

From: Paul Geissler <paulgeisslerco@gmail.com>
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To: Public UVS Panel
Subject: Comment on Voting System Requirements for a Uniform Voting System in Colorado
Attachments: CommentPaulHGeissler.docx

Thank you for the opportunity to comment on Voting System Requirements for a Uniform Voting System in Colorado. The same comment is also attached as a MS Word document.

Although the requirements seem to be very extensive, I did not see requirements to allow for a **risk-limiting audit**. A risk-limiting audit (<http://www.stat.berkeley.edu/~stark/Preprints/gentle12.pdf>) provides statistical assurance that election outcomes are correct by manually comparing portions of the audit trail [paper ballots or voter-verified paper audit trail (VVPAT) records] with the voting system records for the same ballots to estimate the risk (chance that a full recount would result in a different outcome). We can be assured that the risk of an incorrect result is less than the risk limit. Cost is minimized because only enough ballots are compared to be assured the risk is less than the risk limit. The audit would be completely independent of the voting system and would check all components of the system.

To allow efficient risk-limiting audits, I suggest that a voting system should:

- Report the voting system records of votes for each ballot in user selected batches of not more than 250 paper ballots or VVPAT records.
- Track the physical location of each batch of not more than 250 paper ballots or VVPAT records so that selected batches can be easily retrieved by election workers and matched with the voting system records for the same batch.
- Each paper ballot or VVPAT record would have a unique identifier that could not be traced back to the voter and that would match the voting system identifier. Each batch would have a unique identifier that would match paper ballot or VVPAT batches to voting system batches.

To conduct an efficient risk-limiting audit in its simplest form, election workers would:

1. Estimate the number of batches that need to be compared.
2. Select a random sample of that many batches.
3. Manually compare each paper ballot or VVPAT record to the corresponding voting system record, and record any discrepancies and the number of ballots compared in each batch.
4. Estimate the risk and its confidence interval.
5. If the upper confidence interval for the risk is less than the risk limit, accept the results.
6. If the lower confidence interval for the risk is more than the risk limit, conduct a complete recount.
7. Otherwise, select another random sample of batches and go to step 3.

It will be very helpful for Clerks to have a computer program that would:

- Estimate the number of batches that need to be compared.
- Randomly select the batches to be compared.
- Estimate the risk and its confidence interval.

This functionality could either be part of the voting system or a stand-alone application.

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