



State of Nevada
Governor's Finance Office
Division of Internal Audits

Audit Report

**Secretary of State
Elections Division**

Report No. 19-01
October 17, 2018

EXECUTIVE SUMMARY
Office of the Secretary of State,
Elections Division

Introduction page 1

**Objective: Improve Oversight of Secretary of State
Elections Administration**

Evaluate Using Risk-Limiting Audit (RLA) Methodology page 2

Evaluating using RLA methodology for Nevada’s post-election audits will help ensure post-election audit results are statistically supported and allow for a more effective audit methodology. The Office of the Secretary of State (office) Elections Division (division) would need to modify NAC to reflect the change. Nevada’s current fixed percentage, nonstatistical post-election audits may not be an effective methodology. Fixed percentage, nonstatistical audits may result in ineffective audits due to inadequately sized samples when the margin of victory is close, or inefficient audits due to larger than necessary sized samples in elections held in large jurisdictions, statewide elections, or elections with wide margins of victory.

RLAs are based on statistical audit methodology that has a high probability of correcting incorrect election results because the RLA continues until statistical evidence confirms the result, up to and including a full hand recount. RLAs require ballot-level testing and can be used to audit all Nevada elections and ballot measures. The basis for implementing RLAs is to verify correct interpretation of each ballot, and therefore, voter intent. RLAs are referred to as the “gold standard” of post-election audits and are endorsed by the American Statistical Association. The cost to implement RLAs in Nevada may be charged against the Help America Vote Act (HAVA) Election Security Grant awarded to the Office of the Secretary of State (office) in March 2018.

Evaluate Using Oregon’s Recall Petition Signature Verification Methodology page 7

Evaluating using Oregon’s recall petition signature verification methodology will help ensure recall petition results are statistically supported. NRS requires a fixed percentage/number, nonstatistical methodology for election petition verifications that may not ensure accurate recall petition determinations because it does not incorporate other statistical elements into its methodology, such as risk or margin of error. Recall petitions filed with the division in August 2017 to recall two Nevada State Senators were determined to be sufficient using the methodology required by NRS. Both Senators filed court challenges to the legal sufficiency of the petitions in early 2018 and the court subsequently ordered every signature on both petitions be verified. Following full petition verification, the court ruled both recall petitions failed to qualify for a special election. Oregon’s signature verification methodology uses statistical elements not included in Nevada’s methodology. The Division of Internal Audits applied Oregon’s recall petition signature verification methodology to Nevada sampling data using results issued by the division. Findings show that both petitions would have been deemed insufficient to hold a special election consistent with the full petition verification.

Revise and Clarify NRS and NAC page 10

Revising and clarifying NRS and NAC will allow for consistent interpretation and election practices amongst state and local jurisdictions. Sections of NRS 293 and 293B are outdated and refer to standards that no longer exist and a federal agency that no longer has oversight over federal voting system standards. NAC 293B.110 regarding local election official certification of voting tabulation

software and operating systems is unclear. As written, the NAC requirements are not possible to accomplish. NAC 293.255 requires post-election audits of only VVPAT equipped voting system machines and is only enforceable in Nevada jurisdictions that use VVPAT systems. NAC requirements do not cover all ballot categories and voting systems used in Nevada, including the voting system used in Carson City. Adequate post-election audits help ensure the integrity of voting systems and election results. Carson City performed alternate post-election audit procedures to verify voter intent; however, Carson City's audit methodology may have been inadequate to confirm election results.

**Improve Policies and Procedures for Approving Voting Systems..... page 13
and Oversight of Jurisdictions' Election Practices**

Improving policies and procedures for voting system approval will provide guidance for division personnel and provide for consistent voting system approvals and oversight of election practices. The division does not have documented policies and procedures for how manufacturer applications, reports, and other supporting documentation are reviewed to ensure systems meet or exceed federal standards consistent with NRS 293B.104. Additionally, there is inadequate documentation of division procedures for oversight of local election officials' compliance with NRS and NAC. The division represents there is no requirement for local jurisdictions to report certification results to the office; however the division tracks notifications from local jurisdictions of their pre and post-election certifications required by NRS and NAC. Multiple jurisdictions submitted incorrect or incomplete pre and post-election certifications and several have yet to notify the division of their certifications. The division represents they have not been able to perform reviews of jurisdictions' election practices, certifications, or pre and post-election testing and audits due to lack of resources. The division requested and received approval for two new elections administration positions and is currently working with human resource staff to fill the positions.

Ensure Compliance with HAVA Grant Requirements page 18

Complying with HAVA grant, federal, and state requirements will help ensure written procedures and internal controls are documented. Noncompliance with federal requirements creates the risk of losing access to federal funding or having to repay already expended funds to the federal government. Federal guidelines require written procedures and internal controls for federal grant administration. The division's written procedures and internal controls (policies) for federal grant administration inadequately reflect current federal requirements. Adequate policies are necessary to ensure the division's grant administration practices comply with federal requirements as required by federal regulation and state guidelines.

Appendix A page 20

Scope and Methodology, Background, Acknowledgments

Appendix B page 23

Response and Implementation Plan

Appendix C page 27

Timetable for Implementing Audit Recommendations

Appendix D page 29

Discussion on Risk-Limiting Audits

INTRODUCTION

At the request of the Secretary of State, we conducted an audit of the Office of the Secretary of State (office), Elections Division (division). Our audit focused on the division's administration of election activities in the State of Nevada. The audit's scope and methodology, background, and acknowledgements are included in Appendix A.

Our audit objective was to develop recommendations to:

- ✓ Improve Oversight of Secretary of State Elections Administration.

Office of the Secretary of State Response and Implementation Plan

We provided draft copies of this report to the Office of the Secretary of State for its review and comments. The office's comments have been considered in the preparation of this report and are included in Appendix B. In its response, the office accepted our recommendations. Appendix C includes a timetable to implement our recommendations.

NRS 353A.090 requires within six months after the final report is issued to the Executive Branch Audit Committee, the Administrator of the Division of Internal Audits shall evaluate the steps the office has taken to implement the recommendations and shall determine whether the steps are achieving the desired results. The administrator shall report the six month follow-up results to the committee and the office officials.

The following report contains our findings, conclusions, and recommendations.

Improve Oversight of Secretary of State Elections Administration

The Office of the Secretary of State (office), Elections Division (division) can improve oversight of elections administration by:

- Evaluating using risk-limiting audit (RLA) methodology for post-election audits and modifying Nevada Administrative Code (NAC) to reflect the change;
- Evaluating using Oregon's recall petition signature verification methodology;
- Revising and clarifying Nevada Revised Statutes (NRS) and NAC;
- Improving policies and procedures for approving voting systems and oversight of jurisdictions' election practices; and
- Ensuring compliance with Help America Vote Act (HAVA) grant, federal, and state requirements.

Improving oversight of elections administration will help ensure consistent conduct of elections, effective petition practices, and compliance with HAVA grant requirements.

Evaluate Using Risk-Limiting Audit (RLA) Methodology

The division should evaluate using RLA methodology for Nevada's post-election audits. RLAs will help ensure post-election audit results are statistically supported and allow for a more effective audit methodology. The division should modify NAC to reflect the change from fixed percentage, nonstatistical to RLA methodology. See Appendix D for a detailed discussion of RLAs.

Nevada Uses Fixed Percentage Nonstatistical Audit Methodology

NAC 293.255 requires fixed percentage, nonstatistical post-election audits in order to ensure voting machines accurately record all votes cast. A fixed percentage, nonstatistical audit methodology may not effectively ensure voting machines accurately record all votes cast.

Local election officials in counties with populations of 100,000 or more must randomly select two percent of all voting machines used in the election or not less than 20 voting machines, whichever is greater.¹ The requirement changes to three percent or not less than four voting machines, whichever is greater, for counties with a population of less than 100,000.

Nevada's Fixed Percentage Nonstatistical Audits May Not Be Effective

Nevada's fixed percentage audit methodology is a nonstatistical methodology because it does not consider risk-limiting factors such as margin of victory and confidence levels. This may not be effective because fixed percentage, nonstatistical audits may result in inadequately sized samples or inefficient audits.²

NAC Requirements May Result in Inadequately Sized Samples

A larger statistical sample is required to support election results when margin of victory is close because there is less room for error.³ As such, fixed percentage audits required by NAC may result in an inadequately sized sample (too small) to provide statistical confidence in election results when margin of victory is close.

NAC Requirements May Result in Inefficient Audits

The sample size required to achieve statistical accuracy in a post-election audit is affected more by margin of victory than a jurisdiction's population size.⁴ A fixed percentage audit based on population is an inefficient methodology to use in large jurisdictions or cross-jurisdictional elections because it results in larger than necessary samples and increased audit workload.⁵ Consequently, fixed-percentage audits required by NAC may be inefficient in the majority of elections, especially statewide elections or elections with wide margins of victory.

¹Local election officials include county clerks, clerk/recorders, clerk/treasurers, voter registrars, and support staff.

²An adequately sized sample is representative of actual voting results when testing conclusions would be similar to those if the same procedures had been applied to testing 100 percent of the votes.

³Mark Lindeman and Philip B. Stark. "A Gentle Introduction to Risk-Limiting Audits," *IEEE Security and Privacy Special Issue on Electronic Voting* 10, no. 5 (2012), 42, doi: 10.1109/MSP.2012.56.

⁴The margin of victory in an RLA is calculated as the smallest reported margin in number of votes divided by the number of ballots cast.

⁵John McCarthy et al. "Percentage-Based versus Statistical-Power-Based Vote Tabulation Audits," *American Statistical Association* 62, no. 1 (2008): 11, doi: 10.1198/000313008X273779.

RLAs Are Based on Statistical Methodology

RLAs are based on statistical audit methodology that has a high probability of correcting incorrect election results because the RLA continues until statistical evidence confirms the result, up to and including a full hand recount. RLA methodology incorporates margin of victory and a risk limit as elements of a statistical algorithm to determine sample size.⁶

The risk limit defines the largest chance the audit will stop short of discovering the outcome is wrong without a full hand count, no matter the issue. For example, a 5 percent risk limit will provide almost complete confidence that evidence will affirm the election results. Risk limits should consider potential issues such as previous random errors, voter errors, voting system configuration errors, software bugs, equipment failures, or deliberate fraud.⁷

RLAs Require Ballot-Level Testing

RLAs require ballot-level testing conducted through hand examining randomly selected individual paper ballot records and comparing to corresponding official electronic vote records to determine if voter intent was correctly interpreted by the voting system.⁸ Testing continues until there is sufficiently strong statistical evidence that a full hand count would confirm the original election results. Ballot-level testing includes all categories of ballots.

Nevada's post-election audit comparison of paper ballot records to electronic vote records stops at a fixed percentage and does not continue until there is sufficiently strong statistical evidence to confirm the original election results. Nevada's post-election audits do not include all categories of ballots.

RLAs Can Be Used to Audit All Nevada Elections and Ballot Measures

RLAs may be conducted simultaneously on multiple elections using the same sample and can be used for elections and ballot measures that require a majority vote, a supermajority, have more than one winner, are cross-jurisdictional, or have ranked-choice voting. As such, RLA methodology can be used to audit all Nevada elections and ballot measures because Nevada's elections and ballot measures fall within these criteria.

⁶The risk limit is the confidence level that statistical evidence will affirm the election results.

⁷Lindeman and Stark, "A Gentle Introduction to Risk-Limiting Audits," 42.

⁸Electronic vote records are detailed individual voter records used to interpret, record, and determine total vote tallies and election results. These records consist of electronically tabulated paper ballot votes (such as absentee ballots) and electronic votes cast directly on an electronic voting system.

Accurately Interpreting and Verifying Voter Intent is Key to Implementing RLAs

The basis for implementing RLAs is to verify correct interpretation of each ballot, and therefore, voter intent.⁹ Pending federal voting system standards include principles that designate auditability of election results, voting system software independence, and voting system resilience as key properties of voting systems that have the ability to accurately interpret voter intent. The only existing technology that incorporates these key properties is a voter verified paper trail, according to the U.S. Election Assistance Commission (EAC) Board of Advisors.¹⁰

Modify NAC to Reflect RLA Requirements

The Secretary of State will need to modify NAC 293 to ensure all categories of ballots are subject to audit and verifiable for voter intent in order to implement RLAs and comply with federal standards as prescribed by NRS 293.2696 and NRS 293B.063.

RLAs Are Gold Standard of Post-Election Audits

Some states (Colorado, Rhode Island, and Virginia) require RLAs as the method of post-election audit, while other states (Ohio and Washington) allow RLAs to be performed as one of multiple methods allowed for post-election audits. RLAs are referred to as the “gold standard” of post-election audits by the Center for American Progress.¹¹

RLA Methodology Endorsed by the American Statistical Association

The American Statistical Association¹² has endorsed RLA methodology as it provides "an acceptably small probability of failing to correct a wrong machine-counted outcome. When a machine-counted outcome is correct, a risk-limiting

⁹The term “ballot” encompasses all ballot categories, including early voted ballots, electronic and paper ballots cast at polling locations, absentee ballots, mail-in ballots, provisional ballots, and emergency ballots.

¹⁰U.S. Election Assistance Commission. Board of Advisors. *Resolution 2018-03*. Florida, 2018. <https://www.eac.gov/documents/2018/04/27/resolution-2018-03-auditability-of-voter-intent-passed-10-8-4-advisors-resolution-page/>. The EAC was established by the Help America Vote Act (HAVA) of 2002 and is an independent, bipartisan commission charged with developing guidance to meet HAVA requirements, adopting voluntary voting system guidelines, and serving as a national clearinghouse of information on election administration.

¹¹The Center for American Progress describes itself as a nonpartisan policy institute that develops policies for policymakers to support economic mobility, global prosperity, and effective government.

¹²The American Statistical Association (AMSTAT) is the world’s largest professional statistician association whose members serve in industry, government, and academia. AMSTAT publishes numerous professional statistical journals.

audit can often confirm the result after examining only a small fraction of the ballots cast."¹³

HAVA Funds Can Be Used to Implement RLAs in Nevada

Nevada was awarded almost \$4.3 million in federal funding in March 2018 through the Help America Vote Act (HAVA) Election Security Grant. HAVA grant funding can be used to improve the administration and security of federal elections, including implementing a post-election audit methodology that provides a high level of confidence in the accuracy of election results.

The cost to implement RLAs in Nevada may be charged against the HAVA grant with approval from the EAC. Costs to implement RLAs may include: developing and hosting an RLA software platform to assist local election officials perform audits; training division and local level personnel on the RLA process; and purchasing or retrofitting voting systems to ensure RLA capabilities.

Conclusion

Nevada's fixed percentage, nonstatistical post-election audits may not be an effective methodology. Evaluating using risk-limiting audit methodology for Nevada's post-election audits will help ensure election results are statistically supported. This would require the division to modify NAC to reflect the change from fixed percentage, nonstatistical to risk-limiting methodology.

Recommendation

1. Evaluate using risk-limiting audit methodology for post-election audits and modifying NAC to reflect the change.

¹³"American Statistical Association Statement on Risk-Limiting Post-Election Audits, 4/17/10," April 17, 2010, http://www.amstat.org/asa/files/pdfs/POL-Risk-Limiting_Endorsement.pdf.

Evaluate Using Oregon’s Recall Petition Signature Verification Methodology

The division should evaluate using Oregon’s recall petition signature verification methodology to help ensure election petition results are statistically supported.¹⁴

In Nevada, recall petitions must have signatures from 25 percent of the number of voters who voted in that jurisdiction in order to be deemed sufficient to hold a special election. Every elected public official in Nevada is subject to recall from office, with the exception of U.S. Senators, Representatives, and elected judges.

Statewide initiative and referendum petitions must have signatures equaling 10 percent of the voters who voted in the entire state at the last preceding election gathered from each of Nevada’s four congressional districts to qualify for inclusion on the ballot. County and municipal initiative petitions must have signatures equaling 15 percent of the voters who voted in the county or city election; referendum petitions require 10 percent.

Nevada Requires Fixed Percentage/Number Nonstatistical Signature Verification Methodology

NRS requires a fixed percentage/number, nonstatistical methodology for election petition verifications, whereby a sample of a minimum of five percent of signatures or 500 signatures submitted is randomly selected, whichever is greater.¹⁵ Following receipt of the initial Secretary of State Notice of Sufficiency that verifies the petition has the minimum number of signatures, local election officials verify petition signatures are valid and meet the threshold to hold a special election or for inclusion on the ballot.

The projected total for valid petition signatures is calculated by applying the percentage of valid signatures verified in the sample to the aggregate number of signatures submitted.¹⁶ The percentage of valid signatures verified in the sample is referred to as the expansion factor.

¹⁴Election petitions in this analysis include initiative, referendum, and recall petitions.

¹⁵NRS 293.1277.

¹⁶The total number of valid voter withdrawal requests is subtracted from the projected total number of valid petition signatures to arrive at the calculation used for final sufficiency determination.

Nevada's Signature Verification Methodology May Not Ensure Accurate Petition Determinations

Nevada's signature verification methodology may not ensure accurate recall petition sufficiency determinations. Nevada's methodology does not incorporate other statistical elements into its methodology, such as risk or margin of error. Consequently, the methodology may lead to unreliable sample testing results, flawed conclusions regarding aggregate petition results, and inaccurate sufficiency determinations.

Recall Petitions Were Deemed Sufficient Using Methodology Required by NRS

Recall petitions were filed with the division in August 2017 to recall two Nevada State Senators. Both petitions were initially determined to be sufficient and the responsible local election official randomly selected and examined a sample of submitted signatures for verification using the methodology required by NRS. The local election official filed the signature verification results with the division, which issued final Notices of Sufficiency.

Methodology Required by NRS Led to Inaccurate Signature Verification Results

Both Senators filed court challenges to the legal sufficiency of the petitions in early 2018 and the court subsequently ordered every signature on both petitions be verified. The full petition verification results showed the petitions did not contain the requisite number of signatures to order a special election and original petition sufficiency determinations were inaccurate. The court ruled the recall petitions failed to qualify for a special election.

Oregon's Signature Verification Methodology Includes Statistical Elements

Oregon's signature verification methodology requires a larger sample size (10 percent) than Nevada's methodology. The methodology additionally expands calculations to include statistical elements in addition to the expansion factor, such as margin of error and confidence limits.

The Oregon methodology also requires a second sample of at least 10 percent of all signatures plus one additional signature if initial sample results show the petition does not have the requisite number of valid signatures to be deemed sufficient.

DIA Calculations Show Oregon's Methodology Would Have Produced Accurate Results

The Division of Internal Audits (DIA) applied Oregon's recall petition signature verification methodology to Nevada sampling data using results issued in the division's Notices of Sufficiency. Nevada statute allows for those who sign petitions to request to withdraw their signature from the petition. Total valid pre-submission withdrawal requests verified at a later date were then subtracted from the results.

Findings show that both petitions would have been deemed insufficient using the Oregon methodology, both before and after subtracting valid withdrawal requests and with using only Nevada's original five percent sample data in lieu of Oregon's 10 percent sample size requirement.¹⁷ These findings agree with the final full-count court-issued ruling of insufficiency.

Conclusion

Nevada requires a fixed percentage/number, nonstatistical sampling methodology for recall petition signature verifications, which may not ensure accurate petitions. Evaluating using Oregon's recall petition signature verification methodology will help ensure recall petition results are statistically supported.

Recommendation

2. Evaluate using Oregon's recall petition signature verification methodology.

¹⁷The petitions were calculated as having 1,704 and 1,038 fewer signatures than required to be deemed sufficient using the Oregon methodology.

Revise and Clarify NRS and NAC

The division should revise NRS and NAC to update and clarify state statutes and regulations. This will allow for consistent interpretation amongst state and local jurisdictions subject to these NRS and NAC requirements and lead to consistent election practices.

NRS References Outdated

Sections of NRS 293 and 293B require voting systems to meet or exceed federal standards established by the Federal Election Commission (FEC); however, oversight of federal voting system standards and voting system certification was transferred to the EAC upon passage of the Help America Vote Act (HAVA) in 2002. The standards created by the FEC were superseded by standards adopted by the EAC in 2005 and are currently in the process of being revised. NRS refers to standards that no longer exist and a federal agency that no longer has oversight over federal voting system standards.

NAC Language Unclear

NAC 293B.110 requires local election officials to certify voting tabulation software and operating systems have been certified by the U.S. Election Assistance Commission (EAC) Voting System Certification (certification program) and Laboratory Accreditation Program (accreditation program) prior to each federal election. This requirement applies to all Nevada statewide elections by extension as the voting system machines used in federal elections are also used in statewide elections every two years. As written, the NAC requirements are not possible to accomplish.

EAC Certifies Voting Systems

The EAC's certification program is the process whereby a manufacturer may submit a new voting system or modification to an existing system to the EAC for comprehensive testing against federal voting system standards by an accredited voting system test laboratory (lab). Only voting systems that successfully meet all federal voting system standards receive EAC certification. All EAC certified voting systems are listed on a publicly available EAC web page.¹⁸

EAC Does Not Certify System Components

The EAC certification applies to entire systems and does not apply to individual system components or untested configurations. Per HAVA (Act) Section 301 and as defined in EAC voting system guidelines, a voting system is the total combination of mechanical, electromechanical, and electronic equipment used to

¹⁸<https://www.eac.gov/voting-equipment/certified-voting-systems/>.

define ballots, cast and count votes, report or display election results, connect the voting system to the voter registration system, and maintain and produce any audit trail information. The EAC certifies voting systems submitted by manufacturers that have successfully passed the requisite testing performed at federally accredited labs, which test voting systems for compliance with federal voting system standards.

Although NAC 293B.110 requires federal certification of tabulating software and machine operating systems, these are considered components of a voting system according to EAC federal guidelines. However, federal certification of components is not possible because the EAC only certifies entire voting systems.

EAC Accredits Federal Testing Labs

The EAC's accreditation program is the process whereby labs undergo evaluation by the National Institute of Standards and Technology (NIST) for meeting EAC procedural criteria. NIST makes recommendations for accreditation to EAC based on its findings and the EAC determines which labs will receive accreditation.

NAC Language Includes Both Certification and Accreditation

Current language in NAC 293B.110 is unclear because it includes references to both certification and accreditation. The EAC certification program relates to federally certified voting systems, while the EAC accreditation program relates to the process whereby labs become accredited. A voting system cannot become accredited, only certified. Therefore, the current language in NAC 293B.110 to certify voting system components under the EAC's accreditation program is inaccurate.

NAC Requires Post-Election Audits for VVPAT Equipped Voting Systems Only

NAC 293.255 requires post-election audits of only Voter-Verified Paper Audit Trail (VVPAT) equipped voting system machines. The requirement for post-election audits is only enforceable in Nevada jurisdictions that use VVPAT equipped voting systems. The NAC requirement does not cover all ballot categories and voting systems used in Nevada. The division has approved five voting systems for use in Nevada, four of which are not VVPAT equipped, including the voting system used in Carson City. Moreover, no jurisdiction is auditing all ballot categories. Adequate post-election audits help ensure the integrity of voting systems and election results.

Carson City Performed Alternate Post-Election Audit Procedures to Verify Voter Intent

The Carson City Clerk-Recorder recognized the Carson City voting system placed into service for the 2018 Primary Election is not VVPAT equipped and is not subject to post-election audits in conformance with NAC 293.255. The Clerk-Recorder established written procedures to perform alternate ballot-level post-election audit procedures to ensure Carson City election results were verified in some manner. The post-election audit compared electronic records to paper ballots to verify voter intent. Carson City audited ballots from one of five tabulators to verify it correctly interpreted the paper ballot barcodes.

Carson City's Audit Methodology May Have Been Inadequate to Confirm Election Results

Carson City Clerk-Recorder staff randomly selected 100 paper ballots from one tabulator of five total tabulators used in the 2018 Primary Election. Carson City procedures called for comparing each vote cast for each candidate or measure to those recorded on paper ballots.

The Carson City procedure of selecting 100 ballots of the total 9,058 ballots cast in the jurisdiction represents a one percent sample of total ballots cast. Moreover, samples were selected from only one tabulator and not randomly from all five tabulators.

NAC 293.255 requires three percent of all machines or not less than four machines to be audited for a jurisdiction of Carson City's size. Carson City's sample size and audit methodology did not follow NAC guidelines and may have been inadequate to statistically confirm election results.

Conclusion

Portions of NRS are outdated and guidance provided in NAC regarding jurisdictions' pre-election certification of voting systems is unclear. Additionally, post-election audits required by NAC are not enforceable in all jurisdictions and do not include all ballot categories. Revising and clarifying NRS and NAC will allow for consistent interpretation amongst state and local jurisdictions and consistent election practices.

Recommendation

3. Revise and clarify NRS and NAC.

Improve Policies and Procedures for Approving Voting Systems and Oversight of Jurisdictions' Election Practices

The division should improve policies and procedures for approving voting systems and oversight of jurisdictions' election practices. This will provide procedural guidance to division personnel and provide for consistent voting system approvals and oversight of election practices.

Voting System Review Procedures Undocumented

The division does not have documented policies and procedures for how manufacturer applications, reports, and other supporting documentation are reviewed to ensure systems meet or exceed federal standards consistent with NRS 293B.104. The basic process for approval of voting systems for use in Nevada is defined in NRS 293B.105; however, there are no documented policies and procedures to help ensure the same level of review occurs for each system.

Oversight Procedures Undocumented

There is inadequate documentation of division procedures for oversight of local election officials' compliance with NRS and NAC. Documenting procedures for conducting oversight of local election official voting system certifications helps ensure certifications are reviewed for accuracy, completeness, consistency, timeliness, and that appropriate local election personnel are certifying the reports.

Without documented procedures, the division may not be reviewing local certification reports to ensure officials verified voting systems only have authenticated software and firmware installed on voting systems, or that voting systems accurately record votes. Moreover, documented procedures will help the division verify appropriate and knowledgeable local elections staff are conducting voting machine certifications.

NRS and NAC Require Pre and Post-Election Certifications

NRS 293B.150 through 293B.165 describe the process for local election officials to conduct logic and accuracy testing (LAT) on electronic voting machines and tabulating equipment and programs. Testing must be conducted prior to early voting and again before and after counting ballots. These tests help ensure electronic voting machines and tabulating equipment correctly count votes cast for all offices and on all measures and helps ensure accurate election results.

NAC 293B.110 and 293B.120 describe the process for local election officials to certify voting machine operating system software and firmware (software

certification), which is required both before and after each federal election. Local election officials certify they have verified digital signatures (hash values) for software and firmware installed on their jurisdiction's voting system by comparing them to hash values published in the National Software Reference Library (NSRL) compiled and hosted by the National Institute of Standards and Technology (NIST). The purpose of verifying hash values is to confirm the software and firmware installed on the voting systems are authenticated and have not been altered. This helps ensure voting systems have not been tampered with.

Jurisdictions Did Not Notify Division of Certifications Required by NRS and NAC

Jurisdictions did not notify the division of pre and post-election LAT certifications. Local election officials must conduct pre-election LATs no earlier than two weeks before and no later than 5 p.m. the day prior to the first day of early voting in accordance with NRS 293B.150. The pre-election LAT deadline for the 2018 Primary Election was May 25, 2018, and NRS 293B.155 specifies the post-election LAT deadline is immediately after the election.

The division represents there is no requirement for local jurisdictions to report certification results to the office. Without notifications of pre and post-election certifications, the division cannot verify local jurisdictions ensured voting systems had not been altered or tampered with.

Division Tracks Local Notifications of Certifications Required by NRS and NAC

The division maintains an excel spreadsheet to track notifications from local jurisdictions of required pre and post-election certifications. According to the division's tracking spreadsheet, only 11 of 17 jurisdictions notified the division of their pre-election LAT certifications on or before the statutory deadline for performing the certification. One jurisdiction has yet to notify the division of its certification. Only three of 17 jurisdictions notified the division of their post-election LAT certifications immediately following the election and two jurisdictions have yet to notify the division of their certifications.

Jurisdictions did not notify the division of their pre and post-election software certifications required by NAC 293B.110 and NAC 293B.120. Local election officials must conduct pre-election software certifications before each election cycle for federal office. The pre-election software certification deadline for the 2018 Primary Elections was May 25, 2018. According to the division's tracking spreadsheet, only one jurisdiction (Carson City) notified the division of its pre-election software certification in accordance with NAC 293B.110. Eleven jurisdictions notified the division of their pre-election certifications between 25 and 38 days following the regulatory deadline to perform the certifications; three jurisdictions notified the division of their certifications without designating pre or

post-election certification; and two jurisdictions have yet to notify the division of their certifications.

Local election officials must conduct post-election software certifications within seven business days following the election. The post-election software certification deadline for the 2018 Primary Election was June 23, 2018. According to the division's tracking spreadsheet, only three jurisdictions notified the division of their post-election software certifications required by NAC 293B.120 on or before June 23, 2018. Eight jurisdictions notified the division of their post-election certifications between two and 16 days following the regulatory deadline; three jurisdictions notified the division of their certifications without designating pre or post-election certification; and three have yet to notify the division of their certifications.

Clark County Submitted Software Certification Inconsistent with Division Guidelines

NSRL provides a subset of hash values tailored specifically for voting systems to allow election officials to confirm software is the "expected software" and to verify "the software remains the same during distribution, installation, setup, or use."¹⁹ Local election officials compare the hash values of software installed on each voting machine and tabulator to the published NSRL values for software testing required by NAC 293B.110 and 293B.120. The division received a detailed pre-election software certification from Clark County on June 21, 2018, after the June 12, 2018 Primary Election. Clark County's certification contained values from a different family of hash algorithms than required by the division in its system-specific certification instructions.

Division staff did not review the Clark County certification, note the discrepancy, nor contact Clark County Election Department staff to address the discrepancy. The division should have ensured hash values provided by Clark County agreed to NSRL hash values published in March 2018 to ensure voting systems had not been altered or tampered with.

Clark County is the largest jurisdiction in Nevada representing approximately 69 percent of registered voters in the state. Altered voting system software and firmware on Clark County voting system machines could potentially allow for election tampering great enough to alter local and statewide election outcomes.

¹⁹"NSRL and Voting System Software," Information Technology Laboratory, Software and Systems Division, National Institute of Standards and Technology, last modified April 19, 2018. <https://www.nist.gov/software-quality-group/nsrl-subprojects/nsrl-and-voting-system-software>.

Carson City Submitted Incorrect Certification

Carson City was the only jurisdiction to submit a timely pre-election software certification for the June 12, 2018 Primary Election; however, the certification was incorrect based on NAC requirements. The certification contained hash values for two software installation files for the ES&S voting system, instead of fully installed software programs.²⁰

Even if Carson City's certification contained hash values for fully installed software, the hash values were not included in the published NSRL hash value file published in March 2018. The division would not have been able to confirm the software was authenticated.

The division did not provide instructions to Carson City to perform alternate procedures that would confirm the integrity of the voting system software, such as obtaining authenticated hash values directly from the manufacturer.

Jurisdictions Submitted Certifications Without Required Information

Three jurisdictions submitted pre-election software certifications and five jurisdictions submitted post-election software certifications that did not include hash values for the software and firmware verified by local election officials. Additionally, seven jurisdictions submitted post-election certifications that provided hash values for only firmware and did not provide hash values for software. Division staff did not note the discrepancy, nor contact jurisdictions to address the discrepancies.

The Division Has Not Been Able to Perform Reviews of Jurisdiction Election Practices

Improved policies and procedures will help the division conduct oversight of jurisdictions' election practices. However, the division confirmed they have not been able to perform reviews of jurisdictions' election practices, certifications, or pre and post-election testing and audits due to lack of resources. NRS 293.124 specifies the Secretary of State is the Chief Officer of Elections for the state of Nevada and is responsible for the execution and enforcement of NRS election provisions and all other state and federal election laws. By not performing these reviews, the division is not ensuring statutory and regulatory election requirements are executed and enforced consistent with federal and state requirements.

²⁰A software installation file is a compressed software package that installs software on an operating system when activated. It is not the installed, operating version of the software in place on a system.

Division Requested and Received Approval for Two New Elections Administration Positions

The division requested and received approval for two new elections administration positions at the June 20, 2018 Interim Finance Committee meeting.²¹ The division advised it is currently working with human resource staff to fill the positions. The division requested a programmatic position to plan, coordinate, and manage elections administration activities within federal and state requirements. This includes oversight of local election officials' election practices, on-site visits, one-on-one training, policies and procedures development, and technical assistance.

The division also requested an IT support position to assist with ongoing voter registration and IT system support for federal elections, as well as monitoring and coordinating compliance with state and federal requirements. This includes analysis, interpretation, and recommendation for legal, policy, and procedure changes.

Conclusion

The division needs to improve policies and procedures for its voting system approval process and for oversight of local election officials' certifications submitted to the division in accordance with NRS and NAC.

Improving policies and procedures for voting system approval will provide procedural guidance for division personnel. Without documented policies and procedures in place, practices may be inconsistent within the division and across jurisdictions.

Improving policies and procedures to implement division oversight of jurisdictions' election practices, certifications, and pre and post-election testing and audits will ensure statutory and regulatory election requirements are being executed and enforced consistent with federal and state requirements as required by NRS 293.124.

Recommendation

4. Improve policies and procedures for approving voting systems and oversight of jurisdictions' election practices.

²¹State of Nevada Legislature's Interim Finance Committee. Carson City: Legislative Counsel Bureau, 2018. <https://www.leg.state.nv.us/App/InterimCommittee/REL/Interim2017/Meeting/4938>.

Ensure Compliance with HAVA Grant Requirements

The division should ensure compliance with Help America Vote Act (HAVA) grant, federal, and state requirements. This will ensure written procedures and internal controls are documented. Noncompliance with federal requirements creates the risk of losing access to federal funding or having to repay already expended funds to the federal government.

Adequate Written Procedures and Internal Controls Required for Federal Grant Administration

Federal guidelines require written procedures and internal controls for federal grant administration. The division's written procedures and internal controls (policies) for federal grant administration inadequately reflect current federal requirements. Adequate policies are necessary to ensure the division's grant administration practices comply with federal requirements.

Written Policies Are Not Adequate and Do Not Reflect Current Federal Requirements

The division's policies do not include all federal grant administration requirements. For example, policies do not cover how the division reviews applicant requests for funding to determine amounts sub-awarded or to assess subgrantee risk. Further, policies do not include all contractual and subgrant award restrictions. Moreover, policies are tailored to grants previously awarded to the division; there is no mention of the 2018 HAVA grant. The division's policies cite multiple sources of superseded guidance and do not address current federal grant administration requirements.

Federal Regulation and State Guidelines Require Effective and Documented Internal Controls

Federal regulation requires grant recipients to establish and maintain effective internal control over federal grant awards.²² Management is required to document organizational internal control responsibilities in its policies.

State guidelines also require agencies to develop written policies to carry out the system of internal accounting and administrative control for the uniform system of control adopted pursuant to NRS 353A.020 and required by Nevada State Administrative Manual Section 2416.

²² 22 CFR 200.303.

Conclusion

The division did not have adequate written procedures in compliance with grant, federal, and state requirements. Complying with HAVA grant, federal, and state requirements will ensure written procedures and internal controls are documented.

Recommendation

5. Ensure compliance with Help America Vote Act grant, federal, and state requirements.

Appendix A

Scope and Methodology, Background, Acknowledgements

Scope and Methodology

We began the audit in May 2018. In the course of our work, we interviewed management and discussed processes inherent to the Office of the Secretary of State (office), Election Division's (division) responsibilities. We researched division records, scientific journals, professional publications, applicable Nevada Revised Statutes (NRS), Nevada Administrative Code (NAC), State Administrative Manual (SAM) sections, and other state and federal guidelines. Additionally, we reviewed applicable federal and independent reports and audits. We concluded fieldwork in August 2018.

We conducted our audit in conformance with the *International Standards for the Professional Practice of Internal Auditing*.

Background

The Secretary of State, elected to a four-year term, is responsible for maintaining the official records of the acts of the Nevada Legislature and of the executive branch of state government, as prescribed by law. The Secretary of State is the Chief Officer of Elections for the state. The office is organized into eight divisions: Commercial Recordings, Document Preparation Services/Domestic Partnerships/Registry for Advanced Directives for Healthcare (Living Will Lock Box), Elections, Executive Administration, Nevada Business Portal, Notary, Operations and Securities. The divisions that directly support elections administration include:

- **Elections** – is responsible for the execution, interpretation, and enforcement of federal and state election, and campaign finance laws; administering the requirements of the Help America Vote Act (HAVA); serving as the filing office for statewide elective positions, initiative petitions, and referendums; maintaining the statewide voter registration database; and conducting voter outreach programs.

This division also administers the Advisory Committee on Participatory Democracy (ACPD) which is comprised of ten members selected by the office and whose purpose is to assist the Secretary of State in: identifying and proposing programs that promote citizen participation in governance; establishing a Jean Ford Democracy Award; and working with partner

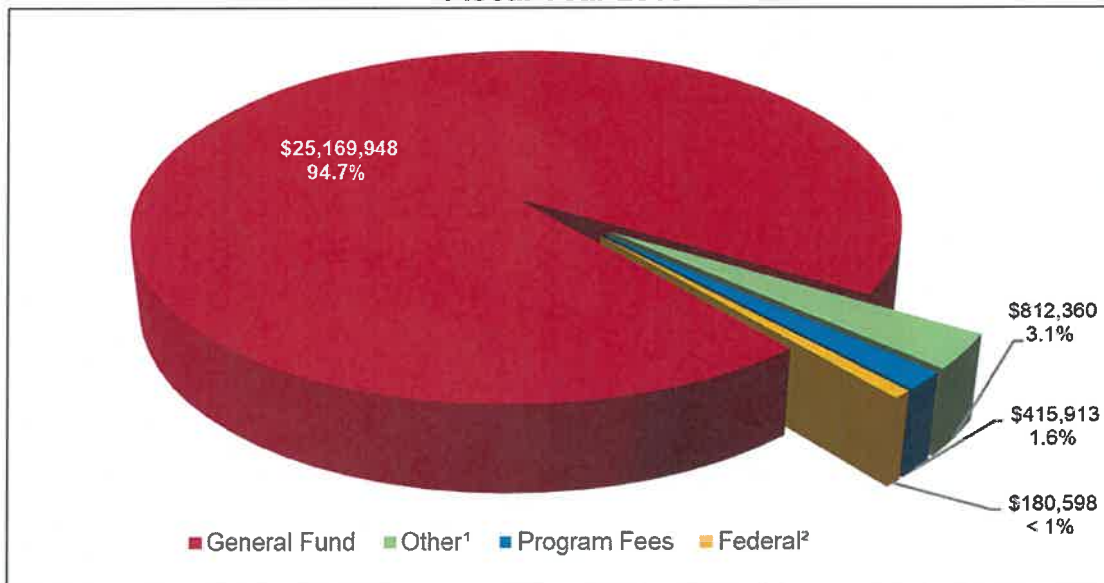
organizations at the local, state, and national levels to increase voter participation in Nevada.

- **Executive Administration** – provides leadership, strategic direction and administrative support to the office as a whole. The division includes all of the office’s deputies, the Securities Administrator, the Public Information Officer as well as the Executive Assistant to the Secretary of State.
- **Operations** – supports the internal functions of the office, including Personnel, Information Technology (SoSTek), Facilities, Accounting and preparation and management of the office’s budget.

The office is funded by the state general fund, program fees, federal funding, and other revenues. The office’s budget for fiscal year (FY) 2018 was approximately \$26.6 million. Exhibit III summarizes the office’s budget by funding source for FY 2018.

Exhibit III

**Office of the Secretary of State Funding Sources
Fiscal Year 2018**



Source: State Accounting System

Chart Notes:

¹Other includes balance forward from prior year, reversions, and transfers in.

²The \$4.3 million in HAVA grant funding received in March 2018 is accounted for in fiscal year 2019 and is not included in the graphic above.

Acknowledgments

We express appreciation to the Secretary of State, Chief Deputy Secretary of State, Deputy Secretaries of State, HAVA Administrator, Carson City Clerk-Recorder, and staff for their cooperation and assistance throughout the audit.

Contributors to this report included:

Warren Lowman
Executive Branch Audit Manager

Heather Domenici, CPA, MAcc
Executive Branch Auditor

Appendix B

Secretary of State Elections Division Response and Implementation Plan

BARBARA K. CEGAVSKE
Secretary of State

STATE OF NEVADA

SCOTT W. ANDERSON
Chief Deputy Secretary of State

WAYNE THORLEY
Deputy Secretary for Elections



OFFICE OF THE
SECRETARY OF STATE

September 28, 2018

Mr. Steve Weinberger
Administrator, Division of Internal Audits
209 East Musser Street, Suite 300
Carson City, NV 89701

RE: Response to Elections Division Audit Report

Dear Mr. Weinberger:

Thank you for the work your team has completed in reviewing the oversight responsibilities of the Elections Division of the Office of the Secretary of State. We have reviewed the draft report from your audit and generally accept your recommendations.

Recommendation Number 1 – Evaluate using risk-limiting audit methodology for post-election audits and modifying the NAC to reflect the change.

We accept and agree with this recommendation. Risk-limiting audits have been a matter of recent discussion at the state and national level as a better statistical auditing method based upon risk-limiting factors such as margins of victory and confidence levels. These factors are not present in the fixed percentage, non-statistical audits currently provided for in state law. We also agree that risk-limiting audit methodology may be more effective for many election contests, including ballot measures.

We have considered¹, and the report confirms, the need to investigate changes in processes and possible software solutions that will provide appropriate sample sizes based on risk-limiting audit methodology. If it is determined that risk-limiting audits are appropriate for Nevada, the *Nevada Administrative Code (NAC)* will need to be revised, and a revision to the *Nevada Revised Statutes (NRS)* may also be necessary. We will conduct the necessary workshops and hearings to change the NAC and will propose any legislation for required legislative changes. Of course, such revisions are incumbent on approval by the Legislative Commission and passage by

¹ In July 2018, an employee of the Secretary of State's Elections Division traveled to Colorado to observe the 2018 primary election risk-limiting audit performed by election officials in Colorado and report on whether risk-limiting audits would be feasible in Nevada.

NEVADA STATE CAPITOL
101 N. Carson Street, Suite 3
Carson City, Nevada 89701-3714

MEYERS ANNEX
COMMERCIAL RECORDINGS
202 N. Carson Street
Carson City, Nevada 89701-4201

LAS VEGAS OFFICE
2250 Las Vegas Blvd North, Suite 400
North Las Vegas, NV 89030

NYSOS.GOV

the Legislature. This report gives the justification for revisions necessary to implement risk-limiting audits.

We also agree that the funding received by Nevada through the Help America Vote Act (HAVA) Election Security Grant may be used to implement risk-limiting audits. As detailed in the narrative and spending plan submitted to the U.S. Election Assistance Commission, the Secretary of State's office already allocated \$719,000 of HAVA Election Security Grant funds to election auditing enhancements. In addition to providing for training and software enhancements, this funding has been approved to support a new position in the Secretary of State's office that will oversee election auditing in Nevada. Recruitment for this position will begin as soon as approval is received from the Division of Human Resource Management.

We have already started researching risk-limiting audits, and these efforts will continue after the 2018 general election. Implementation, including any regulation or law changes, software purchases, policy and procedural changes, and guidance and training, as appropriate, will be completed in time to conduct a risk-limiting audit test after the 2020 primary election. Depending on the results of the test, full implementation could be achieved as soon as the 2020 general election.

Recommendation Number 2 – Evaluate using Oregon's recall petition signature verification methodology.

We accept and agree with this recommendation. We will evaluate the Oregon recall petition signature verification methodology. Recent recall activities in Nevada have uncovered potential weaknesses in the recall signature verification methodology provided for in the NRS, with a Nevada judge ordering a verification of all signature submitted on two recent recall petitions after the legal sufficiency of the petitions was called into question. While at the time of this response these two recall petitions are still under review by the courts, it remains apparent that the current methodology may be insufficient. Similar to Recommendation Number 1, a non-statistical, fixed percentage methodology for determining the sufficiency of a recall petition may not be an appropriate means of determining whether a recall petition contains enough valid signatures.

We will determine if and what NRS and NAC provisions will require revision if after evaluation, the Oregon recall petition signature verification methodology or other methodology is deemed appropriate. These changes will be dependent on approval from the Legislature and Governor, or the Legislative Commission, as the case may be.

Recommendation Number 3 – Revise and clarify NRS and NAC.

We accept and agree with this recommendation. We are fully aware that many of the NAC and the NRS related to elections are in need of updating, with some NAC and NRS reflecting provisions that have been outdated for many years. However, recent changes in voting machines

and processes, as well as a new focus on election security and county oversight, have created a more recent need for updates to NRS and NAC. We are committed to reviewing the NRS and NAC pertaining to election administration and proposing the changes to bring them up-to-date and in-line with current equipment and practices, as well as to reflect recent court interpretations. We have 2 Bill Draft Requests (BDRs) that must be submitted by December 31, 2018 for the 2019 Session of the Nevada Legislature. It is possible that many of these changes may be proposed in one or both of those BDRs, with additional changes proposed as potential amendments to election-related bills during the 2019 Session. We will propose changes to the NAC through the regulatory process, being aware of procedural limitations due to the legislative session. As with Recommendation Numbers 1 and 2, any changes to statute require legislative and Governor approval, while regulatory changes require Legislative Commission approval.

Recommendation Number 4 – Improve policies and procedures for approving voting systems and oversight of jurisdictions’ election processes.

We accept and agree with this recommendation. We are fully aware of the limitations on certain processes and oversight due to limited resources. While Nevada has consistently used the NRS and NAC, as well as federal guidelines, as its guides for approving voting systems and overseeing jurisdictional election practices, we agree that these should be put into formalized, standardized policies and procedures where none exist and update existing policies and procedures. The Division has received approval for two new positions funded by the HAVA Election Security Grant, as well as one additional position as the result of reallocation of positions within the office as a whole. These positions will be used in-part to ensure that policies and procedures are formally in place for the approval of voting systems and the oversight of county and other election processes. These additional resources will allow for more on-site inspection, training, and review opportunities with the counties. The recruitment process to fill these positions has started and is ongoing at the time of this response. We appreciate the acknowledgement of this need and verification of the remediation we have already started.

Recommendation Number 5 – Ensure compliance with the Help America Vote Act grant, federal, and state requirements.

We accept and agree with this recommendation. We will review existing procedures and ensure that they reflect current HAVA, federal, and state requirements. The division has relied on grant procedures relating to original HAVA grant funding and guidelines and any updates. Until the recent award of the 2018 HAVA Election Security Grant and a 2018 Homeland Security Grant Program award from the Nevada Division of Emergency Management, Nevada had not received grant funding related to Elections since 2013. We acknowledge that the receipt of these new grant funds will require an update and possible creation of procedures and internal controls that reflect any new requirements.

Again, I sincerely appreciate the efforts you and your staff have taken to share with us opportunities for improvement within our operations. Please feel free to contact Chief Deputy Scott Anderson at 775-684-5711 or Deputy for Elections Wayne Thorley at 775-684-5720 should you need any additional information.

Respectfully,

A handwritten signature in blue ink that reads "Barbara K. Cegavske". The signature is written in a cursive style with a loop at the end of the last name.

BARBARA K. CEGAVSKE
Secretary of State

Appendix C

Timetable for Implementing Audit Recommendations

In consultation with the Office of the Secretary of State (office), the Division of Internal Audits categorized the recommendations contained within this report into two separate implementation time frames (i.e., *Category 1* – less than six months; *Category 2* – more than six months). The office should begin taking steps to implement all recommendations as soon as possible. The office target completion dates are incorporated from Appendix B.

Category 1: Recommendations with an anticipated implementation period less than six months.

<u>Recommendation</u>	<u>Time Frame</u>
5. Ensure compliance with Help America Vote Act grant, federal, and state requirements. (page 19)	Apr 2019

Category 2: Recommendations with an anticipated implementation period exceeding six months.

<u>Recommendations</u>	<u>Time Frame</u>
1. Evaluate using risk-limiting audit methodology for post-election audits and modifying NAC to reflect the change. (page 6)	Jun 2020
2. Evaluate using Oregon's recall petition signature verification methodology. (page 9)	Jan 2020
3. Revise and clarify NRS and NAC. (page 12)	Jan 2020
4. Improve policies and procedures for approving voting systems and oversight of jurisdictions' election practices. (page 17)	Jan 2020

The Division of Internal Audits shall evaluate the action taken by the office concerning the report recommendations within six months from the issuance of this report. The Division of Internal Audits must report the results of its evaluation to the Executive Branch Audit Committee and the office.

Appendix D

Discussion on Risk-Limiting Audits

Background

Post-election audits should be efficient and highly effective in detecting miscounts large enough to change election outcomes.²³ Samples should be no larger than necessary to confirm the correct outcome. Risk-limiting audits (RLA) use statistical audit methods to reduce the number of ballots audited and to provide statistical support for election results. Using this method, fewer ballots are audited if the margin of victory is large and more ballots are audited if the margin of victory is small.

RLAs are endorsed by the American Statistical Association because they use statistical methods to help ensure "an acceptably small probability of failing to correct a wrong machine-counted outcome. When a machine-counted outcome is correct, a risk-limiting audit can often confirm the result after examining only a small fraction of the ballots cast."²⁴

Overview

An RLA has a high probability of correcting incorrect election results, no matter the cause. It is a manual inspection of randomly selected individual ballots to determine whether voter intent was correctly interpreted, which continues until it is statistically likely that a full recount would yield the same results. This methodology uses the margin of victory and risk limits to determine sample size as elements of a statistical algorithm.

RLAs may be conducted simultaneously on multiple elections using the same sample and can be used for elections and ballot measures that require a majority vote, a supermajority, have more than one winner, are cross-jurisdictional, or have ranked-choice voting. Cross-jurisdictional audits require election results to be available before the audit begins and that the sample can be drawn from a pool of all ballots cast.

RLAs are independent of system software and address the limitations and vulnerabilities of voting systems, including system configuration, attempts to manipulate election results, software encoding errors, and system elements

²³John McCarthy et al. "Percentage-Based versus Statistical-Power-Based Vote Tabulation Audits," 11.

²⁴American Statistical Association Statement on Risk-Limiting Post-Election Audits, 4/17/10," American Statistical Association, April 17, 2010, http://www.amstat.org/asa/files/pdfs/POL-Risk-Limiting_Endorsement.pdf.

designed to infer voter intent. RLAs only revise the original election results when the audit leads to a full hand count that shows the original count was incorrect. RLAs cannot alter correct election results; however, there is a chance that incorrect results would not be corrected when using an RLA. The largest chance of not correcting incorrect election results is the risk limit. The larger the limit, the larger the chance incorrect election results would not be corrected without a full hand recount. An acceptable risk limit is determined by election officials responsible for the audit process.

Two examples of risk-limiting audits are ballot-polling audits and ballot-level comparison audits. Ballot-polling audits require having access to the election results and are used when voting machines cannot export ballot-level vote counts. Ballot-polling audits generally require manually reviewing a greater number of ballots than ballot-level comparison audits and create a higher workload for elections with close-vote margins.

In the past, voting systems did not provide the level of information required for the voting system to interpret every ballot for RLA ballot-level comparison audits and there were privacy concerns related to pre-labeling ballots. However, recent legislation in Colorado has prompted major voting system vendors to enhance voting machines and scanners with the ability to assign a unique number on every ballot, as well as providing Cast Vote Records (CVR) that can be used to do ballot-level RLAs.

Ballot-Level Comparison Audits

Ballot-level comparison audits investigate election results by comparing hand counts to voting system counts for individual ballots. These audits have two phases: (1) checking to ensure that ballot subtotals for each election agree to the total reported votes for each candidate and if not, the audit cannot proceed; and (2) checking voting system subtotals against randomly selected ballot hand counted subtotals to determine if the voting system subtotals are adequate to accurately determine election results. The audit must continue until there is strong evidence that the election results are correct. If election results are wrong, the audit would generally require a full hand count.

Comparison audits use an algorithm to determine sample size that includes consideration for understatements (understated number of votes for winner) and overstatements (overstated number of votes for winner), as well as the smallest reported margin. Understatements do not affect the results because correcting understatements increases the margin of victory, which does not change the election outcome. Therefore, overstatements increase the required sample size.

Auditors can examine ballots one at a time sequentially or in parallel using this method of sample selection. The auditor can elect to stop ballot-level examination

at any point during the audit and require a full hand count. Essentially, the audit continues until the results of the algorithm meet the required sample number using the risk limit, or until a full hand count is performed to replace the original tabulated election results. Using this methodology, auditors may sample in stages and compare the ballots in each sample to the voting system interpretation of voter intent. The auditor continues to draw samples until the requirements of the algorithm indicate sampling may stop. Ballots already examined are returned to the sampling population and may be drawn multiple times using statistically random methods.

Statistical Random Sampling Methods

RLAs rely on auditors selecting random samples of ballots with replacement. The risk limit will not be correct if samples are selected using incorrect, non-statistical methods. The term "random" appears to have many different meanings ascribed to it by law based on review of state post-election audit requirements for nine states surveyed, including Nevada.²⁵ However, the term "random" in auditing refers to a variety of statistical sampling methods that do not include nonstatistical methods such as selecting samples using auditor judgment. Other nonstatistical methods include drawing slips of paper, using third-party spreadsheet software, or using any other method where randomness cannot be easily confirmed.

Additionally, the sample selection method should be such that all ballots have equal probability of being selected in each draw and the selection should be publicly observable in order to maintain public confidence in the process. Reliable methods of random selection generally have a tangible source of randomness, as well as multi-party participation to attempt to forestall collusion. Rolling dice can be used to generate a seed for a pseudo-random number generator.²⁶ For example, Colorado recently held a public meeting on July 6, 2018 to randomly select a seed using a 10-sided die to use with a pseudo-random number generator to select random audit samples for the 2018 primary elections. The results of the seed were reported in a formally published public notice, immediately following the selection.

Nevada requires random sampling of Voter Verifiable Paper Audit Trail (VVPAT) voting machines, but does not provide any further guidance as to the methodology to use in making the selection. Further guidance will be vital to and is a requirement of RLAs, should Nevada adopt RLA methodology.

²⁵Arizona, California, Idaho, Massachusetts, Nevada, New Jersey, Oregon, Utah, and Washington.

²⁶A pseudo-random number generator is an algorithm that generates numbers that have many numbers in a long sequence before repeating. Because they are not truly random, they require a seed produced by a physical means (ex. rolling dice) to ensure the process leads to random sample selection.

Algorithm Source Code

The source code for the algorithms used in post-election audit calculations should be published prior to the audit to ensure verifiability and to allow the calculations to be replicated. Likewise, ballot-level voting system subtotals should be published prior to beginning the audit to publicly verify that they are the same election results used for the audit.

The code required to program a useable system for all elections held in a state, including statewide and single jurisdictional elections, already exists and is accessible to the public as open source code. Open source code means that anyone can use the code free of charge and modify it to fit their particular needs on their own servers and systems. Free & Fair, a private sector business, has already prototyped an open source code risk-limiting audit tool for RLAs in single jurisdictions called OpenRLA. Additionally, Colorado contracted with Free & Fair to build an RLA system to be used statewide by election officials, which was first used in the November 2017 statewide general election. This system facilitated statewide, multi-county, and individual county audits in Colorado.