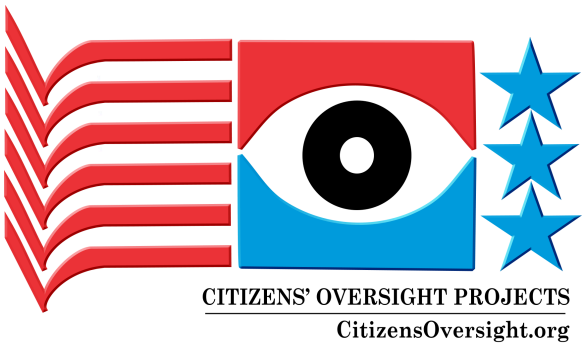

AuditEngine

Ballot Image Audits of:

Burlington, Mercer and Monmouth Counties (2022) New Jersey

Raymond Lutz
Executive Director and Lead Developer,
Citizens' Oversight Projects

V1.0 2023-07-04; V2.0 2023-10-31 (REF: M2009)

Citizens' Oversight Projects

a 501(c)(3) nonprofit and nonpartisan organization
http://citizensoversight.org

Introduction

AuditEngine serves as a ballot-image auditing (BIA) platform designed to process ballot images derived from voting systems. Its primary function involves generating an independent vote tabulation, which is then cross-referenced against the official results. For individuals seeking a primer on AuditEngine, we recommend referring to the provided background material:

Here, we review the elections in New Jersey, in the 2022 General Election, in three counties, Burlington, Mercer and Monmouth Counties. We must note that in both Mercer and Monmouth Counties, they replaced their (very bad) DRE (direct recording electronic) machines with machines that include paper records, and also ballot images. Although we do point out a few shortcomings in this election, we must acknowledge that these districts did vastly improve their robustness with regard to hacking and errors, and also allow for meticulous audits. We DO expect a few mishaps in the process of introducing these new machines, and we hope our report will help to further enhance accuracy.

"Auditing Elections Using Ballot Images and AuditEngine -- General Background" -- https://docs.google.com/document/d/18A1K8mXXHnhisLqBQigx0ibboz39FAh9hOSykcR-jT4/edit?usp=sharing

AuditEngine's efficacy has been demonstrated through various comprehensive case studies. Notable instances include examinations conducted in the 2020 Election within three Florida counties (Volusia, Collier, and Port St. Lucie)[1], as well as assessments conducted in Georgia (Fulton and Bartow County) and Wisconsin (Dane County)[2]. Additionally, AuditEngine has been leveraged in numerous other election scenarios.

It is important that we make clear that AuditEngine has robust capabilities to "read" the voter-verifiable text on ballot summary cards produced by BMD

[1] https://docs.google.com/document/d/1Jb5AegEfR2ddjbN5LYjVgrpZtHk19ooSnrb-90N5QTQ/edit?usp=sharing -- Case study, three FL Counties

[2] https://copswiki.org/Common/M1986 -- 2020 General Election Audit Reports for Bartow GA, Fulton GA and Dane WI

devices that primarily use barcodes to encode the vote. Although we recommend BMD devices only that produce full-face ballots with ovals that can be easily verified by the voter, or purely hand-marked ballots, which are guaranteed to be voter verified because the voter used their own hand to mark them, we can still read the ballot summary cards in our audits.

A distinct interest within New Jersey prompted an investigation into the three counties constituting the 3rd Congressional District. This particular focus was placed on Burlington, Mercer, and Monmouth counties. We express gratitude for the collaborative efforts that facilitated the retrieval of ballot images and available cast vote records for these counties.

Key Findings

Repeated Ballots Detected and Removed

AuditEngine detected 977 repeated ballot images (and cast vote records) in Monmouth County, which were originally treated as separate ballots. Please note that we were unaware of this issue when we started our analysis but AuditEngine was able to detect and diagnose it because AuditEngine compares all the images to find repeats. It will find situations where images are uploaded twice and they are digitally identical.

Monmouth County had been notified of a problem after certification and they had to conduct hand counts of affected contests. The Ocean Township school board results were incorrect and the outcome was flipped[3]. Other contests were hand-counted, and this provided us with a somewhat unique opportunity to compare our performance with these hand counts of complete contests. Without any adjudication, AuditEngine was within +/- 3 votes of the hand-counted totals. We believe our results may even be more accurate than the hand counts with respect to this error.

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3 https://www.njsba.org/news-publications/school-board-notes/february-7-2023-vol-xlvi-no-26/recount-wrong-candidate-was-certified-as-winner-of-ocean-township-board-of-education-seat/ -- "Recount: Wrong Candidate Was Certified as a Winner of Ocean Township Board of Education Seat"

Configuration Errors

Also, in Monmouth County, in addition to the repeated ballot error, AuditEngine discovered 3 contests that had configuration errors, such that the vote counts were incorrect. In the case of **Longbranch BOE**, the CVR (cast vote record) was off by +/- 500 votes for the candidates, while the final aggregated result was consistent with the result from AuditEngine.

The Monmouth County clerk explained that they had detected that this contest was incorrect due to a "printing error", and they hand-counted the ballots to create the aggregated result. There was no disclosure on the website about this issue, no hand count results were provided, as were the other contests that were affected by the repeated-ballot error. This contest was NOT affected by the 977 repeated ballot error. The ballots in Longbranch that were incorrect were bilingual (English-Spanish) ballots.

There were two other contests with inaccurate vote counts of nearly 100 votes in each. However, as these contests were not competitive, there was no change in the outcome. One of these was on bilingual ballots but the other was not. Thus, the claim that the reason was due to a printing error seems inaccurate as it is more likely a configuration error.

Possibly Incorrect Outcome in Mercer County

In Mercer County, the "Hamilton Township School Board" contest was shown by AuditEngine to have the third and fourth place finishers flipped, with Quaste winning the 3rd seat. We must take this result with a grain of salt because there were 6,372 incompletely indexed cast vote records (due to missing RecordIds) and 9,405 images missing compared with the official ballot counts. A news article documented that the initial results had Quaste in the lead and then ultimately McSheene won the 3rd seat See "Final Ballot Counts Flip Results of Hamilton Board of Education Race"[4] We believe that it is warranted to obtain the remainder of the ballot images to confirm this result.

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[4] https://www.tapinto.net/towns/hamilton-slash-robbinsville/sections/elections/articles/final-ballot-counts-flip-results-of-hamilton-board-of-education-race

Common Observations

Although these three counties all used Election Systems & Software (ES&S) and Dominion Voting Systems, which AuditEngine has already successfully processed many times, we found that there were many ballot formatting and data nuances in these counties which took additional time to accommodate, and required code development to do so was extensive. It underlines the fact that ballot image auditing can only be economically applied when we have consistent data and the counties constrain their process to limit the number of variations that must be accommodated. Once we have improved the code to handle a given variation, then we can likely handle it in the future without delay.

Unlike most jurisdictions in the country that tend to use portrait orientation ballots (narrow and tall), counties in NJ have historically used a landscape (wide and short) ballot format with a grid layout as it is similar to the DRE (Direct Recording Electronic AKA "touch screen") systems they recently or still do use. Burlington County still uses the *Sequoia AVC Advantage*[5] which has been studied and shown to have serious vulnerabilities[6]. These machines produce no ballot images for review, so in Burlington County, we were limited to processing only the mail-in ballots. Unfortunately, the results from Burlington County were not subtotaled to include only the mail-in ballots, and therefore, although we were able to independently tabulate these ballots, the results could not be compared, and since there are no auditable records from in-person voting, it was impossible to evaluate the consistency of this county.

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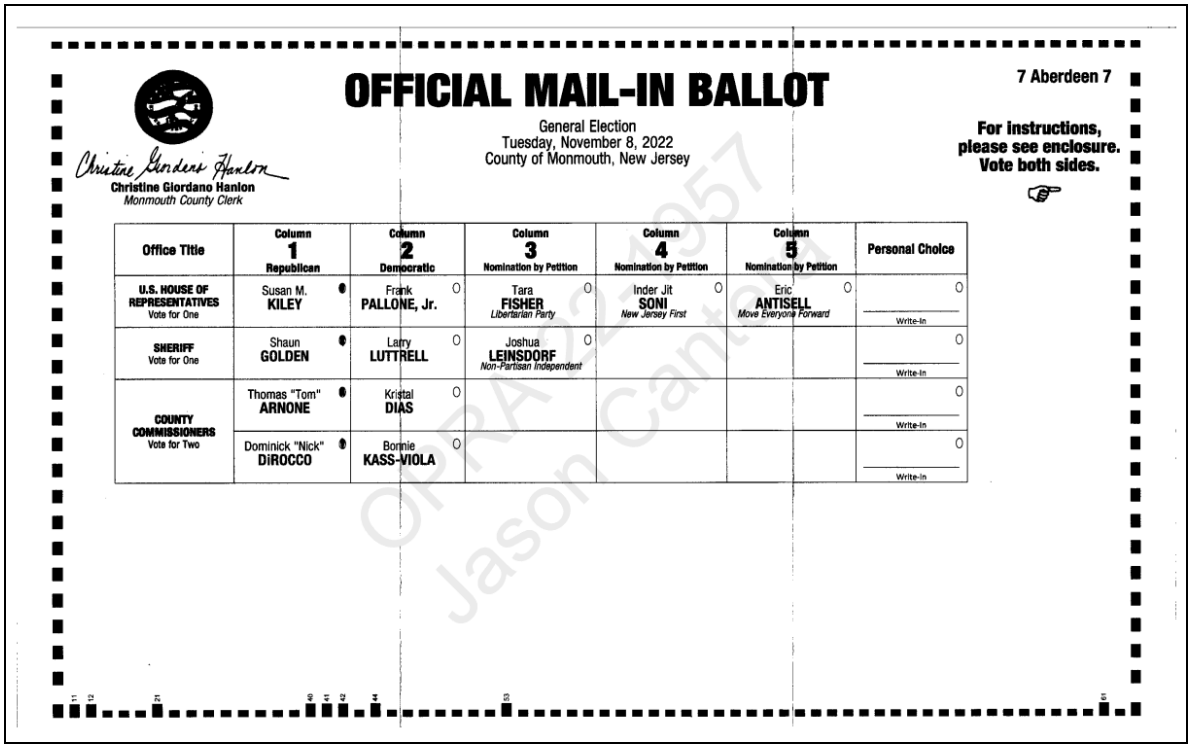
[5] https://verifiedvoting.org/election-system/sequoia-dominion-avc-advantage/

[6] https://verifiedvoting.org/wp-content/uploads/2020/08/appel_advantage_nj_lawsuit.pdf -- The New Jersey Voting-machine Lawsuit and the AVC Advantage DRE Voting Machine, Appel, Andrew, et al



OFFICIAL MAIL-IN BALLOT

7 Aberdeen 7

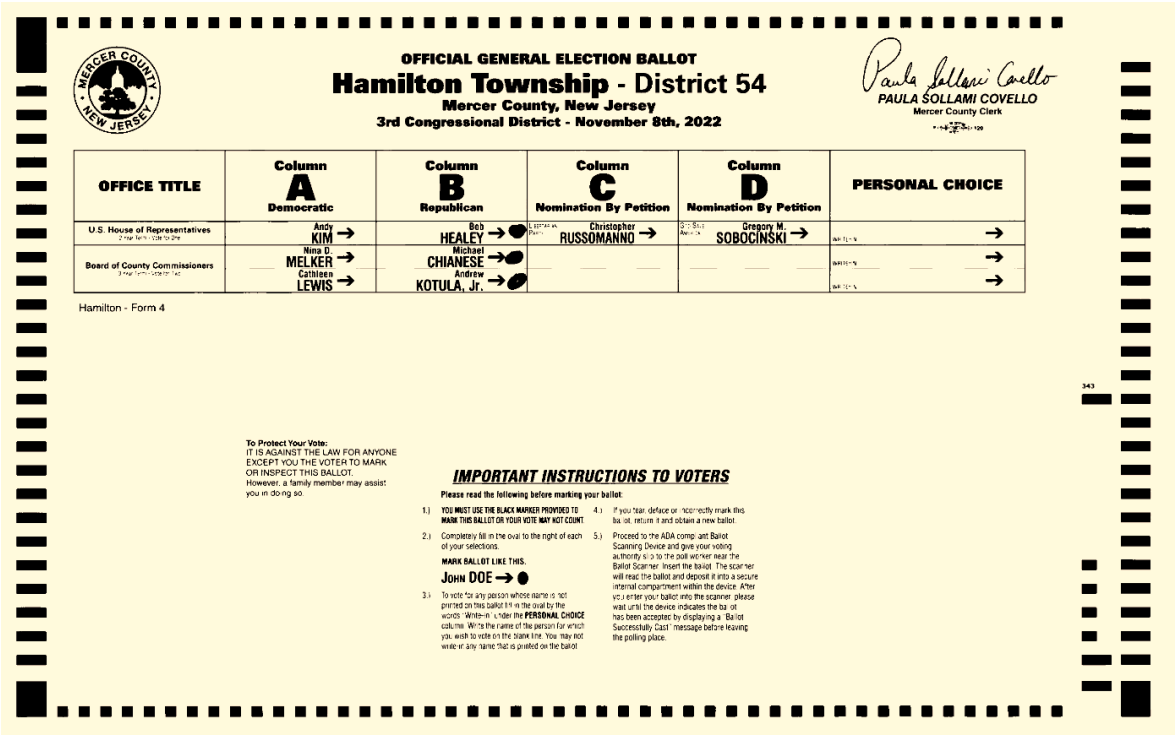
General Election
Tuesday, November 8, 2022
County of Monmouth, New Jersey

For instructions, please see enclosure. Vote both sides.

Christine Giordano Hanlon
Monmouth County Clerk

Office Title	Column 1 Republican	Column 2 Democratic	Column 3 Nomination by Petition	Column 4 Nomination by Petition	Column 5 Nomination by Petition	Personal Choice
U.S. HOUSE OF REPRESENTATIVES Vote for One	Susan M. **KILEY**	Frank **PALLONE, Jr.**	Tara **FISHER** *Libertarian Party*	Inder Jit **SONI** *New Jersey First*	Eric **ANTISELL** *Move Everyone Forward*	Write-In
SHERIFF Vote for One	Shaun **GOLDEN**	Larry **LUTTRELL**	Joshua **LEINSDORF** *Non-Partisan Independent*			Write-In
COUNTY COMMISSIONERS Vote for Two	Thomas "Tom" **ARNONE**	Kristal **DIAS**				Write-In
	Dominick "Nick" **DiROCCO**	Bonnie **KASS-VIOLA**				Write-In

Figure 1. Typical Mail-in Ballot (MIB) format used by Monmouth County (ES&S)



OFFICIAL GENERAL ELECTION BALLOT

Hamilton Township - District 54

Mercer County, New Jersey
3rd Congressional District - November 8th, 2022

PAULA SOLLAMI COVELLO
Mercer County Clerk

OFFICE TITLE	Column A Democratic	Column B Republican	Column C Nomination By Petition	Column D Nomination By Petition	PERSONAL CHOICE
U.S. House of Representatives	Andy **KIM** →	Bob **HEALEY** →	Christopher **RUSSOMANNO** →	Gregory M. **SOBOCINSKI** →	→
Board of County Commissioners	Nina D **MELKER** → Cathleen **LEWIS** →	Michael **CHIANESE** → Andrew **KOTULA, Jr.** →			→ →

Hamilton - Form 4

343

To Protect Your Vote:
IT IS AGAINST THE LAW FOR ANYONE EXCEPT YOU THE VOTER TO MARK OR INSPECT THIS BALLOT. However, a family member may assist you in doing so.

IMPORTANT INSTRUCTIONS TO VOTERS

Please read the following before marking your ballot:

1.) **YOU MUST USE THE BLACK MARKER PROVIDED TO MARK THIS BALLOT OR YOUR VOTE MAY NOT COUNT.**

2.) Completely fill in the oval to the right of each of your selections.

MARK BALLOT LIKE THIS.

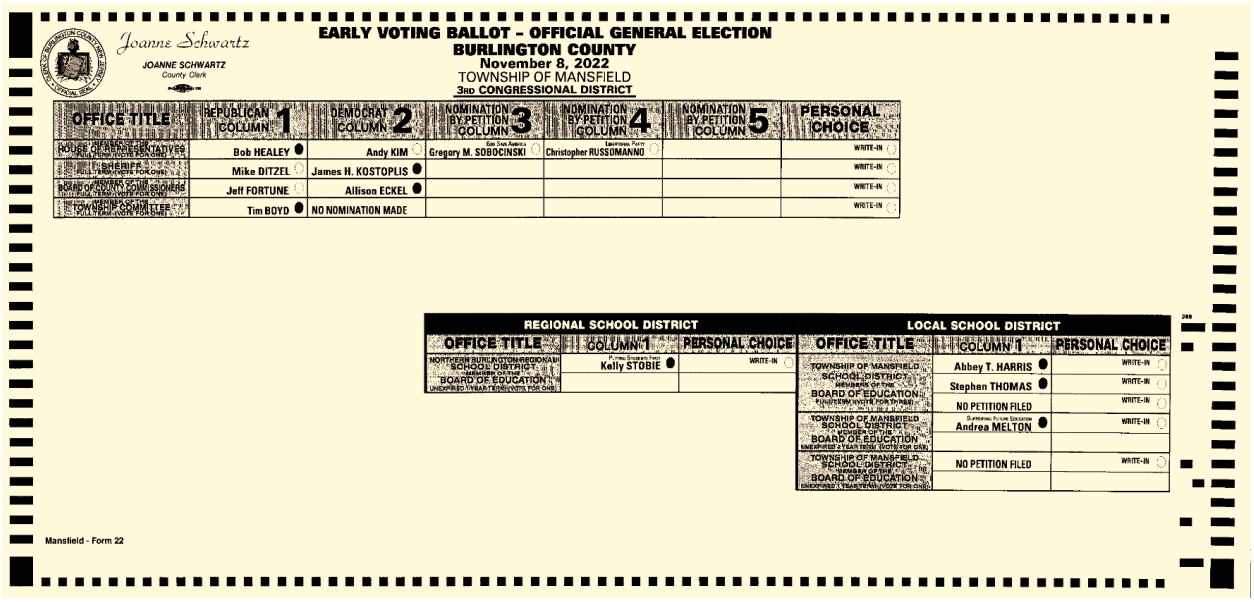
JOHN DOE → ●

3.) To vote for any person whose name is not printed on this ballot fill in the oval by the words "Write-In" under the **PERSONAL CHOICE** column. Write the name of the person for which you wish to vote on the blank line. You may not write in any name that is printed on the ballot.

4.) If you tear, deface or incorrectly mark this ballot, return it and obtain a new ballot.

5.) Proceed to the ADA compliant Ballot Scanning Device and give your voting authority slip to the poll worker near the Ballot Scanner. Insert the ballot. The scanner will read the ballot and deposit it into a secure internal compartment within the device. After you enter your ballot into the scanner, please wait until the device indicates the ballot has been accepted by displaying a "Ballot Successfully Cast" message before leaving the polling place.

Figure 2. Typical Ballot used in Mercer County (Dominion). This format was used both by in-person and MIB.



Joanne Schwartz
JOANNE SCHWARTZ
County Clerk

EARLY VOTING BALLOT – OFFICIAL GENERAL ELECTION
BURLINGTON COUNTY
November 8, 2022
TOWNSHIP OF MANSFIELD
3RD CONGRESSIONAL DISTRICT

OFFICE TITLE	REPUBLICAN COLUMN 1	DEMOCRAT COLUMN 2	NOMINATION BY PETITION COLUMN 3	NOMINATION BY PETITION COLUMN 4	NOMINATION BY PETITION COLUMN 5	PERSONAL CHOICE
REPRESENTATIVE IN CONGRESS (VOTE FOR ONE)	Bob HEALEY ●	Andy KIM ○	Gregory M. SOBOCINSKI ○ (Gun Owners for America)	Christopher RUSSOMANNO ○ (Libertarian Party)		WRITE-IN ○
LEGISLATIVE (VOTE FOR ONE)	Mike DITZEL ○	James H. KOSTOPLIS ●				WRITE-IN ○
BOARD OF COUNTY COMMISSIONERS (VOTE FOR NOT MORE THAN TWO)	Jeff FORTUNE ○	Allison ECKEL ●				WRITE-IN ○
TOWNSHIP COMMITTEE (VOTE FOR NOT MORE THAN TWO)	Tim BOYD ●	NO NOMINATION MADE				WRITE-IN ○

REGIONAL SCHOOL DISTRICT			LOCAL SCHOOL DISTRICT		
OFFICE TITLE	COLUMN 1	PERSONAL CHOICE	OFFICE TITLE	COLUMN 1	PERSONAL CHOICE
NORTHERN BURLINGTON REGIONAL SCHOOL DISTRICT MEMBER OF THE BOARD OF EDUCATION (UNEXPIRED 1 YEAR TERM) (VOTE FOR ONE)	Kelly STOBIE ● (Putting Students First)	WRITE-IN ○	TOWNSHIP OF MANSFIELD SCHOOL DISTRICT MEMBER OF THE BOARD OF EDUCATION (VOTE FOR NOT MORE THAN THREE)	Abbey T. HARRIS ●	WRITE-IN ○
				Stephen THOMAS ●	WRITE-IN ○
				NO PETITION FILED	WRITE-IN ○
			TOWNSHIP OF MANSFIELD SCHOOL DISTRICT MEMBER OF THE BOARD OF EDUCATION (UNEXPIRED 2 YEAR TERM) (VOTE FOR ONE)	Andrea MELTON ● (Common Sense Education)	WRITE-IN ○
			TOWNSHIP OF MANSFIELD SCHOOL DISTRICT MEMBER OF THE BOARD OF EDUCATION (UNEXPIRED 1 YEAR TERM) (VOTE FOR ONE)	NO PETITION FILED	WRITE-IN ○

Mansfield - Form 22

Figure 3. Typical Mail from Burlington County, NJ (Dominion)

Figure 4. Sequoia AVC Advantage DRE used for election-day voting in Burlington County, NJ. These produce no auditable records.

Although the outside frame of the ballots were the same as what we have processed in other counties, terms of timing marks and barcodes, the use of a landscape ballot layout adds another orientation question, as the ballots can be turned either way (CW or CCW), and the back may be oriented with a common top (flip on short edge) or a common left side (flip on long edge).

The ES&S ballots and Dominion ballots tended to have the front turned 90 degrees counter-clockwise. But ES&S tended to have the back oriented with a common left side (the top in portrait orientation) while Dominion tended to have the back oriented with a common top. The former approach by ES&S is superior because bleed-through is unlikely to be aligned with targets on the other side, whereas a common top orientation will result in targets being in the same column location on back and front unless they are actively staggered. Unfortunately, the orientation of back to front and whether the

front image was inverted to start with was not consistent, so any orientation was possible and had to be checked.

In general, we advise against the grid format and the landscape orientation due to these (and other) issues. We would like to see some research in terms of how many errors are made by voters using either format. However, it is clear that the electorate is used to this format, and so it does seem prudent to stick with the same format.

Monmouth County

Monmouth County is an extremely interesting case because AuditEngine was able to detect the repeated ballot uploading, remove the additional ballots, and produce accurate and consistent results with the hand-counts performed. In addition, AuditEngine detected three other contests with inaccurate vote counts, and fortunately, one of those contests was hand-counted by election staff to achieve results consistent with the results from AuditEngine. That contest was competitive and the outcome was incorrectly evaluated by the official Cast Vote Records.

Click the link below for the Final Report for Monmouth County, NJ. All other reports can be found from that page:
https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Monmouth_20221108/reports/Final_Report.html

Here are some of the issues we encountered when processing these ballot images.

1. Monmouth uses ES&S ExpressVoteXL machines for in-person voting (BMD -- ballot marking device) which produce images of a ballot summary card which has (linear code-128) barcodes at the top. The summary cards have a slightly different BMD layout than with regular ExpressVote machines which we had to accommodate.

   ExpressVoteXL is not widely used in the US, only in 19 counties presently in DE, NJ and PA. It also offers a landscape display to mimic the Sequoia machines being replaced.

Figure 5. ES&S ExpressVote XL BMD with attached ballot summary card printer (and reader).

2. The images of BMD summary cards have a longer image than ExpressVote machines and may be inverted in the file.
3. The barcodes on these ballots are the same Code128 barcodes as are used with ExpressVote ballots, but the code for each vote is not assigned the same way. ExpressVote barcodes are formed with the Row and Column numbers of the target on the corresponding nonBMD ballot. Here, they are assigned sequentially, according to the targets on the corresponding nonBMD ballot, but the assignment was not consistent and sometimes sequence numbers were skipped. Therefore, we could not predict the encoding of the barcodes.

   Although we don't rely on the barcodes, sometimes we may find it helpful to check our interpretation if the text portion is damaged in the image. Here, due to the way the barcodes were assigned in an unpredictable fashion, it was not feasible to use them in our audit in this manner. This only affects that rare case where reading the text is difficult. Without using the barcodes, we may have a few additional unprocessable ballots.

4. The headers on the BMD ballots were inconsistent, which is rare within a single county. We recommend that all headers are consistent.

5. For the nonBMD (absentee) ballots, ES&S normally provides:

    a. one PDF file for each ballot sheet, with two ballot images (front and back) in each PDF file.

    b. The name of that file matches the "Cast Vote Record" ballot number (ballot_id) in the cast vote record (CVR) spreadsheet file.

    c. All the PDF image files are combined into one or more ZIP archives.

    In this case, the ballot images were provided as follows:

    a. Large PDF files contain many pages of images (perhaps 10,000 images in each one), commonly with two images for each ballot but with the BMD ballots frequently having only one image of the front side.

    b. They used "bookmarks" in the PDF files for each ballot, to provide the same file name, if it were placed in its own PDF file. But one PDF file did not have any bookmarks at all and the correlation to the CVR records was determined by matching the order with the CVR.

    c. There were 53 such PDF archive files.

6. The text on hand-marked ballots is turned in a landscape orientation, although the data is always provided in portrait orientation. This is not difficult to determine the top of the front, due to the presence of a style indicating barcode along the left edge (in portrait orientation) but for ES&S, the back has no fiducial marks in the frame that indicates the orientation of the body. We were able to work around this by looking for "Vote on Both Sides" in several places to determine the orientation, as this moved around depending on available space. Because of this difficulty, we recommend that for any landscape formats, a fiducial mark is added in a consistent location on the back to help determine the rotation.

7. We learned later that Monmouth County accidentally read six flash drives into the Election Management System (EMS) twice. This means there are ballot images with different designations (ballot_id's) but with identical images. We have a stage in our processing which looks for identical images across all images, and we found 977 repeated images. This stage reports on these repeated images and withholds them from further processing so we can get accurate counts.

8. This issue was covered by the media, which they blamed on human error, but certainly, it should be impossible to read in the same thumbdrive twice because such an error is predictable. The fact that the software does not prevent double uploading is astounding. Here are a number of news reports, and reports generated after review of this issue was conducted by the state Attorney General:

    a. https://newjerseyglobe.com/campaigns/probe-blames-voting-machine-manufacturer-for-double-counting-votes-in-22-election/ -- Probe blames voting machine manufacturer for double-counting votes in '22 election -- David Wildstein

    b. https://newjerseyglobe.com/wp-content/uploads/2023/09/Monmouth-County-Investigation-Investigative-Facts-Report-8-31-2023-With-Exhibits.pdf -- Investigation Of The Vote Miscount In The Monmouth County November 2022 Election Investigative Findings -- Peter C. Harvey

    c. https://newjerseyglobe.com/wp-content/uploads/2023/09/Monmouth-County-Investigation-Policy-Recommendations-Report-8-31-2023.pdf -- Investigation Of The Vote Miscount In The Monmouth County November 2022 Election Policy Recommendations -- Peter C. Harvey

9. In Monmouth, we processed a total of 53 PDF files containing 232,197 sets of images of ballot sheets representing 194,494 BMD ballots and 36,628 nonBMD (hand marked) ballots. There were 74 more ballot images than cast vote records, and one more ballot claimed by the official results than cast vote records. 977 ballots were found to be repeated images. There were no repeated ballot id numbers (the

repeated sheets had different numbers). This is detailed in the Discrepancy Report[7] under "High Level Reconciliation".

10. In Monmouth County, there were 232,198 official ballots cast in 467 precincts, for a total of 148 contests. There were 466 ballot styles, mostly due to repeated layouts for each precinct. There were only 62 unique contest patterns on the ballots. There was no variation in the order of options (no rotation) in any contest.

11. AuditEngine recorded the 977 repeated ballots as "unprocessed". These were actually the repeated ballots (which we should probably improve our report to remove from this set). There were 506 "ballot variants" where the style code was unreadable or had other full-ballot concerns, not including the 977 repeated ballots. In this group are completely blank sheets, sheets which have corrupted images, and some where the CVR record is missing or is blank.

    The following figure shows an image with two of these problems. Here, the voter used large checkmarks over the name, but not intersecting the ovals, and so this ballot would be regarded as "blank" and would require human-eye review. But also, we see that the image is "stretched", which we then will kick out because any automatic processing is unreliable.

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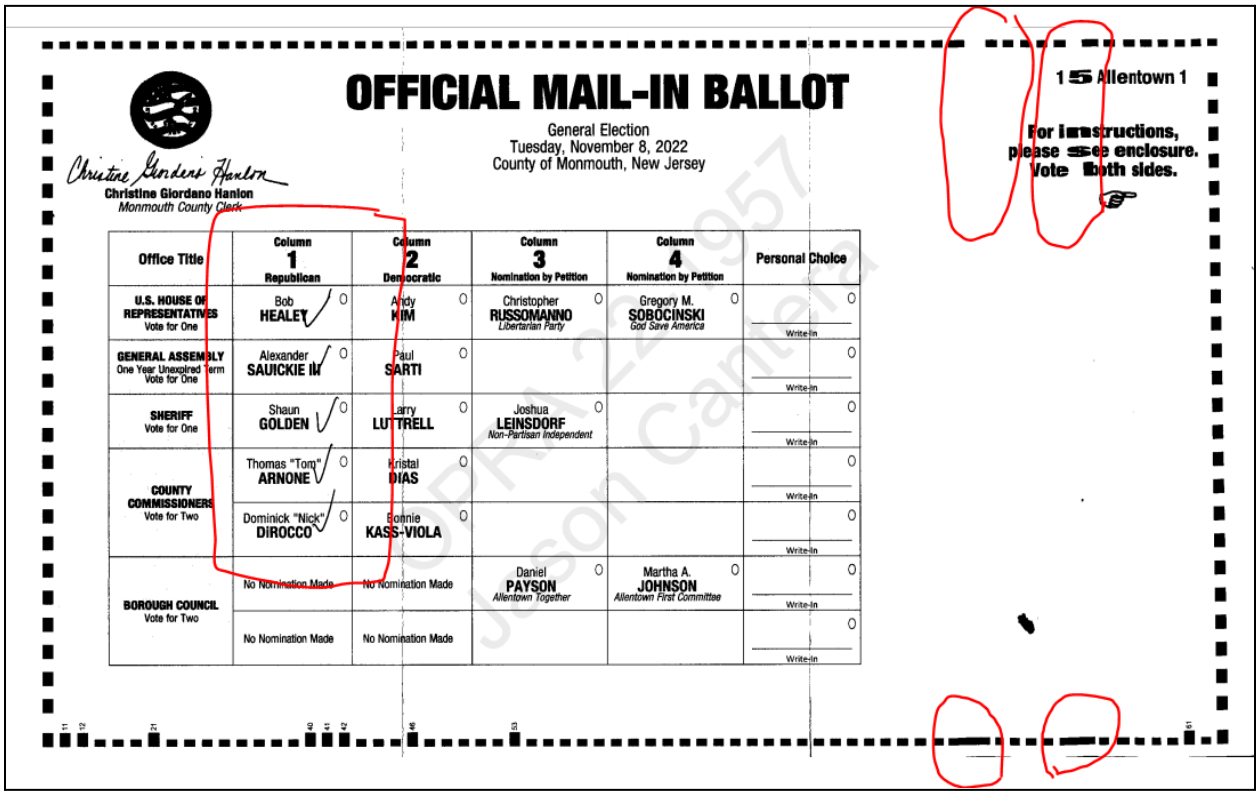
7 https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Monmouth_20221108/reports/Discrepancy_Report.html -- Discrepancy Report



OFFICIAL MAIL-IN BALLOT

General Election
Tuesday, November 8, 2022
County of Monmouth, New Jersey

15 Allentown 1

For instructions, please see enclosure. Vote both sides.

Christine Giordano Hanlon
Monmouth County Clerk

Office Title	Column 1 Republican	Column 2 Democratic	Column 3 Nomination by Petition	Column 4 Nomination by Petition	Personal Choice
U.S. HOUSE OF REPRESENTATIVES Vote for One	Bob HEALEY	Andy KIM	Christopher RUSSOMANNO Libertarian Party	Gregory M. SOBOCINSKI God Save America	Write-in
GENERAL ASSEMBLY One Year Unexpired Term Vote for One	Alexander SAUICKIE III	Paul SARTI			Write-in
SHERIFF Vote for One	Shaun GOLDEN	Larry LUTTRELL	Joshua LEINSDORF Non-Partisan Independent		Write-in
COUNTY COMMISSIONERS Vote for Two	Thomas "Tom" ARNONE	Kristal DIAS			Write-in
	Dominick "Nick" DIROCCO	Bonnie KASS-VIOLA			Write-in
BOROUGH COUNCIL Vote for Two	No Nomination Made	No Nomination Made	Daniel PAYSON Allentown Together	Martha A. JOHNSON Allentown First Committee	Write-in
	No Nomination Made	No Nomination Made			Write-in

12. There were 205,328 ballot sheets that compared exactly between AuditEngine and the official results, and had no other variations (such as write-ins, overvotes, or disagreements) which is 88.3% of all sheets.

13. In addition, there are 25,649 sheets with only one or a few contests marked as variants. These are the "Variants Removed Sheets".

14. Among the sheets that are completely nonvariant, and those that have the variant contests removed, there were 1,345,727 contests that completely agreed with the voting system result, leaving 28,998 contests considered "Contest Variants". Thus, 97.9% of contests are fully agreed and nonvariant.

15. Of the contest variants, there were 1,774 write-ins in contests on non-BMD ballots, and 9,729 write-ins on BMD ballots. There were 772 overvoted contests, and a relatively large number of "True Disagreements" of 16,723 contests.

16. ES&S does not provide records of, or -- to our knowledge -- any tools to adjudicate ballots using human-eye review. The CVR results from ES&S systems are typically only the machine interpretation and do not include any adjudications or adjustments by the election staff. For example, many of the variants detected by AuditEngine are write-ins, and these may or may not be considered write-ins once they are reviewed. Sometimes the write-ins are for listed candidates, and then it may also be initially considered an overvote, but after adjudication, this should be considered one vote for the listed candidate. In most instances, write-ins are for unqualified candidates and after adjudication would correctly be converted to an undervote.

17. AuditEngine was able to compare ballot-by-ballot with the official CVR results. In many cases, the disagreements were write-ins where the user wrote-in the name of a listed candidate. Interestingly, for BMD ballots, AuditEngine was frequently able to read this as a listed candidate and properly award the vote.

18. Turning to the contest breakdown, the most significant issues were found in the following contests. We also reviewed all ballots in close contests using our adjudication tool "AdjudiTally" to verify the marks.

    a. **Long Branch Boe / Mbe Local Vote 3 -S Long Branch BOE (4170)** There were 747 disagreements and a total of 1,145 variants, which is 276% and 424% of the margin of victory of only 270 votes. This is a vote-for 3 contest. This contest was not involved in the repeated ballot upload error, and yet the CVR results were significantly different. This was a misconfiguration error which was blamed on a printing mistake, and the contest was hand-counted, which produced results that were consistent with the result from AuditEngine. The hand-count was not reported, however, on the website of the county clerk. We believe all such failures and hand counts should be reported to the public.

b. **Freehold Br Boe / Mbe Local Vote 3 -S Freehold Br BOE (4066)** There were 152 disagreements and 380 variants. The outcome of this contest did not change and there were only two listed candidates in a vote-for 3 contest.

c. "Neptune Township Board of Education, Full Term (4267)" which is a vote-for 3 contest. Here, the third and fourth place finishers stayed in position with a constant 14-vote margin even though they both lost 5 ballots due to the repeated ballot incident.

d. "Township of Ocean Board of Education (4281)" which is a vote-for-3 contest also kept the 3rd and 4th place finishers in position but the margin went from 20 to 6 in the audit results. Here additional scrutiny would be appropriate. (This contest was hand counted and the outcome changed[8].)

e. "Hazlet Fire No.1 / Fire Commish Full V2 -M Hazlet Fire No. 1 (4447)" was also close with a margin of only 93. Both 3rd and 4th place finishers lost a vote in the audit results.

19. Hand count reports. Hand counts were performed and these have been captured in "manual_stdresults.json" for those contests that were completely hand counted. We did not attempt to process contests that were only partially hand counted, such as federal or county-wide contests. In these cases, the hand-counted reports are included in our discrepancy report for side-by-side comparisons.

    a. https://results.enr.clarityelections.com/NJ/Monmouth/116246/web.307039/#/summary

    b. https://www.monmouthcountyvotes.com/wp-content/uploads/2023/02/2022-11-08_OCEAN_BOE_REPORT_FINAL.pdf

    c. https://www.monmouthcountyvotes.com/wp-content/uploads/2023/02/2022-11-08_TINTONFALLS_PRE_CERT.pdf

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8 https://www.njsba.org/news-publications/school-board-notes/february-7-2023-vol-xlvi-no-26/recount-wrong-candidate-was-certified-as-winner-of-ocean-township-board-of-education-seat/ -- Recount: Wrong Candidate Was Certified as a Winner of Ocean Township Board of Education Seat

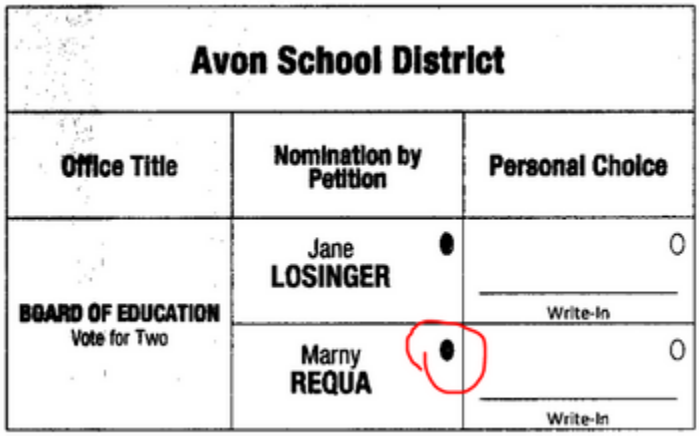
d. https://www.monmouthcountyvotes.com/wp-content/uploads/2023/02/2022-11-08_BELMAR_BOE_REPORT_FINAL.pdf

e. https://www.monmouthcountyvotes.com/wp-content/uploads/2023/02/2022-11-08_FAIRHAVEN_BOE_REPORT_FINAL.pdf

20. Unprocessed Ballots. There were 2 unprocessed ballots that had stretched images.

Located two more contests with mistakes by the voting system.

1. **Avon School District.** This is a vote-for 2 contest and there are only two candidates. Thus, it is uncontested and mistakes here will not change the outcome. In 94 cases, clear votes for Marny Requa were not properly registered. In this case, it was not a bilingual ballot. Here is an example.



Avon School District

Office Title	Nomination by Petition	Personal Choice
BOARD OF EDUCATION Vote for Two	Jane LOSINGER ●	0 _____ Write-In
	Marny REQUA ●	0 _____ Write-In

Marny Requa got a total of 572 votes according to AuditEngine but only 478 votes in CVR and official results. Down 94. Detail here:

https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Monmouth_20221108/reports/Discrepancy_Report.html#contest-avon-board-of-education-3951

See samples and pictures of the 94 ballots.

https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Monmouth_20221108/reports/Discrepancy_Report.html#contest-avon-board-of-education-3951-group-x_uv

2. **Freehold Br BOE** is bilingual with 107 mistakes.

Mercer County

Click the following link to access the Final Report for Mercer County, NJ. All other reports can be found from that page.

https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Mercer_20221108/reports/Final_Report.html

1. Mercer County uses Dominion Voting Systems equipment. The county also uses a landscape ballot format.
2. There were 100,140 ballots cast according to the official report, with 36 ballot image archives and 2 CVR files.
3. The images were sometimes supplied as RAR archives with internal zips and took some time to get organized.
4. One archive had ballot image names of the format TTTTT_BBBBB_NNNNNN_D.

   D always found to be 0. _D not normally used in most Dominion counties. We ignored the addl_digits when parsed. However, this last digit is sometimes used to denote the page number if there are two images for a single sheet.
5. In Tabulator01012.zip, found strange ballot image names:

   a. Tabulator01012/Batch016/Images/0110CB~1.TIF. Changed to 99999_00001_00001

   b. Tabulator01012/Batch016/Images/1582A~1.TIF. Changed to 99999_00001_00002

   If these ballots already exist, they will be removed in the repeated ballot image analysis.
6. **Incompletely Indexed CVR records**
   The CVR data was supplied in a flat CSV (character separated values) file and does not have a RecordId Column. When supplied, AuditEngine can use the ImprintedId to form the ballot_id number so it corresponds

with the ballot image identifier. But in some cases, the ImprintedId was not included, as shown here.

	A	B	C	D	E	F	G	
1	2022 Mercer General Election							
2	5.15.16.1							U.S. Hous
3								Andy KIM
4	TabulatorNum	BatchId	ImprintedId	CountingGroup	PrecinctPortion	BallotType	Count	Dem
10132	1003	86	1003-86-42	Vote by Mail	Princeton 20 (178)	Vote by Mail-Princeton 1	8	
10133	1003	86	1003-86-15	Vote by Mail	Princeton 20 (178)	Vote by Mail-Princeton 1	8	
10134	100	0		Early Voting	West Windsor 9 (250)	Early Voting-West Windsor 1	3	
10135	100	0		Early Voting	Robbinsville Twp 9 (190)	Early Voting-Robbinsville Twp 1	5	
10136	100	0		Early Voting	West Windsor 4 (245)	Early Voting-West Windsor 1	5	
10137	100	0		Early Voting	East Windsor 1 (1)	Early Voting-East Windsor 1	3	
10138	100	0		Early Voting	East Windsor 14 (14)	Early Voting-East Windsor 1	6	

For these records, we formed a ballot_id for internal use by using the Tabulator Num and BatchId as shown, and then used the record index of the CVR file for the RecordId. This provides a unique number because the records with missing ImprintedId and no RecordId were all in the same file.

Thus, the first ballot_id synthetically generated in this example would be 00100_00000_010134. But these synthetically generated ballot_id values cannot be indexed to the ballot images for comparison. There were 9,405 ballot_ids missing in this manner.

The zip files of images are apparently missing files.

	Mercer_20221108_FED_Tabulator00100.zip
	Mercer_20221108_EV_Tabulator00101.zip
	Mercer_20221108_EV_Tabulator00102.zip
	Mercer_20221108_EV_Tabulator00106.zip
	Mercer_20221108_EV_Tabulator00107.zip
	Mercer_20221108_EV_Tabulator00108.zip
	Mercer_20221108_EV_Tabulator00109.zip
	Mercer_20221108_EV_Tabulator00110.zip
	Mercer_20221108_EV_Tabulator00111.zip
	Mercer_20221108_EV_Tabulator00112.zip
	Mercer_20221108_EV_Tabulator00113.zip
	Mercer_20221108_EV_Tabulator00114.zip
	Mercer_20221108_EV_Tabulator00115.zip
	Mercer_20221108_EV_Tabulator00116.zip
	Mercer_20221108_EV_Tabulator00117.zip
	Mercer_20221108_EV_Tabulator00118.zip
	Mercer_20221108_EV_Tabulator00119.zip
	Mercer_20221108_EV_Tabulator00121.zip
	Mercer_20221108_EV_Tabulator00122.zip
	Mercer_20221108_EV_Tabulator00123.zip
	Mercer_20221108_EV_Tabulator00124.zip
	Mercer_20221108_EV_Tabulator00126.zip
	Mercer_20221108_VBM_Tabulator01000.zip
	Mercer_20221108_VBM_Tabulator01001.zip
	Mercer_20221108_VBM_Tabulator01002.zip
	Mercer_20221108_VBM_Tabulator01003.zip
	Mercer_20221108_PRV_Tabulator01005.zip
	Mercer_20221108_PRV_Tabulator01006.zip
	Mercer_20221108_PRV_Tabulator01007.zip
	Mercer_20221108_FEDM_Tabulator01010.zip
	Mercer_20221108_VBM_Tabulator01012.zip
	Mercer_20221108_ED_Tabulator10000.zip
	Mercer_20221108_ED_Tabulator10001.zip
	Mercer_20221108_ED_Tabulator10002.zip
	Mercer_20221108_ED_Tabulator10003.zip

7. **6,372 Missing Images.** The data we received from the county is missing 6,372 ballot images. There were 93,768 unique ballot_ids, 6,372 fewer than the published total of 100,140 ballots cast.

8. Some of the archives had to be converted from zipped RAR to just zipped, or RAR to zipped. We have to use the standard zip format. Please note there are gaps in the numbers, specifically, for

Tabulator 00103, 00104, 00105, 01004, 01008, 01009, 01011.

9. There was significant shortcomings in the data we were provided including:

    a. 570 repeated ballot ids. These ballots were not counted twice and their existence is not any indication that the outcome is incorrect. They are sometimes mistakenly placed twice in separate ZIP archives or are in a sub-folder within the same archive. The ballot Images are identical and the ballot_ids are as well.

    b. 9,405 cast vote records with no RecordId and no ImprintedId. These cannot be correlated with ballot images. The number of CVR records was correct when compared with the official result.

    c. 6,372 ballots were missing when compared with the official count. It appears that all of the 6,372 missing images are within the set of 9,405 CVR records without RecordIds (or ImprintedIds).

10. To help to get to the bottom of this issue, we added the "Tabulator Report" to the Metadata Report (BIF Report) and this was provided to stakeholders in the area. The many issues with this data helped us to improve our report for future use.

11. This county provided the "flat" CVR data as comma-separated values (CSV) files, and there were no additional adjudication records. Some of the CVR records are blank, perhaps due to damaged ballots. This is in contrast with other Dominion CVR records provided by recently installed voting systems, which use a JSON format and also may provide "modified" records that show when the ballots have been adjudicated and changed.

12. There were no BMD ballots.

13. There were 3,223 contests classified as "overvoted" and 5,411 overvotes, and 1157 "true disagreements".

14. In the contests, one of the most divergent contests according to the ballot images available was the "**Members of the Board of Education - Hamilton Township (Vote For=3)**"[9] The official results had the 3 winners as 'Stacy BYRNE', 'Dina THORNTON', and 'Jason McSHEENE' with a margin of victory between the 3rd and 4th place winners at 278 votes. The audit found the winners are most likely 'Stacy BYRNE', 'Dina THORNTON', and 'Monica QUASTE', with Quaste getting 68 more votes than McSheene. However, this is based on an incomplete set of ballot images (6,372 ballots missing). Yet, we see that the ballot images that we do have indicate a win for Quaste, and the difference is made up with the records we do not have, which means the win for McSheene may have been maliciously introduced using the records related to the missing ballot images and missing CVR records.

15. Dominion commonly does provide functionality to review ballot images and adjudicate the determination by the voting system to refine the results. When the CVR is provided in JSON format, Dominion may provide a second "modified" record for any given ballot sheet, which is the result of adjudication by staff. Despite having some limitations, this additional information is helpful in diagnosing problems.

    In this case, however, the CVR is in CSV format, and does not have any adjudication ("modified") record. Nevertheless, we note that the CVR has been modified from the initial machine interpretation based on review of overvotes by the election staff during an adjudication process.

    When AuditEngine detects an overvoted contest, it is marked as 1 overvote, no matter how many options are marked. This is the standard methodology. To be clear, if the contest is a vote-for 3 contest and the user votes for 10, it is still only one overvote (not 7 and not 10).

    However, this CVR reports 3 undervotes in this situation, which means that the overvote was reviewed by staff and they determined that the contest was not voted at all, and therefore is the same as 3 undervotes. This is a common procedural approach to making sure all the overvotes are reviewed, but it will result in what looks like a disagreement in the

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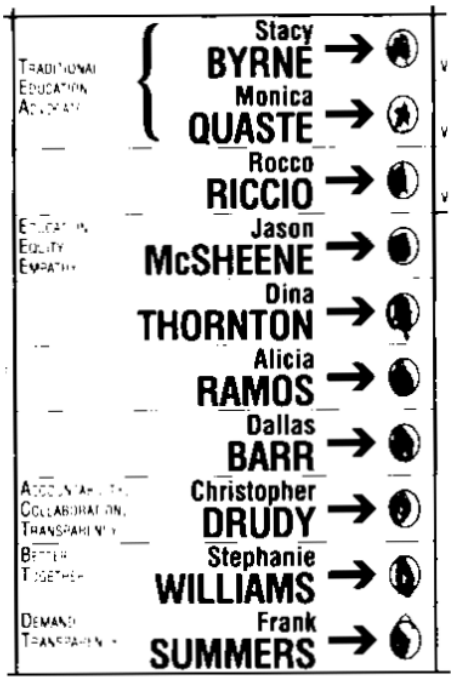
9 https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Mercer_20221108/reports/Discrepancy_Report.html#contest-members-of-the-board-of-education-hamilton-township-vote-for3

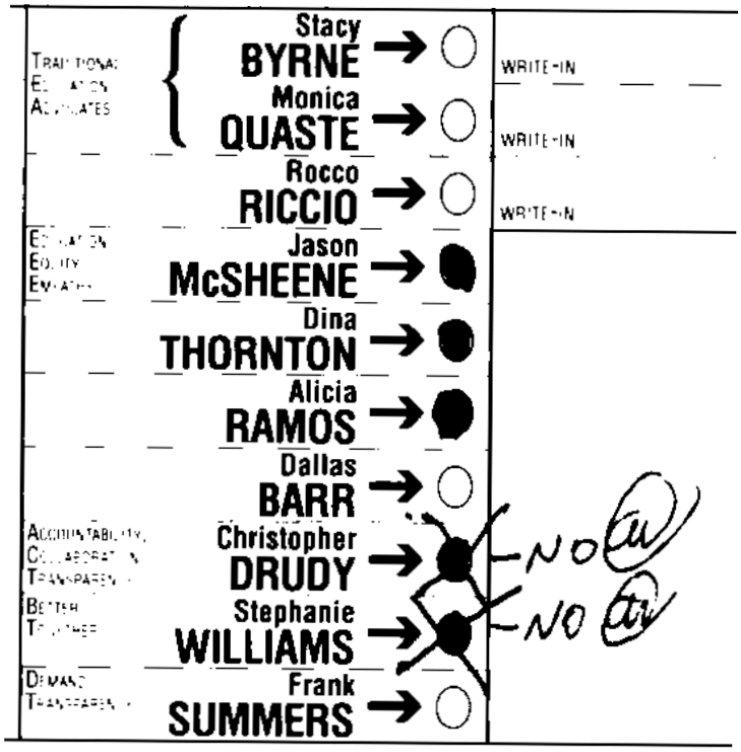
'ov_uv' category, where the audit system reports an overvote but the official results report undervotes, and it will appear that there are no overvotes and more undervotes in any statistical comparison.

For example, on ballot 01000_00017_000032, we see the following in this contest.

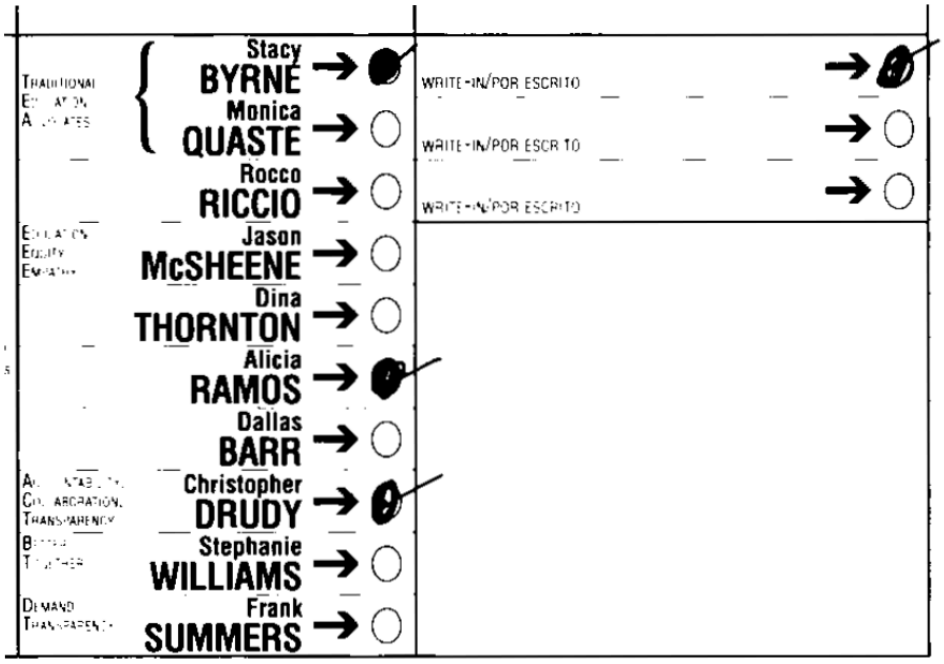


The voter voted for all 10 candidates in a "vote for 3" contest. Although this is obviously an overvote, it is recorded in the official CVR as three undervotes. This means that the CVR has been altered by election staff after they have reviewed the marks. We found this type of adjustment to all overvotes in a consistent way. That means that for overvotes, the CVR records are post-adjudication, and not pre-adjudication as they were in the Monmouth County case described earlier.

In the following figure, ballot 01000_00018_000036, is shown regarding Hamilton Township BOE. The CVR was correctly adjusted to give McSheene, Thornton, and Ramos the votes and disregarding the votes for Drudy and Williams. Although AuditEngine is configured to allow one cross-out in an overvoted situation, it does not attempt to consider two crossouts. This is marked by AuditEngine as an overvote and it would need additional human-eye review to refine the result.

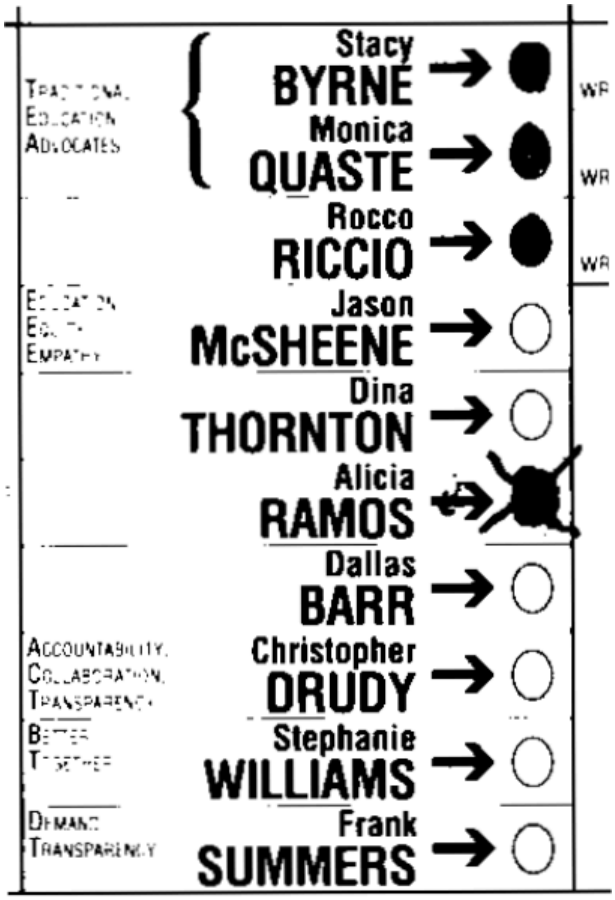


Below, 4 ovals are marked and yet there is no name actually written-in. So AuditEngine initially considered this an overvote, and it would be adjusted in adjudication with our AdjudiTally app. The voting system results reported this as three votes for the three listed candidates. But this depends on state law how this is interpreted. If you vote a write-in oval and leave it blank, in many states, if there is no recount, then it stands as an overvote.

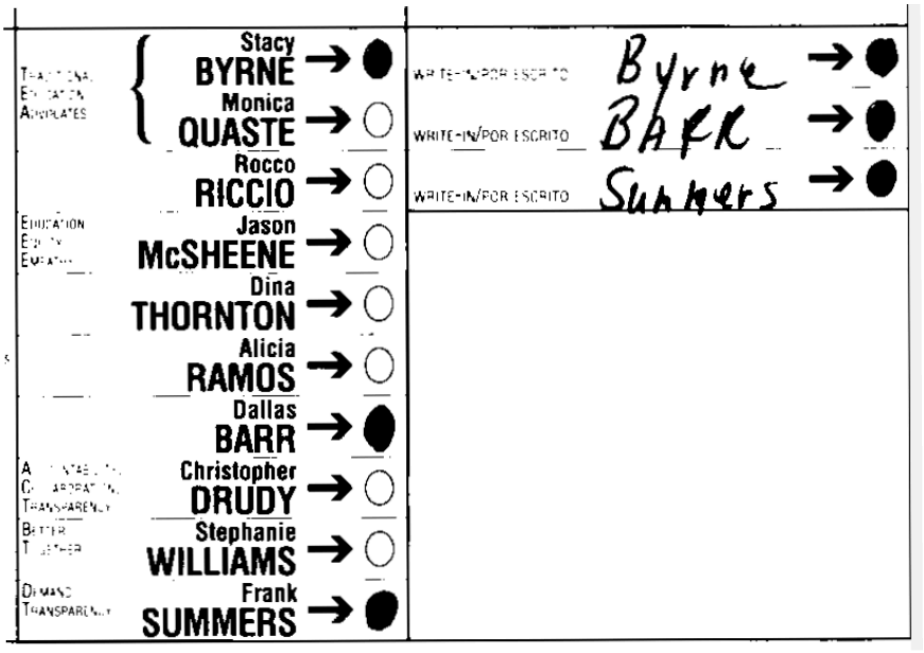


The ballot in the figure below, 01001_00046_000043, has a cross-out that was correctly adjudicated in the CVR but AuditEngine treated it as an overvote. If we spent a little more time with AuditEngine fine tuning the heuristics for these bubbles, then it would likely be able to automatically treat this single cross-out overvote as votes for the non-crossed out candidates. As it stands, this would be marked as an overvote by AuditEngine and would be reviewed in additional

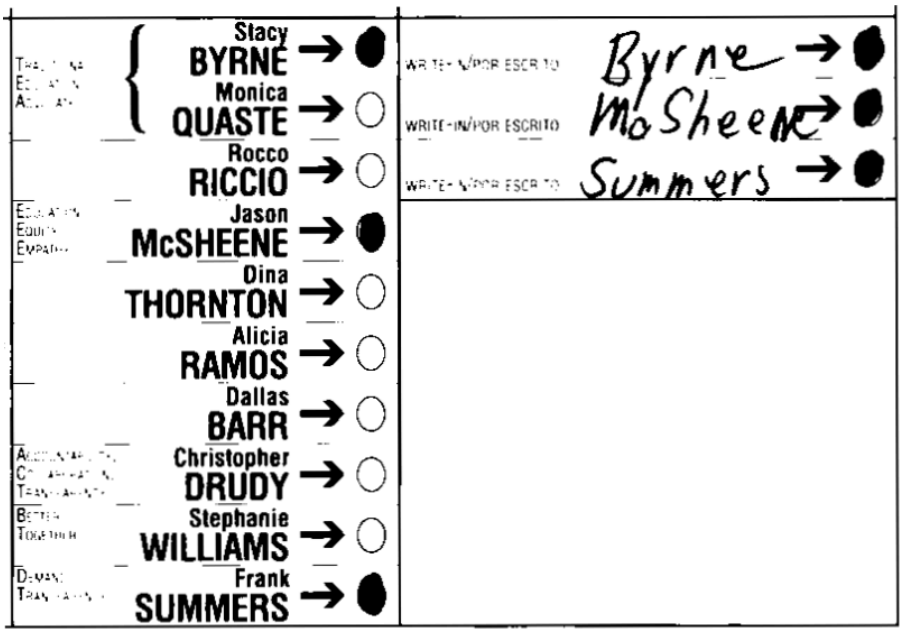
human-eye review in close contests using our AdjudiTally app.



The following example, ballot 01003_00020_000001 shows a fairly common case where the voter wrote in the three listed candidates that they also voted for. This is regarded as an overvote by AuditEngine and would need additional human-eye review. Here the election staff correctly adjusted the CVR as one vote for each of the listed candidates.

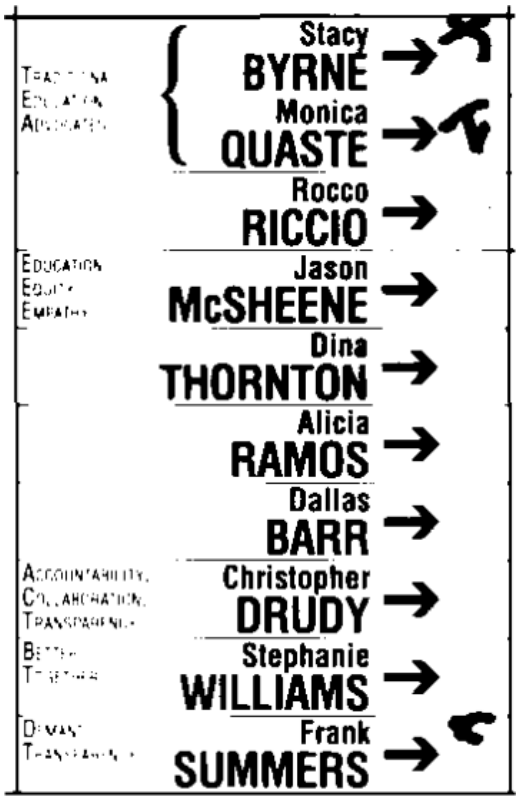


This next ballot has the next number in sequence, and the written-in printing seems suspiciously like the one above. We just find this to be fascinating.

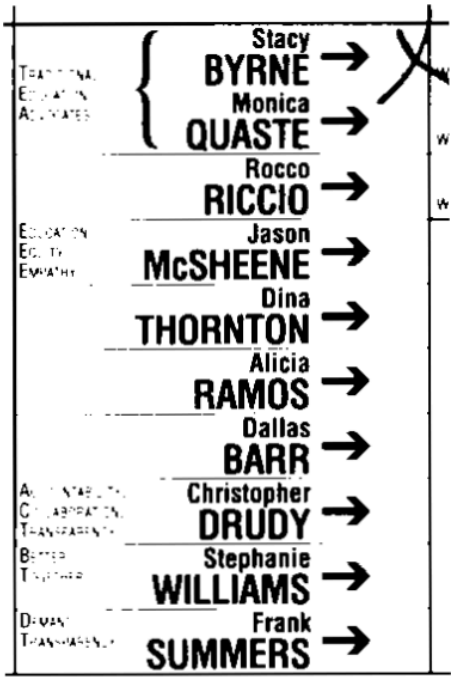


In the following case, ballot 10000_00001_000103, there are clearly three votes and yet the official result in the CVR only reports one, a vote for

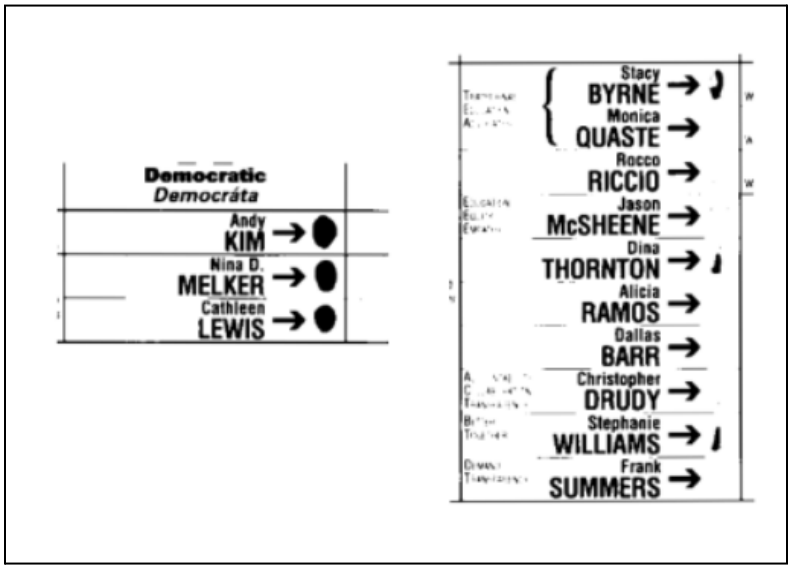
Quaste. AuditEngine awarded a vote for Byrne, Quaste and Summers. This illustrates that frequently, AuditEngine will do a better job than the voting system, particularly with undervotes or marginal marks. Also, we should note that this was not adjudicated by the election staff or they would have corrected the CVR in this case. Here, having both AuditEngine and the voting system both interpret the ballots can locate those ballots that need additional scrutiny. AuditEngine correctly interpreted this ballot because it considers a slightly larger evaluation area than just the oval, for this case where the voter had trouble marking Stacy Byrne and Frank Summers inside the oval.



In the following example, we see an example of an undervote that is clearly intended to be a vote. Undervotes are commonly never reviewed by election staff, and this one was not, but AuditEngine is configured to largely find these and award them appropriately.



Ballot 01006_00022_000019 is suspicious because the marks on the back are quite unlike those on the front. Because of this difference, it was flagged by AuditEngine for further review, but the CVR was correct.



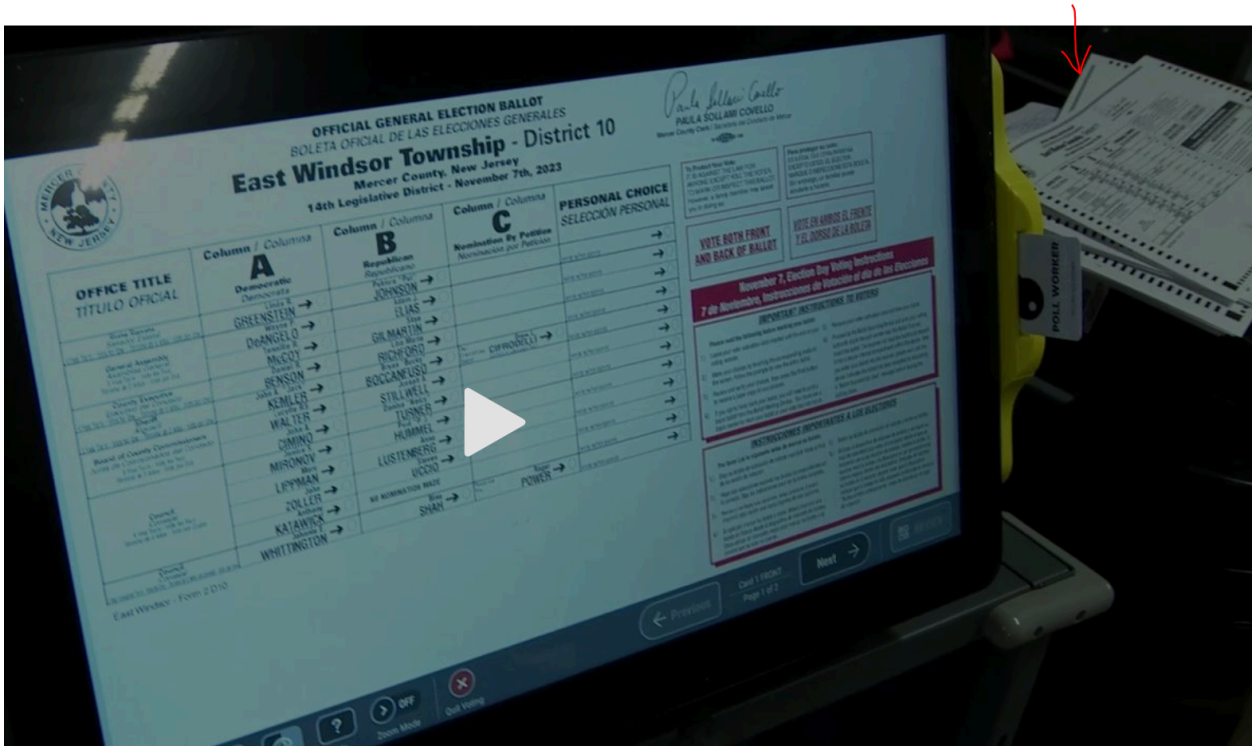


Figure X: New BMD voting system purchased by Mercer County with full-face ballots printed for easy voter verification (no barcodes).

Burlington County

The Burlington County Final Report is at this location:
https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Burlington_20221108/reports/Final_Report.html

Discrepancy Report:
https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Burlington_20221108/reports/Discrepancy_Report.html

1. Burlington still predominantly uses *Sequoia "AVC Advantage" DRE* (AKA "touch screen") machines for in-person voting[10]. These provide no paper audit trail and thus no ballot images, and remote hacks have been demonstrated. It should be a high priority in NJ to retire these old machines. (It appears they plan to use them again in 2024).

[10] https://verifiedvoting.org/election-system/sequoia-dominion-avc-advantage/

2. In the November 2022 election, there were 167,067 ballots cast with 124 contests and 460 styles.
3. Absentee ballots are hand-marked and they use Dominion Voting Systems ImageCast for these ballots. These images were available.
4. No cast vote records were provided but the Dominion System they used does create CVR records. This is a violation of record-keeping laws for federal elections where all election data must be preserved for 22 months.
5. Audit engine processed a total of 51,798 ballot images. There were 115,269 ballot images "missing" because none were produced by the Sequoia AVC Advantage DRE machines.
6. There were no repeated ballot_ids and no repeated images.
7. Dominion has a barcode on each side of the sheet, so it was possible to be certain of the orientation of these landscape ballots without looking at the content of the ballot.
8. There were no BMD ballot images.
9. All ballots only had one side.
10. Because we had no CVR, we were unable to compare ballot to ballot to find discrepancies. Since we are missing so many ballots and without the CVR, this type of audit is almost worthless unless we can get a listing of the results that are limited to only the ballots we are able to study. But if we find some issues there, then it does not mean it is significant enough to affect the outcome. Unfortunately, most reports do not subtotal them this way.
11. The most important step Burlington County can take is to retire the Sequoia AVC Advantage DRE machines that have no paper trail and replace them with better machines that will make ballot images. All counties should create and save ballot images and also Cast Vote Records (CVRs). Since they are already using Dominion Voting Systems for their absentee and early voting, this would be an obvious choice.

Summary and conclusion

The election data from these three counties diverged from other data we have processed, even though they are from the two leading vendors, ES&S and Dominion. This is due to the use of ExpressvoteXL machines and landscape ballot format in a grid, rather than columns on a portrait oriented page.

Only Monmouth had a complete set of records, including repeated images due to the upload of a thumb drive more than once. We were able to detect these ballots and pull them out of the ballot image and CVR data, and locate the contests that should receive more scrutiny.

Burlington could be refined perhaps by comparing the absentee ballot images that we did process with the results for only for these same set of absentee ballots. But unfortunately, we don't have data broken down in that fashion. If we have only the results for all ballots, they cannot be easily compared. And without the CVR, we cannot compare ballot-to-ballot. Thus, we can't validate Burlington one way or the other. As an urgent matter, Burlington should retire the unauditable touch-screen machines and move to paper-based systems, and then keep ballot images and CVR data so the elections can be checked by a third party.

Both Mercer County and Monmouth County have contests that were detected by AuditEngine as likely incorrect outcomes. In the case of Monmouth, this was also detected by the election staff, and as a result they hand counted that contest, and confirmed the problem. But we find that other contests should also be hand counted due to the inaccurate results and a determination made as to the reason for the inaccurate results.

In Mercer County, we recommend that they hand count the contest "Members of the Board of Education - Hamilton Township (Vote For=3)" to verify or confirm the issue. As we are missing a large number of ballot images and CVR records, we cannot say for certain what the outcome may be. A full hand count of the paper ballots can determine if there was any malicious manipulation of the results based on the records that are missing from our review.

We appreciated this opportunity to work with this data and the extended time provided, and particularly the help given by Greg Sobocinski and his campaign. Our work in this case helped us to be able to handle this data in the future.

Appendix 1:

Communication with County of Monmouth

Available at this URL: https://copswiki.org/Common/M2000

Ray Lutz, Executive Director
CitizensOversight, Inc.
raylutz@citizensoversight.org
619-820-5321

August 25, 2023

County Clerk Christine Giordano Hanlon, Esq.
Deputy of Elections Judith D. Ricci
Location: 300 Halls Mill Road, Freehold NJ 07728
Phone: 732.431.7790
E-mail: ClerkOfElections@co.monmouth.nj.us

Dear Christine Giordano Hanlon:

I hope this message finds you well. I am writing to provide you with a concise overview of the results from our recent ballot image audit using our ballot-image auditing solution, AuditEngine. AuditEngine processes ballot images generated by your voting equipment, conducting an independent tally that is subsequently compared to Cast-Vote Records on a ballot-by-ballot basis.

We were approached by members of the public to conduct a "public oversight" audit encompassing your county, as well as Mercer and Burlington counties in NJ. This presented a unique challenge as we encountered the need to adapt to the specific ballot format utilized in your elections, specifically the ExpressVote XL ballots and landscape grid layout. After updating our code accordingly, we successfully executed an independent audit.

The significance of our audit was underscored by an incident involving the double-uploading of a thumb drive, resulting in the replication of 977 ballot images and associated cast vote records. While we acknowledge that such occurrences can potentially be attributed to human errors, we also recognize the importance of the integrity of the election management system itself. Our analysis revealed that this incident was more aligned with a system-level issue within the ES&S election management system, as it should inherently prevent such instances of double uploading.

However, I would like to draw your attention to a specific anomalous case that merits further discussion. While the final reported results for the contest in question were consistent with the result captured by analyzing images, our examination revealed a discrepancy in the corresponding cast-vote record. We believe that a collaborative discussion on this case could shed light on the underlying factors contributing to this fascinating difference.

However, we have one unusual case we would like to further discuss with you. In this unusual case, your ultimate reported results for the contest were correct, but the cast-vote record was not.

Upon conducting a comprehensive review, we identified inconsistencies within the contest labeled as **'Long Branch Boe / Mbe Local Vote 3 -S Long Branch BOE (4170)'**

This specific contest displayed significant disparities among the Cast-Vote Record (CVR), the Audit results, and the "Official Results." (Note, this is a "Vote for 3" contest.)

1. This election used ES&S ExpressVote XL for in-person voting and used central scanning for mail ballots. There were 231,220 ballots cast after repeated ballots were removed.

2. Aggregated results were provided in the file "summary.csv" from the Monmouth County website. We understand that these aggregated results were posted prior to completion of the hand counts. In some of our reports, we call these aggregated results as "Official Results".

3. There were 977 repeated ballot images in the image data and corresponding records in the CVR. The aggregated results included

these additional repeated ballots. We understand that these repeated ballots occurred because one thumb drive was loaded twice to the EMS, resulting in 977 additional repeated ballot images and CVR records. (Note that because we have the digital images, we are able to detect repeated images and we now routinely do so.)

4. Using ballot image data, we were able to find all the repeats and mark 977 repeated ballots to be skipped, while keeping the first 977 ballot images.

5. For those contests involved in the repeated ballot error, those that were smaller contests were hand-counted in full, whereas county-wide contests were partially counted. Hand counting was performed by the Monmouth County election office.

6. The contest of interest here, 'Long Branch Boe / Mbe Local Vote 3 -S Long Branch BOE (4170)', was not involved in the repeated ballot error, and it was not (to our knowledge) hand-counted, as there were no hand-counting results published to the Monmouth County website.

7. The contest "Long Branch Boe / Mbe Local Vote 3 -S Long Branch BOE (4170)" was flagged in our contest review. In this comparison, we compare each ballot image, as interpreted by our software, with the cast-vote record (CVR) as provided in the data provided. The high-level comparison results are summarized in this table:

Total	Agreed & NonVariant	Agreed Overvotes	Agreed Write-ins	No CVR	Gray Only	Disagreed	All Variants	Disagreed% of Margin	Variant% of Margin	Vote Margin	Margin%
5,919	4,775	20	6	0	127	747	1,144	276.67%	423.70%	270	2.61%

8. Of the total of 5921 ballots involved in the contest

    a. 2 were left out of this comparison because they were not fully extracted by our software. However, this has been corrected and they are now included. If the total is 5919 above, then they were not included in this summary. These 2 ballots were both BMD ballots and they were not involved in this inconsistency.

b. 4,775 were classified as Agreed and NonVariant, meaning that the AuditEngine audit result completely agreed on those ballots with the result as listed in the CVR, and in addition, those ballots had no overvotes, writeins, or gray flags. With the two ballots initially not interpreted, this number will be 4,777.

c. The balance, 1,144, were classified as "All Variants", including 20 agreed overvotes, 6 agreed writeins, 127 gray flags, and most importantly, 747 were classified as disagreed.

d. This disagreed count is 276% of the official margin of victory of 270 votes (2.61%). Since this is a vote-for 3 contest, the margin of interest is between the 3rd and 4th place finisher. Therefore, this issue is of concern as it may alter the outcome.

9. The overall contest summary is shown below.
The CVR lists Caroline BENNETT as the overall leader with 2030 votes, followed by Thresa DANGLER with 2,000 votes, and then Rick Garlipp with 1607 votes. The CVR listing can be seen in the leftmost column in the right table.

   AuditEngine and the aggregated results agree that Theresa DANGLER received 2410 votes, Rick Garlipp received 1896 votes, and Avery Grant took third place with 1588 votes.

Contest: Long Branch Boe / Mbe Local Vote 3 -S Long Branch BOE (4170)

parameter	CVR	Diff	Audit	Diff	Official Results
overvotes	1	19	20	-20	0
undervotes	7,415	-961	6,454	-6454	0
num_ballots	5,921	-2	5,919	7	5,926
writeins	73	0	73	6	79
tot_votes	10,345	898	11,243	12	11,255
margin	270		95		99
winners	['Caroline BENNETT (246)', 'Theresa DANGLER (242)', 'Rick GARLIPP (243)']		['Theresa DANGLER (242)', 'Rick GARLIPP (243)', 'Avery W. GRANT (245)']		['Theresa DANGLER (242)', 'Rick GARLIPP (243)', 'Avery W. GRANT (245)']

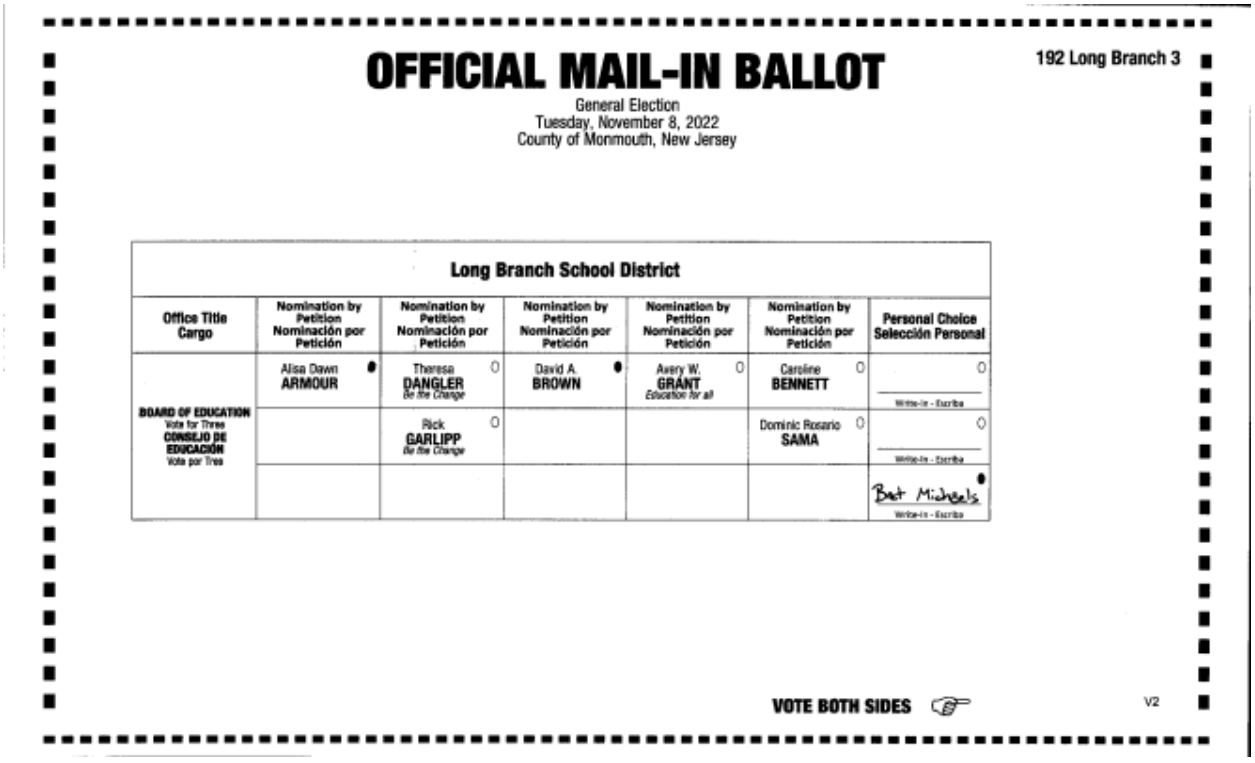
option	CVR	Diff	Audit	Diff	Official Results	CVR share
Caroline BENNETT (246)	2,030	-538	1,492	-3	1,489	19.6%
Theresa DANGLER (242)	2,000	409	2,409	1	2,410	19.3%
Rick GARLIPP (243)	1,607	289	1,896	0	1,896	15.5%
David A. BROWN (244)	1,337	23	1,360	4	1,364	12.9%
Avery W. GRANT (245)	1,272	315	1,587	1	1,588	12.3%
Alisa Dawn ARMOUR (241)	1,170	222	1,392	1	1,393	11.3%
NP5 Dominic Rosario SAMA (247)	856	178	1,034	2	1,036	8.3%

10. The entire discrepancy report for this contest can be viewed at this URL. It may have had some minor updates since this letter. https://us-east-1-audit-engine-jobs.s3.amazonaws.com/US/NJ/US_NJ_Monmouth_20221108/reports/Discrepancy_Report.html#contest-long-branch-boe-mbe-local-vote-3-s-long-branch-boe-4170

11. Many of the 747 disagreed ballots were carefully reviewed, including manual review of the raw data provided by the county and not relying on AuditEngine to provide the images or data. These were all consistent with the report in AuditEngine.

12. A number of ballots will be reviewed in examples here.
Ballot #7263, when reviewed by AuditEngine resolved votes for Alisa Dawn ARMOUR, David A. BROWN, and one writein. Total votes were 3.

    When viewing the image, that corresponds to the actual vote shown in the image. The write-in is apparently for Bret Michaels.



OFFICIAL MAIL-IN BALLOT

192 Long Branch 3

General Election
Tuesday, November 8, 2022
County of Monmouth, New Jersey

Long Branch School District

Office Title / Cargo	Nomination by Petition Nominación por Petición	Nomination by Petition Nominación por Petición	Nomination by Petition Nominación por Petición	Nomination by Petition Nominación por Petición	Nomination by Petition Nominación por Petición	Personal Choice Selección Personal
BOARD OF EDUCATION Vote for Three / CONSEJO DE EDUCACIÓN Vote por Tres	Alisa Dawn ARMOUR ●	Theresa DANGLER Be the Change ○	David A. BROWN ●	Avery W. GRANT Education for all ○	Caroline BENNETT ○	○ Write-in - Escriba
		Rick GARLIPP Be the Change ○			Dominic Rosario SAMA ○	○ Write-in - Escriba
						Bret Michaels ● Write-in - Escriba

VOTE BOTH SIDES

V2

The CVR shows a vote for Caroline BENNETT (246) and David A. BROWN (244), and one undervote.

To confirm the CVR matches our report, we looked at the original CVR file as posted by the Monmouth County Elections Dept.

The CVR record for this ballots is in the first CVR file. In this case, we will pull this record directly out of the .xlsx file to show correspondence with the record provided in the AuditEngine report. As you see, the CVR lists David A. BROWN and Caroline BENNETT, and one undervote.

Cast Vote Record	Loch Arbour Board of Ed	Long Branch Boe / Mbe	Local Vote 3 -S Long Branch BOE (4170)	M
7261		Caroline BENNETT (246	undervote	undervote
7262		Caroline BENNETT (246	undervote	undervote
7263		David A. BROWN (244)	Caroline BENNETT (246)	undervote
7264		Caroline BENNETT (246	undervote	undervote

13. The original CVR record agrees with the report of that record by AuditEngine, and it differs from the actual vote.

14. In fact, as we look at the set of ballots that are contiguous in the CVR, we see ballots from 7224 to 7300 (inclusive -- 77 ballots) that are all unusual in the fact that there are only three vote patterns:

    a. most are votes for "Caroline BENNETT" with two undervotes,

    b. then second most prevalent are all undervotes,

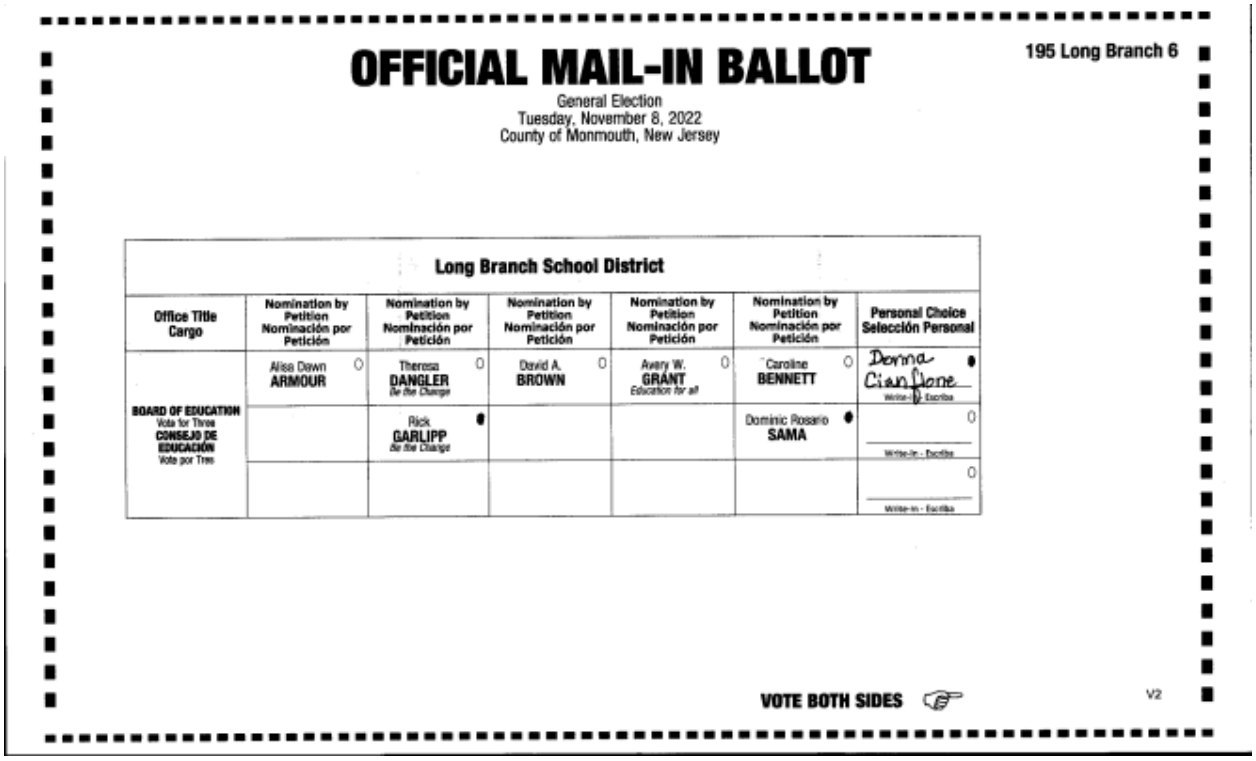
    c. and the rest are votes for "David A. BROWN" and "Caroline BENNETT"

7223				
7224		Caroline BENNETT (246)	undervote	undervote
7225		Caroline BENNETT (246)	undervote	undervote
7226		Caroline BENNETT (246)	undervote	undervote
7227		David A. BROWN (244)	Caroline BENNETT (246)	undervote
7228		Caroline BENNETT (246)	undervote	undervote
7229		undervote	undervote	undervote
7230		undervote	undervote	undervote
7231		David A. BROWN (244)	Caroline BENNETT (246)	undervote
7232		undervote	undervote	undervote
7233		undervote	undervote	undervote
7234		Caroline BENNETT (246)	undervote	undervote
7235		Caroline BENNETT (246)	undervote	undervote
7236		Caroline BENNETT (246)	undervote	undervote
7237		Caroline BENNETT (246)	undervote	undervote
7238		undervote	undervote	undervote
7239		Caroline BENNETT (246)	undervote	undervote
7240		Caroline BENNETT (246)	undervote	undervote
7241		undervote	undervote	undervote
7242		Caroline BENNETT (246)	undervote	undervote
7243		Caroline BENNETT (246)	undervote	undervote
7244		Caroline BENNETT (246)	undervote	undervote
7245		Caroline BENNETT (246)	undervote	undervote
7246		Caroline BENNETT (246)	undervote	undervote
7247		Caroline BENNETT (246)	undervote	undervote
7248		David A. BROWN (244)	Caroline BENNETT (246)	undervote
7249		undervote	undervote	undervote
7250		Caroline BENNETT (246)	undervote	undervote
7251		undervote	undervote	undervote
7252		undervote	undervote	undervote
7253		David A. BROWN (244)	Caroline BENNETT (246)	undervote
7254		Caroline BENNETT (246)	undervote	undervote
7255		Caroline BENNETT (246)	undervote	undervote
7256		Caroline BENNETT (246)	undervote	undervote
7257		Caroline BENNETT (246)	undervote	undervote
7258		Caroline BENNETT (246)	undervote	undervote

whereas, the sample below shows a more typical pattern which has much more variation:

d	Loch Arbour Board of Ed	Long Branch Boe / Mbe Local Vote 3 -S Long Branch BOE (4170)			Manalapan -
32898					
32899		Alisa Dawn ARMOUR (24	Theresa DANGLER (242)	Rick GARLIPP (243)	
32900		undervote	undervote	undervote	
32901		undervote	undervote	undervote	
32902		Theresa DANGLER (242)	Caroline BENNETT (246)	NP5 Dominic Rosario SAMA (247)	
32903					
32904		Alisa Dawn ARMOUR (24	David A. BROWN (244)	Avery W. GRANT (245)	
32905		Theresa DANGLER (242)	David A. BROWN (244)	Avery W. GRANT (245)	
32906					
32907		undervote	undervote	undervote	
32908		Alisa Dawn ARMOUR (24	Avery W. GRANT (245)	NP5 Dominic Rosario SAMA (247)	
32909		Rick GARLIPP (243)	NP5 Dominic Rosario SAMA	undervote	
32910		Theresa DANGLER (242)	Rick GARLIPP (243)	undervote	
32911					
32912		Theresa DANGLER (242)	David A. BROWN (244)	NP5 Dominic Rosario SAMA (247)	
32913		Alisa Dawn ARMOUR (24	Avery W. GRANT (245)	NP5 Dominic Rosario SAMA (247)	
32914					
32915		Alisa Dawn ARMOUR (24	Theresa DANGLER (242)	Rick GARLIPP (243)	
32916		Alisa Dawn ARMOUR (24	Theresa DANGLER (242)	Rick GARLIPP (243)	
32917		Theresa DANGLER (242)	Rick GARLIPP (243)	Caroline BENNETT (246)	
32918		Theresa DANGLER (242)	Rick GARLIPP (243)	Avery W. GRANT (245)	
32919					
32920		David A. BROWN (244)	Caroline BENNETT (246)	NP5 Dominic Rosario SAMA (247)	
32921		Alisa Dawn ARMOUR (24	Caroline BENNETT (246)	undervote	
32922		Alisa Dawn ARMOUR (24	Theresa DANGLER (242)	Caroline BENNETT (246)	
32923		undervote	undervote	undervote	
32924		Theresa DANGLER (242)	Rick GARLIPP (243)	Avery W. GRANT (245)	
32925		Avery W. GRANT (245)	Caroline BENNETT (246)	NP5 Dominic Rosario SAMA (247)	
32926		Theresa DANGLER (242)	Rick GARLIPP (243)	Avery W. GRANT (245)	
32927					
32928					
32929		Theresa DANGLER (242)	Avery W. GRANT (245)	Caroline BENNETT (246)	
32930		Alisa Dawn ARMOUR (24	Theresa DANGLER (242)	Caroline BENNETT (246)	
32931		Alisa Dawn ARMOUR (24	Theresa DANGLER (242)	Caroline BENNETT (246)	
32932		undervote	undervote	undervote	
32933		Theresa DANGLER (242)	Caroline BENNETT (246)	NP5 Dominic Rosario SAMA (247)	
32934		undervote	undervote	undervote	
32935					

15. **Ballot 7942**. CVR lists one vote for Caroline BENNETT. AuditEngine interpreted that votes were cast for Dominic Rosario SAMA, Rick GARLIPP, and one write-in.



OFFICIAL MAIL-IN BALLOT

195 Long Branch 6

General Election
Tuesday, November 8, 2022
County of Monmouth, New Jersey

Long Branch School District

Office Title / Cargo	Nomination by Petition / Nominación por Petición	Nomination by Petition / Nominación por Petición	Nomination by Petition / Nominación por Petición	Nomination by Petition / Nominación por Petición	Nomination by Petition / Nominación por Petición	Personal Choice / Selección Personal
BOARD OF EDUCATION Vote for Three / CONSEJO DE EDUCACIÓN Vote por Tres	Alisa Dawn ARMOUR	Theresa DANGLER *Be the Change*	David A. BROWN	Avery W. GRANT *Education for all*	Caroline BENNETT	Donna Cianfione (Write-In / Escriba)
		Rick GARLIPP *Be the Change*			Dominic Rosario SAMA	(Write-In / Escriba)
						(Write-In / Escriba)

VOTE BOTH SIDES

V2

Property	Audit	CVR
num_ballots	1	1
overvotes	0	0
tot_votes	3	1
undervotes	0	2
writeins	1	0
Alisa Dawn ARMOUR (241)	{'vote': 0, 'PMV': '158', 'IND': 'N'}	{'vote': 0}
Avery W. GRANT (245)	{'vote': 0, 'PMV': '174', 'IND': 'N'}	{'vote': 0}
Caroline BENNETT (246)	{'vote': 0, 'PMV': '177', 'IND': 'N'}	{'vote': 1}
David A. BROWN (244)	{'vote': 0, 'PMV': '169', 'IND': 'N'}	{'vote': 0}
NP5 Dominic Rosario SAMA (247)	{'vote': 1, 'PMV': '434', 'IND': 'D'}	{'vote': 0}
Rick GARLIPP (243)	{'vote': 1, 'PMV': '433', 'IND': 'D'}	{'vote': 0}
Theresa DANGLER (242)	{'vote': 0, 'PMV': '158', 'IND': 'N'}	{'vote': 0}

16. This pattern is roughly consistent throughout the 747 disagreed ballots. The strange thing is that your final aggregated results of this contest from the file "summary.csv" were consistent with the results from AuditEngine and yet differed from the Cast Vote Records you provided.

17. We have seen similar situations from ES&S where the aggregated results may differ from the Cast Vote Records. However, this normally occurs only when there is an issue with uploading the data from flash memory. In Volusia County, in our audit of the 2020 General Election, we found that the CVR and image data would differ from the aggregated results in two situations: 1) if the system was reset, which cleared the aggregated results but not the CVR nor the ballot images, or 2) if no thumb drive was uploaded but they used the modemed-in aggregated results. We also noticed that in New York, they left some data in memory from the LAT, resulting in a difference in the CVR and the aggregated totals as well.

    In these cases, the CVR and the ballot images matched, but they differed from the aggregated totals.

18. Here, however, the aggregated totals match the ballot images but differ from the CVR.

19. The ballots that differ in this contest in this situation are all nonBMD ballots, that apparently were scanned centrally. It is conceivable that this one contest configuration in that central-count scanner was incorrect, resulting in the faulty CVR data. However, we don't understand how the CVR data can be wrong in this way, and yet the aggregated data is still valid.

If you would be so kind, please answer the following questions so we can understand this issue:

1. Were you aware of this inconsistency between the CVR data for this contest and the aggregated result?

2. Can you explain how the aggregated totals were correct, even though the CVR was incorrect?

3. Did you do anything to compensate for the incorrect CVR data, such as re-running these ballots, or performing an additional hand-count?
4. We could not find any statement as to how the repeated ballots were initially detected. Do you have any information about how the thumbdrive double loading was initially detected?

Thank you for your kind assistance in this matter.

Sincerely,

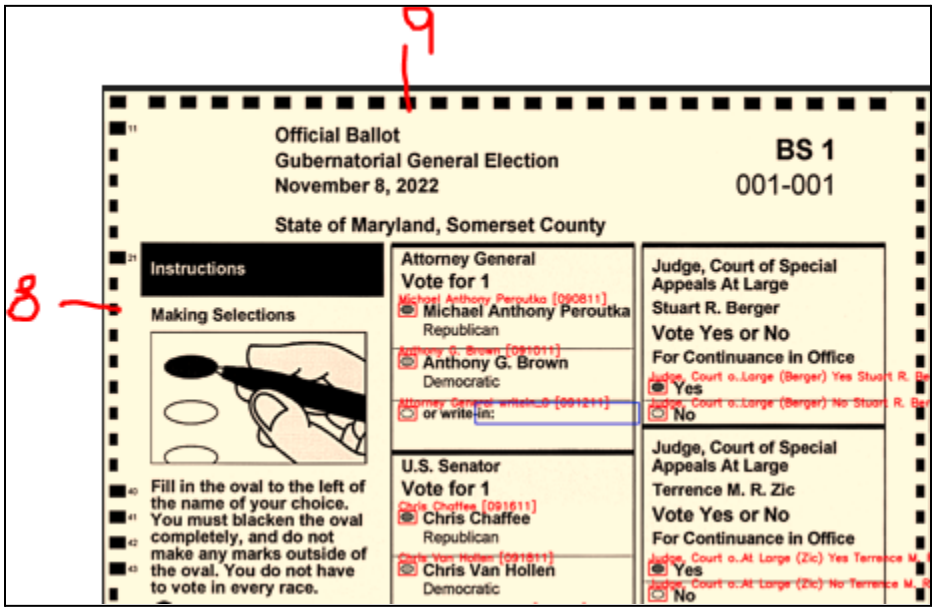
Ray Lutz

Executive Director, Citizens Oversight.

Appendix

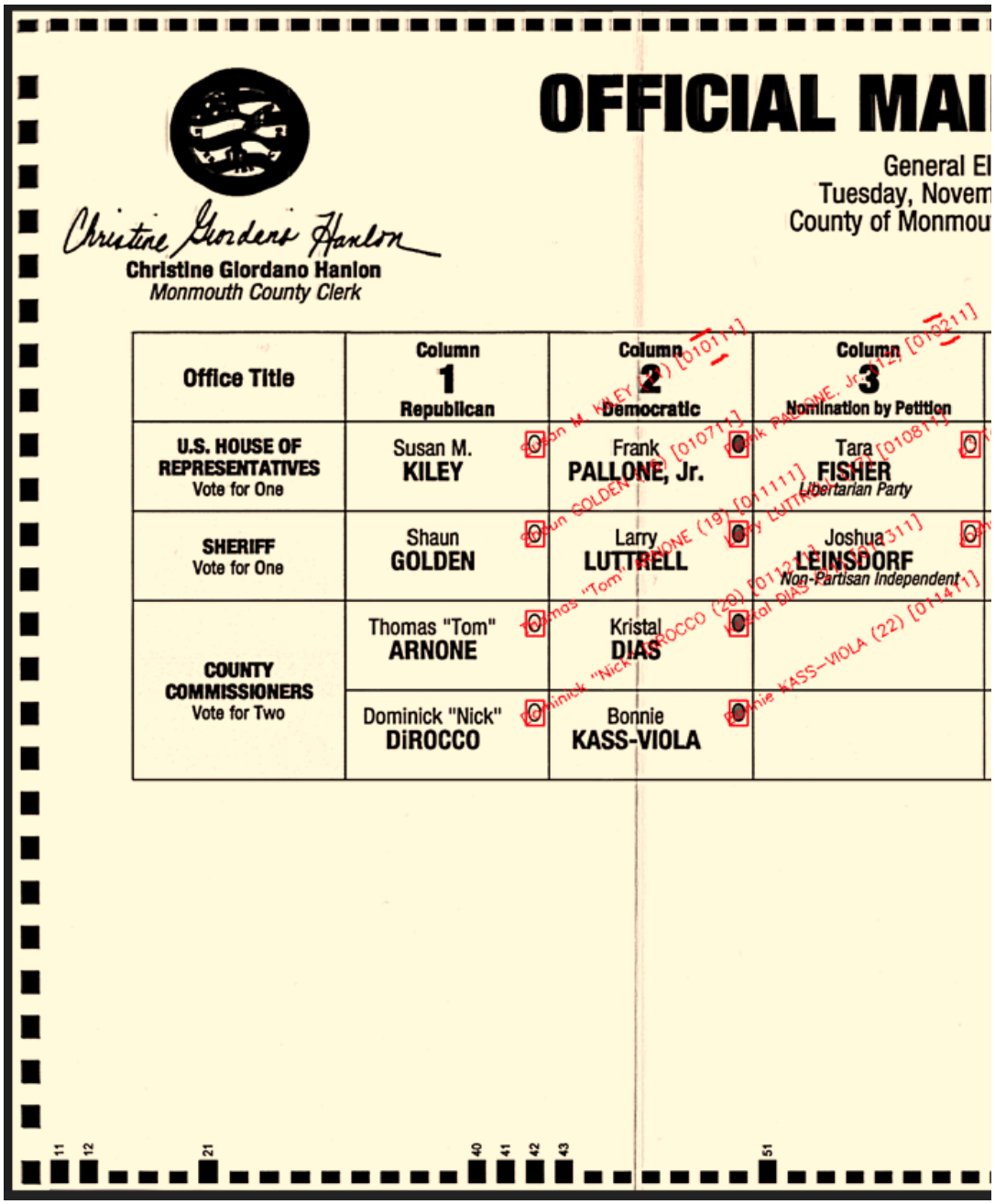
Barcodes in ExpressVote XL are not encoded like ExpressVote ballots are.

1. **Normal ES&S BMD ballots** use code-128 barcodes that are 6 digits, with the first two digits and second two digits being the column and row coordinates of the target for that option on the nonBMD ballot of the same style, and the 5th and 6th digits being the page and sheet numbers. For example, the target for "Michael Anthony Peroutka" will be expressed in the barcode as "090811" meaning the 9th timing mark from the left and the eighth one down, not including the corner mark. The 11 at the end means page 1 and sheet 1. For ovals on the back, these will be 21.



2. **ExpressVote XL uses a sequential method.** They use the same 6 digits, but the first two digits are always 01. The next two digits are the sequence of the oval on the ballot sheet, in the order from top-left to lower right, staying within each contest until it is fully assigned, and

running vertically first, and front to back of the sheet. See the following example:



OFFICIAL MAI

General El
Tuesday, Novem
County of Monmou

Christine Giordano Hanlon
Monmouth County Clerk

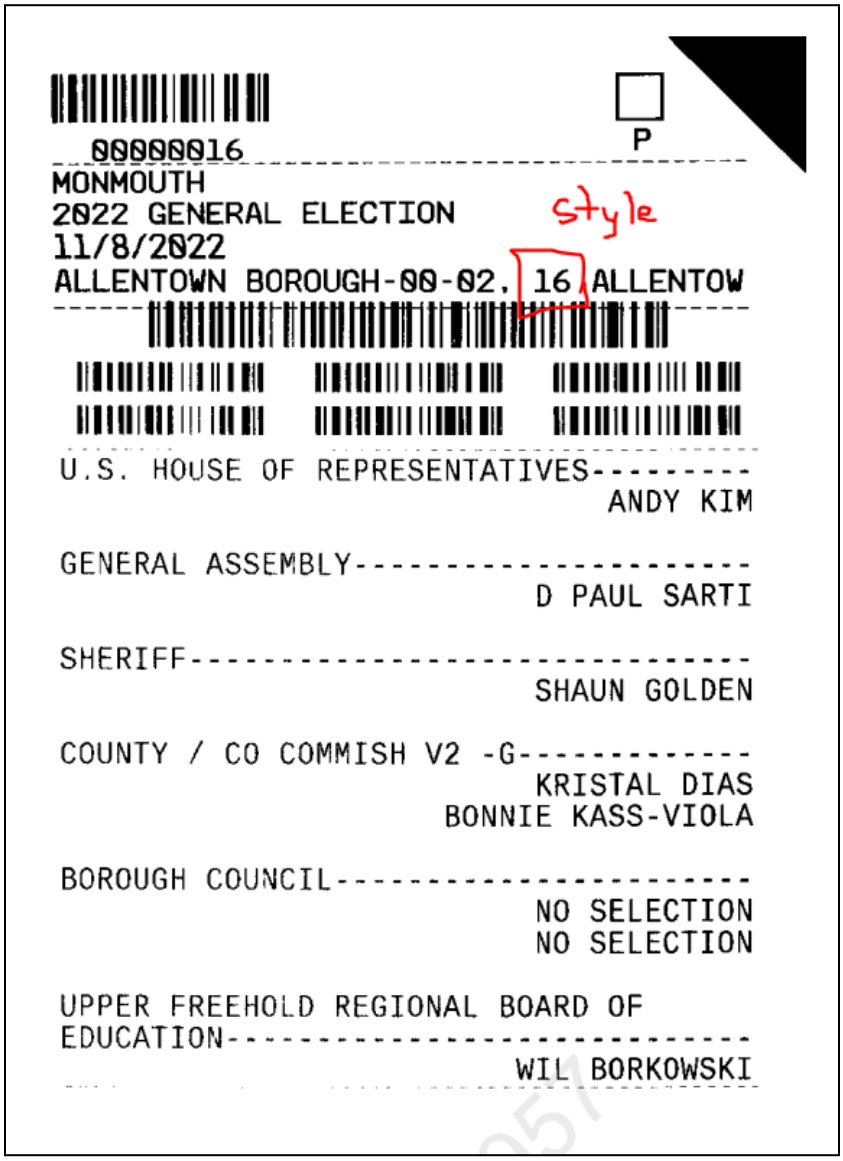
Office Title	Column 1 Republican	Column 2 Democratic	Column 3 Nomination by Petition
U.S. HOUSE OF REPRESENTATIVES Vote for One	Susan M. KILEY	Frank PALLONE, Jr.	Tara FISHER (Libertarian Party)
SHERIFF Vote for One	Shaun GOLDEN	Larry LUTTRELL	Joshua LEINSDORF (Non-Partisan Independent)
COUNTY COMMISSIONERS Vote for Two	Thomas "Tom" ARNONE	Kristal DIAS	
	Dominick "Nick" DiROCCO	Bonnie KASS-VIOLA	

Susan M. Kiley is assigned the code 010111 because it is the first one on the ballot. If it was encoded like ExpressVote (not XL), then it would be 161711. The second option on the ballot is considered Frank Pallone Jr, because it is the

next one in this contest, and is assigned the code 010211. Notice that Thomas "Tom" Arnone is assigned 011111 because it is oval number 11 on the page. And the option BELOW it, Dominick "Nick" DiRocco is considered next at 011211.

We find that sometimes the assignments are NOT in the expected order, as one will be skipped. Thus, it is not possible to predict the assignment of these sequential numbers.

Here is an example of skipped barcode assignments:

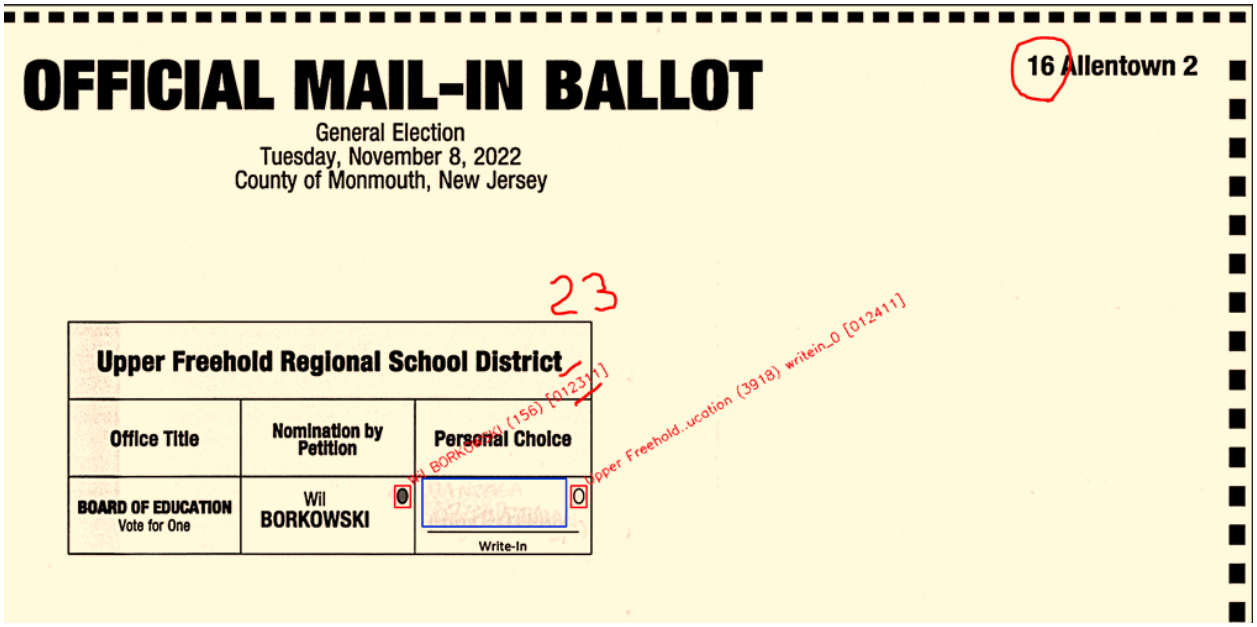


The last item on the ballot is a vote for Wil Borkowski.

Here are the converted barcodes, with 012711 being the code for Wil Borkowski.

idx	code_str	raw_data	x	y	w	h	rot	type
0	00000016	b'00000016'	34	41	218	50	0	CODE128
1	00000073010000540688000000600	b'00000073010000540688000000600'	138	287	543	42	0	CODE128
2	010211	b'010211'	60	352	186	29	0	CODE128
3	010911	b'010911'	317	352	186	30	0	CODE128
4	011511	b'011511'	573	352	186	30	0	CODE128
5	011611	b'011611'	60	399	187	28	0	CODE128
6	012711	b'012711'	317	399	186	30	0	CODE128
7	010711	b'010711'	573	399	186	30	0	CODE128

This is style 16. Here is the mapping for the back of this ballot.



There are only 24 ovals on this ballot and the barcode for Wil Borkowski is predicted by the sequential assignment algorithm that normally works would be 012311. However, it is actually encoded as 012711. Perhaps at one time, there were 4 other ovals included and they were deleted, because there is a skip of 4 in the sequence.

We can also note that although these ovals occur on the back, the last two digits are not 21 as they would be in the prior col/row assignment. Also, unlike the ExpressVote, which always has the barcodes in order, the ExpressVote XL does not order them consistently.

Thus, without prior knowledge of these occasional arbitrary skips, it is not feasible to use the barcodes as a check on our OCR processing.