and reporting data through a centralized system. TREADS spans six programs and one administratively attached board within the Waste Management and Remediation Division. In December 2018, DEQ reported the system development phase of TREADS as complete. Presently, DEQ actively manages TREADS in the operations and maintenance (O&M) phase of the software development lifecycle (SDLC). This means DEQ modifies existing features, diagnoses and fixes existing errors, and implements new features as needed. Our follow-up work determined the system is not meeting all business needs originally intended.

Our audit contained six recommendations to DEQ. DEQ concurred with all recommendations and reported them complete in their follow-up report to our office. These included recommendations for creating and enforcing a system development framework with defined roles and responsibilities, improving technical risk mitigation, and improving communication and status reporting. Based on follow-up work, we found DEQ partially implemented four recommendations and did not implement two recommendations.

## **Background**

TREADS is a single point data entry (one system access point for data entry) web-based system that supports DEQ's Waste Management and Remediation Division (division). The multiple programs the system serves 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. TREADS manages data, environmental samples, and documentation as well as integrates with a spatial data system.

In 2013, the division hired a vendor to design, develop, and implement TREADS. In June 2016, after the vendor's contract was terminated, the division took over TREADS' project management and system development. Our audit focused on the division's design and development of TREADS and examined the division's system development methodology (framework). The framework serves to organize, program, and supervise the process of developing a software system. The division was using the former vendor's Agile/Scrum framework. The Agile/Scrum framework is used to deliver working software frequently, from a couple weeks to a couple months, with a preference on a shorter timescale. Other common frameworks exist like the Waterfall framework, a traditional method for large projects where work is a sequential, linear process of several discrete phases. No phase begins until the prior phase completes. When a phase has completed, it is not reopened. Both development frameworks have advantages and disadvantages.

Our original audit had three objectives. We wanted to determine:

- If development methodology aligned with best practices to ensure an effective system development process,
- If the use of Agile/Scrum mitigated business and technical risk by implementing controls during sprint development, and
- The status of TREADS and how the status was communicated and reported to internal and governmental stakeholders.

Our audit work determined DEQ was missing a clear and defined project development framework for TREADS. Although DEQ addressed business risk and specific design challenges within sprint development, key technical risks were not being mitigated through sprint development. While progress was being tracked at a high level, improvements needed to be made in overall progress reporting and communication of status to both internal and governmental stakeholder. Audit work also identified a lack of healthy culture necessary for a successful project.

## **Audit Follow-Up Results**

Follow-up work included discussions with the agency, review of the project management system, and inspection of various project documents, presentations, meeting notes, training material, and status reports. DEQ reported the TREADS project as closed as of December 31, 2018, and DEQ reported all audit recommendations as implemented in January 2019. DEQ recategorized TREADS from a development project to a project in O&M.

## **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.**

### **Implementation Status – *Not Implemented***

The purpose of the recommendation was to ensure a successful project using an effective development framework. At the time of the audit, the Agile/Scrum framework was not effectively used because roles and responsibilities defined by the framework were not understood and enforced. DEQ selected the Waterfall development framework as a model for software development to complete the project. DEQ reported TREADS' documentation was updated to provide more clarity on where and how to use best practices. DEQ provided on-site training regarding reporting, communication, responsibilities, expectations, and tools. Staff with roles within TREADS were identified and their responsibilities clarified, especially for the steering committee and development team. Our follow-up review determined the Waterfall method was not clearly defined, especially the controls to ensure project success. Users continued to describe the methodology as a mix of Waterfall model with Agile/Scrum tools. DEQ's training material did not describe the key controls for a Waterfall model, such as the necessity to successfully complete one phase before beginning the next. The incomplete Waterfall phases were development and testing. Because of not defining the framework and its controls, TREADS users experienced significant problems. For example, testing was incomplete, bad data was present, and reporting was incorrect for invoice processing and payments.

### **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.**

### **Implementation Status – *Partially Implemented***

The purpose of the recommendation was to ensure staff participated and communicated in the development process in meaningful and effective ways to assure a successful project. At time of the audit, the TREADS steering committee was not involved with critical decisions for the project's direction. Multiple priorities set by multiple DEQ programs overwhelmed the capacity of the development team to maintain focus towards the original purpose of TREADS. DEQ discussed and made changes to project management plans and staffing plans for greater clarity, then provided training for all TREADS participants on their responsibilities and on how to report concerns and progress. The steering committee became stronger, meetings better attended, and concerns were generally discussed and acted upon. However, follow-up work observed a breakdown in the reporting and communication structure between August 2018 and December 2018. Meeting notes suggested the steering committee became less effective in addressing problems in testing and data quality. Incomplete testing did not reveal data conversion errors and missing controls to limit data duplication.

### **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.**

### **Implementation Status – *Partially Implemented***

The purpose of recommending consistent and transparent technical risk mitigation and prioritization was to ensure all TREADS members knew what work was most important and why certain types of work had priority over others. At the time of the audit, important technical risks were not prioritized, and TREADS risked longer delays and increased costs by not clearly communicating risk.

DEQ identified technical risks at the beginning of 2018 and risk mitigation discussions occurred during standup and steering committee meetings. DEQ used a risk register, a tool for documenting risks and actions to manage each risk. During our follow-up work, we found DEQ added technical risk discussions to their standup meetings. However, we identified risk that were not being tracked in the risks register. Examples include:

- Risks about user acceptance testing and out-of-date test scenarios,
- Incomplete cross-functional testing and compatibility assurance,
- Incomplete work and its financial consequences,
- Missing system controls and error induction, and
- Data quality checks and data conversion errors.

#### **RECOMMENDATION #4**

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

#### ***Implementation Status – Partially Implemented***

The purpose of this recommendation was to create better communication within the project teams to ensure a successful project. At the time of the audit, the Agile communication plan was not effective in managing communications between the many programs within a multi-level department in a large state agency. TREADS users did not have a clear understanding of management priorities and decisions. During our follow-up work, we found DEQ updated its communication plan with clear priorities between programs, the steering committee, and the DEQ management team. Our work showed the communication plan clarified the reporting structure. However, how DEQ implemented the Waterfall methods did not reduce risk. Critical communication processes of the Waterfall model were not present. As TREADS progressed from development, to testing, to implementation, we found no evidence the communication plan was aligned with the key controls of the Waterfall framework. If it had been, each phase of the Waterfall would have been satisfactorily completed before the next phase began.

#### **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.**

#### ***Implementation Status – Partially Implemented***

This recommendation was made to emphasize the leadership role of the steering committee in plotting successful TREADS implementation. At the time of the audit, the steering committee did not effectively prioritize and communicate priorities. The scope and consequences of decisions were buried at a program level, causing conflict as programs requested features and functions that might adversely affect another program. These over-arching decisions needed steering committee attention and resolution to provide consistent direction for every program. Our follow-up work found the steering committee took a more active role since the completion of our original audit work. We found the development team acted in a more collaborative and productive way and TREADS progress improved. Despite these efforts, however, the collaboration and interaction did not ensure all TREADS programs were complete and ready for production. We found two DEQ programs unable to use TREADS for business purposes, and all programs had some nonfunctional issues. We observed the level of collaboration and interaction diminished, especially in the last few months of the program, when it was clear certain functions of TREADS would not be completed.

**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.**

**Implementation Status – *Not Implemented***

The purpose of this recommendation was to align status reporting tools to the development framework for effective status reporting. Each framework has key indicators that describe if the project is on time, on budget, and is likely to be successful. At the time of the audit, TREADS team members, program staff, and agency staff did not share or understand the project's status indicators. Our follow-up work found the revised status indicators, especially those provided by the independent verification and validation helped the steering committee understand the project status. However, we determined these status indicators were not effective in projecting the negative effects of the development backlog, failed cross functional tests, and final project schedule. Based on interviews, stakeholders expected problems and knew the deadline would not be extended. They accepted the risks of implementing before they were ready.