RI Feb2022 RLA protocol v1.docx

Risk-limiting audit protocol for Rhode Island Minerva 2.0 pilot v 1: February 10, 2022

Basic audit design

Rhode Island will conduct a ballot-polling risk-limiting audit (RLA) of Portsmouth's Issue 1, "School Construction and Renovation Projects," in the November 2021 election. The risk limit will be 10%. The initial sample size will be **[[140]]** ballots. Work will be divided among audit teams for ballot retrieval and interpretation, plus a few additional staff. (Two staff members can serve as the ballot custody team and subsequently as the data entry team.) The audit will use VotingWorks' open-source Arlo software to generate the random sample. Because Arlo does not implement Minerva 2.0, we will run two instances of the audit in Arlo: one with the true first-round sample size, and one with an arbitrarily large sample (500 ballots) that can be used to extract samples for further rounds if needed.

Preparing for the audit

1. Check the supply list; obtain or print any materials needed for the audit.
2. Recruit audit board members and other staff to perform the work of the public audit. Prepare the spaces where the audit will occur.
3. Optionally, print a label template page on white paper to see whether the scale should be adjusted. (On our COTS printers, the labels print best at 103%.)
4. Create two instances of the audit in Arlo: "2022 RI Minerva 2.0 pilot" and "Auxiliary oversample RI Minerva 2.0 pilot." Enter/upload the basic election data, including the ballot manifest, the risk limit, and the reported vote totals (Approve 2391, Reject 1414, Undervotes 9; 3814 ballots cast).

Beginning the public audit

5. Log into Arlo as the state administrator and open the main ("2022 RI...") instance.
6. Have participants/observers take turns removing one of 20 ten-sided dice from an opaque container and rolling the die they removed. Write each digit on a whiteboard in full view. When the 20-digit seed is complete, type it into Arlo; read it back to confirm that it has been typed correctly before submitting the seed.
7. Print retrieval lists, labels (on removal label stock), and placeholder sheets (colored paper preferred) and distribute them to the audit boards. The audit boards are identified by number, e.g., "Audit Board #2." Scissors may be needed to divide the labels correctly. Also print a copy of the retrieval list (or a summary thereof) to be used by the ballot custody team.

8. At this time or slightly later (while ballots are being retrieved):

    a. Print the Arlo-generated credentials that will be used to enter audit board ballot interpretations, and the manual tally sheets that will be used to record those interpretations before they are entered.

    b. In the Arlo auxiliary instance, enter the 20-digit seed, set the sample size to 500, and "launch" the audit. Then log in as the local official, set the number of audit boards to 1, and retrieve the retrieval list. This will be used if it is necessary to proceed to a second round.

Retrieving ballots

9. Ballots will be retrieved by three two-person audit boards. For each audit board, for each batch on the audit board's retrieval list:

    a. Send one audit board member to "check out" the batch from the ballot custody team. The ballot custody team enforces seal rules and ensures that each check-out and check-in is logged with date, time, and signature.

    b. At the audit board table, take one batch at a time from which ballots are to be removed, setting aside the band and cover sheet. **On the pull sheet, pay close attention to batch IDs.** It is important to retrieve ballots from the correct batches.

    c. Retrieve ballots:

        i. If the ballot number is small, you can manually count down to the ballot to be retrieved; as you count each ballot, flip it face-down* and place it on the table.

        ii. Otherwise, you can use a counting scale (or the *k*-cut method, not described here): Place all the ballots **face-down*** on the counting scale. Recalibrate the scale **for each batch** by typing the number of ballots in the batch, then pressing the SMPL or SAMPLE/UNIT button. Then remove ballots, flipping them face-up onto the table – or, if you go too far, flipping ballots back onto the stack – until the desired count is displayed. (**If you are retrieving more than one ballot from a batch, start with the largest ballot number.**) The topmost ballot on the scale is the ballot to retrieve. Team members can take turns handling ballots and verifying the scale readings.

        * It is not necessary for all the ballots to face the same direction, nor do ballots have to remain in the same order they were found in the ballot container. However, while retrieving ballots from a batch, it is important to keep the ballots in a consistent order.

        iii. Using the removable label provided, label the retrieved ballot by batch and ballot number. Set this ballot aside, face down. (A folder will be provided to keep your board's retrieved ballots separate from other

ballots.) Put the correct placeholder sheet, labeled with the batch and ballot number, in place of the retrieved ballot.

d. When you are done retrieving ballots from a batch, return it for check-in, and check out the next batch (if any).

10. When the retrieval process is complete, audit boards should **sign their retrieval lists** and return them to the supervising officials.

Interpreting ballots

11. Ballots will be interpreted in teams of three: a caller, a verifier, and a tallier. The verifier should be between the caller and the tallier. For each ballot to be interpreted:

    a. The caller places the ballot where the verifier can see it. The caller calls out the ballot ID; the verifier and tallier make sure that this ID is next on the tally sheet (or, if necessary, the tallier writes the ID).
    b. Then the caller offers their interpretation of the vote: Approve, Disapprove, undervote or overvote. If the verifier agrees, the verifier repeats the interpretation. If the verifier disagrees or is unsure, the process pauses for further discussion. (If the caller and verifier are unable to agree, the ballot is set aside for review by senior election officials.)
    c. When the caller and verifier agree, the tallier marks the tally sheet accordingly; the verifier ensures that the tally is correct.

12. Team members pause at the end of each tally sheet to compute and check their totals. They then sign the tally sheet and send it to the data entry table.

13. After all retrieved ballots have been interpreted, return them to custody. (*After the audit is complete,* these ballots may be stored separately, or returned to the batches from which they came.)

Evaluation

14. After all tally sheets have been entered into Arlo, one of the Arlo administrators obtains the Arlo interim report and checks the vote totals there against the vote totals from the tally sheets. Any discrepancies are investigated
15. Once the vote totals are confirmed, the Minerva team enters them into a Jupyter notebook and determines whether the risk limit has been met.
16. If the risk limit *has not* been met, and if resources permit, the pilot proceeds to a second round. Because Arlo does not support the statistical method being tested in this pilot, in a second round, the printing of audit board resources will follow a different process described in the auxiliary protocol, and the tally sheets will not be entered into Arlo. Otherwise, the process proceeds much as described in steps 9-13.