

**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION**

DONNA CURLING, ET AL.,)	
)	
Plaintiffs,)	
)	CIVIL ACTION
vs.)	
)	FILE NO. 1:17-cv-2989-AT
BRAD RAFFENSPERGER,)	
ET AL.,)	
)	
Defendants.)	

**COALITION PLAINTIFFS' BRIEF IN SUPPORT OF MOTION FOR
PRELIMINARY INJUNCTION**

June 21, 2019

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The Coalition Plaintiffs file this Brief in Support of their Motion for Preliminary Injunction.

I. INTRODUCTION: OVERVIEW OF RELIEF SOUGHT

This Motion seeks to protect the constitutional rights of Georgia citizens to vote and have their ballots counted in the 2020 elections, including the March Presidential primary, and the remaining 2019 elections. The Coalition Plaintiffs seek injunctive relief that will ensure that voters' rights to a secret ballot will be protected immediately; that hand-market paper ballots with Accu-Vote scanners will replace DRE voting machines no later than October 1, 2019; that election results will be audited; and that the problems with the electronic pollbooks are promptly remedied and paper back-ups provided at polling locations.

Unless injunctive relief is granted, the State will have no constitutionally acceptable voting system for the foreseeable future. The State's new ballot marketing device ("BMD") system, *if* ever deployed, will not be operational until, at the very earliest, the late March 2020 Presidential primaries, and will not address the constitutional violations at issue in this case. It is therefore imperative that the State be enjoined to replace the unconstitutionally defective DRE voting machines with hand-marked paper ballots so that Georgia voters have a constitutional voting

system for the balance of 2019 and for the 2020 Presidential primary, other primaries, and the general election.

Coalition Plaintiffs continue to seek relief in this case relating to the DRE voting system and the electronic pollbooks, as sought in two prior Motions for Preliminary Injunction. (Docs. 258, 327). With respect to the DREs, the relief that the Coalition Plaintiffs seek is to replace only the DRE electronic voting machines, not the entire Diebold Accu-vote DRE certified election system. If this Motion is granted, the DRE voting machines would be sidelined,¹ but the State would continue to use the Diebold/GEMS election management system, and the Diebold optical scanners until Georgia implements another accountable voting system.

If the Coalition Plaintiffs' Motion is granted, the voter's selection will no longer be made on un-auditable DRE touchscreen machines and instead will be marked directly on a paper ballot and then scanned by the Diebold Accu-Vote optical scanners.² The selections will be recorded on the scanner's removable

¹ The Coalition Plaintiffs' Motion, by its terms, does not prohibit the use of electronic or other appropriate units for persons with disabilities.

² Georgia law permits the paper ballot scanning to take place either at each polling location or centrally at the election office at the option of the county election board. O.C.G.A. § 221-2-483(a). As reflected in their Motion, Coalition Plaintiffs recommend leaving this choice to each county superintendent's discretion based on local logistics, personnel and training considerations.

memory card for transfer to the GEMS server for consolidation and tabulation of vote totals, as mail and provisional ballots are processed today.

Though modest in scope, the relief sought by the Coalition Plaintiffs remedies the core defect in Georgia's current system configuration for in-person voters: the absence of "a paper trail or any other means by which to independently verify or audit the recording of *each* elector's vote, i.e., the actual ballot selections made by the elector for either the elector's review or for audit purposes." (May 21, 2019 Order, Doc. 375, at 4). If the motion is granted, there is an independent record of voters' selection in the form of the voter-marked paper ballots. *See Curling v. Kemp*, 334 F. Supp. 3d 1303 , at 1328 (N.D. Ga. 2018) (a new balloting system in Georgia "should address democracy's critical need for transparent, fair, accurate, and verifiable election processes").

The key to the feasibility of this remedy is that Georgia has long used this system for processing paper ballots. In the November 2018 elections, the State processed over 250,000 hand-market paper ballots using the same certified Diebold components and processes that it would use to count virtually *all* the votes if Coalition Plaintiffs' injunctive relief were granted. In fact, if Coalition Plaintiff's requested injunctive relief is granted, the State would need to make only minimal if any changes to procedures for ballot layout, paper ballot procurement, counting,

and reporting paper ballots; the counties would merely order more paper ballots from printers and, instead of giving voters a voter access card to enable the DRE voting machines, pollworkers will issue paper ballots.

In contrast to the relief sought by the Coalition Plaintiffs, the Curling Plaintiffs seek relief in their Proposed Order that would immediately replace not only the DRE touchscreen voting machines, but the entire “Diebold AccuVote DRE voting system.” (Doc. 387-8 at 2). While the Coalition Plaintiffs agree that the entire system should be replaced over the next few years, the State does not have the resources or the equipment necessary to purchase and mobilize new machines in time for the November 2019 elections, or the 2020 elections. Under the current circumstances, the only feasible relief is the relief proposed by the Coalition Plaintiffs, using the hand marked paper ballot system already in place in Georgia augmented by robust post-election audits.

Even with the change to hand-marked paper ballots, rigorous post-election audits are essential. “Thorough post-election auditing is essential and must be taken seriously in all elections, but this is especially true when using an outdated and vulnerable Diebold system.” (A. McReynolds Supp. Decl. ¶ 28 (Doc. 413 at 229-30)). For this reason, the Coalition Plaintiffs in their Motion seek an order requiring Defendant State Election Board and Plaintiffs to confer and file with this

Court a proposed plan for a pre-certification audits of the paper ballot tabulations, and to apply applicable audit techniques to DRE components until paper ballot elections are fully implemented.

As the Coalition Plaintiffs have documented in prior filings and with this Motion, Georgia voters continue to be subjected to disenfranchisement because of malfunctioning electronic pollbooks. The Coalition Plaintiffs therefore also seek relief relating to the remediation of the electronic pollbooks.

In this Brief, the Coalition Plaintiffs will focus primarily on new evidence. Part II will address the feasibility of the relief sought: cost, training, provisioning equipment, management of early voting, and particular issues relating to counties and municipalities. In Part III, the Coalition Plaintiffs will address new evidence substantially strengthening the likelihood of success on the merits, including scores of first-hand accounts of the malfunctioning DREs in the November 2018 elections, the discrepancies in vote totals, the extreme undervote in race for Lieutenant Governor, and the new evidence confirming that the DREs violate ballot secrecy. In Part IV, the Coalition Plaintiffs will address the additional evidence establishing the immediate need for relief relating to electronic pollbooks. In Part V, the requirement for post-election audits is explained. In Part VI, the Coalition Plaintiffs will show that the Defendants have no equities whatsoever:

even after this Court's September 2018 order, Defendants have taken no discernable action to address the constitutional infirmities of the State's DRE voting system. Finally, in Part VII, the Coalition Plaintiffs will explain that granting injunctive relief now will provide a safe, sensible, constitutional alternative to, and contingency for, the State's planned deployment of the BMD system in 2020.

II. FEASIBILITY OF THE RELIEF

A. Overview – “Most Widely Accepted Voting Method in the Nation”

The system that the Coalition Plaintiffs recommends is used across the nation in approximately 112,000 precincts covering 133 million registered voters. (A. McReynolds Decl., Doc. 413 at 223-24 n. 1). According to Amber McReynolds, an expert in the field: “This hand marked paper ballot and scanning method of balloting is the most widely accepted voting method in the nation.” (*Id.* at 224); *see also* Hoke Decl., Doc 413 at 255 (noting that such balloting is used in 45 states and the District of Columbia).

With respect to logistics of transitioning to hand-marked paper ballots, the Coalition Plaintiffs have filed declarations from three experts with substantial experience managing or monitoring transitions to hand-marked paper ballot systems. (Doc. 413 at 237 (C. Hoke); *id.* at 219 (A. McReynolds); *id.* at 270 (V.

Martin)). All concur that the transition using the existing Diebold system is feasible. (*E.g.*, V. Martin Decl., Doc. 413 at 274 (“[I]t is my opinion that in Georgia an immediate switch to hand-marked paper ballots using the optical scanning capabilities of its current voting system is feasible, economical and essential for fair elections.”)).

B. Logistics

1. Sensible Timing

The State has adequate time to transition to hand-marked paper ballots for use during 2019’s relatively smaller elections. Such ““off-year elections” are the ideal time for a mission-critical technology transition.” (Hoke Decl., Doc. 413 at 254). These elections are crucially important, but “are likely to require fewer ballot styles, and contain fewer questions or races, than would be required in a primary or general election.” (*Id.*). As a result of likely lower turnout, “poll workers and administrators, as well as voters, can gain additional familiarity with marking and scanning paper ballots.” (*Id.* at 255).

2. Availability of Printed Ballots

Granting the requested relief means the Defendants must increase the quantity of paper ballots being printed, but the largest ballot printer in the country is ready, willing and able to provide as many ballots as Georgia needs for twenty-six cents a ballot. (Doc. 277 at 87). Georgia already has 900 Accu-Vote scanners

and, if more are needed, scanners are widely available at reasonable prices. (Doc. 265 at 8; Doc. 277 at 88-89; *id.* at 110). Moreover, the cost of additional paper ballots and scanners will probably be offset by the considerable cost savings associated with not having to test, transport, secure, and close down 27,000 aging DRE machines. (*See* Doc. 258-1 at 298-299).

3. *Training*

Little additional training of pollworkers is necessary; pollworkers are already trained to securely handle and account for paper ballots for provisional voters. “Instructing voters and pollworkers on DRE operation is far more complex than working with hand-marked paper ballots.” (V. Martin Decl., Doc. 413 at 275). County election officials have the experience in operating the Accu-vote optical scanners and GEMS election management software.

4. *Early Voting and Number of Ballot Styles*

Counties can switch to hand-market paper ballots without reducing the availability of early voting. In the September 12, 2018 hearing, Fulton County Election Director Richard Barron testified that 400-450 ballot styles would be required for management in the November 2018 early voting locations, (Tr. at 262:25). Mr. Barron’s assertions appear to have been wildly exaggerated. In testimony in a state court election contest in January 2019, Mr. Barron testified that

the county had only 115 ballot styles during the November 2018 election.³ But even if more ballot styles had been required, there is no evidence that more ballot styles and having enough paper ballots available at every early voting center would be unmanageable. Denver, by contrast, managed more than 850 ballot styles at its early voting centers in the 2008 primary and 425 ballot styles for the 2008 Presidential Election. (Doc. 413 at 232-233). Moreover, in Georgia, each county's election office currently manages multiple ballot styles for mail balloting.⁴

5. *Long lines*

At the September 12, 2018 hearing, Defendants predicted chaos, long lines, and resulting voter disenfranchisement if Georgia switched to hand-marked paper ballots. Yet continued use of DRE voting machines in 2018, combined with inaccurate electronic pollbooks, caused long lines and voter disenfranchisement throughout the State. Some lines were as long as 4 to 5 hours. (*E.g.*, Doc. 412 at 106). The Coalition Plaintiffs have filed hundreds of pages of declarations from

³(Ex. E hereto, Brown Decl., Ex. 2. Tr: 39:14).

⁴ In her Declaration, Virginia Martin addresses the challenge of needing numerous ballot styles in early-voting centers in a few high-population centers. Ms. Martin explains that the problem is not unique to Georgia “and has been solved in jurisdictions across the country without the reliance on touchscreen voting machines.” (Doc. 413 at 277). Ms. Martin goes on to list a number of common-sense inventory management solutions employed in other jurisdictions, including advance planning, careful daily inventory management, ballot-on-demand printers, and requiring high-volume early-vote centers to be managed by the most experience staff. (*Id.*).

voters describing in painful and depressing detail their experience in trying to vote in Georgia in 2018. (*See* Doc. 412, *passim*; Doc. 413, at 7 - 195).

Using hand-marked paper ballots, repairing the electronic pollbook defects, and using paper backup pollbooks (discussed below) “can dramatically shorten polling place lines” by avoiding the complexity of operating “aging and unreliable electronic voting equipment.” (Doc. 413 at 274). A key benefit of using hand-market paper ballots is the ability to expand capacity quickly when high turnout occurs. It is difficult to add DRE voting machines once deployment decisions have been made. But it is easy to acquire more ink pens and cardboard privacy shields and make a modest increase in the number of pollworkers. (Doc. 413 at 274).

C. Particular Issues with Counties and Municipalities

1. Necessary Parties and Redressability

In a separate May 29, 2019 brief (Doc. 379), the Coalition Plaintiffs addressed in detail the Court’s concerns relating to whether preliminary injunctive relief against the named defendants (the Secretary, the State Board, and the Fulton County Board) will be effective as it relates to elections conducted by other counties and municipalities. As explained in that brief, an injunction prohibiting the Secretary from using DREs will, in effect, prohibit their use statewide because the Secretary of State, by law and by longstanding practice, is the party responsible

for programming the DREs and all voting system components for every county election. O.C.G.A. § 21-2-50(a)(15). The Secretary of State's office also owns most of the DREs. Only seven municipalities conduct their own DRE-based elections. (Doc. 379 at 2 n.1). If the Secretary does not program the DREs, there is no practical means for the counties and the municipalities to conduct elections using the DRE system.

In addition, granting injunctive relief will not result in undue prejudice to municipalities that have been relying upon counties for election assistance because counties and municipalities regularly enter into multi-year governmental agreement providing for such assistance, and there is no reason to believe such mutually beneficial agreements will be curtailed because of the entry of injunctive relief. (Doc. 379 at 4 – 7). It appears from available information that counties plan to continue to conduct municipal elections during 2019, although many smaller municipalities will continue their practice of conducting their own elections using hand counted paper ballots.

Expert Virginia Martin, with substantial experience running elections in Columbia County, New York, a jurisdiction of modest size, discusses the burdens upon municipalities in making the transition, and concludes, based on her experience, “that pollworkers in municipal elections will encounter minimal

difficulty in a transition to paper ballots, particularly given the small number of ballot styles to handle.” (Doc. 413 at 311).

In her declaration, Ms. Martin also explains the cost to municipalities if the transition is *not* made immediately. Municipal elections across the country are frequently extremely close, with a margin of victory of only a few votes. (The experience in Georgia is the same.⁵) Leaving the results of these extremely close elections to Georgia’s unauditible, flawed DRE voting system “from which the results cannot be recounted is taking an unacceptable risk with the governance of municipalities.” (Doc. 413 at 281).

III. PLAINTIFFS REMAIN LIKELY TO SUCCEED ON THE MERITS

The strength of plaintiffs’ case on the merits has increased since this Court, in its September 2018 order, found that Plaintiffs were substantially likely to succeed on the merits. 334 F. Supp. 3d at 1324. As explained in Part A, the defectiveness of the DREs was again confirmed; in the 2018 elections Georgia voters experienced a multitude of problems in their attempts to vote. As explained in Part B, there was an unprecedented undervote in the 2018 election for Lieutenant Governor, further evidence of system defects. As explained in Part C,

⁵ For example, in the 2019 City of Atlanta special election for a vacant city council seat, Antonio Brown’s margin of victory (to make it to the run-off) over the third place finisher was three votes.

new evidence and admissions by the Secretary of State confirms that the State uses the DREs to violate citizens' rights to ballot secrecy.

A. Numerous Voters Experienced Problems in the 2018 Election

In support of this Motion, the Coalition Plaintiffs have filed a Consolidated Exhibit with 473 pages of declarations of representative voters and pollwatchers from across the state describing wide-ranging problems in Georgia's 2018 elections (Docs. 412 and 413). Several of those illustrative declarations are discussed below:

Lieutenant Governor's race: For some voters, the Lieutenant Governor's race did not appear on the electronic ballot at all (Doc. 412 at 17 (S. Talley Decl.)), or did not appear on the electronic ballot until the final summary verification screen, (*E.g., id.* at 8 (C. Ramirez Decl.); at 10 (K. Polattie Decl.); at 13 (T. Thomas Aff.)).

Incorrect candidates: Voters reported receiving ballots from the wrong congressional district. (*Id.* at 19 (J. Gronewald Aff.)). Attorney Robin Shahar, a pollwatcher at Allgood Elementary, describes the experience of a voter whose ballot included a race which listed Karen Handel as a Democrat, with no Republican opponent. (*Id.*, at 24). The voter explained to Ms. Shahar that "she didn't think Karen Handel's race should be on the Allgood ballot because she

knew Karen Handel is a Republican.” In addition, Allgood Elementary School Precinct in Stone Mountain is not in the 6th Congressional District.

Self-casting ballots. A common problem experienced by voters throughout the state involved DREs casting the ballot before the voter pressed the “cast vote” button and before the voters could study or make corrections on the review screen. (E.g. Ex. E hereto, Brown Decl., Ex. 1, page 70:20). A “voting equipment issues” chart produced by Rockdale County Board of Elections discloses seven separate instances in which DREs “self-cast” ballots before the voters were finished voting. (*Id.*, Ex. 7). When DeKalb County voter Grace Ann Young tried to vote “[s]omething popped up on the screen as if it were going to let me review my vote, but then the screen suddenly said that I had voted. I did not click ‘cast my ballot’ or do anything else.” Young asked a pollworker for clarification on whom she had voter for; the pollworker said they could not tell. (Doc. 412 at 41-42). A Savannah voter, Vernon Jones, reported: “instead of allowing me to review my votes, the machine automatically cast them.” A pollworker told Jones there was nothing wrong with the machine. (*Id.* at 35). The voter behind Mr. Jones had an issue with the same machine: “He inserted his voting card but the machine failed to bring up any information.” (*Id.* at 36). Instead of reporting or trying to remedy the problem, the poll manager simply shut down the machine, leaving Jones and other voters

without a method to validate their votes. (*Id.*). *See also id.* at 39 (Decl. of D. Shah) (same).

Vote flipping. Teri Adams, voting in Cochran, Georgia, selected Stacey Abrams but saw Brian Kemp's name selected on her final review page. Adams re-selected Stacey Abrams, only to again see Brian Kemp's name selected on the review page. Only on her third try did Adams' review page correctly display Stacey Abrams as her selection. (*Id.* at 44). Allison Bish, a Gwinnett County voter, and Joycelyn Lester, of Blakely, Georgia, separately encountered the same problem: they tried three times to vote for Stacey Abrams but saw Brian Kemp selected on their review screen; only on their fourth attempt did they see Stacey Abrams selected. (*Id.* at 44 (A. Bush); *Id.* at 66 (J. Lester)).

Shirley Francois, a DeKalb County voter, saw all her Democratic candidates switched to Republican candidates on the electronic ballot several times. Curious and frustrated, she decided to test the glitch by instead selecting all Republican candidates. Curiously, her selections *stayed Republican*. Only after several more tries was Francois able to see Democratic candidates on her review screen. (*Id.* at 58-59).

Machine malfunctions. Numerous voters encountered malfunctioning DRE machines. Courtnie Fore, a Kennesaw voter, saw an "error" message on her voting

machine that continued even after pollworkers handed her a new yellow voter ID card. This caused confusion for Ms. Fore as well as the pollworkers themselves, one of whom said it appeared that “[Ms. Fore] had already voted,” even though her DRE machine only produced error messages. (*Id.* at 86). Mandi Herndon, a DeKalb County voter, similarly encountered “invalid card” messages with her original yellow voter access card as well as a second one given to her by a pollworker. Even though Ms. Herndon never had an opportunity to cast her vote, she “was told that it was recorded as if [she] had already voted.” (*Id.* at 94-5).

Another voter, Sharita Mitchell, encountered similarly faulty machines in Thomas County. Every time Ms. Mitchell selected a candidate and tried to move to the next page, “the whole screen would glitch . . . it flickered and a green and black line appeared.” (*Id.* at 100-101). Finally, the final review screen correctly displayed all of Ms. Mitchell’s selections. When she tried to cast her vote, however, the screen “glitched” once again. Though a final page did appear saying “your vote has been cast,” Ms. Mitchell remained deeply concerned over whether her vote was recorded. The pollworker “did not express any concern about the machine,” and “was not helpful.” (*Id.*).

In other instances, pollworkers knowingly allowed a malfunctioning DRE machine to be used. Nathaniel Lack, a Republican voter in Fulton County, waited

in line longer than any time he can remember in twenty-three years of voting at St. James United Methodist Church. He was shown to a voting machine with an “out of order” sign sitting next to it that “had apparently been taken down.” (*Id.* at 96). A pollworker told Mr. Lack that the machine was broken. But, pollworkers continued to allow the machine to be used. “They said they put the Out of Order sign on it when they knew it was not working properly but took the sign down when the lines began to form and allowed voters to use it anyway.” (*Id.*). Mr. Lack eventually did see a review screen with correct candidates. As a computer expert, Mr. Lack is not confident that his vote, or any other votes on that machine, was correctly recorded:

The touchscreen was obviously failing to operate as it should, failing to register votes using the check boxes for most candidates I attempted to select yet working on checkboxes for most of the other election measures - suggesting to me a software problem and not merely a hardware problem.

Voters at Annistown Elementary School in Snellville had to wait for four hours due to machine malfunctions. Jeffrey Marion, for example, arrived at Annistown at 6:30 a.m., intending to vote at 7:00 a.m., but machines were down and he had to wait until 11:15 a.m. to vote. (*Id.* at 106). While Mr. Marion was able to wait over four hours to fulfill his civic duty, many voters do not have that luxury.

Derrick Oatis, a Gwinnett County voter, waited several hours at his Shadowbrook Church polling location due to machine malfunctions. (*Id.* at 109-10). While Mr. Oatis waited, a pollworker announced further delays and 90% of the waiting voters, over 70 people, simply left:

This was so disheartening to me because I knew that many of them would not come back. Fortunately, I had the flexibility to remain until I could cast my vote on a machine . . . The delay of 2.5 hours left several people without the chance to vote - how many, I don't know. Voting should not be this difficult under any circumstances. Eligible voters should be able to vote under the simplest terms possible.

(*Id.*).⁶

Electronic Pollbooks. Many voters reported problems with the electronic pollbook operations. Amy Hoover, a Fulton County voter, repeatedly saw error messages when she inserted the electronic pollbook-created voter access card given to her at the Defoor Centre polling location. When pollworkers looked into the issue, they said Ms. Hoover's card indicated that she had voted, even though she had not. Pollworkers did not know how to address this problem. The same issue happened to several other voters around Ms Hoover. (*Id.* at 104). Ms. Hoover and the other voters with the same problem were told to "wait around or

⁶ Pollworkers should have issued emergency ballots, as required by law, O.C.G.A. § 21-2-418 (h), which are automatically counted.

return in a few hours,” which she did, and was eventually allowed to cast her vote. (*Id.* at 104-05).

Pollwatcher Kelly Dermody, an attorney, observed a host of problems at Therrel High School precinct, including a broken machine for checking in voters, long lines, “a large number of voters who were told that they were in the wrong precinct,” multiple registration irregularities, and the refusal by the pollmanager to issue provisional ballots before 5 p.m. (*Id.*, at 145). “Many of those said that they had lived in the same location and voted at the same location for many years and could not understand why they were being told to vote elsewhere.” *Id.*

Lisa Schnellinger, from Pickens County, was a pollwatcher at Anchor Church in Gwinnett County. Ms. Schnellinger observed two-hour wait times throughout most of the day. (*Id.* at 288). The primary issue, according to Ms. Schnellinger, is that “people were being turned away” and told to vote in another location. “[T]hey all indicated that they had not been given the option of voting provisionally.” (*Id.* at 289). Gainesville lawyer Martha M. Pearson, a pollwatcher at the West Manor Park Recreation Center, describes the same problem: numerous voters were told that they were voting in the wrong location but not given provisional ballots (or only reluctantly given provisional ballots), or told that their names did not appear in the voter database. (*Id.* at 265-67). Identical problems

were reported by pollwatcher Robin Shahar (*id.* 20-33), and numerous individual voters. (*E.g., id.*, 122-23 (E. Alston); 124 (J. Baiye); 126 (A. Brown); 131-33 (K. Carter); 135-38 (A. Clark); 139-40 (C. Corona); 152-54 (F. Dixon); 155-56 (C. Duncan); 157-58 (P. Einzig-Roth); 159-61 (R. Fajardo)). In addition, a pollworker herself reported seeing similar issues, and questioned “the integrity of the voting records and whether there had been tampering with the records.” (*Id.* at 129, D. Brown).

B. Voting System Reporting Issues and Discrepancies

The November 2018 election saw widespread documented reports of inaccurate DRE unit results and discrepancies in the polling place tallies left uninvestigated. Two examples follow:

1. Irregular DRE machine tape totals

One example of such irregularities comes from Grady High School where the reported official totals materially exceed the votes cast according to the publicly posted DRE machine tapes. The Secretary of State reports 280 more votes in the Lieutenant Governor’s race than is reflected on the 14 DRE machine tapes photographed. (Ex. D hereto, Greenwald Aff., Exhibit B)).⁷ Further, there were

⁷ Exhibit B is worksheet that may be more easily reviewed online at <https://coalitionforgoodgovernance.sharefile.com/d-s047e77a45514d55a>).

only 10 DRE machines in the polling place (Ex. C hereto, Johnson Aff., ¶ 5), but 14 machine tapes were posted after the close of the polls. (Ex. D hereto, Greenwald Aff. ¶ 19). This is clear evidence of irregularity.

2. DRE polling place recap sheets show unreconciled discrepancies between ballots cast and counted.

As explained in Coalition’s August 3, 2018 Motion for Preliminary Injunction, election night polling place recap sheets frequently show unresolved differences between the number of voters voting at the polling place and the number of ballots cast, which are reported both higher and lower than the number of voters. (Marks Decl., 258-1 at 252 ¶ 3). Evidence will show that similar discrepancies appear in the November 2018 elections.

C. Extreme Undervote in Lieutenant Governor’s Race⁸

It is axiomatic that, in major elections, almost everyone who casts a ballot votes for the race at the “top of the ticket,” which is followed by a slight decline in the number of votes cast in the statewide down-ballot races that follow. (When

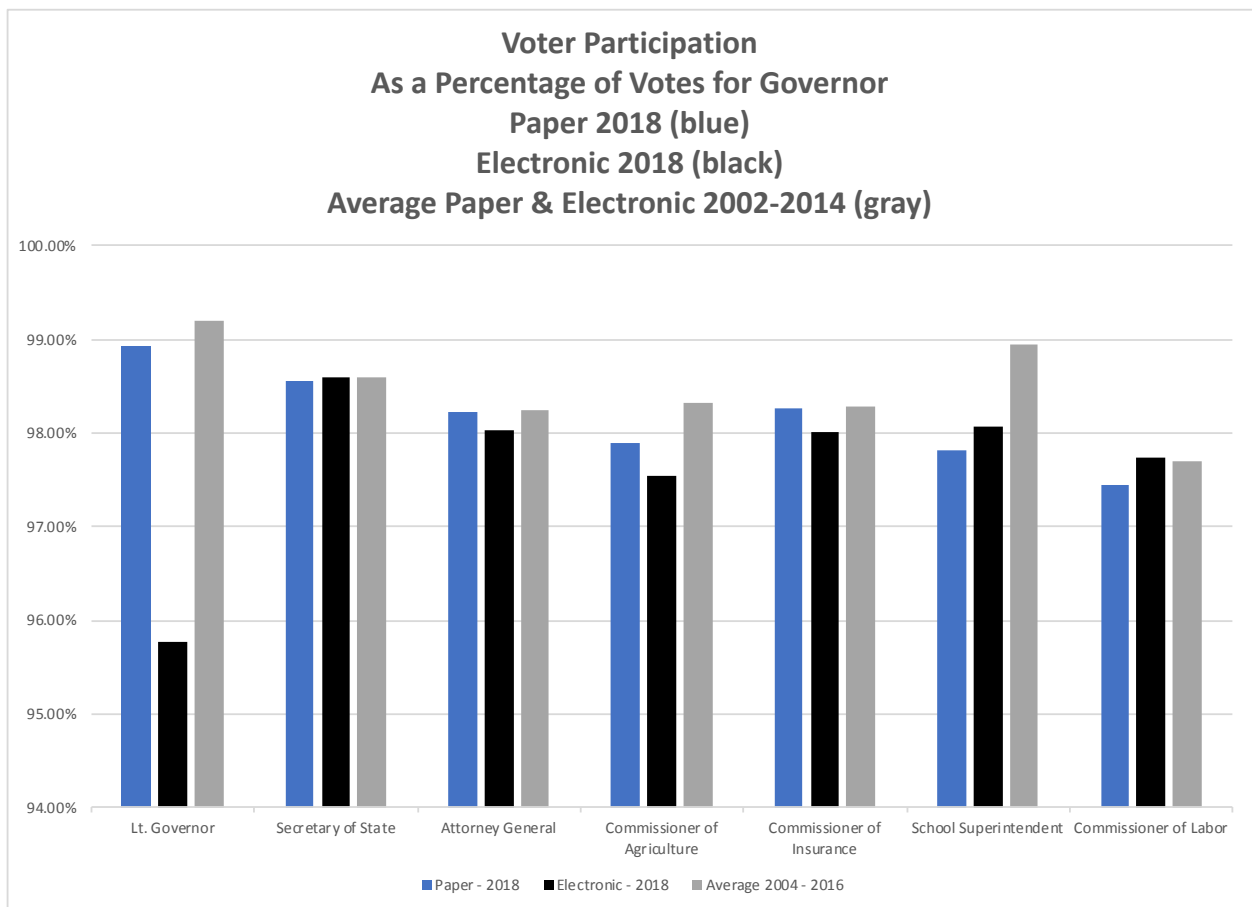
⁸ The Coalition for Good Governance and a group of voters filed a state-court election contest challenging the Lieutenant Governor’s race because of the massive and unprecedented undervote, and sought forensic discovery of the GEMS database and the internal memory of the DREs. The Superior Court (Honorable Adele Grubbs) allowed only a three day discovery period, did not allow any forensic discovery, and ruled that the plaintiffs had failed to prove their case. Judge Grubbs’ decision is on appeal to the Supreme Court of Georgia. (Ex. E hereto, Brown Decl., Ex. 3).

voters do not vote in a specific race, their “blank vote” is referred to as an “undervote.”) Historically, the undervote rate for down-ballot statewide offices in Georgia has ranged from one to two percent. (Ex. B hereto, Brill Affidavit, ¶ 13, Ex. A, Tbl. 2.).⁹ In the 2018 general election, however, the second race on the ballot, the Lieutenant Governor contest between Geoff Duncan and Sarah Riggs Amico, reported 125,000 *fewer* votes than expected based on historic voter participation rates.

The Lieutenant Governor’s race received far fewer votes than all of the other statewide races – Secretary of State, Attorney General, Commissioner of Agriculture, Commissioner of Insurance, State School Superintendent, and Commissioner of Labor – with the Lieutenant Governor undervote rate being twice as high as much less prominent down ballot races such as Commissioner of Agriculture and School Superintendent. The undervote pattern exists only in votes cast on the DRE voting machines; votes on paper ballots conformed to the historical pattern, with the election for Lieutenant Governor receiving only slightly

⁹ In *Crittenden*, the Lieutenant Governor election contest, the parties stipulated to the admissibility of the election results posted on the Secretary of State’s website, which is the source of the numbers here and throughout this Brief. (Ex. E hereto, Brown Decl. Ex. 1, Tr. at 273). In the four general elections before the 2018 election, the race for Lieutenant Governor received an average of 99.2% of the number of votes cast for Governor; the race for Secretary of State received 98.6%; and the other down ballot state-wide races averaged about 98%. See <https://results.enr.clarityelections.com/GA/91639/Web02-state.221451/#/>.

fewer paper-ballot votes than Governor, and slightly more paper-ballot votes than Secretary of State. *Id.* This DRE machine/paper ballot disparity is reflected in the following chart comparing the voter participation rates (as a percentage of votes cast for Governor) of ballots cast in the 2018 election on paper (blue bars); ballots cast on the DREs (black bars); and the average participation rate in the four previous elections (gray bars):



Statistical analysis demonstrates votes cast for candidates in the Lieutenant Governor’s race were lost. Dr. Philip B. Stark, Professor of Statistics and Associate

Dean of Mathematical and Physical Sciences at the University of California, Berkeley, concludes that the “substantially higher” undervote rate for ballots cast on DRE equipment is statistically significant at the .01 percent level in 101 of 159 Georgia Counties; by contrast, no more than five counties had a DRE machine/paper ballot undervote disparity for any of the other eight statewide races. (Ex. A hereto, Stark Decl., ¶ 22 & tbl. 1). Dr. Stark concludes that “[t]his disparity in undervote rates by voting technology strongly suggests that malfunction, misconfiguration, bugs, hacking, or other error or malfeasance caused some DREs not to record votes in the Lt. Governor’s contest.” (*Id.* ¶ 23).

Precinct-level analysis of the reported votes in the 2018 election reveals that the drop off rate of voter participation for Lieutenant Governor was much greater in precincts with a high percentage of African American voters.¹⁰ For example, approximately 83 percent of voters in Fulton County’s 03A AME Temple precinct are African American.¹¹ In that precinct, the DRE machine drop off rate for Lieutenant Governor’s race was 10.3%, while Fulton County’s overall Lieutenant

¹⁰ Because undervote data is not available on the Secretary’s website by mode of voting, Coalition’s analysis generally measures drop off rates of participation from the top of the ballot Governor’s race as a proxy for undervote patterns.

¹¹ Ga. Sec’y of State, “Active/Inactive Voters by Race/Gender,” *available at* https://sos.ga.gov/index.php/elections/general_election_turnout_by_demographics_december_2018.

Governor race machine drop off rate was 4.3% for Election Day DRE voting, 3.5% for DRE early voting, and 1.3% for mail ballots.¹² There was no dropoff, however, for mail ballots in the 03A AME Temple precinct. *Id.* Similarly, the DRE machine drop off rate for the Lieutenant Governor’s race in Lowndes County’s Mildred precinct, where approximately 80 percent of the voters are African American, was 9.8%, while the average drop off rate for all other Lowndes County precincts was 4.6%.¹³ While the DRE machine dropoff was 9.8% in the Mildred precinct, the undervote rate for mail ballots in the same precinct for the Lieutenant Governor race was only 1.8%—a full 8.0 percentage points lower. *Id.*

D. New Evidence: the DREs Violate Ballot Secrecy: State and Local Officials Know How You Voted

1. Background

Newly obtained evidence proves Coalition Plaintiffs’ long-standing concerns that DRE electronic ballots are not anonymous, in violation of the United States

¹² Ga. Sec’y of State, “Official Results for Lieutenant Governor,” *available at* <https://results.enr.clarityelections.com/GA/91639/Web02-state.221451/#/cid/21000/c/Fulton> (Nov. 17, 2018).

¹³ *Compare* Ga. Sec’y of State, Official Results for Lieutenant Governor, *available at* <https://results.enr.clarityelections.com/GA/91639/Web02-state.221451/#/cid/21000/c/Lowndes> (Nov. 17, 2018), *with* Ga. Sec’y of State, “Active/Inactive Voters by Race/Gender,” *available at* https://sos.ga.gov/index.php/elections/general_election_turnout_by_demographics_december_2018.

Constitution, the Georgia Constitution, and Georgia law.¹⁴ The Coalition Plaintiffs alleged in their Third Amended Complaint that the DREs deprive voters of the right to cast a secret ballot. (Doc. 226 ¶¶ 2, 154, 162, 178).

The manner in which Georgia configures the DREs permits election insiders or malicious intruders to connect the voter to his or her vote through a unique identifier attached to the electronic cast vote record. The DRE system creates a cast vote record (also called a ballot image) for each electronic ballot cast, recording the voter's selections on each race or ballot question. Attached as Exhibit A to the Declaration of Jeanne Dufort are examples of ballot image reports maintained by Fulton County. (Doc. 413 at 204-206).

The State Defendants and county officials have now admitted that the ballot image report maintained by State and county officials in the GEMS databases, memory cards, and on each DRE-cast ballot contains information that the election officials (or those with unauthorized access) can use to identify how every DRE-voter in Georgia has voted. On April 29, 2019, the State Defendants filed a Motion to Quash (Doc. 369) a subpoena that the Coalition Plaintiffs had served

¹⁴ It has long been known that the Diebold DREs record electronically cast ballots containing timestamps, permitting those with access to the computer memory records and the order of voters casting votes to connect the ballot record with the voter. Voting system experts including Professor Halderman have researched this issue and published concerns about this violation of voter privacy. Source Code Review of the Diebold Voting System, <https://www.verifiedvoting.org/wp-content/uploads/2016/11/diebold-source-public-jul29.pdf>

upon non-party Morgan County Board of Elections and Registration. The subpoena requested production of certain ballot image reports. In their Motion to Quash, the State Defendants state:

A cast vote record is otherwise known as a ballot image – a direct image of the vote cast by a person in the November 6, 2018 election. Disclosure of this ballot image would be in direct contradiction with the Constitution of Georgia which requires votes be cast by “secret ballot.” Ga. Const. art. 2, § 1, para. I.

(Doc. 369, page 22). The only way that disclosure of a ballot image could violate the requirement that votes be cast by “secret ballot” is if the ballot image disclosed the identity of the voter (either directly or in combination with other election records). And, if the ballot image directly or indirectly discloses the identity of the voter, then any election official, their employees with access to the GEMS database that contains the ballot images, or hackers can learn every citizen’s vote within several clicks on the computer. Additionally, voters’ ballot images are stored on the 30,000 DRE memory cards and the 30,000 DREs, making the protection of this unlawfully recorded data impossible.

On January 20, 2019 the Secretary issued a bulletin informing counties that ballot images are not public records according to advice from the Attorney

General, but without explaining the Attorney General's rationale. (Ex. F hereto, Marks Decl., Ex. 4)

The violation of secret ballot protections has been corroborated by counsel for Morgan County and subsequently the Morgan County Elections Director. On May 9, 2019, Georgia voter Jeanne Dufort sent an Open Records Act Request to the Morgan County Elections office seeking a copy of her ballot image record for her votes in 2016 and 2019 elections. (Doc. 413 at 198). In his May 13, 2019 response, Morgan County counsel stated that the records sought by Dufort did not exist,¹⁵ but then stated that even if the records were in existence "those documents would be exempt from disclosure pursuant to Ga. Const. Art. II, Sec. 1, Par.I, which provides that all elections 'shall be by secret ballot.'" (Doc. 413 at 208). Morgan County's admission is particularly direct: Dufort was asking for her own ballot image report, a simple one page document. For the disclosure of that document to violate ballot secrecy, Morgan County must have had information that links that ballot image report to Dufort.

Concerned about the violation of voter privacy, Dufort attended the Morgan County Board of Elections and Registration meeting on May 30, 2019 and asked

¹⁵ This response suggests non-compliance with State law, which requires ballot image reports to be maintained for 24 months. O.C.G.A. § 21-2-73.

about the nature of the county's position that cast vote records must be withheld because of secret ballot protections. Jennifer Doran, the Morgan County Elections Supervisor, confirmed that ballots could be identified and therefore must be withheld from disclosure to the public. (Doc. 413 at 211).

If Morgan County's GEMS database has information linking Jeanne Dufort's ballot image report to Dufort, Morgan County and the Secretary of State know exactly how Dufort has voted for every single election in which Dufort has cast her vote on a DRE machine. And, if Morgan County has this information on Dufort, then it stands to reason that every county, and the Secretary of State, has a record of every vote of every voter in Georgia who voted on a DRE.

The ability to retrieve an individual ballot was again confirmed on June 17, 2019 by the Rockdale County Board of Elections and Registration in their response to Coalition Plaintiffs' document subpoena. Rockdale County's "Voting Equipment Issues" chart produced in that response shows that after a ballot had been cast prematurely, the poll manager was able to retrieve the ballot and cancel it. (Ex. E hereo, Brown Decl., Ex. 7, see Machine 9, 10/24/18 entry date). This was only possible if there was a unique identifier on the ballot.

Ms. Alice O’Lenick of the Gwinnett County Board of Elections also confirmed in a public presentation that Gwinnett uses unique identifiers on ballots to retrieve ballots from voters who vote more than once. (Doc. 413 at 290).

Plaintiff Megan Missett filed a declaration concerning the loss of her secret ballot protections and the burden on her right to vote (Doc. 413 at 303-305), as did Coalition members Pride Forney (Doc. 413 at 308), and Jeanne Dufort. (Doc. 413 at 197-202).

2. Violation of Ballot Secrecy Increases Plaintiffs Likelihood of Success on the Merits

The new evidence provides an additional basis for Plaintiffs’ likelihood of success on the merits. Georgia has granted all voters the right to a secret ballot.

The Georgia Constitution provides:

Elections by the people shall be by secret ballot and shall be conducted in accordance with procedures provided by law.

Ga. Const. art. II, § 1, ¶ I. This absolute right to ballot secrecy is codified in several state statutes. Ga. Code Ann. § 21-2-70(13); Ga. Code Ann. § 21-2-322; Ga. Code Ann. § 21-2-365; Ga. Code Ann. § 21-2-379.1; Ga. Code Ann. 21-2-373; Ga. Code Ann. § 21-2-386(5). Having granted this right, the State must apply it in a manner compliant with federal constitutional requirements. The State

Defendants' admissions that DREs create records that compromise ballot secrecy falls woefully short of several constitutional requirements.

It places a substantial burden on the right to vote which is not narrowly tailored to meet a legitimate state interest and, indeed, has justification at all. *See Anderson v. Celebrezze*, 460 U.S. 780, 789 (1983); *Burdick v. Takushi*, 504 U.S. 428, 434 (1992). It separately violates the Equal Protection Clause because it treats different persons differently, i.e., voters who vote via the DRE system as compared to voters voting absentee. *See Bush v. Gore*, 531 U.S. 98, 104-05 (2000). It violates procedural due process, because it deprives voters of the right to secrecy guaranteed to them by Georgia law, without due process. And it violates the federal right to ballot secrecy, which even the State has recognized:

The United States Supreme Court has also recognized the necessity of the secret ballot to prevent electoral abuses and its prevalence in all 50 states. *Burson v. Freeman*, 504 U.S. 191, 206-07 (1992). Indeed, “[s]ociety has a strong interest in encouraging all individuals, even the most timid, to vote.” *In re Dinnan*, 661 F.2d 426, 432 (5th Cir. Unit B 1981). State Defendants therefore object to this request for protected information on the basis that disclosure of cast vote images would destroy the secrecy of the ballot maintained by the Constitution of Georgia and recognized by the Supreme Court.

(Doc. 369 at 22).

See McIntyre v. Ohio Elections Comm’n, 514 U.S. 334, 343 (1995) (“the freedom to publish anonymously extends” to political advocacy and is “perhaps best exemplified by the secret ballot.”).

Plaintiffs intend to seek leave of court to amend their complaint to add claims based specifically on the deprivation of this fundamental right, where they will further explicate the scope of these constitutional violations.

3. *Strong Public Interest in Protecting Ballot Secrecy*

The State of Georgia has a compelling state interest in protecting ballot secrecy, which tips the equities decisively in favor of Plaintiffs by establishing that the injunctive relief sought in the public interest. *Winters, supra*. Consistent with this Constitutional mandate, state law provides that the county superintendent shall “conduct all elections in such manner as to guarantee the secrecy of the ballot and to perform such other duties as may be prescribed by law;” O.C.G.A. § 21-2-70(13). O.C.G.A. § 21-2-373 states: “The Secretary of State, in specifying the form of the ballot, and the State Election Board, in promulgating rules and regulations respecting the conduct of elections, shall provide for ballot secrecy in connection with write-in votes.”

Georgia election regulations are in accord. *See* Ga. Comp. R. & Regs. 183-1-11-.01 (“Each Superintendent of Elections shall ensure that handicapped persons

casting their vote at the polls are able to do so in private by providing such facilities and equipment as necessary to maintain the secrecy of the ballot.”); Ga. Comp. R. & Regs. 183-1-14-.07 (providing that a “spoiled ballot” includes a ballot “that contains writing which compromises the secrecy of the ballot.”).

Defendants may take the position that ballot secrecy is not violated if “only” election officials know how everyone voted and, so long as election officials do not disclose this information to members of the public, there is no violation of ballot secrecy. To the contrary: ballot secrecy, if it means anything, means that no one, not the State, not the local county election official, not the voter’s neighbor or employer, and not some internet hacker, will have access to information as to how a voter voted. Indeed, the statute authorizing DRE use provides:

It shall permit voting in absolute secrecy so that *no person* can see or know for whom any other elector has voted or is voting, save an elector whom he or she has assisted or is assisting in voting, as prescribed by law. . . .

O.C.G.A. 21-2-379.1 (6) (emphasis added).

Eliminating DREs, therefore, will advance the compelling state interest of protecting ballot secrecy, further strengthening the claim for injunctive relief.

IV. ELECTRONIC POLLBOOK ACCURACY

A. Relief Initially Sought and Court's Disposition

In their August 3, 2018 Motion for Preliminary Injunction, the Coalition Plaintiffs sought an order requiring “the Defendant Secretary of State, before October 1, 2018, to conduct an audit of and correct any identified errors in the DRE system’s pollbook data that will be used” in the November and December elections. (Doc. 258, at 2.) This Court’s September 2018 Order does not specifically address this claim for injunctive relief, but the claim is fully consistent with the Court’s findings and analysis.¹⁶

B. Vulnerability and Corruption of Electronic Pollbooks

As this Court found in its September 2018 Order, the electronic pollbooks are a part of the vulnerable Diebold system that the State has done nothing to remediate. The electronic pollbook computers, maintained in each polling place, reference electronic voter data files on the electronic pollbook memory cards and encodes the DRE voter access card that activates the specific electronic ballot on the DRE machine that should contain the accurate ballot contests based on the

¹⁶ On October 2, 2018 Coalition Plaintiffs filed an additional Motion for Injunctive Relief seeking correction of errors in the electronic pollbooks in advance of the November 6, 2018 election and the use of updated paper backups of pollbooks to adjudicate pollbook discrepancies in the polling places. The Motion was stayed by the Court’s October 23, 2018 Order (Doc. 336).

voter's address. (Curling, 334 F.Supp. 3d at 20 n.4). A working copy of the Secretary's voter registration information, which populates the electronic pollbooks, was previously maintained by the Center for Election Services at Kennesaw State University, (*Id.* at 7), where it was left accessible to the public for at least six months during the period from August 2016 to March 1, 2017. (*Id.*). Electronic pollbook files were also transmitted from the CES elections.kennesaw.edu server over the internet from CES to counties in advance of elections.

1. Electronic Pollbook Problems in 2018 Primaries

With their August 2018 Motion, the Coalition Plaintiffs presented alarming evidence from a number of voters in 2018 primary elections documenting unexplained discrepancies between their voter registration information in Diebold's electronic pollbooks maintained at the voting places and their information in the Secretary's official voter registration records, or errors in the official voter registration records themselves. (Doc. 258-1 at 19–20, Clark Decl., Doc 258-1, at 108-109, ¶¶ 10–15; Bowers Decl., Doc 258-1, at 72-75, ¶¶ 35–46; Marks Decl., Doc 258-1, at 262, ¶, Luse Decl., Doc 258-1, at 258-259, ¶¶ 6–8, Mitchell Decl., Doc 258-1, at 287-288, ¶¶ 8-11, Kadel Decl., Doc 258-1, at 120-

123, ¶¶ 8-28). The experience of these individual voters likely reflected only a small fraction of what must have been occurring statewide.

2. *Electronic Pollbook Problems in the November 2018 Election*

With this Motion, Coalition Plaintiffs have filed scores of affidavits and declarations from individual voters describing numerous problems with the Electronic pollbooks in the November 2018 elections. Small selections of these voter affidavits and declarations are described above, and the declarations themselves are collected in the Notice of Filing Evidence, Part One, behind Exhibit A, Tab H (Doc. 412 at 108 to 323).

C. Disenfranchisement

Problems with the electronic pollbooks leads directly to massive voter disenfranchisement. Voters presenting themselves to vote whose names do not appear in a particular precinct's electronic pollbook records should be offered a provisional ballot. Yet there is substantial evidence that pollworkers frequently send voters away without offering them a provisional ballot. (Doc. 412 at 289; *id.* at 265). More disturbing, there is substantial evidence that, even after voters asked for provisional ballots, pollworkers refused. (*E.g., id.* at 22). In Fulton County, a pollworker told voters that no provisional ballots would be given to voters until "after 5 p.m.," citing a "5 p.m. rule," which rule does not exist. (*Id.* at 146).

D. Electronic pollbook errors generate provisional ballot problems

When the underlying voter registration records are inaccurate and vulnerable to manipulation and security risks, errors and defects will flow into the DRE voting system electronic pollbooks, which themselves are vulnerable and where voters suffer the harmful effects of those errors.

The Court of course may take judicial notice of the evidence presented to the Court in *Common Cause Georgia v. Kemp*, 347 F. Supp. 2d 1270 (N.D. Ga. 2018).

This evidence included statistical evidence as well as additional sworn declarations of poll watchers and voters intended to convey the real life experience of voters who faced hurdles in their registration status and even in obtaining the opportunity to cast provisional ballots at the polls after they were affirmatively told they were not on the registration rolls, despite having voted from the same home in the recent past or affirmatively represented they had timely registered and were regular voters.

Id. at 1293. In *Common Cause*, this Court concluded:

Plaintiff has shown a substantial likelihood of proving that the Secretary's failure to properly maintain a reliable and secure voter registration system has and will continue to result in the infringement of the rights of the voters to cast their vote and have their votes counted.

Id. at 1295.

E. Relief sought

The relief that the Coalition Plaintiffs are seeking includes four parts. First, the Secretary should be ordered to audit the electronic pollbook data and its source

record, the voter registration database, to the fullest extent possible to identify and correct discrepancies between electronic pollbook voter data and the most accurate official voter registration data maintained by the Secretary. The Defendants should be undertaking such an audit as a matter of course, and it is highly recommended by the experts. (*See generally* V. Martin Decl. at ¶¶ 12-14, Doc. 413 at 272). This Motion does not attempt to specify the exact protocols that the State Defendants should follow to obtain the most accurate voter data available and use it in the polling places, but it does ask this Court to require the State Defendants to confer with the Coalition Plaintiffs and file a report with the Court within ten (10) days detailing the audit and data correction procedures and timeline that the State Defendants will follow.

Second, this Motion asks the Court to require that, after voter-database discrepancies are corrected and the voter registration database is updated to reflect early voting and create electronic pollbooks, updated paper backup copies of the pollbooks be required to be delivered to and maintained at all polling places on Election Day. Using paper backups of electronic pollbooks is a standard recommended procedure¹⁷ to avoid polling place voter disenfranchisement that can

¹⁷ See, e.g., *Brennan Center for Justice*, “Election Security Advance Planning Checklist.” https://www.brennancenter.org/sites/default/files/publications/2018_08_13_ChecklistV4.pdf

emanate from electronic failures or mechanical or power failure. (McReynolds Decl., Doc. 277, at 98–100, ¶¶ 13–20; Martin Decl., Doc 277, at 81, ¶¶ 16–17; Bernhard Decl., Doc 277, at 42–43, ¶ 12.) The paper backups should be used as the official record on Election Day for adjudication of any electronic pollbook discrepancies related to voter eligibility and polling-place assignment.

Third, this Motion asks the Court to enjoin the Secretary to immediately undertake a review of the pollbook software to determine the source of the defect or malware and promptly undertake remedial action, making a report to the Court of his findings and software remediation plan within 30 days of the Court’s Order.

Fourth, the injunctive relief ordered by this Court in *Common Cause* addressed the processing of provisional ballots after they were cast by voters. The injunctive relief sought in this case addresses the separate problem of voters being denied provisional ballots in the first place. Coalition Plaintiffs accordingly request that, in addition to the injunctive relief sought in the Coalition Plaintiffs’ original motion, the Secretary and the State Board be enjoined to immediately instruct every Superintendent in every election to ensure that every person attempting to vote but is denied a ballot (electronic or paper) is immediately notified that they are entitled to cast a provisional ballot.

V. AUDIT REQUIREMENTS

The necessity of an audit of election results using hand-marked (or voter verified) paper ballots counted by computers is no longer debated and is understood to be essential for accountable elections. Post-election audits are now required by Georgia law (Doc 357-1 Act 24 § 42) for state and federal elections beginning November 2020. Computerized ballot counting, no matter how modern or expensive, brings with it the well-understood risk of computer tampering or programming errors. It is essential that Georgia undertake effective post-election auditing as part of the adoption of auditable verifiable elections.

The nation's leading expert in statistically value post-election auditing, Professor Philip Stark, has submitted two detailed declarations to this Court thoroughly explaining the necessity of audits for all elections counted by optical scanners, as well as audit measures to provide some checks and balances on DRE-reported results, although the results themselves cannot be audited. (Doc. 296 p 6-17; Doc. 327 p, 53-57).

Coalition Plaintiffs seek immediate improved accountability in Georgia's elections as the State transitions to auditable paper ballot elections. There is no need to wait to make improvements in election accountability until verifiable paper ballot elections are fully implemented. As Professor Stark describes in his

September 30, 2018 Declaration [Doc 327-1 p. 53-57], to improve accountability and voter confidence, verification and auditing techniques should be applied to available elements of the DRE-based elections although the final results cannot be verified. For example, optical scan tabulations of paper ballots (mail absentee ballots and provisional ballots) can and should be audited. DRE reported results should be tested against the polling place machine level reports. As documented throughout this brief, discrepancies frequently occur between results documented at the polling place and official reported results from the precinct. Discrepancies are generally not documented or investigated. Audit techniques should be applied to elements of the intervening DRE-based elections, prior to full implementation of hand marked paper ballot elections.

Relief requested

Coalition Plaintiffs recognize that Georgia needs to transition from partial verification efforts for pending DRE-based election, through robust traditional audits for paper ballot elections to more sophisticated Risk Limiting Audits over time, and therefore recommend a process monitored by the Court to have the Parties work together beginning immediately to recommend to the Court practical, immediate and effective audit plans for implementation in all future elections.

Audits of election results of paper ballot elections conducted after October 1, 2019 should be based on the audit principles discussed in Professor Stark's Declaration, (Doc. 296, at 12 ¶¶ 27-31, at 13-14 ¶¶34-39, at 14-17 ¶¶41-47, and Exhibit G ¶¶ 9-12) and focused on contested candidate races.

So long as DRE-based elections are conducted, pre-certification audits of the computer-generated tabulations of absentee mail ballots and tests of accuracy in recording the DRE machine output are required for all federal, state, and county elections conducted in Georgia after September 1, 2019, based the principles recommended by Professor Stark. (Doc 327-1 Exhibit G ¶ 8-12).

VI. DEFENDANTS HAVE NO EQUITIES

In its September 2018 Order, this Court warned that if “Defendants continue to move in slow motion or take ineffective or no action,” their arguments against injunctive relief would “only weaken,” and that “further delay is not tolerable in their confronting and tackling the challenges before the State’s election balloting system.” 334 F. Supp. 3d at 1327. More than six months later, in the April 9, 2019 Status Conference, counsel for the State Defendants represented that the State took that warning “to heart.” (Transcript, at 5:6). Counsel then explained HB316 and the efforts planned to procure the new ballot marking device (“BMD”) system, which Coalition Plaintiffs assert does not address the constitutional violations that

must be remedied in Georgia's election scheme. In a June 12, 2019 email, however, counsel acknowledged that "the new system hasn't even been procured yet." (Ex. E hereto, Brown Decl., Ex. 4).

As to the State's actual, current DRE voting system – the one that will be used to issue and count hundreds of thousands, if not millions, of ballots before any new system is deployed – the State has done nothing at all to determine if it is infected with malware or contains defective programming. The State has also not taken any meaningful action make the system more reliable, even in the face of clear evidence of system-wide anomalies and wide-spread system malfunctions in the mid-term election.

Defendant State Board of Elections is charged by law with the duty to "promulgate rules and regulations so as to obtain uniformity in the practices and proceedings of superintendents, registrars, deputy registrars, poll officers, and other officials, as well as the legality and purity in all primaries and elections" and to "take such other action, consistent with law, as the board may determine to be conducive to the fair, legal, and orderly conduct of primaries and elections." O.C.G.A. § 21-2-31(1) & (10). A review of the minutes and summaries of the few State Election Board meetings since this Court's September 17, 2019 decision reveals no discussion of any of the following topics: this Court's September 17,

2019 decision; the election security of the DRE voting system; the feasibility of converting to a hand marked paper ballot system; methods of post-election auditing or plans to discuss post-election auditing; or security and reliability issues concerning the DRE voting system. (Doc. 413 at 216). Secretary Raffensperger, Chair of the State Election Board, has called only a single meeting of the Board since the November 2018 meeting, and the Board will not meet again until August 21, 2019.¹⁸ The State Board has displayed a complete lack of interest in addressing the State's failed voting system.

Similarly, the Fulton County Board of Elections is charged with the wide-ranging responsibility to ensure that “the conduct of primaries and elections in the several precincts of [their county] . . . may be honestly, efficiently, and uniformly conducted.” The Board is also required to “conduct all elections in such manner as to guarantee the secrecy of the ballot.” O.C.G.A. § 21-2-70 (8) & (13).¹⁹

A review of the minutes and summaries of Defendant Fulton County Board of Elections similarly reveals *no* discussion of any of these topics. Remarkably, despite a long discussion on April 22, 2017 about the serious electronic pollbook software defect that disenfranchised some voters just days before, (Doc. 412 at

¹⁸ http://sos.ga.gov/index.php/elections/state_election_board

¹⁹ O.C.G.A. § 21-2-70 describes the powers and duties of election “superintendents.” O.C.G.A. § 21-2-2 defines “superintendent” to include the county board of elections if a county has such.

295-301), the Fulton Board did not record the discussion in the minutes, and apparently took no follow up action, despite the pending June 20, 2017 high profile Congressional District 6 election. The State Election Board and the Fulton County Board will take no action to protect Georgia voters' constitutional right to vote unless ordered by this Court to do so.

The Defendants' technical staffs have followed the lead of the State Board and the Fulton County Board in doing *nothing* to address either the intrinsic defects of the DRE system or the exacerbated vulnerabilities caused by the State's neglect. "[T]he State offered little more than a one-sentence response to these data system incursions and vulnerabilities at CES." (Curling, 334 F.Supp. 3d at 7). "In fact, Defendants presented scant evidence to rebut Plaintiffs' expert evidence regarding Georgia's persistent failure to update or replace systems, despite security flaws identified by the software industry." (*Id.* at 16). In the September 12, 2018 hearing in this case, Defendants presented no witnesses to address the impact of the voting system's compromise at CES or to explain what remedial efforts, if any, the Defendants undertook to ensure the integrity of the system or its data following that compromise. (*Id.*). Four months later, in testimony in a state-court election contest, Michael Barnes, of the Secretary of State's Center for Election System ("CES"), acknowledged that the Secretary still had not performed any forensic

examination of any of the election computer systems to determine whether they have been infected with malware, either because of their exposure at KSU or from any other incident.²⁰

Given the importance to our democracy of reliable and accountable elections, given the universal condemnation of Georgia's DRE voting system, and given this Court's specific and detailed analysis of the vulnerabilities in that system, the inaction by the State Board of Elections, the Fulton County Board of Elections, the Secretary of State, and their technical staffs in the months following this Court's Opinion and leading up to the 2020 Presidential election cycle constitutes an egregious and inexcusable abdication of legal duty and governmental responsibility.

VII. CONCLUSION: PROTECTING THE VOTE FOR THE 2020 ELECTIONS

The State Defendants are unlikely to muster a defense of the DRE system, and will instead claim that injunctive is unnecessary to protect citizens' constitutional rights because of the new "ballot marking device" ("BMD") system that the Secretary intends to contract for later this summer and install just in time for the 2020 Presidential primaries. This argument is without merit. Most

²⁰(Ex. E hereto, Brown Decl. Ex. 1, Tr. 227-228).

fundamentally, the indisputably serious flaws in the DRE system have been well known to the entire computer science and national security community for years, culminating in the call for a complete ban on electronic voting by the Chairman of the House Intelligence Committee Chairman Devin Nunes a year ago in 2018. (*See generally* Doc. 258-1 at 11-14). And Georgia has had, all along, the opportunity to deploy an auditable system that would not violate its citizens constitutional rights; the relief sought by the Coalition Plaintiffs in this Motion is the same relief that the Coalition Plaintiffs described in repeated 2018 demands.²¹ The State Board of Elections – which is charged with the responsibility to ensure the security of Georgia’s election – ignored these demands and, even after this Court’s September 2018 order, did not address the issue in any public meetings. The State Defendants’ total lack of diligence cannot form a defense to equitable relief that is necessary at this time to protect constitutional rights.

In addition, as counsel for the Secretary recently stated with respect to a discovery dispute, “the new system hasn’t even been procured yet,”²² and the

²¹ These letters are collected in Exhibit 5 to the Brown Declaration, attached hereto as Exhibit E.

²²Counsel stated in his email: “As you know from the RFP that we provided to the parties and Judge Totenberg, the new system hasn’t even been procured yet. *If and when* an intervening action occurs that we believe moots the case, we will raise it at that time. Until then, we have not raised mootness.” (Ex. E hereto, to Brown Decl., Ex. 4) (emphasis added).

speculation that it might be deployed is insufficient to either moot the case or deny injunctive relief. As the Curling Plaintiffs describe in their brief, “it is far from certain that the BMDs will be implemented across Georgia on the schedule set by the Secretary of State.” (Doc. 387-1 at 11). Indeed, concerns about the implementation apparently drove the Secretary to postpone the Presidential primary until March 24, 2020. (*See* Ex. E hereto, Brown Decl., Ex. 8).

The Secretary’s uncertainty about the primary date reflects the reality that BMD implementation risks are very high. Even if a contract is signed and implementation proceeds without a vendor protest, Georgia’s installation would be the largest and most complex voting system conversion ever attempted in U.S. history. The implementation will require the programming and installation of over 41,000 new computers and new electronic pollbooks, and integration with the current, maligned, voter registration system. Attempting to deploy the BMD system, a voting system that will not pass constitutional muster, is reckless in the extreme.

In sum, the law and the equities compel the granting of this Motion. The Plaintiffs are substantially likely to prevail on the merits of their claims. The Coalition Plaintiffs’ proposed remedy is narrowly tailored to address the constitutional violations and takes advantage of processes and equipment already

in use throughout Georgia. There is no good reason for the State to continue infringing upon citizens' constitutional rights until a new system is deployed. It is imperative that the State have a constitutional election system in place and operational in 2019 so that it may be also used in the 2020 Presidential primaries and the general election.

Respectfully submitted this 21st day of June, 2019.

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CERTIFICATE OF COMPLIANCE

Pursuant to LR 7.1(D), I hereby certify that the foregoing document has been prepared in accordance with the font type and margin requirements of LR 5.1, using font type of Times New Roman and a point size of 14.

/s/ Bruce P. Brown
Bruce P. Brown

CERTIFICATE OF SERVICE

This is to certify that I have this day caused the foregoing to be served upon all other parties in this action by via electronic delivery using the PACER-ECF system.

This 21st day of June, 2019.

/s/ Bruce P. Brown
Bruce P. Brown

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**IN THE SUPERIOR COURT OF FULTON COUNTY
STATE OF GEORGIA**

**COALITION FOR GOOD
GOVERNANCE, RHONDA J.
MARTIN, SMYTHE DUVAL, AND
JEANNE DUFORT,**

Plaintiffs,

v.

**ROBYN A. CRITTENDEN,
Secretary of State of Georgia,
et al.,**

Defendants.

**CIVIL ACTION FILE
NO. 2018CV31348**

DECLARATION OF PHILIP B. STARK

PHILIP B. STARK hereby declares as follows:

Qualifications and Background

1. I am Professor of Statistics and Associate Dean of Mathematical and Physical Sciences at the University of California, Berkeley, where I am also a faculty member in the Graduate Program in Computational Data Science and Engineering; a co-investigator at the Berkeley Institute for Data Science; principal investigator of the Consortium for Data Analytics in Risk; director of Berkeley Open Source Food; and affiliated faculty of the Simons Institute for the Theory of Computing, the Theoretical Astrophysics Center, and the Berkeley Food Institute. Previously, I was Chair of the Department of Statistics and Director of the Statistical Computing Facility.
2. I have published more than one hundred and ninety articles and books. I have served on the editorial boards of archival journals in physical science, Applied Mathematics, Computer Science, and Statistics. I currently serve on four editorial boards. I have lectured at universities, professional societies, and government agencies in thirty countries. I was a Presidential Young Investigator and a Miller Research Professor. I received the U.C. Berkeley Chancellor's Award for Research in the Public Interest, the Leamer-Rosenthal Prize for Open Social Science, and a Velux/Villum Foundation Professorship. I am a member of the Institute for Mathematical Statistics and the Bernoulli Society. I am a Fellow of the American Statistical Association, the Institute of Physics, and the Royal Astronomical Society. I am professionally accredited as a statistician by the American Statistical Association and as a physicist by the Institute of Physics.

3. I have consulted for many government agencies, including the U.S. Department of Justice, the U.S. Department of Agriculture, the U.S. Department of Commerce, the U.S. Department of Housing and Urban Development, the U.S. Department of Veterans Affairs, the Federal Trade Commission, the California Secretary of State, the California Attorney General, the California Highway Patrol, the Colorado Secretary of State, the Georgia Department of Law, and the Illinois State Attorney. I currently serve on the Board of Advisors of the U.S. Election Assistance Commission and on the Board of Directors of Verified Voting Foundation. (The opinions expressed herein are, however, my own: I am not writing as a representative of any entity.)
4. I have testified before the U.S. House of Representatives Subcommittee on the Census; the State of California Senate Committee on Elections, Reapportionment and Constitutional Amendments; the State of California Assembly Committee on Elections and Redistricting; the State of California Senate Committee on Natural Resources; and the State of California Little Hoover Commission.
5. I have been an expert witness or non-testifying expert in a variety of state and federal cases, for plaintiffs and for defendants, in criminal matters and a range of civil matters, including, *inter alia*: truth in advertising, antitrust, construction defects, consumer class actions, credit risk, disaster relief, elections, employment discrimination, environmental protection, equal protection, fairness in lending, federal legislation, First Amendment, import restrictions, insurance, intellectual property, jury selection, mortgage-backed securities, natural resources, product liability class actions, *qui tam*, risk assessment, toxic tort class actions, trade secrets, utilities, and wage and hour class actions.

6. I have been qualified as an expert on statistics in federal courts, including the Central District of California, the District of Maryland, the Southern District of New York, and the Eastern District of Pennsylvania.
7. I have also been qualified as an expert on statistics in state courts.
8. I have used statistics to address a wide range of questions in many fields.¹
9. I served on former California Secretary of State Debra Bowen's Post-Election Audit Standards Working Group in 2007.
10. In 2007, I invented a statistical approach to auditing elections ("risk-limiting audits") that has been incorporated into statutes in California (AB 2023, SB 360, AB 44, AB 2125), Colorado (C.R.S. 1-7-515), and Rhode Island (RI Gen L §17-19-37.4 (2017)), and which were recently proposed in federal legislation (the PAVE Act of 2018). RLAs have been tested in California, Colorado, Indiana, Michigan, New Jersey, Ohio, Virginia, and Denmark.
11. RLAs are widely viewed as the best way to check the accuracy of vote tabulation. They have been endorsed by the Presidential Commission on Election Administration, the National Academy of Sciences report *Securing the Vote: Protecting American Democracy*, the American Statistical Association, the League of Women Voters, Verified Voting Foundation, Citizens for Election Integrity Minnesota, and other groups concerned with election integrity.
12. I have worked closely with state and local election officials in California and Colorado to pilot and deploy RLAs. The software Colorado uses to conduct RLAs is based on software I wrote.

¹ For example, I have used statistics to analyze the Big Bang, the interior structure of the Earth and Sun, the risk of large earthquakes, the reliability of clinical trials, the accuracy of election results, the accuracy of the U.S. Census, the risk of consumer credit default, the causes of geriatric hearing loss, the effectiveness of water treatment, the fragility of ecological food webs, risks to protected species, the effectiveness of Internet content filters, high-energy particle physics data, and the reliability of models of climate, among other things.

13. I worked with Travis County, Texas, on the design of STAR-Vote, an auditable and end-to-end cryptographically verifiable voting system.
14. I testified as an expert witness in the general area of election integrity, including the reliability of voting equipment, in 2016 presidential candidate Jill Stein's recount suit in Wisconsin, and filed a report in her suit in Michigan.
15. I have testified as an expert in election auditing and the accuracy of election results in two election-related lawsuits in California.
16. I have testified to both houses of the California legislature regarding election integrity and election audits. I have testified to the California Little Hoover Commission about election integrity, voting equipment, and election audits.
17. I submitted two declarations in Donna Curling et al. v. Brian P. Kemp et al., Civil Action 1:17-cv-2989-AT, United States District Court, Northern District of Georgia, Atlanta Division. My declarations concerned election integrity and security, vulnerabilities of Georgia's election systems, and the need for voter-marked paper ballots and post-election audits in Georgia.
18. Since 1988, I have taught statistics at the University of California, Berkeley, one of the top two statistics departments in the world (see, e.g., QS World University Rankings, 2014) and the nation (US News and World Reports, 2014). I teach statistics regularly at the undergraduate and graduate levels. I have created five new statistics courses at Berkeley. I developed and taught U.C. Berkeley's first online course in any subject, and among the first approved for credit throughout the ten campuses of the University of California system. I also developed and co-taught online statistics courses to over 52,000 students, using an online textbook and other pedagogical materials I wrote and programmed.

19. Appendix 1 is my current *curriculum vitae*, which includes my publications for the last ten years and all cases in the last four years in which I gave deposition or trial testimony.

Materials Relied Upon

20. I relied on XML files of Georgia election results downloaded via the Georgia Secretary of State's website, at the URL <https://results.enr.clarityelections.com/GA/91639/222278/reports/detailxml.zip> I also relied on photographs of poll tapes from the Winterville Train Depot polling place in Clarke County, Georgia. I understand that the photographs were taken by Ms. Lee Ann Pingel after the close of the polls on election day.

Opinions

21. I offer opinions with respect to two kinds of anomalies in the results of the 2018 midterm elections in Georgia.

22. My first opinion concerns the difference in undervote rates between paper ballots and votes cast on DREs in statewide contests. The undervote rate in the Lt. Governor's contest is substantially higher for ballots cast on direct-recording electronic (DRE) equipment than for ballots cast by mail using paper ballots, by an amount that cannot reasonably be ascribed to chance. In 101 of 159 Georgia counties, the difference is statistically significant at level 0.01 percent.² In contrast, in the contests for Secretary of State, Attorney General, Commissioner

² The significance levels are for a two-sample test that uses the hypergeometric distribution of the number of "good" items in a simple random sample from a population of items that can be either "good" or "bad." The total number of undervotes by mode of voting (by mail, early, and Election Day) was estimated by treating the statewide contest that received the most votes in each county as if that number of votes was equal to the number of ballots cast. That estimation was necessary because Georgia does not report total ballots cast by mode of voting. Because this maximum was almost always for the gubernatorial contest, that contest is not included in the calculation: its relative undervote rate is, by definition, zero. Provisionally cast ballots, of which there are relatively few, were not included. Under the null hypothesis, mode of voting (electronic versus paper) is a label assigned as if at random to each ballot, conditioned on the total number of ballots cast by each mode of voting. Data for the analyses was downloaded via the Georgia Secretary of State's website from the URL <https://results.enr.clarityelections.com/GA/91639/222278/reports/detailxml.zip> Software used to extract contest-

of Agriculture, Commissioner of Insurance, State School Superintendent, Commissioner of Labor, Public Service Commission District 3, and Public Service Commission District 5, the difference is statistically significant in no more than 5 counties. See Table 1.

23. This disparity in undervote rates by voting technology strongly suggests that malfunction, misconfiguration, bugs, hacking, or other error or malfeasance caused some DREs not to record votes in the Lt. Governor's contest.

Table 1: Counties with statistically significant ($p < 0.0001$) disparities in undervote rates between paper ballots and DREs

Contest	Counties with significant undervote rate disparities
Lt. Governor	101
Secretary of State	4
Attorney General	4
Commissioner of Agriculture	5
Commissioner of Insurance	4
State School Superintendent	5
Commissioner of Labor	2
Public Service Commission, District 3	4
Public Service Commission, District 5	4

24. My second opinion concerns the machine-level results for the Winterville Train Depot polling place in Clarke County. There were seven DREs in the polling place; they recorded similar numbers of ballots (117, 135, 131, 133, 135, 144, 135). In this polling place, Democratic candidates won a majority in all ten statewide contests. Every DRE reported a majority for the Democratic candidate in all ten statewide contests except machine 3, which reported a majority for the Republican candidate in every contest.

25. On the assumption that voters were directed to DREs as if at random, the chance any of the seven machines would show disparities as large as machine 3 did in individual contests

level results from those official is given in Appendix II. Software to perform the statistical tests is given in Appendix III.

ranges from less than one percent to approximately 15 percent.³ Seven of the ten values are significant at level 5 percent or below. See Table 2.

Table 2: Consistency of Results across DREs in Winterville Train Station Polling Place

Contest	P-value
Governor	0.114
Lt. Governor	0.025
Secretary of State	0.018
Attorney General	0.151
Commissioner of Agriculture	0.026
Commissioner of Insurance	0.030
State School Superintendent	0.097
Commissioner of Labor	0.008
Public Service Commission, District 3	0.046
Public Service Commission, District 5	0.025

26. On the assumption that votes were cast on different DREs as if at random, the chance that any of the seven machines would show anomalies as large as machine 3 did is about 0.00009 percent, i.e., less than one in a million.⁴
27. If the Democratic and Republican party labels are flipped on the third machine, the anomaly disappears. For individual contests, no P-value is below 0.280 on the assumption that voters are directed to DREs as if at random, compared with values as small as 0.008 (and seven values below 5 percent) for the actual poll tapes. See Table 3.

³ These results are based on permutation tests conditional on the number of ballots cast on each machine. The test statistic is the largest absolute difference between the expected and actual fraction of Republican votes in each contest. The P-values are two-sided, conservative P-values for a randomized test; the randomization was performed using a cryptographically secure pseudo-random number generator. Software to perform the statistical tests is given in Appendix IV.

⁴ This result is based on a permutation test conditional on the number of ballots cast on each machine. The test statistic is the largest absolute difference between the expected and actual fraction of Republican votes in each contest. Results for different contests were combined using Fisher's combining function to produce the value reported in paragraph 25. The P-values are conservative P-values for randomized tests; the randomization was performed using a cryptographically secure pseudo-random number generator. Software used for the calculations is given in Appendix IV.

28. Similarly, on the assumption that votes are distributed randomly across machines, the chance that the discrepancies would be as large as observed would be roughly 97 percent, rather than 0.00009 percent, the value for the original data.

Table 3: Consistency in Results across DREs in Winterville Train Station Polling Place, if D and R were Flipped on Machine 3.

Contest	P-value
Governor	0.464
Lt. Governor	0.795
Secretary of State	0.450
Attorney General	0.543
Commissioner of Agriculture	0.734
Commissioner of Insurance	0.604
State School Superintendent	0.807
Commissioner of Labor	0.797
Public Service Commission, District 3	0.280
Public Service Commission, District 5	0.939

29. These tests strongly suggest that machine 3 had some other software or hardware problem: misconfiguration, error, defect, hack, or malfunction. The most plausible explanation is that machine 3 was misconfigured in a way that caused votes for Republican candidates to be recorded as votes for Democratic candidates, and vice versa.

I understand that the Winterville Train Depot polling place is one of a number of polling places in which Georgia voters photographed poll tapes after the close of polls. It was not selected at random, but neither is there reason to believe that problems are confined to that polling place.

Conclusions

30. Based on my analysis, described above, and my knowledge of Georgia's DRE voting system used in the November 6, 2018 election, it is my opinion that the certified results of the Lieutenant Governor's race are in substantial doubt.

- 31. Further statistical analysis of available data may be informative, but it cannot by itself determine who won, nor ascertain with certainty whether there were malfunctions, errors, bugs, defects or hacks, nor, if there were such problems, whether those problems caused the wrong candidate to appear to win.
- 32. The investigation most likely to produce definitive evidence is a forensic examination of the hardware and software of DREs and other computerized systems used by Georgia counties and the State of Georgia to record, tabulate, aggregate, and report votes and election results, including the hardware and software of devices used to configure those systems.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this date, 7 January 2019, in Berkeley, California.

Philip B. Stark

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

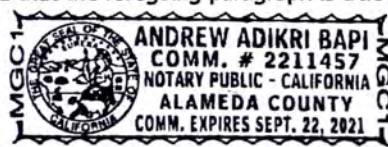
STATE OF CALIFORNIA)SS
 COUNTY OF ALAMEDA)
 On JAN, 07th 2019 before me, ANDREW ADIKRI BAPI., Notary Public, personally appeared
PHILIP B. STARK.

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature



This area for official notarial seal.

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Curriculum Vitae

Philip Bradford Stark

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P.B. Stark: CV

January 4, 2019

1

Biographical Information

Born: 7 October 1960, Houston, Texas.

Citizenship: U.S.A.

Interests

Theory: Inference, inverse problems, multiplicity, nonparametrics, optimization, restricted parameters, sampling

Applications: Astrophysics, cosmology, ecology, elections, geophysics, health, legislation, litigation, marketing, physics, public policy, risk assessment and control, uncertainty quantification

Appointments

10/2015–present Associate Dean, Division of Mathematical and Physical Sciences, University of California, Berkeley

6/2016–8/2016 Visiting Professor of Theoretical Computer Science, IT University of Copenhagen

7/2012–6/2015 Chair, Department of Statistics, and Director, Statistical Computing Facility, University of California, Berkeley

7/2011–6/2012 Vice Chair, Department of Statistics, University of California, Berkeley

7/2011–8/2011 Acting Chair, Department of Statistics, University of California, Berkeley

7/2008–present Faculty, Designated Emphasis in Computational and Data Science and Engineering, University of California, Berkeley

7/1998–present Professor, Department of Statistics, University of California, Berkeley

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2

7/2001–6/2003 Faculty Assistant in Educational Technology (to Vice Provost for Undergraduate Education), University of California, Berkeley

6/1996 Visiting Associate Professor, School of Mathematical Sciences, Tel Aviv University, Tel Aviv, Israel

7/1994–6/1998 Associate Professor, Department of Statistics, University of California, Berkeley

7/1988–6/1994 Assistant Professor, Department of Statistics, University of California, Berkeley

7/1987–6/1990 National Science Foundation Postdoctoral Fellow in Mathematical Sciences

1/1987–6/1987 Postgraduate Research, Department of Statistics, University of California, Berkeley

8/1986–12/1986 Postgraduate Research, Institute for Geophysics and Planetary Physics, UC San Diego

Awards and Fellowships

Velux/Villum Foundation Visiting Professor Programme (2015–2016)

Leamer-Rosenthal Prize for Transparency in Social Science (2015)

Chancellor's Award for Public Service, Research in the Public Interest, University of California, Berkeley (2011)

John Gideon Award for Election Integrity, Election Verification Network (2011)

Mellon Library/Faculty Fellow for Undergraduate Research (2006–2007)

Presidential Chair Fellow, University of California, Berkeley (2003–2004)

Fellow, American Statistical Association (selected 2014)

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3

Fellow, Institute of Physics (elected 1999)

Miller Research Professor, Miller Institute for Basic Research in Science (1999)

Dobson Fellow, University of California at Berkeley (1998, 1999)

Presidential Young Investigator (1989–1995)

National Science Foundation Postdoctoral Fellowship in Mathematical Sciences (1987–1989)

University Fellowship, University of Texas at Austin (1982–1983)

Affiliations

Association of Foragers

Berkeley Institute for Data Science (BIDS), University of California, Berkeley

Berkeley Food Institute, University of California, Berkeley

Berkeley Open Source Food, University of California, Berkeley

Center for Astrostatistics, Pennsylvania State University

Global Oscillation Network Group (GONG)

National Partnership for Advanced Computational Infrastructure (NPACI)

Simons Institute for the Theory of Computing, University of California, Berkeley

Solar and Heliospheric Observatory Solar Oscillations Investigation (SOHO-SOI)

Space Sciences Laboratory, University of California, Berkeley

Theoretical Astrophysics Center, University of California, Berkeley

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Professional Societies

American Statistical Association: Fellow and Accredited Professional Statistician

Bernoulli Society for Mathematical Statistics and Probability

Institute of Mathematical Statistics

Institute of Physics: Fellow and Chartered Physicist

International Statistical Institute

Royal Astronomical Society: Fellow

Education

A.B. 1980, Princeton University, Princeton, New Jersey

Ph.D. 1986, University of California, San Diego, La Jolla, California

Mentors

Robert L. Parker, Institute for Geophysics and Planetary Physics, Scripps Institution of Oceanography, University of California, San Diego (PhD dissertation advisor)

George E. Backus, Institute for Geophysics and Planetary Physics, Scripps Institution of Oceanography, University of California, San Diego (postdoctoral advisor)

David L. Donoho, Department of Statistics, Stanford University (post-doctoral advisor)

Publications

Refereed Publications

1. Stark, P.B. and C. Frohlich, 1985. The depths of the deepest deep Earthquakes, *Journal of Geophysical Research*, *90*, 1859–1869.
2. Stark, P.B., R.L. Parker, G. Masters, and J.A. Orcutt, 1986. Strict bounds on seismic velocity in the spherical Earth, *Journal of Geophysical Research*, *91*, 13,892–13,902.
3. Stark, P.B., 1986. *Travel-Time Inversion: Regularization and Inference*, Ph.D. Thesis, Scripps Institution of Oceanography, University of California, San Diego, 106pp.
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232. Big Data and Social Good, Institute for Geodesy and Geophysics, Wuhan, China, 27 December 2017.
231. Big Data, Quantifauxcation, and Cargo-Cult Statistics, Big Data Conference, China University of Geosciences, Wuhan, China, 26 December 2017.
230. P -values, Probability, Priors, Rabbits, Quantifauxcation, and Cargo-Cult Statistics, Statistics 159, Reproducible and Collaborative Data Science, University of California, Berkeley, CA, 14 November 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/rabbits157-17.ipynb>
229. Opportunities in applied statistics: an $n = 1$ observational study, Statistics Undergraduate Student Association (SUSA), University of California, Berkeley, CA, 30 October 2017.

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228. Don't Bet on Your Random Number Generator, Consortium for Data Analytics in Risk (CDAR) Annual Colloquium, University of California, Berkeley, CA, 27 October 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/prngCDAR17.slides.html>
227. Leave Election Integrity to Chance, *Science @ Cal*, University of California, Berkeley, CA, 21 October 2017.
226. Audits and Evidence-Based Elections, 2nd *Take Back the Vote Conference*, Berkeley, CA, 7–8 October 2017. Video: <https://www.youtube.com/watch?v=pPGTkjpijUU>
225. Wild And Feral Foods: Increasing Nutrition, Food Security, Farm Biodiversity, and Farm Revenue; Decreasing Herbicides, Water Use, and the Carbon Footprint of the Food System, *2nd AgroecoWeb—International Online Congress on Agro-ecology and Permaculture*, Brazil, 4–10 October 2017. Video: <https://vimeo.com/235073616>
224. How Statistics can improve election integrity, PoliSci 191, *The Right to Vote in America*, University of California, Berkeley, 4 October 2017.
223. Wild and Feral Food Identification Walk, ESPM 98, *Berkeley Urban Garden Internship (BUGI)*, University of California, Berkeley, 27 September 2017.
222. Urban Foraging and Gleaning, *FoodInno*, University of California, Berkeley, 16 September 2017.
221. ETAS-trophic failures: fit, classification, and forecasting, *Big Data in Geosciences: From Earthquake Swarms to Consequences of Slab Dynamics*, a conference in honor of Robert Geller, University of Tokyo, Tokyo, Japan, 25–27 May 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/gellerFest17.pdf>
220. Risk-Limiting Audits, *Global Election Technology Summit*, San Francisco, CA, 17 May 2017. <https://www.getsummit.org/>
219. Where the Wild Things Grow, *Berkeley Path Wanderers Association*, Berkeley, CA, 22 April 2017. <http://berkeleypaths.org/events/event/where-the-wild-things-grow-2/>

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218. Sometimes a Paper Trail Isn't Worth the Paper It's Written On, Keynote lecture, Workshop on Advances in Secure Electronic Voting, Financial Crypto 2017, Malta, 3–7 April 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/malta17.htm>
217. Don't Bet on Your Random Number Generator, Distinguished Lecture (http://www.uni.lu/snt/distinguished_lectures), Center for Security, Reliability, and Trust, University of Luxembourg, Luxembourg, 31 March 2017. Slides: <https://github.com/pbstark/pseudorandom/blob/master/prngLux17.ipynb>
216. Faculty-Student Feedback: End-of-Semester Teaching Evaluations, Dialogues, Center for Teaching and Learning, University of California, Berkeley, 20 March 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/setUCBDialogue17.htm>
215. Edible Weeds Tour of South Hayward, Seed Lending Library, Hayward Public Library, Weekes Branch, Hayward, CA, 11 March 2017. <http://www.libraryinsight.com/eventdetails.asp?jx=hzp&lmx=%C7cn%2D%AA%AE&v=3>
214. Risk-limiting Audits and Evidence-based Elections, Santa Clara County Citizens Advisory Committee on Elections, San Jose, CA, 7 March 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/santaClara17.pdf>
213. Causal Inference from Data, Emerging Science for Environmental Health Decisions, Workshop on Advances in Causal Understanding of Human Health Risk-Based Decision Making, National Academy of Sciences, Engineering, and Medicine, Washington, DC, 6–7 March 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/nasCause17.htm>
212. BRII and Brie, Berkeley Research Impact Initiative (BRII), University of California, Berkeley, CA 22 February 2017.
211. Uncertainty Quantification, Conférence Universitaire de Suisse Occidentale, Les Diablerets, Switzerland, 5–8 February 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/lesDiablerets17-1.pdf>, <https://www.stat.berkeley.edu/~stark/Seminars/lesDiablerets17-1.pdf>

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ars/lesDiablerets17-2.pdf, <https://www.stat.berkeley.edu/~stark/Seminars/lesDiablerets17-3.pdf>

210. Whose Votes (were) Counted in the Election of 2016?, ISF 198, *The 2016 U.S. Elections in Global Context: A Semester-Long Teach-In*, University of California, Berkeley, 24 January 2017. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/teachIn17.pdf>
209. Invited panelist, “How Blockchain Technology Will and Won’t Change the World,” University of California, Berkeley, College of Letters and Sciences, hosted by Glynn Capital and Boost VC, San Mateo, CA, 30 November 2016.
208. Teaching Evaluations (Mostly) Do Not Measure Teaching Effectiveness, Distinguished Lecture Series, Department of Computer Science and Engineering, University of California, San Diego, San Diego, CA, 14 November 2016. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/setUCSD16.htm>
207. Simple Random Sampling is not that Simple, *Random Processes And Time Series: Theory And Applications, A Conference In Honor Of Murray Rosenblatt*, UC San Diego, San Diego, CA, 21–23 October 2016.
206. Invited panelist, “Productive Ecologies in the Anthropocene: Foraging Systems,” *Sixth International Conference on Food Studies*, Berkeley, CA, 12–13 October 2016.
205. Teaching Evaluations (Mostly) Do Not Measure Teaching Effectiveness, Ethics Colloquium Series, Colorado State University, Fort Collins, CO, 3 October 2016. Slides: <https://www.stat.berkeley.edu/~stark/Seminars/setCSU16.htm> Video: <https://echo.colostate.edu/ess/echo/presentation/64309bd5-6afd-4394-b5d3-5e6748f545f1>
204. Simple Random Sampling is not that Simple, Neyman Seminar, Department of Statistics, University of California, Berkeley, Berkeley, CA 21 September 2016.
203. The Aliens Have Landed ... and They Are Delicious, *Visions of the Wild*, Vallejo, CA, 15 September 2016.

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202. Simple Random Sampling: Not So Simple, Section of Theoretical Computer Science, IT University of Copenhagen, Copenhagen, Denmark, 27 June 2016.
201. Simple Random Sampling: Not So Simple, Section of Mathematics, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland, 24 June 2016.
200. Invited panelist, “Carrot vs. Stick: approaches to encouraging reproducibility,” Moore-Sloan Data Science Environment Reproducibility Conference, New York University, New York, 3 May 2016.
199. Guest lecturer, MCB 15 (Public Understanding of Science), University of California, Berkeley, 12 April 2016.
198. Teaching Evaluations: Biased Beyond Measure, Center for Studies in Higher Education, and The Social Science Matrix, University of California, Berkeley, CA 11 April 2016. <https://www.stat.berkeley.edu/~stark/Seminars/setCSHE16.htm> Video: <https://www.youtube.com/watch?v=yhxUxBk-6GE>, <http://uctv.tv/shows/Teaching-Evaluations-Biased-Beyond-Measure-30870>
197. Teaching Evaluations (Mostly) Do Not Measure Teaching Effectiveness, Wharton Statistics Department, University of Pennsylvania, Philadelphia, PA, 17 March 2016. <https://www.stat.berkeley.edu/~stark/Seminars/setPenn16.htm>
196. Invited Panelist, “The potentials and pitfalls of electronic auditing,” Election Verification Network Conference: Securing Elections in the 21st Century, George Washington University, Washington, DC, 10–11 March 2016.
195. Invited Panelist, “Interoperability standards, proprietary codes, and verification/testing,” III Arnold Workshop: Reproducibility in Modeling and Code, American Association for the Advancement of Science, Washington, DC, 16–17 January 2016. <http://www.aaas.org/event/iii-arnold-workshop-modeling-and-code>
194. Teaching Evaluations (Mostly) Do Not Measure Teaching Effectiveness, Department of Applied Mathematics and Statistics, University of Cal-

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ifornia, Santa Cruz, 1 February 2016. <https://www.stat.berkeley.edu/~stark/Seminars/setUCSC16.htm>

193. A Noob's Guide to Reproducibility and Open Science, Department of Nuclear Engineering, Berkeley Institute for Data Science, and Berkeley Initiative for Transparency in Social Science, University of California, Berkeley, 25 January 2016. <https://www.stat.berkeley.edu/~stark/Seminars/reproNE16.htm> Video: <http://www.ustream.tv/recorded/81987743>
192. Chair, Wild Edibles Taste Workshop, 2015 Indigenous Terra Madre Conference, Shillong, Meghalaya, India, 3–7 November, 2015.
191. Invited Panelist, “From Field to Fork, the Stories of Chefs, Communities, and Writers,” 2015 Indigenous Terra Madre Conference, Shillong, Meghalaya, India, 3–7 November, 2015. <https://www.stat.berkeley.edu/~stark/Seminars/forageITM15.htm>
190. Guest lecturer, ESPM 117 (Urban Garden Ecosystems), University of California, Berkeley, 20 October 2015. <https://www.stat.berkeley.edu/~stark/Seminars/forageAgroEcol15.htm>
189. Invited Panelist, “Statistical Implications of Big Data Applied to Risk Modeling,” Consortium for Data Analytics in Risk (CDAR) Symposium, University of California, Berkeley, 16 October 2015. <http://cdar.berkeley.edu/events/2015cdarsymposium/>
188. Guest lecturer, Statistics 210A (Theoretical Statistics), University of California, Berkeley, 13–15 October 2015. <https://github.com/pbstark/Nonpar>
187. Risk-Limiting Audits and the Colorado Uniform Voting System Pilot, Colorado Pilot Election Review Committee Meeting, Office of the Colorado Secretary of State, Denver, CO, 9 October 2015. <https://www.stat.berkeley.edu/~stark/Seminars/auditC015.pdf>
186. Wild and Feral Food in EBRPD, East Bay Regional Park District Volunteer Meeting, Oakland, CA, 15 September 2015. <https://www.stat.berkeley.edu/~stark/Seminars/forageEBRPD15.htm>

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185. Probability and Statistics for Physical Science and Engineering PhD Students (a 15-hour course), University of Tokyo, 23–26 August 2015. Materials: <http://www.github.com/pbstark/PhysEng>
184. Statistics for Engineering PhD students (a 30-hour course), University of Padova, Padova, Italy, 29 June–7 July 2015. Materials: <http://www.github.com/pbstark/Padova15>
183. Pay no attention to the model behind the curtain, Significant Digits: Responsible Use of Quantitative Information, European Commission Joint Research Centre, Brussels, Belgium, 9–10 June 2015. <https://www.stat.berkeley.edu/~stark/Seminars/rabbitsBrux15.htm>
182. Reaping without Sowing: Wild Food and Urban Foraging, Berkeley Food Institute Seed Grant Forum, Berkeley, CA, 6 May 2015. <https://www.stat.berkeley.edu/~stark/Seminars/bfi-15-5-6.htm> Video: <http://food.berkeley.edu/seed-grant-forum/>
181. Invited panelist, Data Science: Supporting new Modes of Research, Annual Meeting of the Association of Research Libraries, Berkeley, CA, 28–30 April, 2015.
180. Teaching evaluations: class act or class action?, National Center for the Study of Collective Bargaining in Higher Education and the Professions, Annual Conference, Hunter College, New York, NY, 19–21 April 2015. <https://www.stat.berkeley.edu/~stark/Seminars/se tNCSCB15.htm>
179. Where the Wild Things Grow, Berkeley Path Wanderers Association, Berkeley, CA, 4 April 2015. <http://berkeleypaths.org/events/event/where-the-wild-things-grow/>
178. Invited panelist, Brave New Audits: How We Can Implement Risk-Limiting Audits with Today’s Machines, Off-the-Shelf Hardware, and Open Source Software, 2015 Election Verification Network Annual meeting, New Orleans, LA, 4–6 March 2015. <https://www.stat.berkeley.edu/~stark/Seminars/evn15.htm> Video: <https://youtu.be/DBcVicxJigs>

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177. Co-chair, Election Auditing, NIST / U.S. Election Administration Commission Future of Voting Systems Symposium II, Washington, DC, 9–10 February 2015.
176. Teaching evaluations: truthful or truthy?, European Commission Joint Research Centre *Third Lisbon Research Workshop on Economics, Statistics and Econometrics of Education*, Lisbon, Portugal, 23–24 January 2015. <http://cemapre.iseg.ulisboa.pt/educonf/3e3/> <https://www.stat.berkeley.edu/~stark/Seminars/setLisbon15.htm>
175. Bad Numbers, Bad Policy, 5th Impact Assessment Course by the Joint Research Centre and the Secretariat General of the European Commission, Brussels, Belgium, 20–21 January 2015. <https://ec.europa.eu/jrc/en/event/training-course/5th-impact-assessment-course> <https://www.stat.berkeley.edu/~stark/Seminars/fauxBrux15.htm>
174. Quantifauxcation, European Commission Joint Research Centre, Ispra, Italy, 19 January 2015. <https://www.stat.berkeley.edu/~stark/Seminars/fauxIspra15.htm>
173. Preproducibility for Research, Teaching, Collaboration, and Publishing, Replicability and Reproducibility of Discoveries in Animal Phenotyping, Tel Aviv University, Tel Aviv, Israel, 5–7 January 2015. <https://www.stat.berkeley.edu/~stark/Seminars/reproTAU15.htm> Video: http://video.tau.ac.il/events/index.php?option=com_k2&view=item&id=5563:preproducibility-for-research-teaching-collaboration-and-publishing&Itemid=552
172. Urban Foraging—Real Street Food, Discover Cal: A Menu for Change, Los Angeles, CA, 18 November 2014. <https://www.stat.berkeley.edu/~stark/Seminars/discoverCallA14.htm>
171. Guest lecturer, 6.S897/17.S952: Elections and Voting Technology, MIT, 13 November 2014.
170. Open Geospatial Data Down in the Weeds: Urban Foraging, Food Deserts, Citizen Science, Sustainability, and Reproducibility, Assessing

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the Socioeconomic Impacts and Value of ‘Open’ Geospatial Information, The George Washington University, Washington DC, 28–29 October 2014. <https://www.stat.berkeley.edu/~stark/Seminars/openGeospatial14.htm>

169. Student Evaluations of Teaching, University of San Francisco, 23 October 2014. <https://www.stat.berkeley.edu/~stark/Seminars/setUSF14.htm>
168. Guest lecturer, CS 76N: Elections and Technology, Stanford University, 14 October 2014.
167. Statistical Evidence and Election Integrity, XXIX International Forum on Statistics, UPAEP, Puebla, Mexico, 29 September–3 October 2014. <https://www.stat.berkeley.edu/~stark/Seminars/foro14.pdf>
166. Nonparametric Inference, Auditing, and Litigation, Short course at XXIX International Forum on Statistics, UPAEP, Puebla, Mexico, 29 September–3 October 2014. <https://github.com/pbstark/MX14>
165. Invited participant, Pew Charitable Trusts roundtable: Challenges Related to the Voting Systems Marketplace, Chicago, IL, 8 September 2014.
164. Invited panelist, U.S. Election Assistance Commission roundtable: Expanding the Body of Knowledge of Election Administration—Reflections and Future Direction, 3 September 2014. http://www.eac.gov/eac_grants_expanding_the_body_of_knowledge_of_election_administration_%E2%80%93reflections_and_future_dire/
Video: <http://mediasite.yorkcast.com/webcast/Play/a90f223fa61940cd893b70fab55fe1b51d>
163. Reproducibility, Evidence, and the Scientific Method, Late-breaking session on Reproducibility, Joint Statistical Meetings, Boston, MA, 2–7 August 2014. <https://www.stat.berkeley.edu/~stark/Seminars/reproJSM14.htm>
162. Invited panelist, Big Data & Academic Libraries, International Alliance of Research Universities, 3rd Librarians’ Meeting, University of California, Berkeley, CA, 23–24 June 2014.

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161. Mini-Minimax Uncertainty Quantification for Emulators, 2nd Conference of the International Society for Nonparametric Statistics, Cadiz, Spain, 11–16 June 2014. <https://www.stat.berkeley.edu/~stark/Seminars/emulatorISNPS14.pdf>
160. Reproducible and Collaborative Statistical Data Science, Transparency Practices for Empirical Social Science Research, 2014 Summer Institute, University of California, Berkeley, CA, 2–6 June 2014. <https://www.stat.berkeley.edu/~stark/Seminars/bitss14.pdf>
159. Risk-Limiting Audits for Denmark and Mongolia, Third DemTech Workshop on Danish Elections, Trust, and Technology for the Mongolian General Election Commission, IT University of Copenhagen, Copenhagen, Denmark, 24 May 2014. <https://www.stat.berkeley.edu/~stark/Seminars/itu14.pdf>
158. How to Lie With Big Data (and/or Big Computations), Panel on Data Deluge or Drought (Quality and Quantity), MPE13+ Workshop on Global Change, DIMACS Special Program: Mathematics of Planet Earth 2013+, University of California, Berkeley, CA, 19–21 May 2014. <https://www.stat.berkeley.edu/~stark/Seminars/mpe14.pdf>
157. Invited panelist, Relying on Data Science: Reproducible Research and the Role of Policy, DataEDGE conference, UC Berkeley School of Information, Berkeley, CA, 8–9 May 2014.
156. Invited panelist, Some Tools and Solutions, University of Washington / Moore–Sloan First Reproducibility Workshop, eScience Institute, University of Washington, Seattle, WA, 8 May 2014 <https://www.stat.berkeley.edu/~stark/Seminars/reproUW14.pdf>
155. Some people have all the luck, Institute for Pure and Applied Mathematics, UCLA, Los Angeles, CA, 28 April 2014. (with Skip Garibaldi and Lawrence Mower) http://www.ipam.ucla.edu/programs/PUBLIC_C2014/ Video: <https://www.youtube.com/watch?v=s8cHHWNb1A4>
154. Invited panelist, Ask a Statistician, SIAM/ASA/GAMM/AGU Conference on Uncertainty Quantification, Savannah, GA, 29 March – 3 April 2014.

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153. Invited panelist, The Reliability of Computational Research Findings: Reproducible Research, Uncertainty Quantification, and Verification & Validation, SIAM/ASA/GAMM/AGU Conference on Uncertainty Quantification, Savannah, GA, 29 March – 3 April 2014. <https://www.stat.berkeley.edu/~stark/Seminars/reproUQ14.pdf> Video: http://client.blueskybroadcast.com/SIAM14/UQ/siam_uq14_MS42_3
152. Invited panelist, New Paradigms for Voting Systems, 2014 Election Verification Network Annual meeting, San Diego, CA, 5–7 March 2014. <https://www.stat.berkeley.edu/~stark/Seminars/evn14NewParadigms.pdf> Video: <https://www.youtube.com/watch?v=bT1HYkiYBZI>
151. Invited panelist, End-to-End Verifiable Voting Roundtable, 2014 Election Verification Network Annual meeting, San Diego, CA, 5–7 March 2014. Video: https://www.youtube.com/watch?v=jsGSQV_rFzA
150. Invited panelist, Improving Teaching through uncharted Waters: Peer Observation and other Approaches, Dialogues, a Colloquium Series on Teaching, Center for Teaching and Learning, University of California, Berkeley, 26 February 2014. <http://teaching.berkeley.edu/dialogues-colloquium-series-teaching>
149. Invited panelist, Unpacking the Voting Technology Debate, 2014 Voting and Elections Annual Summit, Overseas Vote Foundation and U.S. Vote Foundation, George Washington University, Washington, D.C., 30 January 2014. <https://www.overseasvotefoundation.org/initiatives-UOCAVASummit-summit2014-agenda> Video: <http://www.youtube.com/watch?v=UXqqn0WhsmA&list=PLtRB8fQzBR8Nza-G-RGln-HTrkp4UM6F&feature=share&index=1#t=23m30s>
148. Risk-Limiting Audits for Party-List Elections. IT University of Copenhagen, Copenhagen, Denmark, 21 November 2013. <https://www.stat.berkeley.edu/~stark/Seminars/itu13.pdf>
147. Selective Inference and Conditional Tests. Department of Statistics and Operations Research, Tel Aviv University, Tel Aviv, Israel, 28 October 2013.

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146. Ontology of Earthquake Probability: Metaphor. Dynamics of Seismicity, Earthquake Clustering and Patterns in Fault Networks, Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, NC, 9–11 October 2013. <https://www.stat.berkeley.edu/~stark/Seminars/samsiSeis13.pdf>
145. Invited panelist, Innovations in On-line Learning, Designing a World University, World Academy Forum on Global Higher Education, Berkeley, California, 2–3 October 2013.
144. E2E to Hand-to-Eye: Verifiability, Trust, Audits, Vote ID 2013: The 4th International Conference on e-Voting and Identity, University of Surrey, Guildford, UK 17–19 July 2013. <https://www.stat.berkeley.edu/~stark/Seminars/voteID13.pdf>
143. Mini-Minimax Uncertainty of Emulators, Center for Security, Reliability, and Trust, University of Luxembourg, Luxembourg, 9 July 2013. <https://www.stat.berkeley.edu/~starkstark/Seminars/emulatorLux13.pdf>
142. Invited panelist, Extracting Actionable Insight From Dirty Time-Series Data, Berkeley Research Data Science Lectures, University of California, Berkeley, 21 June 2013. Video: <http://vcresearch.berkeley.edu/datascience/webcast-data-science-lecture-series-june-21>
141. Uncertainty quantification for emulators, Dipartimento di Fisica e Astronomia, Università di Bologna, Bologna, Italy, 5 June 2013. <https://www.stat.berkeley.edu/~stark/Seminars/emulatorUniBo13.pdf>
140. Leveraging Paper Ballots, Running Elections Efficiently, A Best Practices Convening, Common Cause – Common Cause / NY – Columbia University School of International and Public Affairs, Columbia University, New York, NY, 20 May 2013. <https://www.stat.berkeley.edu/~stark/Seminars/ccNY13.pdf>
139. Uncertainty quantification for emulators, University of California, Los Angeles, 11 April 2013. <https://www.stat.berkeley.edu/~stark/Seminars/emulatorUCLA13.pdf>
138. Brittle and Resilient Verifiable Voting Systems, Verifiable Voting Schemes Workshop: from Theory to Practice, Interdisciplinary Centre

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for Security, Reliability and Trust, University of Luxembourg, Luxembourg 21–22 March 2013. <https://www.stat.berkeley.edu/~stark/Seminars/vv13.pdf>

137. Now What?, Election Verification Network Annual Conference, The Right to a Secure, Transparent and Accurate Election, Atlanta, Georgia 14–15 March 2013. <https://www.stat.berkeley.edu/~stark/Seminars/evn13nowWhat.pdf>
136. Machine-Assisted Transitive Audits, Election Verification Network Annual Conference, The Right to a Secure, Transparent and Accurate Election, Atlanta, Georgia 14–15 March 2013.
135. Risk-limiting Audits and Evidence-Based Elections in a Nutshell, Election Verification Network Annual Conference, The Right to a Secure, Transparent and Accurate Election, Atlanta, Georgia 14–15 March 2013. <https://www.stat.berkeley.edu/~stark/Seminars/evn13nutshell.pdf>
134. Reproducibility in Computational and Experimental Mathematics, ICERM, Brown University, Providence, RI, 10–14 December 2012. <http://icerm.brown.edu/tw12-5-rcem>
133. Whaddya know? Bayesian and Frequentist approaches to inverse problems, Inverse Problems: Practical Applications and Advanced Analysis, Schlumberger WesternGeco, Houston, TX, 12–15 November 2012. <https://www.stat.berkeley.edu/~stark/Seminars/swg12.pdf>
132. Evidence-Based Elections, E-Voting: Risk and Opportunity Conference, Center for Information Technology Policy, Princeton University, Princeton, NJ, 1 November 2012. <https://www.stat.berkeley.edu/~stark/Seminars/princeton12.pdf> Video: http://youtu.be/1Z6JW1t_sFI
131. Evidence-Based Elections, Berkeley/Stanford Data, Society and Inference Seminar, Stanford University, Stanford, CA 8 October 2012. <https://www.stat.berkeley.edu/~stark/Seminars/dataSocietyInference12.pdf>
130. Voting Technology Exploratory Meeting, The Pew Charitable Trusts Center on the States, Santa Monica, CA 23–24 August 2012.

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129. Lightning Debates, Workshop on Electronic Voting Technology / Workshop on Transparent Elections, (EVT/WOTE '12), USENIX, Bellevue, WA, 6–7 August 2012. Video: <https://www.usenix.org/conference/ewtwote12/panel-2-title-tbd>
128. BRAVO: Ballot-polling Risk-limiting Audits to Verify Outcomes, Workshop on Electronic Voting Technology / Workshop on Transparent Elections, (EVT/WOTE '12), USENIX, Bellevue, WA, 6–7 August 2012. <https://www.stat.berkeley.edu/~stark/Seminars/evt12.pdf> Video: <https://www.usenix.org/conference/ewtwote12/s6-paper-title-tbd>
127. The Will of the People and the Luck of the Draw: Using Statistics to Limit the Risk of Wrong Electoral Outcomes, Joint Statistical Meetings, San Diego, CA, 29 July 2012. <https://www.stat.berkeley.edu/~stark/Seminars/jsm12.pdf>
126. Evidence-Based Elections, Risk-Limiting Audits, and Resilient Canvass Frameworks, SecVote 2012 Summer School on Secure Voting, Leibniz-Zentrum für Informatik, Schloss Dagstuhl, Germany, 16 July 2012. <https://www.stat.berkeley.edu/~stark/Seminars/dagstuhl12.pdf>
125. The Effectiveness of Internet Content Filters, Distinguished Lecture (http://www.en.uni.lu/snt/distinguished_lectures), Center for Security, Reliability, and Trust, University of Luxembourg, Luxembourg, 13 July 2012. <https://www.stat.berkeley.edu/~stark/Seminars/luxembourg12.pdf>
124. Evidence-Based Elections, International Association of Clerks, Records, Election Officials & Treasurers (IACREOT) annual conference, Albuquerque, NM, 30 June 2012. <https://www.stat.berkeley.edu/~stark/Seminars/iacreot12.pdf>
123. Confidence Limits, Progress on Statistical Issues in Searches, SLAC National Accelerator Laboratory, Stanford, CA, 4–6 June 2012. <https://www.stat.berkeley.edu/~stark/Seminars/slac12.pdf>
122. UQQ, UQ: Transition Workshop, Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, NC, 21–23 May

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2012. <https://www.stat.berkeley.edu/~stark/Seminars/samsi12.pdf>
121. Testing for Poisson Behavior, Seismological Society of America Annual Meeting, San Diego, CA, 17–19 April 2012. <https://www.stat.berkeley.edu/~stark/Seminars/ssa12.pdf>
120. Get Out The Audit (GOTA), Election Verification Network Annual Conference, Santa Fe, NM, 29–30 March 2012. <https://www.stat.berkeley.edu/~stark/Seminars/evnGOTA12.pdf>
119. The Long View: Evidence-Based Elections, Election Verification Network Annual Conference, Santa Fe, NM, 29–30 March 2012. <https://www.stat.berkeley.edu/~stark/Seminars/evnLongView12.pdf>
118. The Will of the People and the Luck of the Draw: Risk-Limiting Audits and Resilient Canvass Frameworks, San Francisco Chapter of the American Statistical Association, Berkeley, CA, 16 February 2012. <https://www.stat.berkeley.edu/~stark/Seminars/asa12.pdf>
117. Evidence-Based Elections: Colorado’s Future?, Colorado Elections Best Practices & Vision Commission, Denver, CO, 14 December 2011. <https://www.stat.berkeley.edu/~stark/Seminars/co-11-12-14.pdf> Audio: <mms://pub.sos.state.co.us/20111214130705B>
116. From the Virtual Trenches, *Letters and Sciences Colloquium on Undergraduate Education: The Virtual University—Challenges and Opportunities*, University of California, Berkeley, CA, 16 November 2011. <http://ls.berkeley.edu/stories/archive/fall-2011-colloquium-undergraduate-education-0> <https://www.stat.berkeley.edu/~stark/Seminars/onlineEd11.pdf> Video: <http://www.youtube.com/watch?v=40vGDuPSJso>
115. Earthquake Clustering and Declustering, Institute de Physique du Globe de Paris, Paris, France, 4 October 2011. <https://www.stat.berkeley.edu/~stark/Seminars/ipg11.pdf>
114. Fears, Predictions, Hopes & Plans, *Panel on the Future*, Election Integrity: Past, Present, and Future, Caltech/MIT Voting Technology Project, Cambridge, MA, 1 October 2011. <https://www.stat.berke>

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ley.edu/~stark/Seminars/mit11.pdf Video: <http://techtv.mit.edu/collections/vtp/videos/14802-eippf-2011-3-the-future>

113. Risk-limiting Audits: Soup to Nuts, and Beyond, Workshop on Electronic Voting Technology / Workshop on Transparent Elections, (EVT/WOTE '11), USENIX, San Francisco, CA, 9 August 2011. <https://www.stat.berkeley.edu/~stark/Seminars/evtRLA11.pdf>
112. SOBA: Secrecy-preserving Observable Ballot-level Audit, Workshop on Electronic Voting Technology / Workshop on Transparent Elections, (EVT/WOTE '11), USENIX, San Francisco, CA, 9 August 2011. <https://www.stat.berkeley.edu/~stark/Seminars/evtSoba11.pdf>
111. The Effectiveness of Internet Content Filtering, Workshop on Free and Open Communication on the Internet (FOCI '11), USENIX, San Francisco, CA, 8 August 2011. <https://www.stat.berkeley.edu/~stark/Seminars/foci11.pdf>
110. SticiGui, Onsophic, and Statistics W21, Panel on online instruction, Joint Statistical Meetings, Miami Beach, FL, 31 August 2011. <https://www.stat.berkeley.edu/~stark/Seminars/jsm11.pdf>
109. Risk Limiting Audits, Colorado Secretary of State, Colorado Risk Limiting Audit (CORLA) Kick-off Meeting, Denver, CO, 16 June 2011. <https://www.stat.berkeley.edu/~stark/Seminars/co-11-6-16.pdf>
108. Simultaneous Confidence Intervals with more Power to Determine Signs, Conference in honor of Erich Lehmann, Rice University, Houston, TX, 12 May 2011. <https://www.stat.berkeley.edu/~stark/Seminars/lehmann11.pdf>
107. Close enough for government [to] work, Verified Voting Foundation, Palo Alto, CA, 27 April 2011. <https://www.stat.berkeley.edu/~stark/Seminars/vv-11-4-27.pdf>
106. Close enough for government [to] work: Risk-limiting post-election audits, Berkeley-Stanford Joint Statistics Colloquium, Stanford University, Stanford, CA, 12 April 2011. <https://www.stat.berkeley.edu/~stark/Seminars/stanford11.pdf>

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105. Audits: The After-Math of Elections, Verify early, verify often: creating secure, transparent and accurate elections, Election Verification Network, Chicago, IL, 25–26 March 2011. <https://www.stat.berkeley.edu/~stark/Seminars/reed11.pdf>
104. Simultaneous Confidence Intervals with more Power to Determine Signs, Department of Mathematics, Reed College, Portland, OR, 10 March 2011. <https://www.stat.berkeley.edu/~stark/Seminars/reed11.pdf>
103. Close enough for government work: Risk-Limiting Post-Election Audits, Wharton Statistics Department, University of Pennsylvania, Philadelphia, PA, 26 January 2011. <https://www.stat.berkeley.edu/~stark/Seminars/penn11.pdf>
102. Audits: The After-Math of Election Reform, Conference on Innovative Electoral Reforms and Strategies, Washington, DC, 10–11 December 2010. <https://www.stat.berkeley.edu/~stark/Seminars/innovative10.pdf>
101. Risk-Limiting Post-Election Audits: Statistics, Policy, and Politics, Department of Statistics, Rice University, Houston, TX, 1 November 2010. <https://www.stat.berkeley.edu/~stark/Seminars/rice10.pdf>
100. Are Declustered Earthquake Catalogs Poisson?, Department of Statistics, Pennsylvania State University, State College, PA, 14 October 2010. <https://www.stat.berkeley.edu/~stark/Seminars/psu10.pdf>
99. Super-simple simultaneous single-ballot risk-limiting audits, 2010 Electronic Voting Technology Workshop / Workshop on Trustworthy Elections (EVT/WOTE '10), Washington, DC, 9–10 August 2010. <https://www.stat.berkeley.edu/~stark/Seminars/ewtote10.pdf>
98. AB 2023 and Risk-Limiting Audits, California Association of Clerks and Election Officials Legislative Committee Meeting, 14 May 2010. <https://www.stat.berkeley.edu/~stark/Seminars/caceo-legis10.pdf>
97. Justice and inequalities, Department of Statistics and Operations Research, Tel Aviv University, Tel Aviv, Israel, 13 April 2010. <https://www.stat.berkeley.edu/~stark/Seminars/tau10.pdf>

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96. Size Matters: Smaller Batches Yield More Efficient Risk-Limiting Audits, Small-Batch Audit Meeting, Washington, DC, 27–28 March 2010. <https://www.stat.berkeley.edu/~stark/Seminars/smallBatch10.pdf>
95. Sexy Audits and the Single Ballot, Election Verification Network (EVN) annual conference, Washington, DC, 25–27 March 2010. <https://www.stat.berkeley.edu/~stark/Seminars/evn10.pdf>
94. Simple, Affordable, Post-Election Audits, Institute for Mathematical Behavioral Sciences, University of California, Irvine, CA, 7 January 2010. <https://www.stat.berkeley.edu/~stark/Seminars/uci10.pdf>
93. Efficient Post-Election Audits of Multiple Contests: 2009 California Tests, Conference on Empirical Legal Studies, University of Southern California Gould School of Law, Los Angeles, CA, 20–21 November 2009. <https://www.stat.berkeley.edu/~stark/Seminars/cels09.pdf>
92. Risk-Limiting Audits, Audit Working Meeting, American Statistical Association, Arlington, VA, 23–24 October 2009. <https://www.stat.berkeley.edu/~stark/Seminars/asa09.pdf>
91. Invited panelist, Uncertainty Quantification and Error Analysis, Scientific Grand Challenges in National Security: the Role of Computing at the Extreme Scale, Washington, DC, 6–8 October 2009.
90. Some Ado about (mostly) Nothing: zero-dominated data, Alameda County Workshop on Avian Mortality at Altamont, Emeryville, CA, 22 September 2009. <https://www.stat.berkeley.edu/~stark/Seminars/altamont09.pdf>
89. Freedman’s Dialogue with the Social Sciences, 2009 Joint Statistical Meetings, Washington, DC, 5 August 2009.
88. Invited panelist, David A. Freedman’s Dialogue with the Social Sciences, The Society for Political Methodology 26th Annual Summer Meeting, Institution for Social and Policy Studies, Yale University, New Haven, CT, 23 July 2009.

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87. Election Auditing: How Much is Enough?, The Society for Political Methodology 26th Annual Summer Meeting, Institution for Social and Policy Studies, Yale University, 23 July 2009. (Keynote lecture) <http://www.stat.berkeley.edu/~stark/Seminars/polMeth09.pdf>
86. Risk-Limiting Post-Election Audits, Department of Statistics, University of California, Berkeley, CA, 31 March 2009. <https://www.stat.berkeley.edu/~stark/Seminars/ucb09.pdf>
85. Uncertainty Quantification Qualification, Lawrence Livermore National Laboratory, Livermore, CA, 26 March 2009. <https://www.stat.berkeley.edu/~stark/Seminars/llnl09.pdf>
84. 2008 Risk-limiting Audits in California, The Pew Charitable Trusts Audit Workshop, Salt Lake City, UT, 23–24 February 2009. <https://www.stat.berkeley.edu/~stark/Seminars/pew09.pdf>
83. Election Auditing and Nonparametric Confidence Bounds, Department of Mathematics, Reed College, Portland, OR, 20 November 2008. <https://www.stat.berkeley.edu/~stark/Seminars/reed08.pdf>
82. Risk-Limiting Post-Election Audits, Department of Statistics, Kansas State University, Manhattan, KS, 2 October 2008. <https://www.stat.berkeley.edu/~stark/Seminars/ksu08.pdf>
81. CAST: Canvass Audits by Sampling and Testing, 2008 American Political Science Association Annual Meeting, Panel 2008MP04292: Catch Me If You Can: Techniques to Detect Electoral Fraud, Boston, MA, 28–31 August 2008. <https://www.stat.berkeley.edu/~stark/Seminars/apsa08.pdf>
80. Invited panelist, Joint Statistical Meetings session, Statistical Measures Can Help Restore Confidence in U.S. Elections, Denver, CO, 3–7 August 2008.
79. Invited Panel on Post-Election Auditing: The Academic & Advocacy Perspective, California Association of Clerks and Election Officials (CACEO) 100th Anniversary Celebration Conference, Long Beach, CA, 8–11 July 2008.

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78. Statistical Audits: Why and How Much?, Invited Panel on Post-Election Auditing: Practical Experience and Best Practices, California Association of Clerks and Election Officials (CACEO) 100th Anniversary Celebration Conference, Long Beach, CA, 8–11 July 2008. <https://www.stat.berkeley.edu/~stark/Seminars/caceo08.pdf>
77. Invited Panel on Online Learning, UC21st Century, Teaching, Learning and Technology: Past, present and future, University of California, Davis, 20–21 June 2008.
76. SticiGui—What is it?, Department of Statistics, University of California, Los Angeles, CA, 29 May 2008. <https://www.stat.berkeley.edu/~stark/Seminars/ucla08.pdf>
75. Election Auditing: How Much Is Enough?, Mathematical Sciences Research Institute, Annual Meeting of Academic Sponsors and Steering Committee, Berkeley, CA, 7 March 2008. <https://www.stat.berkeley.edu/~stark/Seminars/msri08.pdf>
74. Invited panelist, 2007 Post Election Audit Summit, Minneapolis, MN, 25–27 October 2007. <https://www.stat.berkeley.edu/~stark/Seminars/peaSummit07.pdf>
73. Urning Voter Confidence, Department of Mathematics, Reed College, Portland, OR, 11 October 2007. <https://www.stat.berkeley.edu/~stark/Seminars/reed07.pdf>
72. Frequentist Methods in Inverse Problems, Sandia CSRI Workshop on Large-Scale Inverse Problems and Quantification of Uncertainty, Santa Fe, NM, 10–12 September 2007. <https://www.stat.berkeley.edu/~stark/Seminars/sandia07.odp>
71. How Statistics Helps, 9th US Congress on Computational Mechanics, San Francisco, CA, 22–26 July 2007. <https://www.stat.berkeley.edu/~stark/Seminars/compMech07.odp>
70. Nonparametrics: nonpareil?, Veterans Administration Hospital, Neuropsychology Brown Bag Lunch, Martinez, CA, 15 May 2007. <https://www.stat.berkeley.edu/~stark/Seminars/ebire-5-15-07.pdf>

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69. The Null Hypothesis: Are Earthquakes Predictable?, Assessment schemes for earthquake prediction, Royal Astronomical Society/Joint Association for Geophysics Discussion Meeting 7–8 November 1996, the Geological Society, London
68. Shaking Down Earthquake Predictions, Department of Statistics, University of California, Davis, 25 May 2006 <https://www.stat.berkeley.edu/~stark/Seminars/ucd-5-25-06.pdf>
67. Measuring Resolution in Nonlinear and Constrained Inverse Problems, Workshop on Statistical Inverse Problems, Institute for Mathematical Stochastics, Göttingen, Germany, 23–25 March 2006. http://www.num.math.uni-goettingen.de/gk/?Workshops:Workshop_on_Statistical_Inverse_Problems
66. Resolution in Nonlinear and Constrained Inverse Problems, Workshop on Computational and Mathematical Geoscience, Colorado School of Mines, Golden CO, 15–17 June 2005.
65. Quantifying uncertainty in inverse problems, Summer school: Mathematical Geophysics and Uncertainty in Earth Models, Colorado School of Mines, Golden CO, 14–25 June 2004. <https://www.stat.berkeley.edu/~stark/Seminars/mines04.pdf>
64. Estimating power spectra of galaxy structure: can Statistics help?, Penetrating bars through masks of cosmic dust: the Hubble tuning fork strikes a new note, Pilanesberg National Park, South Africa, 7–12 June 2004. <http://www.stat.berkeley.edu/~stark/Seminars/bars04.ppt>
63. Quantifying uncertainty in inverse problems, Institute for Pure and Applied Mathematics (IPAM) Conference on Statistical Methods for Inverse Problems, IPAM, Los Angeles, CA, 5–6 November 2003. <https://www.stat.berkeley.edu/~stark/Seminars/ipam03.ppt>
62. Using what we know: inference with physical constraints, PhysStat 2003: Statistical Problems in Particle Physics, Astrophysics and Cosmology, Stanford Linear Accelerator Center, Stanford, CA, 8–10 September 2003. <https://www.stat.berkeley.edu/~stark/Seminars/phyStat03.pdf>

61. Statistical Approaches to Inverse Problems. Danish Interdisciplinary Inversion Group Seminars on Inverse Problems: Insight and Algorithms. Niels Bohr Institute, Copenhagen University, Copenhagen, Denmark, 27–29 May 2002. <https://www.stat.berkeley.edu/~stark/Seminars/bohr02.ppt>
60. Statistical Measures of Uncertainty in Inverse Problems. Institute for Mathematics and its Applications Tutorial on Inverse Problems and the Quantification of Uncertainty, Annual Program Mathematics in the Geosciences, Minneapolis, MN, 19 March 2002. <https://www.stat.berkeley.edu/~stark/Seminars/ima02.ppt>
59. Data Errors, Model Errors, and Estimation Errors, Frontiers of Geophysical Inversion Workshop, Waterways Experiment Station, U.S. Army Corps of Engineers Engineer Research and Development Center, Vicksburg, MS, 17–19 February 2002. <https://www.stat.berkeley.edu/~stark/Seminars/wes02.ppt>
58. Strategic Planning and Implementation I: The Challenge of Adapting Organizations and Creating Partnerships to Target New Markets, University Teaching as E-business?, Center for Studies in Higher Education, Berkeley, CA, 26–27 October 2001.
57. Inverse Problems and Data Errors, New Developments in Astrophysical Fluid Dynamics, Chateau de Mons, Caussens, France, 25–29 June 2001.
56. Data Reduction and Inverse Problems in Helioseismology, Workshop Statistics of inverse problems, Institut Henri Poincaré, Paris, France, 28–29 May 2001.
55. Why Statistics is worth the Stigma, Letters and Sciences Faculty Forum, University of California, Berkeley, CA, 23 April 2001. <https://www.stat.berkeley.edu/~stark/Seminars/stigma01.ppt>
54. Inverse Problems in Helioseismology, Second MaPhySto Workshop on Inverse Problems: Inverse problems from a Statistical Perspective, Aalborg, Denmark, 28–31 March 2001.
53. What are the Chances?, NATO Advanced Research Workshop: State of scientific knowledge regarding earthquake occurrence and implications

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for public policy, Le Dune, Piscinas — Arbus, Sardinia, Italy, 15–19 October 2000.

52. Why Unadjusted Census Results should be Used for Reapportionment and Funding within the State of California, 13th Annual Demographic Workshop, U.S. Bureau of the Census, California State Census Data Center, and the Population Research Laboratory of the University of Southern California, Los Angeles, CA, 15 May 2000.
51. Invited discussant, Workshop of the National Academy of Sciences Panel to Review the 2000 Census, Washington, D.C., 2–3 February 2000.
50. Invited discussant, Panel discussion on the role of sampling in the US Census, San Francisco Bay Area Chapter of the American Statistical Association, 20 December 1999.
49. Lecturer, Mathematical Geophysics Summer School, Stanford University, Stanford, CA, 2–20 August 1999.
48. Less Asymptotic Tomography. 9th SOHO Workshop: Helioseismic Diagnostics of Solar Convection and Activity, Stanford University, Stanford, CA, 12–15 July 1999.
47. Invited panelist, Reinventing Undergraduate Education: Technology Enhanced Learning in the Sciences, Math, and Engineering, University of California, Berkeley, CA, 23 April 1999.
46. Error in Numerical Models Fitted to Data. DSRC/DARPA Study on Numerical Simulation of Physical Systems: The State of the Art, and Opportunities for Further Advances, Kick-Off Meeting, Arlington, VA, 19–20 January 1999. <https://www.stat.berkeley.edu/~stark/Seminars/dsrc99.htm>
45. Sampling to Adjust the U.S. Census. Miller Institute for Basic Research in Science, University of California, Berkeley, CA, 12 January 1999. <https://www.stat.berkeley.edu/~stark/Seminars/mibrs99.htm>
44. A Statistician’s Perspective on Census Adjustment, Berkeley Breakfast Club, Berkeley, CA, 5 December 1998. <https://www.stat.berkeley.edu/~stark/Seminars/bbc98.htm>

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43. SticiGui: Melts in your Browser, not in your Brain, Joint Berkeley-Stanford Statistics Colloquium, Department of Statistics, Stanford University, Stanford, CA, 27 October 1998. <https://www.stat.berkeley.edu/~stark/Seminars/bsc98.htm>
42. SticiGui: Statistics Tools for Internet and Classroom Instruction with a Graphical User Interface, 1998 Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, Orlando, FL, 12 August 1998.
41. Presidential Panel on Statistics in Public Policy, 1998 Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, Orlando, FL, 10 August 1998.
40. Misfit Measures and Statistical Inconsistency in Linear Inverse Problems. AMS/IMS/SIAM Joint Summer Research Conferences in the Mathematical Sciences, Mathematical Methods in Inverse Problems for Partial Differential Equations, Mt. Holyoke, MA, 4–9 July 1998. <https://www.stat.berkeley.edu/~stark/Seminars/ams-ims-siam-98.pdf>
39. Uncertainties for functions from incomplete, erroneous data. NSF/DOE Workshop on Uncertainty in Modeling, National Science Foundation, Arlington, VA, 11–12 June 1998. <https://www.stat.berkeley.edu/~stark/Seminars/nsf-doe-98.htm>
38. Sampling to adjust the 1990 Census for Undercount. U.S. House of Representatives Subcommittee on the Census, May 1998. <https://www.stat.berkeley.edu/~stark/Census/house-5-5-98-pbs.pdf>
37. Sounding the Sun: Helioseismology. 1998 American Association for the Advancement of Science (AAAS) Annual Meeting and Science Innovation Exposition, Philadelphia, PA., February 1998. <https://www.stat.berkeley.edu/~stark/Seminars/Aaas/helio.htm>
36. Data Sampling Rate Reduction for the OERSTED geomagnetic Satellite, Department of Geological Sciences, Stanford University, Stanford, CA, 28 July 1997. <https://www.stat.berkeley.edu/~stark/Preprints/Oersted/writeup.htm>

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35. Does God play dice with the Earth, and if so, are they loaded? Fourth SIAM Conference on Mathematical and Computational Methods in the Geosciences, Albuquerque, NM, 16 June 1997. <https://www.stat.berkeley.edu/~stark/Seminars/doesgod.htm>
34. Solving Problems for a Large Statistics Lecture Course using a Website UC Berkeley Academic Senate Workshop on Classroom Technology, Berkeley, CA, 11 April 1997. <https://www.stat.berkeley.edu/~stark/Seminars/itpTalk.htm>
33. Deficiencies of the simple theories, Local Helioseismology Workshop, University of Cambridge, Cambridge, England, 1997.
32. CMB's, Royal Astronomical Society Ordinary Meeting, London, England, 1996.
31. The Null Hypothesis, Royal Astronomical Society and Joint Associations for Geophysics discussion meeting on Assessment of Schemes for Earthquake Prediction, London, England, 1996.
30. On the consistency of multiple inference in inverse problems using l_p confidence sets, International Conference on Multiple Comparisons, Tel Aviv, Israel, 1996.
29. Confidence Intervals in Inverse Problems, Conference in Honor of George Backus, Institute for Geophysics and Planetary Physics, La Jolla, CA, 1995.
28. The Need for Wave-Equation Travel-Time Tomography, Institute for Mathematics and Its Applications, Conference on Tomography, Minneapolis, MN, 1995.
27. Inference, Prior Information, and Misfit Measures, Interdisciplinary Inversion Conference on Methodology, Computation and Integrated Applications, University of Aarhus, Aarhus, Denmark, 1995.
26. Optimization and Inference in Travel-Time Seismology, National Research Council Board on Mathematical Sciences Symposium on Mathematical Sciences in Seismology, Washington, DC, 1995.

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25. Prior Information and Confidence Intervals in Inverse Problems, International Union of Geodesy and Geophysics Meeting, Boulder, CO, 1995.
24. Something AGAINST Nothing: A Confidence Game, Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, Orlando, FL, 1995.
23. Uncertainties in Travel-Time Seismology, SIAM/GAMM Symposium on Inverse Problems: Geophysical Applications, Fish Camp, CA, 1995.
22. Toward Tubular Tomography, 27th General Assembly of the Int. Assoc. of Seismology and Phys. of the Earth's Inter. (IASPEI), Wellington, New Zealand, 1994.
21. Alternative Data Analysis Techniques, Global Oscillation Network Group annual meeting, Los Angeles, CA, (presented by C. Genovese due to illness), 1994.
20. Mathematical Aspects of Integral Equation Inversion, Global Oscillation Network Group workshop, Sydney, Australia, 1994.
19. Conservative Finite-Sample Confidence Envelopes for Monotone and Unimodal Densities, Mathematisches Forschungsinstitut Oberwolfach meeting on Curves, Images and Massive Computation, Oberwolfach, Germany, 1993.
18. Invited discussant, Joint IMS/ASA/ENAR Meeting, Philadelphia, PA, 1993.
17. Uncertainty of the Quadrupole Component of the Cosmic Microwave Background, Israel Statistical Association Annual Meeting, Tel Aviv, 1993.
16. Brute-Force Minimax Estimation in Geochemistry, Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, San Francisco, CA, 1993.

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15. Conservative Numerical Uncertainty Estimates in Inverse Problems, SIAM 40th Anniversary Meeting, Los Angeles, CA, 1992.
14. Minimax Estimation in Geomagnetism, European Geophysical Society Annual Meeting, Wiesbaden, Germany, 1991.
13. Minimax Estimation in Geophysical Inverse Problems: Applications to Seismic Tomography and Geomagnetism, Schmitt Institute for Physics of the Earth, Academy of Sciences of the USSR, Moscow, 1991.
12. Imagining Earth's Interior: Controversies in Seismology and Geomagnetism, Mathematical Sciences Research Institute Workshop on Statistical Methods in Imaging, Berkeley, CA, 1991.
11. Discretization and its Discontents: New Methods in Inverse Theory, Institute for Theoretical Physics program Helioseismology—Probing the Interior of a Star, National Science Foundation Institute for Theoretical Physics, University of California, Santa Barbara, 1990.
10. Inference in Infinite-Dimensional Inverse Problems, Schmitt Institute for Physics of the Earth, Academy of Sciences of the USSR, Moscow, 1990.
9. Inference in Infinite-Dimensions: Discretization and Duality, Israel Statistical Association Annual Meeting, Jerusalem, 1990.
8. Superresolution: What, When and How?, Institute for Theoretical Physics program Helioseismology—Probing the Interior of a Star, National Science Foundation Institute for Theoretical Physics, University of California, Santa Barbara, 1990.
7. Sparsity-Constrained Deconvolution, International Union of Radio Science Meeting, Boulder, CO, 1989.
6. Invited discussant, Statistics, Earth and Space Sciences Meeting of the Bernoulli Society, Leuven, Belgium, 1989.
5. Rigorous Computer Solutions to Infinite-Dimensional Inverse Problems, rcp 264 problemes inverses, Montpellier, France, 1989.
4. Duality and Discretization Error, Conference on Mathematical Geophysics, Blanes, Spain, 1988.

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3. Spectral extrapolation with positivity, International Union of Radio Science Meeting, Boulder, CO, 1987.
2. Travel-Time Constraints on Core Structure, Special Session on Geophysics of the Core and Core-Mantle Boundary, American Geophysical Union Spring Meeting, Baltimore, MD, 1986.
1. Smooth Models from $\tau(p)$ and $X(p)$ Data, Scripps Industrial Associates Short Course on Inverse Theory, Scripps Institution of Oceanography, La Jolla, CA, 1986.

Other Invited Seminars

California State University, Chico (Mathematics 1993)

Colorado School of Mines (Mathematical and Computer Sciences 1997)

Copenhagen University (Niels Bohr Institute for Astronomy, Physics, and Geophysics 1996)

Hebrew University of Jerusalem (Statistics 1993)

IT University of Copenhagen (2013, 2014, 2016)

Kansas State University (Statistics 2008)

Pennsylvania State University (Statistics 1010)

National Solar Observatory (1997)

Naval Postgraduate School (Operations Research, 2001)

Reed College (Mathematics, 2007, 2008, 2011)

Rice University (Statistics, 2010)

Schlumberger-Doll Research (1988, 1990, 1991, 1992)

Southern Methodist University (Statistical Sciences, 1998)

Stanford University (Center for Space Physics and Astrophysics 1992; Mathematics 1997; Geology and Geophysics 1993, 1997; Statistics 1988, 1993, 1995, 2011)

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The Technion (Statistics 1987)

Tel Aviv University (Geology and Geophysics 1988, 1991; Statistics 1991, 2010)

University of Bologna (Physics and Astronomy, 2013)

University of British Columbia (Geophysics and Astronomy 1996)

University of California, Berkeley (Astronomy 1996; Center for Pure and Applied Mathematics 1988; Geology and Geophysics 1988; Materials Science and Mineral Engineering 1988; Physics, 2001; Seismographic Stations, 1991, 1992, 1996; Statistics 1987, 1988(2), 1989(2), 1990, 1991, 1992, 1994, 1996(2), 1997, 2006, 2009, 2011)

University of California, Davis (Statistics 1995, 2006; Mathematics 2000)

University of California, Los Angeles (Mathematics 1992; Statistics 2000, 2008, 2013)

University of California, Riverside (Earth Sciences 1996; Statistics 1996)

University of California, San Diego (Institute for Geophysics and Planetary Physics 1985, 1986, 1987, 1988(2), 1990, 1998, 2005; Mathematics 1994)

University of Cambridge (Institute for Astronomy 1992, 1997)

University of Chicago (Statistics 1990)

University of Edinburgh (Earth Sciences, 1998)

University of Luxembourg (Interdisciplinary Centre for Security, Reliability and Trust 2012)

University of Paris, Institute de Physique du Globe de Paris (2011)

University of Pennsylvania (Wharton Statistics Department, 2011)

University of Texas at Austin (Geological Sciences 1988; Mathematics 1990, 1991; Institute for Geophysics 1990)

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Veterans Affairs Northern California Health Care System, Martinez, CA (East Bay Institute for Research and Education, 2007)

Yale University (Geology and Geophysics 1988; Statistics 1988)

Press

217. A.I. Is Helping Scientists Predict When and Where the Next Big Earthquake Will Be, Thomas Fuller and Cade Metz, *The New York Times*, 26 October 2018. <https://www.nytimes.com/2018/10/26/technology/earthquake-predictions-artificial-intelligence.html>
216. Mega Millions Frenzy At A Fever Pitch Ahead Of Tuesday Night Drawing, Don Ford, *KPIX CBS Television*, 23 October 2018. <https://sanfrancisco.cbslocal.com/2018/10/23/mega-millions-frenzy-at-a-fever-pitch-ahead-of-tuesday-night-drawing/>
215. Innovators Look To “Accidental Crops” as a Nutritious, Environmentally Friendly and Free Source of Food, Natalie Parletta, *Ensia*, 28 September 2018. <https://ensia.com/articles/wild-greens/>
214. Can Urban Soil Offer Edible Weeds Fit for Foraging?, Eden Stiffman, *Civil Eats*, 21 September 2018. <https://civileats.com/2018/09/21/can-urban-soil-offer-edible-weeds-fit-for-foraging/>
213. Georgia Voters—out of Country, out of Luck?, Sean Steinberg, *WhoWhatWhy*, 11 September 2018. <https://whowhatwhy.org/2018/09/11/georgia-voters-out-of-country-out-of-luck/>
212. Even Scientists Jump to Conclusions—and That’s a Problem, *Cosmos: The Science of Everything*, Paul Biegler, 6 September 2018, <https://cosmosmagazine.com/social-sciences/even-scientists-jump-to-conclusions-and-that-s-a-problem>
211. Elections Scholar: Kansas Voting System Would Allow Undetectable Tampering, Jennifer Cohn, *TYT*, 6 September 2018. <https://tyt.com/stories/4vZLCHuQrYE4uKagy0oyMA/5YIEQxHW5qmWayG0kYCSy2>

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210. West Virginia is testing a mobile voting app for the midterms. What could go wrong?, Jen Kirby, *Vox*, 17 August 2018. <https://www.vox.com/2018/8/17/17661876/west-virginia-voatz-voting-app-election-security>
209. Election Security Hot Topic at Walnut Creek Town Hall, Debora Villalon, *KTVU*, 14 August 2018. <http://www.ktvu.com/news/election-security-hot-topic-at-congressional-town-hall-in-walnut-creek>
208. Weeds growing in poor city areas more nutritious than store-bought produce, Natalie Parletta, *Cosmos: The Science of Everything*, 13 August 2018. <https://cosmosmagazine.com/biology/weeds-growing-in-poor-city-areas-more-nutritious-than-store-bought-produce>
207. Voting Machine Company Admits Installing Vulnerable Remote-Access Software, Jimmy Falls, *Who. What. Why*, 19 July 2018. <https://whowhatwhy.org/2018/07/19/voting-machine-company-admits-installing-vulnerable-remote-access-software/>
206. Can the Emmys Be Hacked? One contender tried to find out, Geoff Edgers, *Washington Post*, 2 June 2018. <https://www.washingtonpost.com/news/arts-and-entertainment/wp/2018/06/22/can-the-emmys-be-hacked-one-contender-tried-to-find-out/>
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rate. As of 21 October 2015, this was one of the 50 most popular MOOCs of all time)

BerkeleyX 2.2x* <https://www.edx.org/course/uc-berkeleyx/uc-berkeleyx-stat2-2x-introduction-685>, an Introductory Statistics MOOC (20,871 students enrolled in first offering; 17% completion rate)

BerkeleyX 2.3x* <https://www.edx.org/course/uc-berkeleyx/uc-berkeleyx-stat2-3x-introduction-825>, an Introductory Statistics MOOC (22,443 students enrolled in first offering; 12% completion rate)

Introduction to Statistics (Statistics 2)

Introduction to Probability and Statistics (Statistics 20)

Introductory Probability and Statistics for Business (Statistics 21, N21*, W21*)

Introduction to Probability and Statistics for Scientists and Engineers (Statistics 25)

Societal Risks and the Law* (Statistics C79)

Freshman Seminar on Statistics (Statistics 39)

Statistical Inferences for Social and Life Scientists (Statistics 131A)

Concepts of Probability (Statistics 134)

Concepts of Statistics (Statistics 135)

Linear Modeling: Theory and Applications (Statistics 151A)

Nonparametric Inference and Sensitivity Auditing with Applications to Social Good* (Statistics 157)

Reproducible and Collaborative Statistical Data Science* (Statistics 157, now 159/259). Video review: <http://youtu.be/Bq71Pqdukeo>

Probability and Statistics for Physical Science and Engineering PhD Students*

Statistics for Engineering PhD students*

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Introduction to Probability and Statistics at an Advanced Level (Statistics 200A)

Theoretical Statistics (Statistics 210B)

Statistical Models: Theory and Applications (Statistics 215A, Statistics 215B)

Not enough Statistics for Journalists* (Journalism 219)

Statistics Masters Program Capstone* (Statistics 222)

Nonparametric and Robust Methods (Statistics 240)

Topics in Probability and Statistics (Statistics 260)

Statistical Consulting (Statistics 272)

* Course I created or co-created.

Former Graduate Students and Postdocs

Imola K. Fodor, Roche

Johann Gagnon-Bartsch, University of California, Berkeley

Christopher R. Genovese, Carnegie Mellon University

Niklaus W. Hengartner, Los Alamos National Laboratory

Janne Huttunen, University of Auckland and University of Kuopio

Bradley Luen, Indiana University

Tian Luo, U.S. Bureau of Labor Statistics

Dmitry I. Nikolayev, Schmidt Institute for Physics of the Earth

R. Jay Pulliam, University of Texas at Austin

Karthik Ram, University of California, Berkeley

Jeffery Regier, University of California, Berkeley

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Chad M. Schafer, Carnegie Mellon University

Daniel Turek, University of California, Berkeley

Vincent S. Yates, Yammer

Graduate Committees

1. Alameida, Jose, Mathematics. Ph.D. qualifying examination, 2008
2. Atz, Milos, Nuclear Engineering. Ph.D. qualifying examination, 2018
3. Bach, Andre, Physics. Ph.D. qualifying examination, 2011
4. Bar-Yossef, Ziv, Computer Science. Ph.D. qualifying examination, 2001; dissertation committee, "The Complexity of Massive Data Set Computations," 2002
5. Bein, Ed, Biostatistics. MA examination, 2002
6. Berny, Axel Dominique, EECS. Ph.D. qualifying examination, 2004; dissertation committee, "Analysis and Design of Wideband LC VCOs," 2006
7. Bertelli, E., IEOR. Ph.D. qualifying examination, 2018
8. Bloniarz, Adam, Statistics. Ph.D. qualifying examination, 2014
9. Bodik, Peter, Computer Science. Ph.D. qualifying examination, 2007; dissertation committee, "Automating Datacenter Operations Using Machine Learning," 2010
10. Bowman, John Penfield, IEOR. Ph.D. qualifying examination, 2003
11. Bunn, Emory Freeman, Physics. Ph.D. qualifying examination, 1994; dissertation committee, "Statistical Analysis of Cosmic Microwave Background Anisotropy," 1995
12. Burleigh, Kaylan, Astronomy. Ph.D. qualifying examination, 2016, 2017; dissertation committee, "A Monte Carlo Method for Identifying Imaging Systematics in Galaxy Surveys," 2018

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13. Burstein, Richard David II, Mathematics. Ph.D. qualifying examination, 2004; dissertation committee, "Hadamard Subfactors of Bisch-Haagerup Type," 2008
14. Buttrey, Samuel Edward, Statistics. Ph.D. qualifying examination, 1994; dissertation committee, "Nearest-Neighbor Classification with Categorical Variables," 1996
15. Calef, Brandoch Hugh, Applied Mathematics. Ph.D. qualifying examination, 1997; dissertation committee, "Optimal Sampling of the Discrete Fourier Transform," 2002
16. Charman, Andrew Emile, Physics. Ph.D. qualifying examination, 2003; dissertation committee, "Random Aspects of Beam Physics and Laser-Plasma Interactions," 2006
17. Chen, Raymond Lei, EECS. Ph.D. qualifying examination, 1993; dissertation committee, "A Qualitative Modeling Framework of Semiconductor Manufacturing Processes: Self-Learning Fuzzy Inference System and the Statistical Analysis of Categorical Data," 1994
18. Chien, George, EECS. Ph.D. qualifying examination, 1998
19. Fernandez, Arturo, Statistics. Ph.D. qualifying examination, 2017
20. Feldman, Arnold R., EECS. Ph.D. qualifying examination, 1995; dissertation committee, "High-Speed, Low-Power Sigma-Delta Modulators for RF Baseband Channel Applications," 1997
21. Fodor, Imola K., Statistics. Ph.D. qualifying examination, 1997; chair, dissertation committee, "Spectrum Estimation in Helioseismology," 1999
22. Fong, Keng Leong, EECS. Ph.D. qualifying examination, 1996; dissertation committee, "Design and Optimization Techniques for Monolithic RF Downconversion Mixers," 1997
23. Gagnon-Bartsch, Johann, Statistics. Ph.D. qualifying examination, 2009; co-chair, dissertation committee "Removing Unwanted Variation from Microarray Data with Negative Controls," 2012

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24. Gawiser, Eric Joseph, Physics. Ph.D. qualifying examination, 1998
25. Genovese, Christopher Ralph, Statistics. Ph.D. qualifying examination, 1992; chair, dissertation committee, "Statistical Problems in Helioseismology," 1994
26. Goldman, Megan, Biostatistics. Chair, Ph.D. qualifying examination, 2009
27. Gung, Yuan-Cheng, Geophysics. Dissertation committee, "Q Tomography of the Earth Mantle," 2003
28. Hansen, Bendek, Statistics. Chair, MA thesis committee, "Minimax Expected Length Confidence Intervals," 2000
29. Hansen, Mark Henry, Statistics. Chair, Ph.D. qualifying examination, 1992
30. Hengartner, Niklaus Walther, Statistics. Co-chair, dissertation committee, "Topics in Density Estimation," 1993
31. Higgins, Mike, Statistics. Ph.D. qualifying examination, 2009, 2010
32. Huang, Hsiang-Ping, Mathematics. Ph.D. qualifying examination, 1996
33. Huang, Jianhua, Statistics. Ph.D. qualifying examination, 1994; dissertation committee, "Topics in Extended Linear Modeling," 1997
34. Huang, Yuanlin, Civil Engineering. Ph.D. qualifying examination, 1993, 1994
35. Jiang, Xuesong, EECS. Ph.D. qualifying examination, 2001
36. Jones, David Morgan, Mathematics. Ph.D. qualifying examination, 1994; dissertation committee, "On Modular Galois Representations in Characteristic 3," 1998
37. Katsis, Dimitrios, EECS. Ph.D. qualifying examination, 2005
38. Kiesling, Max Karl, Civil Engineering. Ph.D. qualifying examination, 1994

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39. Kuusela, Mikael Johan, Statistics, École Polytechnique Fédérale de Lausanne, dissertation committee, “Uncertainty quantification in unfolding elementary particle spectra at the Large Hadron Collider,” 2016
40. Lara, Jose Daniel, Energy and Resources Group. Ph.D. qualifying examination, 2018
41. Li, Bo, Statistics. Ph.D. qualifying examination, 2004
42. Li, Wenyu, Mechanical Engineering. Ph.D. qualifying examination, 2017
43. Loscutoff, Peter, Physics. Ph.D. qualifying examination, 2011; dissertation committee, “Search for resonant $WZ \rightarrow l\nu\ell\ell$ production using $13fb^{-1}$ in $\sqrt{s} = 8TeV$ pp collisions with the ATLAS detector,” 2013
44. Luen, Bradley, Statistics. Ph.D. qualifying examination, 2006; Chair, dissertation committee, “Earthquake Prediction: Simple Methods for Complex Phenomena,” 2010
45. Luo, Tian, Statistics. MA thesis chair, “Nonparametric estimation of business survival with an application to restaurant startups,” 2014
46. Madar, Vered, Statistics and Operations Research, Tel Aviv University. MA thesis committee, “Non-equivariant confidence intervals,” 2002; Ph.D. committee, “Simultaneous Confidence Intervals for Multiple Parameters with More Power to Determine the Sign,” 2007
47. Maurer, Tessa, Civil and Environmental Engineering. Ph.D. qualifying examination, 2018
48. Megnin, Charles Henri, Geophysics. Ph.D. qualifying examination, 1996; dissertation committee, “The Shear Velocity Structure of the Mantle from the Inversion of Time-Domain Waveform Data,” 1999
49. Mieler, Michael William, Civil Engineering. Ph.D. qualifying examination, 2011
50. Millman, Kenneth Jarrod, Biostatistics. MA thesis committee, “permute—a Python package for permutation tests and confidence sets,” 2015

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51. Miratrix, Luke W., Statistics. Chair, Ph.D. qualifying examination, 2010
52. Mohanty, Sudatta, Civil Engineering. Ph.D. qualifying examination, 2017
53. Murmann, Boris, EECS. Ph.D. qualifying examination, 2002; dissertation committee, "Digital Calibration for Low-Power High-Performance A/D Conversion," 2003
54. Oreluk, James, Mechanical Engineering. Ph.D. qualifying examination, 2017
55. Ottoboni, Kellie, Statistics. Ph.D. qualifying examination, 2017
56. Ou, Jeffrey Jiajiunn, EECS. Ph.D. qualifying examination, 1995
57. Petkov, Vladimir Plamenov, EECS. Ph.D. qualifying examination, 2003
58. Poobuapheun, Nuntachai, EECS. Ph.D. qualifying examination, 2005; dissertation committee, "LNA and Mixer Designs for Multi-Band Receiver Front-Ends," 2009
59. Puente, Suzette, Statistics. M.A. committee, 2013
60. Pulliam, R. Jay, Geophysics. Ph.D. dissertation committee, "Imaging Earth's Interior: Tomographic Inversion of Mantle P-Wave Velocity Structure," 1991
61. Qian, Kun, EECS. Ph.D. qualifying examination, 2009; dissertation committee, "Variability Modeling and Statistical Parameter Extraction for CMOS Devices," 2015
62. Regier, Jeffery, Statistics. Chair, M.A. committee, 2013; dissertation committee, "Topics in large-scale statistical inference," 2016
63. Rein, Steven Richard, Statistics. Chair, Ph.D. qualifying examination, 1990
64. Rossi, Jim, Journalism. M.A. thesis committee, "Reverse-engineering the Echo Chamber," 2017

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65. Schafer, Chad Michael, Statistics. Ph.D. qualifying examination, 2001; chair, dissertation committee, “Constructing Confidence Regions of Optimal Expected Size: Theory and Application to Cosmic Microwave Inference,” 2004
66. Son, Sang Won, EECS. Ph.D. qualifying examination, 2000; dissertation committee, “High Dynamic Range CMOS Mixer Design,” 2002
67. Stern, Aaron James, Computational Biology. Ph.D. qualifying examination, 2017.
68. Suzuki, Toru, Demography. Ph.D. qualifying examination, 1995; dissertation committee, “Projection of Households in Japan with a Dynamic Macro-Simulation Model,” 1999
69. Tee, Luns, EECS. Ph.D. qualifying examination, 2001
70. Tenorio, Luis-Francisco, Mathematics. Ph.D. dissertation committee, “Asymptotic Dynamics of Locally Oblique Solitary Wave Solutions of the KP Equation,” 1992
71. Thompson, Neil, Statistics. M.A. committee, 2012
72. To, Albert Chi Fu, Statistics. M.A. committee, 2005
73. Wagner, Tim Allen, CS. Ph.D. qualifying examination, 1995; dissertation committee, “Practical Algorithms for Incremental Software Development Environments,” 1997
74. Wang, Jason, Astronomy. Ph.D. qualifying examination, 2017; dissertation committee, “Footage of Other Worlds: Unveiling the Dynamical Architecture of Young Exoplanetary Systems,” 2018
75. Wicks, Charles Wesley Jr., Geophysics. Ph.D. qualifying examination, 1990; dissertation committee, “An Investigation of Mantle Discontinuities Beneath the Southwest Pacific,” 1994
76. Wilhelm, Matthieu, Université de Neuchâtel, Statistics. Ph.D. dissertation committee, “Random sampling with repulsion,” 2017
77. Yao, Shijing, EECS. Ph.D. qualifying examination, 2015

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78. Yates, Vincent, Statistics. Chair, M.A. committee, 2012
79. Ying, Jun, Naval Architecture. D. Eng. qualifying examination, 1995; dissertation committee, “Development and Verification of Computer Simulation Models for Evaluation of Siting Strategies and Evacuation Procedures for Mobile Drilling Units in Hurricanes,” 1996
80. Zhang, Xiaoyan, Statistics. Ph.D. qualifying examination, 1997
81. Zagheni, Emilio, Demography. Ph.D. qualifying examination, 2008
82. Zamora, Joel Barajas, UC Santa Cruz, EE. Ph.D. dissertation defense, 2015; dissertation committee, “Online Display Advertising Causal Attribution and Evaluation,” 2015

First-year PhD advising

2014–15 Thanh-Nhan (Andrew) Do

2014–15 Kellie Ottoboni

2016–17 Jake Soloff

Current PhD advisees

2014– Kellie Ottoboni

2018– Amanda Glazer

Undergraduate Research and Honors Thesis Advisees

2018 Omar Buenrostro, Alan Chuang, Christopher Fan, Jin Kweon, James Li, Hubert Luo, William Ma, Jiazhong (Frank) Mei, Arun Ramamurthy, Avi Sen, Neil Sharma, Karen Tu, Zihui (Lucy) Wang, Steven Ye, Saam Zahedian, Wentao Zhan

2015 Fang Cai, Catherine Darin (U. Pennsylvania)

2014 Hriday Kemburu, He Ma, Rachel Redberg

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2010–2011 Katherine McLaughlin
 2010 Aaron Taylor, Hua Yang
 2009 Joshua M. Levin
 2008 Jonathan Ong
 2007 Gerold Ng
 2003–2004 Feng Tang
 1993–1996 Dendy Harjanto
 1988–1993 10 others

Service

Professional Societies and Government Agencies

- 2018 – Advisory Board, U.S. Election Assistance Commission
 – Consultant, Colorado Secretary of State
 – Reviewer, National Academies of Sciences, Engineering, and Medicine, Policy and Global Affairs Division
 – Editorial Board, *ScienceOpen*
 – Chair for Auditability, IEEE/NIST Voting System Standards Committee (VSSC) Working Group For Voting Methods Mathematical Models (C/VSSC/1622.X_WG)
 – Organizing Committee, Election Audit Summit, Caltech/MIT Voting Technology Project, December 2018. <https://electionlab.mit.edu/election-audit-summit>
 – Program committee, 2018 Workshop on Advances in Secure Electronic Voting Schemes (VOTING'18, held in conjunction with the 2018 Conference on Financial Cryptography and Data Security, FC'18)
 – Program committee, 2019 Workshop on Advances in Secure Electronic Voting Schemes (VOTING'19, held in conjunction with the 2019 Conference on Financial Cryptography and Data Security, FC'19)

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- Program committee, Fourth International Joint Conference on Electronic Voting (E-Vote-ID 2019)
 - Referee, *Geophysical Research Letters*
 - Referee, *Proceedings of the National Academy of Sciences*
 - Referee, *PeerJ*
- 2017
- Advisory Board, U.S. Election Assistance Commission
 - Consultant, Colorado Secretary of State
 - Founding Steering Committee and Editorial Board, USENIX Journal of Voting Technology
 - Editorial Board, *ScienceOpen*
 - Chair for Auditability, IEEE/NIST Voting System Standards Committee (VSSC) Working Group For Voting Methods Mathematical Models (C/VSSC/1622.X_WG)
 - Program committee, 2018 Workshop on Advances in Secure Electronic Voting Schemes (VOTING'18, held in conjunction with the 2018 Conference on Financial Cryptography and Data Security, FC'18)
 - Program committee, 2017 Workshop on Advances in Secure Electronic Voting Schemes (VOTING'17, held in conjunction with the 2017 Conference on Financial Cryptography and Data Security, FC'17)
 - Chair, Mini-symposium on Open Data and Reproducibility, *2017 International Scientific Computing with Python (SciPy) Conference*, Austin, TX.
 - Referee, *Proceedings of the National Academy of Sciences*
- 2016
- Advisory Board, U.S. Election Assistance Commission
 - Consultant, Colorado Secretary of State
 - Travis County Texas Elections Division STAR-Vote System Brain Trust
 - Founding Steering Committee and Editorial Board, USENIX Journal of Voting Technology

P.B. Stark: CV

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- Associate editor, SIAM/ASA Journal of Uncertainty Quantification
 - Editorial Board, *ScienceOpen*
 - Chair for Auditability, IEEE/NIST Voting System Standards Committee (VSSC) Working Group For Voting Methods Mathematical Models (C/VSSC/1622.X_WG)
 - Program committee, 2016 Workshop on Advances in Secure Electronic Voting Schemes (VOTING’16, held in conjunction with the 2016 Conference on Financial Cryptography and Data Security, FC’16)
 - Program committee, 2017 Workshop on Advances in Secure Electronic Voting Schemes (VOTING’17, held in conjunction with the 2017 Conference on Financial Cryptography and Data Security, FC’17)
 - Program committee, 12th International Joint Conference on Electronic Voting (E-Vote-ID 2016), Bregenz, Austria
 - Session co-organizer, “Productive Ecologies in the Anthropocene: Foraging Systems,” Sixth International Conference on Food Studies, Berkeley, CA
- 2015
- Consultant, Colorado Secretary of State
 - Travis County Texas Elections Division STAR-Vote System Brain Trust
 - Founding Steering Committee and Editorial Board, USENIX Journal of Voting Technology
 - Associate editor, SIAM/ASA Journal of Uncertainty Quantification
 - Editorial Board, *ScienceOpen*
 - Chair for Auditability, IEEE/NIST Voting System Standards Committee (VSSC) Working Group For Voting Methods Mathematical Models (C/VSSC/1622.X_WG)
 - Program committee, VoteID 2015: The 5th International Conference on e-Voting and Identity, Bern, Switzerland. <http://www.voteid15.org/>

P.B. Stark: CV

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- Program committee, 2015 European Symposium on Research in Computer Security (ESORICS 2015), Vienna, Austria. <http://esorics2015.sba-research.org/>
 - Program committee, 2016 Workshop on Advances in Secure Electronic Voting Schemes (VOTING'16, held in conjunction with the 2016 Conference on Financial Cryptography and Data Security, FC'16)
 - Session organizer, Teaching Computational Thinking and Practice, 2015 SIAM Conference on Computational Science and Engineering (CSE15)
 - Organizer, Berkeley Institute for Data Sciences and Moore/Sloan Data Science Environments 2015 Conference on Reproducibility
 - Referee, PeerJ
- 2014
- Consultant, Colorado Secretary of State
 - Travis County Texas Elections Division STAR-Vote System Brain Trust
 - Founding Steering Committee and Editorial Board, USENIX Journal of Election Technology and Systems (JETS)
 - Associate editor, SIAM/ASA Journal of Uncertainty Quantification
 - Editorial Board, *ScienceOpen*
 - Member, IEEE/NIST Voting System Standards Committee (VSSC) Working Group For Voting Methods Mathematical Models (C/VSSC/1622.X_WG)
 - Organizing committee co-chair, 2014 SIAM/ASA Conference on Uncertainty Quantification, Savannah, GA
 - Program committee, VoteID 2015: The 5th International Conference on e-Voting and Identity, Bern, Switzerland. <http://www.voteid15.org/>
 - Program committee, 2015 European Symposium on Research in Computer Security (ESORICS 2015), Vienna, Austria. <http://esorics2015.sba-research.org/>

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- Session organizer, late-breaking session on Reproducibility, 2014 Joint Statistical Meetings, Boston, MA
 - Session organizer and chair, 2014 Conference of the International Society for Nonparametric Statistics, Cadiz, Spain
 - Session organizer, Teaching Computational Thinking and Practice, 2015 SIAM Conference on Computational Science and Engineering (CSE15)
 - Referee, PLoS One
- 2013
- Consultant, California Secretary of State
 - Consultant, Colorado Secretary of State
 - Consultant, U.S. Department of Justice, Civil Division
 - Travis County Texas Elections Division STAR-Vote System Brain Trust
 - Founding Steering Committee and Editorial Board, USENIX Journal of Election Technology and Systems (JETS)
 - Associate editor, SIAM/ASA Journal of Uncertainty Quantification
 - Organizing committee co-chair, 2014 SIAM/ASA Conference on Uncertainty Quantification, Savannah, GA
 - Session organizer, Conference of the International Society for Nonparametric Statistics, Cadiz, Spain
- 2012
- Consultant, California Secretary of State
 - Consultant, Colorado Secretary of State
 - Consultant, U.S. Department of Justice
 - Travis County Texas Elections Division STAR-Vote System Brain Trust
 - Founding Steering Committee, USENIX Journal of Election Technology and Systems (JETS)
 - Reviewer, National Science Foundation
 - Program committee, 2012 Electronic Voting Technology / Workshop on Transparent Elections (EVT/WOTE '12), USENIX Security Symposium, Bellevue, WA

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- Session organizer, 2012 Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, San Diego, CA
- Session organizer, 1st Conference of the International Society for NonParametric Statistics, Chalkidiki, Greece
- Organizing committee co-chair, 2014 SIAM/ASA Conference on Uncertainty Quantification, Savannah, GA
- Program committee, 2012 SIAM/ASA/SAMSI/USACM Conference on Uncertainty Quantification, Raleigh, NC
- Session organizer, Election Verification Network (EVN) annual conference, Santa Fe, NM

- 2011
 - Consultant and Expert Witness, U.S. Department of Justice, Civil Division (for U.S. Department of Housing and Urban Development)
 - Program committee, 2012 SIAM/ASA/SAMSI/USACM Conference on Uncertainty Quantification, Raleigh, NC
 - Consultant, California Secretary of State
 - Consultant, Colorado Secretary of State
 - Session organizer, Election Verification Network (EVN) annual conference, Chicago, IL

- 2010
 - Consultant and Expert Witness, U.S. Department of Justice, Civil Division (for Department of Housing and Urban Development)
 - Consultant, State of Illinois
 - Consultant, California Attorney General (for California Highway Patrol)
 - Consultant, New York State Senate
 - Reviewer, Department of Defense Strategic Environmental Research and Development Program
 - Session organizer, Election Verification Network (EVN) annual conference, Washington, DC

- 2009
 - Consultant, California Secretary of State

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- 2008 – Consultant, California Secretary of State
- 2007 – California Secretary of State Post-Election Audit Standards Working Group http://www.sos.ca.gov/elections/elections_peas.htm
- 2006 – Consultant and Expert Witness, U.S. Department of Justice, Civil Division
- 2005 – Consultant, U.S. Department of Justice, Civil Division
 - Consultant, U.S. Department of Veterans Affairs Medical Center
 - Consultant, Habeas Corpus Resource Center
- 2004 – Reviewer, National Science Foundation
 - Consultant, U.S. Department of Justice, Civil Division
 - Consultant, U.S. Attorney’s Office
 - Consultant, U.S. Department of Veterans Affairs Medical Center
- 2003 – Reviewer, National Science Foundation
 - Referee, National Sciences and Engineering Research Council of Canada
 - Consultant, U.S. Department of Veterans Affairs Medical Center
- 2002 – Consultant, U.S. Department of Agriculture
 - Consultant, U.S. Department of Justice, Civil Division
- 2001 – Consultant, U.S. Department of Justice, Civil Division
 - Co-organizer, Institute for Mathematics and Its Applications Annual Program *Mathematics in the Geosciences* and workshop on Inverse Problems and the Quantification of Uncertainty
- 2000 – Invited discussant, National Academy of Science Committee on National Statistics workshop on dual-system estimation for the 2000 Census
 - Consultant, U.S. Department of Justice, Civil Division
- 1998 – Witness, U.S. House of Representatives Subcommittee on the Census.

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- Panelist, National Science Foundation
- 1997 – Session organizer, International Statistical Institute and Bernoulli Society Meeting, Istanbul, Turkey
- 1996–present – Global Oscillation Network Group (GONG) Data Users Committee (Chair, 1996–1998)
- Reviewer for United States Geological Survey
- 1996–1999 – Consultant, National Security Agency
- 1995 – Institute of Mathematical Statistics Program Chair, Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, Orlando, FL
- 1994–1996 – Consultant to Federal Trade Commission
- 1993 – Session organizer and chair, IMS/ASA/ENAR meeting, Philadelphia, PA
- Session organizer and chair, Joint Statistical Meetings of the American Statistical Association, International Biometric Society, and Institute of Mathematical Statistics, San Francisco, CA
- 1992 – Faculty sponsor, Department of Energy TRAC program
- 1990–1994 – Bernoulli Society Committee on Statistics in the Physical Sciences
- 1991–present – Reviewer for National Aeronautics and Space Administration (Space Physics Division)
- 1991 – Local organizer and session chair, Mathematical Sciences Research Institute Workshop on Statistical Methods in Imaging, Berkeley, CA
- 1989 – Session organizer and chair, Bernoulli Society Satellite Meeting, Leuven, Belgium
- 1989–present – Reviewer for National Science Foundation (Atmospheric Sciences; Infrastructure; International Programs; Mathematical Sciences; Methodology, Measurement, and Statistics; Solar-Terrestrial Program; Statistics and Probability)

*P.B. Stark: CV**January 4, 2019*

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Foundations, Non-Profit Corporations, and Industry

- 2013–present – Board of Directors, Verified Voting Foundation
- 2011–2013 – Board of Advisors, Verified Voting Foundation
- 2010–2011 – Technical Advisory Board, Clear Ballot Group
- 2007 – Advisory Board, Facebar, Inc.
- 2000–2001 – Technical Advisory Board, Cogit.com
- 2000–2002 – National Advisory Board, eTextbooksOnline.com
- Technical Advisory Board, Atomic Dog Publishing

Editorial and Referee Service*Editorial Service*

- 2014–present – Faculty Review Board, Berkeley Scientific Journal
- 2013–present – Editorial Board, ScienceOpen
- 2013–present – Associate Editor, SIAM/ASA Journal on Uncertainty Quantification
- 2012–present – Founding Steering Committee and Editorial Board, USENIX Journal of Election Technology and Systems (JETS)
- 2011–present – Editor, Frontiers in Statistics and Probability (Springer)
- 2008 – Guest Editor, Inverse Problems
- 1998–1999 – Editor, Statistical Science
- 1997–2000 – Editorial Board, Inverse Problems
- 1994–1998 – Associate Editor, Journal of Geophysical Research

Referee Service

1. American Association for the Advancement of Science

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2. American Mathematical Monthly
3. Annales Geophysicae
4. Annals of the Institute of Statistical Mathematics
5. Annals of Statistics
6. Arabian Journal for Science and Engineering
7. Astrophysical Journal
8. Bulletin of the Seismological Society of America
9. Cambridge University Press
10. Chapman-Hall
11. Computational Statistics and Data Analysis
12. Electronic Journal of Statistics
13. Geophysical Journal International
14. Geophysical Research Letters
15. Geophysics
16. Geophysical & Astrophysical Fluid Dynamics
17. HarperCollins
18. IEEE Journal on Acoustics, Speech and Signal Processing
19. IEEE Journal on Information Theory
20. Inverse Problems
21. Inverse Problems and Imaging
22. Journal of the American Statistical Association
23. Journal of Computational Physics
24. Journal of Economic Literature

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25. Journal of Geophysical Research
26. Jurimetrics
27. Nature
28. Nature Climate Change
29. PeerJ
30. Political Analysis
31. Physics of the Earth and Planetary Interiors
32. PLoS One
33. Proceedings of the National Academy of Sciences
34. Science
35. SIAM Review
36. Simon and Schuster
37. Springer-Verlag
38. Statistics, Politics, and Policy
39. Statistical Science
40. Tectonophysics

University Service

- 2018–2019
- Associate Dean, Division of Mathematical and Physical Sciences
 - UC Berkeley Signature Initiatives working group for Inclusive Intelligence
 - Advisory Board, Berkeley Institute for Data Science (BIDS)
 - Scientific Advisory Board, European Union H2020 Project Moving Towards Adaptive Governance in Complexity: Informing Nexus Security (MAGIC), Universitat Autònoma de Barcelona (Spain) and University of Bergen (Norway)

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- Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
 - Member, Berkeley Science Network <http://bsn.berkeley.edu>
 - Schmidt Science Fellows Program review committee
- 2017–2018
- Associate Dean, Division of Mathematical and Physical Sciences
 - Chancellor’s Strategic Planning Committee on Enrollment Growth
 - Interdepartmental Committee on the Formation of the Division of Data Sciences
 - Director, Statistical Computing Facility
 - *Ad hoc* Data Sciences Divisional committee on undergraduate degree programs
 - Advisory Board, Berkeley Institute for Data Science (BIDS)
 - Academic Program Review Committee, Academic Senate representative, Department of Agricultural and Resource Economics
 - Scientific Advisory Board, European Union H2020 Project Moving Towards Adaptive Governance in Complexity: Informing Nexus Security (MAGIC), Universitat Autònoma de Barcelona (Spain) and University of Bergen (Norway)
 - Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
 - Faculty Advisory Committee, Athletic Study Center
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
 - Member, Berkeley Science Network <http://bsn.berkeley.edu>
- 2016–2017
- Associate Dean, Division of Mathematical and Physical Sciences
 - Director, Statistical Computing Facility

*P.B. Stark: CV**January 4, 2019*

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- Advisory Board, Berkeley Institute for Data Science (BIDS)
 - Scientific Advisory Board, European Union H2020 Project Moving Towards Adaptive Governance in Complexity: Informing Nexus Security (MAGIC), Universitat Autònoma de Barcelona (Spain) and University of Bergen (Norway)
 - Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
 - Faculty Advisory Committee, Athletic Study Center
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
 - Member, Berkeley Science Network <http://bsn.berkeley.edu>
- 2015–2016
- Associate Dean, Division of Mathematical and Physical Sciences
 - Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
 - Faculty Advisory Committee, Athletic Study Center
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
 - Member, Berkeley Science Network <http://bsn.berkeley.edu>
- 2014–2015
- Chair, Department of Statistics
 - Director, Statistical Computing Facility
 - Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
 - Campus Working Group on Course Curriculum and Design
 - Faculty Advisory Committee, Athletic Study Center
 - Engineering Science Advisory Committee, College of Engineering
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University

*P.B. Stark: CV**January 4, 2019*

115

- Member, Berkeley Science Network <http://bsn.berkeley.edu>
- 2013–2014 – Chair, Department of Statistics
- Director, Statistical Computing Facility
- Commission on the Future of the UC Berkeley Library <http://academic-senate.berkeley.edu/issues/commission-future-uc-berkeley-library>
Charge: <http://evcp.berkeley.edu/sites/default/files/Library%20Commission%2009.21.2012.pdf>
Final Report: <http://evcp.berkeley.edu/news/commission-future-uc-berkeley-library-report>
- Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
- Campus Working Group on Course Curriculum and Design
- Faculty Advisory Committee, Athletic Study Center
- Engineering Science Advisory Committee, College of Engineering
- Search Committee, Director of IT for College of Letters and Sciences
- Faculty Athletic Fellow
- Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
- External Review Committee, Department of Applied Mathematics and Statistics, Colorado School of Mines
- Member, Berkeley Science Network <http://bsn.berkeley.edu>
- 2012–2013 – Chair, Department of Statistics
- Director, Statistical Computing Facility
- Commission on the Future of the UC Berkeley Library
- Faculty Advisory Committee, Berkeley Resource Center for Online Education (BRCOE)
- Engineering Science Advisory Committee, College of Engineering
- Faculty Athletic Fellow

*P.B. Stark: CV**January 4, 2019*

116

- Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
- Member, Berkeley Science Network <http://bsn.berkeley.edu>
- 2011–2012
 - Acting Department Chair, Department of Statistics, July–August
 - Vice Chair, Department of Statistics
 - Academic Senate Alternate Representative to University of California Systemwide Assembly
 - Academic Senate Committee on Academic Planning and Resource Allocation (CAPRA)
 - Campus Committee on Classroom Policy and Management (CC-CPM)
 - Business Resumption Coordination Group (BRCG)
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
- 2010–2011
 - Academic Senate Committee on Academic Planning and Resource Allocation (CAPRA)
 - Campus Committee on Classroom Policy and Management (CC-CPM)
 - Course Note-Taking Taskforce (<http://campuspol.chance.berkeley.edu/policies/coursenotes.pdf>)
 - *Ad hoc* tenure/promotion committee
 - Faculty Athletic Fellow
 - Program Advisory Committee, Doctor of Business Administration Program, Lincoln University
- 2009–2010
 - Academic Senate Committee on Computing and Communications (COMP)
 - Faculty Athletic Fellow
- 2008–2009
 - Faculty Athletic Fellow

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- 2007–2008
 - Undergraduate Student Learning Initiative Faculty Advisory Committee
 - Faculty Athletic Fellow
- 2006–2007
 - Faculty Athletic Fellow
- 2005–2006
 - Faculty Athletic Fellow
- 2004–2005
 - Chair, Educational Technology Committee
 - e-Berkeley Steering Committee
 - e-Berkeley Committee of Chairs
 - e-Berkeley Implementation Task Force
 - CourseWeb Steering Committee
 - Faculty Athletic Fellow
- 2003–2004
 - Chair, Educational Technology Committee
 - e-Berkeley Steering Committee
 - e-Berkeley Implementation Task Force
 - Student Systems Policy Committee
 - CourseWeb Steering Committee
- 2002–2003
 - Faculty Assistant in Educational Technology (to Vice Provost for Undergraduate Education)
 - Chair, Educational Technology Committee
 - Provost’s Academic Council
 - e-Berkeley Steering Committee
 - e-Berkeley Implementation Task Force
 - Campus Committee on Classroom Policy and Management (CC-CPM)
 - Student Systems Policy Committee
 - e-Berkeley Symposium Program Committee
 - Faculty Search Committee, Graduate School of Education
 - CourseWeb Steering Committee

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- 2001–2002
 - Faculty Assistant in Educational Technology (to Vice Provost for Undergraduate Education)
 - Chair, Educational Technology Committee
 - Provost’s Academic Council
 - e-Berkeley Steering Committee
 - e-Berkeley Implementation Task Force
 - Campus Committee on Classroom Policy and Management (CC-CPM)
 - Academic Senate Committee on Academic Planning and Resource Allocation (CAPRA)
 - CITRIS II Program Committee
 - TeleBEARS and BearFacts Committees (combined into Student Systems Policy Committee as of 3/2002)
 - e-Berkeley Portal Working Group
 - Faculty search committee, Graduate School of Education
- 2000–2001
 - Space Allocation and Capital Improvements (SACI)
 - Academic Senate Committee on Academic Planning and Resource Allocation (CAPRA)
 - CAPRA Subcommittee on Expanded Enrollment
 - CAPRA Subcommittee on changes to Academic Coordinator title
 - *Ad hoc* hiring/tenure committee
- 1999–2000
 - Space Allocation and Capital Improvements (SACI)
 - Academic Senate Library Committee (LIBR)
 - Academic Senate Committee on Academic Planning and Resource Allocation (CAPRA), Physical Planning Subcommittee, *ex officio* representative from Library Committee
 - Academic Effects Study Committee, Molecular Engineering Building
 - *Ad hoc* tenure/promotion committee
 - SACI subcommittee to audit space in Barrows Hall

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- 1998–1999 – Space Allocation and Capital Improvements (SACI)
 - Electronic Dissertations Project
 - Planning Space for the Physical Sciences Libraries
- 1997–1998 – *Ad hoc* tenure/promotion committee
- 1996 – Review of College of Science, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia
- 1994–1999 – University review committee for Department of Agricultural and Resource Economics, University of California, Berkeley
- 1993–1995 – Physical Sciences Division committee for Graduate Affirmative Action and Retention
 - Physical Sciences Division committee for Science and Mathematics Academic Re-Training (SMART)

Contracts and Grants

1. PI, NASA Grant NAG 5-883, “Constructing Core Fields Consistent with Geomagnetic Data and Geophysical Constraints,” 1987–1990.
2. Project Director and PI, NSF Grant DMS-8810192, “Inference in Curved-Ray Tomography: Solid Earth Structure,” 1989–1992.
3. PI, NSF Grant INT-9205103, “Long and Medium-Term Research: Inference in Seismological Investigations of Subducting Lithosphere,” 1992–1994.
4. PI, NSF Grant DMS-930006P, “Estimating the Sun’s Internal Angular Velocity from Free-Oscillation Frequency Splittings,” 1993–1994.
5. PI, NSF Presidential Young Investigator Award DMS-8957573, 1989–1995.
6. Co-I, NASA Grant NAG5-2438, “The Analysis of Cobe DMR Sky Maps,” 1993–1994. PI: J. Silk
7. PI, NASA Grant NAGW-2515, “New Methods for Inversion and Analysis of Solar Free-Oscillation Data,” 1991–1995.

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8. PI, NSF Grant DMS-9404276, “New Methods for Inference From COBE Data,” 1994–1997.
9. PI, NSF Grant AST-9504410, “Function Estimation and Inference in Helioseismology,” 1995–1998.
10. PI, LLNL/IGPP Grant 97-AP028, “Helioseismology with Solar Luminosity Constraints,” 1996–1997.
11. Co-I, NASA Grant NAG5-3941, “Development of data analysis, compression and visualization tools for large data sets in astrophysics and cosmology,” 1997–1998. PI: J. Silk
12. PI, NASA Grant NRA-96-09-OSS-034SOHO, “Modern Statistical Methods for Helioseismic Spectrum Estimation,” 1997–1998.
13. PI, NASA Grant NAG 5-3919, “Data Sampling Rate Reduction for the Oersted Satellite,” 1997–1998.
14. PI, UC Berkeley Classroom Technologies Grant, “Statistics *Statim*,” 1997–1998.
15. Co-I, NSF Grant DMS-9872979,” *KDI: Computational Challenges in Cosmology*,” 1998–2000. PI: A. Jaffe.
16. Co-I, NSF Grant IIS-98-17353, “*Re-Inventing Scholarly Information Dissemination and Use*,” 4/1/1999–3/31/2004. PI: R. Wilensky and D. Forsythe.
17. PI, Hewlett Packard Company Grant 89293, “Applied Mobile Technology Solutions in Learning Environments,” 3/19/2003–8/31/2004. Status report:
<https://www.stat.berkeley.edu/~stark/Grants/hp89293.htm>
18. PI, Hewlett Packard Company Grant 14928, “Applied Mobile Technology Solutions in Learning Environments—2004 Extension Grant,” 4/1/2004–6/30/2005.
19. PI, LLNL Grant B565605, “Uncertainty in Complex Simulations,” 4/3/2007–9/30/2007.

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20. PI, LLNL Grant B585264, “Uncertainty Quantification with Applications to Climate Modeling,” 11/3/2009–9/30/2010.
21. PI, Genentech Inc. Grant 008485, “Measuring Glucose with NIR,” 2/24/2010–10/31/2010.
22. Co-I, NSF Grant DUE-1060487, “S-STEM Berkeley Science Network Scholarship Program,” 3/1/2011–2/28/2015. PI: M. Richards.
23. PI, State of Colorado U.S. Election Assistance Commission subaward UC01, 2010 Pre-Election Logic and Accuracy Testing and Post-Election Audit Initiative, 5/23/2011–4/23/2013.
24. PI, State of California Election Assistance Commission subaward 10I10066, Post Election Risk-Limiting Audit Pilot Program, 9/13/2011–4/23/2013.
25. PI, Bill and Melinda Gates Foundation Grant OPP1077697, “An Introductory Statistics MOOC With Field-Tested Online Assessments,” 12/20/2012–7/31/2013.
26. Co-I, UC Berkeley MOOCLab Grant, “Forum Usage in Statistics MOOCs: Disentangling Correlation from Causation,” 10/2013–8/2014. PI: M. Hearst.
27. Co-I, Berkeley Institute for Data Science, grant from the Gordon and Betty Moore Foundation and the Sloan Foundation. 12/2013–12/2018. PI: S. Perlmutter.
28. PI, UC Berkeley Food Institute Grant, “Reaping without Sowing: Urban Foraging, Sustainability, Nutrition, and Social Welfare,” 2/2014–8/2015.
29. Co-I, NSF, DGE–1450053, “NRT-DESE Data Science for the 21st Century (DS421),” 2015–2020. PI: D. Ackerley.
30. PI, UC Berkeley Food Institute Grant, “Wild Food: Investigating and Reducing Barriers to the Consumption of Foraged Foods,” 5/2015–12/2015.

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31. PI, State Street Bank and Trust Company Grant, “Industry Partners Program: Consortium for Data Analytics in Risk (CDAR); and Berkeley Institute for Data Science (BIDS) at UC Berkeley,” 2/2015–6/2018.
32. PI, Dascena subaward from NIH, “SBIR: A Computational Approach to Early Sepsis Detection,” 4/2017–6/2017.
33. PI, Peder Sather Grant, “Mainstreaming Sensitivity Analysis and Uncertainty Auditing,” 7/2017–6/2018.
34. Co-I, NSF Grant DMS–1745640, “(RTG): Advancing Machine Learning–Causality and Interpretability,” 2018–2023.

Consulting and Expert Witness Experience

Baker & McKenzie LLP, New York, NY: sampling and uncertainty quantification (client Nuclear Electric Insurance Limited, NEIL)

Bartlit Beck Herman Palenchar & Scott LLP, Denver, CO: intellectual property litigation (client Tessera)

Bingham McCutchen LLP, Los Angeles, CA: sampling in litigation

Bramson, Plutzik, Mahler & Birkhaeuser LLP, Walnut Creek, CA: consumer class action litigation

Bruce P. Brown Law, Atlanta, GA: election integrity litigation (client Donna Curling et al.)

Brinks, Hofer, Gilson & Lione, Chicago, IL: intellectual property litigation (clients R.J. Reynolds, Actavis)

Calfee, Halter & Griswold LLP, Cleveland, OH: tort litigation (client FirstEnergy Corp)

California-American Water Company: utilities regulation, census and survey data

Capital One: economic modeling and credit risk management; intellectual property litigation; credit loss forecasting

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Carey and Carey, Palo Alto, CA: equal protection, civil litigation

CIBC: economic modeling and credit risk management

Cisco Systems: predicting email spool fill

City of Santa Rosa, CA: water treatment monitoring

Cogit.com, San Francisco, CA: Technical advisory board; data mining, targeted web advertising

Constantine, Cannon, San Francisco, CA, and New York, NY: *Qui Tam* litigation (three cases)

Contra Costa County Public Defender, Richmond, CA: equal protection, due process, medical treatment for defendants found incompetent to stand trial

Council of Europe, Venice Commission, Venice, Italy: election integrity, electoral fraud

Crosby, Heafey, Roach, & May, Oakland, CA: insurance litigation (client Farmer's Insurance)

Croskery Law Offices, Cincinnati, OH: employment discrimination litigation

East Bay Municipal Utilities District, Oakland, CA: water treatment monitoring

EEG Systems Laboratory, San Francisco, CA: inverse problems for electrical activity of the brain

Emery Celli Brinckerhoff & Abady LLP, Washington, DC: election recounts (client Jill Stein)

eTextbooksOnline.com, New York, NY: National Advisory board

Farella Braun + Martel LLP, San Francisco, CA: sampling and estimation in litigation

Federal Trade Commission, San Francisco, CA: sampling in litigation

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Florida Education Association, Tallahassee, FL: teaching evaluations in academic employment decisions

Folger, Levin & Kahn, LLP, San Francisco, CA: sampling and risk management in litigation (client California Self-Insurers' Security Fund)

Fried, Frank, Harris, Shriver & Jacobsen LLP, New York, NY: sampling and estimation in securities litigation (clients Citigroup Global Markets Inc.; Goldman, Sachs & Co.; UBS Securities LLC)

Fuller-Austin Joint Defense Group: modeling in litigation

Georgia Department of Law, Atlanta, GA: lottery winnings (client Georgia Lottery Corporation)

Gibson, Dunn & Crutcher, New York, NY: sampling and estimation in litigation (client AIG / Lavastone Capital)

GMAC Financial Services: economic modeling and credit risk management

Habeas Corpus Resource Center, San Francisco, CA: bias in jury selection

Howard, Rice, Nemerovski, Canady, Falk, & Rabkin, San Francisco, CA: sampling in litigation; inference from retail sales data (clients K-Mart Corp., R.J. Reynolds)

Howrey LLP, East Palo Alto, CA: sampling in litigation (client Apple Inc.)

HSBC: economic modeling and credit risk management

Jones Day, Columbus, OH: sampling and estimation in litigation (client Cardinal Health)

Kaiser Permanente Northern California, Redwood City, CA: clinical trials in oncology

Kelley Jasons McGuire & Spinelli, LLP: insurance litigation (client St. Paul Fire & Marine Insurance Company)

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Keller Grover LLP, San Francisco, CA: *Qui Tam* litigation

Kemnitzer, Barron & Krieg, LLP, San Francisco, CA: sampling in consumer class action litigation

Kipling Law Group, Seattle, WA: sampling in litigation (client AT&T Wireless)

KLA Instruments Corporation, San Jose, CA: calibration of algorithms to detect IC mask flaws

Kramer, Levin, Naftalis, & Frankel, New York, NY: sampling in litigation

Latham & Watkins, LLP, Menlo Park, CA, and San Francisco, CA: sampling in consumer class action litigation (clients Apple Inc., Silver Spring Networks)

Law Offices of Gorman & Miller, San Jose, CA: trade secret litigation

Law Offices of Ilson W. New, San Francisco, CA: natural resource legislation (client California Abalone Association)

Law Offices of Ramirez, Tollner, Stebbins, Bahrnick, & Sasseen, San Jose, CA: trade secret litigation

Law Offices of Welebir & McCune, Woodside, CA: product liability litigation

Law Offices of Wells, Pinckney & McHugh, Austin, TX: employment discrimination arbitration

Law Offices of Wolkin & Timpane, San Francisco, CA: insurance litigation (client CIGNA)

Law Offices of Scott K. Zimmerman, Brentwood, CA: product liability litigation

Life Chiropractic College West, Hayward, CA: experimental design

Littler Mendelson, P.C., Dallas, TX, Los Angeles, CA, and San Francisco, CA: sampling in employment wage and hour class action litigation

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Los Angeles Superior Court, Central District: sampling in employment wage and hour litigation

Manatt, Phelps & Phillips LLP, San Francisco, CA: utilities regulation (client California-American Water Company)

Mayer, Brown, Rowe & Maw, Chicago, IL: intellectual property litigation (client Capital One)

Mayer Brown LLP, New York, NY: mortgage-backed securities litigation (clients Bank of New York Mellon, Citibank N.A.)

Memorial University Faculty Association (MUNFA), St. Johns, NL, Canada: teaching evaluations in academic employment decisions

Meyers Nave, Oakland, CA: election dispute litigation (client Novato Sanitary District)

Monaghan Safar Ducham PLLC, Burlington, VT: employment discrimination

Morgan, Lewis & Bockius LLP, Los Angeles, CA: sampling in litigation

Morrison & Foerster, San Francisco, CA: product liability class action litigation, causal inference in litigation (clients American Cemwood, Iovate Health Sciences)

Munger, Tolles & Olson, LLP, San Francisco, CA and Los Angeles, CA: consumer class action litigation, intellectual property litigation, sampling (clients Verizon Wireless, Philip Morris, Tessera)

Murphy & McGonigle, Washington, DC: risk management and credit loss forecasting (client Capital One)

National Security Agency: adaptive filtering, combining expert opinions, digital communications, information retrieval, estimation

National Solar Observatory, Tucson, AZ: spectrum estimation

Albert A. Natoli, P.C., New York, NY: surveys in consumer class action litigation

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Nichols Kaster PLLP, Minneapolis, MN: sampling and damage estimation in consumer class action litigation

Norton Rose Fulbright US LLP, Houston, TX: construction defect litigation (client M.J. Dean Construction, Inc.)

Nossaman LLP, San Francisco, CA: utilities regulation (client California-American Water Company)

Office of the Attorney General, State of California, Oakland, CA: sampling in litigation (client California Highway Patrol)

Ontario Confederation of University Faculty Associations (OCUFA) and Ryerson Faculty Association, Toronto, ON: teaching evaluations in academic employment decisions

Oracle: sampling and risk analysis

Orrick, Herrington & Sutcliffe LLP, Los Angeles and Sacramento, CA: sampling in litigation

Pacific Gas & Electric Co., San Francisco, CA: statistics and causal inference in litigation

Paul, Hastings, Janofsky & Walker LLP, Washington, DC: intellectual property litigation (client Capital One)

Phillips & Cohen LLP, San Francisco, CA: statistical inference in *Qui Tam* litigation

Porter & Hedges, LLP, Houston, TX: sampling in litigation

Schlumberger-Doll Research, Ridgefield, CT: inverse problems, signal processing

Robins Kaplan LLP: *Qui Tam* litigation

Shearman & Sterling, Washington, DC: survival analysis in litigation

Skadden, Arps, Slate, Meagher & Flom LLP, San Francisco, CA: case-control studies in litigation

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Spector Roseman Kodroff & Willis, P.C., Philadelphia, PA: *Qui Tam* litigation

Spriggs & Hollingsworth, Washington, DC: environmental litigation

State of Illinois, Monroe County State's Attorney, Waterloo, IL: evidence in capital prosecution

St. Paul Fire and Marine Insurance Company, Baltimore, MD: projecting tort liability

Susman Godfrey, LLP, Los Angeles, CA

Travis County, TX: design of auditable voting systems

United Faculty of Florida, Tallahassee, FL: teaching evaluations in academic employment decisions

U.S. Attorney's Office, Northern District of California: ethnic bias in grand jury selection

U.S. Department of Agriculture, Washington, D.C.: fairness in lending, import restrictions and risk assessment

U.S. Department of Commerce, Bureau of the Census, Washington, D.C.: estimation and modeling

U.S. Department of Housing and Urban Development, Washington, D.C.: disparate impact of hurricane Katrina relief program

U.S. Department of Justice, Civil Division, Federal Programs Branch, Washington, D.C.: sampling the Internet and testing Internet content filters; USDA import restrictions on cattle and beef; disparate racial impact in HUD disaster relief; fairness in lending; prevalence of "sexting" among young adults

U.S. Department of Veterans Affairs Medical Center, Martinez, CA: speech and non-speech hearing segregation in aging

U.S. House of Representatives, Washington, D.C.: sampling to adjust the U.S. Census

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Weintraub Genshlea Chediak Law Corporation, Sacramento, CA: wage and hour class action litigation (client Tai Wah, Inc.)

Wiegel Law Group, San Francisco, CA: sampling in class action litigation (client Trinity Management Services)

Willoughby, Stuart & Bening, San Jose, CA: insurance litigation

Winston & Strawn LLP, Chicago, IL: consumer class action litigation

Zimmerman Reed, Scottsdale, AZ: consumer class action litigation

Testimony (incomplete prior to 2003)

47. **December 2018.** Phoenix Light SF Ltd., in its own right and the right of Blue Heron Funding V Ltd., Blue Heron Funding VI Ltd., Blue Heron Funding VII Ltd., Kleros Preferred Funding V PLC, Silver Elms CDO PLC, Silver Elms CDO II Ltd., C-BASS CBO XVII Ltd., C-BASS CBO XIV Ltd. and each of Blue Heron Funding V Ltd., Blue Heron Funding VI Ltd., Blue Heron Funding VII Ltd., Kleros Preferred Funding V PLC, Silver Elms CDO PLC, Silver Elms CDO II Ltd., C-BASS CBO XVII Ltd. and C-BASS CBO XIV Ltd., in their own right, *vs.* The Bank of New York Mellon, Case 14-cv-10104 (VEC) Deposition.
46. **November 2018.** United States of America and State of New York, *ex rel.* Edward Lacey, *vs.* Visiting Nurse Service of New York. (U.S. District Court, Southern District of New York, Case 14-CV-5739 (AJN)) Deposition.
45. **August 2018.** Delores James *vs.* University of Florida (Grievances # 0817-00108 and 1117-00109) Arbitration.
44. **July 2018.** Testimony to the State of California Little Hoover Commission. Video: <http://www.lhc.ca.gov/report/voting-equipment-security>. Written testimony : <https://www.stat.berkeley>

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.edu/~stark/Preprints/lhs18.pdf

43. **July 2018.** United States of America, *ex rel.* Stephen A. Krahling and Joan A. Wlochowski, *vs.* Merck & Co., Inc. (U.S. District Court, Eastern District of Pennsylvania, Case 10-4374 (CDJ)) and *In Re: Merck Mumps Vaccine Antitrust Litigation* (Master File No. 12-3555 (CDJ)) Deposition.
42. **April 2018.** Ryerson University *vs.* The Ryerson Faculty Association re FCS & Related Issues (2018 CanLII 58446) Arbitration.
41. **August 2017.** Application of California-American Water Company (U210W) for Authorization to Modify Conservation and Rationing Rules, Rate Design, and Other Related Issues for the Monterey District (Public Utility Commission of the State of California, Application 15-07-019) Hearing.
40. **July 2017.** United States, the States of California, Delaware, Florida, Illinois, Indiana, Nevada, New Mexico, New York, and Tennessee, the Commonwealths Of Massachusetts and Virginia, and The District Of Columbia, *ex rel.* John Hendrix, *vs.* J-M Manufacturing Company, Inc., d/b/a JM Eagle, a Delaware corporation, and Formosa Plastics Corporation, U.S.A., a Delaware corporation (U.S. District Court, Central District of California, Case ED CV 06-00055-GW) Deposition.
39. **March 2017.** The People of the State of California *vs.* Keegan Lee Czirban, Richard Allen, Filoberto Pablo Alvidrez, Jaqwayne Bryant, Dale Gabriel Burnell, Juan Pablo Cardona aka Juan Luna-Cardona, Miguel Colina, Emmanuel Cordova, Ramon Duenas, Connie Renee Fields, Anisa Sakari Fortenberry, Louie Frank Gamboa, Cynthia Marie Harrell, Briana Hawkins, Jeremiah James Johnson, Kieth Carl Knutson, Mark Alex Mallory, Brian McMahon, David Moore, Marquise Lamar Owens, Mitkayem Dean Robinson, Patrice Sanders, and Seth Rui Sears. (Superior Court of the State of California, County

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of Contra Costa, 05-151662-4 and associated cases) Trial.

38. **March 2017.** Kelly Brunarski and Yvette Harmon *vs.* Miami University. (U.S. District Court, Southern District of Ohio, Western Division, 1:16-cv-0311) Deposition.

37. **January 2017.** The Western and Southern Life Insurance Company, et al. *vs.* The Bank of New York Mellon. (Court Of Common Pleas, Hamilton County, Ohio, A1302490) Trial.

36. **December 2016.** Fixed Income Shares: Series M, Lvs II LLC, PCM Fund, Inc., PIMCO Absolute Return Strategy II Master Fund LDC, PIMCO Absolutereturnstrategy III Master Fund LDC, PIMCO Absolute Return Strategy III Overlay Master Fund Ltd., PIMCO Absolute Return Strategy IV Master Fund LDC, PIMCO Absolute Return Strategy V Master Fund LDC, PIMCO Bermuda Trust: PIMCO Bermuda Foreign Low Duration Fund, PIMCO Bermuda Trust: PIMCO Bermuda U.S. Low Duration Fund, PIMCO Cayman Spc Limited, PIMCO Cayman Japan Coreplus Segregated Portfolio, PIMCO Cayman Trust: PIMCO Cayman Global Advantage Bond Fund, PIMCO Cayman Trust: PIMCO Cayman Global Aggregate Ex-Japan (Yen-Hedged) Bond Fund II, PIMCO Cayman Trust: PIMCO Cayman Global Aggregate Exjapan (Yen-Hedged) Income Fund, PIMCO Cayman Trust: PIMCO Cayman Global Aggregate Ex-Japan Bond Fund, PIMCO Cayman Trust: PIMCO Cayman Global Bond (Nzdhedged) Fund, PIMCO Dynamic Credit Income Fund, PIMCO ETF Trust, PIMCO Total Return Active Exchange-Traded Fund, PIMCO Funds: Global Investors Series PLC, Diversified Income Fund, PIMCO Funds: Global Investors Series PLC, Global Bond Fund, PIMCO Funds: Global Investors Series PLC, Global Investment Grade Credit Fund, PIMCO Funds: Global Investors Series PLC, Income Fund, PIMCO Funds: Global Investors Series PLC, PIMCO Credit Absolute Return Fund, PIMCO Funds: Global Investors Series PLC, Unconstrained Bond Fund, PIMCO Funds: PIMCO Commodities Plus Strategy Fund, PIMCO Funds: PIMCO Commodity Real Return Strategy Fund, PIMCO Funds: PIMCO Credit Absolute Return

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Fund, PIMCO Funds: PIMCO Diversified Income Fund, PIMCO Funds: PIMCO Floating Income Fund, PIMCO Funds: PIMCO Foreign Bond Fund (Unhedged), PIMCO Funds: PIMCO Global Advantage Strategy Bond Fund, PIMCO Funds: PIMCO Global Bond Fund (Unhedged), PIMCO Funds: PIMCO Income Fund, PIMCO Funds: PIMCO International Stocksplus AR Strategy Fund (U.S. Dollarhedged), PIMCO Funds: PIMCO Investment Grade Corporate Bond Fund, PIMCO Funds: PIMCO Low Duration Fund, PIMCO Funds: PIMCO Low Duration Fund II, PIMCO Funds: PIMCO Low Duration Fund III, PIMCO Funds: PIMCO Real Return Fund, PIMCO Funds: PIMCO Short-Term Fund, PIMCO Funds: PIMCO Total Return Fund, PIMCO Funds: PIMCO Unconstrained Bond Fund, PIMCO Funds: PIMCO Worldwide Fundamental Advantage AR Strategy Fund, PIMCO Funds, Private Account Portfolio Series Emerging Markets Portfolio, PIMCO Funds: Private Account Portfolio Series International Portfolio, PIMCO Funds: Private Account Portfolio Series Mortgage Portfolio, PIMCO Funds: Private Account Portfolio Series Short-Term Portfolio, PIMCO Funds: Private Account Portfolio Series U.S. Government Sector Portfolio, PIMCO Multi-Sector Strategy Fund Ltd., PIMCO Offshore Funds - PIMCO Absolute Return Strategy IV Efund, PIMCO Variable Insurance Trust: PIMCO Global Advantage Strategy Bond Portfolio, PIMCO Variable Insurance Trust: PIMCO Global Bond Portfolio (Unhedged), PIMCO Variable Insurance Trust: PIMCO Low Duration Portfolio, CREF Bond Market Account, CREF Social Choice Account, TIAA Global Public Investments, MBS LLC, TIAA-CREF Bond Fund, TIAA-CREF Bond Plus Fund, TIAA-CREF Life Insurance Company, Prudential Bank & Trust, FSB, Prudential Retirement Insurance and Annuity Company, The Gibraltar Life Insurance Company, Ltd., The Prudential Series Fund, LIICA RE II, Inc., Monumental Life Insurance Company Modified Separate Account, Transamerica Life Insurance Company, Transamerica Premier Life Insurance Company, Kore Advisors LP, and Sealink Funding Limited *vs.* Citibank N.A. (U.S. District Court, Southern District of New York, 14-cv-09373-JMF) Deposition.

35. **November 2016.** Jill Stein, Petitioner, *vs.* Wisconsin Elections

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Commission and Members of the Wisconsin Elections Commission, each and only in his or her official capacity: Mark L. Thomsen, Ann S. Jacobs, Beverly Gill, Julie M. Glancey, Steve King, and Don M. Millis, Respondents. (State of Wisconsin Circuit Court, Dane County, Judge Valerie Bailey-Rihn) Trial.

34. **October 2016.** Citizens Oversight, Inc., a Delaware non-profit corporation; and Raymond Lutz, an individual, *vs.* Michael Vu, San Diego Registrar of Voters; Helen N. Robbins-Meyer, San Diego County Chief Administrative Officer; County of San Diego, a public entity; and Does 10–10, Defendants. (Superior Court of California, County of San Diego–Central Division, 37-2016-00020273-CL-MC-CTL) Trial.
33. **July 2016.** *Loc Vu-Quoc vs. University of Florida.* (American Arbitration Association Case no. 01-15-0006-1052). Arbitration.
32. **July 2016.** Memorial University of Newfoundland Faculty Association *vs.* Memorial University of Newfoundland (Arbitration I15-07) Arbitration.
31. **June 2016.** Gasia Thomas, et al., *vs.* First Energy Corporation, et al. (Court Of Common Pleas, Cuyahoga County, Ohio, 13-CV-798520) Deposition.
30. **May 2016.** The Western and Southern Life Insurance Company, et al., *vs.* The Bank of New York Mellon. (Court Of Common Pleas, Hamilton County, Ohio, A1302490) Deposition.
29. **February 2016.** Palms Place, LLC, a Nevada limited liability company, *vs.* Kittrell Garlock & Associates, Architects, AIA, LTD. d/b/a KGA Architecture, a Nevada professional corporation; M.J. Dean Construction, LLC, a Nevada limited liability company; Does I through X; Roe Corporations I through X; and Roe LLC I through X, Defendants.

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M.J. Dean Construction, Inc., a Nevada corporation, Counterclaimant, *vs.* Palms Place, LLC, a Nevada limited liability company, Does I-X, Roe Corporations I-X, Boe Bonding Companies I-X, Loe Lenders I-X and Toe Tenants I-X, Counterdefendants.

Kittrell Garlock & Associates, Architects, AIA, Ltd. d/b/a KGA Architecture, a Nevada professional corporation, Counterclaimant, *vs.* Palms Place, LLC, a Nevada limited liability company, and Toes I-XV, Counterdefendants.

M.J. Dean Construction, Inc., a Nevada corporation, Third-Party Plaintiff, *vs.* Embassy Glass, Inc., a Nevada corporation; Zetian Systems, Inc., a Nevada corporation; Bombard Mechanical, LLC, a Limited Liability Company; Century Steel, Inc., a Nevada corporation; Pacific Custom Pools, Inc., a Nevada corporation; Superior Tile & Mechanical, Inc., a Nevada corporation; Mesa Mechanical, LLC, a Limited Liability Company; Dean Roofing Co., a Nevada Corporation; Does 1 through 50; Roe Corporations 1 through 50, Third-Party Defendants.

Palms Place, LLC, a Nevada limited liability company, Cross-Claimant, *vs.* Embassy Glass, Inc., a Nevada corporation; Zetian Systems, Inc., a Nevada corporation; Does 1 through 50; Roe Corporations 1 through 50, Cross-Defendants. (Nevada District Court, Clark County, Nevada, A-11-645150-C) Deposition.

28. **September 2015.** Lavastone Capitol LLC *vs.* Coventry First LLC, LST I LLC, LST II LLC, LST Holdings LTD., Montgomery Capital, Inc., Alan Buerger, Reid Buerger, Constance Buerger, and Krista Lake. (U.S. District Court, Southern District of New York, 14-CV-07139 JSR) Trial.

27. **May 2015.** Lavastone Capitol LLC *vs.* Coventry First LLC, LST I LLC, LST II LLC, LST Holdings LTD., Montgomery Capital, Inc., Alan Buerger, Reid Buerger, Constance Buerger, and Krista Lake. (U.S. District Court, Southern District of New York, 14-CV-07139 JSR) Deposition.

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26. **April 2015.** Testimony before the California State Assembly Committee on Elections and Redistricting. Legislative hearing. <https://www.stat.berkeley.edu/~stark/Preprints/ab44-assembly-2015-4-15.htm>
25. **July 2014.** New Jersey Carpenters Health Fund, New Jersey Carpenters Vacation Fund, and Boilermaker Blacksmith National Pension Trust, on Behalf of Themselves and All Others Similarly Situated, *vs.* Residential Capital, LLC; Residential Funding, LLC; Residential Accredited Loans, Inc.; Bruce J. Paradis; Kenneth M. Duncan; Davee L. Olson; Ralph T. Flees; Lisa R. Lundsten; James G. Jones; David M. Bricker; James N. Young; Residential Funding Securities Corporation d/b/a GMAC RFC Securities; Goldman, Sachs & Co.; RBS Securities, Inc. f/k/a Greenwich Capital Markets, Inc. d/b/a RBS Greenwich Capital; Deutsche Bank Securities, Inc.; Citigroup Global Markets, Inc.; Credit Suisse Securities (USA) LLC; Bank of America Corporation as successor-in-interest to Merrill Lynch, Pierce, Fenner & Smith, Inc.; UBS Securities LLC; JPMorgan Chase & Co., Inc. as successor-in-interest to Bear, Stearns & Co., Inc.; and Morgan Stanley & Co., Inc. (U.S. District Court, Southern District of New York, Case 08-CV-8781 HB) Deposition.
24. **October 2013.** United States, the States of California, Delaware, Florida, Illinois, Indiana, Nevada, New Mexico, New York, and Tennessee, the Commonwealths Of Massachusetts and Virginia, and The District Of Columbia Ex Rel. John Hendrix, Plaintiffs, *vs.* J-M Manufacturing Company, Inc., d/b/a JM Eagle, a Delaware corporation, and Formosa Plastics Corporation, U.S.A., a Delaware corporation (U.S. District Court, Central District of California, Case ED CV 06-00055-GW) Trial.
23. **September 2013.** Tessera, Inc. *vs.* Advanced Micro Devices, Inc., a Delaware corporation; Spansion, LLC, a Delaware limited liability corporation; Spansion, Inc., a Delaware corporation; Spansion Technology, Inc., a Delaware corporation; Advanced Semiconductor Engineering, Inc., a Republic of China corporation; ASE (U.S.), Inc., a California

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corporation; ChipMOS Technologies, Inc., a Republic of China corporation; ChipMOS U.S.A., Inc., a California corporation; Siliconware Precision Industries Co., Ltd., a Republic of China corporation; Siliconware USA, Inc., a California corporation; STMicroelectronics N.V., a Netherlands corporation; STMicroelectronics, Inc., a Delaware corporation; STATS ChipPAC, Inc., a Delaware corporation; STATS ChipPAC (BVI), Inc., a British Virgin Islands company; STATS ChipPAC, Ltd., a Singapore company (U.S. District Court, Northern District of California, Case C 05-04063 CW) Deposition.

22. **July 2013.** United States, the States Of California, Delaware, Florida, Illinois, Indiana, Nevada, New Mexico, New York, and Tennessee, the Commonwealths Of Massachusetts And Virginia, and The District Of Columbia Ex Rel. John Hendrix, Plaintiffs, *vs.* J-M Manufacturing Company, Inc., d/b/a JM Eagle, a Delaware corporation, and Formosa Plastics Corporation, U.S.A., a Delaware corporation (U.S. District Court, Central District of California, Case ED CV 06-00055-GW) Deposition.
21. **June 2013.** Free Speech Coalition, Inc., American Society Of Media Photographers, Inc.; Michael Barone; David Connors a/k/a Dave Cummings; Thomas Hymes; Townsend Enterprises, Inc. d/b/a Sinclair Institute; CIR Distribution, LLC d/b/a Channel 1 Releasing; Barbara Alper; Carol Queen; Barbara Nitke; David Steinberg; Marie L. Levine a/k/a Nina Hartley; Dave Levingston; Betty Dodson; Carlin Ross *vs.* Eric H. Holder, Jr., Attorney General of the United States (U.S. District Court, Eastern District of Pennsylvania, Case 2:09-4607 MMB) Trial.
20. **October 2011.** Jonathan Buckheit *vs.* Tony Dennis, Dean Devlugt, Town of Atherton, County of San Mateo, Anthony Kockler and Jerry Carlson (U.S. District Court, Northern District of California, Case CV09-5000 JCS) Deposition.
19. **June 2010.** Testimony before California State Senate Committee

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on Elections, Reapportionment and Constitutional Amendments. Legislative hearing. <https://www.stat.berkeley.edu/~stark/Preprints/ab2023-senate-15-6-10.htm>

18. **April 2010.** Testimony before California State Assembly Committee on Elections and Redistricting. Legislative hearing. <https://www.stat.berkeley.edu/~stark/Preprints/ab2023-assembly-20-4-10.htm>
17. **March 2010.** Suzan Sharpley and Robert Abeling *vs.* William Long; Novato Sanitary District; Elaine Ginnold, Marin County Registrar of Voters; Does 1–10. (State of California Superior Court, County of Marin, Case CIV 096368) Trial.
16. **January 2010.** Kastanos et al. *vs.* Central Concrete Supply Co., Inc. (State of California Superior Court, County of Alameda, Lead Case No. HG 07-319366) Trial.
15. **June 2009.** Star Scientific, Inc., *vs.* R.J. Reynolds Tobacco Company, et al. (U.S. District Court, Maryland District, Northern Division, Case Nos. MJG-01 1504 and MJG-02 2504) Trial.
14. **May 2009.** Star Scientific, Inc., *vs.* R.J. Reynolds Tobacco Company, et al. (U.S. District Court, Maryland District, Northern Division, Case Nos. MJG-01 1504 and MJG-02 2504) Deposition.
13. **July 2008.** Coordination Proceeding Special Title (Rule 1550(b)) Cellphone Termination Fee Cases (State of California Superior Court, County of Alameda, Case 4332) Deposition.
12. **April 2008.** Coordination Proceeding Special Title (Rule 1550(b)) Cellphone Termination Fee Cases (State of California Superior Court,

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County of Alameda, Case 4332) Deposition.

11. **August 2007.** Self-Insurers' Security Fund *vs.* Gallagher Bassett Services, Inc. (U.S. District Court, Northern District of California, Case No. C 06-02828 JSW) Deposition.
10. **March 2007.** Peter Wachtell *vs.* Capital One Financial Corporation and Capital One Services, Inc. (U.S. District Court, District of Idaho, Case No. CIV03-267-S-MHW) Deposition.
9. **November 2006.** Coordination Proceeding Special Title (Rule 1550(b)) Cellphone Termination Fee Cases (State of California Superior Court, County of Alameda, Case 4332) Deposition.
8. **November 2006.** ACLU *vs.* Gonzales (U.S. District Court, Eastern District of Pennsylvania, Civil Action No. 98-5591) Trial.
7. **August 2006.** ACLU *vs.* Gonzales (U.S. District Court, Eastern District of Pennsylvania, Civil Action No. 98-5591) Deposition.
6. **December 2004.** Star Scientific, Inc., *vs.* R.J. Reynolds Tobacco Company, et al. (U.S. District Court, Maryland District, Northern Division, Case Nos. MJG-01 1504 and MJG-02 2504) Trial.
5. **December 2003.** Richison et al. *vs.* American Cemwood Corporation (State of California Superior Court, San Joaquin County, Case No. 005532) Trial.
4. **December 2003.** Pacific Gas and Electric Co. *vs.* City and County of San Francisco (U.S. District Court, Northern District of California, Case No. C99-2071 VRW) Deposition.

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3. **May 2003.** Richison et al. *vs.* American Cemwood Corporation (State of California Superior Court, San Joaquin County, Case No. 005532) Deposition.
2. **May 1998.** Testimony before the U.S. House of Representatives Subcommittee on the Census. Legislative hearing.
1. **1997.** Testimony before the State of California Senate Committee on Natural Resources. Legislative hearing.

<https://www.stat.berkeley.edu/~stark/bio.pdf>

Last modified January 4, 2019.

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II

Pre-processing Georgia XML Election Data

```
In [1]: %matplotlib inline
import math
import numpy as np
import scipy as sp
import scipy.optimize
from scipy.stats import hypergeom, binom, norm
from scipy import special
from cryptorandom.cryptorandom import SHA256
from cryptorandom import sample
from permute.utils import binom_conf_interval
import matplotlib.pyplot as plt
import pandas as pd
from lxml import etree
import csv

elec_fn = '../Data/detail.xml'
```

```
In [2]: elec = etree.parse(elec_fn)
```

```
In [3]: e_root = elec.getroot()
```


Example record:

11/9/2018 8:13:23 PM EST November 6, 2018 - General Election

11/6/2018

Richmond

```
<VoterTurnout ballotsCast="70355" totalVoters="122747" voterTurnout="57.32">
  <Precincts>
    <Precinct ballotsCast="536" name="101" percentReporting="4" totalVoters="830" voterTurnout="64.58"/>
  </Precincts>
</VoterTurnout>
```

... ..

```
In [4]: # Contest key=20000 is Governor, Choice key=40 is Kemp
elec.xpath("sum(Contest[@key='20000']/Choice[@key='40']//County/@votes)")
# elec.xpath("Contest[@text='Governor']/Choice[@text='BRIAN KEMP (REP)']//County/@votes")
# elec.find('//Precinct')
```

Out[4]: 1978408.0

Create a CSV file with total ballots cast in each county

Verified matching between CSV, XML, and GA website on 1/4/2019 by KO:

- totals for Appling, Atkinson, Bacon, Baker, Baldwin match
- total ballots cast statewide 3,949,905 matches

```
In [5]: totals = elec.xpath("ElectionVoterTurnout/Counties/County")

# open a file for writing

total_ballots_by_county = open('../Data/total_ballots_by_county.csv', 'w')
total = 0

# create the csv writer object

csvwriter = csv.writer(total_ballots_by_county)

csvwriter.writerow(["County", "Ballots cast"])
for v in totals:
    csvwriter.writerow([v.attrib["name"], v.attrib["ballotsCast"]])
    total += int(v.attrib["ballotsCast"])

# close the file

total_ballots_by_county.close()

# assert that the total by county, summed, equals the reported total

assert total == int(elec.xpath("ElectionVoterTurnout/@ballotsCast")[0])
```

Create a CSV file with reported votes by county by contest by candidate

Verified matching between CSV, XML, and GA website on 1/4/2019:

- Votes for Kemp in Bryan county, broken out by vote type, match in CSV and XML. The sum matches the website total 10,507.
- Votes for Geoff Duncan (Lt. Gov) in Ware county, broken out by vote type, match in CSV and XML. The sum matches the website total 7,619.

```
In [6]: # open a file for writing

votes = open('../..//Data/votes_by_candidate_county.csv', 'w')

# create the csv writer object

csvwriter = csv.writer(votes)
csvwriter.writerow(["Contest", "Candidate", "Vote type", "County", "Ballots cast"])

for contest in e_root.iter("Contest"):
    contest_name = contest.attrib["text"]
    for choice in contest.iter("Choice"):
        candidate = choice.attrib["text"]
        for votetype in choice.iter("VoteType"):
            val = votetype.attrib["name"]
            for v in votetype:
                csvwriter.writerow([contest_name, candidate, val, v.attrib["name"], v.attrib["votes"
]])

# close the file

votes.close()
```

Create CSV file with undervotes in the down-ticket statewide contests

Undervotes are counted *relative* to the number of ballots cast in the Governor's race. (We have total voter turnout, but it isn't broken out by vote type. Ballots cast for Governor are broken out by vote type.)

Checked on 1/4/19:

- No negative undervote counts
- For each Vote Type in each County, the Total Ballots is the same for every Contest

```
In [7]: total_ballots_cast = pd.read_csv('../..//Data/total_ballots_by_county.csv')
reported_votes = pd.read_csv('../..//Data/votes_by_candidate_county.csv')
```

In [8]: `reported_votes.head()`

Out[8]:

	Contest	Candidate	Vote type	County	Ballots cast
0	Governor	BRIAN KEMP (REP)	Election Day	Appling	2334
1	Governor	BRIAN KEMP (REP)	Election Day	Atkinson	808
2	Governor	BRIAN KEMP (REP)	Election Day	Bacon	609
3	Governor	BRIAN KEMP (REP)	Election Day	Baker	409
4	Governor	BRIAN KEMP (REP)	Election Day	Baldwin	3054

```
In [9]: statewide_contests = np.array(["Governor", "Lieutenant Governor", "Secretary Of State", \
    "Attorney General", "Commissioner Of Agriculture", \
    "Commissioner Of Insurance", "State School Superintendent", "Commissio
ner Of Labor", \
    "Public Service Commission, District 3 - Metro-Atlanta", \
    "Public Service Commission, District 5 - Western"])
reported_votes = reported_votes[reported_votes["Contest"].isin(statewide_contests)]

reported_votes_by_contest = reported_votes.groupby(["Contest", "County", "Vote type"])["Ballots cast"
].agg(np.sum)
reported_votes_by_contest = reported_votes_by_contest.reset_index()
reported_votes_by_contest.head()
```

Out[9]:

	Contest	County	Vote type	Ballots cast
0	Attorney General	Appling	Absentee by Mail	519
1	Attorney General	Appling	Advance in Person	3180
2	Attorney General	Appling	Election Day	2860
3	Attorney General	Appling	Provisional	3
4	Attorney General	Atkinson	Absentee by Mail	88

```
In [10]: gov_race = reported_votes_by_contest[reported_votes_by_contest["Contest"]=="Governor"]
gov_race = gov_race.copy()
gov_race.rename(columns={'Ballots cast': 'Total ballots'}, inplace=True)
gov_race = gov_race.drop(columns=["Contest"])
gov_race.head()
```

Out[10]:

	County	Vote type	Total ballots
2544	Appling	Absentee by Mail	530
2545	Appling	Advance in Person	3298
2546	Appling	Election Day	2978
2547	Appling	Provisional	3
2548	Atkinson	Absentee by Mail	88

```
In [11]: max_votes_estimated = reported_votes_by_contest.groupby(["County", "Vote type"]).agg(np.max)
max_votes_estimated = max_votes_estimated.drop(columns=["Contest"]).reset_index()
max_votes_estimated.rename(columns={'Ballots cast': 'Total ballots'}, inplace=True)
```

```
In [12]: merged_votes = pd.DataFrame()
for contest in statewide_contests[1:]:
    this_race = reported_votes_by_contest["Contest"]==contest
    merged_votes_contest = pd.merge(max_votes_estimated, reported_votes_by_contest[this_race])
    merged_votes_contest["Undervotes"] = merged_votes_contest["Total ballots"] - merged_votes_contest
    ["Ballots cast"]
    merged_votes = pd.concat([merged_votes, merged_votes_contest])

merged_votes.head()
```

Out[12]:

	County	Vote type	Total ballots	Contest	Ballots cast	Undervotes
0	Appling	Absentee by Mail	530	Lieutenant Governor	523	7
1	Appling	Advance in Person	3298	Lieutenant Governor	3092	206
2	Appling	Election Day	2978	Lieutenant Governor	2768	210
3	Appling	Provisional	3	Lieutenant Governor	3	0
4	Atkinson	Absentee by Mail	88	Lieutenant Governor	88	0

```
In [13]: merged_votes.to_csv('../Data/undervotes_by_county.csv', index=False)
```

```
In [14]: # version information
%load_ext version_information
%version_information scipy, numpy, csv, pandas, matplotlib, notebook, cryptorandom, permute
```

Loading extensions from ~/.ipython/extensions is deprecated. We recommend managing extensions like any other Python packages, in site-packages.

/anaconda/lib/python3.6/site-packages/IPython/core/formatters.py:839: FormatterWarning: JSON expects JSONable list/dict containers, not JSON strings
 FormatterWarning)

Out[14]:

Software	Version
Python	3.6.7 64bit [GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)]
IPython	7.2.0
OS	Darwin 18.2.0 x86_64 i386 64bit
scipy	1.1.0
numpy	1.15.4
csv	1.0
pandas	0.23.1
matplotlib	3.0.2
notebook	5.7.4
cryptorandom	0.2
permute	0.1.alpha4
Sun Jan 06 13:57:02 2019 PST	

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III

Differential undervote rate in Lt. Gov contest

Compare undervote rates by mode of voting (paper versus electronic) using hypergeometric 2-sample test.

```
In [1]: %matplotlib inline
import math
import numpy as np
import scipy as sp
import scipy.optimize
from scipy.stats import hypergeom, binom, norm, chi2
from scipy import special
from collections import Counter
from cryptorandom.cryptorandom import SHA256
from cryptorandom import sample
from permute.utils import binom_conf_interval
from permute.npc import fisher
import matplotlib.pyplot as plt
import pandas as pd
import csv
```

```
In [2]: statewide_contests = np.array(["Lieutenant Governor", "Secretary Of State", \
                                     "Attorney General", "Commissioner Of Agriculture", \
                                     "Commissioner Of Insurance", "State School Superintendent", "Commissio
ner Of Labor", \
                                     "Public Service Commission, District 3 - Metro-Atlanta", \
                                     "Public Service Commission, District 5 - Western"])
votes = pd.read_csv('../Data/undervotes_by_county.csv')
votes.head()
```

Out[2]:

	County	Vote type	Total ballots	Contest	Ballots cast	Undervotes
0	Appling	Absentee by Mail	530	Lieutenant Governor	523	7
1	Appling	Advance in Person	3298	Lieutenant Governor	3092	206
2	Appling	Election Day	2978	Lieutenant Governor	2768	210
3	Appling	Provisional	3	Lieutenant Governor	3	0
4	Atkinson	Absentee by Mail	88	Lieutenant Governor	88	0

```
In [3]: mode_mask = votes['Vote type'].isin(['Advance in Person', 'Election Day', 'Absentee by Mail'])
dre_mask = votes['Vote type'].isin(['Advance in Person', 'Election Day'])

p_thresh = 0.0001
contests_sig = Counter()

for c in statewide_contests:
    cont_mask = votes['Contest'] == c
    for cty in votes['County'].unique():
        cty_mask = votes['County'] == cty
        N = votes[mode_mask & cont_mask & cty_mask]['Total ballots'].sum()
        G = votes[mode_mask & cont_mask & cty_mask]['Undervotes'].sum()
        g = votes[dre_mask & cont_mask & cty_mask]['Undervotes'].sum()
        n = votes[dre_mask & cont_mask & cty_mask]['Ballots cast'].sum() + g
        # pmf(k, M, n, N) = choose(n, k) * choose(M - n, N - k) / choose(M, N),
        p = 2*min(hypergeom.cdf(g, N, G, n), hypergeom.sf(g-1, N, G, n))
        if p <= p_thresh:
            contests_sig[c] = contests_sig[c]+1
    print(c, cty, N, G, n, g, G/N, g/n, p)
```

Lieutenant Governor Appling 6806 423 6276 416 0.06215104319717896 0.0662842574888464 2.1439776587662
654e-08

Lieutenant Governor Atkinson 2520 218 2432 218 0.0865079365079365 0.08963815789473684 0.000601198899
3767051

Lieutenant Governor Bacon 3829 244 3655 242 0.06372420997649517 0.06621067031463748 0.00144527105022
85972

Lieutenant Governor Baker 1291 101 1150 95 0.07823392718822618 0.08260869565217391 0.117291214017724
9

Lieutenant Governor Baldwin 15633 892 14475 882 0.05705878590161837 0.060932642487046634 6.904218122
683707e-19

Lieutenant Governor Banks 6852 220 6629 219 0.03210741389375365 0.033036657112686676 0.0105795886299
9079

Lieutenant Governor Barrow 27398 1060 26135 1049 0.03868895539820425 0.04013774631719916 3.900219802
989691e-11

Lieutenant Governor Bartow 37327 478 35759 476 0.012805743831542852 0.01331133420956962 5.3293861989
1327e-07

Lieutenant Governor Ben Hill 5533 335 5213 332 0.06054581601301283 0.06368693650489161 4.49526479982
811e-06

Lieutenant Governor Berrien 6247 320 5925 320 0.05122458780214503 0.0540084388185654 5.5789533967082
33e-08

Lieutenant Governor Bibb 60460 3049 55999 3014 0.050430036387694346 0.053822389685530096 1.963474639
7364817e-60

Lieutenant Governor Bleckley 4855 214 4598 212 0.04407826982492276 0.046107003044802086 0.0012309494
917529596

Lieutenant Governor Brantley 5689 292 5501 291 0.051327122517138335 0.052899472823123066 0.000969897
9815758128

Lieutenant Governor Brooks 5696 353 5231 344 0.061973314606741575 0.06576180462626649 1.099160869978
3508e-05

Lieutenant Governor Bryan 14970 543 14388 540 0.03627254509018036 0.03753127606338615 1.329546300843
3782e-06

Lieutenant Governor Bulloch 23543 988 22467 972 0.041965764770844835 0.04326345306449459 4.385804568
643126e-07

Lieutenant Governor Burke 8719 483 7751 480 0.05539626103910999 0.06192749322668043 3.34824474118164
02e-21

Lieutenant Governor Butts 8863 355 8483 352 0.04005415773440144 0.041494754214310973 0.0002285992830
354893

Lieutenant Governor Calhoun 1899 116 1714 114 0.061084781463928386 0.06651108518086347 0.00095255580
82105067

Lieutenant Governor Camden 17053 631 15860 622 0.03700228698762681 0.03921815889029004 5.87490475744
2742e-11

Lieutenant Governor Candler 3538 181 3418 179 0.05115884680610514 0.05236980690462258 0.098032171079
81956

Lieutenant Governor Carroll 41739 1548 40221 1541 0.037087615898799685 0.03831331891300564 5.4443703

82616403e-17
Lieutenant Governor Catoosa 23725 890 23185 887 0.0375131717597471 0.03825749406944145 3.23155990066
39145e-06
Lieutenant Governor Charlton 3369 191 3206 191 0.056693380825170676 0.05957579538365564 0.0001157816
1633823924
Lieutenant Governor Chatham 103338 4809 97161 4735 0.04653660802415375 0.04873354535255915 1.1932271
711283063e-54
Lieutenant Governor Chattahoochee 1102 65 1067 65 0.05898366606170599 0.06091846298031865 0.23009572
741168619
Lieutenant Governor Chattooga 7427 313 7202 311 0.042143530362192004 0.043182449319633436 0.00671638
4526635276
Lieutenant Governor Cherokee 106299 2789 100987 2758 0.026237311733882728 0.027310445898977097 9.253
11760914282e-30
Lieutenant Governor Clarke 43261 1655 40239 1623 0.03825616606181087 0.04033400432416313 1.974619000
0816885e-21
Lieutenant Governor Clay 1186 75 1043 72 0.06323777403035413 0.06903163950143816 0.02649754259821546
Lieutenant Governor Clayton 91840 4721 85993 4663 0.05140461672473868 0.0542253439233426 8.702654564
519675e-71
Lieutenant Governor Clinch 2254 163 2145 162 0.07231588287488909 0.07552447552447553 0.0045125102105
991214
Lieutenant Governor Cobb 310381 7920 284480 7718 0.02551702584887606 0.027130202474690664 2.79628003
48733273e-105
Lieutenant Governor Coffee 12595 930 12200 924 0.07383882493052799 0.07573770491803279 1.61202247911
70078e-07
Lieutenant Governor Colquitt 12953 819 12439 816 0.06322859569211765 0.06560012862770319 2.214245812
745641e-11
Lieutenant Governor Columbia 61591 1955 58655 1928 0.03174165056582942 0.03287017304577615 1.7844777
319302836e-16
Lieutenant Governor Cook 5803 285 5559 282 0.04911252800275719 0.050728548300053966 0.00332478691271
6678
Lieutenant Governor Coweta 58056 1929 55244 1909 0.033226539892517566 0.03455578886394903 5.87107139
6746346e-21
Lieutenant Governor Crawford 4931 263 4697 259 0.05333603731494626 0.05514157973174367 0.00785466526
9436633
Lieutenant Governor Crisp 7024 434 6661 430 0.061788154897494306 0.06455487164089475 1.8179405492627
983e-06
Lieutenant Governor Dade 5450 253 5321 249 0.046422018348623854 0.04679571509114828 0.55416253626200
07
Lieutenant Governor Dawson 11570 367 11131 364 0.03171996542783059 0.032701464378762014 0.0007329956
740859268
Lieutenant Governor DeKalb 310968 12765 291296 12458 0.041049239793161996 0.042767494232670546 7.724
111758782382e-98
Lieutenant Governor Decatur 9043 498 8495 497 0.055070220059714695 0.05850500294290759 8.46781550033

1415e-13

Lieutenant Governor Dodge 7051 477 6603 468 0.06764997872642178 0.0708768741481145 3.855428784205159
e-06

Lieutenant Governor Dooly 3793 312 3597 308 0.08225678882151331 0.0856269113149847 0.000369678656833
16676

Lieutenant Governor Dougherty 31297 2043 29353 2021 0.06527782215547816 0.0688515654277246 7.7599128
64954536e-33

Lieutenant Governor Douglas 55197 1894 51964 1874 0.03431345906480425 0.03606342852744208 1.33049764
50251036e-27

Lieutenant Governor Early 4131 192 3658 182 0.04647785039941903 0.04975396391470749 0.00385303859557
69424

Lieutenant Governor Echols 1143 72 1108 72 0.06299212598425197 0.06498194945848375 0.197934412738428
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Lieutenant Governor Effingham 23365 951 22615 941 0.04070190455809972 0.04160955118284325 1.82246779
2925356e-05

Lieutenant Governor Elbert 7319 364 6756 362 0.0497335701598579 0.05358200118413262 1.10959042218242
58e-10

Lieutenant Governor Emanuel 7710 483 7320 475 0.06264591439688716 0.06489071038251366 0.000112312986
19889423

Lieutenant Governor Evans 3447 223 3248 221 0.06469393675659994 0.06804187192118226 0.00026845534065
73045

Lieutenant Governor Fannin 11203 492 10545 492 0.043916807997857715 0.04665718349928876 1.1645457611
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Commissioner Of Agriculture Terrell 3930 149 3603 145 0.03791348600508906 0.04024424091035248 0.0077
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Commissioner Of Agriculture Thomas 17241 444 16250 428 0.025752566556464244 0.02633846153846154 0.05
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Commissioner Of Agriculture Tift 13669 397 13108 384 0.029043821786524253 0.02929508696978944 0.4844
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Commissioner Of Agriculture Toombs 8851 268 8170 252 0.030279064512484466 0.03084455324357405 0.3382
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Commissioner Of Agriculture Towns 6132 187 5848 182 0.03049575994781474 0.03112175102599179 0.255896
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Commissioner Of Agriculture Treutlen 2610 104 2464 96 0.03984674329501916 0.03896103896103896 0.4464
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Commissioner Of Agriculture Troup 23663 614 22399 587 0.025947682035244897 0.026206527077101655 0.33
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Commissioner Of Agriculture Turner 3269 107 3121 106 0.03273172223921689 0.033963473245754564 0.0808
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Commissioner Of Agriculture Twiggs 3787 150 3512 146 0.039609189331925004 0.041571753986332574 0.024
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Commissioner Of Agriculture Whitfield 27302 778 26285 759 0.028496080873196102 0.028875784668061632
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Commissioner Of Agriculture Wilcox 2815 87 2610 82 0.030905861456483125 0.031417624521072794 0.76523
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Commissioner Of Insurance Banks 6852 118 6629 115 0.017221249270286048 0.017348016292050083 0.921992
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Commissioner Of Insurance Hall 67282 1176 63789 1136 0.017478671858743796 0.017808713101004875 0.004
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Commissioner Of Insurance Macon 4217 203 3886 189 0.048138487076120465 0.048636129696345856 0.723511
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Commissioner Of Insurance Madison 11697 253 11170 246 0.0216294776438403 0.022023276633840645 0.2221
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Commissioner Of Insurance Marion 2930 87 2689 84 0.029692832764505118 0.031238378579397545 0.1260339
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Commissioner Of Insurance McDuffie 8792 171 7924 163 0.019449499545040945 0.020570418980312973 0.019
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Commissioner Of Insurance Oglethorpe 6484 160 6075 155 0.024676125848241828 0.02551440329218107 0.11
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Commissioner Of Insurance Rockdale 36600 535 34747 516 0.014617486338797813 0.014850202895213976 0.1
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Commissioner Of Insurance Upson 10558 255 9956 244 0.024152301572267474 0.02450783447167537 0.412434
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Commissioner Of Insurance Walker 21451 446 20638 433 0.020791571488508694 0.02098071518558 0.3989477
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State School Superintendent Appling 6806 195 6276 183 0.028651190126359093 0.029158699808795412 0.47
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State School Superintendent Bacon 3829 97 3655 95 0.025332985113606685 0.025991792065663474 0.348067
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Commissioner Of Labor Coffee 12595 392 12200 382 0.03112346169114728 0.031311475409836066 0.61989282
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Commissioner Of Labor Ware 11004 198 10377 185 0.017993456924754635 0.017827888599787994 0.678542357
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Commissioner Of Labor Washington 8159 358 7432 332 0.04387792621644809 0.044671689989235736 0.304667
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Commissioner Of Labor Worth 7831 175 7526 170 0.022347082109564553 0.02258836035078395 0.63448805051
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Public Service Commission, District 3 - Metro-Atlanta Appling 6806 209 6276 192 0.030708198648251542
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Public Service Commission, District 3 - Metro-Atlanta Atkinson 2520 122 2432 122 0.04841269841269841
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Public Service Commission, District 3 - Metro-Atlanta Bacon 3829 109 3655 106 0.028466962653434316
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Public Service Commission, District 3 - Metro-Atlanta Baldwin 15633 486 14475 462 0.0310880829015544

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Public Service Commission, District 3 - Metro-Atlanta Echols 1143 31 1108 31 0.02712160979877515 0.0
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Public Service Commission, District 3 - Metro-Atlanta Effingham 23365 402 22615 386 0.01720522148512
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Public Service Commission, District 3 - Metro-Atlanta Elbert 7319 195 6756 191 0.02664298401420959
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Public Service Commission, District 3 - Metro-Atlanta Emanuel 7710 271 7320 261 0.03514915693904021
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Public Service Commission, District 3 - Metro-Atlanta Evans 3447 124 3248 119 0.03597331012474616 0.
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Public Service Commission, District 3 - Metro-Atlanta Fannin 11203 234 10545 222 0.02088726234044452
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Public Service Commission, District 3 - Metro-Atlanta Fayette 57962 1068 55315 1007 0.01842586522204
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Public Service Commission, District 3 - Metro-Atlanta Floyd 30225 654 28965 622 0.02163771712158809
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Public Service Commission, District 3 - Metro-Atlanta Forsyth 93239 1665 88811 1551 0.01785733437724
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Public Service Commission, District 3 - Metro-Atlanta Franklin 8149 146 7761 143 0.01791630874953982
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Public Service Commission, District 3 - Metro-Atlanta Fulton 421806 9898 403964 9295 0.0234657638819
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Public Service Commission, District 3 - Metro-Atlanta Gilmer 12471 308 11912 303 0.02469729773073530
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Public Service Commission, District 3 - Metro-Atlanta Glascock 1300 60 1219 58 0.046153846153846156
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Public Service Commission, District 3 - Metro-Atlanta Glynn 32501 672 30689 647 0.02067628688348051
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Public Service Commission, District 3 - Metro-Atlanta Gordon 17772 441 17225 423 0.02481431465226198
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Public Service Commission, District 3 - Metro-Atlanta Grady 8356 167 7956 157 0.019985639061752034
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Public Service Commission, District 3 - Metro-Atlanta Gwinnett 312709 5075 292312 4762 0.01622914594
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Public Service Commission, District 3 - Metro-Atlanta Habersham 15495 357 14642 339 0.02303969022265
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Public Service Commission, District 3 - Metro-Atlanta Hall 67282 1320 63789 1257 0.01961891739246752
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Public Service Commission, District 3 - Metro-Atlanta Hancock 3539 156 3049 140 0.04408024865781294
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Public Service Commission, District 3 - Metro-Atlanta Haralson 10585 214 10192 208 0.020217288615965
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Public Service Commission, District 3 - Metro-Atlanta Harris 15972 291 15243 279 0.01821938392186326
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Public Service Commission, District 3 - Metro-Atlanta Hart 9618 266 9178 260 0.027656477438136828 0.
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Public Service Commission, District 3 - Metro-Atlanta Heard 4051 87 3773 83 0.02147617872130338 0.02
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Public Service Commission, District 3 - Metro-Atlanta Henry 98365 1470 93368 1363 0.0149443399583185
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Public Service Commission, District 3 - Metro-Atlanta Houston 59158 883 55968 816 0.0149261300246796
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Public Service Commission, District 3 - Metro-Atlanta Irwin 3556 94 3423 93 0.026434195725534307 0.0
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Public Service Commission, District 3 - Metro-Atlanta Jackson 26889 437 25870 420 0.0162519989586819
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Public Service Commission, District 3 - Metro-Atlanta Jasper 5907 105 5486 100 0.017775520568816656
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Public Service Commission, District 3 - Metro-Atlanta Jeff Davis 4815 201 4586 193 0.041744548286604
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Public Service Commission, District 3 - Metro-Atlanta Jefferson 6756 237 6149 215 0.0350799289520426
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Public Service Commission, District 3 - Metro-Atlanta Jenkins 2856 76 2668 72 0.02661064425770308 0.
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Public Service Commission, District 3 - Metro-Atlanta Johnson 3483 143 3247 130 0.0410565604364054
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Public Service Commission, District 3 - Metro-Atlanta Jones 12432 255 11648 235 0.020511583011583012
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Public Service Commission, District 3 - Metro-Atlanta Lamar 7346 143 6942 136 0.019466376259188675
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Public Service Commission, District 3 - Metro-Atlanta Lanier 2679 92 2571 88 0.03434117207913401 0.0
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Public Service Commission, District 3 - Metro-Atlanta Laurens 18939 530 17653 497 0.0279845820793072
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Public Service Commission, District 3 - Metro-Atlanta Lee 13549 208 13069 200 0.015351686471326297
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Public Service Commission, District 3 - Metro-Atlanta Liberty 15358 244 14408 228 0.0158874853496549
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Public Service Commission, District 3 - Metro-Atlanta Lincoln 3967 96 3617 95 0.02419964708847996 0.
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Public Service Commission, District 3 - Metro-Atlanta Long 3988 122 3819 120 0.030591775325977934 0.

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Public Service Commission, District 3 - Metro-Atlanta Lowndes 35212 601 33322 569 0.0170680449846643
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Public Service Commission, District 3 - Metro-Atlanta Macon 4217 178 3886 166 0.042210101968223855
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Public Service Commission, District 3 - Metro-Atlanta Madison 11697 279 11170 272 0.0238522698127725
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Public Service Commission, District 3 - Metro-Atlanta Marion 2930 81 2689 77 0.02764505119453925 0.0
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Public Service Commission, District 3 - Metro-Atlanta McDuffie 8792 166 7924 154 0.01888080072793448
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Public Service Commission, District 3 - Metro-Atlanta McIntosh 5408 150 4968 139 0.02773668639053254
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Public Service Commission, District 3 - Metro-Atlanta Meriwether 8639 207 8156 199 0.023961106609561
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Public Service Commission, District 3 - Metro-Atlanta Miller 2313 114 2181 108 0.04928664072632944
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Public Service Commission, District 3 - Metro-Atlanta Mitchell 7446 164 6882 156 0.0220252484555466
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Public Service Commission, District 3 - Metro-Atlanta Monroe 12932 290 12236 285 0.02242499226724404
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Public Service Commission, District 3 - Metro-Atlanta Montgomery 3528 124 3317 119 0.035147392290249
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Public Service Commission, District 3 - Metro-Atlanta Morgan 9554 208 9144 199 0.02177098597446096
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Public Service Commission, District 3 - Metro-Atlanta Muscogee 63141 1165 58719 1094 0.0184507689140
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Public Service Commission, District 3 - Metro-Atlanta Newton 43129 766 40394 724 0.01776067147395024
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Public Service Commission, District 3 - Metro-Atlanta Oconee 20733 453 19802 433 0.02184922587179858
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Public Service Commission, District 3 - Metro-Atlanta Oglethorpe 6484 155 6075 149 0.023904996915484
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Public Service Commission, District 3 - Metro-Atlanta Paulding 61222 986 57915 925 0.016105321616412
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Public Service Commission, District 3 - Metro-Atlanta Peach 10355 210 9910 201 0.020280057943022695
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Public Service Commission, District 3 - Metro-Atlanta Pickens 13362 303 13140 297 0.0226762460709474
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Public Service Commission, District 3 - Metro-Atlanta Pierce 6883 122 6556 119 0.017724829289553972
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Public Service Commission, District 3 - Metro-Atlanta Pike 8534 133 8230 130 0.015584719943754394 0.
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Public Service Commission, District 3 - Metro-Atlanta Polk 12859 264 12412 259 0.020530367835757058
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Public Service Commission, District 3 - Metro-Atlanta Pulaski 3622 162 3390 150 0.0447266703478741
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Public Service Commission, District 3 - Metro-Atlanta Putnam 9321 177 8723 169 0.018989378822014805
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Public Service Commission, District 3 - Metro-Atlanta Quitman 940 54 880 45 0.0574468085106383 0.051
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Public Service Commission, District 3 - Metro-Atlanta Rabun 7578 178 6735 153 0.023489047242016364
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Public Service Commission, District 3 - Metro-Atlanta Randolph 2788 100 2475 86 0.035868005738880916
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Public Service Commission, District 3 - Metro-Atlanta Richmond 70043 1462 64729 1345 0.0208728923661
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Public Service Commission, District 3 - Metro-Atlanta Rockdale 36600 566 34747 542 0.015464480874316
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Public Service Commission, District 3 - Metro-Atlanta Schley 1931 57 1835 57 0.029518384256861728 0.
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Public Service Commission, District 3 - Metro-Atlanta Screven 5407 168 5136 163 0.03107083410393934
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Public Service Commission, District 3 - Metro-Atlanta Seminole 3214 67 2950 62 0.020846297448662104
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Public Service Commission, District 3 - Metro-Atlanta Stephens 9069 206 8533 191 0.02271474252949608
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Public Service Commission, District 3 - Metro-Atlanta Stewart 1784 139 1551 124 0.07791479820627803
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Public Service Commission, District 3 - Metro-Atlanta Sumter 10556 300 9679 275 0.028419856006062904
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Public Service Commission, District 3 - Metro-Atlanta Talbot 2952 146 2667 123 0.0494579945799458 0.
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Public Service Commission, District 3 - Metro-Atlanta Taliaferro 917 80 755 63 0.08724100327153762
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Public Service Commission, District 3 - Metro-Atlanta Tattnall 6639 222 6247 217 0.03343877089923181
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Public Service Commission, District 3 - Metro-Atlanta Taylor 3265 80 3022 76 0.02450229709035222 0.0
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Public Service Commission, District 3 - Metro-Atlanta Telfair 3631 144 3300 141 0.039658496282015974

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Public Service Commission, District 3 - Metro-Atlanta Terrell 3930 115 3603 114 0.029262086513994912
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Public Service Commission, District 3 - Metro-Atlanta Thomas 17241 373 16250 360 0.02163447595847108
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Public Service Commission, District 3 - Metro-Atlanta Tift 13669 366 13108 357 0.02677591630697198
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Public Service Commission, District 3 - Metro-Atlanta Toombs 8851 266 8170 245 0.03005310134448085
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Public Service Commission, District 3 - Metro-Atlanta Towns 6132 171 5848 162 0.027886497064579255
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Public Service Commission, District 3 - Metro-Atlanta Treutlen 2610 109 2464 98 0.04176245210727969
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Public Service Commission, District 3 - Metro-Atlanta Troup 23663 504 22399 473 0.021299074504500696
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Public Service Commission, District 3 - Metro-Atlanta Turner 3269 101 3121 100 0.030896298562251453
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Public Service Commission, District 3 - Metro-Atlanta Twiggs 3787 121 3512 117 0.031951412727752836
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Public Service Commission, District 3 - Metro-Atlanta Union 11863 272 11381 259 0.022928432942763213
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Public Service Commission, District 3 - Metro-Atlanta Upson 10558 220 9956 209 0.020837279787838607
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Public Service Commission, District 3 - Metro-Atlanta Walker 21451 439 20638 421 0.02046524637546035
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Public Service Commission, District 3 - Metro-Atlanta Walton 38635 689 36866 661 0.01783357059660929
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Public Service Commission, District 3 - Metro-Atlanta Ware 11004 206 10377 179 0.01872046528535078
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Public Service Commission, District 3 - Metro-Atlanta Warren 2260 81 2073 77 0.03584070796460177 0.0
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Public Service Commission, District 3 - Metro-Atlanta Washington 8159 336 7432 311 0.041181517342811
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Public Service Commission, District 3 - Metro-Atlanta Wayne 10122 274 9621 261 0.027069749061450307
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Public Service Commission, District 3 - Metro-Atlanta Webster 1100 38 948 32 0.0345454545454546 0.
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Public Service Commission, District 3 - Metro-Atlanta Wheeler 1927 46 1812 46 0.023871302542812663
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Public Service Commission, District 3 - Metro-Atlanta White 11434 189 10897 182 0.016529648417001924
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Public Service Commission, District 3 - Metro-Atlanta Whitfield 27302 641 26285 622 0.02347813347007
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Public Service Commission, District 3 - Metro-Atlanta Wilcox 2815 79 2610 74 0.028063943161634103 0.028352490421455937 0.9593432621537887

Public Service Commission, District 3 - Metro-Atlanta Wilkes 4371 146 4070 137 0.033401967513154884 0.03366093366093366 0.8886538257438112

Public Service Commission, District 3 - Metro-Atlanta Wilkinson 4264 165 3994 158 0.0386960600375234 54 0.039559339008512766 0.337104462822968

Public Service Commission, District 3 - Metro-Atlanta Worth 7831 179 7526 173 0.022857872557783168 0.022986978474621313 0.8988030857136999

Public Service Commission, District 5 - Western Appling 6806 226 6276 210 0.03320599471054952 0.0334 60803059273424 0.8054904187792586

Public Service Commission, District 5 - Western Atkinson 2520 132 2432 132 0.05238095238095238 0.054 276315789473686 0.016122961340751463

Public Service Commission, District 5 - Western Bacon 3829 118 3655 115 0.03081744580830504 0.031463 74829001368 0.4136270649993572

Public Service Commission, District 5 - Western Baker 1291 69 1150 61 0.053446940356312936 0.0530434 7826086957 0.9738962828133593

Public Service Commission, District 5 - Western Baldwin 15633 452 14475 433 0.02891319644342097 0.02 9913644214162347 0.006591322499004788

Public Service Commission, District 5 - Western Banks 6852 127 6629 124 0.018534734384121423 0.01870 568713229748 0.8047273007916005

Public Service Commission, District 5 - Western Barrow 27398 477 26135 449 0.01741002992919191 0.017 18002678400612 0.22940550742667565

Public Service Commission, District 5 - Western Bartow 37327 666 35759 646 0.017842312535162216 0.01 806538214155877 0.134702198867361

Public Service Commission, District 5 - Western Ben Hill 5533 109 5213 102 0.019699981926622086 0.01 956646844427393 0.8884472670232344

Public Service Commission, District 5 - Western Berrien 6247 148 5925 144 0.023691371858492075 0.024 30379746835443 0.22710873920044516

Public Service Commission, District 5 - Western Bibb 60460 1304 55999 1239 0.021567978828977836 0.02 2125395096341007 0.0005451911597622057

Public Service Commission, District 5 - Western Bleckley 4855 156 4598 148 0.032131822863027806 0.03 218790778599391 1.1103478666393036

Public Service Commission, District 5 - Western Brantley 5689 164 5501 160 0.028827561961680435 0.02 9085620796218868 0.7261992993684885

Public Service Commission, District 5 - Western Brooks 5696 144 5231 132 0.025280898876404494 0.0252 34180844962723 1.0299899941910269

Public Service Commission, District 5 - Western Bryan 14970 276 14388 265 0.01843687374749499 0.0184 18126216291353 1.0202278225083454

Public Service Commission, District 5 - Western Bulloch 23543 571 22467 545 0.024253493607441702 0.0 24257800329371967 1.0732926005375494

Public Service Commission, District 5 - Western Burke 8719 214 7751 197 0.024544099093932792 0.02541 6075345116758 0.15903705275728275

Public Service Commission, District 5 - Western Butts 8863 181 8483 171 0.02042197901387792 0.020157

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Public Service Commission, District 5 - Western Calhoun 1899 46 1714 42 0.02422327540810953 0.024504
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Public Service Commission, District 5 - Western Camden 17053 319 15860 300 0.018706385973142555 0.01
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Public Service Commission, District 5 - Western Candler 3538 97 3418 94 0.027416619559072923 0.02750
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Public Service Commission, District 5 - Western Carroll 41739 734 40221 697 0.017585471621265482 0.0
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Public Service Commission, District 5 - Western Catoosa 23725 454 23185 444 0.019135932560590097 0.0
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Public Service Commission, District 5 - Western Charlton 3369 99 3206 93 0.029385574354407838 0.0290
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Public Service Commission, District 5 - Western Chatham 103338 2306 97161 2155 0.022315121252588593
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Public Service Commission, District 5 - Western Chattooga 7427 199 7202 195 0.026794129527400026 0.0
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Public Service Commission, District 5 - Western Cherokee 106299 1991 100987 1880 0.01873018560851936
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Public Service Commission, District 5 - Western Clarke 43261 1057 40239 996 0.02443309216153117 0.02
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Public Service Commission, District 5 - Western Clay 1186 43 1043 35 0.03625632377740304 0.033557046
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Public Service Commission, District 5 - Western Clayton 91840 1600 85993 1473 0.017421602787456445
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Public Service Commission, District 5 - Western Clinch 2254 97 2145 95 0.04303460514640639 0.0442890
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Public Service Commission, District 5 - Western Cobb 310381 5389 284480 4791 0.017362531856009226 0.
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Public Service Commission, District 5 - Western Coffee 12595 384 12200 378 0.030488289003572845 0.03
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Public Service Commission, District 5 - Western Colquitt 12953 426 12439 413 0.032888134023006256 0.
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Public Service Commission, District 5 - Western Columbia 61591 963 58655 911 0.015635401276160477 0.
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Public Service Commission, District 5 - Western Cook 5803 119 5559 117 0.020506634499396863 0.021046
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Public Service Commission, District 5 - Western Coweta 58056 1048 55244 987 0.018051536447567865 0.0
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Public Service Commission, District 5 - Western Crawford 4931 136 4697 131 0.027580612451835327 0.02
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Public Service Commission, District 5 - Western Crisp 7024 265 6661 250 0.03772779043280182 0.037531
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Public Service Commission, District 5 - Western Dade 5450 187 5321 175 0.03431192660550459 0.0328885
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Public Service Commission, District 5 - Western Dawson 11570 193 11131 191 0.016681071737251512 0.01
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Public Service Commission, District 5 - Western DeKalb 310968 7052 291296 6574 0.022677574541431916
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Public Service Commission, District 5 - Western Decatur 9043 203 8495 194 0.022448302554462014 0.022
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Public Service Commission, District 5 - Western Dodge 7051 316 6603 304 0.04481633810806978 0.046039
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Public Service Commission, District 5 - Western Dooly 3793 170 3597 161 0.04481940416556815 0.044759
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Public Service Commission, District 5 - Western Dougherty 31297 687 29353 638 0.021950985717480907
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Public Service Commission, District 5 - Western Douglas 55197 740 51964 685 0.013406525716977372 0.0
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Public Service Commission, District 5 - Western Early 4131 101 3658 85 0.024449285887194385 0.023236
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Public Service Commission, District 5 - Western Echols 1143 36 1108 36 0.031496062992125984 0.032490
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Public Service Commission, District 5 - Western Effingham 23365 421 22615 403 0.018018403595120906
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Public Service Commission, District 5 - Western Elbert 7319 226 6756 220 0.030878535319032653 0.0325
6364712847839 0.002032951582612749

Public Service Commission, District 5 - Western Emanuel 7710 286 7320 273 0.037094682230869 0.037295
081967213116 0.8183761770801574

Public Service Commission, District 5 - Western Evans 3447 140 3248 135 0.040615027560197275 0.04156
403940886699 0.34029955221063424

Public Service Commission, District 5 - Western Fannin 11203 294 10545 277 0.026242970632866198 0.02
626837363679469 1.0744290948116275

Public Service Commission, District 5 - Western Fayette 57962 1018 55315 952 0.01756323108243332 0.0
17210521558347645 0.006094672951580157

Public Service Commission, District 5 - Western Floyd 30225 671 28965 641 0.022200165425971877 0.022
130157086138445 0.7457274302067718

Public Service Commission, District 5 - Western Forsyth 93239 1656 88811 1533 0.017760808245476677
0.017261375280089176 1.8837798464975777e-06

Public Service Commission, District 5 - Western Franklin 8149 149 7761 144 0.018284452080009818 0.01
8554310011596443 0.5601609085536978

Public Service Commission, District 5 - Western Fulton 421806 10398 403964 9746 0.02465114294249015
0.02412591220999891 1.173090842874586e-22

Public Service Commission, District 5 - Western Gilmer 12471 311 11912 301 0.024937855825515196 0.02

5268636668905307 0.34057429430248476
Public Service Commission, District 5 - Western Glascock 1300 67 1219 65 0.05153846153846154 0.05332
239540607055 0.393558468869634
Public Service Commission, District 5 - Western Glynn 32501 649 30689 618 0.019968616350266144 0.020
13750855355339 0.42310815660732837
Public Service Commission, District 5 - Western Gordon 17772 485 17225 464 0.02729011928876885 0.026
937590711175616 0.14787927263825196
Public Service Commission, District 5 - Western Grady 8356 169 7956 160 0.02022498803255146 0.020110
608345902465 0.8407083319994644
Public Service Commission, District 5 - Western Greene 8989 161 8366 144 0.017910779842029146 0.0172
12526894573272 0.10713206483891735
Public Service Commission, District 5 - Western Gwinnett 312709 5171 292312 4829 0.01653614062914722
5 0.016520019704972768 0.8051367655959298
Public Service Commission, District 5 - Western Habersham 15495 358 14642 338 0.023104227170054857
0.02308427810408414 1.0122663028762025
Public Service Commission, District 5 - Western Hall 67282 1344 63789 1272 0.01997562498142148 0.019
94074213422377 0.8171570638734527
Public Service Commission, District 5 - Western Hancock 3539 167 3049 151 0.0471884713195818 0.04952
443424073467 0.11887908051775431
Public Service Commission, District 5 - Western Haralson 10585 214 10192 206 0.02021728861596599 0.0
2021193092621664 1.0864801433358255
Public Service Commission, District 5 - Western Harris 15972 292 15243 274 0.01828199348860506 0.017
97546414747753 0.24236040515255847
Public Service Commission, District 5 - Western Hart 9618 284 9178 276 0.029527968392597213 0.030071
91109174112 0.18299005779717126
Public Service Commission, District 5 - Western Heard 4051 91 3773 87 0.022463589237225377 0.0230585
74078982243 0.4814567376073515
Public Service Commission, District 5 - Western Henry 98365 1498 93368 1369 0.01522899405276267 0.01
466241110444692 1.156010345915356e-08
Public Service Commission, District 5 - Western Houston 59158 916 55968 857 0.015483958213597484 0.0
1531232132647227 0.18432577933394206
Public Service Commission, District 5 - Western Irwin 3556 89 3423 88 0.025028121484814397 0.0257084
42886356996 0.2928814702730029
Public Service Commission, District 5 - Western Jackson 26889 458 25870 442 0.01703298746699394 0.01
7085427135678392 0.8604798787546384
Public Service Commission, District 5 - Western Jasper 5907 111 5486 102 0.018791264601320468 0.0185
9278162595698 0.7885853504297384
Public Service Commission, District 5 - Western Jeff Davis 4815 197 4586 190 0.04091381100726895 0.0
4143044047099869 0.5419296903754992
Public Service Commission, District 5 - Western Jefferson 6756 272 6149 256 0.04026050917702783 0.04
1632785818832334 0.0746451471338513
Public Service Commission, District 5 - Western Jenkins 2856 85 2668 78 0.02976190476190476 0.029235
38230884558 0.6510448288617523

Public Service Commission, District 5 - Western Johnson 3483 146 3247 133 0.04191788687912719 0.0409
6088697259008 0.3739981805513459

Public Service Commission, District 5 - Western Jones 12432 264 11648 240 0.021235521235521235 0.020
604395604395604 0.09048584097117787

Public Service Commission, District 5 - Western Lamar 7346 153 6942 141 0.02082766131227879 0.020311
14952463267 0.2713729615006901

Public Service Commission, District 5 - Western Lanier 2679 104 2571 100 0.03882045539380366 0.03889
5371450797356 1.1798596105129258

Public Service Commission, District 5 - Western Laurens 18939 574 17653 530 0.03030783040287238 0.03
0023225514076927 0.44014013339862756

Public Service Commission, District 5 - Western Lee 13549 217 13069 209 0.016015942135950992 0.01599
2042237355574 1.0104475279709573

Public Service Commission, District 5 - Western Liberty 15358 257 14408 243 0.016733949733038156 0.0
1686563020544142 0.7397947737960499

Public Service Commission, District 5 - Western Lincoln 3967 97 3617 93 0.024451726745651627 0.02571
191595244678 0.12180560809084388

Public Service Commission, District 5 - Western Long 3988 131 3819 129 0.03284854563691073 0.0337784
7604084839 0.15463710514728618

Public Service Commission, District 5 - Western Lowndes 35212 622 33322 581 0.01766443257980234 0.01
74359282155933 0.20649087103919786

Public Service Commission, District 5 - Western Lumpkin 11551 249 11084 238 0.021556575188295384 0.0
2147239263803681 0.8510427929384123

Public Service Commission, District 5 - Western Macon 4217 196 3886 183 0.04647853924590942 0.047092
12557900155 0.6268420351113634

Public Service Commission, District 5 - Western Madison 11697 294 11170 284 0.025134649910233394 0.0
25425246195165622 0.44354517250760017

Public Service Commission, District 5 - Western Marion 2930 93 2689 91 0.03174061433447099 0.0338415
7679434734 0.02765636651166906

Public Service Commission, District 5 - Western McDuffie 8792 172 7924 159 0.019563239308462238 0.02
0065623422513883 0.3718745948389663

Public Service Commission, District 5 - Western McIntosh 5408 155 4968 146 0.028661242603550297 0.02
938808373590982 0.355894289944239

Public Service Commission, District 5 - Western Meriwether 8639 219 8156 207 0.025350156268086583 0.
025380088278567924 1.0940121602665944

Public Service Commission, District 5 - Western Miller 2313 109 2181 103 0.04712494595763078 0.04722
604309949564 1.1385910463587023

Public Service Commission, District 5 - Western Mitchell 7446 156 6882 151 0.020950846091861403 0.02
1941296134844523 0.036672432668027076

Public Service Commission, District 5 - Western Monroe 12932 293 12236 283 0.022656974945870708 0.02
312847335730631 0.15486211657408733

Public Service Commission, District 5 - Western Montgomery 3528 140 3317 134 0.03968253968253968 0.0
4039794995477841 0.5131907229246476

Public Service Commission, District 5 - Western Morgan 9554 220 9144 204 0.023027004396064477 0.0223

0971128608924 0.05466533175230605
Public Service Commission, District 5 - Western Murray 11091 335 10826 324 0.030204670453520873 0.02
9927951228523923 0.3580275547171526
Public Service Commission, District 5 - Western Muscogee 63141 1274 58719 1188 0.020177064031295038
0.02023195217902212 0.7733221878202343
Public Service Commission, District 5 - Western Newton 43129 800 40394 757 0.01854900415033968 0.018
7404069911373 0.2880989761521879
Public Service Commission, District 5 - Western Oconee 20733 476 19802 447 0.02295856846573096 0.022
573477426522572 0.1202837055129326
Public Service Commission, District 5 - Western Oglethorpe 6484 172 6075 163 0.02652683528685996 0.0
2683127572016461 0.695117645501655
Public Service Commission, District 5 - Western Paulding 61222 994 57915 927 0.016235993597072947 0.
016006216006216007 0.0766314869492585
Public Service Commission, District 5 - Western Peach 10355 229 9910 218 0.022114920328343796 0.0219
9798183652876 0.792675496062349
Public Service Commission, District 5 - Western Pickens 13362 323 13140 316 0.024173027989821884 0.0
24048706240487064 0.5820561037769895
Public Service Commission, District 5 - Western Pierce 6883 115 6556 113 0.01670783088769432 0.01723
6119585112872 0.16728354434850806
Public Service Commission, District 5 - Western Pike 8534 145 8230 140 0.016990860089055544 0.017010
93560145808 1.1725803903565406
Public Service Commission, District 5 - Western Polk 12859 299 12412 295 0.023252196904891515 0.0237
67321946503384 0.03987970208163621
Public Service Commission, District 5 - Western Pulaski 3622 156 3390 144 0.04307012700165654 0.0424
7787610619469 0.591303853479195
Public Service Commission, District 5 - Western Putnam 9321 184 8723 177 0.019740371204806352 0.0202
91184225610454 0.1776297378552062
Public Service Commission, District 5 - Western Quitman 940 56 880 47 0.059574468085106386 0.0534090
90909090906 0.01342285417074256
Public Service Commission, District 5 - Western Rabun 7578 196 6735 172 0.025864344154130376 0.02553
8233110616183 0.6787100960207484
Public Service Commission, District 5 - Western Randolph 2788 93 2475 87 0.03335724533715925 0.03515
151515151515 0.17515856030177251
Public Service Commission, District 5 - Western Richmond 70043 1496 64729 1386 0.021358308467655584
0.02141234995133557 0.7766781701287755
Public Service Commission, District 5 - Western Rockdale 36600 549 34747 520 0.015 0.014965320747114
859 0.8679756248542636
Public Service Commission, District 5 - Western Schley 1931 59 1835 59 0.030554117037804248 0.032152
588555858314 0.09415527581014056
Public Service Commission, District 5 - Western Screven 5407 195 5136 189 0.036064361013501016 0.036
799065420560745 0.2675794565779546
Public Service Commission, District 5 - Western Seminole 3214 75 2950 67 0.023335407591785935 0.0227
1186440677966 0.5430594967203946

Public Service Commission, District 5 - Western Spalding 24385 644 23102 598 0.02640967808078737 0.025885204744177992 0.04484866487087142

Public Service Commission, District 5 - Western Stephens 9069 204 8533 190 0.022494211048627193 0.022266494784952538 0.6402134380663298

Public Service Commission, District 5 - Western Stewart 1784 146 1551 135 0.08183856502242152 0.08704061895551257 0.0421204678975389

Public Service Commission, District 5 - Western Sumter 10556 289 9679 267 0.027377794619173928 0.027585494369253023 0.7637525828603964

Public Service Commission, District 5 - Western Talbot 2952 149 2667 126 0.05047425474254742 0.047244094488188976 0.02836724592664313

Public Service Commission, District 5 - Western Taliaferro 917 82 755 67 0.08942202835332606 0.08874172185430464 0.9750644110224309

Public Service Commission, District 5 - Western Tattnall 6639 233 6247 224 0.03509564693477933 0.03585721146150152 0.21954603259521557

Public Service Commission, District 5 - Western Taylor 3265 96 3022 91 0.029402756508422664 0.030112508272667107 0.5371054667862808

Public Service Commission, District 5 - Western Telfair 3631 154 3300 148 0.04241255852382264 0.0448484848484846 0.019424675730026663

Public Service Commission, District 5 - Western Terrell 3930 127 3603 123 0.032315521628498725 0.03413821815154038 0.03078080554622569

Public Service Commission, District 5 - Western Thomas 17241 393 16250 377 0.022794501479032538 0.0232 0.17241499512802666

Public Service Commission, District 5 - Western Tift 13669 393 13108 384 0.028751188821420734 0.02929508696978944 0.07142525881580374

Public Service Commission, District 5 - Western Toombs 8851 233 8170 215 0.026324709072421196 0.02631578947368421 1.0582709695304873

Public Service Commission, District 5 - Western Towns 6132 170 5848 163 0.027723418134377037 0.02787277701778386 0.9322587028040169

Public Service Commission, District 5 - Western Treutlen 2610 114 2464 106 0.04367816091954023 0.04301948051948052 0.6087605455069713

Public Service Commission, District 5 - Western Troup 23663 485 22399 451 0.02049613320373579 0.02013482744765391 0.1298792381630499

Public Service Commission, District 5 - Western Turner 3269 110 3121 109 0.0336494340776996 0.03492470362063441 0.07170857879422024

Public Service Commission, District 5 - Western Twiggs 3787 135 3512 128 0.03564827039873251 0.03644646924829157 0.4471770187750836

Public Service Commission, District 5 - Western Union 11863 293 11381 279 0.02469864283907949 0.024514541780159917 0.6090116230548572

Public Service Commission, District 5 - Western Upson 10558 255 9956 243 0.024152301572267474 0.024407392527119324 0.5958370915441289

Public Service Commission, District 5 - Western Walker 21451 485 20638 466 0.02260966854692089 0.02257970733598217 0.9489688603052256

Public Service Commission, District 5 - Western Walton 38635 701 36866 666 0.018144169794228032 0.01

```
8065426137904846 0.6458197747078304
Public Service Commission, District 5 - Western Ware 11004 209 10377 194 0.01899309342057434 0.01869
5191288426328 0.4247145967232283
Public Service Commission, District 5 - Western Warren 2260 81 2073 78 0.03584070796460177 0.0376266
2807525326 0.17034714801558465
Public Service Commission, District 5 - Western Washington 8159 363 7432 337 0.044490746415001836 0.
04534445640473628 0.2678820104022079
Public Service Commission, District 5 - Western Wayne 10122 261 9621 249 0.025785417901600473 0.0258
80885562831305 0.9364324100734366
Public Service Commission, District 5 - Western Webster 1100 42 948 37 0.038181818181818185 0.039029
535864978905 0.930897630835706
Public Service Commission, District 5 - Western Wheeler 1927 65 1812 62 0.033731188375713546 0.03421
633554083885 0.898138914021616
Public Service Commission, District 5 - Western White 11434 198 10897 188 0.017316774532097255 0.017
252454804074516 0.9063220103137342
Public Service Commission, District 5 - Western Whitfield 27302 705 26285 688 0.02582228408175225 0.
02617462431044322 0.06556951727951156
Public Service Commission, District 5 - Western Wilcox 2815 80 2610 74 0.028419182948490232 0.028352
490421455937 1.0660068156500393
Public Service Commission, District 5 - Western Wilkes 4371 163 4070 150 0.03729123770304278 0.03685
5036855036855 0.6621223032847633
Public Service Commission, District 5 - Western Wilkinson 4264 175 3994 168 0.04104127579737336 0.04
206309464196294 0.2491133660137237
Public Service Commission, District 5 - Western Worth 7831 198 7526 192 0.025284127186821607 0.02551
1559925591284 0.6850700503010596
```

```
In [4]: contests_sig
```

```
Out[4]: Counter({'Lieutenant Governor': 101,
                'Secretary Of State': 4,
                'Attorney General': 4,
                'Commissioner Of Agriculture': 5,
                'Commissioner Of Insurance': 4,
                'State School Superintendent': 5,
                'Commissioner Of Labor': 2,
                'Public Service Commission, District 3 - Metro-Atlanta': 4,
                'Public Service Commission, District 5 - Western': 4})
```

```
In [5]: # version information
%load_ext version_information
%version_information scipy, numpy, csv, pandas, matplotlib, notebook, cryptorandom, permute
```

Loading extensions from ~/.ipython/extensions is deprecated. We recommend managing extensions like any other Python packages, in site-packages.

/anaconda/lib/python3.6/site-packages/IPython/core/formatters.py:839: FormatterWarning: JSON expects JSONable list/dict containers, not JSON strings
 FormatterWarning)

Out[5]:

Software	Version
Python	3.6.7 64bit [GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)]
IPython	7.2.0
OS	Darwin 18.2.0 x86_64 i386 64bit
scipy	1.1.0
numpy	1.15.4
csv	1.0
pandas	0.23.1
matplotlib	3.0.2
notebook	5.7.4
cryptorandom	0.2
permute	0.1.alpha4
Sun Jan 06 12:23:30 2019 PST	

A
P
P
E
N
D
I
X

IV

Vote distribution by machine in Winterville

For each contest, randomly partition votes onto 7 machines. Condition on the number of ballots cast per machine.

Test statistic is $\max_i |R_{im} - R_i|$, where R_{im} is the fraction of Republican votes cast on machine m in contest i , and R_i is the overall fraction of Republican votes in contest i .

Test for contests separately, and use Fisher's combining function for an overall test.

Compare results for the original data with results if D and R were swapped on machine 3.

```
In [1]: %matplotlib inline
import math
import numpy as np
import scipy as sp
import scipy.optimize
from scipy.stats import hypergeom, binom, norm, chi2
from scipy import special
from cryptorandom.cryptorandom import SHA256
from cryptorandom import sample
import matplotlib.pyplot as plt
import pandas as pd
import csv

seed = '2018CV313418 3463593937' # case caption number [space] 10 rolls of 10-sided dice
prng = SHA256(seed)
```



```
In [2]: votes = pd.read_csv('../Data/winterville.csv')
votes.head()
```

Out[2]:

	Contest	Machine	Candidate	Party	Votes
0	Governor	0	B. KEMP (R)	R	40
1	Governor	0	S. ABRAMS (D)	D	73
2	Governor	0	T. METZ (L)	L	4
3	Governor	0	Write-in	W	0
4	Governor	1	B. KEMP (R)	R	51

```
In [3]: statewide_contests = np.array(["Governor", "Lt Governor", "Secretary of State", \
    "Attorney General", "Commissioner of Agriculture", \
    "Commissioner of Insurance", "State School Superintendent", "Commissio
ner of Labor",
    "PSC Eaton", "PSC Pridemore"])
```

```
In [4]: # Number of voters per machine taken from poll tape summary
num_voters_per_machine = [117, 135, 131, 133, 135, 144, 135] # double-checked
cum_voters_per_machine = np.cumsum(num_voters_per_machine)
cum_voters_per_machine = np.insert(cum_voters_per_machine, 0, 0)
num_votes = np.sum(num_voters_per_machine)

# Does any race on any machine has more votes than reported for the machine?
for m in range(len(num_voters_per_machine)):
    tmp = votes[votes["Machine"]==m]
    tot = tmp.groupby("Contest").agg(np.sum)
    assert np.all(tot["Votes"] <= num_voters_per_machine[m])
```

```
In [5]: # Find winning party within the precinct in each statewide contest
mask_D = votes['Party']=="D"
mask_R = votes['Party']=="R"
for c in statewide_contests:
    mask_c = votes["Contest"] == c
    D_votes = votes[mask_c & mask_D]['Votes'].sum()
    R_votes = votes[mask_c & mask_R]['Votes'].sum()
    print(c, D_votes, R_votes, '\t', ('DEM' if D_votes > R_votes else 'REP'))
```

```
Governor 505 400          DEM
Lt Governor 479 393      DEM
Secretary of State 511 365      DEM
Attorney General 509 390      DEM
Commissioner of Agriculture 475 423      DEM
Commissioner of Insurance 482 382      DEM
State School Superintendent 492 405      DEM
Commissioner of Labor 494 402      DEM
PSC Eaton 494 367          DEM
PSC Pridemore 487 374      DEM
```

```
In [6]: def get_repub_fraction(df):
    repub = df.loc[df["Party"]=="R"].copy()
    repub["R_votes"] = repub["Votes"]
    valid_votes = df.groupby(["Contest", "Machine"]).agg(np.sum).reset_index()
    valid_votes["Tot_votes"] = valid_votes["Votes"]
    combined = pd.merge(repub, valid_votes, on = ["Contest", "Machine"])
    return combined["R_votes"]/combined["Tot_votes"]
```

```

In [7]: def permute_votes_across_machines(vote_df, reps, prng=np.random):
        """
        Input: votes dataframe, filtered to contain only one contest

        """

        # Votes for Republican, Democrat/other, and undervotes
        votes_per_candidate = vote_df.groupby(["Party"]).agg(np.sum).reset_index()
        r_votes = int(votes_per_candidate.loc[votes_per_candidate["Party"] == "R", "Votes"])
        d_votes = np.sum(votes_per_candidate["Votes"]) - r_votes
        u_votes = num_votes - r_votes - d_votes
        overall_r_proportion = r_votes/(r_votes + d_votes)

        # test statistic = largest % votes for R on a machine
        votes_for_r = get_repub_fraction(vote_df)
        max_votes_for_r = np.max(votes_for_r)

        # Randomly assign r_votes 1s, d_votes 0s, and u_votes np.nans
        vote_list = np.array([1]*r_votes + [0]*d_votes + [np.nan]*u_votes)
        perm_distr = np.zeros(reps)

        for r in range(reps):
            prng.shuffle(vote_list)

            # Find fraction of votes for R on each machine
            votes_for_r_perm = np.zeros(len(num_voters_per_machine))
            for i in range(len(num_voters_per_machine)):
                votes_for_r_perm[i] = np.nanmean(vote_list[cum_voters_per_machine[i]:cum_voters_per_machi
ne[i+1]])
            perm_distr[r] = np.max(votes_for_r_perm)

            # Center the statistic at the expected fraction of R votes
            perm_distr_norm = perm_distr - overall_r_proportion
            statistic_norm = max_votes_for_r - overall_r_proportion

        return {"statistic":max_votes_for_r,
                "pvalue":(1+np.sum(np.abs(perm_distr_norm) >= np.abs(statistic_norm)))/(reps+1)
                }

```

```
In [8]: reps=10000
ps = {}
for c in statewide_contests:
    vote_df = votes[votes["Contest"] == c]
    res = permute_votes_across_machines(vote_df, reps=reps, prng=prng)
    ps[c] = res['pvalue']
    print(c, "\n    statistic =", res["statistic"], "\n    P-value =", res["pvalue"])

fisher_chi = -2*np.sum([math.log(p) for c, p in ps.items()])
print('Combined:\n    ', fisher_chi, chi2.sf(fisher_chi, df=2*len(statewide_contests)))
```

Governor
statistic = 0.5190839694656488
P-value = 0.11398860113988601

Lt Governor
statistic = 0.5645161290322581
P-value = 0.0245975402459754

Secretary of State
statistic = 0.5116279069767442
P-value = 0.0184981501849815

Attorney General
statistic = 0.515625
P-value = 0.1506849315068493

Commissioner of Agriculture
statistic = 0.5813953488372093
P-value = 0.025997400259974

Commissioner of Insurance
statistic = 0.5348837209302325
P-value = 0.030496950304969503

State School Superintendent
statistic = 0.5419847328244275
P-value = 0.09669033096690331

Commissioner of Labor
statistic = 0.5736434108527132
P-value = 0.007899210078992101

PSC Eaton
statistic = 0.5114503816793893
P-value = 0.0456954304569543

PSC Pridemore
statistic = 0.5267175572519084
P-value = 0.025297470252974703

Combined:
65.67868786714891 9.094420735646933e-07

What if D and R vote totals were flipped on Machine 3?

```
In [9]: votes_flipped = votes.copy()
votes_flipped.loc[(votes_flipped.Machine==3) & (votes.Party=="R"), 'Party'] = "D"
votes_flipped.loc[(votes_flipped.Machine==3) & (votes.Party=="D"), 'Party'] = "R"
votes_flipped.head(20)
```

Out[9]:

	Contest	Machine	Candidate	Party	Votes
0	Governor	0	B. KEMP (R)	R	40
1	Governor	0	S. ABRAMS (D)	D	73
2	Governor	0	T. METZ (L)	L	4
3	Governor	0	Write-in	W	0
4	Governor	1	B. KEMP (R)	R	51
5	Governor	1	S. ABRAMS (D)	D	79
6	Governor	1	T. METZ (L)	L	3
7	Governor	1	Write-in	W	0
8	Governor	2	B. KEMP (R)	R	60
9	Governor	2	S. ABRAMS (D)	D	67
10	Governor	2	T. METZ (L)	L	2
11	Governor	2	Write-in	W	0
12	Governor	3	B. KEMP (R)	D	68
13	Governor	3	S. ABRAMS (D)	R	59
14	Governor	3	T. METZ (L)	L	4
15	Governor	3	Write-in	W	0
16	Governor	4	B. KEMP (R)	R	65
17	Governor	4	S. ABRAMS (D)	D	67
18	Governor	4	T. METZ (L)	L	3
19	Governor	4	Write-in	W	0

```
In [10]: ps_flipped = {}
for c in statewide_contests:
    vote_df2 = votes_flipped[votes_flipped["Contest"] == c]
    res = permute_votes_across_machines(vote_df2, reps=reps, prng=prng)
    ps_flipped[c] = res['pvalue']
    print(c, "\n    statistic =", res["statistic"], "\n    P-value =", res["pvalue"])

fisher_chi = -2*np.sum([math.log(p) for c, p in ps_flipped.items()])
print('Combined:\n    ', fisher_chi, chi2.sf(fisher_chi, df=2*len(statewide_contests)))
```

```
Governor
    statistic = 0.48148148148148145
    P-value = 0.46425357464253575
Lt Governor
    statistic = 0.4728682170542636
    P-value = 0.7945205479452054
Secretary of State
    statistic = 0.4496124031007752
    P-value = 0.44955504449555045
Attorney General
    statistic = 0.484375
    P-value = 0.5433456654334566
Commissioner of Agriculture
    statistic = 0.49230769230769234
    P-value = 0.7339266073392661
Commissioner of Insurance
    statistic = 0.4645669291338583
    P-value = 0.6042395760423958
State School Superintendent
    statistic = 0.48031496062992124
    P-value = 0.8065193480651934
Commissioner of Labor
    statistic = 0.46875
    P-value = 0.7967203279672033
PSC Eaton
    statistic = 0.4732824427480916
    P-value = 0.27987201279872015
PSC Pridemore
    statistic = 0.4307692307692308
    P-value = 0.9387061293870613
Combined:
    9.997865529313279 0.9682106300793477
```

```
In [11]: # version information
%load_ext version_information
%version_information scipy, numpy, csv, pandas, matplotlib, notebook, cryptorandom, permute
```

Loading extensions from ~/.ipython/extensions is deprecated. We recommend managing extensions like any other Python packages, in site-packages.

/anaconda/lib/python3.6/site-packages/IPython/core/formatters.py:839: FormatterWarning: JSON expects JSONable list/dict containers, not JSON strings
 FormatterWarning)

Out[11]:

Software	Version
Python	3.6.7 64bit [GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)]
IPython	7.2.0
OS	Darwin 18.2.0 x86_64 i386 64bit
scipy	1.1.0
numpy	1.15.4
csv	1.0
pandas	0.23.1
matplotlib	3.0.2
notebook	5.7.4
cryptorandom	0.2
permute	0.1.alpha4
Sun Jan 06 14:03:18 2019 PST	

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**IN THE SUPERIOR COURT OF FULTON COUNTY
STATE OF GEORGIA**

**COALITION FOR GOOD
GOVERNANCE, RHONDA J.
MARTIN, SMYTHE DUVAL, AND
JEANNE DUFORT,**

**Plaintiffs,
v.**

**ROBYN A. CRITTENDEN,
Secretary of State of Georgia,
et al.,**

Defendants.

**CIVIL ACTION FILE
NO. 2018CV31348**

AFFIDAVIT OF CHRISTOPHER BRILL

Appeared before me, the undersigned officer duly authorized to administer oaths, Christopher Brill, who after being duly sworn states as follows:

1. Since 2006, I have devoted my career to the study of political processes in the United States generally, with a particular focus on research and analyses of political and electoral data, from precinct level to nationwide in scope.

2. My experience includes, but is not limited to, research and analyses of statewide voter files to identify socio-economic, geographic and other characteristics of voter file data.

3. I also have experience comparing and matching political and electoral data, including voter file data, against large and complex datasets; analyzing the results of such comparisons and matching; and identifying strengths and weaknesses in the methods, protocols and algorithms used in performing these kinds of analyses.

4. My experience also includes identifying reasons for false positive and false negative results when comparing or matching such data across large datasets and developing best practices for optimizing accurate matches and comparisons of data.

5. Since 2013, I have been employed as a Senior Data Analyst with TargetSmart Communications LLC, where my duties and responsibilities include, but are not limited to, collecting and analyzing political, electoral, consumer, demographic and other datasets; product development; and strategic consulting.

6. I obtained a Bachelor of Arts degree in Political Science from the University of New Mexico 2006. My current resume is attached and incorporated herein by reference as Exhibit B.

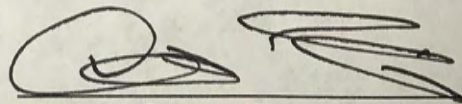
7. I have been retained by Plaintiffs' counsel in this matter to conduct analyses of the November 6th 2018 general election vote results in GA, with a focus on the under voting that took place with respect to the Lt. Governor's election; to offer my opinions concerning said data and analyses based upon by background,

training and experience; and to prepare a preliminary report summarizing my analyses of this data and opinions.

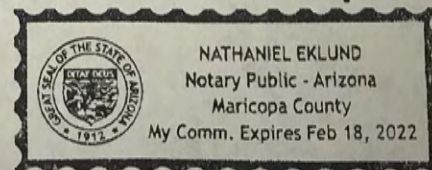
8. The sources used for the analysis are from officially published election result tabulations made available by the Secretary of State, as well as publicly available individual voter file data.

9. My preliminary report is attached and incorporated herein by reference as Exhibit A.

10. My opinions and preliminary report for the Coalition for Good Governance are based upon the information that has currently been made available to me and is accurate to the best of my knowledge and belief, and I would testify to these opinions if called upon to do so. I reserve the right to amend, supplement and otherwise update my opinions and report if additional information is made known to me during the pendency of this litigation.



Christopher Brill



Sworn to and subscribed before me:

On this 7th day of January, 2019

Nathaniel Eklund
Notary Public, State of Arizona

My Commission Expires: Feb. 18, 2022

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To: Marilyn Marks
From: Christopher Brill, Senior Data Analyst
Date: January 5th 2019
Subject: Exhibit A: Analysis of the 2018 Georgia Lt. Governor undervote

Research Summary

The purpose of this analysis is to examine for possible irregularities in the number of votes cast for the 2018 Lieutenant Governor's election in Georgia. TargetSmart was approached by Marilyn Marks, Executive Director, for the Coalition for Good Governance to examine what appeared to be a significantly lower number of votes being cast for the Lt. Governor's election than all other statewide constitutional offices in the November 6, 2018 election

TargetSmart is considered an industry leader in voter data and political campaign services. In addition to maintaining a nationwide voter file, TargetSmart also maintains a nationwide repository of election results allowing us to examine electoral trends across states and time. For this project, the lead researcher also has over a dozen years' experience collecting and analyzing publicly available election results.

The primary question we want to probe: "was the undervote that occurred during the Lt. Governor election consistent with historic patterns and do the factors that we know contribute to higher rates of under voting apply to this election?"

After an initial examination of the state, county and precinct level results from the 2018 election in Georgia it is our initial conclusion that the vote totals published cast substantial doubt on the final vote total of the Lt. Governor election. The undervote that occurred for the Lt Governor election is simply not consistent with patterns of undervote seen previously in Georgia, or around the country.

Defining Under voting

Before presenting our case, it may help to define terms. Quite simply, an undervote occurs when a voter decides, or by accident, does not vote for a specific office or issue on the ballot. While voters might have countless motivations while in the voting booth on what they do and do not vote for, when it comes to under voting there are generally 3 variables that are most associated with high undervote rates:

- 1) **Low visibility:** If an election on a ballot is not well known to the public, is further down the ballot, or both then a higher undervote is likely to occur. For instance, an office such as 'Community College District Board' might generally suffer from high rates of under voting because voters are not familiar with the office or do not know any of the candidates.
- 2) **Non-Partisan/Lack of partisan cues:** If an election on a ballot is non-partisan, that election may experience a higher rate of under voting. Research shows that voters tend to use a candidate's party affiliation as a 'cue' for whether they should vote one way or another, even if they are unsure who the candidate is. When this cue is not present for non-partisan elections, more voters are likely to skip the contest altogether, resulting in higher rates of under voting.
- 3) **Uncompetitive election/Only one major party on the ballot:** If an election is not competitive, or only one major party has a candidate on the ballot, and is near assured victory before Election Day, under voting tends to be higher. The lower the stakes of the election, the higher the under voting tends to be.

A Focus on the Lt. Governor Election

When the vote totals for the 2018 Lt. Governor election are compared to the other 8 statewide constitutional offices an anomaly becomes visible: Tens of thousands of fewer votes were cast for Lt Governor than any of the other elected offices at the top of the ballot. Table 1 below compares the number of votes cast for Governor in 2018 to the remaining statewide, partisan, constitutional offices.

Table 1: Total 2018 Undervote by Office

Office	2018	Under Vote	Drop Off vs Gov
Governor	3,939,328		
Lt. Governor	3,780,304	-159,024	4.0%
Secretary of State	3,883,594	-55,734	1.4%
Attorney General	3,862,370	-76,958	2.0%
Commissioner of Agriculture	3,843,480	-95,848	2.4%
Commissioner of Insurance	3,861,625	-77,703	2.0%
State School Superintendent	3,862,464	-76,864	2.0%
Commissioner of Labor	3,849,450	-89,878	2.3%

Based on our understanding of the factors that encourage higher rates of under voting (as outlined in the previous section), the Lt. Governor's election would not seem to contain any of the defining variables we usually see when higher than normal under voting occurs. The Lt Governor's election, position wise on the ballot, was directly below one of the most competitive and highly publicized elections for Governor in years. The election was partisan, and the election was extremely competitive (much like other statewide offices on the ballot), with the winner receiving just 51.6% of the vote. **In short, there is little reason to suspect that under voting should be higher for Lt Governor than any of the other 8 constitutional offices based on its competitiveness, position on the ballot or its partisan classification.** Yet, under voting was more than *two times higher* than under voting for Attorney General, and *three times higher* than that for Secretary of State. The question becomes, why?

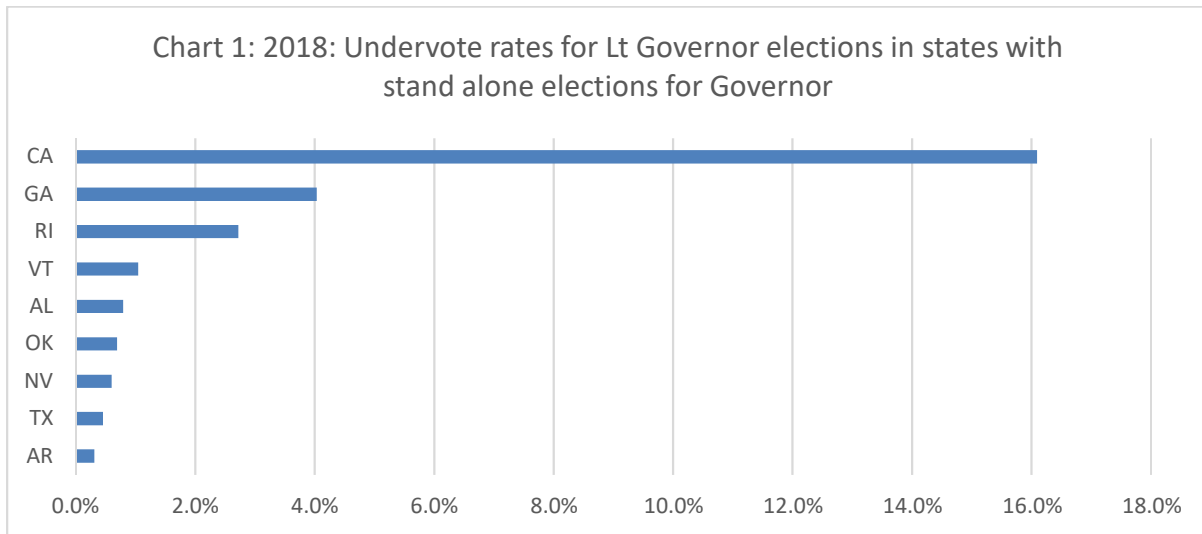
This anomaly becomes more apparent when examining past elections. Table 2 below compares drop off percentages for each of the state's 8 constitutional offices by election cycle since 2002:

Table 2: % Decrease in votes cast compared to that years gubernatorial contest

	2018	2014	2010	2006	2002
Lt. Governor	4.0%	0.8%	0.3%	1.2%	0.9%
Secretary of State	1.4%	0.9%	0.9%	2.8%	1.0%
Attorney General	2.0%	1.0%	0.9%	2.3%	2.8%
Commissioner of Agriculture	2.4%	1.6%	1.2%	1.8%	2.1%
Commissioner of Insurance	2.0%	1.2%	1.2%	2.4%	2.1%
State School Superintendent	2.0%	1.0%	0.9%	1.1%	1.2%
Commissioner of Labor	2.3%	1.7%	1.6%	3.1%	2.8%

In this context, the historic nature of the undervote becomes clear: Since 2002, the undervote percentage compared to Governor, for all constitutional offices has averaged 1.6%. The 4% drop-off seen here is more than 3 standard deviations away from that mean, further indicating the drop-off seen here is an extreme outlier. Overall, the 4% drop-off between Lt Governor and Governor is the largest gap seen in a mid-term this century in Georgia.

Finally, a quick comparison to similar Lt Governor elections that took place elsewhere in 2018 highlights the strangeness of the result in GA. Chart 1 below examines the undervote rate in the 9 states with stand alone elections for Lt. Governor in 2018:



Out of all states, only CA had a higher undervote percentage. Why? Because in 2018, due to California's top two primary set up, just two Democratic candidates were on the ballot- there were no Republican candidates or third-party candidates for voters to choose from; again, an ingredient for higher rates of under voting. Minus California, GA's Lt Governor under vote was the highest among all Lt Governor contests in the country in 2018.

Georgia's 2018 State Representative Elections

Second, an examination of the county and precinct level data from the 2018 election raises additional questions about the reasonableness of the Lt. Governor reported vote tallies. Specifically, if we go even further down the ballot, and examine state representative, otherwise known as 'state house' elections, we see Lt Governor vote totals that are even lower than those for non-competitive state representative elections.

To recap, there were 180 state representative seats up for election in 2018, with as many as 110 of those seats 'uncontested', meaning only 1 major party had a general election candidate on the ballot to choose from. Not surprisingly, this number of uncontested seats resulted in a smaller number of votes cast for state representative. In total just 3,470,967 votes were cast for a state representative in Georgia, or 468,351 fewer votes than cast for Governor, an aggregate drop off of almost 12%. Again, this makes sense based on our knowledge of under voting: uncompetitive or uncontested elections tend to yield smaller vote totals.

With that context present, an analysis of the votes cast across the state's 2,636 precincts show that, inexplicably, more votes were cast for State Representative than Lt Governor in *1,012 precincts, or 38% of all precincts*. Further, in 137 of those 1,012 precincts, the Democratic candidate for State Representative received 100% of the total votes cast for that contest. Ultimately this raises the question: **Why would more voters in a precinct vote in an uncontested or uncompetitive State Representative election than for an election further up the ballot that is contested and competitive?**

To further illustrate this point, we compare state representative vote totals to another statewide election with what appear to be normal rates of under voting: Attorney General. In total there were just 410 precincts where there were more votes cast for State Representative than Attorney General. **In just**

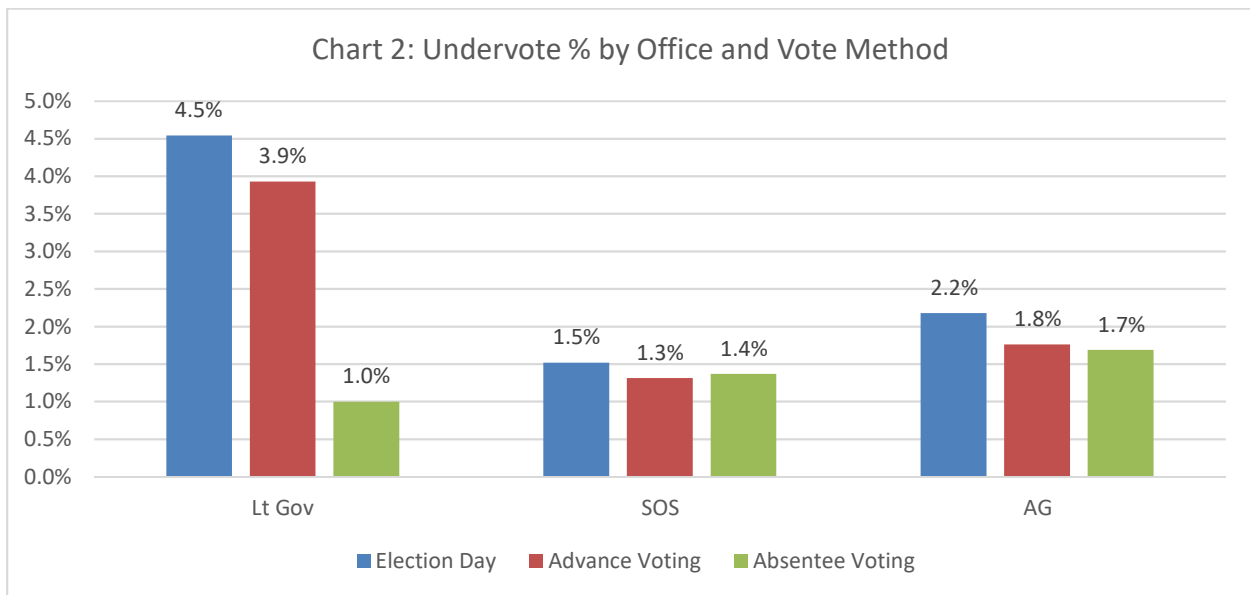
two of those precincts did the Democratic candidate for State Representative receive 100% of the votes. This would line up with our established expectations: if a down ballot election such as state representative, garnered more votes than a statewide election, it would be in precincts with more locally competitive representative elections, and not where candidates are receiving 100% of the vote.

Addressing Voter Choice and Vote Method

We believe that the data presented thus far, combined with the necessary context around what variables accompany higher rates of under voting, shows striking irregularities in the total vote for Lt Governor, that ultimately call into question the accuracy of the vote and the legitimacy of the outcome

With that said, we can't ultimately rule out with 100% certainty that a group of voters decided, *intentionally*, to not vote for Lt. Governor. However, what makes this intention even more unlikely is how the under vote for Lt Governor breaks down when comparing **vote method**. In this context, vote method refers to how a voter decided to cast their ballot- either through mail in absentee, in person early voting (or 'advance voting') and finally Election Day voting at the polls. Early voting and Election Day voting are conducted on electronic machines and mail in absentee is voted on paper ballots.

After examining county level results released by the Secretary of State, we found that there were significant differences in the Lt Governor under vote, depending on the method of vote. For instance, the voting machine election day under vote was approximately 4.5%, while the undervote was as little as 1% among absentee by mail voters, who voted on paper. This is an additional oddity in the data, especially when, as chart 2 demonstrates below, under vote rates are more consistent across method of voting for other offices such as Secretary of State (SOS) and Attorney General (AG):



According to data on the GA voter file, absentee voters tended to skew somewhat older, more Democratic (according to our partisanship modeling) and more African American; but it is unlikely that such a modest skew could have accounted for such a large difference in the under vote between absentee and election day voters. **Therefore, if voters were deliberately under voting in the Lt Governor election, why would that not be consistent across all vote methods? Instead, we would speculate that the key difference here is the technology that is being used to administer absentee votes vs in person votes, and not differences in the voters who selected one vote method or the other.**

Conclusion

In conclusion, based on our analysis of the publicly available data, it is our opinion that the undervote totals reflected in the Lt Governor's race are extremely suspect and irregular and cast a serious doubt over the accuracy of the final vote count and the certified outcome of the Lt. Governor's contest.

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Christopher A. Brill

826 E Lamar Rd
Phoenix AZ 85014

602-295-3389
cbrillaz@gmail.com

Employment History

Senior Data Analyst

TARGETSMART COMMUNICATIONS

Phoenix, AZ. Feb 2013 to Present

- Currently provide support and data analysis to progressive issue and candidate campaigns as well as 501c(3) and c(4) organizations around the United States with a focus on helping clients optimize and execute outreach programs.
- Currently manage the data and targeting efforts for Arizona based progressive coalitions such as Arizona Wins and One Arizona.
- Lead project manager for TargetSmart's 'ElectionBase': a nationwide precinct level election database, merged with voter file and other data sets, in order to provide comprehensive district level profiles and Democratic performance projections.
- Lead client services representative for a wide range of organizations such as America Votes and the Democratic Legislative Campaign Committee (DLCC)

National Data Director

DEMOCRATIC NATIONAL COMMITTEE (DNC)

Washington D.C. Aug 2011 to Jan 2013

- Managed a 7-figure budget as well as a team of 9 people and was responsible for the day to day operations of the DNC data department including data acquisition, analysis and data support services.
- Lead director for the committee's national voter file. Coordinated with the presidential campaign, other national committees and all 50 state parties on voter file, data services and support needs.
- Managed day-to-day vendor and consultant relationships in relation to the national voter file, as well as developed in-house data testing to inform vendor selection process.

Acquisitions Manager

DEMOCRATIC NATIONAL COMMITTEE (DNC)

Washington D.C. Apr 2010 to Aug 2011

- Led the data acquisition team at the DNC and was responsible for acquiring voter file data nationwide as well as establishing a national voter file and data update schedule.
- Provided voter file and data support to state party committees, other national party committees such as the DCCC, DSCC and Organizing for America.

Elections and Targeting Director

ARIZONA DEMOCRATIC PARTY (ADP)

Phoenix AZ. June 2008- April 2010

- Developed and implemented the Coordinated Campaign's vote by mail application chase program in 2008 as well as Permanent Early Voter sign up programs in 2009.
- Compiled and aggregated data to provide daily and weekly briefings with campaign principals, partner organizations and ADP staff.
- Provided voter targeting and data assistance to campaigns, elected officials and party leaders.

Voter File Director

ARIZONA DEMOCRATIC PARTY (ADP)

Phoenix AZ. June 2006- June 2008

- Maintained statewide voter file by coordinating with state, county and city election officials, party staff and data vendors.
- Cultivated relationships with key ADP stakeholders with the goal of promoting the use of a single statewide voter file for local party affiliates and candidates.
- Developed voter file training programs for state party staff, volunteers and candidates.

Skills and Core Competencies

- Core competencies include project management, data acquisition, manipulation and cleaning (data wrangling) visualization, research, and analysis.
- Proficient in multiple progressive software platforms such as NGP-VAN, Blocks, Q-Tool, M-Tool, RegTrak, Grassroots Unwired and Hustle.
- Proficient in data manipulation using tools such as using SQL, R, Vertica and Alteryx.
- Proficient in mapping platforms using ArcGis and Google Fusion Tables.
- Proficient in Microsoft Office products including Outlook, Excel, Word and PowerPoint.

Education

UNIVERSITY OF NEW MEXICO, Albuquerque NM. 2002-2006
Studies leading to a BACHELORS of ARTS in Political Science

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**IN THE SUPERIOR COURT OF FULTON COUNTY
STATE OF GEORGIA**

**COALITION FOR GOOD
GOVERNANCE, RHONDA J.
MARTIN, SMYTHE DUVAL, AND
JEANNE DUFORT,**

Plaintiffs,

v.

**ROBYN A. CRITTENDEN,
Secretary of State of Georgia,
et al.,**

Defendants.

**CIVIL ACTION FILE
NO. 2018CV31348**

AFFIDAVIT OF MICHAEL S. JOHNSON

Appeared before me, the undersigned officer duly authorized to administered oaths,

MICHAEL S. JOHNSON ("Affiant") who, after being sworn, states as follows:

1. I am of lawful age and give this affidavit based on my personal knowledge.
2. I am a registered voter in Cobb County, Georgia.
3. I was appointed as a statewide poll watcher for the November 6, 2018 election, by

the Libertarian Party of Georgia. I observed activites at various polling places in the metro Atlanta area during early voting and on Election Day.

4. On November 6, Election Day morning, I observed the voting activities at Grady High School polling place which includes precincts, 02J, 02K, and 06G. I spent approximately

twenty minutes observing at the Grady High School polling place. Grady High School is in Atlanta and Fulton County, Georgia.

5. I observed ten (10) DRE voting machines in use during my visit which lasted about 20 minutes. I did not observe any spare DRE units, or units that were not in service.

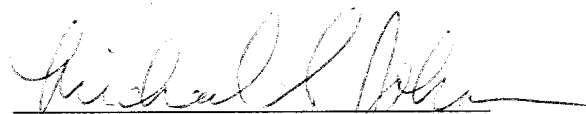
6. I did not notice any malfunctioning or problems with machines during my brief visit.

7. The line of voters awaiting the use of machines was quite long and snaked around the interior of gymnasium. I noticed the inadequate number of machines for use and asked a pollworker about the bottleneck at the machines. She replied that there were not enough machines.

8. The picture of the Grady High School polling place attached as Exhibit A is an accurate reflection of the set up of the polling place with 10 DRE machines as I observed it on the morning of November 6.

9. I received the picture from Marilyn Marks of Coalition for Good Governance. I understand that the picture on Election Day morning was taken as part of a video by an HBO film crew. I met this film crew at other polling locations during the day as they were filming Georgia voting activities.

Further affiant sayeth not.



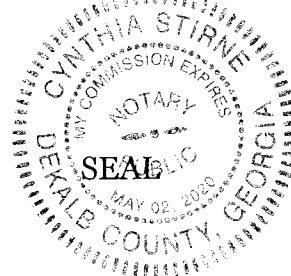
Michael S. Johnson

Sworn to and subscribed before me:

On this 7 day of January, 2019

[Signature]
Notary Public, State of Georgia

My Commission Expires: 05/02/2020



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**IN THE SUPERIOR COURT OF FULTON COUNTY
STATE OF GEORGIA**

**COALITION FOR GOOD
GOVERNANCE, RHONDA J.
MARTIN, SMYTHE DUVAL, AND
JEANNE DUFORT,**

**Plaintiffs,
v.**

**ROBYN A. CRITTENDEN,
Secretary of State of Georgia,
et al.,**

Defendants.

**CIVIL ACTION FILE
NO. 2018CV31348**

AFFIDAVIT OF TARAN GREENWALD

Appeared before me, the undersigned officer duly authorized to administered oaths, TARAN GREENWALD ("Affiant") who, after being sworn, states as follows:

1. I am an analyst for Coalition for Good Governance, a Plaintiff in this action.
2. For the November 6, 2018 Georgia general election, I was a volunteer for candidates and various election transparency advocacy groups seeking to document reports of election results by photographing the DRE machine poll tapes once they were posted on the doors of the polling places after the closing of the polls and the printing of the machine tapes.
3. In Fulton County, after the close of the polls, machine results for each machine in operation in the polling place on Election Day are printed and one copy of each DRE machine tape is posted to or near the door of the polling place for public observation.

4. I took photographs at several polling places on the evening of November 6, shortly after the tapes had been posted. I took the photos of 14 DRE machine tapes at Grady High School polling place in Atlanta at approximately 9 p.m.

5. Those photographs are on Exhibit A. I prepared this exhibit from my original photographs and have not altered or edited the contents of the machine tapes.

6. With the assistance of Coalition for Good Governance's other part time analyst, Samantha Whitley, I prepared a transcript of the information on the tape photographs. That transcript on Exhibit B.

7. Ms. Whitley and I also reviewed the officially reported tallies on the Secretary of State's website for each race for each precinct located in the Grady High School polling place. Those were precincts 02J, 02K, and O6G. The Secretary of State's website showing Fulton County results is <https://results.enr.clarityelections.com/GA/Fulton/91700/Web02.221448/#/>

8. The above referenced Secretary of State results exclude write-in votes, which we accounted for on the worksheet in Exhibit B.

9. Coalition for Good Governance obtained the Grady High School polling place recap sheet (Exhibit C) through a public records request to Fulton County Elections Office. The recap sheet lists the ten (10) DRE machine by serial numbers that were assigned to the Grady polling place. Eight (8) machine serial numbers match the machine serial numbers on the 14 poll tapes. Seven (7) machine tapes were posted on the door that were not listed on the polling place recap sheet. All 14 poll tapes showed print times of approximately 7:30 pm as would be expected after 7pm poll closing time.

10. I have collected photographs of election night machine poll tapes from a number of other polling places from other volunteers and citizens who shared them with Coalition for Good Governance.

11. One of the sets of election night photos I obtained was Midvale Elementary School in DeKalb County. Exhibit D is a pdf compilation of the photographs that I received from other citizens who took this photographs. The photographs can be compared to DeKalb County's copy of these tapes to verify the accuracy of the data.

12. I prepared Exhibit E by comparing the Secretary of State's vote tallies by precinct for DeKalb County posted at this link, <https://results.enr.clarityelections.com/GA/DeKalb/91684/Web02.221448/#/> to the Election Day vote tallies with the Midvale polling place tape on Exhibit D.

Further Affiant sayeth not.



Taran Greenwald

Sworn to and subscribed before me:

On this 7th day of JANUARY, 2019

[Signature]
Notary Public, State of GA

My Commission Expires: 5/16/22

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ELECTION RESULTS REPORT

Fulton County
State of
Georgia General Election

November 6, 2018

DATE: Nov-06-2018

POLL CTR: 280{00
02J, 02K & 06G

MACHINE ID: 2

VERSION: 2 COPY: 0

COUNT: 0 SIZE: 32M

ACCU-VOTE RELEASE: 4, 5, 2

REPORT: US 1, 14, 7

TIME: 19:26 11/06/2018

MACHINE SERIAL: 124301

PUBLIC COUNTER: 149

SYSTEM COUNTER: 2122

** PRECINCT: 220 **

02J

BALLOTS CAST 89

GOVERNOR

RACE # 3

B, KEMP (R) 11

S, ABRAMS (D) 75

T, METZ (L) 3

Write-in 0

WRITE-INS 0

BALLOTS CAST 89

GOVERNOR
RACE # 3

B. KEMP (R) 11
S. ABRAMS (D) 75
T. METZ (L) 3
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

LT GOVERNOR
RACE # 5

G. DUNCAN (R) 13
S. R. AMICO (D) 73
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

820225 DYLAN SAGER

SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 11
J. BARROW (D) 71
S. DUVAL (L) 6
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

ATTORNEY GENERAL

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R 15
C. BAILEY (D) 72
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 20
F. SWANN (D) 66
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 12
J. LAWS (D) 68
D. FOSTER (L) 7
Write-in 0
WRITE-INS 0

Write In Candidates

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 17
O. THORNTON, JR. (D) 68
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

*164866 SID CHAPMAN

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 17
R. KEATLEY (D) 69
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R 14
L. MILLER (D) 68
R. GRAHAM (L) 6
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 12
D. A. RANDOLPH (D) 68
J. TURPISH (L) 7
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D 80
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

718390 ALEXANDER PAUL LORENZ

US HOUSE 6
RACE # 55

K. HANDEL (I) R 0
L. MCBATH (D) 0
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 11
RACE # 65

B. LOUDERMILK (I) R 0
F. D. BRADY, JR (D) 0
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

N. ORROCK (I) D 81
 Write-in 1
 # WRITE-INS 1
 Write In Candidates
 Ballot Candidate
 718390 ALEXANDER PAUL LORENZ

 STATE HOUSE 58
 RACE # 355

P. CANNON (I) D 81
 Write-in 1
 # WRITE-INS 1
 Write In Candidates
 Ballot Candidate
 718390 ALEXANDER PAUL LORENZ

 CO COMM CHAIRPERSON
 RACE # 450

R. PITTS (I) D 77
 Write-in 1
 # WRITE-INS 1
 Write In Candidates
 Ballot Candidate
 718390 ALEXANDER PAUL LORENZ

 SOIL AND WATER
 RACE # 550

V. S. REKUC, JR (I) 58
 J. R. ULSETH 40
 Write-in 1
 Write-in 0
 # WRITE-INS 1
 Write In Candidates
 Ballot Candidate
 103188 NA

 CONST AGREEMENT 1
 RACE # 560

 ELECTION RESULTS REPORT

 - Fulton County
 State of
 Georgia General Election

November 6, 2018
 DATE: Nov-06-2018
 POLL CTR: 280:00
 02J, 02K & 06G
 MACHINE ID: 3
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: —US 1, 14, 7

TIME: 19:26 11/06/2018
 MACHINE SERIAL: 136081
 PUBLIC COUNTER: 141
 SYSTEM COUNTER: 1271

 ** PRECINCT: 220 **
 02J

 BALLOTS CAST 78

GOVERNOR
 RACE # 3

SENATOR (R) 8

GOVERNOR
RACE # 3

B. KEMP (R) 8
S. ABRAMS (D) 68
T. METZ (L) 2
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

LT GOVERNOR
RACE # 5

G. DUNCAN (R) 9
S. R. AMICO (D) 67
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 8
J. BARROW (D) 66
S. DUVAL (L) 4
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R 14
C. BAILEY (D) 64
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 21
F. SWANN (D) 54
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 13
J. LAWS (D) 56
D. FOSTER (L) 4
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 20
D. THORNTON, JR. (D) 56
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 17
R. KEATLEY (D) 56
Write-in 0
WRITE-INS 0

PSC EATON
RACE # 19

C. EATON (I) R 7
L. MILLER (D) 62
R. GRAHAM (L) 5
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 12
D. A. RANDOLPH (D) 58
J. TURPISH (L) 4
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D 72
Write-in 1
WRITE-INS 1
Write In Candidates
Ballot Candidate

506146 CLARK HOWARD

STATE SENATE 36
RACE # 145

N. ORROCK (I) D 69
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

STATE HOUSE 58
RACE # 355

P. CANNON (I) D 69
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D 70
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

SOIL AND WATER
RACE # 550

W. S. REKUC, JR (I) 50
J. R. ULSETH 36
Write-in 0
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

CONST AMENDMENT 1
RACE # 500

YES 67
NO 11

CONST AMENDMENT 2
RACE # 500

```

*****
ELECTION RESULTS REPORT
*****
      Fulton County
      State of
      Georgia General Election

      November 6, 2018
DATE: Nov-06-2018
POLL CTR:      280100
              02J, 02K & 06G
MACHINE ID:    4
VERSION: 2     COPY: 0
COUNT: 0     SIZE: 32M
ACCU-VOTE RELEASE: 4, 5, 2
REPORT:        US 1, 14, 7

TIME: 19:31 11/06/2018
MACHINE SERIAL: 143944
PUBLIC COUNTER: 140
SYSTEM COUNTER: 1386

*****
*** SUMMARY TOTALS
*****

BALLOTS CAST BY PRECINCT
PRECINCT      QUANTITY
    220             83
    225             42
    700             15

TOTAL BALLOTS      140

*****
GOVERNOR
RACE # 3

B. KEMP (R)      21
S. ABRAMS (D)    113

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GOVERNOR
RACE # 3

B. KEMP (R)      21
S. ABRAMS (D)    113
T. METZ (L)      5
Write-in         1
# WRITE-INS      1

Write In Candidates
Ballot Candidate
147243 NATHAN DEAL
*****
LT GOVERNOR
RACE # 5

G. DUNCAN (R)    26
S. R. AMICO (D)  110
Write-in         0
# WRITE-INS      0

Write In Candidates
Ballot Candidate
*****
SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 22

```

SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 22
J. BARROW (D) 107
S. DUVAL (L) 11
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R 27
C. BAILEY (D) 111
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 35
F. SWANN (D) 97
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 24
J. LAWS (D) 99
D. FOSTER (L) 8
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 36
O. THORNTON, JR. (D) 95
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 30
R. KEATLEY (D) 100
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R 22
L. MILLER (D) 103
R. GRAHAM (L) 7
Write-in 0
WRITE-INS 0

Write In Candidates

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 23
D. A. RANDOLPH (D) 98
J. TURPISH (L) 9
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D 121
Write-in 5
WRITE-INS 5

Write In Candidates
Ballot Candidate
820920 ANYBODY ELSE
716377 ANYONE ELSE PLEASE
668742 JOHN WAYNE
623867 NOT HIM
729416 TED TURNER

US HOUSE 6
RACE # 55

K. HANDEL (I) R 0
L. MCBATH (D) 0
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 11

US HOUSE 13
RACE # 73

D. CALLAHAN (R) 0
D. SCOTT (I) (D) 0
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

STATE SENATE 36
RACE # 145

N. ORROCK (I) D 119
Write-in 2
WRITE-INS 2

Write In Candidates
Ballot Candidate

623867 NO
820920 TTT

STATE HOUSE 50

023001 743
 820920 TTT

 STATE HOUSE 58
 RACE # 355

P. CANNON (I) D 120
 Write-in 1
 # WRITE-INS 1
 Write In Candidates
 Ballot Candidate
 623867 NO

 CO COMM CHAIRPERSON
 RACE # 450

R. PITTS (I) D 118
 Write-in 2
 # WRITE-INS 2
 Write In Candidates
 Ballot Candidate
 623867 NO
 398108 NO GULCH

 SOIL AND WATER
 RACE # 550

V. S. REKUC, JR (I) 83
 J. R. ULSETH 89
 Write-in 1
 Write-in 0
 # WRITE-INS 1
 Write In Candidates
 Ballot Candidate
 34321 JAHN KHAN

 CONST AMENDMENT 1
 RACE # 560

YES 121
 NO 17

 CONST AMENDMENT 2
 RACE # 570

YES 76
 NO 50

 ELECTION RESULTS REPORT

 Fulton County
 State of
 Georgia General Election

November 6, 2018
 DATE: Nov-06-2018
 POLL CTR: 280N00
 02J, 02K & 06G
 MACHINE ID: 5
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: US 1, 14, 7

TIME: 19:29 11/06/2018
 MACHINE SERIAL: 129841
 PUBLIC COUNTER: 138
 SYSTEM COUNTER: 2375

 *** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT	
PRECINCT	QUANTITY
220	83
225	39
	16
	*
TOTAL BALLOTS	138

GOVERNOR
RACE # 3

B. KEMP (R) 18
S. ABRAMS (D) 117
T. METZ (L) 2
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate
472507 LEE ANN ROTH GAMBLE

LT GOVERNOR
RACE # 5

G. DUNCAN (R) 18
S. R. AMICO (D) 114
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

SECRETARY OF STATE
RACE # 7

D. RAFFENSPERGER (R) 19
J. BARROW (D) 109
S. DUVAL (L) 5
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R 22
C. BAILEY (D) 111
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 28
F. SWANN (D) 102
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 19
J. LAWS (D) 104
D. FOSTER (L) 9
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 22
O. THORNTON, JR. (D) 109
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 18
R. KEATLEY (D) 109
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R	20
L. MILLER (D)	105
R. GRAHAM (L)	4
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R	19
D. A. RANDOLPH (D)	104
J. TURPISH (L)	6
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D	123
Write-in	3
# WRITE-INS	3

Write In Candidates
Ballot Candidate

15124 ANYBODY ELSE
59830 ERIC BROWN
47575 ROD WINGATE

US HOUSE 6
RACE # 55

HANDEL (I) R	0
REBATH (D)	0
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

ATE SENATE 36
RACE # 145

ORROCK (I) D	123
Write-in	2
# WRITE-INS	2

Write In Candidates
Ballot Candidate

124 ANYBODY ELSE
575 TOM HARP

ATE HOUSE 58
RACE # 355

CANNON (I) D	123
Write-in	2
# WRITE-INS	2

Write In Candidates
Ballot Candidate

124 ANYBODY ELSE
575 MONA CONMAN

COMM CHAIRPERSON
450

ITTS (I) D	119
Write-in	3
# WRITE-INS	3

Write In Candidates
Ballot Candidate

14 ANYBODY ELSE
54 DONALD DUCK
75 WALTER SMITH

AND WATER
550

 AND WATER
 # 550

REKUC, JR (I)	91
ULSETH	76
-in	1
-in	0
TE-INS	1

In Candidates
 Candidate
 BERT

 AMENDMENT 1
 # 560

	131
	6

 AMENDMENT 2
 570

	72
	58

 AMENDMENT 3
 580

 ELECTION RESULTS REPORT

 Fulton County
 State of
 Georgia General Election

November 6, 2018
 DATE: Nov-06-2018
 POLL CTR: 280000
 02J, 02K & 06G
 MACHINE ID: 6
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: US 1, 14, 7

TIME: 19:26 11/06/2018
 MACHINE SERIAL: 133778
 PUBLIC COUNTER: 125
 SYSTEM COUNTER: 8130

 *** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT	
PRECINCT	QUANTITY
220	61
225	56
700	8
TOTAL BALLOTS	125

GOVERNOR

RACE # 3

B. KEMP (R) 18
S. ABRAMS (D) 107
T. METZ (L) 2
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

LT GOVERNOR
RACE # 5

G. DUNCAN (R) 20
S. R. AMICO (D) 105
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 17
J. BARROW (D) 102
S. DUVAL (L) 5
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R 23
C. BAILEY (D) 101
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

Write In Candidates

Ballot Candidate

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 26
F. SWANN (D) 95
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 19
J. LAWS (D) 97
D. FOSTER (L) 7
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 22
O. THORNTON, JR. (D) 101
Write-in * * 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 20
R. KEATLEY (D) 101
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R	20
L. MILLER (D)	97
R. GRAHAM (L)	6
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R	20
D. A. RANDOLPH (D)	98
J. TURPISH (L)	4
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

L. H. LEWIS (I) D	115
Write-in	3
# WRITE-INS	3

Write In Candidates
Ballot Candidate

BY/VS ANYONE ELSE

740943 CHARLES WALKER

342140 NANCY BOWERS

STATE SENATE 36
RACE # 145

N. ORROCK (I) D	115
Write-in	1
# WRITE-INS	1

Write In Candidates
Ballot Candidate

740943 CHARLES WALKER

STATE HOUSE 58
RACE # 355

P. CANNON (I) D	111
Write-in	2
# WRITE-INS	2

Write In Candidates
Ballot Candidate

740943 CHSRLES WALKER

342140 NANCY BOWERS

CD COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D	114
Write-in	1
# WRITE-INS	1

Write In Candidates
Ballot Candidate

740943 CHARLES WALKER

SOIL AND WATER

 SOIL AND WATER
 RACE # 550

W. S. REKUC, JR (I)	88
J. R. ULSETH	69
Write-in	1
Write-in	1
# WRITE-INS	2

Write In Candidates
 Ballot Candidate
 583353 GEORGE FOREMAN
 583353 LEBRON JAMES

 CONST AMENDMENT 1
 RACE # 560

YES	110
NO	13

 CONST AMENDMENT 2
 RACE # 570

YES	58
NO	61

 CONST AMENDMENT 3
 RACE # 580

YES	80
NO	83

 CONST AMENDMENT 4
 RACE # 590

YES	90
NO	91

 CONST AMENDMENT 5
 RACE # 600

YES	100
NO	101

 CONST AMENDMENT 6
 RACE # 610

YES	110
NO	111

 ELECTION RESULTS REPORT

 Fulton County
 State of
 Georgia General Election

November 6, 2018
 DATE: Nov-06-2018
 POLL CTR: 280P00
 02J, 02K & 08G
 MACHINE ID: 7
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: US 1, 14, 7

TIME: 19:27 11/06/2018
 MACHINE SERIAL: 110984
 PUBLIC COUNTER: 135
 SYSTEM COUNTER: 5071

 *** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT	PRECINCT	QUANTITY
	220	78
	225	40
	226	17
TOTAL BALLOTS		135

 GOVERNOR

```

*****
GOVERNOR
RACE # 3

B. KEMP (R)          18
S. ABRAMS (D)       117
T. METZ (L)         0
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
*****
LT GOVERNOR
RACE # 5

G. DUNCAN (R)       20
S. R. AMICO (D)    110
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
*****
SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 22
J. BARROW (D)       105
S. DUVAL (L)        5
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
*****
ATTORNEY GENERAL
RACE # 9

C. CARR (I) R       24
    
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ATTORNEY GENERAL
RACE # 9

C. CARR (I) R       24
C. BAILEY (D)     107
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
*****
AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R     29
F. SWANN (D)       100
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
*****
INSURANCE COMMISSIONER
RACE # 13

J. BECK (R)        23
J. LAWS (D)        100
D. FOSTER (L)      6
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
*****
STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R     27
D. THORNTON, JR. (D) 102
Write-in            0
# WRITE-INS         0
Write In Candidates
Ballot Candidate
    
```

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 27
R. KEATLEY (D) 101
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R 23
L. MILLER (D) 102
R. GRAHAM (L) 6
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 25
D. A. RANDOLPH (D) 101
J. TURPISH (L) 4
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS III (D) 170
Write-in 4
WRITE-INS 4

Write In Candidates
Ballot Candidate

SANTOS MATT BROS
77030 NICK PACIORE
82791 STEVEN PILES
87081 STEVE

STATE SENATE 36
RACE # 145

N. ORROCK (I) D 114
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

STATE HOUSE 58
RACE # 355

P. CANNON (I) D 114
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D 111
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

152278 DLAF

SOIL AND WATER
RACE # 550

V. S. REKUC, JR (I) 89
J. R. ULSETH 85
Write-in 1
Write-in 0
WRITE-INS 1

Write In Candidates
Ballot Candidate

71868 WITA COST 1120

10407 ANDREWSON 1
RACE # 580

 CONST AMENDMENT 1
 RACE # 560

YES 119
 NO 12

 CONST AMENDMENT 2
 RACE # 570

YES 65
 NO 59

 CONST AMENDMENT 3
 RACE # 580

YES 84
 NO 43

 CONST AMENDMENT 4
 RACE # 590

YES 90
 NO 42

 CONST AMENDMENT 5
 RACE # 600

YES 92
 NO 33

 CONST AMENDMENT 6
 RACE # 610

 ELECTION RESULTS REPORT

 Fulton County
 State of
 Georgia General Election

November 6, 2018
 DATE: Nov-06-2018
 POLL CTR: 280000
 02J, 02K & 06G
 MACHINE ID: 8
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: US 1, 14, 7

TIME: 19:28 11/06/2018
 MACHINE SERIAL: 125680
 PUBLIC COUNTER: 140
 SYSTEM COUNTER: 1518

 *** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT

PRECINCT	QUANTITY
220	85
225	39
700	16
TOTAL BALLOTS	140

 GOVERNOR
 RACE # 2

TOTAL BALLOTS 140

GOVERNOR
RACE # 3

B. KEMP (R)	15
S. ABRAMS (D)	124
T. METZ (L)	1
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

LT GOVERNOR
RACE # 5

G. DUNCAN (R)	19
S. R. AMICO (D)	115
Write-in	1
# WRITE-INS	1
Write In Candidates	
Ballot Candidate	
977068 JOE BIDEN	

SECRETARY OF STATE
RACE # 7

RAFFENSPERGER (R)	16
J. BARROW (D)	109
S. DUVAL (L)	11
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R	22
C. BAILEY (D)	111
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

AGRICULTURE COMMISSIONER
RACE # 11

BLACK (I) R	31
SWANN (D)	103
Write-in	0
WRITE-INS	0
Write In Candidates	
Ballot Candidate	

INSURANCE COMMISSIONER
RACE # 13

BECK (R)	20
LAWS (D)	103
FOSTER (L)	7
Write-in	0
WRITE-INS	0
Write In Candidates	
Ballot Candidate	

STATE SCHOOL SUPERINTENDENT
RACE # 15

WOODS (I) R	29
THORNTON, JR. (D)	102
Write-in	0
WRITE-INS	0
Write In Candidates	
Ballot Candidate	

DR COMMISSIONER
RACE # 17

BUTLER (I) R	24
HEATLEY (D)	100
Write-in	0
WRITE-INS	0
Write In Candidates	
Ballot Candidate	

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*****
TUN
# 19
ATON (I) R      20
LLER (D)       104
AHAM (L)       8
-in            0
TE-INS         0
In Candidates
Candidate
*****
RIDEMORE
# 21
RIDEMORE (I) R  18
RANDOLPH (D)   107
PISH (L)       8
in             0
E-INS          0
In Candidates
Candidate
*****
SE 5
40
LEWIS (I) D    129
n              0
-INS           0
In Candidates
Candidate
*****

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*****
TE 36
I) D          124
              1
              1
Candidates
date
SE RETIRE
*****
58
D            122
              0
              0
Candidates
date
*****
PERSON
              121
              0
              0
dates
te
*****
(I) 95
    72
    0
    0
    0

```

ELECTION RESULTS REPORT

Fulton County
State of
Georgia General Election

November 6, 2018
DATE: Nov-06-2018
POLL CTR: 280R00
02J, 02K & 06G
MACHINE ID: 9
VERSION: 2 COPY: 0
COUNT: 0 SIZE: 32M
ACCU-VOTE RELEASE: 4, 5, 2
REPORT: US 1, 14, 7

TIME: 19:24 11/06/2018
MACHINE SERIAL: 107677
PUBLIC COUNTER: 136
SYSTEM COUNTER: 5229

*** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT

PRECINCT	QUANTITY
220	69
225	47
700	20
TOTAL BALLOTS	136

GOVERNOR
RACE # 3

B. KEMP (R) 26
S. ABRAMS (D) 105
T. METZ (L) 5
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

LT GOVERNOR
RACE # 5

G. DUNCAN (R) 35
S. R. AMICO (D) 98
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

655732 TED METZ

SECRETARY OF STATE
RACE # 7

* B. RAFFENSPERGER (R) 28

RACE # 7

B. RAFFENSPERGER (R)	28
J. BARROW (D)	99
S. DUVAL (L)	6
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

ATTORNEY GENERAL

RACE # 9

CARR (I) R	30
BAILEY (D)	101
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

AGRICULTURE COMMISSIONER

RACE # 11

G. BLACK (I) R	38
F. SWANN (D)	93
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER

INSURANCE COMMISSIONER

RACE # 13

J. BECK (R)	25
J. LAWS (D)	93
D. FOSTER (L)	14
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT

RACE # 15

R. WOODS (I) R	38
O. THORNTON, JR. (D)	94
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

LABOR COMMISSIONER

RACE # 17

M. BUTLER (I) R	34
-----------------	----

COMMISSIONER

17

N. BUTLER (I) R	34
R. KEATLEY (D)	97
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R	28
L. MILLER (D)	93
R. GRAHAM (L)	13
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R	29
D. A. RANDOLPH (D)	91
J. TURPISH (L)	13
Write-in	0
# WRITE-INS	0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D	113
Write-in	7
# WRITE-INS	7

Write In Candidates
Ballot Candidate

888888 ADAM DANIEL GARY
440041 ANYONE BUT LEWIS
173300 BUCKLEY DUKE
819362 CHRIS CURNICK
468884 JACOB BURNAGE
20800 PE
800732 TED METZ

STATE SENATE 36

RACE # 145

N. ORROCK (I) D	110
-----------------	-----

Write-in 4

WRITE-INS 4

Write In Candidates

Ballot Candidate

173300 BUCKLEY DUKE

819362 CHRIS CURNICK

468884 KATHERINE HALL

655732 TED METZ

STATE HOUSE 58

RACE # 355

P. CANNON (I) D	107
-----------------	-----

Write-in 4

WRITE-INS 4

Write In Candidates

Ballot Candidate

173300 BUCKLEY DUKE

819362 CHRIS CURNICK

468884 HART WILLOUGHBY

655732 TED METZ

CO COMM CHAIRPERSON

CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D 108
Write-in 5
WRITE-INS 5

Write In Candidates
Ballot Candidate
173300 BUCKLEY DUKE
819362 CHRIS CURNICK
399513 KRISTIN HALLORAN
20690 ME
655732 TED METZ

SOIL AND WATER
RACE # 550

W. S. REKUC, JR (I) 88
J. R. ULSETH 78
Write-in 0
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

CONST AMENDMENT 1
RACE # 580

ELECTION RESULTS REP

Fulton County
State of
Georgia General Election

November 6, 2018
DATE: Nov-06-2018
POLL CTR: 280[00
02J, 02K & 06G
MACHINE ID: 10
VERSION: 2 COPY: 0
COUNT: 0 SIZE: 32M
ACCU-VOTE RELEASE: 4, 5, 2
REPORT: US 1, 14, 7

TIME: 19:28 11/06/2018
MACHINE SERIAL: 124373
PUBLIC COUNTER: 37
SYSTEM COUNTER: 11546

** SUMMARY TOTALS

ELECTION LAST BY PRECINCT
PRECINCT QUANTITY*
220 19
225 17
700 1
TOTAL BALLOTS 37

GOVERNOR
RACE # 3

B. KEMP (R) 4
S. ABRAMS (D) 33
T. METZ (L) 0
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

LT GOVERNOR
RACE # 5

G. DUNCAN (R) 5
S. R. AMICO (D) 32
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R) 6
L. BARROW (D) 29
D. DUVAL (L) 1
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R 8
C. BAILEY (D) 28
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 9
F. SVANN (D) 28
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 7
J. LAWS (D) 28
D. FOSTER (L) 1
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 8
D. THORNTON, JR. (D) 28
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 7
R. KEATLEY (D) 27
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R 7
L. MILLER (D) 28
R. GRAHAM (L) 3
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 7
D. A. RANDOLPH (D) 24
I. TURPISH (L) 3
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D 32
Write-in 1
WRITE-INS 1
Write In Candidates
Ballot Candidate

733772 TAYLOR HARRISON

STATE SENATE 36
RACE # 145

N. DRROCK (I) D 32
Write-in 1
WRITE-INS 1
Write In Candidates
Ballot Candidate

733772 TAYLOR HARRISON

STATE HOUSE 58
RACE # 355

P. CANNON (I) D 32
Write-in 1
WRITE-INS 1
Write In Candidates
Ballot Candidate
733772 TAYLOR HARRISON

CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D 33
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

SOIL AND WATER
RACE # 550

W. S. REKUC, JR (I) 38
J. R. ULSETH 18
Write-in 0
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

CONST AMENDMENT 1
RACE # 560

YES 36
NO 7

CONST AMENDMENT 2
RACE # 570

YES 20
NO 14

CONST AMENDMENT 3
RACE # 580

 ELECTION RESULTS REPORT

 Fulton County
 State of
 Georgia General Election

November 6, 2018
 DATE: Nov-06-2018
 POLL CTR: 280\00
 02J, 02K & 06G
 MACHINE ID: 11
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: US 1, 14, 7

TIME: 19:27 11/06/2018
 MACHINE SERIAL: 149744
 PUBLIC COUNTER: 44
 SYSTEM COUNTER: 5974

 *** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT

PRECINCT	QUANTITY
220	22
225	15
700	7
TOTAL BALLOTS	44

GOVERNOR
 RACE # 3
 B. KEMP (R) 13
 S. ABRAMS (D) 29
 T. METZ (L) 2
 Write-in 0
 # WRITE-INS 0
 Write In Candidates
 Ballot Candidate

 LT GOVERNOR
 RACE # 5
 G. DUNCAN (R) 13
 S. R. AMICO (D) 30
 Write-in 0
 # WRITE-INS 0
 Write In Candidates
 Ballot Candidate

 SECRETARY OF STATE
 RACE # 7
 B. RAFFENSPERGER (R) 11
 J. BARROW (D) 30
 S. DUVAL (L) 3
 Write-in 0
 # WRITE-INS 0
 Write In Candidates
 Ballot Candidate

 ATTORNEY GENERAL
 RACE # 9
 CARR (I) R 15
 BAILEY (D) 28 * *
 Write-in 0
 WRITE-INS 0
 Write In Candidates
 Ballot Candidate

```

*****
AGRICULTURE COMMISSIONER
OFFICE # 11

BLACK (I) R          16
SWANN (D)            26
Write-in              0
WRITE-INS             0
Write In Candidates
Not Candidate
*****
INSURANCE COMMISSIONER
OFFICE # 13

BECK (R)             13
LAWS (D)             27
FOSTER (L)           4
Write-in              0
WRITE-INS             0
Write In Candidates
Not Candidate
*****
STATE SCHOOL SUPERINTENDENT
OFFICE # 15

WOODS (I) R          17
THORNTON, JR. (D)   26
Write-in              0
WRITE-INS             0
Write In Candidates
Not Candidate
*****
TERRITORIAL COMMISSIONER
OFFICE # 17

BUTLER (I) R         16
EATLEY (D)           26
Write-in              0
WRITE-INS             0
Write In Candidates
Not Candidate
*****

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*****
EATON
OFFICE # 19

EATON (I) R          11
MILLER (D)           29
GRAHAM (L)           3
Write-in              0
WRITE-INS             0
Write In Candidates
Not Candidate
*****
RIDEMORE
OFFICE # 21

RIDEMORE (I) R       12
RANDOLPH (D)         28
RUPISH (L)           3
Write-in              0
WRITE-INS             0
Write In Candidates
Not Candidate
*****
OFFICE # 5
OFFICE # 40

LEWIS (I) D          35
Write-in              1
WRITE-INS             1
Write In Candidates
Not Candidate
*****

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ELECTION RESULTS REPORT

Fulton County
State of
Georgia General Election

November 6, 2018
DATE: Nov-06-2018
POLL CTR: 280J00
02J, 02K & 06G
MACHINE ID: 12
VERSION: 2 COPY: 0
COUNT: 0 SIZE: 32M
ACCU-VOTE RELEASE: 4, 5, 2
REPORT: US 1, 14, 7

TIME: 19:26 11/06/2018
MACHINE SERIAL: 144033
PUBLIC COUNTER: 35
SYSTEM COUNTER: 5751

*** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT
PRECINCT QUANTITY
220 17
225 15
700 3

TOTAL BALLOTS 35

GOVERNOR
 RACE # 3

B. KEMP (R)	7
S. ABRAMS (D)	27
T. METZ (L)	1
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 LT GOVERNOR
 RACE # 5

G. DUNCAN (R)	9
S. R. AMICO (D)	25
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 SECRETARY OF STATE
 RACE # 7

B. RAFFENSPERGER (R)	9
J. BARROW (D)	25
S. DUVAL (L)	1
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 ATTORNEY GENERAL
 RACE # 9

C. CARR (I) R	9
C. BAILEY (D)	26
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 AGRICULTURE COMMISSIONER
 RACE # 11

G. BLACK (I) R	10
F. SWANN (D)	24
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 INSURANCE COMMISSIONER
 RACE # 13

J. BECK (R)	10
J. LAWS (D)	23
D. FOSTER (L)	1
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 STATE SCHOOL SUPERINTENDENT
 RACE # 15

R. WOODS (I) R	9
O. THORNTON, JR. (D)	24
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 LABOR COMMISSIONER
 RACE # 17

M. BUTLER (I) R	10
R. KEATLEY (D)	23
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

```

*****
PSC EATON
RACE # 19

C. EATON (I) R      8
L. MILLER (D)      24
R. GRAHAM (L)      1
Write-in           0
# WRITE-INS        0
Write In Candidates
Ballot Candidate
*****
PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R  9
D. A. RANDOLPH (D) 23
J. TURPISH (L)      1
Write-in           0
# WRITE-INS        0
Write In Candidates
Ballot Candidate
*****
US HOUSE 5
RACE # 40

J. R. LEVIS (I) D   30
Write-in           2
# WRITE-INS        2
Write In Candidates
Ballot Candidate
271598 JOHN ADAMS
650976 NICK SABAN
*****
    
```

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*****
STATE SENATE 36
RACE # 145

N. DRROCK (I) D    29
Write-in          2
# WRITE-INS       2
Write In Candidates
Ballot Candidate
271598 JOHN ADAMS
650976 NICK SABAN
*****
STATE HOUSE 58
RACE # 355

P. CANNON (I) D   29
Write-in          2
# WRITE-INS       2
Write In Candidates
Ballot Candidate
271598 JOHN ADAMS
650976 NICK SABAN
*****
CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D    26
Write-in          2
# WRITE-INS       2
Write In Candidates
Ballot Candidate
271598 JOHN ADAMS
650976 NICK SABAN
*****
SOIL AND WATER
RACE # 550

V. S. REKUC, JR (I) 16
J. R. ULSETH        17
Write-in           0
Write-in           0
# WRITE-INS        0
Write In Candidates
Ballot Candidate
*****
CONST AMENDMENT 1
RACE # 580

YES                34
NO                 0
*****
CONST AMENDMENT 2
RACE # 570

YES                33
NO                 0
    
```

 ELECTION RESULTS REPORT

 Fulton County
 State of
 Georgia General Election

November 6, 2018

DATE: Nov-06-2018
 POLL CTR: 280^00
 02J, 02K & 06G
 MACHINE ID: 13
 VERSION: 2 COPY: 0
 COUNT: 0 SIZE: 32M
 ACCU-VOTE RELEASE: 4, 5, 2
 REPORT: US 1, 14, 7

TIME: 19:31 11/06/2018
 MACHINE SERIAL: 116073
 PUBLIC COUNTER: 37
 SYSTEM COUNTER: 4718

 *** SUMMARY TOTALS

BALLOTS CAST	PRECINCT	QUANTITY
	220	15
	225	15
	700	7
TOTAL BALLOTS		37

GOVERNOR
 RACE # 3

B. KEMP (R)	8
S. ABRAMS (D)	27
T. METZ (L)	2
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 LT GOVERNOR
 RACE # 5

G. DUNCAN (R)	10
S. R. AMICO (D)	24
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 SECRETARY OF STATE
 RACE # 7

B. RAFFENSPERGER (R)	9
J. BARROW (D)	25
S. DUVAL (L)	2
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

 ATTORNEY GENERAL
 RACE # 9

C. CARR (I) R	11
C. BAILEY (D)	24
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R 12
F. SWANN (D) 21
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R) 9
J. LAWS (D) 22
O. FOSTER (L) 3
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

STATE SCHOOL SUPERINTENDENT
RACE # 15

R. WOODS (I) R 12
O. THORNTON, JR. (D) 20
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R 10
R. KEATLEY (D) 22
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

PSC EATON
RACE # 19

C. EATON (I) R 9
L. MILLER (D) 23
R. GRAHAM (L) 3
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 9
D. A. RANDOLPH (D) 22
J. TURPISH (L) 3
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D 26
Write-in 0
WRITE-INS 0
Write In Candidates
Ballot Candidate

STATE SENATE 30
RACE # 145

N. DRROCK (I) D 25
Write-In 1
WRITE-INS 1

Write In Candidates
Ballot Candidate
30448 JEN ALIPKOFF

STATE HOUSE 50
RACE # 355

P. GANNON (I) D 25
Write-In 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D 25
Write-In 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

SOIL AND WATER
RACE # 550

W. S. REXUC, JR (I) 20
J. R. ULSETH 14
Write-In 0
Write-In 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

CONST AMENDMENT 1
RACE # 500

YES 30
NO 5

CONST AMENDMENT 2
RACE # 570

YES 28
NO 11

CONST AMENDMENT 3

ELECTION RESULTS REPORT

Fulton County
State of
Georgia General Election

November 6, 2018
DATE: Nov-06-2018
POLL CTR: 280_00
02J, 02K & 06G
MACHINE ID: 14
VERSION: 2 COPY: 0
COUNT: 0 SIZE: 32M
ACCU-VOTE RELEASE: 4, 5, 2
REPORT: US 1, 14, 7

TIME: 19:32 11/06/2018
MACHINE SERIAL: 123843
PUBLIC COUNTER: 39
SYSTEM CODE: 10292

*** SUMMARY TOTALS

BALLOTS CAST BY PRECINCT	
PRECINCT	QUANTITY
220	17
225	16
700	6
TOTAL BALLOTS	39

GOVERNOR
RACE # 3

B. KEMP (R)	8
S. ABRAMS (D)	30
T. METZ (L)	1
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

LT GOVERNOR
RACE # 5

G. DUNCAN (R)	7
S. R. AMICO (D)	30
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

SECRETARY OF STATE
RACE # 7

B. RAFFENSPERGER (R)	6
J. BARROW (D)	28
S. DUVAL (L)	4
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

ATTORNEY GENERAL
RACE # 9

C. CARR (I) R	8
C. BAILEY (D)	28
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

AGRICULTURE COMMISSIONER
RACE # 11

G. BLACK (I) R	10
F. SWANN (D)	25
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

INSURANCE COMMISSIONER
RACE # 13

J. BECK (R)	8
J. LAWS (D)	25
D. FOSTER (L)	4
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

STATE SCHOOL SUPERINTENDENT
RACE # 15

K. WOODS (I) R	11
O. THORNTON, JR. (D)	26
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

LABOR COMMISSIONER
RACE # 17

M. BUTLER (I) R	10
R. KEATLEY (D)	25
Write-in	0
# WRITE-INS	0
Write In Candidates	
Ballot Candidate	

PSC EATON
RACE # 19

C. EATON (I) R	9
----------------	---

PSC EATON
RACE # 19

C. EATON (I) R 9
L. MILLER (D) 24
R. GRAHAM (L) 4
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC PRIDEMORE
RACE # 21

T. PRIDEMORE (I) R 8
D. A. RANDOLPH (D) 25
J. TURPISH (L) 4
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

US HOUSE 5
RACE # 40

J. R. LEWIS (I) D 33
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate

721789 RICK FLAIR

STATE SENATE 36
RACE # 145

N. ORROCK (I) D 30
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

STATE HOUSE 58
RACE # 355

P. CANNON (I) D 29
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

CO COMM CHAIRPERSON
RACE # 450

R. PITTS (I) D 30
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

SOIL AND WATER
RACE # 550

V. S. REKUC, JR (I) 25
J. R. ULSETH 15
Write-in 1
Write-in 0
WRITE-INS 1

Write In Candidates
Ballot Candidate

120066 SALLY BETHAE

CONST AMENDMENT 1
RACE # 580

YES 30
NO 1

CONST AMENDMENT 2
RACE # 590

YES 30

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Georgia General Election

November 6, 2018

DATE: Nov-06-2018

POLL CTR: 1130/00

MIDVALE ELEM

VERSION: 1 COPY: 0

COUNT: 0 SIZE: 32M

ACCU-VOTE RELEASE: 4, 5, 2

REPORT: US 1, 14, 7

TIME: 19:45 11/06/2018

MACHINE SERIAL: 108936

PUBLIC COUNTER: 727

SYSTEM COUNTER: 5081

Accumulated Results For:

MachineId	Copy	Count
1	0	104
2	0	88
3	0	108
4	0	100
5	0	112
6	0	102
7	0	113

Total Count: 727

** PRECINCT: 1070 **

MIDVALE ELEM

BALLOTS CAST

BALLOT	QUANTITY
57	172
83	555

BLANK VOTED 0
UNDervOTED 235
WRITE-IN 43

Governor
RACE # 10
RUNNING 3
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 3
B. KEMP (R) 389
S. ABRAMS (D) 307
T. METZ (L) 25
Write-in 3
WRITE-INS 3

Write In Candidates
Ballot Candidate
923217 GLORIFY JESUS
537209 LAURA ROLLMAN
453453 LEWIS BROWN

Lt Governor
RACE # 30
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 28
G. DUNCAN (R) 406
S. R. AMICO (D) 292
Write-in 1
WRITE-INS 1

Write In Candidates

537209 LAURA ROLLMAN
453453 LEWIS BROWN

Lt Governor
RACE # 30
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 28
G. DUNCAN (R) 406
S. R. AMICO (D) 292
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate
923217 CHRIST ALONE

Secretary of State
RACE # 50
RUNNING 3
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 19
B. RAFFENSPERGER (R) 390
J. BARROW (D) 282
S. DUVAL (L) 36
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

Attorney General
RACE # 70
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 18
C. CARR (I) R 420
C. BAILEY (D) 289
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

Commissioner of Agriculture
RACE # 90
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 29

RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 18
C. CARR (I) R 420
C. BAILEY (D) 289
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

Commissioner of Agriculture
RACE # 90

RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 29
G. BLACK (I) R 445
F. SWANN (D) 253
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

Commissioner of Insurance
RACE # 110

RUNNING 3
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 24
J. BECK (R) 398
J. LAWS (D) 257
D. FOSTER (L) 48
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

State School Superintendent
RACE # 130

RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 25
R. WOODS (I) R 442
D. THORNTON, JR. (D) 260
Write-in 0
WRITE-INS 0

Write In Candidates

State School Superintendent

RACE # 130
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 25
R, WOODS (I) R 442
O, THORNTON, JR. (D) 260
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

Commissioner of Labor
RACE # 150
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 30
M, BUTLER (I) R 438
R, KEATLEY (D) 259
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

PSC Eaton
RACE # 170
RUNNING 3
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 24
C, EATON (I) R 379
L, MILLER (D) 271
R, GRAHAM (L) 51
Write-in 2
WRITE-INS 2

Write In Candidates
Ballot Candidate
943346 KRISTY HELLER
870295 STEPHANIE H SHANHOLTZER

PSC Pridemore
RACE # 180
RUNNING 3
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 24
T, PRIDEMORE (I) R 384
D, A, RANDOLPH (D) 268
J, TURPISH (L) 50
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate
943346 CHARLOTTE HELLEN

US House 6
RACE # 220
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727

RACE # 180
RUNNING 3
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 24
T. PRIDEMORE (I) R 384
D. A. RANDOLPH (D) 268
J. TURPISH (L) 50
Write-in 1
WRITE-INS 1

Write In Candidates
Ballot Candidate
943346 CHAROTTE HELLER

US House 6
RACE # 220
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 9
K. HANDEL (I) R 414
L. MCBATH (D) 304
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

State Senate 40
RACE # 250
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 727
TIMES BLANK VOTED 26
F. MILLAR (I) R 398
S. HARRELL (D) 303
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

State House 81
RACE # 350
RUNNING 2
TO VOTE FOR 1

TIMES COUNTED 555
TIMES BLANK VOTED 13
E. DIEHL (R) 309
S. HOLCOMB (I) D 233
Write-in 0
WRITE-INS 0

Write In Candidates
Ballot Candidate

State House 87
RACE # 430
RUNNING 1
TO VOTE FOR 1

TIMES COUNTED 172
TIMES BLANK VOTED 64
V. DAVIS (D) 102

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Exhibit D

Midvale Elementary Precinct

DRE Election Night poll tape comparisons to Sec. of State official posted tallies for example races

Candidate/Contest	Midvale DRE Poll Tape	SOS Election Day Tally
Amico	292	328
Duncan	406	468
Lt. Gov. total	698	796
Total Ballots Cast	727	not available
Governor	724	824
Sec. of State	708	809
Attorney General	709	810

Note: similar patterns continue through all contests for which we have photograph of poll tape.

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**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION**

DONNA CURLING, ET AL.,)	
)	
Plaintiffs,)	
)	CIVIL ACTION
vs.)	
)	FILE NO. 1:17-cv-2989-AT
BRAD RAFFENSPERGER,)	
ET AL.,)	
)	
Defendants.)	

DECLARATION OF BRUCE P. BROWN

1. My name is Bruce P. Brown. I am over the age of 18 and competent to testify. I have personal knowledge of the facts stated in this declaration. I represent the Plaintiffs in this case.

2. I represent the Appellants in *Coalition for Good Governance v. Raffensperger*, currently pending in the Supreme Court of Georgia (No. S19A0769). True and correct copies of selections from the transcript from the trial of that case are attached hereto as Exhibit 1 (January 17, 2019) and Exhibit 2 (January 18, 2019).

3. Attached as Exhibit 3 is a true and correct copy of Judge Grubbs' January 18, 2019, final order in *Coalition for Good Governance v. Raffensperger*.


4. Attached hereto as Exhibit 4 is a true and correct copy of a June 12 email I received from Vincent Russo, counsel for the State Defendants in this case.

5. Attached hereto as Exhibit 5 is a true and correct copy of a March 24, 2019 letter from me to Mr. Russo and Bryan Tyson.

6. Attached hereto as Exhibit 6 is a true and correct copy of an April 1, 2019 letter from me to Mr. Russo and Bryan Tyson.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

FURTHER DECLARANT SAYETH NOT.

June 21, 2019


Bruce P. Brown

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DIRECT EXAMINATION
OF SARA LECLERC

3

4

BY MR. BROWN:

5

6

Q. Please state your full name for the record.

A. Sara M. LeClerc.

7

8

Q. Please have a seat. Okay. Could you spell

9

your last name for the court reporter, please?

10

A. Absolutely. It's L-E- capital C-L-E-R-C.

11

Q. Is it LeClerc; is that correct?

A. It's LeClerc, but --

12

13

Q. LeClerc.

A. -- [inaudible] doesn't matter.

14

15

Q. Ms. LeClerc, by whom are you currently employed?

16

17

A. I work for myself. I'm an attorney and I -

18

-

THE COURT: I'm sorry.

19

20

THE WITNESS: I just work for myself. And I'm an attorney and I -- so I work on a contract basis for other

21

firms.

22

BY MR. BROWN:

23

24

Q. And where did you go to law school?

25

A. The University of Virginia.

1 Q. Okay. And when did you graduate?

2 A. 2007.

3 Q. And did there come a time that you

4

4 participated in the 2018 elections in any way?

5 A. Yes.

6

6 Q. And what was your role?

7 A. Well, my first role I would say other --

8

8 well, other than actually in the election as a

9 citizen, I volunteered to observe, be a poll watcher,

10 a poll observer, so.

11 Q. And with whom did you volunteer? Was it an
12 organization that --

13

13 A. Yeah. I went to a training with the
14 Georgia Democrats.

15

15 Q. And did you end up observing any election?

16 A. Yes, I did.

17

17 Q. And where did you -- where were you?

18 A. Well, I did some early voting observations,
19 as well as Election Day, and then also the runoff

20

20 Election Day in December. So I was at different
21 locations for each of those days.

22

22 Q. And on November 7th, where were you
23 located?

24

24 A. It was November 6th.

25 Q. November 6th, I'm sorry.

1 A. And November 6th I was at Allen Temple AME
2 Church.

THE COURT: Which one?

3

4 A. Allen Temple AME. It's on Joseph Boone
5 Boulevard in Atlanta.

6

7 Q. And in the course of being an observer, do
8 you take contemporaneous notes of what you are

9

observing?

10 A. Yes. So, if something happens, it's not

11 just a perfectly smooth process, then I use my iPhone

12 and I have an app at the direction of to an LBJ
13 reporting tool. So I took notes directly to the

14

iPhone and website.

15 Q. And what does LBJ stand for, if you know?

16

In this instance.

17 A. Probably Lyndon Baines Johnson.

18

19 Q. Okay.

20 A. I believe it was named after him, given
21 [inaudible].

22

23 Q. Okay. And did you, in fact, enter your
24 notes and observations when you were at the AME

25

location on November 6th?

26 A. Yeah, I did; well, multiple times

27

28 throughout that day.

29

30 MR. BROWN: And I'm going to hand you a -- an Exhibit

1 and let me -- if I may explain this to counsel.

2

[Thereupon, the referred-to document was entered into

3

4 evidence as Plaintiff's Exhibit No. 2]

5

6 MR. LINDSEY: [inaudible].

MR. BROWN: Understood. Put it on the record while I

7

8 hand it to you because it's hard to read.

9 MR. LINDSEY: [inaudible] with my glasses.

10 BY MR. BROWN:

11 Q. And what I've handed to counsel is a large-
12 print version for Mr. Lindsey, like the books you get

13 from Amazon, and then the actual Excel spreadsheet,
14 which is too small even for me to read, and you could

15 just see that these blocks were copied onto this.

MR. LINDSEY: I understand. Which one do I get?

16

17 Both of these?

18 MR. BROWN: This is what I'm using as evidence.

MR. LINDSEY: Okay. Do I have a copy of that?

19

20 MR. BROWN: And you have that so you can verify it.

MR. LINDSEY: For the record, Your Honor, I had the

21

22 Lasix surgery. I can still read this.

THE COURT: This one? This is P-2?

23

24 MR. BROWN: This is P-2, Your Honor.

25 BY MR. BROWN:

1 Q. Now, Ms. LeClerc, the notes that you take
2 on the LBJ system appear on what looks like an Excel
3 spreadsheet; is that correct? And that is not what's
4 in front of you. That's what I handed to Mr.
5 Lindsey.

6 A. I have the large print of what you said is
7 the Excel spreadsheet.

8 Q. And does that appear to be a large-print
9 version of the very small print on the Excel
10 spreadsheet?

11 A. Yes.

12 Q. And does the Excel spreadsheet have a true
13 and correct recording of the notes that you took on
14 the LBJ system as you were observing things in the
15 AME voting location?

16 A. Yes. All of the notes that start with Sara
17 LeClerc, that's -- those notes are all on, yes.

18 Q. And if it's someone else -- excuse me. And
19 if it's someone else, their name would appear, like,
20 Benjamin Thorpe [ph]; correct?

21 A. Right. There were maybe one or two notes
22 by a different person and their name appears next to
23 those notes.

24 MR. BROWN: Your Honor, I would like to introduce
25 Defendant's 2 into the record. I mean, sorry. P-2 into

1 the record.

2 MR. LINDSEY: If I understand it, these are
3 contemporaneous notes that are from your observations; is

4 that correct?

5 THE WITNESS: Yes.

6 MR. LINDSEY: Okay. No objection.

7 THE COURT: [inaudible]. Yeah. Thank you.

8 BY MR. BROWN:

9 Q. Now, Ms. LeClerc, the way this prints out,
10 where do we start?

11 A. You actually start at the back, so these
12 are my first pages and my last.

13 Q. Okay.

14 A. [inaudible].

15 Q. And let's just walk through your notes and
16 I'll ask you some questions on what you were

17 observing. Looking at page four --

18 A. If I can clarify that.

19 Q. Sure.

20 A. Actually these are by incidence --

21 Q. Okay.

22 A. -- so the first incident actually starts at
23 the bottom of page three.

24 Q. Okay. And what was that incident that you
25 observed?

1 A. There was an issue where the Express
2 machines were to pick up their ballots. The number
3 that was on the machines -- well, there -- there were
4 two machines at this location. So, they -- the two
5 poll workers were comparing the machines and noticed
6 that one machine was a couple numbers different from
7 the other machine's count. So they seemed to be out
8 of sync and having discrepancies.

9 Q. And was that issue resolved?

10 A. Yes. That did get resolved. The poll
11 manager called in for a technical help but was told
12 that it would self-correct in time and it did self-
13 correct [inaudible].

14 Q. And then what was the next incident?

15 A. The next incident that I started taking was
16 that just one of the voters who came in had --
17 started ac- -- oh, I'm sorry.

18 Q. Could you -- I was going to ask you to
19 refer to your notes, so maybe we could follow along
20 with your observations. Was this the senior voter?

21 A. Yes.

22 Q. Okay. Turn with me to the bottom of page
23 two.

24 A. Yes.

25 Q. Are those your notes relating to that

1 senior voter?

2 A. Yes.

3 Q. And just go ahead and explain without

4 looking at this what you recall. That's fine.

5 A. So, I noticed that -- well, a voter came in

6 to check in, got their ballot. She was a rather
7 elderly lady walking on a cane, very kind, and she

8 went to the machine to vote. At that point, nothing
9 out of the ordinary had happened, but she started
10 turning around and asking for some help with the
11 machine.

12 So, we pulled to help her, to assist her. And
13 the two of them were at the machine for a brief time.
14 I think the manager left and the voter continued
15 voting. Then she called the manager back again and
16 the manager went back to assist. And so the two of
17 them were at the machine together for a little while
18 and appear to me ordinary but the manager is allowed
19 to assist the voter if the voter asks for help.

20 It lasted for a little while longer than I would
21 have anticipated and at the end of that, the voter

22 went down -- went over to some chairs to sit and
23 wait, and I noticed that the manager started shutting

24 that DRE machine down, closing it up, and so that was

25 unusual to me and I wanted to figure out what was

1 going on. Why was that machine getting closed? Was
2 there a problem?
3 So at first I was just observing. I didn't want
4 to get in the way of whatever the manager was doing.
5 And I went over to talk to the voter. She was
6 actually just sitting and waiting for her ride so
7 that she could get back to her home. So I went up to
8 her and asked her if everything okay. Was she able
9 to vote? And --

10 MR. LINDSEY: And, Your Honor, I'll object. Ms.
11 LeClerc's been asked [inaudible] what the voter said to be
12 hearsay.

13 THE COURT: [inaudible]. She asked her, fine. Go
14 ahead, what's next?

15 BY MR. BROWN:
16 Q. Did you have a conversation with the voter?

17 A. I had a conversation with the voter.

18 Q. And based upon that conversation, did you
19 have an understanding of what was happening?

20 THE COURT: No. Understanding what's happening is
21 hearsay.

22 MR. BROWN: Okay.

23 THE COURT: Did you did anything as a result of it?

24 BY MR. BROWN:

25 Q. What did you do in response to receiving

1 the information from the voter?

2 A. So, I waited for the manager to finish up
3 what she was doing with the machine and then

4 approached her to ask what happened, what -- why was
5 the machine had been closed, what was going on.

6 Q. And what did the manager tell you?
7 MR. LINDSEY: Again, I'll object, on hearsay.

8 MR. BROWN: That is an admission. The manager is
9 employed by the defendants. That's an admission.

10 THE COURT: Well, does Fulton County -- does Fulton
11 County have anything to say about that?

12 MR. LINDSEY: [inaudible].

13 MS. BURWELL: Well, Your Honor, the -- it is true
14 that the poll manager would be employed by Fulton County,
15 but I don't believe that the poll manager is in a position
16 to bind the County.

17 THE COURT: I -- I -- I agree with that, but I'm
18 going to let the witness say what she said.

19 MR. BROWN: Thank you, Your Honor.

20 THE WITNESS: So, the poll manager told me that she
21 needed to close the machine because that machine had self-

22 cast the voter's ballot before the voter had finished
23 voting. And the manager told me that she was assisting

24 the voter on the review screen. So after you make your
25 selection to get the review screen.

1 And the manager noticed that the -- there was no
2 selection made for the race for lieutenant governor and
3 for one other race, which the manager didn't name to me.

4 And so she had asked the voter -- the voter intended to
5 vote in those races. The voter said, yes --

6 MR. LINDSEY: That would be an objection, Your Honor.
7 That's what the voter said.

8 THE COURT: That's hearsay at this point.

9 MR. LINDSEY: Yes.

10 THE COURT: But as a result of that -- I'm going to
11 let it go ahead on this one.

12 MR. BROWN: Okay.

13 THE COURT: Uh --

14 MR. BROWN: Go ahead, Ms. LeClerc.

15 THE WITNESS: So, the manager pointed to where the
16 lieutenant governor race was, and the voter put her finger

17 on the area for the lieutenant governor race selection so

18 she could vote for the lieutenant governor race. And
19 instead -- which is nowhere near the area for submit

20 ballot, but when she touched lieutenant governor, the
21 machine said, your ballot has been submitted and there was

22 nothing they could do at that point.

23 So, it just self-cast before the voter could actually

24 make her selection on the lieutenant governor or the other

25 race.

1 BY MR. BROWN:

2 Q. Did you observe whether the poll officials
3 took that machine out of service at that time?

4 A. Yes. The manager did take it out of
5 service immediately.

6 Q. And then was that machine put back in
7 service?

8 A. It was put back in service later in the
9 day. Yes.

10 THE COURT: Let's -- let's take a morning break, take
11 a 10-minute break.

12 MR. BROWN: Thank you, Your Honor.

13 [Off the record at 10:25 a.m., and back on the record
14 at 10:37 a.m.]

15 THE COURT:

16 CONTINUATION DIRECT EXAMINATION

17 OF SARA LECLERC

18 BY MR. BROWN:

19 Q. Ms. LeClerc, returning to your testimony

20 about your observations at the AME Church, did you

21 take any photographs of the poll tapes when you were

1 disagree it was different; it's just simply broader.

2 MR. BROWN: I'm asking if there was any.

3 MR. LINDSEY: Your Honor, I'm asking --

4 THE COURT: If it goes to the election system itself,
5 not to the voter registration, the actual -- actual -- was

6 there any hacking in the actual voting system?

7 THE WITNESS: [inaudible].

8 BY MR. BROWN:

9 Q. And you did not investigate any hacking
10 into the election system as distinguished from the
11 registration system; correct?

12 A. Correct.

13 Q. And the Secretary of State's -- okay --
14 you've testified about it before I know there's been

15 a lot of testimony about the exposure of the system
16 at Kennesaw State in 2016 and 2017; are you familiar

17 generally with that issue?

18 A. I am.

19 Q. What has -- has the state undertaken a

20 forensic examination of the components of the
21 election's system to determine whether or not it was

22 infected with any malware because of that it's the --
23 -

24 MR. LINDSEY: Your Honor, once again, we're talking

25 about two entirely different systems; and unless he's

1 dealing with specifically the voter system we're going to
2 object to relevancy.

3 MR. TYSON: We would object to the lack of foundation
4 as far as the 2016 incident that affected any sort of like
5 databases. This is two years ago. There's no explanation
6 as to how --

7 THE COURT: I sustain it as to whether there's been
8 something because of something that happened that isn't in
9 front of me. I mean, you know, did they investigate
10 routinely for malware? I mean, that's one thing. But --
11 not going back and try to put something else on the record
12 that's not before me.

13 MR. BROWN: Well, I'll get it before you, Your Honor.
14 BY MR. BROWN:

15 Q. Now, Mr. Barnes, the -- what was exposed to
16 the public internet in 2016 and 2017?

17 MR. TYSON: Your Honor, we going to renew the
18 objection again.

19 THE COURT: Sustained.

20 MR. BROWN: Okay.
21 BY MR. BROWN:

22 Q. Mr. Barnes, what forensic review has your
23 office done with respect to the DRE machine voting
24 systems that were used in the 2018 election?

25 A. The Secretary of State's office in 2017

1 A. That the highest number of write-ins cast
2 for statewide office was in the lieutenant governor's
3 office.

4 Q. Okay.

5 MR. LINDSEY: Your Honor, we would tender Exhibits --

6 [inaudible] 7, 8, and 9.

7 THE COURT: Mr. Brown.

8 MR. BROWN: You're tendering those?

9 MR. LINDSEY: [inaudible] I'm tendering --

10 THE COURT: He tendered his exhibits.

11 MR. LINDSEY: I'm tendering the exhibits.

12 MR. BROWN: [inaudible]

13 THE COURT: Okay. No objection. That's [inaudible].

14 MR. LINDSEY: Your Honor, I just have one last

15 [inaudible] and I will release him, I guess, [inaudible].

16 Your Honor, I believe the parties have stipulated to the

17 admissibility of Secretary of State certified statewide

18 races.

19 I just want to let it [inaudible] in the record. I

20 would, first of all, tender Exhibits 10, 11, and 12. Is

21 that what I'm up to? Ten being the election for 2010, 11

22 being for '14, and 12 being for '18. Let me show you what

23 I have here. '18 and '14, rather, and '10.

24 BY MR. LINDSEY:

25 Q. [inaudible] Let me simply ask you to look

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**COALITION FOR GOOD GOVERNANCE, ET AL. vs ROBYN A. CRITTENDEN, ET AL.
Transcript of Trial Proceedings on 01/18/2019**

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IN THE SUPERIOR COURT OF FULTON COUNTY

STATE OF GEORGIA

COALITION FOR GOOD . CIVIL ACTION
GOVERNANCE, RHONDA J. . FILE NO.: 2018-CV-313418

MARTIN, SMYTH DUVAL, and .
JEANNE DUFORT, . Taken at:

Plaintiffs, . Superior Court of Cobb County

vs. . 70 Haynes Street

ROBYN A. CRITTENDEN, . Courtroom 402-M

Secretary of State of . Marietta, Georgia 30090
Georgia, et. al .

Defendants. .
.

TRANSCRIPT OF TRIAL PROCEEDINGS

FRIDAY, JANUARY 18, 2019

9:04 a.m. to 10:49 a.m.

STATE OF GEORGIA SENIOR JUDGE ADELE P. GRUBBS
REPORTED BY:

PRISCILLA GARCIA, COURT REPORTER
NOTARY PUBLIC, STATE OF GEORGIA

TRANSCRIBED BY:
CHRISTIAN NAADEN

1 recruited, poll workers trained; polling places we
2 have to make sure are -- are set.

3 We have to get all of our workers set up for
4 early voting. We have to get all the machines ready.
5 We -- we also make sure we get all of the -- the --

6 all of the voter registration applications processed
7 that are timely, and there are lots of little, sundry
8 duties that go along with all those.

9 Q. And those are the same -- the procedures
10 you go through for every election; is that correct?

11 A. Correct.

12 Q. Now, can you tell the judge about ballot
13 styles and what that means?

14 A. Well, we had 115 ballot styles in -- in the
15 November election. Those are based on -- on all the
16 -- the precincts and the districts, all the different
17 districts that -- that are within the county, from
18 state senate districts to -- to city boundaries to
19 House of Representative districts, all the -- all the
20 political districts are taken into account, along
21 with the precincts.

22 Q. So let me ask you about early voting. And
23 can you explain to the judge how early voting works?

24 A. During early voting, all of the ballots are
25 available at every polling place. You can vote

1 anywhere during early voting.

2 Q. So what does that mean in terms of ballot
3 styles?

4 A. Well, for our 370-plus precincts that we
5 have, all of those are available with the 115

6 different ballot styles.

7 Q. How does that differ from Election Day?

8 A. On Election Day, the voters have to go to
9 their -- their assigned precinct to vote. So those
10 -- those precincts are what are available in each
11 polling place.

12 Q. So on -- for early voting, if you live in

13 Roswell, you can vote in Chattahoochee Hills, and
14 they can pull up your ballot?

15 A. Correct.

16 Q. But on Election Day, you can only vote in
17 Roswell?

18 A. Yes, at whatever assigned place in Roswell,
19 yes.

20 Q. So during early voting, are there things
21 that could occur that would cause a machine to say

22 "Cancel" on it?

23 A. Well, if it -- if they -- if the screen

24 comes up and there's a cancel sign on there, that --

25 that indicates that the ballot was created by the

1 Express Poll in -- in the disabled mode, for a
2 disabled voter.

3 Q. Okay. So explain for the -- to the judge
4 what that means?

5 A. There's -- the Express Poll has two
6 different modes. You can have the regular mode where
7 -- where the ballot comes up, or there's a -- there's
8 also a mode for -- for disabled voters, because those
9 voters, the ballot doesn't appear on the screen.

10 The only thing that appears is -- is a
11 "canceled" button, so -- to cancel that out. Now if
12 the voter goes up, he can put -- it's in the disabled
13 mode, the Express Poll operator has to select the
14 option to go back to regular mode.

15 If they don't, the next card they create is
16 going to be in disabled mode.

17 Q. And so is that what makes it flash
18 "Cancel"?

19 A. Yeah.

20 Q. Does that mean that there's a problem with
21 the machine?

22 A. No.

23 Q. Okay. What does that mean?

24 A. The DRE's doing what it's told.

25 Q. So what happens to the voter in that

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**IN THE SUPERIOR COURT OF FULTON COUNTY
STATE OF GEORGIA**

Rhonda Martin, Smythe Duval,
Jeanne Dufort

Plaintiffs,

vs.

Geoff Duncan.
Fulton County Board of Registration
and Elections,
Gwinnett county Board of Registration
And Elections

Defendants.

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CIVIL ACTION
FILE NO.: 2018CV313418

ORDER DISMISSING PLAINTIFFS' PETITION

The above and forgoing case having come on regularly to be heard
with all parties represented by counsel and,

Plaintiffs having made Motions for Jury trial, see Fuller v. Thomas
284 Ga. 397 (2008), Continuance and to Compel Discovery and the
Court having denied the same, and,

Plaintiffs having presented evidence and rested their case, and,

The Defendants having made a Motion for Involuntary Dismissal

Pursuant to O.C.G.A. § 9-11-41(b),

It is hereby ordered as follows:

1.

O.C.G.A. § 9-11-41(b) states in material part –

“After the plaintiff, in an action tried by the court without a jury, has completed the presentation of his evidence, the defendant, without waiving his right to offer evidence in the event the motion is not granted, may move for dismissal on the ground that upon the facts and the law the plaintiff has shown no right to relief.”

2.

In this case the Plaintiffs contest the result of the election for Lieutenant Governor held November 6th, 2018, and request that the result be set aside and that a new election be held on paper ballots.

3.

The Plaintiffs have not shown any evidence that illegal votes have been received or legal votes rejected at the polls sufficient to change or place in doubt the result in the race for Lieutenant Governor held on November 6, 2018. O.C.G.A. §21-2-522.

4.

The Plaintiffs did presented evidence that the DRE system of voting used in Georgia has many problems and irregularities and is regarded as an outdated and inaccurate system of conducting a vote.

5.

In the particular race for Lieutenant Governor at issue here, the Plaintiffs showed that there were five instances of problems with voting at two precincts, that, of the 8 voting machines at the Winterville precinct in Clark County Georgia, 7 went decidedly Democratic and 1 went decidedly Republican and that there was a 4.5% undervote in the Lieutenant Governor race. There was no evidence of misconduct, fraud, or irregularity by any primary or election official or officials.

6.

“It is presumed that election results are valid, and the party contesting the Election has the burden of showing an irregularity or illegality sufficient to change place in doubt the result of the election” Hunt v. Crawford 270 GA.7 (1998). That case goes on to say “the setting aside of an election in which the people have chosen their representative is a drastic remedy that should not be undertaken lightly, but, instead should be reserved for cases in which the person challenging the election has clearly established a violation of election procedures and has demonstrated that the violation has placed the result of the election in doubt.”

7.

In the Lieutenant Governor’s race Geoff Duncan received 1,951,738 votes

and Sarah Amico received 1,828,566 votes, a difference of 123,172 votes. In the Lieutenant Governor's race there were 4.5% fewer voters than in the Governor's race. The numbers also show that Sarah Amico, a Democrat, also received more votes than those cast for the Democrat in the State-wide races for Commissioner of Agriculture, Commissioner of Insurance, State School Superintendent, and Commissioner of Labor. These number do not show any irregularity or illegality in themselves.

8.

“Where the focus is on improperly cast ballots or irregularities in the conduct of the election, the number of illegal of irregular ballots necessary to cast doubt on an election is derived by taking the difference between the total votes cast in the election and the race at issue, and adding the margin of victory in the race at issue” Fuller v. Thomas 284 Ga. 397 (2008)

9.

In the present case the most votes that the Plaintiff has shown that could be

in any way arguably considered irregular or illegal is approximately 32,000 votes. That assumes that all such votes would have been cast for Sarah Amico.

10.

Therefore, Plaintiffs Petition is hereby dismissed.

SO ORDERED this 18th day of January, **2019**



JUDGE ADELE P. GRUBBS
Senior Judge, State of Georgia

CERTIFICATE OF SERVICE is attached.

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Subject: RE: Proposed Joint Protec1ve Order
Date: Wednesday, June 12, 2019 at 12:23:09 PM Eastern Daylight Time
From: Vincent Russo
To: Cross, David D.
CC: Bruce Brown, Kimberly Anderson, John Powers, Chapple, Catherine L., Ringer, Cheryl, BentroN, Jane P., Carlin, John P., Manoso, Robert W., Conaway, Jenna B., Miriyala, Arvind S., sparks@khlawfirm.com, hknapp@khlawfirm.com, cichter@ichterdavis.com, Burwell, Kaye, david.lowman@fultoncountyga.gov, ram@lawram.com, Josh Belinfante, Bryan Tyson, bjacoutot@taylorenghish.com, Carey Miller, Brian Lake, Alexander Denton
Attachments: image001.jpg

David,

We have given you a clear answer. We do not contend that the claims are currently moot. You asked whether we intend to assert mootness “at the PI phase or at trial in January or at any other point in this li1ga1on.” As you know from the RFP that we provided to the par1es and Judge Totenberg, the new system hasn’t even been procured yet. If and when an intervening ac1on occurs that we believe moots the case, we will raise it at that 1me. Un1l then, we have not raised mootness.

Vincent

Vincent R. Russo | 404.856.3260 | 

From: Cross, David D. [mailto:DCross@mofo.com]
Sent: Wednesday, June 12, 2019 12:13 PM
To: Vincent Russo <vrusso@robbinsfirm.com>
Cc: Bruce Brown <bbrown@brucepbrownlaw.com>; Kimberly Anderson <Kimberly.Anderson@robbinsfirm.com>; John Powers <jpowers@lawyerscommiNee.org>; Chapple, Catherine L. <CChapple@mofo.com>; Ringer, Cheryl <Cheryl.Ringer@fultoncountyga.gov>; BentroN, Jane P. <JBentroN@mofo.com>; Carlin, John P. <JCarlin@mofo.com>; Manoso, Robert W. <RManoso@mofo.com>; Conaway, Jenna B. <JConaway@mofo.com>; Miriyala, Arvind S. <AMiriyala@mofo.com>; sparks@khlawfirm.com; hknapp@khlawfirm.com; cichter@ichterdavis.com; Burwell, Kaye <Kaye.Burwell@fultoncountyga.gov>; david.lowman@fultoncountyga.gov; ram@lawram.com; Josh Belinfante <Josh.Belinfante@robbinsfirm.com>; Bryan Tyson <btyson@taylorenghish.com>; bjacoutot@taylorenghish.com; Carey Miller <carey.miller@robbinsfirm.com>; Brian Lake <Brian.Lake@robbinsfirm.com>; Alexander Denton <Alexander.Denton@robbinsfirm.com>
Subject: RE: Proposed Joint Protec1ve Order

Vincent -

Do you intend to assert the mootness argument you describe below in response to our PI motion? Given the motion already is on file and scheduled for a hearing barely more than a month from now, we’re entitled to a clear answer to this question, which I’ve now asked three times. It’s a simple yes or no. Your response seems to imply the answer is no, but please confirm.

Thanks.
DC

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Bruce P. Brown

Law

March 24, 2019

Vincent Russo
Robbins Ross Alloy Belinfante
Littlefield LLC
500 Fourteenth St. NW
Atlanta, Georgia 30318

Bryan P. Tyson
Taylor English Duma LLP
Suite 200
1600 Parkwood Cir.
Atlanta, Georgia 30329

Re: HB316 and *Curling v. Raffensperger*, No. 17-CV-02989-AT (N.D. Ga.)

Dear Vincent and Bryan:

The purpose of this letter is to restate our demand communicated in our letter of April 16, 2018 (copy attached as Exhibit A), that your clients Secretary of State Brad Raffensperger and State Election Board Members David J. Worley, Rebecca N. Sullivan, Ralph F. Simpson, and Seth Harp (the “Election Board”) exercise their power, authority and responsibilities under Georgia law and the United States Constitution to conduct the upcoming 2019 and 2020 elections using hand-marked paper ballots and employing statistically valid post-election audits in all such elections. We also wish to supplement our objections stated in our letter of February 18, 2019 (copy attached as Exhibit B) to the un-auditable electronic ballot marking devices contemplated by the HB316, recently passed by the General Assembly.¹ HB316 is not a realistic or legally viable solution to Georgia’s DRE voting system security flaws and does not address the issues in the *Curling v Raffensperger* case.

It is a fair reading of Judge Totenberg’s September 17, 2018 Order that the Secretary would have been enjoined to use hand-marked paper ballots in the November 2018 election had there been more time to change from the DRE machines. *Curling v. Kemp*, 334 F. Supp. 3d 1303, 1327 (N.D. Ga. 2018). With the 2018 midterms finalized in

¹See <http://www.legis.ga.gov/Legislation/20192020/184671.pdf>.

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December, the Secretary continues to have the time and, given the vulnerability of the DRE machines, the duty to replace the DREs with hand-marked paper ballots. The change to a reliable and verifiable voting system cannot wait until a totally new system is deployed in 2020 (or, realistically, far beyond); there continue to be important elections in Georgia almost every month in 2019². As explained below, the new system contemplated by HB316, is fatally flawed in numerous constitutional and statutory respects. It is imperative that the State immediately deploy the voting method that is the modern standard in the country-- hand-marked paper ballots with precinct scanning and statistically valid post-election audits.

A. HB316 Does Not Address the Fundamental Issues raised in our Third Amended Complaint or in Judge Totenberg's September 2018 ruling.

As stated in our February 18, 2019 letter, electronic voting on Ballot Marking Devices ("BMDs") is merely an updated and unproven version of electronic voting on DREs. According to virtually every qualified expert in the field, BMDs are at least as vulnerable to undetected error or attack as the insecure DRE system. As we have previously stated, the paper printout ballot generated by BMDs are generally unverifiable and unverified by the voter, and the results the system produces are not auditable.

We intend to challenge the BMDs as an unconstitutional infringement on a citizen's right to vote and have the vote counted accurately. As stated in Count I of Coalition's Third Amended Complaint (Doc 226, ¶169):

Inherent in individuals' fundamental right to vote is the right to participate in a trustworthy and verifiable election process that safely, accurately, and reliably records and counts all votes cast and that produces a reliable election result capable of being verified as true in a recount or election contest.

BMDs as a class of election machines simply cannot meet these basic requirements, and the particular systems that are certified by the U.S. Election

² There have been special elections in January, February, March 2019, and more are scheduled for April 2019 and beyond.

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Assistance Commission (“EAC”) and likely to respond to Georgia’s Request for Proposal (“the RFP”) are deficient in multiple respects. There are five EAC certified systems.³

- a) ES&S ExpressVote;
- b) Dominion ImageCast X;
- c) Unisyn FreedomVote;
- d) Hart Verity Duo (certified March 18, 2019); and
- e) Clear Ballot Clear Access (certified March 19, 2019).

As you may know, three of the EAC-certified BMDs under consideration for purchase by Georgia (ES&S, Dominion and Unisyn) convert the voter’s selection on the screen to a barcode and it is the barcode that is printed on the printed vote record (“the paper ballot”) and then fed into the scanner by the voter. Although the printed vote record also includes human-readable information that is supposed to show the votes cast by the voter, it is the barcode (not readable by the voter) that is read and counted by the scanner and the basis for the ultimate tabulation of the votes.

The fourth system, Hart, works similarly, but rather than tabulating barcodes, a human readable list of selections is printed and read by the scanner, interpreted into votes, and tabulated. The fifth system’s BMD, Clear Ballot Access, prints the voter’s selection onto a regular full face paper ballot with bubbles colored in by candidate names, and tallies the votes upon optical scanning of the bubble marks.

Not one of these five systems produces an auditable result. As we explained in our February 18, 2019 letter, auditing and voting system experts are in virtually unanimous agreement that in most elections, electors are unable to verify that the machine has printed the ballot content or votes selected with 100% accuracy. Ballots are simply too long and too complex for voters to reliably detect errors in the printout of the “official paper ballot” record. For example, voters are not likely to detect if down-ballot races, or numerous referenda, are left off the paper printout, or if their votes were switched between “Yes” and “No.” In addition, most voters, having already spent the time voting on the machine, do not undertake the tedious additional step of verifying that the machine has recorded the voter’s selections correctly or completely. Further,

³ For an explanation of the product offerings in the BMD category, see https://trustthevote.org/wp-content/uploads/2019/02/14Jan_PrinciplesGuidelinesForPVR-v4.5.pdf, page 14.

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realistic and effective procedures to identify and address faulty machines in the polling place are unlikely to be developed.

Even if these severe problems with voter verification and auditing could be overcome, there is no practical way for pollworkers to respond to a voter's report that a machine made an error in recording a vote. For example, a pollworker cannot ask to see the voter's ballot or other evidence of the alleged error, without violating statutory secret ballot protections. Having no means of verifying the error, the pollworker must either ignore the risk of continuing to operate a misprogrammed BMD, or accept the voters' word and remove the machine from service. Even a small number of incorrect (or malicious) error reports could lead to long lines and disenfranchisement of voters.

It is for these reasons that the only expert on the SAFE Commission voted against the SAFE Commission's recommendation to deploy BMDs⁴ and the inventor of risk limiting audits and the nation's foremost expert on post-election auditing, Professor Philip Stark, concludes that audits of BMD-generated results are "meaningless."⁵ Twenty-four leading voting systems experts, cybersecurity experts, and election quality leaders echoed this concern in a letter to the SAFE Commission, noting that a valid BMD audit is "impossible."⁶ Further, the National Academy of Sciences warned: "Unless a voter takes notes while voting, BMDs that print only selections with abbreviated names/descriptions of the contests are virtually unusable for verifying voter intent."⁷ We are unaware of any independent qualified expert who disagrees with the near universal conclusion that current-generation BMDs should not be used as the standard method of voting. We acknowledge BMDs may be the best (although still inadequate) currently available choice for voters with disabilities who need electronic assistance in voting, and the best available accessible units should be installed in each polling place.

⁴ <https://www.linkedin.com/pulse/why-computer-scientists-prefer-paper-ballots-wenke-lee>

⁵ <https://coalitionforgoodgovernance.sharefile.com/d-sd71f31ae0914ac8a>

⁶ <https://coalitionforgoodgovernance.sharefile.com/d-s4fd23d23d9e44c5b>

⁷ Securing the Vote: Protecting American Democracy, at 79,;
https://www.nap.edu/login.php?record_id=25120&page=https%3A%2F%2Fwww.nap.edu%2Fdownload%2F25120

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Because the BMDs do not produce auditable “accountable” election results, their use violates the U.S. Constitution. As Judge Totenberg stated in her September 17, 2018 ruling:

If a new balloting system is to be launched in Georgia in an effective manner, it should address democracy’s critical need for transparent, fair, accurate, and verifiable election processes that guarantee each citizen’s fundamental right to cast an accountable vote.

Curling, 334 F. Supp. 3d at 1328.

B. The Barcode Systems Do Not Even Comply with HB316

It should go without saying that requiring a voter to cast a barcoded vote that they cannot read or know the meaning of is an impermissible burdening of the right to vote. In addition to not meeting U.S. Constitutional requirements, the three systems that use bar codes (ES&S, Dominion and Unisys) do not even comply with a number of the specific provisions of HB316.

1. *Official results not “elector verifiable” or “readable by the elector”*

HB316 provides:

7.1. 'Electronic ballot marker' means an electronic device that does not compute or retain votes; may integrate components such as a ballot scanner, printer, touch screen monitor, audio output, and a navigational keypad; and uses electronic technology to independently and privately mark a paper ballot at the direction of an elector, interpret ballot selections, communicate such interpretation for elector verification, and print an elector verifiable paper ballot.

The barcoded votes on the “paper ballot” are not, of course, “elector verifiable.” Though these three systems also print what the vendors say is a human readable recapitulation of the voter’s selections, that information does not constitute the “ballot” or “vote” that will be counted; it is the barcode that the scanners read as the official vote cast. The voter, however, has no way of knowing what the barcode says. The barcode may be coded incorrectly or coded correctly on the touchscreen and then miscoded at the scanner where the vote is cast.

The use of barcodes further runs afoul of Sections 18 and 19 of HB316 which, together, require the official ballot governing the result to be in a format “readable by the elector.” HB316 Section 18 (lines 378-380) states that the “electronic ballot markers shall produce paper ballots which are marked with the

Mssrs. Russo and Tyson

March 24, 2019

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elector's choices in a format readable by the electors." HB316 Section 19 (lines 558-561) states that such paper ballot "printed by the electronic ballot marker shall constitute the official ballot *and* shall be used for, and govern the result in, any recount conducted pursuant to Section 21-2-495 and any audit conducted pursuant to Section 21-2-498." The fatal problem with the three systems (ES&S, Dominion and Unisyn) which use barcodes is that the portion of the ballot that is "readable by the elector" is *not* the ballot that is tabulated or that governs *any* result at any stage of ballot processing.

2. Official results cannot be "manually inspected"

The use of barcodes also is inconsistent with HB316 Section 42 (lines 1232-1233), which states: "Audits performed under this Code section shall be conducted by *manual inspection* of random samples of paper official ballots." (Emphasis added). But the barcodes on the "paper official ballots" determine the results to be audited, and they cannot be manually inspected.

3. Systems Improperly "retain votes"

Section 7.1 of HB316 bill appropriately prohibits BMDs that "compute or retain votes." The BMDs offered by Dominion and ES&S, however, have the capacity to retain votes and tabulate votes. This "auto-cast" capacity has been dubbed "permission to cheat" by the voting system computer scientists because one operational setting allows the unit to cast votes directly from the touchscreen unit without printing a ballot for verification, much like DREs.⁸ An additional prohibited capability is the setting using the "all-in-one" BMD as a scanner for vote capture, where after the voter reviews his machine-printed paper ballot, the voter casts his ballot into the BMD scanner slot rather than a stand-alone optical scanner.⁹ The all-in-one machine combines the scanner and printer path, permitting additional unauthorized marks to be made by the printer onto the paper ballot, unseen by the voter after he has cast this ballot into the scanner slot. This is the technology and security flaw that is causing the NY Board of Elections to consider decertification of the use of this technology in the Dominion BMD.¹⁰

⁸<https://freedom-to-tinker.com/2018/09/14/serious-design-flaw-in-ess-expressvote-touchscreen-permission-to-cheat/>

⁹ <https://freedom-to-tinker.com/2019/03/08/reexamination-of-an-all-in-one-voting-machine/>

¹⁰The system that is under investigation in New York uses the same technology as ES&S' ExpressVote BMD. <https://s3.amazonaws.com/ftt-uploads/wp-content/uploads/2019/03/07164530/190307-Kellner-memo-Dominion-ICE.pdf>;

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4. *Violation of Secret Ballot Requirement*

The scanners used by ES&S (and probably other vendors) violate Georgia's secret ballot laws and HB316. The Georgia Constitution states: "Elections by the people shall be by secret ballot." (Ga. Const. Art. II, § 1, ¶ I). Section 26 (line 533) of HB316, requires that ballot marking devices "[p]ermit voting in absolute secrecy so that no person can see or know any other elector's votes." *See also* O.C.G.A. § 21-2-365(6) (scanning systems "shall permit voting in absolute secrecy").

ES&S DS200 scanners capture timestamps on each ballot record at the time the voter casts the ballot. The order of voters casting their ballots in the polling place can easily be determined by poll workers, poll watchers, security video surveillance, other voters, the public observing the election, and commercial data collectors. Insiders with access to the internal memory records of the optical scanners can connect a voter with his ballot. That information can be illicitly sold or abused to violate the voters' constitutional right to an absolutely secret ballot. While some vendors claim to "anonymize" reported ballot data by changing the timestamps for external reports when the data is exported to public records, the original electronic records containing the timestamp and chronological order of ballots cast can continue to be accessed by insiders and successful hackers.

Coalition Plaintiff's Third Amended Complaint includes a claim for the violation of voters' right to cast an absolutely secret ballot. The scanners incorporated in some of the BMD voting systems under consideration violate Georgia's requirement of "absolute secrecy" in voting.

In sum, these conflicts between HB316, which clearly contemplates the use of BMDs, and the realities of how these unproven electronic systems operate, underscore how ill-served Georgia citizens will be if these systems are ever purchased, particularly given their outrageous cost and the availability of much more economical and superior alternatives.

C. The "Gold Standard" Alternative: Paper Ballots, Precinct Scanning and Proper Audits

In her September 17, 2018 Order, Judge Totenburg stated: "the Court advises the Defendants that further delay is not tolerable in their confronting and tackling the challenges before the State's election balloting system." *Curling*, 334 F. Supp. at 1303. As we have communicated for almost two years and demanded again in April, 2018, the

<https://www.lohud.com/story/news/local/westchester/2019/03/08/hackers-voting-machines-imagecast-evolution/3078807002/>.

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State has an inexpensive and fully verifiable “gold standard” system immediately available at minimal cost, with no delays: hand marked paper ballots, scanned by the State’s Diebold Accu-vote Optical Scanners, and tabulated by the GEMS servers currently in use.

What the Coalition Plaintiffs demand is *the standard method* of voting in this country. We estimate that across the nation, approximately 112,000 precincts covering 132 million registered voters use hand-marked paper ballots with precinct scanners of the type we recommend be deployed into immediate service in Georgia. The specific optical scan equipment currently owned by Georgia is successfully used in over 11,300 precincts serving 13 million voters across the country. This method uses equipment that Georgia officials already use in every election in every county election office. In addition, there are hundreds of experienced election administrators across the country who can provide assistance if needed in making this transition. We particularly emphasize and recommend precinct scanning of paper ballots as explained on page 4 of the April 16, 2018 letter. It is the most secure and widely accepted method of balloting.

Expanding the inventory of optical scanners sufficient to supply every polling place immediately would likely cost less than \$200,000 and serve the state well for several years to come while the State selects and employs a new auditable balloting system.

Even if the BMDs did not have all the design and security problems described above, a system conversion on this scale with 40,000 pieces of unproven computer equipment and new programs in 159 counties with limited information technology staff during a presidential election year is irresponsible, unrealistic, unworkable, and a recipe for a chaotic 2020 election cycle and system failures. We demand a more secure and responsible transition that is immediately available to Georgia—the interim use of hand-marked paper ballots and the currently owned and operational Diebold Accu-vote optical scan system.

As you know, any voting system computer can be misprogrammed or hacked, and must be auditable to provide credible election results. Post-election audits are the only method of assuring that the results as reported are credible and accurate. In the Third Amended Complaint and in the Motion for Additional Injunctive Relief [Doc. 372, page 2], Coalition Plaintiffs request that the Court require post-election audits of results of paper ballot elections. Such audits should commence immediately with rules to be promulgated by the Election Board.

Further, we renew our demand that the Secretary of State take all measures to audit the voter registration database and electronic pollbooks to reconcile discrepancies and eliminate all errors that created voter disenfranchisement and polling place confusion in November 2018 and have the continuing potential to do so.

Mssrs. Russo and Tyson

March 24, 2019

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Please let me know if you have any questions.

Sincerely,

A handwritten signature in blue ink, appearing to read "Bruce P. Brown".

Bruce P. Brown

cc: Marilyn R. Marks
Robert A. McGuire
Cary Ichter
Kaye Woodard Burwell
Halsey G. Knapp
David D. Cross
Catherine L. Chapple

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Bruce P. Brown

Law

April 16, 2018

By Email

Roy E. Barnes
John F. Salter
Barnes Law Group, LLC
31 Atlanta Street
Marietta, GA 30060

Re: *Curling, et al. v. Kemp, et al.*, No. 17-CV-02989-AT (N.D. Ga.)

Dear Governor Barnes and Mr. Salter:

Together with Robert McGuire, Cary Ichter and William Ney, I represent the Coalition for Good Governance, Laura Digges, William Digges III, Ricardo Davis and Megan Missett (“the Coalition Plaintiffs”) in the above-styled litigation. The purpose of this letter is to make another urgent demand upon your clients Brian P. Kemp, the Secretary of State of Georgia, and Georgia State Election Board Members David J. Worley, Rebecca N. Sullivan, Ralph F. Simpson, and Seth Harp (the “State Election Board”). Specifically, the Coalition Plaintiffs demand that Secretary Kemp and the Election Board exercise their power, authority and responsibilities under Georgia law and the United States Constitution to conduct the upcoming 2018 elections involving federal and state offices, specifically the May 22, 2018 primary election, any resulting July 24, 2018 runoff elections, and the November 6, 2018 elections, and any special elections, using hand-marked paper ballots in lieu of the Direct Recording Electronic (“DRE”) machines.

The unreliability, unverifiability and vulnerability of Georgia’s DRE systems is the subject of daily local and national news reports and continuing warnings from federal agencies, such as the Department of Homeland Security, the Election Assistance Commission, and the Federal Bureau of Investigation. As recently as last month, the U.S. Senate Select Committee on Intelligence renewed its warnings concerning the unacceptable risks of paperless electronic voting systems of the type Georgia uses. We need not repeat here the many warnings from the authorities and private sector experts concerning the urgent need to decommission Georgia’s DRE machines in favor of paper ballots.

As the Coalition Plaintiffs have explained in detail in their Proposed Third Amended Complaint, filed on April 4, 2018, because Georgia’s DRE touchscreen voting machines are insecure, lack a voter verified paper audit capacity, fail to meet minimum statutory requirements, and deprive in-person voters of the ability to cast a secret ballot

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April 16, 2018
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as guaranteed by Ga. Const. Art. II, § 1, ¶ 1, requiring in-person voters to use those machines violates the voters' constitutional rights to have their votes recorded in a fair, precise, verifiable, and anonymous manner, and to have their votes counted and reported in an accurate, auditable, legal, and transparent process.

“The right to vote freely for the candidate of one's choice is of the essence of a democratic society, and any restrictions on that right strike at the heart of representative government.” *Reynolds v. Sims*, 377 U.S. 533, 555 (1964). The secret ballot—“the hard-won right to vote one's conscience without fear of retaliation”—is a cornerstone of this right to freely vote for one's electoral choices. *McIntyre v. Ohio Elections Comm'n*, 514 U.S. 334, 343 (1995).

In their Proposed Third Amended Complaint, the Coalition Plaintiffs have explained in detail the factual and legal basis for their claims for injunctive relief. The Coalition Plaintiffs again urge the Secretary and the State Election Board to take immediate remedial action to protect the 2018 elections by requiring the statewide use of hand-marked paper ballots. As explained below, the Secretary and the State Election Board have the statutory authority to take this remedial action, and have feasible, economic and practical means for replacing DREs machines with paper-ballot voting immediately.

The Coalition and its supporters have made these or similar demands repeatedly over the past eleven months, and they are made again here with renewed urgency.

A. Statutory Authority

The Secretary stated in his Brief Supporting the State's Motion to Dismiss that he has the “discretionary authority to choose voting equipment for counties.” (Doc. 83-1 at 20, 21). Indeed, the Secretary and the State Board have selected, and the State has provided, both DRE voting machines and paper ballot optical scanners for every county in Georgia.

Paper ballots have been an authorized form of voting under Georgia law continuously for over 240 years. (Article IX Georgia Constitution of 1777). Paperless mechanical lever voting machines were first permitted in approximately 1930 and optical scanners were authorized for the counting of paper ballots by 1981. (*See* O.C.G.A. §§ 21-2-280). DRE machines were first permitted in 2002. Ga. L. 2002, p. 598; Ga. L. 2003, p. 517. None of these laws authorizing mechanical or electronic voting systems, however, required their use or supplanted the authority to use hand-counted or electronically counted paper ballots.¹

¹ Indeed, numerous Georgia statutes authorize, require or contemplate the use of paper ballots today. *See, e.g.*, O.C.G.A. § 21-2-280; § 21-2-281; § 21-2-366; and § 21-2-4-483.

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O.C.G.A. § 21-2-379.3 permitted Georgia's first use of DRE voting systems in 2002 and required that the Secretary of State provide DRE equipment to all counties, after funds were appropriated by the General Assembly. The law, however, does not mandate their use. In fact, the State provided both DREs and optical scanning equipment for paper ballots. Further, counties retain the statutory authority to use optical scanning equipment to scan and count paper ballots, and absentee mail-in and provisional ballots.

In addition, under O.C.G.A. § 21-2-379.2, the Secretary has the authority to revoke his approval of a DRE voting system if he re-examines the system and determines that it "can no longer be safely or accurately used by electors at primaries or elections . . . because of any problem concerning its ability to accurately record or tabulate votes." An examination of the evidence and undisputed academic research would require such a finding and a wholesale revocation of Georgia's DREs. However, given the underlying statutory authority to use paper ballots (either hand-counted or counted by optical scan equipment), and the absence of any state law requiring use of DREs, the replacement of the DREs in lieu of paper ballots does not require the Secretary to invoke O.C.G.A. § 21-2-379.2.

It is true that on April 17, 2005, the State Election Board promulgated Rule 183-1-12-.01 which requires the use of DREs for in-person voting for county, state and federal elections. In doing so, the State Election Board clearly exceeded its authority under Georgia law, which does not require DREs to be used and explicitly allows the use of paper ballots. The General Assembly has charged the State Election Board to promulgate rules to ensure the "legality and purity in all primaries and elections." O.C.G.A. § 21-2-31. Given the overwhelming evidence that the DREs are not reliable or secure, and cannot comply with the operational and security requirements of O.C.G.A. § 21-2-379.1 *et seq.*,² the Election Board has the statutory duty to repeal Rule 183-1-12-.01 immediately, and can do so on an emergency basis. In any event, the Board's Rule provides no defense to the mandates of state and federal law.

In sum, the Secretary and the State Election Board have the clear statutory authority and duty to discontinue the DRE voting systems and to order the use of hand-marked paper ballots.

B. Practical and Feasible Means for Using Paper Ballots

² See Second Amended Complaint ¶¶ 110-121 for details.

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There are at least three feasible methods of conducting paper ballot elections in 2018. Each county board of elections should be permitted to choose the paper ballot system that best suits local needs for conducting a secure election in their jurisdiction.

1. Precinct optical scanning of paper ballots

- (i) Method: voters hand-mark paper ballots and insert the ballots into the Accu-Vote OS optical scanners of the type currently in use for paper ballots. Votes are tabulated by the optical scanners at the polling location after polls close, and the tabulated results are posted on the door of the polling place. Then, the tabulated results are securely transported from the polling location to the county election office by hand delivery of the memory cards and results tapes along with all balloting materials. Unofficial results can be immediately emailed from the polling place to the county election office using digital photos of the results tapes, while county officials await the election night hand delivery of the secured original records.
- (ii) Statutory authority: O.C.G.A. §21-2-483(a). This is the best overall solution, and is the method that Georgia used prior to the 2002 implementation of the DREs. Specific procedures are provided in Title 21, Chapter 2, Article 11 Part 5, and security requirements can be updated and strengthened by promulgation of Election Board Rules.

2. Central count optical scanning of paper ballots

- (i) Method: voters hand-mark paper ballots and cast them into traditional secured ballot boxes at the polling locations. After polls close, the locked boxes are securely transported to the county elections office for ballot counting and reporting using the currently-owned and state-approved Accu-Vote OS scanners. Vote totals for each precinct and the county would be consolidated by the county Elections Department and reported to the public and the Secretary of State using the current GEMS election management system. Although “precinct scan” (described in 1 above) is preferable from a security perspective, the central count method may be temporarily attractive to counties that are concerned about training enough precinct workers to use one scanner

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John F. Salter
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in each polling place.

- (ii) Statutory authority: O.C.G.A. § 21-2-483(a). Specific procedures are provided in Title 21, Chapter 2, Article 11 Part 5, and security requirements can be updated and strengthened by promulgation of Election Board Rules

3. Traditional hand-counted paper ballots

- (i) Method: Voters hand-mark paper ballots, casting them in a traditional secured ballot box. The ballots are manually counted by teams of poll workers in the neighborhood precincts, typically within two hours of the closing of the polls. Unofficial results could be immediately transmitted by an emailed digital photo of the precinct tally sheets, to be immediately followed by Election Night hand delivery of the secured original tally sheets, ballots, and election records to the county Election Board. This is an easily implementable alternative, particularly for the May and July primaries in smaller population counties.
- (ii) Statutory authority: O.C.G.A. § 21-2-280. Numerous Georgia municipalities employ hand counted paper ballots routinely for all municipal elections with detailed procedures are provided by Title 21, Chapter 2, Article 11, Part 2.

In addition, in jurisdictions where optical scan equipment is used, and given the well-documented security risks associated with the Accu-Vote OS and GEMS election management system, it is imperative that, prior to programming for the 2018 elections, such components be thoroughly disinfected and determined to be free from any unauthorized software code. Trusted build copies of the approved software must be reinstalled on all machines after the machines have been fully examined or replaced. It is also imperative that robust post-election audits of the unofficial results be completed before the election results are certified.

The State has the equipment, supplies, software licenses and know-how necessary for all of these three alternatives. The paper ballots needed for these methods are already required to be printed for each precinct for use as mail-in ballots and provisional ballots. The counties merely need to increase the number of paper ballots ordered. A larger paper ballot print order will be a minimal cost, particularly when

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compared to the cost of moving, storing, securing and setting up and taking down the DRE equipment.

As for the scanning equipment: the state owns approximately 1,000 Accu-Vote OS optical scanners used for counting mail-in and provisional ballots. The number of additional scanners needed, if any, will depend on which of the three methods various counties select. If additional scanners are required, other states and vendors have hundreds of surplus Accu-Vote OS machines that can be borrowed or rented inexpensively. Georgia already licenses and uses the software necessary for deployment of either of the optical scan methods, and election personnel in the county offices are already trained on the necessary equipment.

C. Sufficient Time Before Elections to Address the Problems

As you know, over the past eleven months, the Coalition Plaintiffs and other Coalition members have initiated numerous requests to Secretary Kemp and State Election Board Members to abandon the non-compliant DRE system and convert to paper ballots to ensure the security of Georgia's elections.³

Though these warnings and requests have not been heeded, there is still enough time to implement reasonable interim remedies. Virginia was faced with a similar election security issue in 2017. On September 8, 2017, Virginia's State Board of Elections decertified all DREs in the state because of concerns about the integrity of DRE voting systems.⁴ Within two months, on November 7, 2017, twenty-two Virginia

³Prior notices and demands include the following: May, 2017 Change.org citizens petition to use paper ballots for the June 20, 2017 6th Congressional District runoff election (see emails directed to T. Fleming in Secretary of State's Office); May 10, 2017 Georgia voters' request that Secretary Kemp re-examine the DRE voting system under the provisions of O.C.G.A. § 21-2-379.2, with technical documentation supporting the necessity of halting the use of the DRE system (see May 10, 2017 email to T. Fleming and W. Harvey of SOS office); May 17, 2017 Georgia voters' follow up request for re-examination of DRE voting system with additional supporting technical documentation of inadequate system security (see May 17, 2017 email to T. Fleming); May 19 and June 2, 2017 Georgia voters' additional follow-up requests for response on DRE system re-examination prior to June 20, 2017 election (see emails to T. Fleming); May 25, 2017 complaint and motion for temporary restraining order to prohibit the use of the DRE voting system and to require use of paper ballots in the June 20, 2017 runoff election (Fulton County Superior Court, Case No. 2017CV290630); July 3, 2017 litigation to challenge the use of DRE voting systems in Georgia (N.D. Ga., Case No. 17-cv-02989).

⁴<https://www.elections.virginia.gov/Files/Media/Agendas/2017/SBEResolutiondecertifyingDREs09-08-17.pdf>

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counties had immediately and successfully converted to hand-marked paper ballots. In the case of Georgia, Coalition's demands alone have been outstanding for eleven months, giving officials more than adequate time to prepare for hand-marked paper ballot elections. Additionally, officials in the Secretary of State's office have acknowledged the compromised nature of the voting system since its reporting of the August 24, 2016 breach at Center for Election Systems, and no material action has been taken to mitigate the impact of the security failures on voting system components.

Though the above methods cure the constitutional and statutory infirmities that plague the current system, and would greatly enhance voter confidence, the State should consider in due course the best long-term hand-marked paper ballot technology. Temporarily using the currently owned Accu-Vote OS paper ballot system, and hand counts for smaller counties, will permit a more deliberate and phased-in adoption and implementation of a new paper ballot voting system, without undue time pressures driven by the urgent need to decommission the DRE units.

D. Audit of Voter Registration Database

It is undisputed that the State's entire voter registration database including Personally Identifiable Information ("PII") for over 6.5 million voters was unprotected and available on the Center for Election System server to anyone with an internet connection from at least August 24, 2016 until at least March 3, 2017. Additionally, on April 15, 2017, equipment and memory cards containing the entire state voter registration database, also including PII, was stolen and not recovered. Such exposure permitted almost unlimited opportunities for malicious actors to alter voters' registrations including eligibility for voting in certain contests. Voters whose data was disclosed have not been notified of this inappropriate disclosure despite the legal requirement to do so under O.C.G.A § 10-1-912. *See* Second Amended Complaint ¶¶ 146-153.

Further, Fulton County officials have acknowledged that there are "glitches" in the voter registration database programs that can cause voters to be disenfranchised, such as Fulton voter Brian Blosser. *See* Proposed Third Amended Complaint ¶ 152.

The November 6, 2018 general election is the first statewide general election scheduled after the data breaches and data theft were reported. The voter registration database should be responsibly and independently audited in advance of the general election to attempt to detect any malicious manipulation of the database that may cause voter disenfranchisement or disruption during the election. Voters should be notified of the known security breaches and asked to verify their voter registration on line well in advance of the election dates.

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John F. Salter
April 16, 2018
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In sum, if the remedial action described above is initiated immediately, the Secretary and the State Election Board have sufficient time and resources to ensure that Georgia citizens have a far more reliable and secure election system in the upcoming primaries and general elections, which will greatly enhance voter confidence. We look forward to your immediate response, and welcome any questions you may have.

Sincerely,



Bruce P. Brown

cc: Cary Ichter
Robert A. McGuire, III
William Brent Ney
Marilyn R. Marks
Laura Digges
William Digges, III
Ricardo Davis
Megan Missett
David D. Cross
Halsey G. Knapp, Jr.

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Bruce P. Brown

Law

February 18, 2019

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Littlefield LLC
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Bryan P. Tyson
Strickland Brockingham Lewis LLC
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Atlanta, Georgia 30309

Re: HB316 and *Curling v. Raffensperger*

Dear Vincent and Bryan:

Initially, Cary, Rob and I look forward to working with you in this litigation. I'm writing with respect to our clients' views on the voting system provisions of the recently introduced HB316. To be clear: the electronic ballot marking devices ("BMDs") authorized by HB316 will not provide secure or auditable elections or resolve the issues raised in the litigation.

I have attached a letter from twenty-four of the nation's leading elections experts urging Georgia in the strongest possible terms not to deploy BMD's because they do not create election results that can be tested or audited. As the letter states: "BMDs share the pervasive security vulnerabilities found in all electronic voting systems, including the insecure, paperless DREs in current use statewide." In addition, "voter verification" of a BMD-market ballot is unreliable and sporadic, rendering elections conducted with BMD's "unauditable."

In her September 17 ruling in this case, Judge Totenberg wrote:

Transparency and accountability are, at the very least, essential to addressing the significant issues that underlie this case.

Curling v. Kemp, 334 F. Supp. 3d 1303, 1307 (N.D. Ga. 2018). HB316 provides neither basic transparency or accountability in a voting system. Her opinion further explained:

Suffice it to say, at this juncture, that national-and state-commissioned research-based studies by cybersecurity computer scientists and elections experts consistently indicate that an independent record of an elector's physical ballot is essential as a reliable audit confirmation tool.

334 F. Supp. 3d at 1309. As Professor Philip Stark, the nation's leading expert in post-election auditing, has warned, the proposed electronic BMDs do not provide an independent record that can serve as a "reliable audit confirmation tool."

Judge Totenberg concluded her decision as follows:

If a new balloting system is to be launched in Georgia in an effective manner, it should address democracy's critical need for transparent, fair, accurate, and verifiable election processes that guarantee each citizen's fundamental right to cast an accountable vote.

334 F. Supp. 3d at 1328. The experts agree that BMDs accomplish none of the essential needs that Judge Totenberg articulates, and that our litigation seeks.

We allege in the Third Amended Complaint that requiring touchscreen DREs "violates the voters' constitutional rights to have their votes recorded in a fair, precise, verifiable, and anonymous manner, and to have their votes counted and reported in an accurate, auditable, legal, and transparent process." The similar electronic touchscreen process of BMD voting has the same problems for the same fundamental reasons.

The electronic BMD provisions of this year's HB316 are almost identical to the electronic BMD provisions of last year's 2018-SB403, which the legislature wisely defeated. We alleged in the Third Amended Complaint that last year's SB403 "failed to address what is required to remedy the problem":

Crucially, though its proponents called the bill a "paper ballot" bill, SB403 did not require hand-marked auditable paper ballots. Instead, SB403 sought to authorize a new type of unverifiable electronic voting system technology that, while favored by Defendant Secretary of State Brian Kemp and the bill's sponsors, was roundly criticized by experts as an insecure, dangerously hackable, high-risk technology.

Vincent Russo and Bryan Tyson

February 18, 2019

Page Three

Third Amended Complaint, ¶ 12. The electronic BMD provisions of 2018-SB403 and 2019-HB316 are almost identical and neither begin to solve the problems identified in our lawsuit.

Additionally, although little has been said to date about our allegations of the violation of secret ballot constitutional guarantees, our clients and their experts are concerned that the systems under current consideration may include the ability to connect the voter to his ballot either at the scanner level cast vote record or at the BMD level printer, depending on which vendors' equipment is selected. We urge the Secretary's office and the State Board of Elections to fully explore the technology used in multiple components of systems under consideration to ensure that the anonymity of the ballot cannot be compromised.

In addition to multiple other allegations and portions of our claims, our plaintiffs sought relief "requiring the conduct in each case of post-election audits of paper ballots to verify the results reported by the tabulation machines." The paper ballots that are produced by the proposed BMD systems cannot be audited to verify the reported results.

We urge you to use your influence to persuade legislators to reject HB316 because it not good for Georgia voters (or taxpayers) and will not cure the constitutional deficiencies identified in the Third Amended Complaint.

Please let me know if you have questions or would like to discuss these issues.

Sincerely,



Bruce P. Brown

cc: Cary Ichter
Robert A. McGuire
David D. Cross
Halsey G. Knapp
Kaye Burwell

January 7, 2019

The Honorable Robyn Crittenden
Secretary of State Elect Brad Raffensperger
Rep. Barry Fleming
Members of the SAFE Commission
214 State Capitol
Atlanta, Georgia 30334 (via e-mail)

Dear Secretary Crittenden, Secretary Elect Raffensperger, and SAFE Commission Members:

We write to urge you to follow the advice of election security experts nationwide, including the National Academies of Sciences, the Verified Voting Foundation, Freedomworks, the National Election Defense Coalition, cyber security expert and Commission member Professor Wenke Lee, and the many states that are abandoning vulnerable touchscreen electronic voting machines in favor of hand-marked paper ballots as the best method for recording votes in public elections.

Our strong recommendation is to reject computerized ballot marking devices (BMDs) as an option for Georgia's voting system, except when needed to accommodate voters with disabilities that prevent them from hand-marking paper ballots. Hand-marked paper ballots, scanned by modern optical scanners and used in conjunction with risk-limiting post-election audits of election results, should be the standard balloting method statewide.

Although they are expensive and complex devices, computerized ballot markers perform a relatively simple function: recording voter intent on a paper ballot. Since there are no objective, quantitative studies of their benefits, acquiring BMDs for widespread use risks burdening Georgia taxpayers with unnecessary costs. Furthermore, BMDs share the pervasive security vulnerabilities found in all electronic voting systems, including the insecure, paperless DREs in current use statewide. These reasons alone should disqualify BMDs from widespread use in Georgia's elections, especially since there is a better alternative.

Hand-marked paper ballots constitute a safer and less expensive method of casting votes. Hand-marked paper ballots offer better voter verification than can be achieved with a computerized interface. A paper ballot that is indelibly marked by hand and physically secured from the moment of casting is the most reliable record of voter intent. A hand-marked paper ballot is the only kind of record not vulnerable to software errors, configuration errors, or hacking.

The SAFE Commission has heard testimony about voter errors in marking paper ballots and the susceptibility of paper ballots to tampering or theft. No method of balloting is perfect, but vulnerabilities in computerized marking devices, if exploited by hackers or unchecked by bad system designs, raise the specter of large-scale, jurisdiction-wide failures that change election outcomes. For example, with hand-marked paper ballots, voters are responsible only for their own mistakes. On the other hand, voters who use BMDs are responsible not only for

their own mistakes but also for catching and correcting errors or alterations made by a BMD which marks ballots for hundreds of voters. For this reason, well-designed hand-marked paper ballots combined with risk-limiting post-election tabulation audits is the gold standard for ensuring that reported election results accurately reflect the will of the people.

Voter verification of a BMD-market ballot is the principle means of guarding against software errors that alter ballot choices. Many BMDs present a ballot summary card to the voter for verification. The 2018 National Academies of Science, Engineering and Medicine Consensus Report *Securing the Votes: Protecting American Democracy*, which represents the nation's best scientific understanding of election security and integrity, states: "Unless a voter takes notes while voting, BMDs that print only selections with abbreviated names/descriptions of the contests are virtually unusable for verifying voter intent." Although advocates of touchscreen ballot marking devices claim that the human readable text ballot summary cards are "voter verifiable," the contrary is true: voter verified summary cards that contain errors (whether induced by hacking or by design flaws) are likely to be mistakenly cast, making a valid audit impossible. A post-election audit requires a valid source document, either marked directly by the voter or voter verified. Since voter verification of printed ballot summary cards (the source document) is sporadic and unreliable, elections conducted with most ballot marking devices are unauditabile.

While you may have been told that touchscreen systems are more "modern" devices, many of your peers and most election security experts have found this appeal to be based on a mistaken view that the voting public will naively accept new technology as a "step forward." We are intimately familiar with the hidden costs, risks, and complexity of these new technologies. We can assure you there is objective scientific and technical evidence supporting the accuracy of traditional, easily implemented scanned and audited hand-marked paper ballot systems. We urge you to recommend such a system as the safest, most cost-effective, and transparent way of conducting future elections.

If we can be of help in providing more information, we hope you will feel free to call upon us.

Sincerely,

Dr. Mustaque Ahamad
Professor of Computer Science,
Georgia Institute of Technology

Dr. Andrew Appel
Eugene Higgins Professor of Computer
Science
Princeton University

Dr. David A. Bader, Professor
Chair, School of Computational Science and
Engineering
College of Computing
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Matthew Bernhard
University of Michigan
Verified Voting

Dr. Matt Blaze
McDevitt Chair in Computer Science and Law
Georgetown University

Dr. Duncan Buell
NCR Professor of Computer Science and
Engineering
Dept. of Computer Science and Engineering
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Dr. Richard DeMillo
Charlotte B. and Roger C. Warren Professor
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Dr. Larry Diamond
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Hoover Institute and Freeman Spogli Institute
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Donald E. Knuth Professor, Emeritus, in the
School of Engineering and Professor of
Computer Science, Stanford University
Founder of VerifiedVoting.org

Dr. Michael Fischer
Professor of Computer Science
Yale University

Adam Ghatti
Founder / CTO
Ionic Security Inc.

Susan Greenhalgh
Policy Director
National Election Defense Coalition

Dr. Candice Hoke
Founding Co-Director, Center for
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Harri Hursti
Security Researcher
Nordic Innovation Labs

Dr. David Jefferson
Lawrence Livermore National Laboratory

Dr. Douglas W. Jones
Department of Computer Science
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Dr. Justin Moore
Software Engineer
Google

Dr. Peter G. Neumann
Chief Scientist
SRI International Computer Science Lab
Moderator of the ACM Risks Forum

Dr. Ronald L. Rivest
Institute Professor
MIT

Dr. Aviel D. Rubin
Professor of Computer Science
Johns Hopkins University

Dr. John E. Savage
An Wang Professor Emeritus of Computer
Science
Brown University

Dr. Barbara Simons
IBM Research (Retired)
Former President, Association for Computing
Machinery

Dr. Eugene H. Spafford
Professor
Purdue university

Dr. Philip Stark
Associate Dean, Division of Mathematics and
Physical Sciences,
University of California, Berkeley

Affiliations are for identification purposes only. They do not imply institutional endorsements.

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Bruce P.
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April 1, 2019

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Atlanta, Georgia 30329

Re: HB316 and *Curling v. Raffensperger*, No. 17-CV-02989-AT (N.D. Ga.)

Dear Vincent and Bryan:

I am following up on Coalition Plaintiff's letter of March 24, 2019 regarding the troubling aspects of HB316's mandate of electronic ballot marking device voting systems ("BMDs").

I want to bring to your attention the attached news release and letter from four U.S. Senators to the three largest voting system suppliers issued March 27, 2019 (Exhibit A). These Senators raise some of the same questions Coalition Plaintiffs and experts have raised in repeated communications concerning the security and verifiability of BMDs. Please note that the Senators also raise the issue of voter privacy and secret ballot protections in their questions, as Coalition has also raised. We forward this to you to ensure that Secretary Raffensperger and the State Election Board have seen it and encourage them to consider the escalating national security concerns about BMDs and to adopt the straightforward solution of hand marked paper ballots laid out in our previous demand letters.

I also enclose a briefing prepared by OSET Institute entitled "Georgia State Election Technology Acquisition: Assessing Recent Legislation in Light of Planned Procurement" ("the OSET Briefing") (Exhibit B). As you may know, OSET is an independent non-profit organization devoted to researching and developing technology to increase verification, accuracy and security in voting systems. The OSET Briefing analyzes the conflicts between HB316, the State's RFP, and the EAC-certified vendors'

Mssrs. Russo and Tyson

April 1, 2019

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BMD products, and concludes that the vast majority of BMDs in the marketplace “do *not* allow voters to verify the same choice data that the voting system in fact uses to tabulate votes.” This appears to leave the smaller vendors as the only minimally qualified bidders, further increasing the high risk of insecure and ineffective implementation. In addition, the OSET Briefing questions that feasibility of implementing a new election system in time for the 2020 elections.

Given the significant questions concerning BMD systems coming from Congress, computer scientists, auditing experts, cybersecurity experts, and Coalition Plaintiffs, and the monumental task of implementation of a new voting system, it is unrealistic to anticipate that the system contemplated by HB316 will be implemented for the 2020 elections. The interim solution we have previously described should be implemented immediately to avoid these serious risks and to ensure election integrity.

Please let me know if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Bruce P. Brown". The signature is fluid and cursive, with the first name "Bruce" and last name "Brown" clearly distinguishable.

Bruce P. Brown

cc: Marilyn R. Marks
Robert A. McGuire
Cary Ichter
Kaye Woodard Burwell
Halsey G. Knapp
David D. Cross
Catherine L. Chapple

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B
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A

Amy Klobuchar

U.S. Senator for Minnesota

Ranking Members Klobuchar, Warner, Reed, and Peters Press Election Equipment Manufacturers on Security

March 27, 2019

Intelligence Agencies have confirmed that our election systems are a target for foreign adversaries, yet election vendors continue to sell equipment with known vulnerabilities

The Ranking Members of the Senate Rules, Intelligence, Armed Services, and Homeland Security Committees are requesting information about the security of voting systems

WASHINGTON – U.S. Senator Amy Klobuchar (D-MN), Ranking Member of the Senate Rules Committee with oversight jurisdiction over federal elections, sent a letter to the country's three largest election system vendors with questions to help inform the best way to move forward to strengthen the security of our voting machines. In the U.S., the three largest election equipment vendors—Election Systems & Software, LLC; Dominion Voting Systems, Inc.; and Hart InterCivic, Inc.—provide the voting machines and software used by ninety-two percent of the eligible voting population. However, voting and cybersecurity experts have begun to call attention to the lack of competition in the election vendor marketplace and the need for scrutiny by regulators as these vendors continue to produce poor technology, like machines that lack paper ballots or auditability.

Klobuchar was joined on the letter by Senator Mark Warner (D-VA), Vice Chairman of the Senate Intelligence Committee, Senator Jack Reed (D-RI), Ranking Member of the Senate Armed Services Committee, and Senator Gary Peters (D-MI), Ranking Member of the Senate

Homeland Security Committee.

“The integrity of our elections remains under serious threat. Our nation’s intelligence agencies continue to raise the alarm that foreign adversaries are actively trying to undermine our system of democracy, and will target the 2020 elections as they did the 2016 and 2018 elections,” the senators wrote. **“The integrity of our elections is directly tied to the machines we vote on – the products that you make. Despite shouldering such a massive responsibility, there has been a lack of meaningful innovation in the election vendor industry and our democracy is paying the price.”**

The full text of the letter is below:

March 26, 2019

Mr. Phillip Braithwaite

President and Chief Executive Officer

Hart InterCivic, Inc.

Mr. Tom Burt

President and Chief Executive Officer

Election Systems & Software, LLC

Mr. John Poulos

President and Chief Executive Officer

Dominion Voting Systems

Dear Mr. Braithwaite, Mr. Burt, and Mr. Poulos:

We write to request information about the security of the voting systems your companies manufacture and service.

The integrity of our elections remains under serious threat. Our nation's intelligence agencies continue to raise the alarm that foreign adversaries are actively trying to undermine our system of democracy, and will target the 2020 elections as they did the 2016 and 2018 elections. Following the attack on our election systems in 2016, the Department of Homeland Security (DHS) designated election infrastructure as critical infrastructure in order to protect our democracy from future attacks and we have taken important steps to prioritize election security. We appreciate the work that your companies have done in helping to set up the Sector Coordinating Council (SCC) for the Election Infrastructure Subsector.

Despite the progress that has been made, election security experts and federal and state government officials continue to warn that more must be done to fortify our election systems. Of particular concern is the fact that many of the machines that Americans use to vote have not been meaningfully updated in nearly two decades. Although each of your companies has a combination of older legacy machines and newer systems, vulnerabilities in each present a problem for the security of our democracy and they must be addressed.

On February 15, the Election Assistance Commission's (EAC) Commissioners unanimously voted to publish the proposed Voluntary Voting System Guidelines 2.0 (VMSG) Principles and Guidelines in the Federal Register for a 90 day public comment period. As you know, this begins the long-awaited process of updating the Principles and Guidelines that inform testing and certification associated with functionality, accessibility, accuracy, auditability, and security. The VMSG have not been comprehensively updated since 2005 – before the

iPhone was invented – and unfortunately, experts predict that updated guidelines will not be completed in time to have an impact on the 2020 elections. While the timeline for completing VVSG 2.0 is frustrating, these guidelines are voluntary and they establish a baseline – not a ceiling – for voting equipment. Furthermore, VVSG 1.1 has been available for testing since 2015.

In other words, the fact that VVSG 2.0 remains a work in progress is not an excuse for the fact that our voting equipment has not kept pace both with technological innovation and mounting cyber threats. There is a consensus among cybersecurity experts regarding the fact that voter-verifiable paper ballots and the ability to conduct a reliable audit are basic necessities for a reliable voting system. Despite this, each of your companies continues to produce some machines without paper ballots. The fact that you continue to manufacture and sell outdated products is a sign that the marketplace for election equipment is broken. These issues combined with the technical vulnerabilities facing our election machines explain why the Department of Defense's Defense Advanced Research Projects Agency (DARPA) is reportedly working to develop an open source voting machine that would be secure and allow people to ensure their votes were tallied correctly.

As the three largest election equipment vendors, your companies provide voting machines and software used by 92 percent of the eligible voting population in the U.S. This market concentration is one factor among many that could be contributing to the lack of innovation in election equipment. The integrity of our elections is directly tied to the machines we vote on – the products that you make. Despite shouldering such a massive responsibility, there has been a lack of meaningful innovation in the election vendor industry and our democracy is paying the price.

In order to help improve our understanding of your businesses and the integrity of our election systems, we respectfully request answers to the following questions by April 9, 2019:

1. What specific steps are you taking to strengthen election security ahead of 2020? How can Congress and the federal government support these actions?

2. What additional information is necessary regarding VWSG 2.0 in order for your companies to begin developing systems that comply with the new guidelines?
3. Do you anticipate producing systems that will be tested for compliance with VWSG 1.1? Why or why not?
4. What steps, if any, are you taking to enhance the security of your oldest legacy systems in the field, many of which have not been meaningfully updated (if at all) in over a decade?
5. How do EAC certification requirements and the certification process affect your ability to create new election systems and to regularly update your election systems?
6. Do you support federal efforts to require the use of hand-marked paper ballots for most voters in federal elections? Why or why not?
7. How are you working to ensure that your voting systems are compatible with the EAC's ballot design guidelines (i.e. "*Effective Designs for the Administration of Federal Elections*")?
8. Experts have raised significant concerns about the risks of ballot marking machines that store voter choice information in non-transparent forms that cannot be reviewed by voters (i.e. such as barcodes or QR codes), noting that errors in the printed vote record could potentially evade detection by voters. Do you currently sell any machines whose paper records do not permit voters to review the same information that the voting system uses for tabulation? If so, do you believe this practice is secure enough to be used in the 2020 election cycle?
9. Do you make voting systems with Cast Vote Records (CVRs) that can be reliably connected to specific unique ballots, while also maintaining voter privacy? If not, why not? Does your company make voting systems that allow for a machine-readable data export of these CVRs in a format that is presentation-agnostic (such as JSON) and can be reliably parsed without substantial technical effort? If not, why not?

10. Would you support federal legislation requiring expanded use of routine post-election audits, such as risk-limiting audits, in federal elections? Why or why not?
11. What portion of your revenue is invested into research and development to produce better and more cost effective voting equipment?
12. Congress is currently working on legislation to establish information sharing procedures for vendors regarding security threats. How does your company currently define a reportable cyber-incident and what protocols are in place to report incidents to government officials?
13. What steps are you taking to improve supply chain security? To the extent your machines operate using custom, non-commodity hardware, what measures are you taking to ensure that the supply chains for your custom hardware components are monitored and secure?
14. Do you employ a full-time cybersecurity expert whose role is fully dedicated to improving the security of your systems? If so, how long have they been on staff, and what title and authority do they have within your company? Do you conduct background checks on potential employees who would be involved in building and servicing election systems?
15. Does your company operate, or plan to operate, a vulnerability disclosure program that authorizes good-faith security research and testing of your systems, and provides a clear reporting mechanism when vulnerabilities are discovered? If not, what makes it difficult for your company to do so, and how can Congress and the federal government help make it less difficult?
16. How will DARPA's work impact how your company develops and manufactures voting machines?

We look forward to your answers to these questions, and thank you for your efforts to work with us and with state election officials around the country to improve the security of our nation's elections.

Sincerely,

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Georgia State Election Technology Acquisition Assessing Recent Legislation in Light of Planned Procurement

Prepared By:

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Version 8 Final | March 2019

Executive Summary

Following the recent production of a Briefing on cost realities for the system of apparent choice in Georgia, the Institute took note of the apparent concerns over whether and to what extent recent state legislation (HB.316) ready for the Governor's signature would overly control the procurement options for Georgia's new voting system. This Briefing examines the legislation and parses language to clarify meaning in light of our particular domain expertise in election technology and technology public policy, and reviews the RFP to ascertain whether and to what extent its interplay with the legislation would unduly constrain procurement.

Importantly, our Briefing necessarily restricts our examination of HB.316 to the extent of its application to the acquisition of voting systems technology and does not address any other aspect of the legislation.

Findings

1. **HB.316 Protects Voters' Right to a Verifiable Ballot.** HB.316 is well drafted to protect a voter's right to ensure their ballot is counted as cast. In fact, it clearly constrains what kind of voting system technology can be acquired in order to ensure that Georgia voters can verify their ballot to be cast as accurately reflecting their intended choices.
2. **There is a Conflict Between HB.316 and the RFP as Drafted.** Accordingly, there is a constraint on the RFP as released by the requirements of HB.316 for "voter verifiable" ballots because the vast majority of Ballot Marking Devices (BMDs) in the marketplace do *not* allow voters to verify the same choice data that the voting system in fact uses to tabulate votes.

3. **There is a Fundamental Definitional Problem.** HB.316 does not define either “ballot” or “verifiable,” therefore, it is unresolved whether the legislation adopts a formal or substantive definition of a ballot.
4. **Strictly Construed, the RFP and HB.316 in Combination Greatly Constrains Technology Solution Options.** Excepting two commercial solutions, a voter cannot verify the choices that are used for counting with today’s BMDs, therefore, there is no way for the voter to verify what choices are actually being counted, and hence for the majority of solutions, the ballot cannot be said to be “verifiable” by the voter.
5. **Strictly Construed ES&S ExpressVote, Dominion ImageCast X and Unisyn FreedomVote Product Cannot Qualify for Selection Under HB.316.** As drafted, the RFP and HB.316 prohibit the selection of these three products, and in fact, the RFP, in order to adhere to the letter of the new law of HB.316, would restrict the choice to a hybrid product offered by Hart InterCivic, or a traditional format ballot product from Clear Ballot.

Context

At the outset, it is important to contextualize the work in preparing this Briefing by the lead analyst [Edward Perez](#), given his highly relevant credentials. Mr. Perez, a former Director of Product Management and also Manager of Professional Services for one of the three major commercial vendors, has for years provided analysis and responses to Request For Proposal (RFP) responses for major procurements of election technology, which required a strong understanding of solution architecture, contractual terms and requirements, and industry-standard terminology and practices. Moreover, Mr. Perez has and continues to perform competitive intelligence research, which has enabled him to become very familiar with product features, pricing, and service practices associated with all of the major vendors. In sum, he is uniquely qualified to provide a pragmatic, and intellectually honest analysis of the relevant RFP and HB.316 legislation.

Similarly, [Gregory Miller](#), a co-founder of the Institute who is a veteran computer and software engineer and IP lawyer, and [Joy London](#), an associate general counsel and public policy expert with the Institute, both bring over a decade of experience in the analysis of election administration related legislation and review of requests for information, proposals, and quotes for the acquisition of election administration technology. In particular, Ms. London’s work focuses on critical democracy infrastructure, election security, election law, public policy and international government relations, and she leads the Institutes on-going legislation monitoring and analysis services. She offers a particular view through the lens of cybersecurity, having earned a Masters in Cyber Policy & Risk Analysis from Utica College, and published the Capstone research paper: “*The Threat of Nation-State Hacking of State Voter Registration Databases in U.S. Presidential Elections.*”

It is equally important to note the non-profit nonpartisan Institute has no stake in the outcomes in Georgia, other than exercising its mission to help ensure the public interest in this decision that will materially affect the integrity of Georgia elections, and therefore inevitably affect national election results.

Legislation Analysis

Question Presented

Does the statutory language of HB.316 restrict the choices of U.S. EAC-certified voting systems currently manufactured and sold by (1) ES&S ExpressVote, (2) Dominion's ImageCast X, (3) Unisyn FreedomVote, (4) Hart Verity Duo, and (5) Clear Ballot's Clear Access?

Discussion

Three of the five EAC-certified systems ((1) ES&S ExpressVote, (2) Dominion ImageCast X, and (3) Unisyn FreedomVote) under consideration by Georgia use Ballot Marking Devices (BMDs) to convert the voter's selections (of candidates and referenda options) viewed on the machines' screens to a barcode on a printed vote record, which is then fed into a scanner by the voter.

Although the printed vote record includes human-readable information that is supposed to show the votes cast by the voter, it is the barcode (*not readable by the voter*) that is digitally interpreted and counted by the scanner and is the basis for the ultimate tabulation of votes.

In contrast to the voting systems from ES&S, Dominion and Unisyn, the Hart Verity system tabulates voter choices based upon *optical character recognition of printed choice text (not barcodes)*, and the Clear Ballot system tabulates machine-marked traditional format ballots based on marked ovals (*not barcodes*).

The question presented turns on whether any of the voting systems manufactured and sold by these vendors are, in fact, "voter-verifiable."

HB.316, Page 2, Section 1. §7.1 defines "electronic ballot marker" (lines 43-48 with a focus on lines 45-48) as a device that:

“. . . uses electronic technology to independently and privately mark a paper ballot at the direction of an elector, interpret ballot selection, communicate such interpretation for the elector verification, and print an elector verifiable paper ballot.”

The language in §7.1 – “elector verification” and “print an elector verifiable paper ballot” does *not* define the means of “verification” or the process by which the elector’s vote is “verifiable.” Therefore, other statutory language within HB.316 must be examined to determine the lawmakers’ statutory intent of the words “elector verification” and “elector verifiable.”

HB.316 contains four (4) other relevant sections that can be used to determine the Georgia lawmakers’ intent of the meaning of “elector verification” and “elector verifiable.” All four sections use either the word “reading” or “readable” by electors.

HB.316, Page 11, §16 (3) – lines 344-345 of HB.316, reads, in pertinent part:

“Ballots printed by an electronic ballot marker shall be designed as prescribed by the Secretary of State to ensure the ease of reading by electors”

HB.316, Page 12, §18 (2) – lines 378-380, reads, in pertinent part:

“. . . provided, however, that such electronic ballot markers shall produce paper ballots which are marked with the elector’s choices in a format readable by the elector.”

HB.316, Page 13, §21 (a) – lines 424-428, reads, in pertinent part:

“The ballots shall be printed . . . as will suit the construction of the ballot scanner, and in plain, clear type so as to be **easily readable by persons with normal vision** . . .”

HB.316, Page 16, §26 (6) – lines 535-536, reads, in pertinent part:

“Produce a paper ballot which is marked with the elector’s choices in a format **readable by the elector**.”

Analysis and the Issue

Because HB.316 does not define either “ballot” or “verifiable,” it is not immediately apparent whether the legislation adopts a **formal** or **substantive** definition of a ballot. In other words, a formal description of a ballot would simply specify (as does *Georgia Code § 21-2-280*) that a ballot may be electronic or printed on paper, without further specifying any requirements for how voter choices are to be counted or made available for verification by the voter.

On the other hand, a substantive definition of a ballot would go farther, and would conform with the common sense, plain-language understanding that the purpose of a ballot in the democratic voting process is to mark voter choices, which in turn serve as the basis for counting votes (*i.e.* “*tabulating*”).

Furthermore, a substantive definition of a “*voter-verifiable*” ballot would require that the ballot support a voter’s ability to verify *the choices that will be counted*, prior to casting the ballot.

Mindful of the distinction between a formal definition of a ballot, which focuses on the presentation of information (*e.g., a ballot marks voter choices electronically or on paper*), versus a substantive definition (*e.g., a ballot is a medium for marking voter choices that are to be counted, and those choices may or may not be transparent*), HB.316 is *unfortunately silent* on which definition of “ballot” is intended, or what “verifiable” means.

This gap is the crux of the issue, as some voting systems produce “ballots” that meet the formal definition, but not the substantive one, while other voting systems produce ballots that allow voters to review the choices that will, *strictly speaking*, serve as the basis for counting votes.

This distinction is all-important, because if the voter cannot verify the choices that are used *for counting*, then there is no way for the voter to know *what choices are being counted*.

Accordingly, such a “ballot” could not be said to be “voter-verifiable.”

Details

Class 1: Electronic Marking Devices

ES&S ExpressVote, Dominion ImageCast X, Unisyn FreedomVote

Each of the electronic marking devices above produces a paper record that meets a formal definition of a “ballot” insofar as the paper record lists voter choices in a manner that is human-readable. And voters do have the opportunity to verify the choices printed on the paper. However, it is critical to note that the text that the voter can read is *not* used for purposes of counting the votes; instead, the ES&S, Dominion, and Unisyn voting systems count the “ballots” based on information that the voter cannot review, namely, choice information that is embedded in non-transparent barcodes. Accordingly, the human-readable text is a visual presentation

only, and does not rise to the functional level of providing information about voter marks and choices to the counting system. Stated another way, with these systems, it is as if the electronic marking device simultaneously generates *two* parallel “ballots,” with greatly different functional “weight:”

1. One that is interpreted by the voting system, and which is *not* verifiable by the voter, and
2. Another that bears a *cosmetic resemblance* to a ballot, but because its voter choice data is meaningless to the voting system, and is not used for counting, it is unclear whether it constitutes a ballot at all, or whether it is merely a human-readable facsimile of the non-transparent, non-verifiable “ballot” that gets counted.

As a result, with these non-transparent marking devices, it can be said that only the small fraction of voters whose ballots might be reviewed by human eyes in the exceptional case of a manual audit were able to “verify” their choices on the printed record in a manner that was meaningful, and this was only due to the post-election review process. Outside of that small set of ballots, for all other voters, the information that they “verified” on the printed page was not used by the voting system at all; it was inert text on a printed page.

Class 2: Electronic Marking Devices

Hart Verity Duo, Clear Ballot Clear Access

Each of the electronic marking devices above produces a paper record that meets a substantive definition of a “ballot” that could also be said to be “voter-verifiable.” This stems from the fact that their paper records list voter choices in a manner that is human-readable (either marked ovals, with Clear Ballot, or plaintext counted by OCR, with Hart), and *the choices that the voter has the opportunity to verify are the same choices that the voting system uses to count votes*. In this way, the voter has direct access to information about what choices are being counted, and whether they conform to the voter’s intent.

Conclusion to the Question Presented

Does the statutory language of HB.316 restrict the choices of US EAC-certified voting systems currently manufactured and sold by (1) ES&S ExpressVote, (2) Dominion ImageCast X, (3) Unisyn FreedomVote, (4) Hart Verity Duo, and (5) Clear Ballot Clear Access?

It is not clear whether the statutory language of HB.316 restricts Georgia’s ability to select certain EAC-certified voting systems for purposes of a statewide voting system procurement.

Whether a formal presentation of marked voter choices is adequate to meet the standard of “voter-verifiability,” even if voting system does not count those choices, or whether “verifiability” requires that voters have the substantive opportunity to verify the same choice information that the voting system uses to count votes is a legal question that has not been answered. Answering that question touches upon a variety of other issues that must be tested, including:

1. What is the definition of a “ballot”?
2. Given HB.316’s definition (line 31) of “Ballot marking device” as “a pen, pencil, or similar writing tool, or an electronic device designed for use in marking paper ballots *in a manner that is detected as a vote so cast* [emphasis added] and then counted by ballot

scanners,” what does “detected” mean? For purposes of counting, is it acceptable for the voting system to “detect” only information that was not, strictly speaking, marked by the voter? Why or why not?

3. Given HB.316’s definition (Line 53) of “Optical scanning voting system” as “a system employing paper ballots on which electors cast votes with a ballot marking device or electronic ballot marker after which *votes are counted* [emphasis added] by ballot scanners,” what constitutes a “vote” that must be counted? Is it only the information that the voter can verify, or something else? Why?
4. What constitutes a voter’s “verification” of his or her “choices” or “vote”?
5. What is the legal status of encoded voter choice information that an automated voting system processes to produce results, when it is accompanied by additional text? If a voter cannot review and identify errors in the encoded information before casting the ballot, what are the implications under 52 U.S.C. 21081, Sec. (1)(A)(i) and (1)(A)(ii)?²

The questions must be addressed in a legal context. Then and only then can the courts determine whether a voting system that uses a BMD (*with or without a barcode*) meets the statutory intent in HB.316.

In a recent paper,³ “*Election Security & the Right to Vote: Rights and Remedies Implicated by Election Hacking*” it is argued that a court’s decision as to whether a BMD ballot would meet a statutory definition should be based on constitutional law—both federal and state.

To date, the Institute knows of no litigation or case law that can resolve the questions likely to be presented by the combination of HB.316, the GA RFP for new systems acquisition, and the decisions that will be made as a result. However, considering this one publication, we can offer their following observations:

- “The Due Process Clause of the Fourteenth Amendment . . . protects against voting restrictions that render a voting system “fundamentally unfair.”
- While “garden variety election irregularities” do not rise to that level, state election procedures and standards run afoul of due process if they “result in significant disenfranchisement and vote dilution.”

² 52 U.S.C. 21081, Sec. (1)(A)(i) and (1)(A)(ii) provides in relevant part:

(a) Requirements. Each voting system used in an election for Federal office shall meet the following requirements:

(1) In general

(A) Except as provided in subparagraph (B), the voting system (including any lever voting system, optical scanning voting system, or direct recording electronic system) shall—

(i) permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted;

(ii) provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error);

³ Protect Democracy (November 2018). *Election Security & the Right to Vote: Rights and Remedies Implicated by Election Hacking*. Prepared by Altshuler Berzon, LLP. Last accessed on March 25, 2019 <https://protectdemocracy.org/update/white-paper-rights-and-remedies-implicated-by-election-hacking/>

- Courts have consistently held that once state actors have induced a voter’s reliance on a particular manner of voting, invalidation of that voter’s ballot is “fundamentally unfair.”
- Courts thus attempt to police the line between “sporadic” or “episodic” errors in a voting system (held to be “garden variety” and therefore not a violation), and pervasive problems that permeate a voting system (or result in a substantial rate of error or risk of error) that rise to the level of a federal constitutional problem.
- Courts have also examined whether state procedures provide for adequate corrective measures to address the problem.
- Some federal courts have expressed a desire to avoid micromanaging election recounts that are also being managed by state courts, even where errors may be outcome determinative.
- As with many federal constitutional questions in the realm of voting, there is no bright-line rule.
- A hack targeting insufficiently secure voting machines, voter rolls, or tabulation devices might cause an election to be conducted in a fundamentally unfair manner if it:
 - (a) Led to excessive lines at polling places, requiring voters to wait for hours to cast a ballot;⁴
 - (b) Caused the loss of a significant percentage of ballots cast or appeared to “flip” a significant number of votes;⁵
 - (c) Prevented the counting of significant numbers of ballots cast by qualified voters;⁶
or
 - (d) Prevented voters from casting a ballot due to malfunctioning or non-functioning machinery.⁷
- “The facts—in particular the scope of the problem created by hacking and the actions of the public officials in charge of the election before and after the hack—will make a great deal of difference.”

⁴ See: *Ury v. Santee*, 303 F. Supp. 119, 124, 126 (N.D. Ill. 1969)

⁵ See: *League of Women Voters*, 548 F.3d at 478 (stating that possibility that selections “jumped” from chosen candidate to another candidate on DRE implicated substantive due process if it occurred on significant scale).

⁶ See: *NEOCH v. Husted*, 696 F.3d 580, 586 (6th Cir. 2012) (finding that although the number and frequency of voter disqualifications resulting from poll worker error varied from “county to county, the problem as a whole is systemic and statewide”)

⁷ See: *League of Women Voters of Ohio v. Brunner*, 548 F.3d 463, at 478 (6th Cir. 2008) (stating that possibility that selections “jumped” from chosen candidate to another candidate on DRE implicated substantive due process if it occurred on significant scale).

RFP Analysis

All documents associated with the State of Georgia’s RFP for a Statewide Voting System (SVS) – including the RFP itself, all attachments, and technical requirements, have been carefully reviewed by the Institute resulting in the following overall findings:

1. The Georgia RFP uses industry-standard requirements, written in a non-exclusionary manner.
2. In general, the RFP is fair, straightforward, and generally unremarkable and what the Institute would expect for a statewide voting system.
3. Rather than being written in a manner that steers toward a favored outcome, it provides the candidate vendor wide latitude to present product offerings, with almost no restrictive or prescriptive requirements, aside from uniform Ballot Marking Devices (BMDs) for all voters plus digital scanning equipment.
4. The one potential conflict of the RFP in the context of HB.316 is the requirement for “voter verifiable” ballots, whereas the majority of BMDs in the marketplace do not allow voters to verify the choice data that the scanner utilizes to tabulate votes.

In general, it is the Institute’s position that it is a problematic burden on the right to vote, as the analysis of HB.316 earlier implies, to require a voter to cast a ballot that they cannot visually verify because the ballot choices that are to be counted are actually encoded in a barcode. The barcode cannot be deciphered by human visual inspection. Accordingly, the voter—assuming they actually inspect the ballot—is left to assume the data encoded in the barcode identically matches the printed choices appearing in human readable text adjacent to the barcode. This approach appears to violate U.S. constitutional principles (*see footnote 4, supra*).

This issue arises in [Attachment D](#), Mandatory Questions, *Voter-Handled Paper Ballot Verification* as follows:

The proposed SVS solution must provide a voter verifiable paper ballot for every vote cast. The proposed SVS must produce a physical, voter-handled ballot containing the voter’s selections from the input made by the voter. It must also facilitate navigating, marking, and reviewing the displayed ballot on the Ballot Marking Device (BMD) that can be printed, scanned, imaged, and tabulated by the Polling Place Scanner (PPS) and Central Scanning Device (CSD).

The relevant language in HB.316 includes:

- Page 2, line 48: “and print an elector verifiable paper ballot”
- Page 11, line 344: “(3) Ballots printed by an electronic ballot marker shall be designed as prescribed by the Secretary of State to ensure ease of reading by electors.”
- Page 12, line 379: “provided, however, that such electronic ballot markers shall produce paper ballots which are marked with the elector’s choices in a format readable by the elector.”
- Page 13, line 425: “in plain, clear type so as to be easily readable by persons with normal vision; provided, however, that red material shall not be used except that all

ovals appearing on the ballot to indicate where a voter should mark to cast a vote may be printed in red ink."

- Page 16, line 535: *"Produce a paper ballot which is marked with the elector's choices in a format readable by the elector;"*

On a process note, the Institute also observes there is a moderate risk associated with the State attempting to complete the majority of its Phase 2 "Phased Rollout" in Q-1 of next year (2020). As the Institute reads the RFP, aside from the ten (10) pilot counties that will implement in November 2019, the State will roll out a new system to 149 of the 159 counties in a federal Presidential Primary. That is unusual, because States and counties typically avoid the introduction of new technology or procedures in high-profile federal elections.

Observations on Technical Requirements

The Institute offers additional notes below regarding technical requirements.

Attachment E – Mandatory Scored Response Worksheet

While not a significant factor, the requirement of 2.4 is atypical in elections: *"Define how the proposed EMS can be virtualized to run on GASOS and county virtual operating system (OS) environments."* The Institute has not seen an RFP express a preference for virtualizing EMS applications; such is novel and unusual—not that we disagree with the notion, rather that this is a new concept and there is no evidence in the RFP of expressed security, reliability, or other operational service level requirements for such a preference.

Attachment I – Election Management System

These are industry-standard, non-exclusionary requirements. Not all EMS systems have integrated text-to-speech capabilities (Page 2). However, a desire for "text-to-speech" capabilities in the election definition process is common.

Attachment J – Polling Place Scanner

These are industry-standard, non-exclusionary requirements.

Attachment K – Central Scanning Device

These are industry-standard, non-exclusionary requirements.

Attachment L – Ballot Marking Device

These are industry-standard, non-exclusionary requirements. However, it is noteworthy that even in the important BMD Section, the requirements leave the field open for a variety of implementations, including ES&S ExpressVote, Dominion ImageCast X, Unisyn FreedomVote, and Hart Verity Duo.

The Institute also notes that the RFP clearly indicates that the State wants BMDs and *separate* scanners. Thus, the often heard concerns regarding all-in-one BMDs with scanners inside (a.k.a. the "*permission to cheat*"), which several good government organizations have brought to the attention of the Institute, while meritorious, are not applicable in this situation because those integrated devices have never been considered for Georgia and the RFP does not provide for them. In the professional opinion of the Institute, for the purposes

of addressing Georgia's HB.316 legislation and planned acquisition pursuant to the RFP analyzed, the all-in-one device option is a distraction.

Attachment M – EPoll Data Management System

These are industry-standard, non-exclusionary requirements, except for another atypical instance of a desire for virtualization: Page 3: “*Be virtualized to run on GASOS and county virtual operating system (OS) environments.*”

Attachment N – Electronic Poll Book

These are industry-standard, non-exclusionary requirements.

References

1. Georgia Secretary of State, *Current and Past Election Results*, http://sos.ga.gov/index.php/Elections/current_and_past_elections_results
2. Harvey, Chris (Georgia Director of Elections), Memorandum to Brad Raffensperger, (Georgia Secretary of State), *Statewide Voting System Pre-Printed Hand-Marked Ballot Solution*, February 25, 2019
3. Georgia Legislature (2019-2020 Session). *House Bill 316 (As passed by House and Senate)*; By: Representatives Fleming of the 121st, Jones of the 47th, Burns of the 159th, Rynders of the 152nd, Watson of the 172nd, and others. <http://www.legis.ga.gov/Legislation/en-US/display/20192020/HB/316>
4. State of Georgia (March 15, 2019). *Electronic Request for Proposal*, Event ID 47800-SOS0000037, *Statewide Voting System*. <https://www.gpbnews.org/post/heres-request-proposals-replace-georgias-voting-machines> including the following specific elements:
 - a. Appendix A – Line Specifications
 - b. Appendix B – Terms & Conditions
 - c. eRFP
 - i. Introduction
 - ii. Instructions to Suppliers
 - iii. General Business Requirements
 - iv. eRFP Proposal (Bid) Factors
 - v. Cost Proposal
 - vi. Proposal Evaluation, Negotiations, and Award
 - vii. Contract Terms and Conditions
 - viii. Attachment B – Definitions
 - ix. Attachment C – Background and Scope of Work
 - x. Attachment D – Mandatory Response Worksheet
 - xi. Attachment E – Mandatory Scored Response Worksheet
 - xii. Attachment F – Cost Worksheet
 - xiii. Attachment G – Litigation and Default
 - xiv. Attachment H – References
 - xv. Attachment I – Election Management System
 - xvi. Attachment J – Polling Place Scanner

- xvii. Attachment K – Central Scanning Device
 - xviii. Attachment L – Ballot Marking Device
 - xix. Attachment M – EPoll Data Management System
 - xx. Attachment N – Electronic Poll Book
 - xxi. Attachment O – Potential Equipment Distribution
 - xxii. Attachment R – Certificate of Non-Collusion
 - xxiii. Attachment T – Systems and Jurisdictions Implemented
5. Election Systems & Software, *Response to State of Georgia Electronic Request for Information, New Voting System*, Event Number 47800-SOS0000035, August 24, 2018.
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 15. State of Georgia (March 15, 2019). *Electronic Request for Proposal*, Event ID 47800-SOS0000037, *Statewide Voting System.* <https://www.gpbnews.org/post/heres-request-proposals-replace-georgias-voting-machines>

About the Authors

Edward Perez is formerly director of product development for a major commercial voting system vendor. After retiring from the commercial sector, he joined the nonpartisan nonprofit OSET Institute as Global Director of Technology Development. He holds degrees in Government and Political Science from Georgetown University and the University of California at Berkeley and has over 16 years direct experience in the design, development, delivery, deployment and servicing of commercial voting systems.

Joy London is the Associate General Counsel and Director of International Development at the OSET Institute, where her work focuses on critical democracy infrastructure, election security, election law, public policy and international government relations. Ms. London earned her JD from Temple University School of Law and is licensed to practice law in the State of New York. Ms. London has held several positions at international law firms and at one of the Big-4 management consulting firms. She earned a Master of Professional Studies in Cyber Policy & Risk Analysis from Utica College, and published a Capstone research paper: *The Threat of Nation-State Hacking of State Voter Registration Databases in U.S. Presidential Elections*.

Gregory Miller is a co-founder and Chief Operating Officer of the U.S. based 501.c.3 nonprofit non-partisan OSET Institute. He is a trained computer scientist, with graduate business education, and a law degree focused on intellectual property, technology law, and public policy. Greg's technical background includes user interface design, object-oriented software development, TCP/IP networking, and distributed systems. Mr. Miller has been immersed in the administration and technology of elections for over 12 years, including poll work volunteer, polling place monitor, election observer, and assessing Requests For Proposal regarding election administration systems. Gregory is an election technology security advisor to organizations of the national security community and the United States Congress. Mr. Miller served on the San Francisco Voting Systems Task Force from 2010-2012.

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Early Voting: October 15 - November 2, 2018

ROCKDALE COUNTY BOARD OF ELECTIONS

November 6, 2018

Election Day: November 6, 2018

VOTING EQUIPMENT ISSUES

General Election

	PRECINCT	DATE	UNIT #	ISSUE REPORTED	SOLUTION
EARLY VOTING (ABSENTEE)	IN-PERSON	10/22/2018	1	At opening, unit powered down on its own.	Unit was not plugged properly. Plugged unit and Voting Resumed.
		10/23/2019	4	Voter complained that the ballot was cast before pressing "Cast Ballot" while reviewing vote at the summary page.	Elections Director tested Voter Access Card in front of voter to show ballot had been cast. Voter was satisfied.
		10/24/2019	6	Voter stated that the candidate selected wasn't who she selected. Voter had not pressed Cast Ballot.	Voter was shown how to unmark an unintended selection and make the intended selection.
		10/24/2018	9	Voter complained that the ballot was cast before pressing "Cast Ballot" while reviewing vote at the summary page.	Precinct Manager cancelled ballot the ballot and moved the voter to another unit without further delay. Unit 9 was re-calibrated and re-tested before being allowed to use again.
		10/24/2018	6	Voter complained that that unit changed vote on unit. Voter did had pressed "Cast Ballot."	Voting unit was calibrated and tested.
		10/26/2018	11	Voter complained that the ballot was cast before pressing "Cast Ballot" while reviewing vote at the summary page.	Elections Director tested Voter Access Card in front of voter to show ballot had been cast. Voter was satisfied.
		10/27/2018	3	Unit froze while a voter was voting.	Powered unit off and on and Voter Access Card was ejected. Moved voter to another voting unit. Unit 3 was tested before allowing voting to resume on it.
		10/27/2018	18	Unit froze while a voter was voting.	A new Voter Access Card was created for the voter. Powered unit off and on and Voter Access Card was ejected and canceled. Unit 18 was tested before allowing voting to resume on it.
		10/28/2018	3	Voter complained that the ballot was cast before pressing "Cast Ballot" while reviewing vote at the summary page.	Elections Director tested Voter Access Card in front of voter to show ballot had been cast.
		10/30/2018	1	Unit froze while a voter was voting.	Powered unit off and on and Voter Access Card was ejected. Moved voter to another voting unit and she voted with further delay. Unit 1 was tested before allowing voting to resume on it.
ELECTION DAY	Lorraine	11/6/2018	1 & 2	Battery was not charging on Units 1 and 2.	Checked the battery connections. Placed units on a new power strip & they began charging. Voting resumed on the units.
	St. Pius	11/6/2018	4	Outlet section of the unit was smashed and damaged upon delivery to the precinct.	Replaced the unit.
	Stanton	11/6/2018	8	Unit frozen with voter card still in it, while voter was voting.	Moved voter to another unit. Unit was shut down the rest of the day, since it was after 5pm.

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Georgia officials set presidential primary date for March 24

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Georgia election officials set next year’s presidential primary for March 24, shortly after county officials said the uncertainty of the timing could scramble their preparations to hold the vote.

Secretary of State Brad Raffensperger announced the date on Wednesday, reversing a position he staked earlier this week to hold off on deciding the timing of the 2020 primary until the government completes its purchase of new voting equipment.

Georgia was among the last states without a spot on the primary calendar and The Atlanta Journal-Constitution reported earlier this week that the delay was making it difficult for county elections officials to nail down polling places.



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By Northside Hospital

It’s not immediately clear why the timeline changed, and Raffensperger’s office did not comment on the shift. County elections officials were notified Wednesday by a bulletin that also said early voting for the contest would start March 2.

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relevance in deciding each party's candidate.

But leading Democrats welcomed the new date, anticipating that Georgia could play a more prominent role in the primary if it's separated from the group of large states holding their primary vote on Super Tuesday.

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State Sen. Nikema Williams, chair of the Democratic Party of Georgia, said she's pleased Raffensperger "finally did his job" and selected a date, ending months of uneasy limbo that unnerved local elections supervisors.

"This timing uniquely places Georgia as the decision maker for the Democratic presidential primary," she said, "and we expect to continue seeing candidates engage Georgia Democrats."

>> Related: [Battle over Georgia voting rights escalates in federal court](#)

Related: [Abrams to testify on Supreme Court's voting rights ruling](#)

Political Insider: [Why Georgia Democrats might be eager to duck 'Super Tuesday' in 2020](#)

The election will also mark an important test for the new \$150 million system of touchscreen-and-printer voting technology that Georgia is set to purchase to replace the state's 17-year-old electronic voting system.

the state's elections process could also delay or complicate the roll-out.

'Maximize visibility'

The March date comes as a relief to politicians who were worried the vote could be pushed back as far as May, when the Democratic race for president could be all but decided.

Still, even the late March timing is a departure from recent policy.

The Georgia primary was held on Super Tuesday — the first Tuesday in March — in each of the past two presidential election years. Then-Secretary of State Brian Kemp orchestrated an "SEC primary" on that date with other Southern states in 2016.

On Super Tuesday in 2020, California and Texas have planned their presidential primaries on the same March 3 day as many states in the South, sapping the region's importance as a one-day voting bloc.

By going it alone, Georgia's move may pay off.

It's the only state that has so far scheduled a primary on that date, said Allan Keiter, who runs the [270twin.com](#) election-tracking website. And the trove of Georgia delegates awarded in the vote could be pivotal if the race is still competitive.

"The state will have the date to itself and it will maximize visibility in the media and among the candidates still in the race," said Keiter. "There could be lots of visits that week, and voter turnout would also be higher."

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Photo: The Atlanta Journal-Constitution

No more limbo

What's unknown is why state elections officials abruptly reversed their position.

A Raffensperger deputy, Jordan Fuchs, told the AJC in a story published Monday that the office would not set a date until a vendor for new voting machines was chosen and “a specific implementation plan” is in place.

Pressed for comment Wednesday on why the Republican seemingly changed his mind, Raffensperger's office only acknowledged receiving the question.

Antsy elections officials were happy to have a date.

Nancy Boren, the chief elections official in Muscogee County, said she was already expecting a primary sometime in the first quarter of next year but said she needed an exact date to finish her planning.

“Having the date is great – we can start setting the dates for early voting and absentee ballot mailings,” said Boren. “We can now complete all those things we normally do in preparation for an election.”

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already caused complications with scheduling poll workers, printing schedules to mail to voters and booking facilities for the primary.

Kidd said Wednesday that the timing means the end of the uneasy limbo for him and the county’s 300 poll workers, who can now start preparing for the March 24 date.

“It needed to be set,” he said. “I have to be able to actually plan an election for the citizens of Douglas County. We can’t have that uncertainty.”

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About the Author



Greg Bluestein

Greg Bluestein is a political reporter who covers the governor's office and state politics for The Atlanta Journal-Constitution.



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**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION**

**DONNA CURLING, ET AL.,
Plaintiffs**

v.

**RAFFENSPERGER, ET AL.,
Defendants.**

Civil Action No. 1:17-CV-2989-AT

DECLARATION OF MARILYN MARKS

MARILYN MARKS hereby declares as follows:

1. I am Executive Director of Coalition for Good Government, a Plaintiff in this action.
2. Attached as Exhibit 1 is a true and correct copy of an October 25, 2004 article published by the *Atlanta Journal Constitution*.
3. Attached as Exhibit 2 is a true and correct copy of an Open Records Act request that I made on May 28, 2019 to the Georgia Secretary of State, and the response from the Secretary of State's Open Records Officer dated May 31, 2019.
4. Attached as Exhibit 3 is a true and correct copy of an Open Records Act request (No. ORR #336-19) that I made on May 28, 2019 to the Georgia

Secretary of State, and the response from the Secretary of State's Open Records Officer dated May 31, 2019.

5. Attached as Exhibit 4 is a true and correct copy of an "Official Election Bulletin" from Chris Harvey, State Elections Director.

6. I calculated the percentages for voter participation dropoff in DRE voting and mail ballot voting for Fulton County's AME Temple 03A precinct and Lowndes' County's Mildred precinct, and for the two counties, as well as the African American precinct registration, using results data and turnout data provided on the Secretary of State's website for the November 6, 2018 election at:

[https://results.enr.clarityelections.com/GA/Fulton/91700/Web02.221448/#/;](https://results.enr.clarityelections.com/GA/Fulton/91700/Web02.221448/#/)
<https://results.enr.clarityelections.com/GA/Lowndes/91732/Web02.220748/#/>
https://sos.ga.gov/index.php/elections/general_election_november_6_2018

7. Attached hereto as Exhibit 5 is a true and correct copy of the "Agenda" for a Special Meeting, April 22, 2017, of the Fulton County Board of Registration and Elections.

In accordance with 28 U.S.C. § 1746, I pledge under penalty of perjury that the foregoing is true and correct.

Executed on this date, June 21, 2019.


Marilyn Marks

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Officials urged to follow rules to prevent any double voting

By **CARLOS CAMPOS**
ccampos@ajc.com

When an Atlanta man voted twice in the July party primaries, he exposed a potential flaw in Georgia's early-voting program.

Election officials say that the case of double voting was an aberration that shows what can happen when critical Election Day procedures are not followed. As a precaution, Secretary of State Cathy Cox recently warned the state's local election officials to follow protocol to ensure such an abuse does not happen again.

Craig Kidd cast a ballot ahead of the July 20 Republican primary during the five-day period for advance voting. A designated Republican poll watcher and campaign worker for a GOP state Senate candidate, Kidd showed up at his Buckhead polling place on Election Day to make sure his advance vote had been recorded. Kidd says that a poll worker told him there was no record of his vote and advised him to vote again to be sure his vote would be tallied.

Later in the day, Kidd contacted The Atlanta Journal-Constitution to tell a reporter he was alarmed that he was allowed to cast two ballots. Kidd said he was concerned that the ballots of some early voters would not be counted or that some people could vote twice.

Cox referred Kidd's case to Fulton County District Attorney Paul Howard in September, recommending that Kidd

be investigated for voting twice — a felony in Georgia.

Fulton election officials have acknowledged that a breakdown in procedures allowed Kidd to vote twice. When a voter casts an early ballot, a notation of that vote should be made on a master voter registration list that is later sent to precincts prior to Election Day. Poll workers then will cross the advance voters off the list of people eligible to vote at their polling place.

But Fulton County was late sending its master list out, getting it to some precincts after the polls had opened. So some people — including Kidd — who had voted early were not shown as having done so. Fulton officials later disqualified Kidd's early vote, which has a unique identifying number allowing election officials to know who cast it.

John Sullivan, chief of voter registration for Fulton County, said his office has shored up its procedures to make sure each precinct knows prior to Election Day who voted early.

"Our only standard in elections is perfection. Ninety-nine percent in schools is an A. But in elections, that's a failure," Sullivan said.

In mid-September, Cox's office sent a memo to the state's local elections officials reminding them of the importance of making sure those lists are accurately maintained and sent to poll workers before the precincts open on Election Day.

"Advance voting has increased the number of those who vote absentee, and it is critical that these (and all) absentee votes are recorded properly so that poll workers can easily ascertain if someone is attempting to cast a second ballot at the polls on Election Day," the memo reads.

Cox said in a recent interview that the new early-voting program is not uniquely susceptible to fraud. The same procedures to prevent double voting have been used for decades in Georgia for people who cast absentee ballots ahead of Election Day, she said.

"This is not a new process at all," Cox said. "Forever, when you absentee-voted, the counties were required to mark on the voter list that you had already cast an absentee ballot."

Regardless, Gwinnett County's election supervisor, Lynn Ledford, said she used the Kidd situation to remind her poll workers of the potential for double voting.

Sharon Wingfield, Cobb County's election supervisor, is confident that advance voting is not susceptible to fraud. The names of Cobb voters are marked with an "A" on master lists that show whether they have already voted. Those lists are distributed to poll workers well before the precincts open, she said.

"We looked at our procedures again and felt like we had enough safeguards in there to keep that from happening," she said.



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Subject: ORR #335-19 - Marilyn Marks
Date: Friday, May 31, 2019 at 3:31:58 PM Eastern Daylight Time
From: Open Records
To: Marilyn Marks
Attachments: image002.jpg

Good Afternoon,

For this open records request, our office does not have responsive records. This will serve as the final response to this request and your request is now closed.

Sincerely,

Open Records Officer
Georgia Secretary of State



From: Marilyn Marks [<mailto:marilyn@aspenoffice.com>]
Sent: Tuesday, May 28, 2019 1:51 PM
To: Open Records <openrecords@sos.ga.gov>
Cc: btyson@taylorenghish.com; Vincent Russo <vrusso@robbinsfirm.com>; cheryl.ringer@fultoncountyga.gov
Subject: Public records request--AG's opinion re: exempZon of ballot images from public records disclosure

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Secretary of State Open Records Department:

Under the Georgia Open Records Act § 50.18.70 et seq., CoalizOn for Good Governance and I as an individual are requesZng the a copy of the A`orney General's opinion concerning the non-disclosure of ballot images (cast vote records) referenced in the a`ached ElecZon BulleZn. Please supply the AG's memo via email to Marilyn@USCGG.org.

Counties are using this bulletin to deny public records requests for cast vote records, without required reference to the legal authority and citation on which the denial is based. Please provide the legal basis on which you rely to deny ballot images as public records. Presumably that is included in the advice of the AG's office received by you and requested by this public records request.

If there are any fees for searching or copying these records, please inform me if the cost will exceed \$10. However, Coalition for Good Governance, a non-partisan 501(c) (3) organization, with members who are residents of Georgia, requests a waiver of all fees because the disclosure of the requested information is in the public interest and will contribute significantly to the public's understanding of the operations of electronic voting equipment and reporting of results. This information is not being sought for commercial purposes.

The Georgia Open Records Act requires a response time to produce those records within three business days. If production of the records I am requesting will take longer than three days, please contact me with information about when I might expect copies or the ability to inspect the requested records.

If you deny any or all of this request, please cite each specific exemption on which you base your denial of the election information and notify me of the appeal procedures available to me under the law.

Thank you for your consideration. Please contact me at the email or phone number below with any questions.

Sincerely,

Marilyn Marks
Coalition for Good Governance

[REDACTED]

<OEB - 01-30-19 Open Record Requests Ballot images.pdf>

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Subject: ORR #336-19 - Marilyn Marks - Ben Hill County
Date: Friday, May 31, 2019 at 3:38:40 PM Eastern Daylight Time
From: Open Records
To: Marilyn Marks
Attachments: image002.jpg

Good Afternoon,

For this open records request, responsive records are not subject to public disclosure pursuant to Art. II, Sec. 1, Para. I of the Georgia Constitution and OCGA §21-2-500. This will serve as the final response to this request and your request is now closed.

Sincerely,

Open Records Officer
Georgia Secretary of State



From: Marilyn Marks [<mailto:marilyn@aspenoffice.com>]
Sent: Tuesday, May 28, 2019 2:11 PM
To: Open Records <openrecords@sos.ga.gov>
Cc: btyson@taylorenghish.com; Vincent Russo <vrusso@robbinsfirm.com>; cheryl.ringer@fultoncountyga.gov
Subject: Public records request--Ben Hill County ballot image reports

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Dear Secretary of State Open Records Department:

Under the Georgia Open Records Act § 50.18.70 et seq., Coalition for Good Governance and I as an individual are requesting the an electronic copy of the ballot image reports (also called cast vote records) produced by the Ben Hill County voting machines which

representatives of the Secretary's office examined after the November 6, 2018 election.

If there are any fees for searching or copying these records, please inform me if the cost will exceed \$10. However, Coalition for Good Governance, a non-partisan 501(c) (3) organization, with members who are residents of Georgia, requests a waiver of all fees because the disclosure of the requested information is in the public interest and will contribute significantly to the public's understanding of the operations of electronic voting equipment and reporting of results. This information is not being sought for commercial purposes.

The Georgia Open Records Act requires a response time to produce those records within three business days.

If you deny any or all of this request, please cite each specific exemption including citation to code, statute or case law on which you base your denial of the election information, and notify me of the appeal procedures available to me under the law.

Thank you for your consideration. Please contact me at the email or phone number below with any questions.

Sincerely,

Marilyn Marks
Coalition for Good Governance
[REDACTED]

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OFFICIAL ELECTION BULLETIN

April 1, 2019

TO: County Election Officials and County Registrars
FROM: Chris Harvey, State Elections Director
RE: Open Record Requests for GEMS DATABASE

Copies of your GEMS Database are NOT subject to Open Record Requests.

The Georgia Court of Appeals ruled that copies of GEMS are exempt from Open Records Act disclosure requirements because disclosure could compromise election security. Smith v. DeKalb Cty., 288 Ga. App. 574, 654 S.E.2d 469 (2007). A copy of that decision is attached.

I encourage you to share this information with your staff and your county attorney.

Smith v. DeKalb County

Court of Appeals of Georgia

November 27, 2007, Decided

A07A1490.

Reporter

288 Ga. App. 574 *; 654 S.E.2d 469 **; 2007 Ga. App. LEXIS 1254 ***; 2007 Fulton County D. Rep. 3715

SMITH v. DEKALB COUNTY et al.

Subsequent History:

Cert. applied for.
Writ of certiorari denied *Smith v. DeKalb Cty.*, 2008 Ga. LEXIS 291 (Ga., Mar. 10, 2008)

Prior History: Open Records Act. DeKalb Superior Court. Before Judge McMurray, Senior Judge.

Disposition: [***1] Judgment affirmed.

Core Terms

election, records, ballot, permanent injunction, superior court, trial court, inspection, software, seal, exempted, designated, encryption, returns, voting, codes

Case Summary

Procedural Posture

After a requestor sought election documents under the Georgia Open Records Act, O.C.G.A. § 50-18-70 et seq., the Georgia Secretary of State sought a permanent injunction preventing a county from releasing a certain computer disk - read only memory (CD-ROM). The DeKalb County Superior Court (Georgia) enjoined the county from releasing the CD-ROM. The requestor appealed.

Overview

The court first stated that the trial court properly held that the Secretary had standing to object to the request. Under O.C.G.A. §§ 21-2-30, 21-2-31, 21-2-32, 21-2-50 et seq., and 45-13-20 et seq., the Secretary was charged with the supervision of all elections in Georgia. Next, under O.C.G.A. § 21-2-500(a), the custodian of a CD-ROM created by an election superintendent had to maintain it under seal following the election for at least 24 months, unless otherwise directed by a superior

court. A superior court had not ordered that the seal be lifted. Thus, the CD-ROM was by law prohibited or specifically exempted from being open to inspection by the general public under O.C.G.A. § 50-18-70(b). Furthermore, the trial court had found that release of the CD-ROM, which contained passwords, encryption codes, and other security information, would compromise election security and thus was exempt from disclosure under O.C.G.A. § 50-18-72(a)(15)(A)(iv). Although the requestor argued that the State could copy the CD-ROM without including such information, O.C.G.A. § 50-18-70(d) provided that an agency was not required to create records that were not in existence at the time of the request.

Outcome

The court affirmed the judgment.

Counsel: *J. M. Raffauf*, for appellant.

Thurbert E. Baker, Attorney General, *Stefan E. Ritter*, *Calandra A. Almond*, Assistant Attorneys General, *William J. Linkous III*, for appellees.

Judges: ELLINGTON, Judge. Andrews, P. J., and Adams, J., concur.

Opinion by: ELLINGTON

Opinion

[*574] [**469] ELLINGTON, Judge.

Philip Smith appeals from an order of the DeKalb County Superior Court granting a permanent injunction to Cathy Cox, in her [**470] official capacity as Georgia's Secretary of State.¹ Smith contends that the

¹Cox's term as Georgia's Secretary of State has since

court erred in finding that the Secretary of State had standing to pursue the injunction, in granting the Secretary of State's request for temporary restraining orders and the permanent injunction, and in denying his motion to recuse. For the following reasons, we affirm.

The record shows the following facts. On October 23, 2006, Smith's attorney, Mike Raffauf, submitted a written request, pursuant to the Georgia Open Records Act, OCGA § 50-18-70 et seq., to Linda Latimore, the DeKalb County Director of Voter Registration and Elections, for disclosure of certain information concerning the 4th Congressional District 2006 primary and runoff elections. Raffauf requested that Latimore make available for copying and inspection the following materials:

A copy of the GEMS CD-ROM(S), [***2]² generated pursuant to OCGA § 21-2-500 (a)³ and [Rule of the State Election Board] [*575] 183-1-12-.02 (6) (a),⁴ which contains a copy of the

information on each memory card (PCMCIA Card) which shall include all ballot images and ballot styles as well as vote totals and a copy of the consolidated returns from the election management system.

According to Raffauf's request, "[a] review of the entire GEMS backup CD-ROM(S) for both elections is the only way ... to undertake a complete audit."

In response to the request, DeKalb County advised Raffauf by letter that it would produce the requested CD-ROM on November 9, 2006. The county also noted, however, that it was going to utilize the letter to "notify the Secretary of State [and] the Attorney General ... of [its] impending release of the requested CD-ROM in the event they choose to take action." Further, the county refused to produce "documents or records that are not subject to production under the [Open Records] Act" and expressly reserved "any and all statutory exemptions from disclosure provided by OCGA § 50-18-72, and any and all other exemptions or protections provided by law, including [***5] but not limited to privileged and confidential documents."

expired. Karen Handel became Secretary of State on January 8, 2007.

² "GEMS" is an acronym for a software program known as the "Global Election Management System," which is produced by Diebold Election Systems. "CD-ROM" is an acronym for "computer disk – read only memory."

³ OCGA § 21-2-500 (a) states as follows:

Immediately upon completing the returns required by this article, in the case of elections other than municipal elections, the superintendent shall deliver in sealed containers to the clerk of the superior court or, if designated by the clerk of the superior court, to the county records manager or other office or officer under the jurisdiction of a county governing authority which maintains or is responsible for records, as provided in Code Section 50-18-99, the [***3] used and void ballots and the stubs of all ballots used; one copy of the oaths of poll officers; and one copy of each numbered list of voters, tally paper, voting machine paper proof sheet, and

return sheet involved in the primary or election. In addition, the superintendent shall deliver copies of the voting machine ballot labels, computer chips containing ballot tabulation programs, copies of computer records of ballot design, and similar items or an electronic record of the program by which votes are to be recorded or tabulated, which is captured prior to the election, and which is stored on some alternative medium such as a CD-ROM or floppy disk simultaneously with the programming of the PROM or other memory storage device. The clerk, county records manager, or the office or officer designated by the clerk shall hold such ballots and other documents under seal, unless otherwise directed by the superior court, for at least 24 months, after which time they shall be presented to the grand jury for inspection at its next meeting. Such ballots and other documents shall be preserved in the office of the clerk, county records manager, or officer designated by the clerk until the adjournment [***4] of such grand jury, and then they may be destroyed, unless otherwise provided by order of the superior court.

⁴ Ga. Comp. R. & Regs. r. 183-1-12-.02 (6) states, in pertinent part, as follows:

Storage of Returns. (a) After tabulating and consolidating the results, the election superintendent shall prepare a CD-ROM which shall contain a copy of the information contained on each memory card (PCMCIA card) which shall include all ballot images as well as vote totals and a copy of the consolidated returns from the election

On November 9, 2006, the Secretary of State objected to the open records request **[**471]** and filed a petition for a temporary restraining order (“TRO”) and a verified complaint for a permanent injunction prohibiting DeKalb County from releasing the CD-ROM. After the trial court granted two TROs,⁵ Smith intervened. The court conducted a hearing on the petition for a permanent injunction, and the Secretary of State and Smith presented evidence and argument. The court **[*576]** permanently restrained and enjoined DeKalb County and Latimore from “releasing, disclosing, or providing to any person not authorized by law to obtain them copies of the pre-election and post-election CD-ROMs.” Smith appeals from this order.

1. Smith claims that the trial court erred in finding that the Secretary of State had standing to object to his Open Records Act request. As the court found, however, the Secretary of State “is statutorily charged with the supervision of all elections in **[***6]** this State, and as such has a complete right to seek the Court’s intervention in this matter.” See OCGA §§ 21-2-30 (creating the State Election Board and naming the Secretary of State as the board chair); 21-2-31 (duties of the State Election Board); 21-2-32 (authorizing the State Election Board to institute or intervene in court actions involving elections); 21-2-50 et seq. (powers and duties of the Secretary of State regarding elections); 45-13-20 et seq. (general duties of the Secretary of State); see also *Ga. Dept. of Natural Resources v. Theragenics Corp.*, 273 Ga. 724, 725 (545 SE2d 904) (2001) (a corporation had the right to enjoin a state agency from allowing a third-party competitor to review the agency’s file on the corporation, which included some of the corporation’s trade secrets, after the third party filed a request with the agency under the Open Records Act).

2. Smith contends that the court erred in granting the permanent injunction. Smith claims that he is entitled to inspect the CD-ROM by running a copy on an independent computer which would enable him to examine the CD-ROM’s computer codes to determine when various voting records were created and by whom, “to verify **[***7]** file formats, software versions, [and] file sizes” on the CD-ROM, and to look for evidence of irregularities resulting from election fraud and malfunctions of the electronic voting equipment and

management system.

⁵The record shows that the court initially granted a TRO restraining DeKalb County from releasing the CD-ROM on November 9, 2006. The court granted a second TRO on December 11, 2006.

election software.⁶

In determining whether the trial court’s grant of a permanent injunction was proper, the standard of review on appeal is whether or not the trial court manifestly abused its discretion. A trial judge manifestly abuses his discretion when he grants an injunction adverse to a party without any evidence to support such judgment and contrary to the law and equity. Entry of a permanent injunction is appropriate in clear and urgent cases where there is a vital necessity to prevent a party from being damaged and left without an adequate remedy at law.

[*577] (Citations and punctuation omitted.) *City of Atlanta v. Southern States Police Benevolent Assn. &c.*, 276 Ga. App. 446, 458 (4) (623 SE2d 557) (2005). (1) We conclude that the court’s ruling that Smith is not entitled to a copy of the CD-ROM under the Open Records Act is proper for several reasons.

Under Georgia’s Open Records Act,

[a]ll public records of an agency as defined in subsection (a) of this Code section, except those which by order of a court of this state or by law are prohibited or specifically exempted from being open to inspection by the general public, shall be open for a personal inspection by any citizen of this state at a reasonable time and place; and those in charge of such records shall not refuse this privilege to any citizen.

OCGA § 50-18-70 (b). As the trial court found, the Georgia Code provides that the designated custodian of a CD-ROM created by the county or municipal superintendent of an election must maintain it *under seal* following the election for at least 24 months, unless otherwise directed by the superior **[**472]** court. OCGA § 21-2-500 (a);⁷ see Ga. Comp. R. & Regs. r. 183-1-12-.02 (6) (storage of returns). The superior court in this case has not ordered that the seal be lifted as to the CD-ROM Smith seeks. Thus, because the CD-ROM is

⁶Although Smith does not have the GEMS software necessary to access the encrypted information on the CD-ROM, his witness claimed he could break **[***8]** the encryption codes with software from other sources.

⁷After a minimum of 24 months after an election, the custodian shall present the sealed voting records to the grand jury for inspection at its next meeting. OCGA § 21-2-500 (a). After the grand jury adjourns, the custodian may retain the records under seal or destroy them, “unless otherwise provided by order of the superior court.” *Id.*

statutorily designated to be kept under seal, it is by law prohibited or specifically exempted from being open to inspection by the general public and, therefore, [***9] is not an open record subject to disclosure. OCGA § 50-18-70 (b). As a result, the trial court did not abuse its discretion in granting the Secretary of State's petition for a permanent injunction prohibiting the custodian from opening the record in response to Smith's Open Records Act request.

In addition, the trial court found, based on evidence tendered by the Secretary of State, that release of the CD-ROM, which contains passwords, encryption codes, and other security information, would compromise election security. As a result, the trial court ruled that the CD-ROM was exempted from the Open Records Act on the alternative basis of the exemption for "material which if made public could compromise security against sabotage, criminal, or terroristic acts." OCGA § 50-18-72 (a) (15) (A) (iv). See footnote 6, *supra* (regarding Smith's witness' claim that [***10] he could break the encryption codes with software from other sources). Although Smith argues that the [*578] State could copy the CD-ROM without including the passwords, encryption codes, and other security information, the Open Records Act specifically provides that the government agency is not required to create reports, summaries, or compilations that were not in existence at the time of the request. OCGA § 50-18-70 (d).⁸ Accordingly, the trial court did not abuse its discretion in granting the Secretary of State's petition for an injunction on this alternative basis.

In sum, the record supports the court's finding that Smith is not entitled to a copy of the CD-ROM under the Open Records Act.

3. Smith argues that the court improperly granted the TROs and that a prior judge to whom the case had been assigned improperly denied his motion to recuse. The record shows, however, that Smith [***11] was not a party to this action when the court granted the TROs or when it denied the motion to recuse. Further, the judge who denied his motion to recuse was no longer assigned to the case at the time of the hearing on the request for a permanent injunction or the court's ruling

thereon. Thus, these allegations of error lack merit.

Judgment affirmed. Andrews, P. J., and Adams, J., concur.

End of Document

⁸Notably, the evidence showed that DeKalb County has provided the voting records from the 2006 4th Congressional District primary to Smith, allowing his attorney to use a county computer that runs the necessary software so that he could review the records and providing him with print-outs of the information.

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AGENDA

BOARD OF REGISTRATION AND ELECTIONS SPECIAL MEETING – APRIL 22, 2017 @ 10:00 AM

**Fulton County Government Center
130 Peachtree Street, SW, Second Floor
Conference Room 128**

Call to Order - Presiding: Ms. Mary Carole Cooney, Chairperson

RULES:

Cell Phones are to be turned off prior to the meeting.

Citizens are allowed to voice requests, concerns, opinions, etc. during the Communication and Public Response portion of the meeting of the Board of Registration and Elections. Before speaking, each participant must obtain a speaker's card from Mrs. Felisa Cordy, fill out the card and return it to Mrs. Cordy prior to the beginning of this meeting. **Speakers will be granted up to TWO MINUTES each.** During this portion of the meeting, questions addressed to members of the Board and not to the staff.

- 1. Approval of Agenda**
- 2. Communications and Public Response**

NEW BUSINESS

- 3. Review of the April 18, 2017 Elections**
- 4. Certification of Results for the 6th Congressional/32 Senate, City of Johns Creek, City of Roswell Runoff, and City of South Fulton Runoff held on April 18, 2017**
- 5. Discussion for Special Election to be held to fill unexpired term for Fulton County Board of Commissioner District 4**

EXECUTIVE SESSION

Discussion of Personnel and/or Legal Matters

ADJOURN



UNAPPROVED MINUTES

BOARD OF REGISTRATION AND ELECTIONS SPECIAL MEETING –APRIL 22, 2017

The Fulton County Board of Registration and Elections met in Special Session on Saturday, April 22, 2017, at 10:00 a.m., in Conference Room 128, 130 Peachtree Street, Atlanta, GA 30303

Presiding: Ms. Mary Carole Cooney, Chairperson

Other Board Members Present: Ms. Vernetta Nuriddin, Vice Chair
Mr. Stan Matarazzo
Mr. Aaron Johnson

Board Member Absent: Mr. David Burge

Staff Attending: Mr. Richard Barron, Director; Mr. Ralph Jones, Registration Chief; Mrs. Pamela Coman, Registration Manager; Mr. Dwight Brower, Elections Chief; Mrs. Sharon Benjamin, Deputy Elections Chief; Ms. Brenda McCloud, Administrative Coordinator II; and Ms. April Majors, Senior Public Affairs Officer.

Guests Attending: (City of South Fulton Candidate, City Council District 1)

#1 – APPROVAL OF AGENDA

Mr. Johnson moved to approve the agenda as presented. Seconded by Mr. Mararazzo and carried by a unanimous vote of 4-0.

#2 – COMMUNICATIONS AND PUBLIC RESPONSE

None.

NEW BUSINESS

#3 – REVIEW OF THE APRIL 18, 2017 ELECTIONS

Mr. Barron spoke about the article written in Atlanta Journal Constitution. Mr. Barron recapped the statement he made at the Fulton County Board of Commissioners meeting on April 19, 2017. He also spoke about the apathy from the poll workers in Johns Creek and Roswell locations. There was also a discussion regarding an error in the precinct details tab in the Express Poll.

#4 – CERTIFICATION OF RESULTS FOR THE 6TH CONGRESSIONAL/ 32 SENATE, CITY OF JOHNS CREEK, CITY OF ROSWELL RUNOFF, AND CITY OF SOUTH FULTON RUNOFF SPECIAL ELECTIONS HELD ON APRIL 18, 2017.

Chairperson Cooney asked **Mr. Barron** was it his certification and testimony that the election results presented were an accurate count of all the votes cast in the 6th Congressional Special Election held on April 18, 2017

Mr. Barron answered yes.

Chairperson Cooney entertained a motion to certify and make official the election results in the 6th Congressional Special Election held on Tuesday, April 18th, 2017. The motion was made by Mr. Matarazzo, seconded by Ms. Nuriddin and carried by a unanimous vote of 4-0.

Chairperson Cooney asked **Mr. Barron** was it his certification and testimony that the election results presented were an accurate count of all the votes cast in the 32nd Senate Special Election held on April 18, 2017

Mr. Barron answered yes

Chairperson Cooney entertained a motion to certify and make official the election results in the 32nd Senate Special Election held on Tuesday, April 18, 2017. The motion was made by Mr. Matarazzo, seconded by Mr. Johnson and carried by a unanimous vote of 4-0.

Chairperson Cooney asked **Mr. Barron** was it his certification and testimony that the election results presented were an accurate count of all the votes cast in the City of South Fulton Runoff Special Election held on April 18, 2017

Mr. Barron answered yes

Chairperson Cooney entertained a motion to certify and make official the election results in the City of South Fulton Runoff Special Election held on Tuesday, April 18, 2017. The motion made by Mr. Johnson, seconded by Ms. Nuriddin and carried by a unanimous vote of 4-0.

Chairperson Cooney asked **Mr. Barron** was it his certification and testimony that the election results presented were an accurate count of all the votes cast in the City of Johns Creek Special Election held on April 18, 2017

Mr. Barron answered yes

Chairperson Cooney entertained a motion to certify and make official the election results in the City of Johns Creek Special Election held on Tuesday, April 18, 2017. The motion was made by Mr. Matarazzo, seconded by Mr. Johnson and carried by a unanimous vote of 4-0.

Chairperson Cooney asked **Mr. Barron** was it his certification and testimony that the election results presented were an accurate count of all the votes cast in the City of Roswell Runoff Special Election held on April 18, 2017.

Mr. Barron answered yes

Chairperson Cooney entertained a motion to certify and make official the election results in the City of Roswell Runoff Special Election held on Tuesday, April 18, 2017. The motion was made by Mr. Matarazzo, seconded by Ms. Nuriddin and carried by a unanimous vote of 4-0.

#5 – Discussions for Special Election to be held to fill unexpired term for Fulton County Board of Commissioner District 4

Chairperson Cooney entertained a motion to call the election of Fulton County Board Commissioner District 4 to fill the unexpired term of December 31, 2020. The motion made by Mr. Johnson, seconded by Ms. Nuriddin and carried by a unanimous vote of 4-0.

Chairperson Cooney opened the floor for discussion

Mr. Barron stated he was in a budget meeting with the finance department and the County Manager and County Attorneys regarding funds for the remainder of the election in 2017. The discussion came up regarding the date to hold the Board of Commissioner District 4 election. June 20, 2017, is not feasible because there is not enough time to prepare also it will put us in a multiple database situation similar to April 18, 2017, elections. Conducting the election on September 14, 2017, election would be a stand-alone election and cost the county \$1.8 million, and then the runoff will be held in October. If the election takes place in November, it would cost the county approximately \$20,000 because it would be a shared cost with municipalities hosted an election on the same day. There was a concern regarding leaving the seat vacant that long. In the statutes, it states the term has to be six months or less for the Governor to appoint an interim Board Commissioner.

Mr. Johnson is concern about there being a quorum and the policy regarding retaining the staff until a replacement is made. Did the Board Commissioners discuss keeping the staff until a replacement is in place?

Mr. Barron stated no.

Mr. Johnson wants the Board of Commissioners to know that the board wants to make sure that District 4 constituents and District 4 staff will be taken care of in the interim.

Chairperson Cooney entertained a motion to amend agenda item 5 to include a date. The motion was made by Mr. Matarazzo to amend the motion to include November 7, 2017, as the election date and seconded by Ms. Nuriddin and carried by a unanimous vote of 4-0.

Mr. Johnson made a motion that a letter is drafted from the Board of Registration and Elections to the Board of Commissioners to make provisions to District 4 staff and seconded by Ms. Nuriddin and carried by a unanimous vote of 4-0.

EXECUTIVE SESSION

Chairperson Cooney opened the floor for a motion to convene into executive session.

Mr. Matarazzo made the motion to convene into executive session to discuss personnel and legal issues and seconded by Ms. Nuriddin motion carried. (11:17 am).

Vote for the Board:

Mr. Johnson, Mr. Matarazzo, Ms. Nuriddin and Chairperson Cooney Yea and zero nays,

Mr. Matarazzo made a motion to reconvene into special session. Motion seconded by Mr. Johnson and passed by a unanimous vote of 4-0 (11:29 am)

The Board member voted on approving a ten percent salary increase for the Director of Registrations and Elections. Mr. Matarazzo made the motion and seconded by Mr. Johnson and passed by a unanimous vote of 4-0.

ADJOURNMENT

With no other items requiring the Board's action, **Chairperson Cooney** entertained a motion to adjourn.

Mr. Matarazzo moved to adjourn the meeting. Mr. Johnson seconded the motion and carried by a unanimous vote of 4-0. The meeting adjourned at 11:31 AM.

Prepared by,

Felisa Cordy
Secretary to the Board



TO: Fulton County Board of Registration and Elections

FROM: Richard Barron, Director
Dwight Brower, Elections Chief
Ralph Jones, Registration Chief
Brenda McCloud, Administrative Coordinator II

RE: **Monthly Operations Report – APRIL 2017**

DATE: May 9, 2017

ELECTIONS DIVISION

This operations report provides information concerning the major activities and tasks performed during the month of April 2017 by the Elections Division of Fulton County Department of Voter Registration and Elections. The central focus of the Elections Division efforts for this reporting period were the activities involved in the preparation for and conduct of the April 18, 2017 special and runoff elections and the planning and anticipation of the May 16, 2017 and June 20, 2017 special runoff elections for the 32nd State Senate District and the 6th Congressional District respectively.

Personnel Staffing:

The required staff necessary to support the upcoming special runoff elections are coordinated, and funding is expected to be allocated by the county to the department imminently to support these runoff election events. This contract with Happy Faces will provide the temporary staff for early voting, poll staffing, poll worker training and payroll support. Our temporary staffing agency has been alerted by our office of the potential need for a significant amount of contract staff to support what will most likely be a countywide special election on November 7, 2017.

Staffing Development and Training:

Permanent staff trained on the downloading of election-related data files from the state's FTP site rather than hand delivery by courier on compact disk from KSU. We continue to revisit training and hone skills for the primary staff on converting GEM files to Excel format files and developing ballot order quantity data and the resources used to arrive at this estimate. As a result of the data breach at KSU, files are now being posted on the state FTP site for extraction by counties. The SOS provided access to this FTP site to four (4) staff members assigned to the Elections Division. The Elections Division staff received training on the procedures for public access to data files on ENET bearing the name and address of those who have cast an absentee ballot for a given election. This information is of importance to candidates actively involved in an election and is provided upon request. Mrs. Sharon Benjamin is enrolled in the county offered "Developing Tomorrow's Leaders for Today's Supervisor" Series Program. Two (2) representatives from the Elections Division will attend the annual Georgia Elections Official Association (GEOA) Conference in early May 7-10, 2017.

Monthly Operations Report- APRIL 2017

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Election Day Poll and Election Night Worker Support:

The staffing levels have been determined for early voting, poll and election night workers designated to support the May 16, 2017, and the June 20, 2017 special runoff election events. Strategic training centered on the express poll device will be provided for all express poll operators with emphasis on interconnecting three (3) or more express poll devices, express poll installation and other general tasks (changing voter status, performing countywide and statewide level searches) to include the proper usage of the barcode scanner in searching for voters.

Poll Worker/Staff Training:

The Elections Division Staff will be required to attend one of the express poll classes to enhance their knowledge and to better arm themselves to be more proficient in assisting with technical calls related to the express poll device on Election Day.

Poll Worker Payroll:

The Epay cards were used to compensate poll and election night workers for services performed. The cards were mailed on May 2, 2017. We will evaluate whether or not this transition from checks to an Epay system of compensation for the poll and election night workers added value to the overall payroll process or not. This first iteration required the Epay cards to be in possession of the payroll department for loading funds. Subsequent payments for returning workers will result in the Epay cards in the poll and election night workers possession being automatically loaded with their authorized compensation for working future elections. We will issue pay cards for the April 18, 2017 election and beyond if no major issues that will preclude doing so are discovered. The most recent April 18, 2017 served as a pilot initiative and will be evaluated and or critiqued following later this month in conjunction with our payroll division staff.

Early Voting:

The early voting operation event for the May 16, 2017 32nd State Senate District Runoff began on Saturday, May 6, 2017. We are operating one (1) early voting site (North Fulton Annex) for the nine (9) polling precincts involved in this special runoff election event. Coordination is also ongoing to lock-in all early voting sites for the 6th Congressional District Special runoff which will commence on May 30, 2017. The locations are the North Annex, East Roswell, Roswell, Milton, Alpharetta and the Robert F. Ocee Fulton Branch Libraries. Poll set-up and testing will begin one week prior to the start of early voting. Our IT Department will provide the specific technician by name assigned to perform set-up operations at each early voting site.

Election Preparation:

We have advised our IT Department of all known and confirmed impending special election events. The equipment issue quantities required for support of the May 16, 2017 32nd State Senate District Special Runoff Election and the June 20, 2017 6th Congressional District Special Runoff Election have been determined. The Center for Election Systems (KSU) has provided the GEMS databases for each of these runoff elections. Logic and Accuracy (L&A) Testing has commenced and will continue until completed. The provisional paper ballot order quantities have been determined and submitted to the ballot printer to fulfill. The equipment and staffing allocation quantities have been vetted by staff and provided to the EPC, Regional Coordinators and poll managers for their information, planning and other related actions.

Redistricting:

The Cities of College Park, Chattahoochee Hills Country, and Roswell have all notified our office of the need to redistrict their municipal boundaries before the November 2017 Municipal Elections. Our department will meet with IT and conference in the respective city clerk and city zoning representatives to obtain the street names and street ranges impacted for our subsequent appropriate redistricting actions.

Elections Document Audit:

The election control and reporting forms from the April 18, 2017 Special Elections and Runoffs will be reviewed and feedback provided to the appropriate poll managers before the June 20, 2017 special runoff election. The results will be electronically submitted to the appropriate poll managers for information and awareness of any issues identified in their respective poll election documents. The poll management staff of those polls with documents exhibiting continued and recurring issues will be candidates for involuntary replacement.

Election Equipment:

The defective equipment identified following the November 2016 General Election were returned after repair. The repairs were performed under the **2016 extended warranty contract**. All equipment that was returned from the vendor for repair must undergo acceptance testing performed by KSU before we can return this inventory to our general population of election equipment. We no longer carry warranty maintenance coverage on our voting equipment.

Discussions continue with Hall County to obtain the 115 DRE TR6 model voting units they verbally committed through KSU to provide Fulton County at no cost. We will be responsible for the labor and transportation required to relocate the DRE units to our EPC for subsequent acceptance testing by KSU. We made initial contact with the point of contact in Hall County (Mr. Cato). We were notified on May 2, 2017 that all of the administrative hurdles have been cleared to release the DRE units to us. We will continue to keep all inform of the progress toward actual receipt of the DRE election equipment.

Polling Facilities: We have had some public schools that are currently hosting polling operations. Several of these schools will undergo a major renovation this summer. We are temporarily finding alternate locations by primarily consolidating at a location with an existing poll. We anticipate moving these polls back to their original facility once construction is completed and before the November 7, 2017 elections.

Election Supplies & Forms:

The absentee and election supply templates were released by the SOS for all upcoming special runoff elections. A physical inventory was performed to determine required document quantities for all special elections. The large Voting Instruction Signs and the voter certificate binders are no longer issued by the SOS. There seems to be a trend toward reducing election forms previously provided to counties. We will plan our issuing quantity to be a minimum of 60% of the actively assigned voters for the June 20, 2017 federal runoff election event.

Monthly Operations Report- APRIL 2017

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IT Coordination Meeting:

Our formal weekly IT coordination meetings continue for discussions and coordination of IT related support required, support issues and for process improvement recommendations in preparation for the upcoming May 16, 2017 and June 20, 2017 runoff election events. We are seeking to have area IT support based in the vicinity of early voting sites for the June 20, 2016 Special Runoff Election. Specific data as to the number and location of early voting sites, as well as equipment delivery and set-up dates and times for early voting sites in support of the near term special runoff and elections were disseminated. Discussions were also centered on the marrying of laptops to printers to minimize print issues at early voting sites. Coordination was also made for the master voter registration data files to be preloaded by our IT Department on the early voting laptops.

Mock Testing – Transmission of Results/Web Display:

The dates established and agreed upon for mock testing to validate the transmission worthiness of the analog telephone lines have been set up for **May 11, 2017, and June 13, 2017.**

We will use the North Fulton Annexes and Roswell City Hall as transmission sites for the upcoming runoff special elections. For each mock, we will ensure staff continues to obtain practical experience setting-up the SCYTL election night reporting systems and viewing the mock web results. Significantly more functionality and report capability exist in the new application than the previously used reporting system.

SCYTL Election Night Results:

Select staff participated in a “Goto Meeting” with Scytl the vendor. A select team will be responsible for setting up and staging the election night display for the May 16, 2017 and June 20, 2017 Special Runoff Elections web display after receiving training and practical experience. We will be working in close concert with the vendor to learn the steps involved and perform all the expected associated tasks for our county only election results display. Step by step training documentation will be developed once all training is completed and administrators have achieved an acceptable level of proficiency in performing all required set-up tasks.

Easy Vote:

The vendor for election modules (Easy Check-in; Focus and Easy Inventory) has advised the user of an impending new release. The upgrades and enhancements that are resident in the new version are expected to be minor as compared to the current version in use. The new release was distributed to users on April 30, 2017.

Implementation Election Management System & Poll Worker Training

We continue to coordinate with Easy Vote and Scytl representatives on various aspects of the election management application and the poll worker scheduling and training application respectively. Periodic discussions continue with Easy Vote, Fulton County IT, and our department to discuss any thorny operational, functional or support issues that might arise leading up to full implementation. The Easy Focus application is now functional, and a primer was provided for select senior staff. We project to have this application fully installed, implemented and functional for all users in the next month or so.

Precincts:

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Tentative plans are to still meet with the City of Atlanta Municipal Clerk Office representatives. The basis of the meeting is to discuss possible options for those voters living in the Fickett Elementary School corridor (Precinct 11B) but is assigned to the Ralph Bunche Middle School (11C) voting poll. The leading option being considered is to create a split poll at poll 11B that encompass a portion of the residential streets that are near Fickett Elementary School but are now assigned to vote at poll 11C (Ralph Bunche Middle School).

We will look at and make precinct consolidations where possible. All consolidation action will be consistent with their being a facility with the adequate capacity to house and absorb parking for the active voter population of the consolidated polls and our remaining compliant with Georgia Election Code governing precincts.

Open Records Request (ORR):

We have obtained an ORR for GEMS data about the 6th Congressional/32nd State Senate Districts Elections held on April 18, 2017. The primary resource (GEMS) needed to get the requested data for the most time-consuming data is fully engaged in creating election media. Attorney Rosenberg has provided estimated cost data based on the amount of time and the lowest hourly salary of the employee able to extract this data to the requester.

Tasks to Be Performed for Future Reporting Periods:

- Prepare for the conduct of early and Election Day voting activities for the May 16, 2017 and June 20, 2017 Special Runoff Elections.
- Continue training on "Things Every Election Division Employee Should Know" program
Provide information and testing of the applications in the elections management system, Poll Worker Online Training, and the SCYTL ENR applications.
- Coordinate for and test WEBEOC8 application for Election Day enhancements
- Continued Review /Update procedures for Election Checklists and Check-in Instructions
- Continue the maintenance of access database for management of active poll worker applications.
Perform maintenance of worksite locations in PW AMS.
- Continue to refine audit procedures for election documents originating from the polls
- Develop daily votes cast audit system between ENET absentee report, physical absentee in-person applications and Easy Vote.
- Set-up SCYTL ENR Reporting Application
- Participate in Poll & ENW AMS migration.
- Set-up, establish election-related tasks for November General in Easy Vote Focus application

REGISTRATION DIVISION

This Monthly Report provides a summary of the critical registration activities, workload levels, and voter statistics for the Registration Division of the Fulton County Registration & Elections Department for April 2017. The primary activities upon which we worked in April were processing voter registration applications, confirmation notices, researching street issues, municipal voter/street audits as well as voter registration applicant processing problems, preparing notices to voter registration applicants, scanning, indexing registration cards, and training.

VOTER REGISTRATION

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The total number of voter registration applications we have received in 2017 is 78,523. We received 19,036 voter applications in April. The applications that we received are being keyed and processed.

As of May 1, 765,871 (630,987 active and 134,884 inactive) registered voters reside in Fulton County.

The Historical Overview of Registration Applications for the Month of March/April is as follows:

Year	March Voter Registration Applications	April Voter Registration Applications
2011	6,649	5,834
2012	11,323	11,571
2013	6,061	5,724
2014	7,627	5,374
2015	6,498	5,608
2016	13,933	19,704
2017	21,425	19,036
Total Applications for 2017		78,523

Workload Statistics for February

The following workload statistics are based on voter registration applications and other documents (confirmations and list maintenance) received from Secretary of State:

	Applications	Voters
April 1, 2017 Total		<u>763,739</u>
Remaining Applications from March	9,951	
Applications for the month of April	<u>19,036</u>	
Total Number of Applications to be processed	28,987	
Updated Fulton Voter Applications	9,552	
New registrations to Fulton	2,998	
Transferred into Fulton	<u>1,370</u>	
Total New registration to Fulton		4,368
Total Number of Applications processed	28,987	
Remaining Non Processed Applications	15,067	
Total Removals of Fulton County Government		(2,236)
Felons	(366)	
Moved out of State	(86)	
Duplication	(302)	
Error	(2)	

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Hearing	(0)
Not Verified Deletion	(0)
Requested	(22)
Transfers out of county:	(1,106)
Vital Records	(352)
Mental Incompetent	(0)

May 1, 2017 Total**765,871****REGISTRATION REPORTS:****FELON LIST**

State law requires counties to review felon reports and to conduct hearings for those voters with matching data that raises questions regarding their eligibility to vote in accordance with O.G.C.A 21-2-228. All reports must be processed in accordance with O.C.G.A. 21-2-231.

Number scheduled for May Hearing 25

DEPUTY REGISTRAR ACTIVITIES

The Registration Division completed the following Voter Education Activities for the Month of April:

PERSONNEL/STAFFING:

Staff and County Employees – We have eight permanent staff and seven temporary staff. We have all allotted positions filled. In July, we will add additional staff for the Municipal Elections. One of our temporary employees has submitted their two-week notice to end their assignment. We will be hiring another temporary employee to replace him.

HEAD OF HOUSEHOLD MAILING

We will have a head of household mailing for the voters who are registered in the 6th congressional district. The letter will provide the voter's polling location on the front and the advance voting locations and time on the back. These letters should be out by May 22nd.

VOTER REGISTRATION CERTIFICATION

We have three employees who have completed their certification from the State for voter registration. They will be rewarded at the Board meeting.

ABSENTEE MAILING

We have mailed the absentee ballots for the 32nd Senate election on May 1st. The first mailing of the absentee ballots for the 6th congressional district election is May 5th.

REGISTRATION REPORTS:

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FELON LIST

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Number scheduled for May Hearing 25

DEPUTY REGISTRAR ACTIVITIES

The Registration Division completed the following Voter Education Activities for the Month of April:

Deputy Registrars Trained	Deputy Registrar Classes	Deputy Registrar Drives
7	1	0

There were 50 TVICs issued.

PERSONNEL/STAFFING:

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TASKS TO BE PERFORMED FOR FUTURE REPORTING PERIODS:

- Provisional Letters for March Election
- Notifications of Hearing for Felons
- Train Incoming Temporary Staff
- Coordinating Deputy Voter Registration Drives as Requested
- Continue List Maintenance Activities
- Continue Review / Update Voter Registration procedures

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- Prepare Voter ID Distribution List of Targeted Organizations Upon Approval
- Continue Indexing, Scanning Voter Registration Applications
- Continue to Perform / Conduct performance counseling sessions
- Respond to State Election Investigations
- Continue Precinct Card Mailings and other Correspondences
- Staff Training

ADMINISTRATION DIVISION

This report provides information performed during the month of April 2017, on the operations and activities of the Administrative Division that includes personnel, payroll, procurement, finance, travel and training coordination and conduct of election-related matters.

Campaign Contribution Reports for Period 15 Days Before Special Election**The City of South Fulton Special Runoff Election**

The filing period for Runoff Candidates of their Campaign Contribution Disclosure Report was due the 6th day before Runoff on April 12, 2017, with a grace period deadline on April 14, 2017. We sent email reminders to all candidates running for Mayor and Council Member Districts 1-7. Candidates are submitting their reports to the Voter Registration Office at South Service Center on Stonewall Tell Road.

A report of the following candidates that have not filed or filed late have been submitted to State Ethics:

Runoff Candidate	Office	Grace End Deadline	Date Filed
Bennie Crane	Mayor	4/14/2017	Non-Filer
Rosie Jackson	City Council Dist 5	4/14/2017	Non-Filer
Khalid kamau	City Council Dist 6	4/14/2017	Non-Filer

To review filed reports go to: <http://www.fultoncountyga.gov/japps/3/>

Hold mouse over "Disclosure Forms," move mouse to City of South Fulton and choose report to review.

2017 Election Update

Budget: On April 20, 2017, we met again with the County Manager, CFO, Chief Strategy Office, County Attorney and Director of Finance to discuss funding needed for confirmed 2017 special elections and potential countywide elections in November 2017 (FIB/BOC Chair). The director was asked to collaborate with the CFO to prepare a presentation at the BOC meeting on May 3, 2017. The funding will need to be a budget soundings request for BOC approval.

In early May 2017, concentration will be placed on preparing the November municipal budgets and

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contracts, so that the municipal clerks can inform their council on funds needed to conduct their elections.

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IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION

DONNA CURLING, et al.,

Plaintiffs,

v.

BRAD RAFFENSPERGER, et al.,

Defendants.

Civil Action No.
1:17-cv-02989-AT

DECLARATION OF CHRISTOPHER BRILL

Pursuant to 28 U.S.C. § 1746, I, Christopher Brill, hereby declare as follows:

1. Since 2013, I have been employed as a Senior Data Analyst with TargetSmart Communications LLC, where my duties and responsibilities include, but are not limited to, collecting and analyzing political, electoral, consumer, demographic and other datasets; product development; and strategic consulting.
2. Since 2006, I have devoted my career to the study of political processes in the United States generally, with a particular focus on research and analyses of political and electoral data, from precinct level to nationwide in scope.

3. My experience includes, but is not limited to, research and analyses of statewide voter files to identify socio-economic, geographic and other characteristics of voter file data.
4. I also have experience comparing and matching political and electoral data, including voter file data, against large and complex datasets; analyzing the results of such comparisons and matching; and identifying strengths and weaknesses in the methods, protocols and algorithms used in performing these kinds of analyses.
5. My experience also includes identifying reasons for false positive and false negative results when comparing or matching such data across large datasets and developing best practices for optimizing accurate matches and comparisons of data.
6. I obtained a Bachelor of Arts degree in Political Science from the University of New Mexico 2006. My current resume is attached and incorporated herein by reference as Exhibit A.
7. I have been retained by Plaintiffs' counsel in this matter to conduct analyses of the November 6, 2018 general election vote results in Georgia, in particular to analyze the undervote in statewide contests, including the Lieutenant Governor's election; to offer my opinions concerning said data and analyses

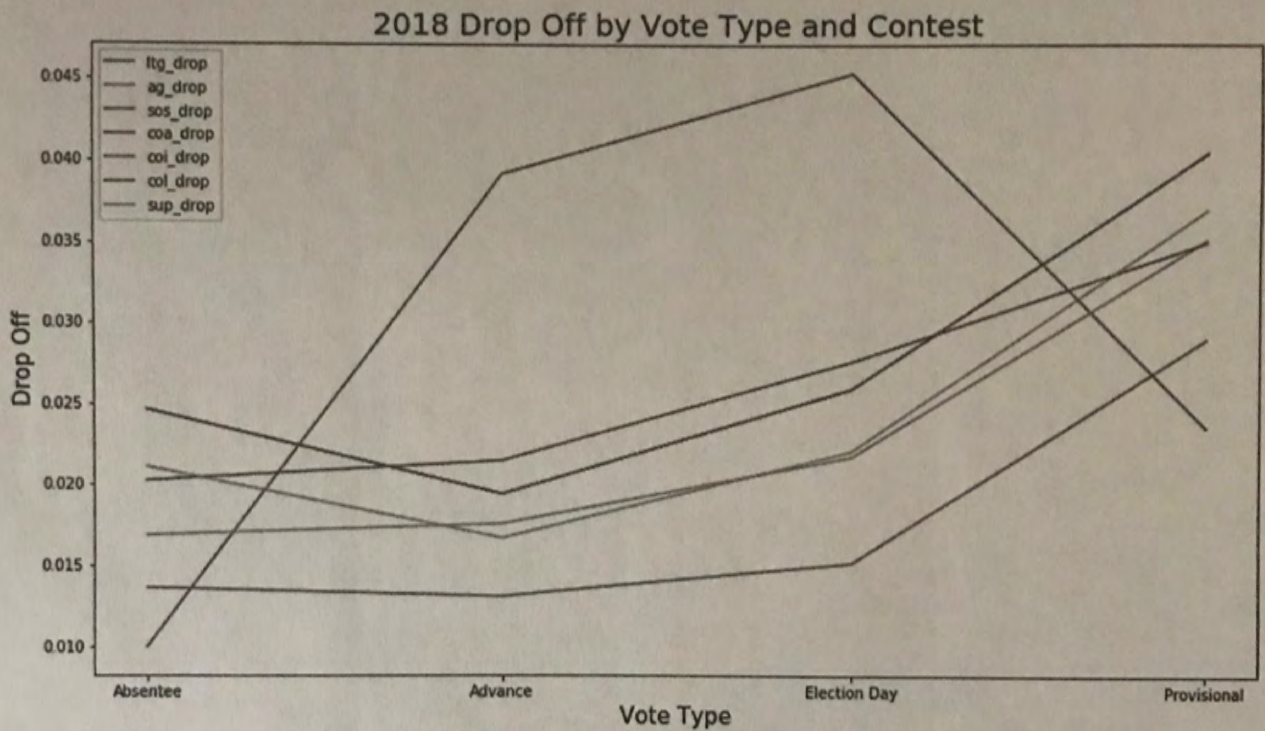
based upon by background, training and experience; and to prepare a preliminary report summarizing my analyses of this data and opinions.

8. I am not billing Plaintiffs' counsel for my services in this matter.
9. My report and accompanying affidavit and exhibits, which include my curriculum vitae, were filed with the court in *Coalition for Good Governance v. Raffensperger*, No. 2018CV31348 (Fulton Cty. Sup. Ct.), and are attached hereto as Exhibit A.
10. The sources used for the analysis are from officially published election result tabulations made available by the Georgia Secretary of State, as well as publicly available individual voter file data.
11. My opinions and preliminary report are based upon currently available information. I reserve the right to amend, supplement and otherwise update my opinions and report if additional information is made known to me during the pendency of this litigation.
12. It is typical in Georgia and other states that in major elections, almost everyone who casts a ballot votes for the race at the "top of the ticket," which is followed by a slight decline in the number of votes cast in the statewide down-ballot races that follow.

13. In gubernatorial elections dating back to 2002, the undervote rate for down-ballot statewide offices in Georgia has ranged from one to two percent, and has never exceeded 3.1 percent.
14. In the 2018 general election, however, the second race on the ballot, the Lieutenant Governor contest between Geoff Duncan and Sarah Riggs Amico, had an undervote rate of 4.0 percent. Thousands fewer votes were cast in the Lieutenant Governor's race than would have been expected based on historic voter participation rates.
15. I have analyzed election results in the more than 2,600 voting precincts in Georgia using a series of data manipulation tools including an internal license of 'Alteryx' a well-known analytics platform commonly used by experts in the field, as well as some additional analysis via open sourced Python data libraries. The methodology and code for my analysis is attached hereto as Exhibit B.
16. The undervote rate in the November 2018 Lieutenant Governor's race among votes cast in person on DRE machines on Election Day was approximately 4.5 percent.
17. The undervote rate in the November 2018 Lieutenant Governor's race among votes cast in person on DRE machines during early voting was approximately 3.9 percent.

18. The undervote rate in the November 2018 Lieutenant Governor’s race among absentee votes cast by paper ballot was approximately 1 percent.

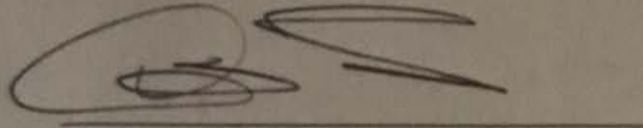
19. A chart comparing the undervote in the Lieutenant Governor’s race by (1) in person Election Day vote; (2) in person advance vote; and (3) absentee vote is below:



	ltg_drop	ag_drop	sos_drop	coa_drop	coi_drop	col_drop	sup_drop
vote_type							
Absentee	0.00998766	0.0168936	0.0136643	0.0202705	0.0246538	0.0246538	0.0211293
Advance	0.039255	0.0176167	0.0131164	0.02155	0.0194733	0.0194733	0.0167233
Election Day	0.0453874	0.0217586	0.0151843	0.0276606	0.0259563	0.0259563	0.0221039
Provisional	0.0235713	0.0351501	0.0290299	0.0349847	0.0404433	0.0404433	0.0368896

20. I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 21, 2019 in Phoenix, Arizona.

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke at the end.

Christopher Brill