From: **MOA Elections Team**

Subject: **Risk Limiting Audit for the May 14, 2024 Mayoral Runoff Election**

I.   Executive Summary

The MOA Elections Team conducted a post-election audit that contained three areas of focus.

1. *Hand-Count.* A pre-determined percentage of ballots in randomly specified contests was selected and the actual random ballots for those specified races were hand counted.
2. *Machine Review.* Cast Vote Records were produced from the tabulation system and tallied for the ballots selected.
3. *Comparison of Hand-Count and Machine Review.* The totals from the hand-count, detailed in paragraph 1, and the totals from the machine count, detailed in paragraph 2, were compared.

The results of the MOA post-election Risk Limiting Audit are that the scanning, adjudication, and tabulation system performed as expected and the results reflect the will of the voters. All ballots were adjudicated and tabulated as expected. The results of the hand-count and the machine tabulation were identical.[1]

II.   WHAT IS A POST-ELECTION RISK LIMITING AUDIT?

A.   Research. Research defines a post-election audit as a check to confirm that the voting equipment and procedures used to count votes worked properly. Post-election audits are recommended by election security experts as one method of protecting the integrity of elections.

There are many types of "post-election audits" used to validate election results or outcomes. As a term of art, it refers to checking paper ballots (or records) against the results produced by the vote tallying equipment to ensure accuracy.

Risk limiting audits (RLA) use statistically developed audit techniques that allows election of a number of ballots to be audited that provide statistical confidence that the tabulation system performed as expected. A RLA is an incremental audit system: If the percentage of risk selected in advance of the audit failed to demonstrate the tabulation system was performing as expected, election officials would review further ballots or conduct a full manual tally of the election.

The MOA Elections Team conducts "Batch-Level Comparison Audits," which is a type of RLA that most resembles a "traditional" audit. In a batch-level comparison audit, the voting system must export identifiable physical batches of ballots. In the MOA RLA, Election Officials physically

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[1] For more detailed information on the results of the audit, see Item G. Comparison of the Hand-Count to the Machine Count, Results of the Risk Limiting Audit, and Exhibit A – RLA Worksheet

selected random batches from the entire election to audit. In "Batch-Level Comparison Audits" and in the MOA RLA, Election Officials add up the selected batch-level results by hand to verify that they produce the reported contest outcomes. The votes in each selected batch were examined manually and hand-counted, and the audit counts were compared to the tabulation system's report and subtotals. Depending on the number and type of discrepancies the audit finds in the sample, the audit either stops or examines more batches manually.

B.   *Implementation of the Risk Limiting Audit at the MOA*

Successful implementation of any new election process requires careful thought and a considerable amount of planning. The MOA Elections Team began looking at post-election audits in 2020. One important step in preparing for the post-election audit, was obtaining the imprinters on the ballot scanners in 2020; the imprinters put a unique number – the scanner, batch, and ballot number – on each ballot, allowing elections officials the ability to pull the actual ballot to confirm the votes.

The MOA Elections Team conducted a practice audit after the 2021 Regular Municipal election in preparation for implementation of post-election audit in 2022. The practice was worthwhile: The Elections Team determined it tested too many ballots in one race and too few in another; the Elections Team pulled individual ballots which was incredibly time consuming. To address this shortcoming, the 2022 audits tested "batches" of ballots, which was more efficient to select and re-file rather than randomly selecting individual ballots and having to refile those.

Now, the Elections Team is happy to provide the results of the Risk Limiting Audit at certification.

III.   <u>PROCEDURES FOR THE RISK LIMITING AUDIT</u>

A.   *Selection of Races and Measure to be audited.*

1. *Selection of Race and Measure.* The MOA Risk Limiting Audit Procedures require the MOA Elections Team to identify the races and measures to be audited by rolling a 6-sided die. In a Mayoral election year, the team will automatically audit the top two mayoral candidates and roll the 6-sided die to randomly select the ballot proposition to audit. In years without a Mayoral race, the team uses the die to randomly select one Assembly race and one ballot proposition to audit.

2. *Target Number of Ballots.* The Elections Team calculates the target number of ballots per race or measure. For the audit, the team selected 5% of the ballots cast in the Mayoral Runoff, totaling 4,000 ballots.

    The exact calculations for the target number of ballots are as follows:

    - Calculate 5% of ballots cast, regardless of the number of votes cast or spread, rounding up to nearest 1,000. E.g., change 79,658 to 80,000 for ease of count:

      <u>In the 2024 Mayoral Runoff, total ballots cast = 80,000 x .05 = 4,000</u>

For the 2024 Mayoral Runoff, the audit actually reviewed 4,372 ballots.

3. ***Random Selection of Batches.*** To reach the 4,000 ballots targeted for review in 2024 Mayoral Runoff, the MOA Elections Team estimated that auditing a minimum of 40 batches would be required, assuming approximately 100 ballots were scanned per batch. However, the Team selected 50 batches for this audit – in the event that some of the batches contained less than the 100 ballots typically scanned per batch.

Next, the team members calculated the percentage of total ballots processed on each scanner: ICC 1 (scanner 1), ICC 2 (scanner 2), and ICC 3 (scanner 3). The result indicated that 29 batches from ICC 1, 11 batches from ICC 2, and 10 batches from ICC 3 would be pulled for audit.

The exact calculations for the number of batches selected from each scanner are as follows:

1. Determine the total number of batches scanned by each ICC:
   - ICC 1 = 542 batches
   - ICC 2 = 209 batches
   - ICC 3 = 183 batches
   - 934 total batches to possibly be verified.

2. Determine the percentage of total batches each ICC scanned:
   - ICC 1 = 542/934 = 58%
   - ICC 2 = 209/934 = 22%
   - ICC 3 = 183/934 = 20%

3. For each ICC selected, use the percentage of total batches each ICC scanned to determine the random number of batches needed from each ICC, and then to determine which batch numbers for each ICC to pull. Since 50 batches were selected for verification, the total number of batches for verification from each ICC is as follows:
   - ICC 1 = 58% of total batches x 50 batches for verification = 29
   - ICC 2 = 22% of total batches x 50 batches for verification = 11
   - ICC 3 = 20% of total batches x 50 batches for verification = 10

B. ***Use Pseudo-Random Number Generator for Random Selection of Batches.***

The staff then used the Pseudo-Random Number generator at https://www.stat.berkeley.edu/~stark/Java/Html/sha256Rand.htm to randomly select the batches of ballots from each ICC. Following the instructions on the Pseudo-Random Number Generator, the selected were as follows:

(1) Roll the ten, ten-sided dice one time, and then a second time and input all twenty numbers into the "Seed". "Seed," is the starting point of a random number generator.
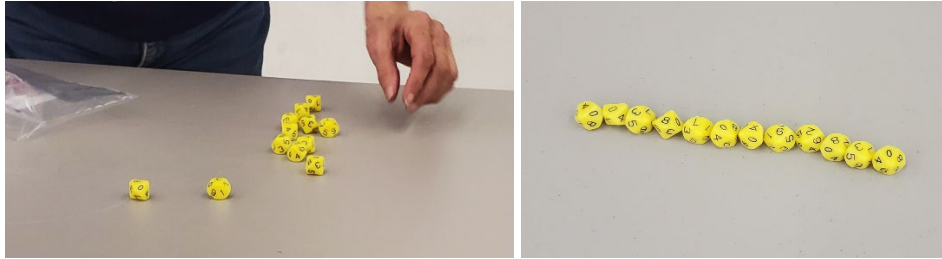
(2) Enter the "Seed" and other information into the random number generator and press "Draw Sample." The result is the list of randomly selected items. This process was done for ICC 1, ICC 2, ICC 3 to audit all three scanners.

ICC 1:

---Pseudo-Random Sample Using SHA-256---

Seed: 2,0,8,2,3,9,5,4,8,7,0,4,0,3,6,2,2,1,3,9   *ICC 1*

Number of objects from which to sample: 542

Current sample number: 29   Draw this many objects: 29   draw sample

reset

Hashed value (for testing):

0888231b6a9c74f33c5664eacdb68098826a5938e8a68625d749d6bfa4f4032c

Randomly selected item: 235

Items selected:

309,139,124,431,57,202,250,149,361,118,59,387,403,65,513,447,507,36,212,442,303,63,234,306,419,542,446,357,235

ICC 2:

---Pseudo-Random Sample Using SHA-256---

Seed: 1,7,4,4,1,2,3,8,3,0,6,9,8,4,7,3,8,5,2,8   *ICC2*

Number of objects from which to sample: 209

Current sample number: 11   Draw this many objects: 11   draw sample

reset

Hashed value (for testing):

d4e928a883043b5f5e6179ddaba457dc186ae4d0c085a5e02f39d3456d1f2842

Randomly selected item: 13

Items selected:

5,134,87,33,115,95,73,25,101,185,13

ICC 3:

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┌─Pseudo-Random Sample Using SHA-256─────────────────────────────────┐
│  Seed: 4,1,1,3,4,7,3,8,8,4,1,8,5,2,7,3,3,9,6,3          ICC 3       │
│  Number of objects from which to sample: 183                       │
│  Current sample number: 10      Draw this many objects: 10   [draw sample] │
│  [reset]                                                           │
│  Hashed value (for testing):                                       │
│  385f40fbc6638a846079681f30b304c1d0204949d9c31731763ddad1866f42a2  │
│  Randomly selected item: 135                                       │
│  Items selected:                                                   │
│  146,19,80,108,51,36,117,105,129,135                               │
│                                                                    │
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The batches were pulled and delivered to counting teams.

C.   Hand-Count Results

Mayoral Race – Ballots are sorted by Candidate A, Candidate B, and other[2]. The results of the hand-count are as follows:

Category	Hand-Count
Candidate 1	2361
Candidate 2	2011
Total	**4372**

D. Machine Count Verification

After the batches of ballots were hand-counted, the Cast Vote Records for the selected batches of ballots were produced and tallied. The batch totals were transferred to the RLA Worksheet[3] and are as follows:

Mayoral Race –

Category	Machine-Count Total
Candidate 1	2361
Candidate 2	2011
Total	**4372**

Comparison of the Hand-Count to the Machine Count

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[2] Other includes blank ballots, or ballots where a voter indicated a vote of someone else.
[3] See Exhibit A – RLA Worksheet

The third and final step in the post-election audit involved comparing the hand-count to the machine count. Here is the comparison:

Mayoral Race –

Category	Hand-Count	Machine-Count Total
Candidate 1	2361	2361
Candidate 2	2011	2011
Total	**4372**	**4372**

The result of the post-election audit is that of 4,372 randomly selected ballots, the hand count and machine count of those ballots was identical. The conclusion is that the scanning, adjudication, and tabulation system performed as expected and the results of the election demonstrated the will of the voters.

Respectfully Submitted:
MOA Elections Team
William Northrop, Election Administrator
Jamie Heinz, Municipal Clerk

Exhibit A

Scanner & Batch #	Hand Count Column A Candidate 1	Hand Count Column B Candidate 2	N=4000	Machine Batch Level Results Candidate 1	Machine Batch Level Results Candidate 1	N=4000
1-309	48	72		48	72	
1-139	55	43		55	43	
1-124	44	29		44	29	
1-431	74	42		74	42	
1-57	91	38		91	38	
1-202	23	25		23	25	
1-250	47	52		47	52	
1-149	71	66		71	66	
1-361	56	34		56	34	
1-118	43	51		43	51	
1-59	42	62		42	62	
1-387	58	17		58	17	
1-403	39	48		39	48	
1-65	58	36		58	36	
1-447	71	45		71	45	
1-63	53	32		53	32	
1-303	51	66		51	66	
1-442	36	34		36	34	
1-212	45	5		45	5	
1-507	12	7		12	7	
1-513	63	29		63	29	
1-36	78	6		78	6	
1-234	54	58		54	58	
1-306	42	29		42	29	
1-419	39	68		39	68	
1-542	16	13		16	13	
1-446	48	48		48	48	

Exhibit A

1-357	30	43		30	43	
1-235	27	66		27	66	
2-5	97	53		97	53	
2-134	38	36		38	36	
2-87	56	52		56	52	
2-33	41	27		41	27	
2-115	36	42		36	42	
2-95	50	43		50	43	
2-73	19	14		19	14	
2-25	75	24		75	24	
2-101	25	34		25	34	
2-185	38	58		38	58	
2-13	46	67		46	67	
3-146	34	29		34	29	
3-19	74	41		74	41	
3-80	47	30		47	30	
3-108	42	43		42	43	
3-51	21	70		21	70	
3-36	61	45		61	45	
3-117	53	47		53	47	
3-105	42	33		42	33	
3-129	32	40		32	40	
3-135	20	19		20	19	
Totals	2361	2011	4372	2361	2011	4372