2022 Georgia Risk-Limiting Audit

FINAL REPORT
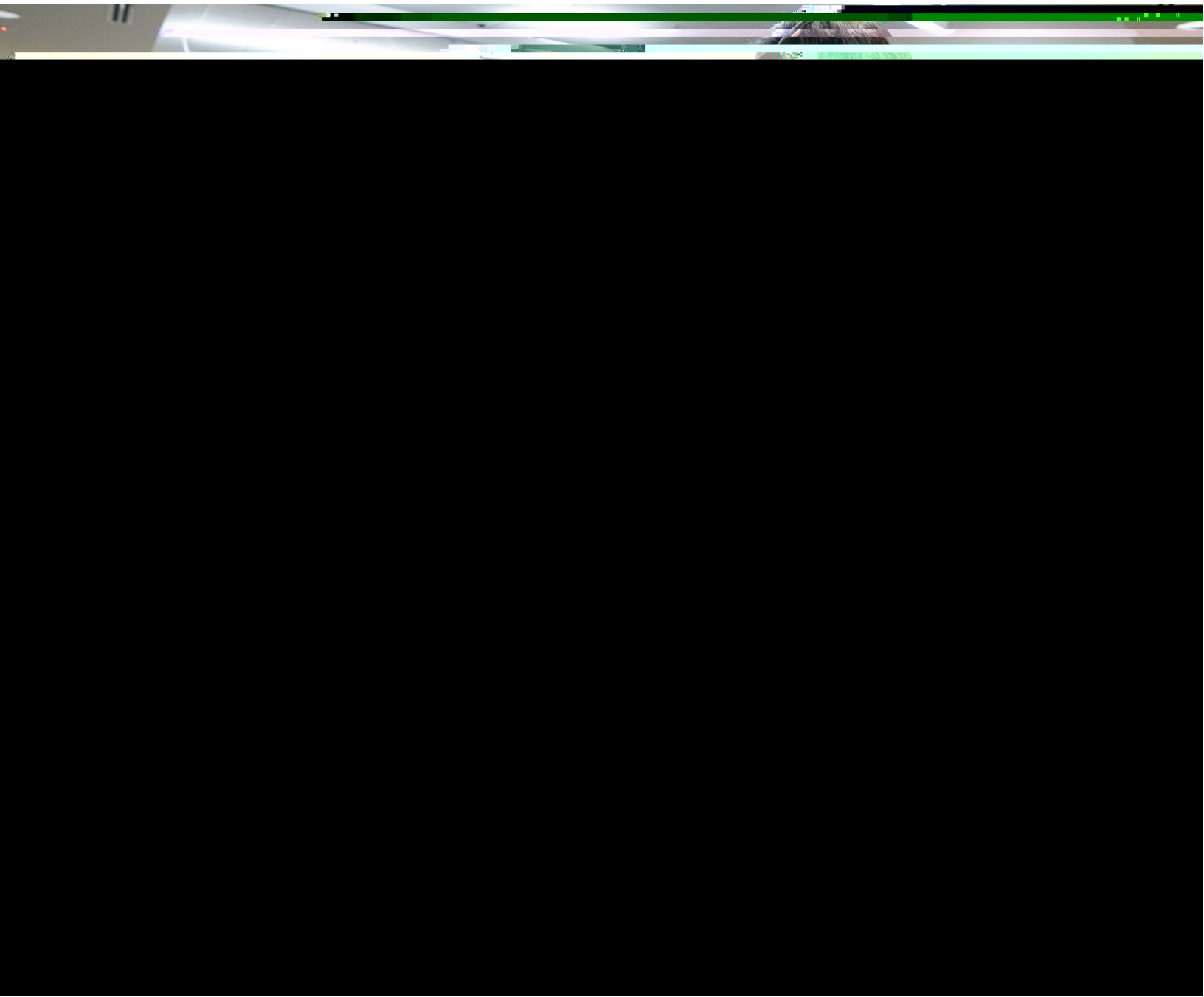
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I. Executive Summary

After the November 2022 election, Georgia conducted a batch-comparison risk-limiting audit (RLA) of the secretary of state contest and confirmed the original reported result, the reelection of Brad Raffensperger.

The Carter Center, which has observed more than 110 elections in 39 countries, was credentialed by the Office of the Secretary of State of Georgia to observe the audit process. The Center had the same access provided to political party monitors. In deploying independent observers for the RLA, The Carter Center aimed to bolster voter confidence in Georgia's electoral process by providing an independent assessment of the state's efforts to make election administration processes more transparent.

On Nov. 17 and 18, The Carter Center sent 40 nonpartisan observers to 33 counties to watch the audit process. Observers collected information on each step of the public process, including reporting on ballot security and chain of custody, the work of the two-person audit boards and bipartisan vote review panels to interpret and count votes, and the data entry process used to upload tally information into the open-source RLA software. The Carter Center also conducted a desk review of the training provided to counties prior to the audit, which included topics such as ballot storage, preparation of source data, and use of the RLA software.

The Carter Center team found that the Office of the Secretary of State and county election officials conducted the Nov. 17 re-tally in an open and transparent way, adhering to rules outlining access and behavior for official party monitors, Carter Center monitors, and public observers. No conflicts among party observers or interference with audit boards were observed. The Center's observers were welcomed by election officials and were able to conduct their observation without hindrance.

In all counties observed, the audit proceeded smoothly and calmly on the counting days, with few significant problems. Most counties completed their work by midafternoon on the first day, with only a handful continuing to the second day. Although counting procedures occasionally deviated from the official procedures   d

In addition, the Carter Center team found several challenges worth addressing going forward including the way the source data was prepared. Ensuring the software independence of the ballot manifest is critical for a trustworthy audit, and simple process improvements will make the entire operation easier for counties and more transparent for observers. The Carter Center

Georgia conducted its first statewide RLA in the presidential election of Nov. 3, 2020. The state planned to conduct a ballot polling-style RLA, where specific ballots are selected randomly from all ballots cast (e.g. from Batch A37, retrieve the 35th ballot and the 472nd ballot) retrieved from storage, and tallied by hand. However, due to the very close margin of victory in the race, the number of ballots that would need to be retrieved was prohibitive. It was determined that increasing the sample size to include all the ballots (which essentially lowered the risk limit for the audit to zero) would be more efficient than sorting through each ballot container to retrieve the specified ballots. This method had been suggested as a valid alternative for conducting RLAs on very close races, but[3]

Georgia statute does not specify which variety of RLA is used — either ballot polling, batch comparison, or some hybrid process. For the 2022 RLA, [ ] of ballots were selected for audit. Batches were chosen for audit using software specially designed for RLA.[5] A pseudorandom number algorithm is initiated by a seed, a random 20-digit number. The seed for this audit was created in a public ceremony, covered by the media, held at 3 p.m. Nov 16 on the south steps of the State Capitol. One at a time, 20 individuals tossed a 10-sided die. The resulting number, along with the vote counts generated by the original electronic tabulation, the chosen risk limit (5%), and additional source data files (ballot manifests and reports of candidate vote totals for each ballot batch) were loaded into the RLA tool, which generated the statewide list of batches to be audited.[6] That evening, the secretary of state's office notified each county which batches to retrieve for audit.[7] A hash that could be used to validate the ballot manifests after the audit was shared by the Office of the Secretary of State via social media.

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[5] The open-source risk-limiting audit software, Arlo, was developed by VotingWorks, a nonpartisan, nonprofit election technology vendor, with support from the U.S. Cybersecurity and Infrastructure Security Agency. Voting Works provided assistance to the Office of the Secretary of State in the implementation of the audit.

[6] The math behind the batch audit takes into consideration the probative value of the batch. An RLA determines to the specified risk limit – whether the announced winner did in fact win the contest. It would be pointless to audit a batch that went heavily for the loser; even if every ballot was wrongly tabulated and these votes should have gone for the winner, the conclusion that the election was correctly decided would only be strengthened.

[7] The Office of the Secretary of State published on its website the list of batch tallies, including those selected for audit. https://sos.ga.gov/si

The following table summarizes Carter Center observer coverage.

RLA County	RLA Counties Observed			
	# of Batches Audited	# of RLA Batches in County	Carter Center Observer Present	# of RLA Batches Observed
Barrow	3	2		2
Bartow	2	1		1

Figure 1below displays the statewide distribution of counties participating in the RLA, and the distribution of observers from The Carter Center across RLA and Ancounties.
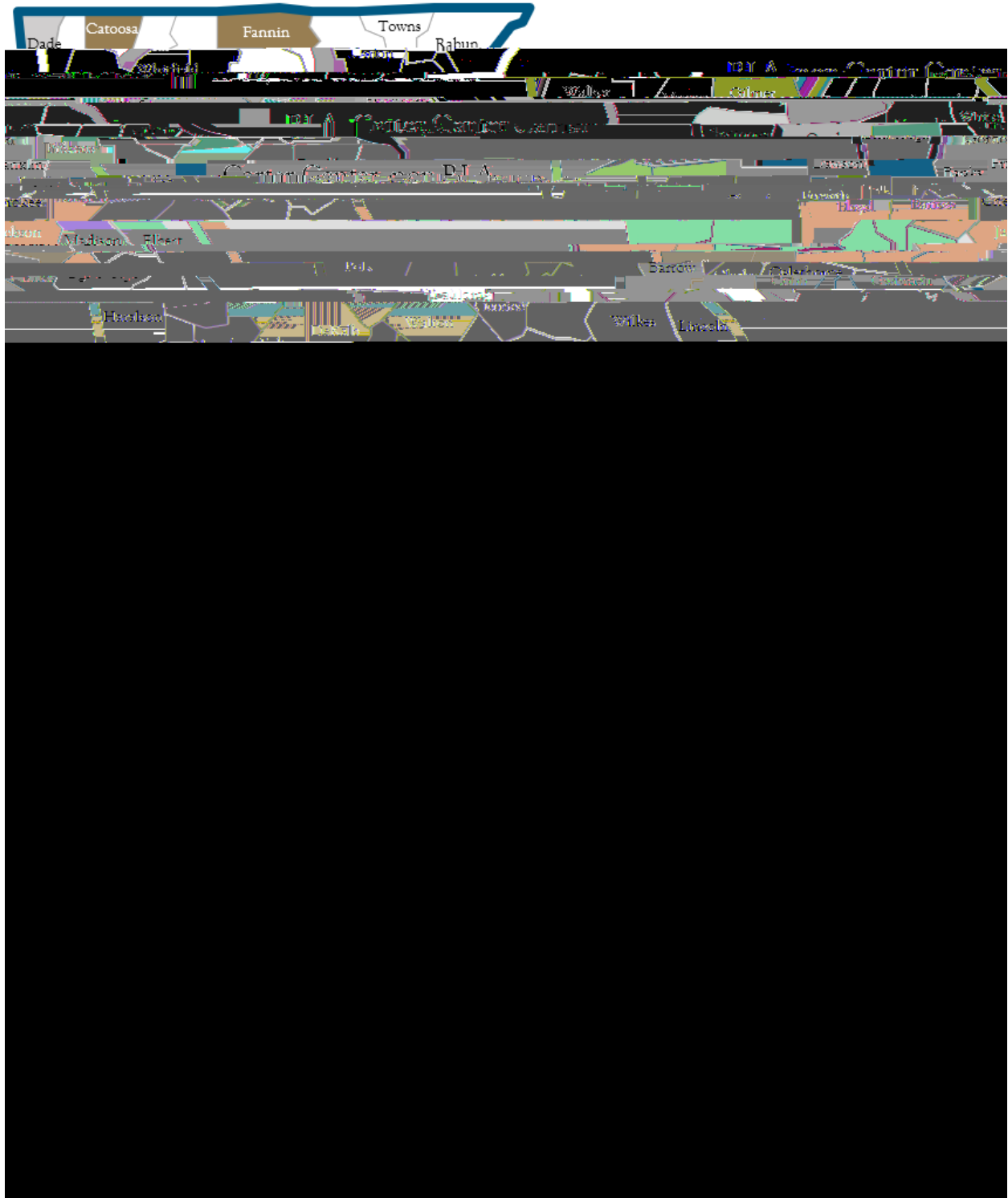
VI.   Findings

Overall, Carter Center monitors reported that although somewhat relaxed in detail, audit processes were conducted according to procedures in an atmosphere of calm, and without significant problems. Delays observed were largely due to challenges in handling the large early voting batches of several thousand ballots. Carter Center monitors noted that the audit tally sheets did not provide categories for recording blank votes and write-ins, and there were some minor delays associated with confusion about how to report invalid ballots. Most counties observed by the Center had finished their audits by early afternoon on the first day. Only two of the counties observed had to continue the audit on the second day and only then to recount ballots that had been counted the day before. Carter Center monitors reported that data entry was not readily visible to observers in most locations and found that there was no interference from political party observers.7eed foun o5 (r)-7 (fe)10 (fou5 (r)-)-2 (ol7 (v)--04 Tc 32.0 [(v)-7 (is))-1 (le-1 (leu2 (ol7 (v)-)-1

some counties prefer to batch and store their in precinct early voting ballots by day, to eliminate the very large ballot batches that come from as ballots build up in the tabulator across 21 days of early voting. This best practice also allows officials to transport voted ballots to secure storage each night during early voting, rather than leaving them locked and sealed in the tabulators at the voting location. Currently, there is no way for counties to track such batching of precinct counted ballots within the voting system, which creates some challenges discussed below. Features to support batching of precinct counted ballots would greatly improve the ability to reconcile ballots across paper and electronic systems.

Another issue is the use of this new software to create ballot manifests using tabulator CVR data instead of a separate independent source, which is important to ensure no ballots are missing from the tabulator records. To make up for the lack of an independent manifest, the state's training instead instructed election officials to validate the manifest against other source after the fact. This included reconciling the overall number of voters marked in the state voter file as having voted in their county ("voter credit") against the total number of ballots counted. This was a useful check, but insufficient to the larger purposes of the audit.

For an audit that doesn't use a software independent source to generate the ballot manifest, any artifacts that election officials use to validate the manifest must become part of the publicly available chain of evidence, disclosed before the audit in the same manner as the ballot manifest. This would require the preparation and public disclosure of a large volume of additional documents and chain-of-custody information that is not usually published during an RLA. The Office of the Secretary of State has indicated that they plan for counties to create ballot manifests from data independent of the voting system in the future. With additional audit experience, creation of the manifest by the counties should become easier.

B. Audit Days

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review panel when they learned they had only about 6,000 ballots to audit. Other counties similarly downsized, and five counties never called on their vote review panel at all.

2. Audit Board Training

From the perspective of the audit boards, a full hand tally (as in 2020) and a comparison audit are identical. Election officials bring the ballot containers to be counted to the audit floor; audit boards take custody of containers one at a time, sort and stack the ballots into piles for each candidate, count the number of ballots in each stack, report the counts on the tally sheets, and return the ballots and resealed containers to the storage area. While the greater volume of ballots in the full hand tally (approximately 5 million) compared with the batch comparison audit (231,000 ballots statewide) creates vastly greater logistical problems, the tasks are the same in concept, facilitating comparisons between the 2020 and 2022 audits.

The audit boards usually were staffed by election workers who were quite familiar with handling and interpreting ballots, but training for their audit tasks varied widely from county to county. In one county visited by Carter Center observers, training consisted of half an hour of orientation at the start of the day, including a four-minute video prepared by the audit software vendor, VotingWorks. The video focused primarily on the "sort and stack" method for tallying ballots.[12] In another county, that same video played on a 6retounty vnotho on1 Tc2-0.001 Tw25.93 067d [(") Thde

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counting process would better prepare counties for handling larger numbers of batches in a closer and more politically contentious election.[14]

The official method for counting (as shown in the training video) was a "sort and stack" procedure. One member of the team read the candidate's name aloud, with the second member confirming the name aloud and then placing the ballot in the proper candidate's stack.[15]

For mail-in/absentee ballots, the ballots to be sorted and counted were marked by the voter in T-4 (t) d mteor

county election officials on where counts are needed, in order to ensure greater consistency across counties.

The very large early voting batches (thousands of ballots) multiplied these problems. In some cases, a single audit board had to deal with the large batch alone – and would rapidly run out of table space when making stacks of 100. In some counties, other audit boards had to sit and wait while one finished a large batch. In other counties, election supervisors parceled out large batches among several audit boards, with candidate totals later summed up. This strategy raises potential chain-of-custody problems since ballots were not always unambiguously signed out to specific audit boards. It also may be more difficult to find the source of counting errors when summed counts do not match the ballot manifest.[16] The result for both large and smaller batches was occasional confusion about totals and extra time taken to redo counts. In two counties observed, counting had to be redone the following day due to problems with mixing batches and transposing numbers.

Tally sheets provided to audit boards listed the three candidate names but did not include separate categories for blank, overvoted, or write-in ballots. By midafternoon, at least one country was informed by the Offic

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votes. The actual number processed—including write-in and no votes—is slightly higher.) The RLA tool variously assigned two, three or five batches to audit.

The table shows a batch size range 1-101 (average 36) for absentee by mail, 250-921 (average 564) for Election Day, and 1,898-9,405 (average 4,737) for early voting. Ballots voted over the entire course of early voting at each location were accumulated into one large batch, with a single batch total registered by the tabulator.

	RLA Batches by County (* RLA batches)	Early Vote	Election Day	Absentee by Mail
1		7,692*		
2	Barrow		921*	
3				50
4	Bartow		817*	
5				15
6	Bibb		250*	
7				11

1. Data e21

Carter Center observers reported that no party representatives were present. About half had a total Republican and Democratic observer; two counties reported seeing only a Democratic observer and five reported only a Republican observer. Six reported a Libertarian observer. State election board members were present in a few counties. A nonpartisan observer was noted in two counties. While all counties prepared a space for public observers, 70% of the counties observed reported no public in attendance. News media coverage also was minimal. While several stations (and The Atlanta Journal-Constitution) covered the dice throw at the Capitol on Nov. 16, on audit day, Georgia Public Broadcasting reported from Fulton County and WTVM from Muscogee.

While the 2022 audit went smoothly, some of the lessons from 2020 s0 (t)-[.-o 1 >>BDC -0.004 T87 -1

VII. Conclusions and Summary of Recommendations for Future RLAs

Georgia's 2022 RLA went smoothly, in a politically key environment, and with relatively few ballots to tally. Overall, audit day implementation proceeded smoothly and with no partisan interference. Most irregularities observed by The Carter Center were minor and would be easily addressed in future audits through clarification and standardization of procedures and training. The Carter Center found that there was meaningful access for partisan and nonpartisan observers, and interested public and media. However, it was a challenge for observers to match the batches seen being counted with the selected batches as listed on the secretary of state's website. A more user-friendly listing by county would increase transparency. Most critical is ensuring that the source data for the RLA – in this case, the ballot manifest – is created in such a way that the integrity of the ov in ov9t

It is worth noting that a number of these recommendations were also made by The Carter Center after the 2020 audit and the Center's observation of the full hand tally (rather than a sampling RLA), as seen below.

- Develop a systematic, statewide strategy for ballot storage.
- Make it a regular practice to create ballot manifests.
- Develop reconciliation procedures specifically designed to handle increased numbers of absentee and early votes.
- Improve the layout and readability of the printed ballot.
- Strengthen public outreach and education about the RLA well in advance of its next implementation in 2022.
- Increase use of party volunteers to staff audit boards and vote review panels.
- Provide training for monitors.
- Re-

VIII. Annexes

A. Carter Center Preliminary Statement on Georgia's 2022 Risk-Limiting Audit Process

Press Release

ATLANTA (Nov. 22, 2022) — Georgia's risk-limiting audit process examining the 2022 secretary of state race was transparent and well-conducted, with only minor problems that can be corrected through more standardization and training, The Carter Center said in a preliminary report issued today.

**The Carter Center Preliminary Statement on
Georgia's November 2022 Risk- Limiting Audit Process**
(Nov. 22, 2022)

The Carter Center commends Georgia's 159 counties on completion of the 2022 risk
audit process. The audit examined the Georgia secretary of state race and confirmed the original
reported result, the reelection of Secretary of State Brad Raffensperger. The Carter Center, which
has observed more than 110 elections in 39 countries, was the only nonpartisan organization
observing the audit. The Center was credentialed by the Office of the Secretary of State to provide
an impartial assessment of the implementation of the audit process and had the same access
provided to political party monitors.[19] The Center's observers reported that the process proceeded
quickly and professionally in most of the counties observed. This is a credit to and work of
Georgia's election officials, who were simultaneously preparing for the Dec. 6 U.S. Senate runoff
while conducting the audit. On Nov. 17 and 18, Th T1356 (1356 (3 (r)-2 (o)5 ((o)-6)-12 (h),)3 gh)2 (e)-

Risk-Limiting Audits: The risk-limiting audit, which looks at a statistically significant random sample of paper ballots, is now considered the gold standard for post-election tabulation auditing. The number of ballots to be audited depends on both the margin of victory in the chosen contest(s) and the chosen "risk limit" for the audit—the maximum chance (say, 5 or 10 percent) that the audit might miss an incorrect outcome. The RLA process is currently in use in over a dozen U.S. states, and Georgia law now requires that an RLA with a risk limit at or below 10 percent be conducted prior to state certification of the election, placing Georgia in the forefront of adopting this approach to post-election auditing. This year, the specific type of RLA used was a Batch Comparison RLA.

Preparation began well in advance of the election, as county election staff processed, counted, and stored voted ballots, keeping them in the groupings in which they were counted (ballot batches). After the election, officials prepared a "ballot manifest," or a record listing each of the carefully labeled containers of ballots, the number of batches of ballots stored in each container, and the number of ballots in each batch. Ballot batches vary greatly in size depending on the type of ballot—a precinct's cumulated early voting ballots could be a batch of several thousand; ballots arriving in the mail on a single day might constitute a batch of a dozen.

For this RLA, entire batches—rather than individual ballots—were selected for audit. The batches were chosen using an algorithm called a pseudo-random number generator, seeded with a random 20-digit number. That seed number was created by rolling 20 10-sided dice in a public ceremony, well-covered by the media, held at 3 p.m. on Nov. 16 on the south steps of the State Capitol. The resulting seed, the ballot manifests from each county, the vote totals originally reported, as well as the chosen 10-

Preliminary Findings: Overall, Carter Center observ

Vote Review Panels. In addition to observing the work of the audit boards, The Carter Center observed the work of the bipartisan vote review panels. These two committees were tasked with reviewing irregular ballots—ballots with write-in candidates, ballots that had to be duplicated because the voter's mark on the original ballot wasn't clear, or ballots where there was a question about voter intent.

All counties observed had vote review panels staffed. However, a relatively small proportion of them were busy because only paper ballots marked by hand required interpretation. The main function of the vote review panels was to determine whether the write-in was qualified. Of the panels the Center observed, only 18 percent had visible access to a Georgia guide to voter intent that could have informed this work, but there were no actual disagreements observed. Since the mix of BMD-marked and hand-marked ballots might well be different in a future audit, counties should be prepared to supply guides and train about how to use them consistently.

The Democratic and Republican parties staffed the vote review panels. Two panel members in one county told Carter Center observers that little to no training was offered on their roles. At the audit site, an elections supervisor gave them a brief overview of what they might see when reviewing the voter hand-marked ballots. Assuming that future audits may focus on races with closer results, parties and vote review panels need to be better prepared for consistent adjudication of disputed ballots.

Data Entry. In terms of transparency, data entry was the most challenging aspect of the audit o(i)5 (n)1 (g)]TJ -0.002 c -0.ms A A bra (b) (rq)--2 s v Eln v v Evote5 (i)5 4 (er)-(ta)11 (Eo a)4 ohdiur

Transparency and Access for the Public and Monitors. Carter Center observers reported that they had adequate access to assess the process and found that in all counties visited, the audit process was conducted transparently and was open to party and other official monitors as well as to general public observation.
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B. Code of Conduct for Nonpartisan Election Observers

Election Observer Code of Conduct

The purpose of election observation is to help ensure the integrity of the election process, by witnessing and reporting accurately and impartially on each aspect of the process to evaluate whether it is conducted i ir an p en andof transpar e1nt imanner andn conor imitywi1ph ap pt ea19.9 (b wr e por2 whats1(s)]TJ 0 Tc 0 -‐ ( )TJ 0.001 Tc -0.001 2.448.2 0 Tdwt t pe po1orltolt(s)]TJ 0 Tc 0 -‐ wincdetc im enpa1tiinsc e1npf(t)-o (a)-ll (l)-1ow (,)-1fo5 (r)-6. v (r)- (e)-5 (r)-ifi5 (c)- (a)-5 (t)-2 (i)-10 (i

- o   I will follow this code of conduct, and any written or verbal instructions given by the Carter Center's observation effort leadership. I will report any conflict of interest that I may have and report any improper behavior that I see conducted by any other observers that are part of this effort.

- **Refrain from speaking about the observation process on social media, to the media or to the public**
    - o   I will refrain from making any personal comments on my observations to the media or members of the public (including through social media). I will refer all med enquiries to The Carter Center leadership team.

I understand that my violation of this Code of Conduct may result in my accreditation as observer being withdrawn and my dismissal from the observation effort.

NAME (please print):

Signature:

Date:

C.   Observer Forms for 2022 Risk-Limiting Audit

TCC GEORGIA 2022 GENERAL RLA OBSERVATION

PART A: OBSERVER INFO

Your Name: _____

County where you are observing the audit: _____

Today's date   : _____

Time you arrive at the audit location   : _____

Time you leave the audit location (   ): _____

A1	Were you allowed to observe?	O Yes	O No
A2	Did the election workers cooperate with you?	O Yes	O No
A3	Were party monitors also able to observe the audit process	O Yes	O No

I have, to the best of my ability, conducted myself in accordance with the Carter Center's Code of Conduct for Observation and provided truthful, complete answers to these questions.


_____

(Sign on the above line)

PART B: PHYSICAL SPACE

B1	Is the audit location clearly marked with signage	O Yes O No O Don't know
B2	How many check in/out stations are set up?	Count:
B3	How many Audit Boards are set up?	Count:
B4	How many Vote Review Panels are set up?	Count:
B5		

B11: Draw the approximate layout of the audit floor. Include the public observation area, secure ballot storage area, check in/out stations, vote review panels, audit boards, etc.

EXAMPLE:
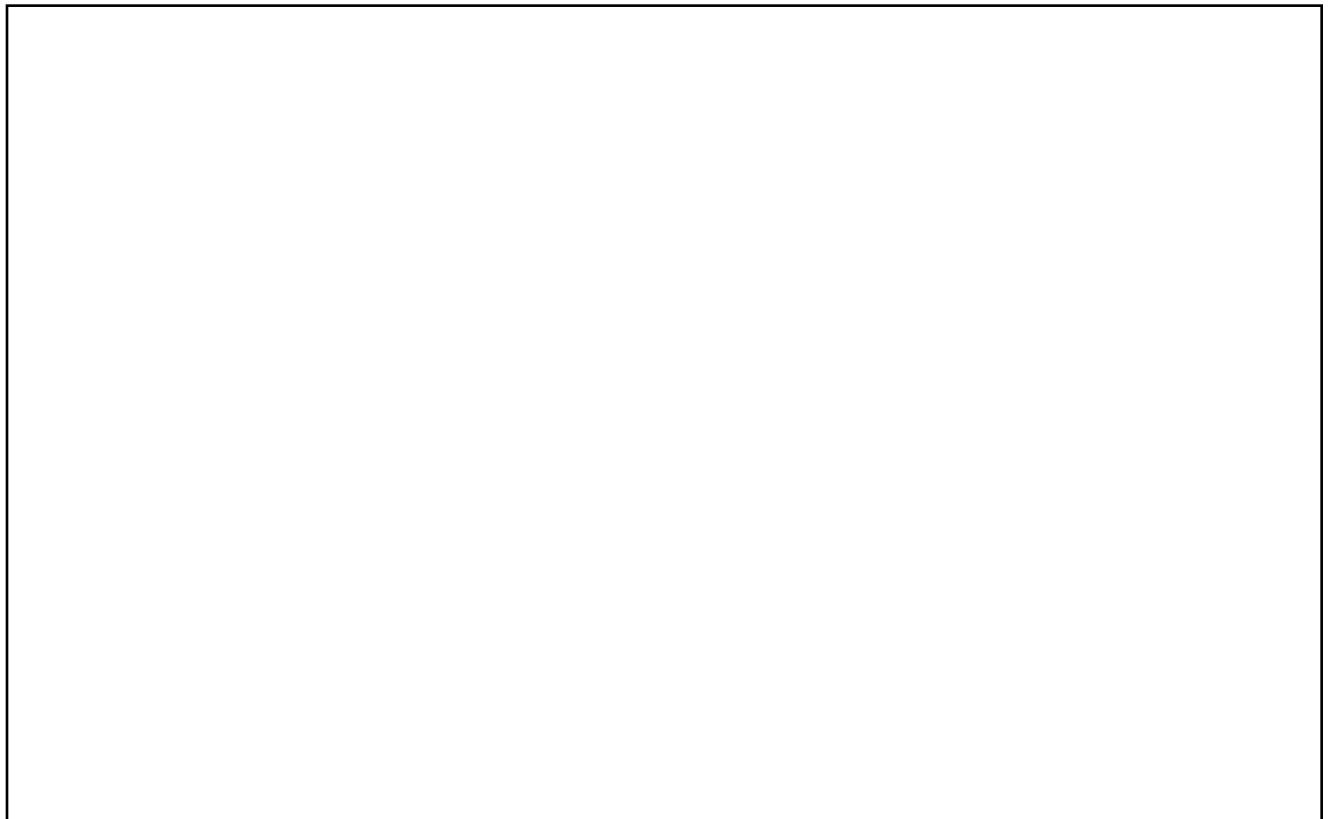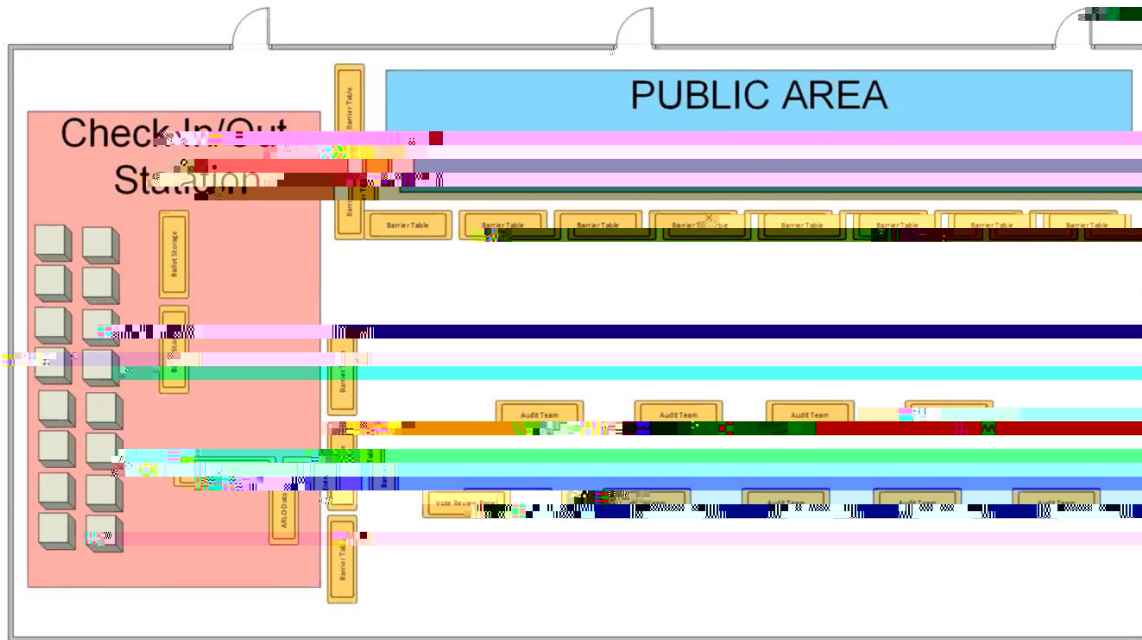
PART C: TRAINING

C1	Were you able to observe the audit board trainir	O Yes	O No	O Don't know
C2	If so, did the audit board training cover:			
C3	- Chain of custody for checking batches in/out?	O Yes	O No	O Don't know
C4	- Checking seals on the containers before opening them?	O Yes	O No	O Don't know
C5	- "Sort & Stack" procedure for sorting ballots?	O Yes	O No	O Don't know
C6	- What to do with blank/overvoted ballots?	O Yes	O No	O Don't know
C7	- What to do with ballots that have been duplicated?	O Yes	O No	O Don't know
C8	- What to do with ballots where the Audit Board cannot agree on the vote(s)?	O Yes	O No	O Don't know
C9	- "Count by 10s" procedure for counting/recording the totals for each stack?	O Yes	O No	O Don't know
C10	- Procedures for resealing the batches?	O Yes	O No	O Don't know
C11	- How to call for help/ask a question?	O Yes	O No	O Don't know
C12	C12			

PART E: VOTE REVIEW PANELS

E1	Were bipartisan Vote Review Panels reviewing ballots where the audit boards could not agree on the vote?	O Yes	O No	O Don't know
E2	Was a copy of Georgia's voter intent guidelines available to guide the vote review panel's decisions?	O Yes	O No	O Don't know

PART F: DATA ENTRY

F1	Was data entry done by a team of two, with one person checking the other's work?	O Yes	O No	O Don't know
F2	Was the data entry visible to monitors, either because they could stand close enough to view the screen or because the screen was projected?	O Yes	O No	O Don't know
F3	Were completed tally sheets entered into the software as soon as the counting was complete?	O Yes	O No	O Don't know

PART G: MONITORS, MEDIA & OTHERS

G1	How many party monitors were present?	Count:		
G2	If party monitors were present, what parties did they represent?	DEM	REP	OTHER
G3	Did an election official check the credentials of a monitors?	O Yes	O No	O Don't know
G4	Were monitors required to wear badges?	O Yes	O No	O Don't know
G5	Were any monitors disruptive?	O Yes	O No	O Don't know
G6	Did monitors attempt to talk to Audit Boards?	O Yes	O No	O Don't know
G7	Did monitors appear to understand the audit step and purpose?	O Yes	O No	O Don't know
G8	Did monitors systematically record observations	O Yes	O No	O Don't know
G9	Were monitors using red pens?	O Yes	O No	O Don't know
G10	Were members of the public in attendance?	O Yes	O No	O Don't know
G11	Were media present at the audit location?	O Yes	O No	O Don't know
G12	IF YES: what media outlet do they represent?	Outlet:		

G13	Were uniformed law enforcement or security present?	O Yes O No O Don't know
G14	Did anyone report a problem to you that you did not directly observe?	O Yes O No O Don't know
G15	Did you witness anyone being removed from the audit location for any reason?	O Yes O No O Don't know

NOTES

Question ID	Comments