

An Audit of the South Carolina State Election Commission and County Election Data from the 11/2/2010 General Election in South Carolina

(Interim Report 9/30/2011)

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Executive Summary

We have requested under FOIA election data from a number of South Carolina counties for the 11/2/2010 General Election. Subsequent to our demonstration that vote counting errors had occurred, the South Carolina State Election Commission (SCSEC) undertook its own collection of data and reconciliation of the totals. This is to report on our analysis of the election based on the data we have gathered, our analysis of the election based on the data the SCSEC has gathered, and our analysis of the data gathering and auditing process itself.

We find enormous room for improvements that would both increase the likelihood of correct results being reported and that would increase voter trust that the results being reported are correct. Significant among the problems we have found are the following:

- Only one-third of the counties supplied to the SCSEC the data it requested. If this is to be the norm in the future, then no proper audit could be conducted on a statewide basis.
- In several instances, the data reported to the SCSEC differed substantially from the data we had obtained. The fact that the counties cannot produce repeatable and consistent audit files should be a cause for concern about the usability of the election system in South Carolina.
- We find numerous instances of iVotronic terminals opened and closed contrary to standard procedure. This seems to be the primary reason that votes do not get counted from terminals, so there needs to be a mechanism to check for this failure of procedure prior to certifying a vote count.
- There appears to be no official procedure for dealing with votes collected on machines that then report their data to be unreliable. Even though the machines report failure, votes seem to be collected as usual without any additional logging information about how the failures are dealt with.
- We also add that the SCSEC has, according to its public information officer, conducted its audit essentially without critical analysis. That is, it has requested data and then run computer programs against that data without checking that it makes sense to run programs against that data. In Fairfield County it “updated” a file with a file containing less data, apparently without checking that the new file was of higher quality than the old, and then had to update a second time. In Horry and Colleton Counties, in spite of our discussions with them about the nature and quality of the data, they have published and run programs against data files known to be incorrect or incomplete.

The Vote Audit Committee of the LWVSC has included Dr. Buell, a computer science professor at USC; Dr. Hare, a retired computer science professor from Clemson; Mr. Heindel, from Charleston; and Mr. Moore, a computer scientist from Boston, Massachusetts, formerly from the Myrtle Beach area. This volunteer group has worked with LWVSC leadership and has enjoyed the cooperation of some of the election directors from South Carolina counties in explaining the election system and in diagnosing errors. Undergraduate research students at USC and at the University of California, Berkeley, and Professor David Wagner of the University of California, Berkeley, have also assisted the committee.

An Analysis of the Statewide Data

The Data

The SCSEC apparently asked for the 30A, 45A, 68, 68A, 152, and 155 files from the 46 counties in South Carolina.

We (the “we” being defined to include Buell, Hare, Heindel, Moore, and Zia as authors of the EVT/WOTE 2011 conference publication¹) asked first for 152 and 155 data and then more recently have been asking for 68 and 68A data.

The 30A report is a precinct-by-precinct report of votes cast for candidates, both on paper and using the iVotronics (which we will refer to as “terminals”). The 45A report is a summary of votes cast for candidates, both on paper and using the terminals. Together these can provide the paper ballot information that will not, of course, be in the 152 and 155 files.

The 68 file is the “manual adjustment log” of individual manual adjustments to the counts produced by the terminals. In some counties there is sometimes no need to make manual adjustments because even the paper ballots are scanned and the totals uploaded electronically. In some counties there are extensive manual adjustments.

The 68A file is the “system log” that should report that the databases have been zeroed and that should have the log entries corresponding to uploads of vote totals from the PEBs and to the collection of audit data from the Compact Flash (CF) cards.

The 152 file contains the individual events logged by individual iVotronic terminals. This file is created from the CF audit data for each terminal.

The 155 file contains the actual cast vote records, with precinct, terminal serial number, and ballot style indicated. This file is created from the CF audit data for each terminal.

If the 68A, the 152, and the 155 files are available for analysis, then the individual cast vote records can be counted, the numbers of votes on each terminal can be counted (there is a “Vote cast by ...” event log entry for each cast vote), and the total number of ballots uploaded from the precincts into the master files can be determined from the 68A file. If this data exists in its entirety, then one can audit the election data at least to the point of verifying that all vote events have been

¹ D. Buell, E. Hare, F. Heindel, C. Moore, and B. Zia, “Auditing a DRE-Based Election in South Carolina”, *Proceedings*, EVT/WOTE 2011.

<http://www.usenix.org/events/evtwote11/tech/>

accounted for and that the vote totals reported from the iVotronic terminals are consistent with the audit data.

Processing the data as above requires a single program, because the data formats are all the same and there are no real variations in procedure from one county to another.

Further processing to verify that the absentee counts are correct is much more difficult because there are several special cases that need to be dealt with. For example, we have instances in which the electronic ballot was misconfigured at the precinct level and is thus not automatically uploaded into the vote counts. Although data will show up in the 152 and 155 files, the inclusion of those vote counts is sometimes done manually. One must be careful, therefore, not to count twice by counting both in the 152/155 files and in the 68 file.

On a case-by-case basis, however, using the six files should produce a complete and accurate verification of the ballot counts and vote totals by contest and candidate.

Response Success—Can the Counties Provide the Requested Data?

Of the 46 counties in South Carolina, only 15 appear to have been able to produce 30A, 45A, 68, 68A, 152, and 155 files that had correct data. These counties were Bamberg, Cherokee, Chester, Chesterfield, Darlington, Dillon, Dorchester, Georgetown, Greenville, Greenwood, Kershaw, Lee, Richland, Spartanburg, and York.

Subjective comment: Although this is a subjective number on some counts, we believe it indicates a major problem with the election system in South Carolina. The state has gone to great lengths to standardize on a single voting platform, and yet 2/3 of the counties did not produce the audit data that would allow for the transparency and reassurance of third-party verification of the results (to say nothing of the ability of the SCSEC to conduct its own verification of the results).

Of the 31 counties that did not provide complete data to the SCSEC, we note that there were 8 counties (Anderson, Berkeley, Charleston, Colleton, Florence, Horry, Lexington, and Sumter) that provided to the SCSEC *different* data from that provided to us when we requested it by FOIA. (We do not include in this a few counties that clearly went back when requested by SCSEC and collected data from CF cards that had previously been overlooked.)

Anderson: Our 155 file has the 750+ precincts; the SCSEC file does not. Our 152 file has at least one terminal that is not present in the SCSEC 152 file.

Berkeley: Our 152 file differs from the SCSEC file in one terminal in precinct 0850.

Charleston: The details are below.

Colleton: The details are below.

Florence: The SCSEC did not get a 68A file or a 152 file, but we have those files.

Horry: The details are below.

Lexington: The 155 file provided to the SCSEC has one precinct's data DUPLICATED.

Sumter: The SCSEC 68A file is missing a large middle segment that is present in the file we obtained.

Finally, one county (Fairfield) provided to the SCSEC an original set of files that was missing some data. They then apparently provided a second file that was incomplete *in a different way*. This second file was posted to the SCSEC website apparently without the SCSEC having checked that it was a "better" file than the original. (That it was different was obvious because it is about 200 thousand bytes smaller than the original.) The data present in the original file but missing in the "updated" file has now been added as a second data file.

It must be noted that several counties did not collect the CF audit data until long after the 11/2/2010 election. One of our programs run on August 8, 2011, showed that Beaufort, Chester, Dorchester, McCormick, and Union counties did not collect their CF data until March 2011 or later, and as mentioned there was substantial data from Horry and other counties not collected until spring of 2011. In all, about 11% of the iVotronic terminals did not have their data collected until sometime in 2011.

Subjective comment: We believe that it is a major problem with the SC election system that the counties are unable to produce consistent and repeatable results in the data files from the election system. The SCSEC canvass checklist specifically says that the CF card data is to be archived in accordance with HAVA regulations.

Data Quality:

We turn now to the question of whether the data that has been provided is correct. That is, is the quality of the data high enough that we can conduct a reasonable audit of the 2010 election? And if the data is not of sufficient quality that an audit can be done, what can we infer about the election system in place in South Carolina?

We can start with the seven counties about which we can infer that the *election system*, which we take to include the ability to conduct a post-election audit for verification and transparency purposes, failed catastrophically for the 11/2/2010 election. These are Charleston, Colleton, Horry, Lancaster, Oconee, Orangeburg, and Williamsburg.

Charleston: We requested by FOIA the 152 and 155 files. We were twice provided with a 155 file that had only about 10% of the vote images. The SCSEC file has only about 75% of the total vote image file and is missing about 30,000 vote images. We requested 68 and 68A files and, although there are discrepancies among the files we received, we did obtain files that have useful information. The SCSEC, in contrast, does not have 68 or 68A files.

Colleton: The failure in Colleton County to get a correct count until multiple recounts has been mentioned in several locations. The problem, however, is more serious than that. We requested data from Colleton County and were provided with a 155 file that differs substantially from that in the possession of and published by the SCSEC. Our 155 file obtained directly from the county, and dated as early as February 3, 2011, includes data for 96 iVotronic terminals. The SCSEC file, which the SCSEC obtained from Colleton County and which we then obtained from the SCSEC, has vote image data for 90 terminals. By putting the two files together one has data for 103 terminals. There are 104 terminals listed in the 68A file, one of which has no votes on it, and the combined file we created from our county data and the SCSEC data is the correct 155 file. Nonetheless, the fact that substantially different files were provided at different times, for an election that was widely publicized as having problems, represents a catastrophic failure of the election system to provide reliable auditable results and data.

Horry: We requested and received 68A, 152, and 155 data from Horry County. The SCSEC requested and received 30A, 45A, 68, 68A, 152, and 155 files. However, the data in these files is very different.

Our 152 file has 59079 "Vote cast" events, and our 155 file has 59079 vote images. There were 71211 ballots cast as per the SCSEC website "detail" file. We are missing about 8500 vote images, as detailed below. The 45A file states that there were 70567 ballots cast, not 71211, of which 3671 were optical scan. The 30A file lists 3459 optical scan votes. Our 155 file and that of the SCSEC has vote image data for 2092 of the 5652 absentee votes, which means that the vote image data is probably missing for one or more terminals with a total of 101 votes.

The SCSEC 152 file has 66651 "Vote cast" events, but the SCSEC 155 file has only 53483 vote images and is thus missing about 14000 vote images.

We had noticed from our data the following:

- There were more than 50 precincts for which the 152 and 155 data was incomplete or entirely missing.
- There was one terminal precinct 0189 (Racepath 1) with 114 votes that had not been included in the certified count.
- There were three probable test votes in the 155 file, one in each of three different precincts.

The election officials in Horry County must have done a re-collection of the CF memory cards from the terminals after our request, because a number of the precincts for which our file is missing data have complete data in the SCSEC file and the 68A records collection of additional data from the CF cards. However, it is still true that:

- The SCSEC file is completely missing 25 precincts in the middle of the file. For many of those precincts, we have the correct data in our file.
- The SCSEC 155 file is completely missing precinct 0189, so an audit of the data would not show the terminal whose votes were not included in the count.
- The SCSEC 155 does allow one to observe that one terminal in precinct 0175 (Nixon's Crossroads 2), with 69 votes, was also not included in the count. We have data for that terminal but would not have been able to determine that the votes were not counted, because our file is missing vote image data from several terminals in that precinct and the missing data masks the omission of that terminal from the count.

Lancaster: It was apparently the case that all the ballots were misconfigured either in the PEBs/iVotronics or in the central computer. The fact that the tables of contests did not match meant that all votes in Lancaster County were totaled from the paper tape generated in each precinct. There is no data to audit, although there should be no reason that 152 and 155 data could not be gathered from the CF cards.

Oconee: The situation in Oconee is somewhat similar to that in Horry County, although we did not ask for that data ourselves and thus do not have data to compare against the SCSEC data. However, the files published by the SCSEC are substantially incomplete. The 68A file has two entries dated 9/30/2010, one entry dated 10/15/2010, but then no entries until a series dated 11/18/2010. Thus, the 68A file contains no information about the events of 11/2/2010 and immediately following. The 68 file contains nothing but a printer output header line.

The 45A file reports a total of 20053 ballots cast, all on iVotronic terminals. There were 21491 certified votes. The SCSEC 152 and 155 files have data for only 5857 votes, about 27% of the total. There is missing data for every precinct in the county.

Orangeburg: The news report from Orangeburg county asserts that when the county received a program from the SCSEC that would collect data to be returned to the SCSEC, that program deleted all the data. There is thus no data to audit, although it is not clear why there should not have been backups of the data as would be kept by all IT operations.

Williamsburg: Williamsburg provided 68 and 68A files, but no event log or vote image data (although it's not at all clear why that data could not and should not be available. The 68A file contains for every precinct the message "more cards than results". This is an indication that the ballots were also misconfigured and that the

ballot styles in the PEBs/iVotronics were not the same as at county headquarters. Again, there should be no reason that the 152 and 155 data could not be gathered from the CF memory cards.

Why Election Auditing Is Needed

Incorrect Results:

We believe that the audit results we have obtained show that audits are necessary in order to ensure and maintain voter confidence in the election process.

We have observed ballot misconfigurations in several counties. Lancaster and Williamsburg show the most serious such problem, with the entire county in each case being misconfigured.

Beaufort County had a misconfigured ballot in precinct 0307, with the result that the official totals are not correct. This error was detected by our group and not by election officials.

Charleston County had a misconfigured ballot in precinct 0337, but this was caught and apparently the correct totals were made through manual adjustment.

Dorchester County had a misconfigured ballot in precinct 0027, but this was caught and apparently the correct totals were made through manual adjustment.

There are several counties (Darlington, Horry, Lexington, ...) in which test votes apparently show up in the 155 file.

Machine Failure:

An additional reason to conduct audits is to ensure that machine failure does not affect the ability to correctly count the votes. We do not mean by this the instances of terminals that need constant calibration or show similar balkiness and have to be closed early.

There were three terminals in Sumter County that had file read or write errors for the CF cards. There was one terminal in Horry County and one in Sumter County that reported "chip vs chip crc error", meaning that the internal memories storing the cast vote records were no longer consistent. There are no log records in the 68, 68A, or 152 files to indicate whether anything was done differently for these terminals that had declared themselves to be unreliable.

Subjective comment: When requested under FOIA, the SCSEC reported that there is no official statewide procedure for determining what constitutes a “vote” when the machines report that their stored data is not reliable. We were told that whatever action would be taken to determine “a vote” from such a machine would be taken at the county level and there would be no requirement to report the machine failure. We believe there should be some standard procedure for logging the accumulation of votes from such machines so as to verify that inaccurate results have not been produced.

Uncounted Votes:

By auditing the files we have discovered that machines with cast votes have not been included in the count. This has normally been the result of one of two failures to follow the official procedure combined with the lack of follow-up auditing to detect the failures to follow procedure. Some terminals were not closed until after the election results were certified. More commonly there are terminals in a precinct that are closed using more than one PEB, but only one PEB’s vote totals are collected at the county level.

Richland: 1127 votes from two precincts were not counted.

Horry: 183 votes from two iVotronic terminals were not counted.

Dorchester: 161 votes from one terminal were not counted.

Fairfield: one vote from one terminal was not counted.

Sumter: 24 votes from one terminal were not counted.