A Report
to the
Montana
Legislature

Information Systems Audit

Data Security and Operational Performance of Montana's Computer-Assisted Mass Appraisal and Tax System (Orion)

Department of Revenue

April 2020

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Division

19DP-03

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April 2020

The Legislative Audit Committee
of the Montana State Legislature:

This is our information systems audit of Orion, Montana's Computer-Assisted Mass Appraisal and Tax System. Orion stores and processes property- and property tax-related information. Orion is managed by the Property Assessment Division within the Department of Revenue.

This report provides the legislature information about how security of Orion is managed; how training, communication, and data management contribute to Orion's validity and reliability; and how Orion's performance is crucial for the division's business deadlines. This report includes recommendations for implementing service-level agreements, improving security of confidential information within Orion, and improving quality assurance and staff training. A written response from the Department of Revenue is included at the end of the report.

We wish to express our appreciation to the personnel of the department for their cooperation and assistance during the audit.

Respectfully submitted,

/s/ Angus Maciver

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INFORMATION SYSTEMS AUDIT

Data Security and Operational Performance of Montana's Computer-Assisted Mass Appraisal and Tax System (Orion)

Department of Revenue

APRIL 2020 19DP-03 REPORT SUMMARY

The Department of Revenue (DOR) uses its Orion computer system to manage the process of property appraisals, calculations of assessed values, and determination of county certified values necessary for levying property taxes. Orion provides property data and assessed values to the counties, so counties can use this information to create tax bills. In fiscal year 2019, property taxes provided $297 million of state revenue, approximately 11 percent of all state revenue. Everyone in Montana is directly or indirectly affected by Orion's operations. Orion data needs to be better protected to avoid manipulation of property values, leakage of confidential information, and to maintain the integrity and trust of the mass appraisal system. Orion performance also needs to be defined and monitored to reduce daily interruptions for field staff which affects the timeliness of the property appraisal process.

Context

Under Montana's property tax system, equity is achieved through statewide oversight and coordination. DOR administers and enforces laws related to property tax assessment. It manages the assessments of all Montana property, so assessed values are made "relatively just and equal, at true value, and in substantial compliance with law" as required by §15-1-201(1)(a), MCA. To accomplish this, DOR uses Orion, a Computer Assisted Mass Appraisal System. Orion is a commercial software product which DOR began using in 2008. DOR owns a license for Orion and contracts with the vendor for software maintenance. Orion is used to manage statewide parcel data and produce assessments and market values based on sales data from similar properties. To do this work, Orion has gathered hundreds of millions of data points since 2008 for over 977,000 properties. The vendor customized Orion for Montana's purposes which includes:

- Collecting, storing, and maintaining property data.
- Maintaining property ownership, legal information, and transfer information.
- Adapting to legislative changes affecting property taxes and appraisals.
- Managing exemptions and other state filing needs.
- Sharing data between DOR offices around the state.

Daily, over 200 DOR staff in Helena and across the state use Orion. These staff include appraisers, property valuation specialists, geographical information system analysts, modelers, management, central office analysts, and support staff. They add, change, upload, download, document, analyze, report, model, and process the considerable amount of property information needed to calculate appraised values from year to year.

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Results

Based on our work, we determined Orion must serve as an accurate, uniform, equitable, reliable, transparent, and cost-effective system. Accomplishing this requires complex processing, multiple users, other computer systems, and system hardware functioning together. Well-defined management and coordinated efforts need to exist to be successful. We evaluated Orion data management, access management, data protection, data validity and consistency, and system performance. Our audit recommends actions in several areas including:

- **Establishing Orion service-level agreements related to performance.** Multiple parties manage Orion, but no service-level agreements exist between them that focus on better performance. Users report mixed satisfaction when using Orion, however, no baseline measurements track how well Orion is working. Responsibilities need to be defined and coordinated to improve Orion's performance.
- **Improving system security and password controls.** Orion contains confidential information which needs to be protected through updating its Security Plan and providing the proper controls. Coordinating better access management and monitoring can improve security. Security weakness posed by a few accounts need to be addressed, as well as how certain software is monitored.
- **Establishing statewide quality assurance of Orion information.** As a statewide system, the uniformity of Orion's data in every region of the state is fundamental to its success. The Orion data and logs show patterns of use that could improve operations. Looking across the state, these patterns can be detected and addressed as needed.
- **Strengthening staff training for Orion use.** Training is key for statewide system consistency. Users have indicated training needs improvement. We saw how training issues contribute to inconsistent data entry and report usage. Given the challenges in developing statewide training, using Orion data and the results of statewide quality assurance can better inform training.

Recommendation Concurrence	
Concur	4
Partially Concur	1
Conditionally Concur	3

Source: Agency audit response included in final report.

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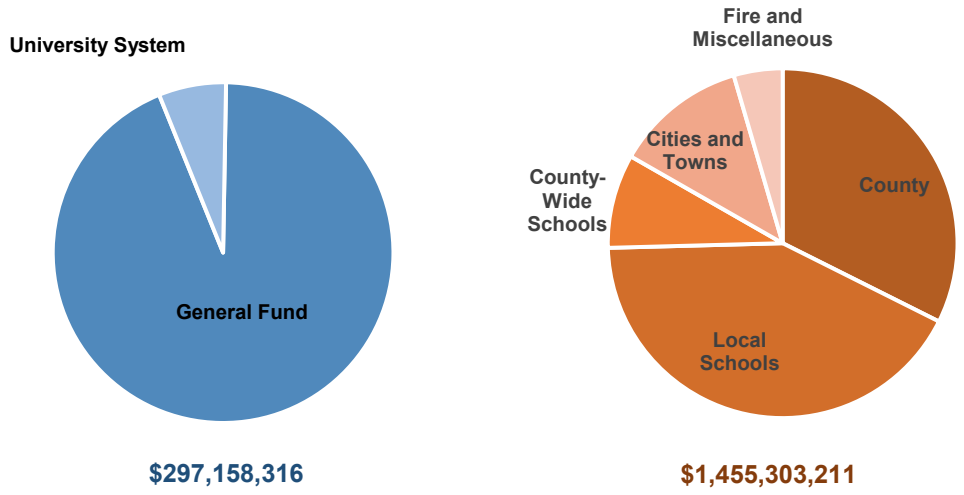
Chapter I – Introduction

Introduction

The Department of Revenue's (DOR) Property Assessment Division (PAD) uses the Orion computer system to manage the process of property appraisals and to determine taxable values so counties and the state can collect tax revenue. In fiscal year 2019, property taxes provided $297 million of General Fund revenue, approximately 11 percent of all state revenue. However, local taxing jurisdictions, such as school districts and counties, receive the largest portion of taxes, totaling over $1.45 billion. Local governments rely on information and processes managed by Orion to generate their revenue. The following table shows property tax revenues from property taxes to state and county programs.

Figure 1
Property Tax Funds Contribute to Significant State Programs and County Budgets
FY 2019



Source: Compiled by Legislative Audit Division from Montana Department of Revenue data.

Orion provides property data and assessed values to the counties which are used to create tax bills. Everyone in Montana is directly or indirectly affected by Orion's operations. Orion is the essential state asset for property taxation.

PAD manages the assessments of all Montana property. Section 15-1-201(1)(a), MCA, requires assessed values be "relatively just and equal, at true value, and in substantial compliance with law." To help PAD accomplish this work as accurately and timely as possible, it needs a Computer Assisted Mass Appraisal System (CAMA). Orion is that

commercial software product built to manage parcel data and produce assessments and market values based on sales data from similar properties. DOR owns a license for Orion and contracts with a private vendor for its maintenance. The vendor has also customized Orion for Montana's purposes to:

- Collect, store, and maintain property data.
- Maintain property ownership, legal, and transfer information.
- Adapt to legislative changes related to property taxes and appraisals.
- Manage property exemptions and other state filing needs.
- Share data between offices around the state.

Some of Orion's data is public and distributed via the PAD website and the State Library's Montana Cadastral website. This public data is used by many others including private, commercial, and governmental parties.

Background

PAD administers laws related to property tax assessment using standards from the International Association of Assessing Officers (IAAO). Over 250 DOR staff in Helena, regional, and area offices use Orion in the performance of their duties. These staff include DOR management, property appraisers, property valuation specialists, Geographic Information System (GIS) analysts, property modelers, and PAD office analysts and support staff.

Montana's property tax system is designed to achieve equity through statewide oversight and coordination. This helps ensure property assessments and taxes are distributed as equitably as possible across the state. The intention of a statewide system is to create legally compliant, fair, and efficient appraisals. Montana and Maryland are the only two states where equity and oversight for appraisals are managed statewide.

This change in property tax structure began with the 1972 Montana Constitution which required the state to appraise, assess, and equalize the valuation of all taxable properties. In the beginning, there was no CAMA system. Instead, DOR did manual sampling of market values and applied the sample estimates to similar properties. This process took time, and sometimes led to extreme swings in appraised values. The swings caused taxpayer concerns and eventually led to a series of lawsuits. By 1987, the department had its first CAMA system to support sampling at greater frequencies. In June 2007, the department implemented Orion and it has since become a vital source of information and contains a continuous record of property details and transactions since its inception.

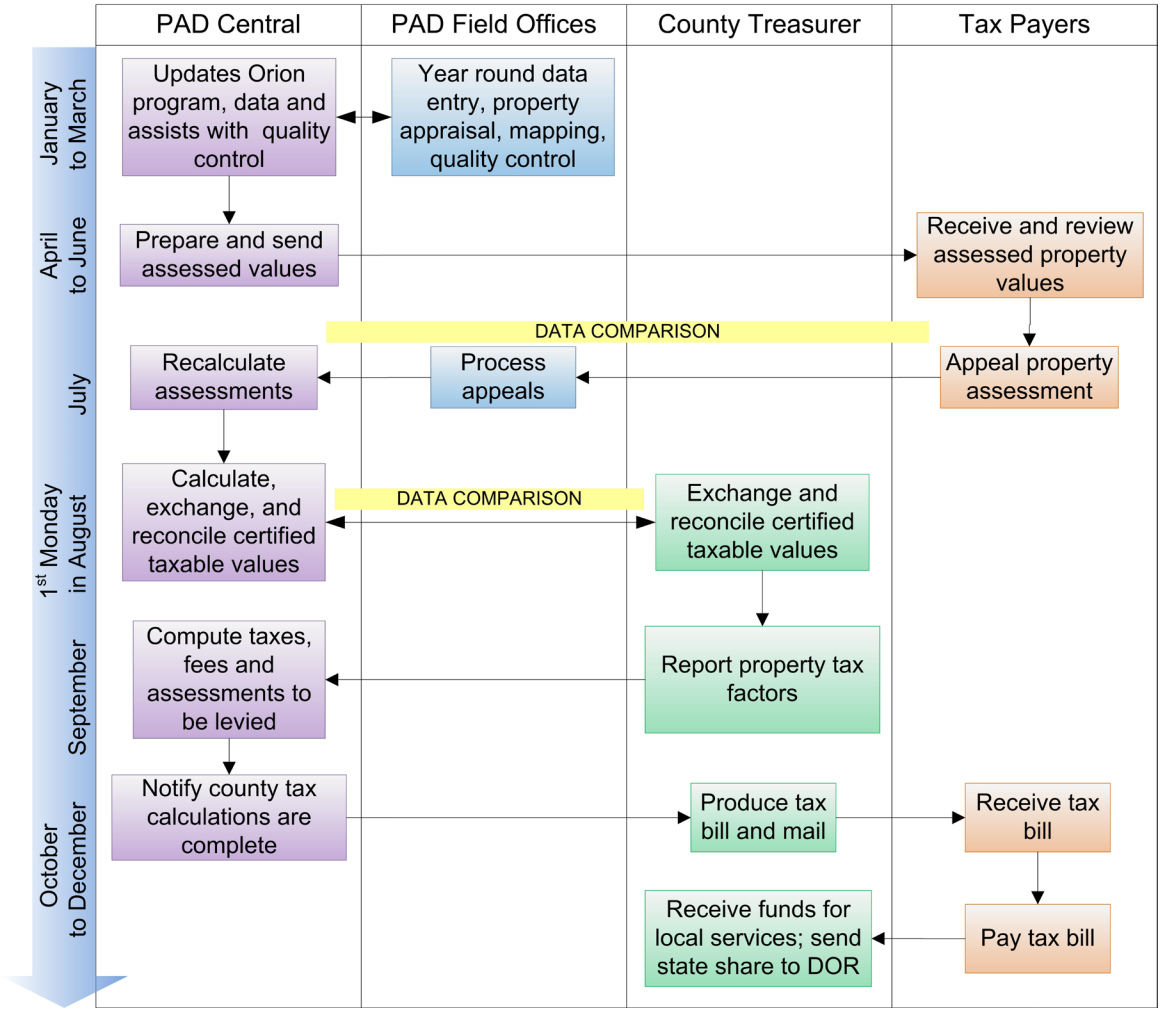
Property Appraisal and Taxation Process

The property appraisal process is a structured method of determining property worth and the taxable proportion. This includes appraising values for 20 different types of property such as residential, agricultural, timber, government, manufactured homes, and commercial properties. In tax year 2019, residential and manufactured homes were 520,563 of the 1,064,883 properties in the Orion reporting database. PAD appraisers visit the property to assess the condition of the property. PAD staff enter any new or updated data into Orion for these property. PAD staff use Orion data to calculate different values for properties including:

1. **Market Value**: The market value is what the property would sell for in its current market. PAD modelers conduct a complex process using statewide data and sales information to develop these values.
2. **Assessed Value**: An assessed value is the dollar value assigned to a property to measure applicable taxes. Assessed valuation determines the value of a residence for tax purposes and takes market value (comparable property sales) and inspections into consideration.
3. **Taxable Value**: By law, a varying percent of the assessed value can be taxed based on the type or use of the property. The taxable value is determined by taking the assessed value times the tax rate applicable to the property.
4. **Certified Values**: This is the total taxable property values for each tax jurisdiction. These values are determined by DOR and required to be provided to counties in August of each year.
5. **Property Tax**: Counties coordinate with taxing jurisdictions to determine the final tax each property owner must pay. This amount is based on the certified values provided by DOR, taxing jurisdictions, and budgets. For example, county budgets are independent of certified values, so the budget does not change if certified values go up or down. The amount of tax needed to fund the budget is what changes when certified values change. So, if the budget remains the same and certified values go up, the percent of property value subject to tax goes down. Conversely, if the certified values go down, the percent of property value subject to tax goes up.

Figure 2 (see page 4) illustrates the property tax process and how statewide activities are coordinated. Throughout the year, information is exchanged between state and local governments and tax payers to check, verify, and produce tax bills. The assessment value is sent to the property owner for review and verification. The certified taxable values are sent to the counties every year. Using the certified values, counties develop yearly tax bills to fund their budgets.

Figure 2
Coordinated Activities in Preparing Property Taxes



Source: Compiled by Legislative Audit Division from Montana Department of Revenue data.

County staff can view but not change Orion data. They do not work in Orion. They have their own systems to manage properties within their county. Because of this, data comparisons are necessary to make sure county- and state-level data match. These comparisons are done throughout the taxing cycle and are represented by the yellow bars in Figure 2.

Orion Operations

Orion operates with other DOR supporting software programs, hardware, interconnected networks, and work processes. Other supporting applications were

acquired or built over the years to make up for missing Orion functionality. These applications include:

- Databases of summarized Orion data so reporting tools do not slow performance of the Orion system.
- Customized reporting applications to provide reports missing from Orion.
- Plug-in applications used for Orion quality assurance reporting.
- Custom-built application to create assessment notices sent to property owners.
- GIS mapping software and services to locate properties and property boundaries on maps.
- Sketching software to render property diagrams.
- Manual information transactions with other DOR systems.
- Remote access infrastructure to allow field offices faster access to Orion.

Orion itself is composed of multiple databases and has a complex architecture. This includes a property database, an administrative database, a reporting database, and servers for applications, file storage, and remote access. Over time the database has grown large and complex because each data change is tracked, the number of properties grow, and a new property record is created each tax year from previous data. One database, for example, contains hundreds of tables, thousands of fields, and billions of records.

Five parties comprised of state government entities and the private sector are responsible for maintaining Orion and its supporting systems, software, and hardware. Each party and a description of their role in maintaining Orion is described below:

1. **PAD** functions as the system owner for Orion. The division is responsible for Orion's operations, testing, processing, and correctness. PAD also coordinates Orion upgrades.
2. DOR's **Technology Services Division** (TSD) manages Orion's computers and servers. It participates in troubleshooting Orion computer problems. It develops and supports applications and services related to Orion. For example, TSD developed the program that compiles property assessment notices for counties.
3. DOR's **Security Office** provides PAD with the security plan, tools, resources, and training to protect confidential information. It inspects PAD's offices and procedures to ensure PAD is complying with state disclosure laws. It also advises on cybersecurity and disclosure issues that could impact Orion.
4. The **State Information Technology Services Division** (SITSD) provides the enterprise information technology services and hardware to DOR, including hosting for servers, remote access, disaster recovery, network, software licensing, and other services.

5. The **private vendor** from whom Orion was purchased provides Orion software, program expertise, on-going support, periodic maintenance, and upgrades.

Audit Scope

Our work looked at Orion as a whole, especially its data, to provide information on quality assurance procedures and training. We did not assess the accuracy of appraisals. We also reviewed procedures related to security, access, and system performance. We gathered system data from 2017 to 2019 for this review, examining:

- End-to-end components of the Orion System.
- System access controls.
- Structure and content of the Orion data sets.
- Use of access, error, and activity logs.
- Third-party control of data.
- Consistency of data between counties, offices, and positions.
- Validity of actual data points.
- Use and variety of training to support data integrity.
- Quality of communication in support of system updates.
- Responsibilities between Orion supporting parties for system performance.

Audit Objectives

Orion must serve as an accurate, uniform, equitable, reliable, transparent, and cost-effective system. This takes complex computer processing, involves multiple users, and incorporates other computer systems and hardware operating together. In this environment, well-defined management and coordinated efforts need to exist to be successful. We looked at Orion access management, data protection, data validity and consistency, and system performance from January 2017 to October 2019. From this work, we developed the following audit objectives:

1. Determine if Orion performance aligns with business requirements through management of service-level agreements and performance monitoring.
2. Determine if Orion user training, communication, and data management procedures exist to ensure mass appraisal system validity and reliability are maintained.
3. Determine if access to Orion is managed to ensure only authorized data and system changes occur and security of information at third-party locations is maintained.

Audit Methodologies

We conducted the following work to answer our objectives:

- Gathered criteria from state policy, federal guidance, and professional standards.
- Designed, distributed, and analyzed a survey sent to all Orion users. We surveyed 312 users; we received 185 complete responses for a 59 percent response rate. The survey addressed user satisfaction regarding training and performance.
- Analyzed statewide Orion data from January 2017 to October 2019 for effects of quality assurance, access management, reporting procedures, data uniformity, and error conditions.
- Reviewed the appropriateness of Orion access by analyzing user roles, rights, and privileges.
- Reviewed data management in Orion and subsystems for compliance with state security policy.
- Analyzed Orion data for unexpected, inconsistent, and erroneous data related to property characteristics.
- Analyzed system error logs from January 1, 2018, to October 23, 2019, for indications of training or quality issues.
- Interviewed agency, administrative, and vendor staff regarding security, responsibilities, and expectations for Orion.

Report Contents

The remainder of this report includes additional background and details of our findings, conclusions, and recommendations. Certain information about password management has been omitted from this report. This information could be used by malicious actors to gain unauthorized access to Orion.

The report describes why parties involved with Orion need to improve communications and commitments by employing service-level agreements; how Orion's security plan needs to be updated to address vulnerabilities; and why PAD can benefit from a statewide quality and training program based on Orion's data. Our analysis of these areas and discussion of our findings and recommendations is organized in the following manner:

- Chapter II addresses the need for service-level agreements between the parties involved with Orion's performance.
- Chapter III discusses Orion security and access.
- Chapter IV discusses how quality assurance and training for Orion users can be improved.

Chapter II – System Performance Needs to Be a Priority

Introduction

System performance refers to the speed of a computer system when users are logging in, entering and uploading data, switching pages, running queries and reports, and completing other tasks. Specific to Orion, with multiple pages, hundreds of data entry fields, and hundreds of users logging in to the system, slow speed and unexpected limited availability can negatively impact the work of the Property Assessment Division (PAD) on any given day. Staffing challenges in field offices also increase the need for less staff to work more efficiently and timely with a growing number of property inspections and transactions. Controls to ensure Orion performance meets PAD's business expectations need to be in place so statutory deadlines for the property tax process are met. These include a well-defined and managed service-level agreement and various tests be conducted as part of a monitoring program.

Service-level agreements (SLAs) define the level of service–quality, availability, responsibilities–expected by PAD from its supporting parties. These include the Department of Revenue's (DOR) Technology Services Division (TSD), the State Information Technology Services Division (SITSD) located within the Department of Administration, and the contracted Orion vendor. An SLA sets out the metrics by which services are measured, responsibilities assigned for monitoring services, and any remedies or penalties should the agreed-on service levels not be achieved. System performance is often a part of SLAs and can include metrics for system response when users are logging in, entering data, switching pages, running queries and reports, uploading information, and completing other tasks.

Multiple Parties Manage Orion Performance

PAD staff interact with Orion software and supporting systems daily to complete their assigned tasks, so their availability and speedy performance are essential. However, managing availability and speed is complicated because Orion's performance depends on multiple parties to provide services:

- SITSD provides the servers, network, and remote access to support TSD. SITSD contracts with network providers for network services to the local DOR offices.
- TSD provides the technical support for Orion's servers and web presence. TSD also creates, updates, and maintains supporting applications like the report writers.

- The vendor provides the software, configurations, database code, and programming support for the Orion software.

The inherent risk in Orion's service chain is multiple parties must be involved. Without clear service measures and responsibilities for each party, the underlying causes for performance issues are difficult to identify and may go unaddressed.

Performance Has Been an Ongoing Concern

Agency staff and other supporting staff indicated Orion had significant performance problems in its first couple years. In 2010, in response to complaints about the performance, as well as recommendations made in a performance audit of Property Tax Reappraisal (10P-11), DOR hired a third party to assess system improvement. The third party recommended nine actions to improve Orion performance.

Over the years, performance gradually improved with software updates and faster, more powerful hardware. However, during our audit work we learned the 2011 recommendations were not followed to implement continuous performance improvement for the Orion database. This included writing performance-improving scripts, regular monitoring of Orion performance, on-going data collection, and regular analysis.

User Satisfaction With Performance Is Mixed

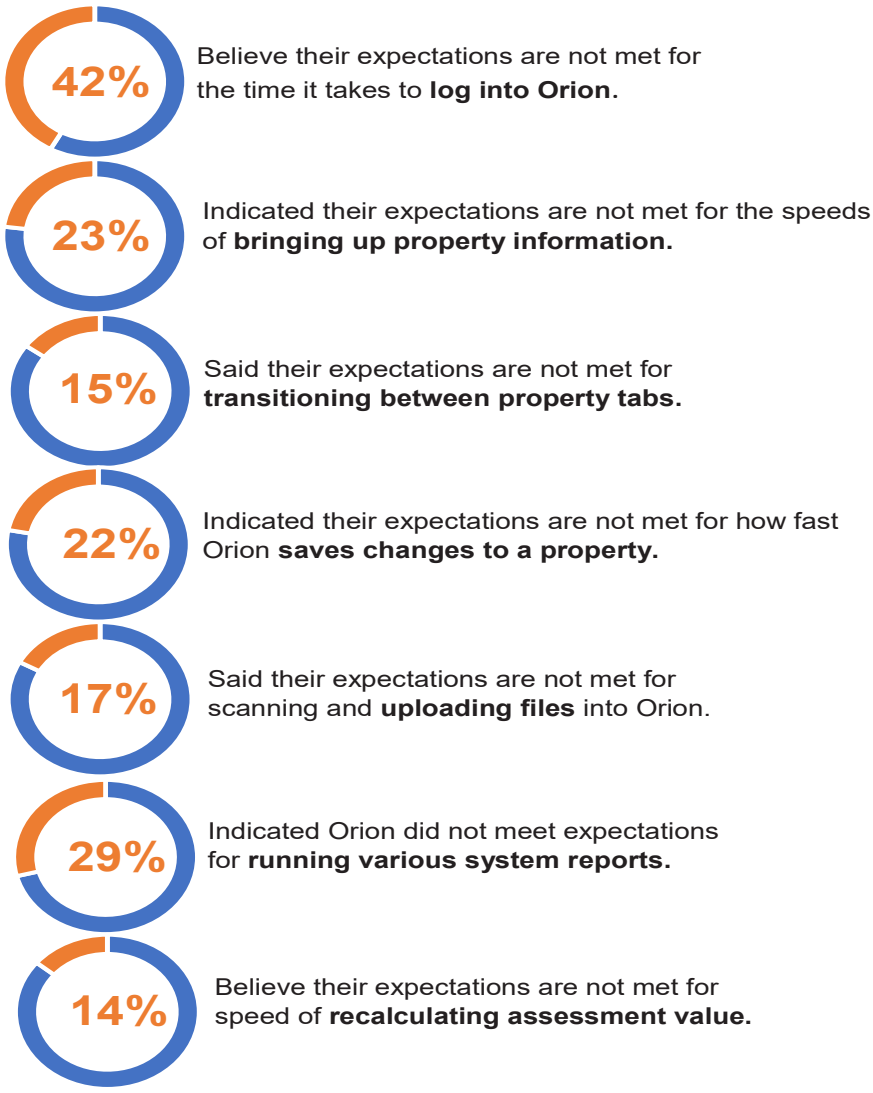
We surveyed all Orion users, including central, regional, and field staff, about the quality of Orion's current performance. In the survey, we measured how often Orion performance met users' expectations. We chose frequent and common activities including:

- Logging in.
- Bringing up property information.
- Clicking through multiple tabs of information about a property, such as ownership, assessment, history, and appraisal. Each tab has multiple fields of data.
- Saving property information changes.
- Uploading property documents such as sketches and real estate transfer documents.
- Running system-generated reports.
- Recalculating assessment value when data is changed.

We provided a range of times for a task, then asked what time range they expect and how often Orion met their ideal time. Response options included "Often," "Most of the Time," "Sometimes," "Rarely," or "Never." Based on the survey responses, we

found variations of satisfaction with Orion between different activities with indications that expectations are not met (sometimes, rarely, or never). Figure 3 shows:

Figure 3
Users Report Where Expectations Are Not Met and Met in Seven Common Orion Activities



Source: Compiled by the Legislative Audit Division from user survey data.

The Lack of Performance Baseline Has Lowered Users' Expectations

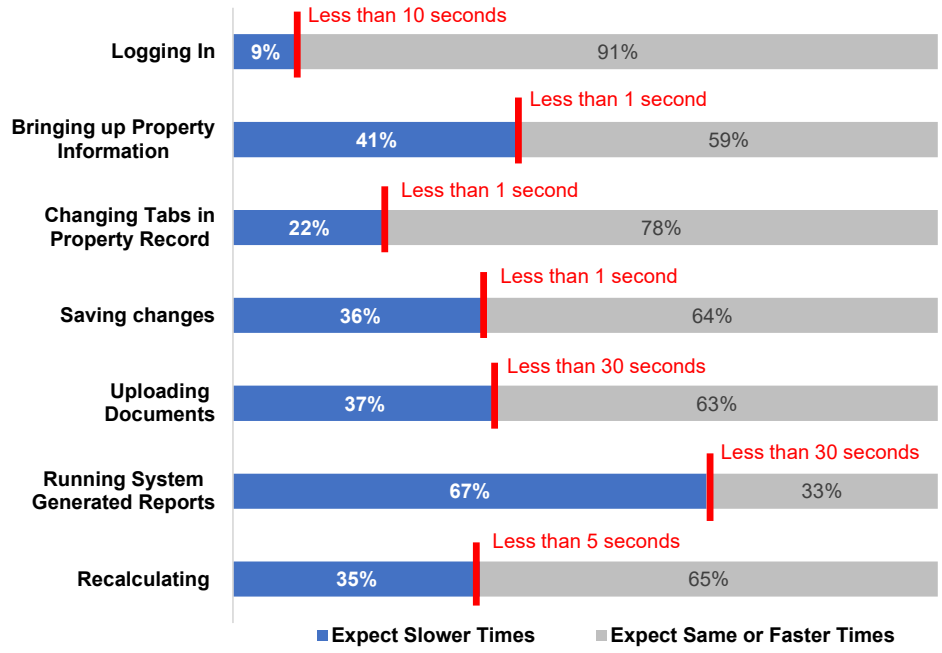
Orion has no performance baseline established by system owners or developers to gauge the time for these tasks. In our survey we asked users what they expect for processing

times for each of these functions. Users generally expect instant results when bringing up data and moving between properties, which is a reasonable expectation when using technology. However, it is apparent that expectations for other functions have lowered.

There are generally accepted times for these types of functions based on research of human attention spans. When using modern technology, response times should be as fast as possible. For example, applications should start in under ten seconds. Responses to user actions should be less than one second. Two-tenths of a second gives the feeling of instantaneous response. After one second of waiting, a user's flow of thought is interrupted. The user will notice the delay and lose the feeling of operating directly with the system. Figure 4 shows expectations for Orion functions are most often lower than generally accepted response times.

Figure 4

Some Users Expect Slower System Performance for Various Orion Functions Than Best Practice Suggests



Source: Compiled by the Legislative Audit Division from user survey data.

Over time, these low expectations lead to acceptance of poor system performance. Table 1 represents a hypothetical worst-case scenario where staff have a portion of their day when they are not able to use the system. The seconds per action were developed based on survey responses, but may not be the same with every action in one day. The table is representing how lowered user expectations equate to acceptable interruptions and potential wasted time. PAD staff do have other duties and tasks outside of Orion, but when the system consistently breaks up their day, it greatly impacts their efficiency and ability to complete work in Orion.

Table 1

In Worst Case Scenario Multiple Interruptions From System Slowness Can Create Hours of Delay

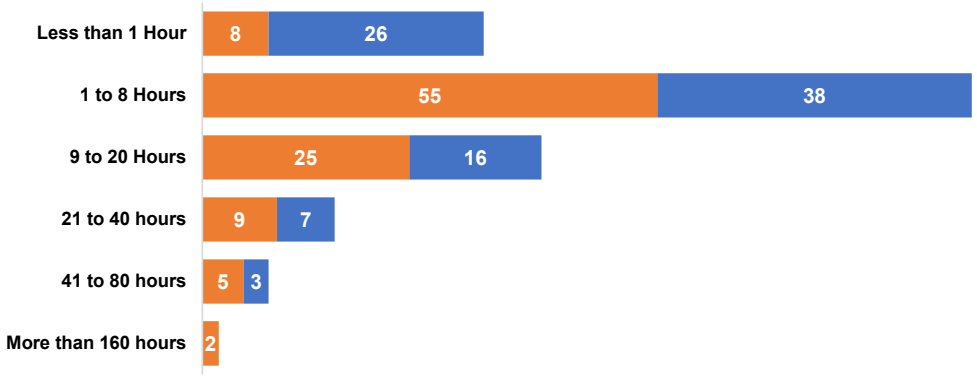
Action	Actions Per Day	Best Case Seconds Per Action	Best Case Minutes Per Day	Worst Case Seconds Per Action	Worst Case Minutes Per Day
Bring up property information to change or review	50	1	0.83	45	37.50
View three tabs per property	150	1	2.50	20	50.00
Recalculate less than half of those properties	20	5	1.67	50	16.67
Save changes to most of the properties	45	1	0.75	35	26.25
	Total Minutes Per Day:		**5.75**		**130.42**

Source: Compiled by Legislative Audit Division from user survey data using hypothetical worst-case scenario.

In Table 1, the user is tasked with bringing up 50 different properties in Orion. Within these properties, an average of three tabs need to be reviewed. With the data changes made by the user, 20 of the properties need recalculated and 45 of the properties need changes to be saved. With the amount of typical changes and actions necessary, over two hours could be spent waiting for less-than-a-minute system response times.

System availability is another key performance metric, outside of time to complete tasks. We asked users to estimate the amount of time they have had to find work outside of Orion over the last year due to unexpected Orion unavailability, not just slowness. Out of 194 responses, 48 percent estimate up to a day while 21 percent estimate up to half a week of redirected time in the last year. Figure 5 (see page 14) shows appraisers have a more negative perception of redirected time than other users. Appraisers work in the field appraising property and in the office updating Orion. In the survey, they expressed frustration when Orion is not available on the days they plan to be in the office.

Figure 5
Appraisers Report Redirecting More Time Than Other Users Throughout the Year Due to Orion Being Unavailable



Source: Compiled by the Legislative Audit Division from Orion user survey data.

Frustration Exists When Reporting and Resolving System Slowness

Throughout our work we also discussed performance issues with all the involved parties and identified frustration from users and IT staff. Several users have a sense of time being wasted while waiting for Orion and disappointment when expectations are not met. Performance between regions varies, and regional users have no way to report objective differences other than phrases like "slower than last week," or "faster now than before the patch." IT staff discussed frustration with diagnosing errors and confusion between multiple parties when working on issues. Both IT staff and Orion users noted resolving certain problems takes longer than expected because clear operational expectations have not been developed.

Foundational Performance Management Practices Do Not Exist

It is apparent Orion performance issues frustrate system users and support staff. We reviewed SLAs and how performance is monitored by various parties in the service chain. SLAs define the level of service–quality, availability, responsibilities–expected from supporting parties. Specifically, they are contracts for performance deliverables. We found current SLAs neither define baseline metrics nor provide for performance responsibilities. Overall, the SLAs do not facilitate a level of communication that is productive in resolving Orion performance issues.

Only one formal SLA exists between PAD and the Orion vendor. The vendor contract states performance is defined as working, error-free software. However, the contract does not stipulate performance metrics to know what level of working is acceptable or expected. The contract also does not contain an agreement on who is responsible for optimizing the performance of the Orion database, even though most of the recommendations from the 2011 third-party assessment were focused on database issues. We found most of the issues still exist and are discussed later in the report.

We also determined the lack of agreement between all parties has caused confusion in addressing performance issues. For example, four help desk systems are in use, one for PAD, two within TSD, and one for SITSD. When a problem arises, one or more help desk tickets are generated. Consequently, problems are often slow to resolve because of confusion about which support ticket is applicable to which help desk.

There Are No Objective Baselines for Orion Performance

In IT management, a baseline is the expected values or conditions against which all performances are compared. Baselines are important because they provide a starting place for measuring improvement and identifying when poor performance occurs. Thus, industry standards suggest establishing baselines along with regular and formal reporting of service agreement performance. Beside intending to identify deviations from the agreed baseline values and understand where improvements can be made, they also provide management a means for monitoring service levels, reporting on achievements, and identifying trends.

To understand if baselines were necessary, present, and in place for efficient and acceptable performance, we reviewed contracts, current agreements, discussed performance with the supporting parties, attended weekly Orion team meetings, and reviewed methodologies in place for monitoring. Of the four parties involved with Orion, only PAD and the vendor have a formal SLA between them. However, their SLA does not reference any baselines for performance improvements.

Coordination to Develop Baselines Is Essential

Over 250 people work daily with Orion and expect a level Orion performance that makes them efficient in their work. Orion users and Orion support teams should agree on what users can expect from Orion in terms of performance and error occurrence. Without baselines for Orion monitoring, management cannot address errors efficiently. If users do not know what the baselines are, they may not report performance issues. Without these user reports, opportunities to improve performance are missed.

PAD and TSD need to establish clear performance expectations to improve user experience and efficiencies with Orion. PAD has not developed a baseline of system performance due to a lack of communication and coordination between all the involved individuals. With the unique architecture of Orion, there is no responsibility assigned for coordinating services. PAD would be unable to establish the baselines on their own without the help and expertise of TSD, and TSD would not be able to address business needs without the contracted vendor. Defining clear expectations for measurable key tasks is fundamental for improving Orion performance.

For Orion, the baseline metrics will depend on the services being provided by each involved party. Many things can be monitored as part of an SLA, but best practice recommends they be as simple as possible to avoid confusion and excessive cost. In choosing metrics, the system owner should examine its operation to decide what is most important, find a metric for it, then clearly communicate that with the other supporting parties. Example of metrics for PAD to consider for inclusion in the SLA are:

- **Service availability**: The amount of time the service is available for use.
- **Defect rates**: Numbers or percentages of errors in major deliverables.
- **Technical quality:** Measurement of the ability to satisfy stated or implied needs.
- **Acceptable response**: Acceptable speeds in response to user input.
- **Security**: Measuring controllable security measures like log reviews.
- **Business results:** Time and work improvements that supports business goals.
- **Customer service**: Solving problems fast, making the experience enjoyable and professional, practicing 'customer comes first' attitude.

RECOMMENDATION #1

We recommend the Department of Revenue establish objective baseline expectations for Orion performance.

Service Commitments Are Required to Maintain Performance Baselines

While objective baselines set the expectation for how Orion should perform, understanding who manages the services related to baselines and what their responsibilities are is also required to maintain performance. Defining service

commitments between parties is an industry standard requiring communication, clear understanding on what metrics are being used, why they are important, and who is responsible for them. In addition to defining the service commitments, an agreement should also be documented for how the services are to be monitored, the data to capture and report, how often the data will be reviewed, and who does the review. SLAs are the agreements that document service commitments, responsibilities, communications, and metrics.

Ultimately, the importance of a clearly defined service commitment is to improve the department's business processes related to Orion. We evaluated help desk tickets to assess instances where users experienced slow login times and slow operating speed of Orion. We tracked these support tickets and observed weekly meetings between PAD staff and the contracted vendor to see how long it took to resolve issues. We also interviewed IT staff and Orion users to obtain their opinions and satisfaction with timely fixes, customer service, and specific system performance.

Because responsibilities and expectations of performance have not been established through SLAs, communication breakdowns occur when trying to resolve issues. This, along with other contributing factors, have led to ongoing struggles with system performance.

Ineffective Monitoring Exists Because of Lack of Agreements

While reviewing Orion performance issues, we identified that current agreements do not provide for performance monitoring, and where monitoring is being done without a formal agreement, no one is assigned to follow up. Because of this, current monitoring procedures of the entire Orion system are not effective.

The lack of service-level agreements has created significant issues in Orion performance improvements. When a performance problem involves two or more of the parties, the solutions take more time and problems are slow to resolve. The reason is the inability to clearly identify the source of the problem and the party responsible for it. While reviewing help desk tickets and attending weekly PAD meetings, we observed one of these situations. Users reported not being able to login or logins taking much longer times than expected during testing. All parties were involved in troubleshooting, and it took them more time than they anticipated to identify the cause of the problem. We observed frustrations among all parties.

Orion Database Monitoring

An important part of overall system performance is the Orion database. This is the source database for all property-related data. If the database is overloaded by the number or complexity of requests for information, the database can slow down or stop, which means Orion slows down or stops. When Orion unexpectedly stops working, data can be lost and difficult to recover.

To avoid this situation, the complexity and the number of requests need to be managed. TSD monitors the requests to the Orion database, but indicated they do not manage them and improve performance because the vendor owns the Orion software. The vendor has no contractual requirement to manage these requests and improve the database performance either. As we tracked performance issues, the vendor focused on system reported bugs and processing issues. Additionally, PAD has developed software that also requests data from the Orion database. This adds another person responsible for requests on the database. There is no agreement to establish responsibility for how all these requests are managed to guarantee Orion's database performance. TSD has the capability to monitor and improve database performance, but it would need a clear agreement with the vendor before making any improvements, because the vendor owns the system software.

SITSD Support Services

SITSD has a role in Orion because it provides database hardware, backup, networking, security, and other services. Therefore, SITSD supports Orion, but does not monitor the Orion application directly. SITSD does not take responsibility for the application level of operation details. Instead, it sees its role as maintaining the services that support enterprise operations.

The quality of these SITSD services impact Orion's performance. Because SITSD does not offer specific SLAs for individual systems like Orion, it is sometimes difficult to involve them when issues specific to Orion occur. SITSD can provide an additional level of expert help, but PAD would need to purchase it. Otherwise, SITSD does not have staff dedicated to Orion's daily operations and performance improvement. The department indicated it would be challenging to establish service-level agreements and hold the vendor accountable without support and coordination from SITSD.

Leadership to Coordinate and Improve Performance Does Not Exist

The responsible parties for monitoring Orion are:

- PAD because they license and use it,

- The vendor because they built and maintain it,
- TSD because they support PAD, and
- SITSD because they support TSD, and Orion runs on SITSD equipment.

All parties have a stake in supporting Orion, but regarding on-going performance improvements, no party is the leader and clear responsibilities for performance, objective measures, active monitoring, accountability, and regular communications are missing. Without someone taking the lead, troubleshooting problems becomes cumbersome. Priorities among the parties differ and direction and coordination does not exist. Without clear responsibilities, ownership does not exist, and resolution of problems is delayed.

Some form of agreement is needed to define responsibilities for covering Orion's entire service chain with all involved parties. Establishing leadership in the performance management process will ensure accountability for service-level baselines within the agreements. With clear responsibility and leadership, the department can direct troubleshooting and resolve problems more quickly.

Responsibilities for Maintaining Performance Need to Be Defined

There are a few options for defining responsibilities within SLAs. Leadership would determine where responsibilities belong. For example, database monitoring could belong to the vendor, TSD, or SITSD. Each option would have an additional cost for system operations. A total cost estimate is difficult to calculate because monitoring at this level has been nonexistent and the work would only be needed after system changes or when issues arise. We estimate the annualized cost range from $25,000 to $83,000 as shown in Table 2.

Table 2

The Impact of No Database Monitoring Cost More Than Options for Database Monitoring

	Costs Without Database Monitoring	Options for Database Monitoring		
		Vendor	TSD	SITSD
Staff	200	1	1	1
Hours/Year	20	520	520	520
$/Hour	$30*	$160	$49*	$140
Total	**$120,000**	**$83,200**	**$25,480**	**$72,800**

Source: Compiled by Legislative Audit Division from Department of Revenue data.

*Including Benefits

While this would be extra operational costs, it does not outweigh the cost of delays created through slow performance. For example, if 200 staff experience 20 hours of slowness or unavailability each per year, the personnel costs are roughly $120,000 at $30/hour.

Establishing the baselines and responsibilities will have to be done through various options. For instance, SITSD prefers agreements with agencies identifying additional staff hours to focus on the specific application. A traditional SLA can be established as part of the vendor contract. Internally, a formal agreement between PAD and TSD would outline the responsibilities and expectations needed for database monitoring.

However the baselines and responsibilities are established, they need to layout a system for properly managing Orion system performance. This includes deciding how the database will be monitored and could cost between $25,000 to $83,000 per year. We also found the department needs to take a more active role in overseeing the development and managing of these agreements. It should incorporate a process to ensure all parties with Orion responsibilities work together to identify acceptable performance criteria, plan and design performance tests, review the results of these tests, and assess how the results measure up against the performance criteria. The department indicated the amount of effort to conduct this work will require dedicated IT contract management staff. It is also important all parties establish a formal process to continually communicate and maintain accountability for their responsibilities in the service chain. To ensure this happens, the department should designate a team of business and technical leaders to oversee and manage the SLA process.

RECOMMENDATION #2

We recommend the Department of Revenue:

A. *Assign a team to manage and lead the service-level agreement process on an ongoing basis.*

B. *Work with the vendor, Technical Services Division, and State Information Technology Services Division to create agency agreements or service-level agreements for Orion's performance.*

C. *Develop a formal and documented process to ensure ongoing communication occurs between all service-level agreement parties to hold them accountable to their service-level agreement baseline.*

Unmonitored Query and Analysis Tool Increase Performance Risk

PAD staff use a commercial query and analysis tool to request, or query, information from an Orion subsystem. The tool can be configured to pull data to assist users for various processes, such as verifying property characteristics, finding erroneous data in specific fields, or filtering for property with specific values. Generally, experienced PAD managers and analysts develop the queries in the tool for staff to run the reports. Staff can analyze the data, trends, and statistics from the tool using standard office software. Over 125 reports are distributed to staff to use or adjust as needed.

The risk inherent with this commercial query tool is that it does not optimize query performance, meaning query requests may take more time and resources than expected. When this happens the Orion subsystem slows down or stops. During fieldwork, we chose complex queries generated by the tool. We started with a test of one of these queries during low-use hours to identify its impact. However, the query we ran nearly brought down the database server. This illustrates how queries can affect system performance and why it is important to optimize, manage, and monitor all queries. If the query would have used all the resources on the server, the server would have stopped functioning. The Orion subsystem processing would have stopped until the situation was addressed. The query we tested is only available for a few managers to use, but there is nothing preventing them from running queries like this in the future.

TSD staff told us this has happened before. The use of the tool is not monitored, so PAD does not know when these queries affect performance, and the supporting parties do not know who is responsible for the performance issues. Orion users should not be able to run untested and poor performing queries on servers involved with daily operations. To avoid such situations, queries generated by the tool should be tested and improved for performance prior to being deployed on servers involved with daily operations.

Other Risks Related to the Query and Analysis Tool Exist

We found multiple risks to Orion because the query and analysis tool is not properly managed. The tool needs processes and controls in place for how it stores, protects, and reports results. These controls ensure the accessibility, reliability, and timeliness of data for users, so they can meet statutory deadlines and maintain transparency and data quality. Risks identified related to the tool are access management, data security, training, and data validity and consistency. These risks are discussed in more detail below:

Access Management and Data Security: Industry standards require any queries to be logged with the user who created the query and the parameters of the query. The tool does not log the user information. Rather, a generic user ID is given to each query ran on the database. As a powerful tool, it lets users pull any or all data from Orion to their desktops on spreadsheets. Without specific identification of who that user is, data can be taken anonymously from Orion. This unauthorized transfer, electronically or physically, of property or personal data from within Orion to an external location is known as data leakage.

Training: The query we tested in the tool and other queries we discussed with the department show a need for training PAD staff. If they are going to have the ability to create ad hoc queries in the tool, they need to understand implications and how to avoid performance issues. Without training, users running these types of queries will create unexpected slowdowns and stoppages.

Data Validity and Consistency: The purpose of using the tool is for statistical reports, ad hoc reporting, and to improve the quality of Orion's data and processes. However, it is unclear what processes exist for managing the tool to reduce duplication of effort and potential errors in queries.

Department Needs to Mitigate Risks From Query and Analysis Tool

There are two reasons for the lack of management over the query and analysis tool. First, coordination among security staff, technical staff, and PAD needs to occur to improve the use of the tool and reduce risks related to performance and security. Secondly, the use of the query tool is not monitored because the department was unaware of how to monitor the tool when multiple users across the state use it.

To address the lack of management over the Orion query tool the department should develop a formal, documented process to manage the tool that includes the following areas:

- Assessing risks of using the query.
- Monitoring the actual use of the tool.
- Storing query results to ensure data remains secure.

Developing a formal plan will ensure the department routinely reviews statewide use of the tool and its performance impacts on Orion. Identifying the risks with the tool will also help the department avoid Orion performance issues and potential security weaknesses of Orion data.

RECOMMENDATION #3

We recommend the Department of Revenue develop a formal process to manage the use of the query and analysis tool that includes:

A. *Ongoing monitoring of query and analysis tool to improve training and quality assurance.*

B. *Addressing security risks to mitigate data leakage.*

C. *Developing queries in a controlled and structured manner to avoid impacts to performance.*

D. *Managing and storing queried information from Orion databases to maintain data security.*

Chapter III – Data Security and Password Management Need Improvement

Introduction

The Department of Revenue (department or DOR) has responsibility for Orion's security and access, which includes a method of planning cost-effective security protection. Knowing what to protect begins with determining what data Orion stores and uses, and what business processes Orion provides. The data and processes are associated with a security classification defined in state policy:

> **Low** – The loss of confidentiality, integrity, or availability has limited adverse effect; for example, the unauthorized disclosure of press releases or public reports.
>
> **Medium** – The loss of confidentiality, integrity, or availability could have a serious adverse effect; for example, the unauthorized release of limited real estate sales data.
>
> **High** – The loss of confidentiality, integrity, or availability could have a severe or catastrophic adverse effect; for example, the unauthorized release of data protected by state or federal privacy regulations and data protected by confidentiality agreements such as personally identifiable information (PII), personal health information (PHI), or federal tax information.

Access controls, based on security classification, protect this information and determine how a person or service should use it. The DOR Security Office is tasked with categorizing all DOR data and seeing that it is managed accordingly. The Security Office shares Orion security management with the Property Assessment Division (PAD).

This chapter covers Orion's security improvements and vulnerabilities. Orion security needs clear, coordinated procedures and responsibilities, as well as regular monitoring for compliance and subsystem changes. This would also mitigate issues we identified in access management, risk management, and the use of shared accounts.

Orion Contains Confidential Information and Manages Critical Business Processes for the State of Montana

Most of Orion's millions of records are public information related to property characteristics. Much of this information is viewable on the Montana Cadastral. However, Orion also contains confidential information, including details of real estate transactions, medical exemption applications, and PII, with security classifications of medium or high. The system also contains 4.3 million uploaded files, such as property photos, sketches, and a variety of other written documents related to properties. While

this data is restricted and not viewable on public records, it still needs to be considered in Orion operations.

Any weaknesses in access controls for Orion increase the risk of exposing high- and medium-security data as well as altering the processes to accurately determine property values. Orion's proper functioning is critical to the success of collecting local and state property taxes. With incorrect or excessive access, one could accidentally or secretly view, move, delete, change, or add data and files. These activities, small or large scale, malicious or not, can affect public perceptions of property taxes. For example, if enough data was changed so that the property tax calculations were incomplete or inaccurate, PAD may delay getting information to counties. Confusion between county and PAD could create further delays. Tax bills might be late, wrong amounts collected, local government budgets could be impacted, and a significant amount of effort on both state and local government officials expended to rectify the situation. Access controls protect the business processes to help prevent situations like this from occurring.

Lack of Priority Given to Orion Has Created Security Weaknesses

Orion does not have an updated security plan due mostly to other DOR priorities. DOR's Security Office focuses first on state and federal income tax information where most highly classified information resides. In addition, these systems are continually audited by the Internal Revenue Service, so the Security Office spends more time preparing and reviewing for these audits. Because Orion is not regulated or audited by a third party, less time is spent managing its security.

PAD focuses on Orion's data completeness, correctness, and system performance to meet critical deadlines for property appraisals. Therefore, daily operational needs come first and foremost, while security risks are addressed as time permits. PAD uses an administrative security control which requires each employee sign a nondisclosure agreement and self-report conflicts of interest. PAD values its staff and trust they do not misuse their positions. While this is typical of business operations, it is also the reason DOR's Security Office needs to address risks and verify self-reported information.

Because Orion security is not the highest priority, core security controls and procedures have not been developed. Our work showed:

- The Orion security plan is incomplete.
- User activity and access within the system to read, change, and delete data and files is not monitored.
- Shared user accounts are used without proper controls in place.

The remainder of this chapter discusses each of these areas in detail and makes recommendations on how they should be improved.

Orion Security Plan Is Not Complete

During our audit, the department had yet to complete the Orion security plan. A security plan identifies, coordinates, and assigns security responsibilities while also identifying risks to the system and what mitigating controls exist. Because the plan is not complete, Orion security weaknesses are present and appropriate controls do not exist in several areas. These include the:

- ◊ Presence of confidential information in data and files.
- ◊ Processes that disclose confidential information.
- ◊ Correct and current access permissions for user records and access logs.
- ◊ Monitoring of user activity within access records or permission assignments.

Our work focused on identifying the effects of not having a security plan. We looked for confidential information in the database and within files stored on servers and workstations. We tested if access to these files prevented unauthorized moves, updates, deletions, and additions. We also assessed if the controls were monitored, and if any relevant actions were sufficiently logged. Through this work, we identified several issues related to confidential information and user access.

Data Classification of Confidential Information: When confidential information is not classified, processes necessary to protect it may not exist. While reviewing DOR's help desk system, we identified various types of confidential information. This specifically includes social security numbers and personal tax information used to verify income for approving property tax relief programs. The confidential data within the help desk system was not classified, and therefore lacked controls around access to the data.

Access to Extract Confidential Information: When users are given tools, like those used for running queries and reporting data, all system data is exposed to those users. This increases the risk of exfiltration. Exfiltration is the unauthorized access to confidential data which could then be taken, copied, or transferred inappropriately to parties that should not have the information. With the query and reporting tool used by PAD, users can extract the contents of the Orion database in a matter of minutes and save it to a spreadsheet on their desktop. Because Orion security planning had not been completed by DOR, data exfiltration risks have not been assessed.

User Activity Monitoring: When logs and file access go unmonitored, unauthorized use may go unnoticed. Orion access logs were established in December 2018. Since then, the access logs have not been monitored. Also, storage locations within the Orion system containing confidential Orion data are rarely monitored. Thus, there is a potential for information to be copied, deleted, or modified without detection. Follow-up is necessary to make certain Orion's data is protected, risks assessed, and violations caught.

Further Security Measures Can Be Taken to Mitigate Orion Data Risks

When discussing our findings with the department, they took immediate action to remedy access issues in the help desk system. Concerning data exfiltration, the department relies on disclosure agreements to mitigate the risk. While we understand there is no way to eliminate the potential of data exfiltration, there are practical ways to stop or identify users that take data without authorization. The department can prevent opportunities by reducing exposure to this information with limiting access and abilities. They can also use tools to track and log activity, thus increasing the chance the department can detect when an employee breaks the agreement.

A security plan addresses these situations through risk identification, compensating controls, level of mitigation, and acceptance of uncontrolled risks. Developing the Orion security plan and regularly reviewing it will ensure all staff responsible for Orion are communicating and coordinating to mitigate risk and impacts.

RECOMMENDATION #4

We recommend Department of Revenue develop, implement, and follow a security plan with annual revisions that include:

A. *Reviewing what confidential information needs to be stored within Orion and subsystems.*

B. *Performing a data classification review of existing data and file storage for proper classification.*

C. *Creating controls to limit user access to confidential data.*

D. *Formally monitoring access logs, user activity, and data/file removal.*

Access Management Responsibilities Are Unclear

We also reviewed how the department manages Orion application access and activity controls for confidential information and critical procedures. We interviewed DOR staff responsible for security to understand the processes for assigning, maintaining, and reviewing Orion security. We found the security responsibilities, defined by state policy, were unclear among the Security Office, the Technology Services Division (TSD), and the Property Assessment Division (PAD). The unclear responsibilities included:

- Official approvals for creating, modifying, and deleting various Orion users and roles, and
- Detecting correct and incorrect access within Orion, its support systems, and related folders and files.

Although other DOR systems have a structure for security responsibilities and access management, that structure is not used with Orion. In Orion, business users known as management analysts assign Orion access because PAD believes this creates process efficiencies. Management analysts make these changes after the security office approves them. In contrast, other DOR systems require the Security Office, not the business users, to make user access changes. This is best practice and represents a key security concept of separation of duties. For Orion, the enforcement of separation of duties has not been developed. Management analysts are both users and administrators within Orion, therefore there is not separation of duties.

When the business makes decisions impacting security, like managing access, the need for efficiency often inappropriately outweighs the need for security. This creates security weaknesses and leaves Orion without many industry standard security measures. Efficiency reasons have also led to contractor staff with inappropriate access to assign security roles and functions, as well as having administrative rights to production data without oversight.

User Access Needs to Be Monitored and Updated Consistently

A process for monitoring, updating, and verifying current user roles has also not been established. While reports exist to review and verify user access changes within Orion, the Security Office is not reviewing Orion access and configuration regularly. As result, we found:

Table 3
Security Access Review Discovered Issues

4	Active users with no jobs in Orion
5	Users with more rights than necessary
8	User who changed jobs, but kept more privileged rights
9	Unused, but active user accounts
12	Users that no longer needed access

Source: Compiled by the Legislative Audit Division from Department of Revenue data.

Since discussing these issues with PAD they have taken steps towards addressing these issues and improving access management.

Procedures to reconcile access to the database do not exist. Backend access is sometimes not updated when users change positions. For example, when a user moves to a different role within DOR which is outside of PAD, they could have maintained their database access to Orion if they are present in the Orion user group. To be removed from Orion, they must have both their Orion user record also flagged as inactive and their access membership changed.

Sometimes, not removing or updating some user accounts can lead to the presence of orphan or ghost accounts. When a user ID goes inactive and the Orion user ID is not updated, a generic identifier is substituted for the user's ID. These accounts are easy to identify because the generic identifier is a long set of numbers quite unlike a state user ID. The presence of the ghost accounts contributes to security risks because they retain all the same access rights as when they were associated with active users. In the event of a security breach, they could provide access to systems, resources, and data. We also found a contractor account present within an administrator group and another on a file storage folder containing uploaded documents. These accounts can be used to change system configurations or delete or change uploaded files.

Lack of Coordination for Access Management Creates Security Risks

Historically, PAD has not always managed security for Orion. The Security Office was involved when Orion was first implemented. However, over time, PAD wanted more efficiency when changing user access in field offices. While we understand the business need for efficiency, removing security's role from the management chain has led to core

security standards not being met. Security policy and procedures to monitor Orion's user access need improvements, like a matrix of appropriate user access allowed to each user role that complies with separation of duty, least privilege, and contractor access standards. By coordinating with the Security Office, these security standards related to access and other general standards, can be discussed and incorporated into business decisions.

RECOMMENDATION #5

We recommend the Department of Revenue coordinate Orion access management procedures with the department Security Office to ensure:

A. *Defined, documented procedures are developed and used for approving, changing, and removing access within Orion, its support systems, and its related folders and files,*

B. *A security matrix exists of user roles and responsibilities that defines separation of duties and least privilege within Orion, its subsystems, and file storage.*

C. *Contractor access is limited and monitored.*

Shared Accounts Pose Security Concerns

While we were reviewing access management, we identified two shared accounts, which are user accounts shared by more than one user. Shared accounts create two risks for an organization:

1. Multiple people can use the account, making it difficult, if not impossible, to review use, and
2. Any change to the password must be coordinated. Users of the account must be notified, the new password securely and reliably distributed, then the password changed. This can be a lot of work because it involves multiple system components as well as people. Because of the effort involved, these important passwords are infrequently changed.

One shared account we identified has administrative control of the Orion application. A person using the account has all administrative privileges within the Orion application. Its password is stored in a password vault and is known to department staff and the contracted vendor. This account is used most often by the contracted vendor staff for verifying, testing, and checking Orion features after upgrades or in special circumstances. However, TSD knows the login credentials for this account. When someone logs in with this account, it is not verified by an active directory like

normal user accounts, so the person can use administrative privileges within Orion anonymously.

The other shared account is used to coordinate processes across Orion servers. The account has privileged access to machines and the database. The password is improperly stored for this account. If the password was identified, the account can be misused and all data within Orion could be altered, or even deleted, and system processes critical to the fairness of property appraisals could be manipulated.

Shared Accounts Need to Be Eliminated

The use of a shared account and password are artifacts from the original 2008 Orion design. Past discussion with the contracted vendor to change this scheme resulted in no action because the vendor said the change could result in a design change. This change would be complex because of the coding necessary to coordinate secure access across many servers. However, the department needs to address these accounts as soon as possible. The malicious use of either shared account could severely and dramatically affect Orion.

During our work we discussed possible resolutions and ways to secure the accounts until more permanent measures could be taken. The vendor described ways to resolve the issue including server configuration changes or encryption and modified access processes. The vendor estimated 200 hours of staff time to resolve, which would cost about $32,000. The option for DOR staff to address the issue without code changes would be about 300 hours or $15,000 of staff time. In either case, the department needs to address the accounts and ensure secure measures are taken immediately until the accounts can be eliminated.

RECOMMENDATION #6

We recommend the Department of Revenue:

A. *Eliminate unsecured shared accounts, and*

B. *Encrypt user credentials and document when shared accounts are used and by whom until these unsecure shared accounts can be eliminated.*

Chapter IV – Developing Statewide Quality Assurance and Training

Introduction

Data validity and consistency are key in ensuring a Computer Automated Mass Appraisal (CAMA) system maintains integrity. The Property Assessment Division (PAD) is responsible for the uniformity of procedures to ensure data quality and fair property appraisals statewide. Orion quality assurance activities and associated training ensure effective and efficient procedures exist. Training users on how to use the system ensures Orion work products, reports, and data are suitable for their intended purposes, and quality assurance identifies when they are not. Quality assurance also provides information on how to improve training which helps monitor training effectiveness.

Accuracy and Integrity of Orion Data, and Efficient Processes Are Fundamental

As recommended by the International Association of Assessing Officers (IAAO), PAD uses a ratio study, a set of statistics describing the distribution of the ratios of the appraised value to the sale price, to measure statistically how close their appraisals are to market value. This is done by comparing appraised values to sales values of properties with similar characteristics. The Tax Policy and Research Office calculated the 2019 ratio study using 6,448 sales. It shows PAD appraisals are within 98 percent to 103 percent of market sales values. The IAAO states the findings of a ratio study can only be as accurate as the data used in the study, and accuracy and integrity of data entered into or transferred through computer systems must be ensured. So, while the Department of Revenue (department or DOR) maintains a high level of accuracy in determining market values, it must also consistently coordinate, train, and assure all data for all properties is sound.

We did not review individual property assessments and the calculation for market values. Controls are already in place to reduce risk and errors for those calculations and assessments. Instead, we examined Orion data to determine if data issues or inconsistencies are eliminated and if uniform processes are used across the state in all PAD locations. The data can be analyzed in such a way to show patterns of use across the state between positions and locations.

From the observations of logs and data, we saw how PAD users inconsistently use some features of Orion. We found evidence that attention to data on a statewide level could improve PAD's overall quality processes and reduce the amount of time spent randomly finding data errors for the division.

Quality Procedures Are Managed Regionally

PAD manages its work by dividing the state into four regions. Each region has a main office and area offices where field staff work to be closer to the properties they are responsible for appraising. In total, PAD has 28 offices including its central office. Each office plays a different role in the appraisal system, but all use Orion in their day-to-day responsibilities related to property appraisals.

Orion users are managed within their regions. Quality control management and processes differ from region to region. When regions manage for quality results separately, the risk increases for statewide inconsistency and challenges PAD's ability to train staff uniformly.

Data and System Usage Are Inconsistent Between Regions

In general, unusual variations in Orion data, especially between similar properties can indicate a variation in process or a data error. Either undermine uniformity of data and demonstrate when Orion is used differently by staff or between areas.

The IAAO indicates uniformity has several aspects, the first of which relates to consistency. Inconsistencies show up in a property as unusual field use, data entry patterns, and record update frequency. We saw inconsistent Orion data and system usage between regions indicative of variations in training, understanding, or processes. To understand how PAD is addressing uniform system use, we reviewed data and processes already in place that identify incorrect system use. We identified quality assurance has been established at varying levels in each region, but it is not coordinated statewide to ensure consistency. Specifically, we identified the following instances:

- Data differences among counties indicate inconsistent usage of Orion fields. We identified 33 fields where only 1 county changed the data in the field across 13 counties in tax year 2018. For example, we found a property coded as residential property with Hotel/Motel income and 14 units. While there may be a valid reason, it raises questions about system procedures or human error that management wanted to review.
- System error logs are not monitored. These logs provide information when the activity is determined by the system to be incorrect. We found 2 counties with higher error rates than other counties. Because these errors are not reviewed, the causes are unknown and not being addressed. Without addressing the cause there is potential for procedural or systematic issues to continue. We also found instances where error descriptions are truncated. When these descriptions are incomplete, Orion diagnostic data is lost, making identifying and solving problems more difficult because only the first part of the message is readable.
- We found 221 appeals from 39 counties in tax year 2018 were due to inaccurate data in Orion. Taxpayers file appeals when they believe the

assessment of their property is inaccurate. This can be due to many reasons, such as inaccurate property data or untimely appraisals. In most cases, appeals occur because the property value seems too high. This information could be tied into quality assurance programs, like system errors, to identify focus areas for quality assurance or training.

- At least 30,000 quality control reports are run a year. The high number indicates inefficiencies, either due to lack of coordination of reporting or training in some processes. Orion users are frustrated with multiple reports used for quality assurance. Reporting is split between three reporting tools– each with shortcomings. For one tool, only 20 of its 562 reports are used most of the time. The second cannot identify the report users and stores report results in uncontrolled locations. The third was not designed for comparison between counties or the state.

Quality Assurance Is Focused on the Appraisal Value

Orion was originally designed for smaller, less involved, property tax jurisdictions, like counties. Montana's Orion was the first upgrade to calculate taxable value within a state. It was not designed with features for statewide monitoring. This uniqueness has limited examples or common practices for PAD to build their quality assurance program.

Quality assurance is taken seriously by the division, and staff focus on details. Their current priority is to find errors in the specific fields associated with appraisals. However, properties have many data fields and assessment modeling only uses key fields that drive property values, like year built, square footage, and number of bedrooms. The other property fields have importance for context, completeness, and other types of analysis.

Assurance Procedures Can Be Coordinated for More Effectiveness

PAD indicated this level and focus of work has not been done due to other priorities and limited staff. For example, at PAD Central Office, the management analysts are integral to Orion's operations because they know the nuances of both Orion and the appraisal process. They, like all PAD staff, work to meet statutory deadlines throughout the year. This involves managing multiple county processes and their own statewide processes to complete them before each deadline. Through this, they have developed some statewide reports for identifying quality issues that occur, for example, with assessments, sales ratios, splits and combinations, processes, and new properties.

While we understand performing and coordinating statewide activities takes time, PAD should review its resources and identify the highest statewide quality assurance

needs for Orion data accuracy; for example, to make sure Orion properties are correctly classified between residential or income. From there, PAD can focus on those quality assurance issues where true and fair data results in more accurate taxable values. Step by step, they can incrementally build a system of quality assurance procedures that address statewide uniformity.

By establishing statewide quality assurance procedures within the central office, PAD will have a more efficient means of addressing quality and the root cause of issues.

- Potential system or process changes to address simultaneous data entry or negative values can be thoroughly understood and discussed instead of multiple reports having to be run over and over by each region to clean up data.
- Errors can be reviewed for changes to the system and processes as well, so users are not frustrated with repetitive or unsolved problems in their work.
- Other system logs and functions can potentially streamline quality assurance work or issue resolution.
- Quality assurance reports can be streamlined and shared across the state.

RECOMMENDATION #7

We recommend the Department of Revenue establish statewide quality procedures that:

A. *Review system field usage to identify user errors and inconsistencies.*

B. *Monitor error logs to identify system errors and training issues.*

C. *Connect causes to address potential system issues or common user error.*

User Training Is Key in Statewide System Consistency

For PAD, quality assurance depends on accurate monitoring, informed responses, and professional judgement, but begins with well-trained staff. The IAAO suggests assessment quality and uniformity depend on training all staff to be consistent, complete, and conscientious of the impacts of their role on successful appraisals. A lack of coordinated statewide training can contribute to inconsistencies in Orion and create more work to assure the quality of data and integrity of the system.

We reviewed the training curriculum to determine how it establishes consistent system use and quality data. We also evaluated Orion monitoring and logs to see if they

contribute content for further training and for the training curriculum. We also talked with regions and surveyed Orion users to see if they are satisfied with Orion training and training in general.

Users Indicated Training Can Be Improved

We surveyed 312 Orion users and received 185 responses from staff in every office across the state and every position within PAD. The survey addressed key areas related to our audit objectives, including:

- Training satisfaction
- Supplemental training
- Quality assurance and reports
- System change communication and training

With the information we gathered, it was clear that some users believe training could be improved. We were able to see how user satisfaction with communication and training varies within jobs and staff location. The variance in user satisfaction may be why so many users have supplemental materials and regions provide unique trainings to fill in the gaps missing from standard training. Our survey of users showed:

- Staff generally want more structured, uniform, quality training. We learned 17 percent of PAD employees did not believe they received enough Orion training. Many created their own individual training materials. When asked about training quality, 48 percent of respondents said the training was easy to comprehend and complete, while the other half, 52 percent, were indifferent or disagree.
- Some users commented they have insufficient knowledge of which fields are required and which are not required. Also, procedures for quality control are confusing because of the various ways to accomplish similar tasks.
- Respondents described a level of frustration and confusion when system changes occur after a patch or major release. Almost a third of respondents had trouble understanding communication about the system changes and how it related to their jobs. When system changes happen, the quality of communication affects how quickly and successfully the changes will be used.
- Seventy-eight percent of users prefer trial-and-error and job shadowing as training rather than using department-created materials. Trial-and-error may be a good way to learn, but in terms of quality assurance and getting it right the first time, it can introduce errors that take later efforts to correct them. Shadowing can lead to the same inconsistencies and be inefficient or inefficiently structured.

Training Issues Contribute to Inconsistent Data Entry and Report Usage

When reviewing the data within Orion, what we identified not only indicated the need for statewide review of data, but the effect of not having more consistent, complete system training. The data we reviewed relates to property data, system activity data, and data generated from querying and reporting.

Orion's property data by region indicates unusual field use that could be due to insufficient or inconsistent training. The outliers we identified within field usage included specific situations where there may be a need for manual work-arounds due to a limit of system capability, or unique property situation. These are areas less likely to be addressed with training or standard procedure and are more susceptible to trial-and-error or job shadowing. While simply looking at the data may indicate system training was not uniform in these specific situations, quality assurance has yet to identify if this unusual field usage is appropriate or not.

Orion log data also provides data that can be used to identify which users are having issues or need more training. We saw examples where errors were clustered in areas, regions, or positions. When higher than expected concentrations of errors take place, it may indicate an area to focus system training or review system operations. However, these logs are not reviewed and analyzed to make targeted improvements.

We also identified formal report development procedures and training are missing for the query and analysis tool. This training would help prevent inefficient queries that adversely affect Orion's performance. Some regions use the tool more than others because managers have independently learned how to use the tool.

Division Faces Challenges in Developing Comprehensive Training for Complex System

Orion contains the information to target training to regions, positions, and individuals. Effective and efficient training can use results from the analysis of Orion data. However, there are challenges to overcome. These challenges relate to knowledge, location, and resources:

Knowledge: There needs to be people who know how find Orion problems and where they are occurring across the state by using Orion logs and data. These individuals must be able to suggest realistic, actionable steps to decrease or eliminate errors and coordinate with central and regional managers.

Location: Practically, it is difficult to bring PAD staff together in one location, physically or virtually, due to the size of our state and network speed and coverage. Thought must be given to the best means to engage department staff individually and as teams. This engagement is necessary to understand the results of data analysis in the context of everyday work. When possible, it is helpful to bring together staff from functional areas from across region or state. For example, a recent commercial appraisal course was offered by PAD for appraisers. PAD staff described the course as successful because it built competence, knowledge, and skills, and because those who have the same job had a chance to meet and exchange experience. Staff involved with modeling assessments meet each year to train, review, and test their appraisal models. We observed their gathering and saw its effectiveness demonstrated by the skill participants showed solving difficult modeling problems. From interviews and observations, this type of group problem-solving is critical to a successful statewide assessment.

Resources: Property value specialists go through on-boarding and task-specfic training, but do not have a statewide meeting for training, yet they often are the ones who are closest to the Orion data entry and control. Until recently, DOR lacked a training coordinator that could review and assess needs statewide. Now the position is in place, property valuation specialists can be included. The training coordinator has also completed the update to the PAD training manual. It is important for PAD employees, who cannot meet statewide, to discuss how they do their work and receive quality training based on the best practices learned from each region. The training coordinator will work with four regional trainers to deliver quality training to them. PAD indicated they are developing system training as best they can, and struggle to find time for it in addition to the required training for property appraisers as required by rule and law.

Deadlines and Priorities for Valuations Drives Staff Training

PAD has based the training program on the priority of deadlines and certifications. Training to ensure PAD meets target metrics for certification have been most important, so training is set up specific to valuation and statewide events related to valuation processes. This also impacts the scope of training. Except for appraisers who are state approved, no other PAD employees have an assessment of training effectiveness. It is left to regional managers to monitor their regional and area staff individually after they start using Orion.

PAD does not monitor data that could provide focus areas and priorities of training development outside of valuations and certifications. Errors and data trends could help trainers understand the source of errors for focused training. An analysis of the existing logs, errors, and data trends can make training more effective and efficient. The analysis will also detect flaws, inefficiencies, and inconsistences that need to be fixed.

RECOMMENDATION #8

We recommend the Department of Revenue:

A. *Coordinate targeted training across the state based on Orion use and issues.*

B. *Incorporate Orion log data and quality assurance programs into training development.*

Department of Revenue

Department Response

MONTANA Department of REVENUE

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Director Gene Walborn

April 13, 2020

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RECEIVED
April 13, 2020
LEGISLATIVE AUDIT DIV.

Dear Mr. Maciver:

Below is the department of Revenue's response to the Information Systems Audit, Data Security and Operational Performance of Montana's Computer Assisted Mass Appraisal and Tax System (Orion).

Recommendation #1:

We recommend the Department of Revenue establish objective baseline expectations for Orion performance.

Concur. Orion user expectations have been informally developed through daily system performance and individual user perceptions. The department agrees that establishing formal performance expectations could be beneficial.

The Orion system is an appraisal software system used by many local government jurisdictions throughout the country. Montana's implementation of Orion is unique in that uses the system statewide covering hundreds of local government jurisdictions. While it is an important goal to have objective expectations, currently, there are no industry standards available for the department to use in the development of baseline expectations. Also, due to the various subsystems required in the end-to-end Orion operations, user expectations may be higher than system capabilities, making these expectations unreasonable. One example is the lack of availability of Internet bandwidth. A user may want 1 second action response time, but due to the Internet available in the department's field office, this is not attainable.

The department will work with the Orion vendor and users to review the ability to develop measurable baseline system capabilities and user expectations. The department anticipates completing this review by December 2021. Based on the findings of the review the department we determine which measurable baseline expectations can be implemented.

Recommendation #2:

We recommend the Department of Revenue:

A. Assign a team to manage and lead the service-level agreement process on an ongoing basis.

B. Work with the vendor, Technical Services Division, and State Information Technology Services to create agency agreements or service level agreements for Orion's performance.

C. Develop a formal and documented process to ensure ongoing communications occur between all service-level agreement parties to hold them accountable to their service-level agreement baseline.

Partially concur. Recommendation #2 recommends the department establish, implement and maintain Service Level Agreements (SLA). The department agrees that SLAs are important and is committed to establishing SLAs with the department's vendors and service providers.

The department will formally establish a team to manage the development and ongoing oversight of SLAs related to the Orion system. The team will be in place by June 2020.

The department will establish internal operational agreements for Orion performance, between the department's Technical Services Division and the Property Assessment Division. These agreements will be in place by the end of June 2021.

The department will work with the Orion vendor to develop an SLA for the functions that the department and the Orion vendor can control. The department will seek to include Orion performance expectations (as developed under response to Recommendation #1), and metrics and enforcement into the Orion contract upon contract renewal by June 2022.

The department will present the audit findings and expectations to the State Information Technology Services Division (SITSD). The parties will discuss the ability to enter into an enforceable SLA. The result of this discussion will determine if the audit recommendation can be implemented and the timing of the implementation.

Recommendation #3:

We recommend the Department of Revenue develop a formal process to manage the use of the query and analysis tool that includes:

A. Ongoing monitoring of query and analysis tool to improve training and quality assurance.

B. Addressing security risks to mitigate data leakage.

C. Developing queries in controlled and structural manner to avoid impacts on

performance.

D. Managing and storing queried information from Orion databases to maintain data security.

Conditionally concur. The department relies on its query and analysis tool for many of its data analysis needs. In addition to tools used to develop queries, the department uses an Office add-in to make query results available in Microsoft Office applications. This is a very efficient means to share query results. Queries using this tool are not run against the Orion production database, so these queries do not impact the performance of Orion.

The department currently has a limited number of staff with the knowledge or training necessary to build queries using this tool. Additional analysis, monitoring, and managing of the department's query system will require additional staff with specialized experience and knowledge in the query system.

The department will review this recommendation to determine the number of additional FTE that will be required to implement the audit recommendation. Based on this review, a determination will be made as to whether additional FTE will be requested in department's 2023 biennium budget proposal.

Recommendation #4:

We recommend Department of Revenue develop, implement, and follow a security plan with annual revisions that include:

A. Reviewing what confidential information needs to be stored within Orion and subsystems.

B. Performing a data classification review of existing data and file storage for proper classification.

C. Creating controls to limit user access to confidential data.

D. Formally monitoring access logs, user activity, and data/file removal.

Concur. We are developing a System Security Plan (SSP) for Orion and each subsystem that includes reviewing and classifying the data while limiting access to confidential data. The SSP will define requirements for monitoring but may not be able to implement fully without additional FTE dedicated to auditing DOR systems.

The department will review this recommendation to determine the number of additional FTE that will be required to implement the audit recommendation. Based on this review, a determination will be made as to whether additional FTE will be requested in department's 2023 biennium budget proposal.

Recommendation #5:

We recommend the Department of Revenue coordinate Orion access management procedures with department Security Office to ensure:

A. Defined, documented procedures are developed and used for approving, changing and removing access within Orion, its supporting systems, and its related folders and files.

B. A security matrix exists of user roles and responsibilities that defines separation of duties and least privilege within Orion, its subsystems, and file storage.

C. Contractor access is limited and monitored.

Concur. A process for ensuring the security and safety of the Orion system is currently in place. Approving, modifying, and removing access to Orion is initiated with a user change request that is approved by the department's Security Office. This process will be reviewed and updated to ensure that all access requests are appropriately handled. Additionally, the department is developing role base access groups which will include a security matrix for all systems, subsystems and file storage. The Security Office has approved a process implemented by the department's Technology Services Division for the enabling and disabling of Orion contractors.

Recommendation #6:

We recommend the Department of Revenue:

A. Eliminate unsecured shared accounts, and

B. Encrypt user credentials and document when shared accounts are used and by whom until these unsecure shared accounts can be eliminated.

Concur. The Security Office is working with the department's Technology Services Division to review and eliminate unsecured shared accounts while ensuring the Orion system and users are operational. Any shared accounts that cannot be eliminated will be encrypted. The use of any necessary shared accounts will be documented and continually reviewed until they can be eliminated.

Recommendation #7:

We recommend the Department of Revenue establish quality procedures that:

A. Review system field usage to identify user errors and inconsistencies.

B. Monitor error logs to identify system errors and training issues.

C. Connect causes to address potential system issues or common user error.

Conditionally concur. The department determines market value through the application of mass appraisal techniques. Mass appraisal is the process of valuing groups of properties as of a given date, using common data, standardized methods, and statistical testing to determine market values. Property data is used to develop models that provide a mathematical expression of how supply and demand factors interact in a market. Appraisal staff is trained and focused on building and calibrating models to accurately predict market value for groups of properties. The department has processes to address quality according to mass appraisal practices and industry best practices, and the department's appraisals meet and exceed industry standards.

The department does not currently have FTE available to establish and manage a statewide program to identify, analyze, and interpret trends or patterns in complex data sets within the Orion system. The department will review this recommendation to determine the number of additional FTE that will be required to implement the audit recommendation. Based on this review, a determination will be made as to whether additional FTE will be requested in department's 2023 biennium budget proposal.

Recommendation #8

We recommend the Department of Revenue:

A. Coordinate targeted training across the state based on Orion use and issues.

Concur. The department has one FTE committed to the development of a training program for the Property Assessment Division. The Property Assessment Division's Appraiser Guide has been completely updated and will be available to all Property Assessment Division staff June 2020. This guide is a comprehensive set of instructions for appraisers, including appraisal techniques and the proper use of the Orion system. Training on the content and use of this Guide will accompany its rollout.

In addition to the development of the Appraiser Guide, the Property Assessment Division plans to develop online training modules. Each module will be aimed at accomplishing specific tasks and will be available for staff beginning June 2020.

B. Incorporate Orion log data and quality assurance programs into training development.

Conditionally Concur. If the Legislature provides the department additional FTE to develop and manage quality assurance programs, as discussed in Recommendation #7, the data provided by these programs will be utilized to develop targeted training.

The department will review the recommendation to develop and manage quality assurance programs to determine the number of additional FTE that will be required to implement the audit recommendation. Based on this review, a determination will be made as to whether additional FTE will be requested in department's 2023 biennium budget proposal.

On behalf of the department, thank you for allowing us to respond to the performance audit report. I would also like to express my gratitude for your staff and their professionalism during the journey of this audit.

Please let me know if you have additional questions.

Sincerely,

Gene Walborn
Director