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# Statistical Analysis of Post-Election Audit Data for the November 03, 2020 Presidential Elections

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## Summary

This report presents a partial analysis of the returns from the post-election audit performed in the State of Connecticut following the November 03, 2020 presidential elections. The audit involved a random selection of 5% of the precincts in which ballots were cast. In each precinct selected, the ballots cast on election day were either hand-counted or counted with electronic assistance.<sup>1</sup>

A total of 19 precinct audits were submitted for analysis, comprising 226 audit records. We are awaiting results from an additional precinct—Farmington 2-6—which will be the subject of a separate report.

The specific goal of the analysis was to use statistical methods to detect signs that one or more tabulators has functioned incorrectly. All of the 19 precinct audit results indicated small discrepancies consistent with anticipated levels of human error in counting or ballot handling. The analysis revealed no conclusive signs that the tabulators functioned incorrectly.

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<sup>1</sup>Auditors are allowed to use an electronic audit assistance tool, provided that they visually examine each ballot to confirm bubble interpretations.

Town	District
Bridgeport	Central-129-03
DeepRiver	District-1
Enfield	District-158
Granby	District-2
Hartford	District-4
New Haven	16 John S. Martinez School
New Haven	District-1-2
Newington	District-8
Newtown	District-3-2
Plainville	District-2
Shelton	3 Long Hill School
Somers	District-1
Stratford	Lordship School
Stratford	Wooster School
Voluntown	District-1
Waterbury	District-71-2
Waterbury	District-72-3
Waterbury	District-73-4
Waterbury	District-74-2

Table 1: Audit precincts analyzed

## 1 Analysis Description

### 1.1 Audit Records

The audit returns are presented in a result report in which auditors record information about the precinct under audit, the result of their count, and the corresponding count value from the tabulator. This analysis considers the vote totals for each candidate as a separate record. Each record consists of three items: the total votes as reported by the tabulator, the number of bubbles containing an “undisputed mark,” and the number of bubbles containing a “questionable mark.” An “undisputed mark” is a mark that covers the majority of the bubble and is dark enough that all auditors agree that it should have been read as a mark by a working tabulator. A “questionable mark” is a mark that is not large or dark enough to convince all of the auditors that a working tabulator would have recorded it.

### 1.2 Expected Vote Ranges

For each record, the undisputed mark total and questionable mark total are used to define an *expected tabulator total range*. The range is defined as having a minimum that is the undisputed mark count and a maximum that is the sum of the undisputed mark count and questionable mark count. If the total as reported by the tabulator is at least the undisputed mark count and no more than the sum of the undisputed and questionable mark counts, then it is reasonable to conclude that the tabulator counted all of the marks that the auditors considered undisputed marks and zero or more of the marks that the auditors considered questionable. In this case, the tabulator is considered to be functioning properly.

### 1.3 Discrepancies

**Total Ballot Count Discrepancies.** If the tabulator total falls outside of this expected range then it is considered an unexplained discrepancy. If the total ballot count is different from the total number of ballots counted during the audit, and the discrepancy value falls somewhere between zero and the ballot count difference, then the source of the discrepancy is considered to be the difference in ballot count. For this reason, it is important that auditors reconcile the tabulator ballot count and the audit ballot count. If these counts differ, then the audit’s conclusion is weakened—any significant differences between the tabulator ballot count and the audit ballot count are grounds for further investigation.

**Anticipated Human Error.** It is common that a small amount of human error will be present in a hand count. For the purposes of this analysis, human error up to 1% of the audit ballot count is anticipated. Any discrepancy that does not exceed 1% of the audit ballot count is noted, but is not considered evidence that the tabulator has malfunctioned.

**Unexplained Discrepancies.** The analysis concludes by considering all unexplained discrepancies that are greater than 1% of the audit ballot count or significant disagreements between tabulator ballot counts and audit ballot counts. Any such discrepancies will trigger a recommendation for further investigation, but do not necessarily constitute evidence of a tabulator malfunction.

## 2 Analysis Results

Of the 226 submitted records, 191 (84.5%) of the audit records confirmed the tabulator count and 35 of the audit records reported a tabulator count that differed from the audit count. The discrepancies

in each of these 35 records were less than 1% of the audit ballot count.

**Further discussion of discrepancies.** Of the 35 records showing a discrepancy between the audit count and the machine count, 8 of the records are explained by the difference in number of ballots counted at the audit and the number of ballots counted by the tabulator. (For example, in a result report that shows that there were 5 fewer ballots processed during the audit count than the tabulator count, a record that indicates that a candidate with an audit vote tally 4 less than the tabulator vote tally is considered to be explained by the difference in ballots counted.) We remark that the discrepancies appearing in these 8 records were in all cases less than 1% of the audit ballot count. All of the 27 remaining unexplained discrepancies were smaller than 1% of the audit ballot count for their precinct. These discrepancies are considered within the range of anticipated human error and are not considered evidence of a tabulator malfunction.

### 3 Conclusion

The University of Connecticut Center for Voting Technology Research (VoTeR Center) received data gathered in the post-election audit performed in the State of Connecticut following the November 3, 2020 election. The audit involved the 5% of the precincts at which ballots were cast randomly selected for audits; the audit returns were conveyed by the Office of the Secretary of the State (SOTS) to the VoTeR Center. The audit data analyzed by the Center contains 226 records, where each record represents information about a given candidate: date, district, office, candidate, machine counted total, hand counted total of the votes considered unquestionable by the auditors, hand counted total of the votes considered questionable by the auditors, and the hand counted total, that is, the sum of undisputed and questionable votes.

Category	Record count
Records within expected range	191
Records outside expected range but with $\leq 1\%$ discrepancy:	
— Discrepancy $\leq 1\%$ explained by ballot count discrepancy	8
— Discrepancy $\leq 1\%$ not explained by ballot count discrepancy	27
Records with discrepancies larger than 1%	0
Total	226

Table 2: Categorization of audit records

Table 2 shows the audit record categories as well as the number of audit records that fall into that category.

Any discrepancy between the total number of ballots counted by the tabulator and the total number of ballots counted in the audit is a concern and weakens the audit’s conclusion. The audit returns from three of the analyzed precinct audits reported a difference in the number of ballots counted by the tabulator and the number of ballots counted on audit day. In two of the audits, the tabulator ballot count was one less than the audit ballot count. A third audit reported counting five fewer ballots than the tabulator’s total. In this third case, the total number of ballots present at the audit was verified through additional hand counts. The size of these discrepancies is consistent with human mishandling of ballots during the election, post-election storage, and transportation.

To conclude, the analyzed audits offer no conclusive evidence of tabulator malfunction in the 2020 Presidential Election.