CUYAHOGA COUNTY
BOARD OF ELECTIONS

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Post-Election Audit Summary

November 8, 2011 General Election (Berea Mayor and State Issue 2)

On December 13 and 14, 2011 we conducted two Risk-Limiting Post-Election Audits for the November General Election. A total of 6,477 ballots were cast for the Berea Mayoral race between two candidates and a total of 384,195 ballots were cast for State Issue 2.

Our Risk-Limiting Audit was based upon the Kaplan-Markov method as explained by Philip B. Stark and Mark Lindeman. Auditing best practices recommend we split up the total ballots cast by precinct into multiple batch types. Our first precinct batch consisted of the Absentee ballot category. Our second precinct batch was made up of the ballots cast in the Election Day, Provisional, Post-Election Day and Post-Absentee categories.

A master spreadsheet was created with statistical formulas to determine the number of batches that must be audited in order to reach a 90% confidence level. This confidence level means the audit has at least a 90% probability of leading to a full recount if the apparent outcome is incorrect. Based on this data, the required numbers of batches to audit for the Berea Mayoral race is forty-eight (48) and the required number of batches for State Issue 2 is eight (8).

We used a "Probability Proportional to Error Bound with Replacement" selection method utilizing multiple containers each filled with ten (10) ping pong balls labeled 0-9. One ping pong ball was randomly pulled from each container. We created a four (4) digit number ranging from 0000 through 9,999 for the Berea Mayoral audit and a six (6) digit number ranging from 000000 through 999,999 for the State Issue 2 audit. The increased range of balls for the State Issue 2 audit was mandated by the increased number of batches in the countywide contest. Unique ranges of numbers were assigned to specific batches based upon their error bound - i.e. the greater the possibility of a miscount within a batch, the more numbers assigned, and the more likely it is to be selected.

We have continued to refine and improve our selection process. In the past, we have used both a hopper filled with ping pong balls and boxes filled with cut up sheets of paper labeled with single digit numbers. We found the hopper technique would not scale well with a large batch of precincts so we previously switched to picking slips of paper from boxes. Although this solved our previous escalation and rounding problems it was very time consuming when many batches had to be picked. In the Berea Mayoral audit, we were required to pick 48 four digit numbers, which would have equated to picking 192 numbers from the boxes. For this election, we switched to picking numbered ping pong balls from multiple boxes as the other method would have been very inefficient. This technique scales well with both large batches of precincts and a large requirement of selections.

In conclusion, we audited 4,482 ballots for the Berea Mayoral race, which amounted to the cost of $805.49. We audited 1,586 ballots for State Issue 2, which amounted to the cost of $493.82. All results match the Amended Official Certification giving us a 100% audit accuracy rate for the election.