COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF STATE

REPORT CONCERNING THE EXAMINATION RESULTS OF CLEARBALLOT CLEARVOTE 2.3 WITH CLEARCAST PRECINCT SCANNER, CLEARCOUNT CENTRAL SCANNING SOLUTION, CLEARACCESS BALLOT MARKING DEVICE, AND CLEARDESIGN ELECTION MANAGEMENT SYSTEM

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EXAMINATION RESULTS OF CLEAR BALLOT CLEARVOTE 2.3 WITH CLEARCAST PRECINCT SCANNER, CLEARCOUNT CENTRAL SCANNING SOLUTION, CLEARACCESS BALLOT MARKING DEVICE, AND CLEARDESIGN EMS

I. INTRODUCTION

Article XI-A of the Pennsylvania Election Code, 25 P.S. §§ 3031.1 et seq., authorizes the use of electronic voting systems. Section 1105-A of the Pennsylvania Election Code, 25 P.S. § 3031.5, requires that the Secretary of the Commonwealth (Secretary) examine all electronic voting systems used in any election in Pennsylvania and that the Secretary make and file a report stating whether, in his opinion, the electronic voting system can be safely used by voters and meets all applicable requirements of the Pennsylvania Election Code (the Code). The ClearVote 2.3 voting system submitted for examination includes modifications upgrades to the ClearCast, ClearAccess, ClearCount, and ClearDesign components of the ClearVote 2.0 system. The Department of State's Bureau of Election Security and Technology (Department) scheduled an examination of the ClearVote 2.3 voting system.

The Secretary of the Commonwealth (Secretary) appointed Pro V&V as professional consultants to conduct an examination of the ClearVote 2.3 voting system. The examination process included a functional examination of the ClearVote 2.3 at Commonwealth Complex in Harrisburg and security examination at Pro V&V test lab facilities in Huntsville, Alabama. Ryan Wilson, (Functional Examiner) of Pro V&V, led the functional examination of the ClearVote 2.3 pursuant to Section 1105-A(a) of the Code, 25 P.S. § 3031.5(a). The system upgrades to Clear Access did not affect the voter facing screens and hence there was no additional accessibility examination performed on the system. The functional examination commenced on January 24, 2023 and was performed in Room G24A/B of the Commonwealth Capitol Complex - Finance Building, 613 North Street, Harrisburg, PA 17120. Sindhu Ramachandran, Chief Division of Election Security and Technology and Matthew Ruch, then-Voting Systems Analyst, both from Bureau of Elections represented the Secretary of the Commonwealth. Clear Ballot Group (CBG) was represented by Russ Dawson, Certification Program Manager. Additional staff members from the Department

also attended the examination.

II. THE CLEARVOTE 2.3 VOTING SYSTEM

ClearVote 2.3 is a paper-based voting system that provides end-to-end election support; from defining an election to generating final reports. The system presented for certification in Pennsylvania is comprised of the following components:

- ClearDesign election management system,
- ClearAccess in-person accessible voting solution,
- ClearCast in-person precinct-scan voting solution,
- ClearCount central scanning, tabulation, results consolidation and reporting solution.

The following is a description of the ClearVote 2.3 components summarized from the System Overview section of the Functional Examiner's report and the ClearVote System Overview document submitted by CBG as part of the Technical Data Package (TDP).

ClearDesign

ClearDesign is an election management system consisting of an interactive set of applications which are responsible for all pre-voting activities necessary for defining and managing elections. This includes ballot design, ballot proofing, ballot layout, and ballot production. All of the hardware components are unmodified Commercial Off the Shelf (COTS) that are connected via a wired, closed, and isolated network not connected to any other systems or to the Internet. The election management system (EMS) is used for the following tasks:

- Create and import jurisdiction data;
- lay out, proof, and produce both paper and accessible ballots in supported languages;

- and program the other ClearVote products

Election department staff can design ballots, proof their design (including accessible ballots), lay out and review one or all ballot styles, generate PDFs for ballot-printing companies and ballot-on-demand printers, and generate the election definition files that program the other components.

ClearAccess

The ClearAccess system is an in-person ballot-marking system designed to ensure access for all voters. The ClearAccess solution runs on a COTS touchscreen computer. The voter can privately and independently indicate his or her choices on the touchscreen, review the selections, make corrections as necessary, and print a machine-marked ballot. The ballots can then be scanned and tabulated by ClearCast or ClearCount. The ClearAccess software logs all transactions without compromising voter privacy and stores no results data because its output is a marked paper ballot.

ClearCast

The ClearCast tabulator is a precinct count, ballot-scanning solution, which processes hand-marked paper ballots and ballots printed by the ClearAccess accessible ballot marking device. The ClearCast application runs on the precinct count-based tabulator, and is used to scan, count and tally marked ballots. Its functionality is divided into three essential modes: Election Mode (Early Voting and/or Election Day), which is used to process voter cast ballots; Pre-Election Mode, which occurs prior to Election Mode, and is used to test all system functionality subsequent to the start of the election; and Post-Election Mode, which is used to perform administrative functions following the close of the election.

ClearCount

ClearCount is a central, high-speed, optical-scan ballot tabulator coupled with ballot processing applications. The ClearCount tabulation system processes ballots and captures

voter intent. It handles four important functions:

1. Central count tabulation,
2. consolidating results imported from precinct voting stations,
3. generating operational reports and contest reports, and
4. logging the activities and data required for independent audits.

The ClearCount tabulation system consists of the following physical components (all of which are unmodified COTS hardware and are connected via closed, wired Ethernet connections):

- ScanServer - A computer running the ClearCount software and hosting its election database and the web server that serves its election reports. The ScanServer uses a Linux operating system (a configured version of which is installed with the ClearCount software).
- ScanStations - One or more computer-scanner pairs used to scan and tabulate ballots. The ScanStation computers use the Microsoft Windows operating system.
- Router - Connects the ScanStations and the election administration stations to the ScanServer via a closed, wired Ethernet.
- Election administration stations - Election officials use this computer to manage elections and county users, to monitor and interact with election reports, and to adjudicate unreadable cards. System administrators use it to monitor the ClearCount system.

Manufacturer Software/Firmware

The **ClearVote 2.3** voting system consists of the following software and firmware components:

Application	Version
ClearDesign	2.3.0
ClearCast	2.2.9
ClearCast Go	2.2.a
ClearAccess	2.3.0
ClearCount	2.3.1

COTS Software/Firmware

Additional COTS software and firmware included in the system has been defined as part of the EAC system certification scope added to this report as Attachment A.

Hardware

Please refer to Attachment A of this report for the EAC certification scope document, which lists all software and hardware components of the EAC certified system.

III. EXAMINATION APPROACH, PROCEDURES AND RESULTS

A. Examination Approach

ClearVote 2.3 Functional Examination

To ascertain whether ClearVote 2.3 can be safely used by voters at elections in the Commonwealth and whether it meets all the requirements of the Code, the Functional Examiner developed test protocols for the examination. The test protocols separated the requirements of Article XI-A of the Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 -

3031.22, into three main evaluation areas, which consisted of a Physical Configuration Audit (PCA), Functional Configuration Audit (FCA) and System Integration Test.

PHYSICAL CONFIGURATION AUDIT (PCA) - The Physical Configuration Audit (PCA) compared the voting system components submitted for evaluation to the manufacturer's technical documentation and the defined configuration for use in the Commonwealth of Pennsylvania. The Functional Examiner performed the PCA to establish a configuration baseline of software and hardware to be tested and confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system. The Functional Examiner also used this review to analyze pertinent EAC certification documentation to confirm the requirements in the Code could be met by documentation review. The following requirements were validated by reviewing system documentation and the EAC certification testing test plan and report.

- 1105-A(a), 25 P.S. § 3031.5(a), requiring that an electronic voting system has been examined and approved by a federally recognized Independent Testing Authority (ITA);
- 1107-A(11), 25 P.S. § 3031.7(11), requiring an electronic voting system to be suitably designed in terms of usability and durability, and capable of absolute accuracy;
- 1107-A(13), 25 P.S. § 3031.7(13), requiring an electronic voting system to correctly tabulate every vote;
- 1107-A(14), 25 P.S. § 3031.7(14), requiring an electronic voting system to be safely transportable; and
- 1107-A(15), 25 P.S. § 3031.7(15), requiring an electronic voting system to be designed so voters may readily understand how it is operated.

FUNCTIONAL CONFIGURATION AUDIT (FCA) – Functional Examiners's FCA encompassed an examination to verify that the system hardware and software perform all the functions necessary to meet the defined requirements. This testing included all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. The system-level hardware and software test cases were prepared

independently to assess the response of the hardware and software to a range of conditions. FCA for this Clear Vote 2.3 test campaign consisted of executing test cases on voting system components as identified below:

ClearCount (with COTS Scanner Fujitsu fi-7900):

- 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter
- 25 P.S. § 3031.7(5) Selection of Candidate and Write-in
- 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions
- 25 P.S. § 3031.7(17) Public Counter, No Reopening of Polls, Media Security with Tamper Proof Locks and Zero Proof and Tally Reports

ClearDesign:

- Evaluation of Election Management System (EMS) to ensure that election definition can meet all the requirements identified in FCA test cases

ClearCast and ClearCast Go:

- 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter
- 25 P.S. § 3031.7(5) Selection of Candidate and Write-in
- 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions
- 25 P.S. § 3031.7(10) Ballot Review and Change
- 25 P.S. § 3031.7(16) Public Counter, No Reopening of Polls, Media Security with Tamper Proof Locks and Zero Proof and Tally Reports

Clear Access:

- 25 P.S. § 3031.7(1) Voter Secrecy

- 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter (Regular/ADA)
- 25 P.S. § 3031.7(5) Selection of Candidate and Write-in
- 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions (Regular/ADA)
- 25 P.S. § 3031.7(10) Ballot Review and Change (Regular/ADA)

Functional Examiner also used FCA to validate all the system components met 1107-A(12), 25 P.S. § 3031.7(12) requiring acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards through test cases and his use during FCA.

SYSTEM INTEGRATION is a system-level test for the integrated operation of both hardware and software. System Integration evaluates the compatibility of the voting system software components or subsystems with one another and with other components of the voting system environment. This compatibility was determined through functional tests integrating the voting system software with the remainder of the system. During test performance, the system was configured exactly as it would be for normal field use. This included connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and tamper-evident seals. During System Integration testing, one General Election and one Primary Election were exercised on the voting system. Functional Examiner also used the system integration testing to test and confirm that ClearVote 2.3 voting system meets the following election code requirements:

- 25 P.S. § 3031.7(4) - Requiring an electronic voting system to permit a voter to vote for candidates of all different parties, and write-in candidates.
- 25 P.S. § 3031.7(6) - Requiring an electronic voting system to permit a voter to cast votes for candidates and ballot questions he or she is entitled to vote for and prevents a voter from casting votes the voter is not entitled to vote on.

- 25 P.S. § 3031.7(8) - Requiring an electronic voting system to prevent a person from casting more than one vote for a candidate or question, except where this type of cumulative voting is permitted by law.

- 25 P.S. § 3031.7(9) - Requiring an electronic voting system to permit voters to vote in their own parties' primaries, and prevents them from voting in other parties' primaries, while also permitting voters to vote for any nonpartisan nomination or ballot question they are qualified to vote on.

ClearVote 2.3 Security Testing

The Security Testing provided a means to assess the required security properties of the voting system under examination. The testing was done by Pro V&V Labs (Security Examiner). Security Examiner reviewed system documentation and test plan and test reports from the federal certification testing as applicable for the Security Testing. Clear Vote 2.3 does not have any security enhancements from ClearVote 2.2. To evaluate ClearVote 2.3 Voting System for conformity to the defined security specifications results from EAC certification testing performed on the ClearVote 2.2 Clear Vote 2.0 and Voting System were reviewed.Security Examiner also conducted a penetration testing. Penetration testing was conducted under the guidelines of the Commonwealth of Pennsylvania Security Testing Standard. The scope of Penetration testing included, but was not limited to, the following

- Voting system security,

- voting system physical security while voting devices are in storage, being configured, being transported, and being used; and

- voting system use procedures.

B. Examination Process and Procedures

Functional Examination

Clear Ballot supplied all the hardware equipment required for the examination. All software and firmware necessary to perform the examination was received directly from the Voting System Test Laboratories (VSTL) that tested the voting system for EAC certification. The trusted build of the software and firmware for each device being evaluated were installed using the appropriate media for installation.

PCA

The Functional Examiner reviewed submitted components and compared the voting system components submitted for evaluation to the manufacturer's technical documentation and the defined configuration for use in testing. The Functional Examiner then established a configuration baseline of software and hardware to be tested and confirmed whether the manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system. During execution of the PCA, the components of the ClearVote 2.3 were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. The Functional Examiner also performed a verification of the Trusted Builds of the software installed on each system component to ensure the certified versions of the software were installed correctly.

FCA

The tests were designed to assess the system's ability to meet the requirements of the election code and each applicable software and hardware component of the system was included in the tests. The Functional Examiner executed test cases for the ClearDesign, ClearCount (Fujitsu fi-7900), ClearCast D, ClearCast Go, and ClearAccess.

System Integration

The Functional Examiner created the election definition using ClearDesign. The election definition process included pre-election activities, including adding parties, precincts, contests, choices and ballot styles. Transport media was used to transfer those definitions to ClearCast Model D, ClearCast Go, ClearAccess, and ClearCount. The polls were opened, zero reports were printed and verified, and ballots were marked manually, as

well as electronically via the ClearAccess Ballot Marking Device, then tabulated through the polling place ClearCast Model D and ClearCast Go scanners. All ballots created (hand-marked, and ClearAccess) were then tabulated through the ClearCount central scanning solutions using COTS central scanner, Fujitsu fi-7900. Polls were closed and write-ins were adjudicated by the examiner. Results reports were generated with results for the election. The result reports were confirmed to match the expected results of the voted ballots.

Examiner used English, Spanish and Chinese ballots for the closed primary election. For the general election, English and Spanish ballots were used.

Accessibility Examination

No separate accessibility examination was conducted for ClearVote 2.3 since the changes from the previous certified system did not include any voter facing enhancements to the ballot marking device. All the findings from the accessibility examinations on Clear Vote 2.0 also apply to Clear Vote 2.3 except for findings related to Pennsylvania's method of straight-party voting.

Security Testing

Evaluation areas for this campaign consisted of Specification Conformity Assessment, and Penetration Testing which were completed after the Security Examiner documented each component name, model, serial number, major component, and any other relevant information needed to identify the component via a PCA.

ClearVote 2.3 system is an upgrade to ClearVote 2.2 and ClearVote 2.0 voting system. There were no specific security specific modifications between ClearVote 2.2 and 2.3. Hence to evaluate ClearVote 2.3 Voting System for conformity to the defined security specifications, the security examiner reviewed system documentation and results from the federal testing performed on ClearVote systems.

The Security Examiner followed the below approach for Penetration Testing.

- System Decomposition and Enumeration
    1. Hardware Asset Enumeration
    2. Software Asset Enumeration
    3. Data Asset Enumeration and Classification
    4. Security Control Enumeration

- Risk Assessment
- Identification of opportunities for attack simulation
- Research technical vulnerabilities and exploits
- Feed results into penetration testing exercises

Examination Results

ClearVote 2.3 Functional Examination

The Functional Examiner's report indicated that the system successfully completed tests executed to ascertain compliance with requirements of the Code.

The Examiner report for ClearVote 2.3 included details of the test execution and indicated successful completion and identified pertinent observations. The following section is a summary of the results of the examination as set forth in fuller detail in the Examiner's Report.

1. **PCA**

The Functional Examiner was able to set up the system for test and reviewed the system documentation and validated the trusted build after installation.

The following was the configuration used for testing used, as documented during PCA by the Functional Examiner.

Clear Design:

- Design Server – Dell T140 Server - S/N: HT99N23

- Design Station – Dell Optiplex XE3 – S/N: 46TRNK3
    - Dell OSS21 All-In-One Small Form Factor Stand – S/N: N/A
    - Dell P2722H Monitor S/N: 478MFC3
- Network Switch – Cisco Business 350 Series (CBS350-8T-E-2G) – S/N: PSZ26301H3Q

ClearCount:

- Count Server – Dell T130 Server – S/N: B2FMMR2
- Count Station #1 – Dell Optiplex XE3 – S/N: 16TRNK3
    - Dell OSS21 All-In-One Small Form Factor Stand – S/N: N/A
    - Dell P2722H Monitor S/N: 5S8MFC3
- Count Station #2 – Dell Latitude 5521 Laptop – S/N: FN3WSG3
- Scan Station – Dell Latitude 5590 Laptop – S/N: 567ZHR2
- Network Switch – Cisco 8 Port Gigabit Smart Switch (SG250-08) – S/N: PSZ22261A0D
- Scanner – Fujitsu fi-7900 – S/N: C30C000286
- Reports Printer – Brother HL-L2350DW – S/N: U64964A8N263531

ClearCast D:

- ClearCast Model D – S/N: CCD041902009
- ClearCast Collapsible Ballot Box – S/N: N/A

ClearCast Go:

- ClearCast Go – S/N: CCER0401015
- ClearCast Go Setup Case /Ballot Box – S/N: 6231101995

ClearAccess:

- Sip & Puff Device – Breeze BZ2 – S/N: 0515
- ClearAccess – S/N: 6231202006 (Note: Setup Case Serial Number used as Unit S/N)
- Elo POS – S/N: K193008675
- Lexmark MS521 – S/N: 4600-630
- APC UPS – S/N: AS2128290646

- Setup Case – S/N: 6231202006

Two observations were noted during the PCA. While attempting to print a ballot off the ClearAccess BMD, the Lexmark MS521dn printer repeatedly jammed while duplexing a ballot. Analysis of the issue revealed that the Lexmark MS521dn printer could not process the 65pound (176gsm) bond paper stock supplied by ClearBallot Group for this examination. The recommended ballot stock identified in the TDP documentation for the printer is 60-pound cover stock (163 gsm). The Examiner tested the system after Clear Ballot provided a thinner ballot stock.

The second observation was that the Dell All-In-One Stands Model No. OSS-21 for the Dell Optiplex XE3 PCs come with a "cage" to cover and secure the rear ports of the PCs. The "cages" which were included with the stands did not fit the Dell XE3 PCs, as the tabs used to lock the cage into place did not line up with those on the back of the PCs. This happened because the "cages" supplied during the testing were not the exact make and model that fits and locks perfectly.

Functional Examiner concluded that 1105-A(a), 25 P.S. § 3031.5(a),1107-A(11), 25 P.S. § 3031.7(11), 1107-A(13), 25 P.S. § 3031.7(13) , 1107-A(14), 25 P.S. § 3031.7(14) and 25 P.S. § 3031.7(15) election code requirements were met by Clear Ballot 2.3 voting system and were addressed as part of the PCA and documentation review.

2. FCA

As set forth in the examination approach, the FCA included test cases to review specific requirements of the Pennsylvania election code against applicable components of the voting system. The following table lists the requirements that were tested during the FCA as detailed below, after loading an election into the devices. The Functional Examiner evaluated the results after each test case and determined that the actual results are as expected.

Statutory Requirement and test case explanation	Devices Tested
25 P.S. § 3031.7(2) - Provides facilities for voting for such candidates as may be nominated and upon such questions as may be submitted. Functional Examiner tested for voter for one, "N of M" contest, and ballot question. Functional Examiner also validated that all the votes were counted appropriately on ClearCast and ClearCount.	ClearCount Fujitsu fi-7900 ClearCast D ClearCast Go Clear Access
25 P.S. § 3031.7(5) - Permits each voter to vote for any person and any office for whom and for which he is lawfully entitled to vote, whether or not the name of such person appears upon the ballot as a candidate for nomination or election. Functional Examiner tested and confirmed that the system allows voting for any candidate on the ballot and allowed the voter to cast a write-in vote. System Level Testing was used to further confirm that the candidates were presented with the correct contests that they were eligible to vote.	ClearCount Fujitsu fi-7900 ClearCast D ClearCast Go Clear Access

25 P.S. § 3031.7(7) - Attempt to Over Vote Contests and Questions Functional Examiner tested to confirm that ClearAccess Ballot Marking Device prevented overvotes, ClearCast warned voters for overvotes if configured and ClearCount and ClearCast did not count any votes for a contest that was overvoted.	ClearCount Fujitsu fi-7900 ClearCast D ClearCast Go Clear Access
25 P.S. § 3031.7(10) - Ballot Review and Change Functional Examiner tested to confirm that ClearAccess Ballot Marking Device allowed the voter to make changes until a ballot is printed. Tabulation devices allowed for the voter to scan the new ballot received after they spoiled the original ballot.	ClearCount Fujitsu fi-7900 ClearCast D ClearCast Go Clear Access
25 P.S. § 3031.7(16) - Public Counter, No Reopening of Polls, Media Security with Tamper Proof Locks and Zero Proof and Tally Reports Functional Examiner validated that the voting device is able to produce a "Zero Proof" and "Tally Report". The voting device has a visible public counter and the counter increments correctly. Functional Examiner also validated that Clear Access can print a zero proof report.	ClearCount Fujitsu fi-7900 ClearCast D ClearCast Go

25 P.S. § 3031.7(1) - Provides for voting in absolute secrecy and prevents any person from seeing or knowing for whom any voter, except one who has received or is receiving assistance as prescribed by law, has voted or is voting. Functional Examiner validated that the observer was not able to determine the voter's selection from any observation position where the straight center measurement is 12 feet, and the side distance observation points are approximately 17 feet. Functional Examiner also reviewed federal test cases and test results to confirm this requirement.	Clear Access Clear Cast

The Functional Examiner also noted that the paper ballots will allow statistical recounts as required by Sections 1117-A, 25 P.S. § 3031.17.

3. System Integration

System Integration is a system level test for the integrated operation of both hardware and software. System Integration evaluates the compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment. This compatibility was determined through functional tests integrating the voting system software with the remainder of the system. During test performance, the system was configured exactly as it would be for normal field use. This included connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and tamper-evident seals.

During System Integration testing, one General Election and one Primary Election were exercised on the voting system, as described below:

General Election Description: A general election combining presidential year contests, non-presidential year contests, and municipal contests into a single election held in three precincts, one of which is a split precinct on the "Representative in the General Assembly" contests. This election contained 20 contests compiled into four ballot styles (excluding language styles). Fifteen of the contests were in all ballot styles. The other six were split between at least two of the precincts with a maximum of 20 different contests spread across the three precincts. All voting variations supported by the Commonwealth of Pennsylvania were defined in this election. The voting variations are as follows:

- Partisan contest
- Non-Partisan contest
- N of M contest requiring the voter to vote for more than one candidate
- Referendum contest
- Retention contest
- Write-in voting
- Split Precinct
- Cross-Party Nominated candidate

This general election was designed to functionally test the handling of multiple ballot styles across geographical subdivisions, support for English and Spanish languages, support for all Pennsylvania voting variations, and audio support for English and Spanish.

Primary Election Description:

A closed primary election was run for two parties in three precincts. This election contained 35 contests compiled into six ballot styles. Each ballot style had 15 contests. The voting variations supported in a primary election by the Commonwealth of Pennsylvania were defined in this election. The voting variations are as follows:

- Partisan contest
- Non-Partisan
- Primary Presidential delegation nominations
- Write-In voting
- N of M Contest
- Cross-Party Filed Candidates

This closed primary election was designed to functionally test the handling of multiple ballot styles across geographical subdivisions, support for three languages, and support for common primary specific voting variations.

Election definitions for both primary and general elections were created within Clear Design and transport media was used to transfer those definitions to ClearCast, ClearAccess and ClearCount. Polls were opened, zero reports were printed and verified, and ballots were marked manually, as well as electronically via the Clear Access Ballot Marking Device, then tabulated through the polling place ClearCast scanner. All ballots created (hand-marked, and ClearAccess) were then tabulated through the ClearCount central scanning solution using COTS central scanner, Fujitsu fi-7900. Polls were closed and write-ins were adjudicated by the examiner. Results reports were generated with results for the election. The result reports were confirmed to match the expected results of the voted ballots.

Functional Examiner concluded that ClearVote 2.3 system met election code requirements 1107-A(4), 25 P.S. § 3031.7(4) , 1107-A(6), 25 P.S. § 3031.7(6), 1107-A(8),

25 P.S. § 3031.7(8), and 1107-A(9), 25 P.S. § 3031.7(9) as demonstrated by test cases used during the Primary and General Election.

Accuracy requirements of 1107-A(11), 25 P.S. § 3031.7(11), that were ascertained by reviewing EAC test reports were further validated by the successful tabulation and validation of the primary and general elections run by the Functional Examiner.

ClearVote 2.3 Security Examination

ClearVote 2.3 system is an upgrade to ClearVote 2.2 and ClearVote 2.0. The Security Examiner reviewed test reports for ClearVote 2.0 and ClearVote 2.2. Since no security modifications were introduced into the ClearVote 2.3 Voting System, the Security Examiner determined that the review of previous test results was sufficient for establishing conformity to the defined security specifications.

Security Examiner also performed penetration testing on Clear Vote 2.3 voting system. Security Examiner performed risk assessment with the primary objective being to use the analysis to identify, select, and prioritize penetration testing scenarios. Areas highlighted by the risk assessment matrices served as identification of critical targets for penetration testing as they presented the biggest areas of risk for the system. The results of the risk assessment were used to conduct the penetration test to ensure the implemented security controls were sufficient to mitigate those risks identified. Security Examiner provided opinions and recommendations for secure implementation of the system which are identified as conditions for implementation in this report.

ClearVote 2.3 Accessibility Examination

No separate accessibility Examination was conducted on ClearVote 2.3 since there were no voter facing changes that required accessibility testing in this release. Details and relevant findings of Accessibility Examination conducted on ClearVote 1.4/1.5 and Clear Vote 2.0 also applies to ClearVote 2.3. Attachment B of this document also lists all the findings from the ClearVote 1.4.5/1.5 and 2.0 accessibility examination.

ClearVote 2.3 was certified by the EAC on October 31, 2022, and hence compiles with Section 1105-A(a) of the Code, 25 P.S.§ 3031.5(a), which requires that a voting system must be examined and approved by a federally recognized independent testing authority (ITA), or VSTL as such authorities are now called. The final EAC certification scope is added to this report as Attachment A.

The Functional Examiner identified that the following within Article XI-A of the Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22, are not applicable to the current examination, as each deal with non-functional testing aspects of acquisition, and use and maintenance aspects of a voting system:

- 25 P.S. § 3031.2;
- 25 P.S. § 3031.3;
- 25 P.S. § 3031.4;
- 25 P.S. § 3031.6;
- 25 P.S. § 3031.8;
- 25 P.S. § 3031.9;
- 25 P.S. § 3031.10;
- 25 P.S. § 3031.11;
- 25 P.S. § 3031.12;
- 25 P.S. § 3031.13;
- 25 P.S. § 3031.14;
- 25 P.S. § 3031.15;
- 25 P.S. § 3031.16;
- 25 P.S. § 3031.18;
- 25 P.S. § 3031.19;
- 25 P.S. § 3031.20;
- 25 P.S. § 3031.21; and
- 25 P.S. § 3031.22.

After all the testing activities, the Examiners and Department concluded that the ClearVote 2.3 demonstrates compliance with all requirements as delineated in Article XI-A of the Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22.

C. Observations

During the examination, and in the review of documentation, the Examiner and/or Department staff noted the following observations:

1. Observations/Findings identified during the Accessibility Examination for ClearVote 1.5 and Clear Vote 2.0 identified in Appendix B.

2. ClearVote 2.3 uses COTS components as printers for the ballot marking devices and as scanning equipment and appropriate precautions will need to be taken to ensure that the printer settings are not altered while polls are open.

3. The ADA compliant ballot marking device ClearAccess presented as part of the ClearVote 2.3 system, could be effectively used by all voters. This allows jurisdictions to expand the use of these devices for a larger universe of voters and not restrict their use to voters using assistive devices.

IV. Conditions for Certification

Given the results of the examination that occurred in October 2018 and January thru February 2019, and the findings of the Examiners as set forth in his reports, **the Secretary of the Commonwealth certifies the ClearVote 2.3 subject to the following conditions:**

A. Pennsylvania counties using the ClearVote 2.3 must comply with the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9,

2011, and any future revisions or directives. In particular, Pennsylvania counties must adhere to item four (4) of the directive when setting up and positioning the ClearAccess in the polling place to assure compliance with the constitutional and statutory requirements that secrecy in voting be preserved (*see* Pa. Const Art. VII § 4; and Section 1107-A(l) of the Code, 25 P.S. § 3031.7(1)).

B. No components of the ClearVote 2.3 voting system shall be connected to any modem or network interface, including the Internet, at any time, except when a standalone local area wired network configuration is used, in which all connected devices are certified voting system components. Transmission of unofficial results can be accomplished by writing results to media and moving the media to a different computer that may be connected to a network. Any wireless access points in the district components of ClearVote 2.0, including wireless LAN cards, network adapters, etc. must be uninstalled or disabled prior to delivery or upon delivery of the voting equipment to a County Board of Elections.

C. Because ClearVote 2.3 is a paper-based system, counties using the ClearVote 2.3 must comply at a minimum with Section 1117-A of the Code, 25 P.S. § 3031.17, that requires a "statistical recount of a random sample of ballots after each election using manual, mechanical or electronic devices of a type different than those used for the specific election." This audit must be conducted via a manual count of the voter marked paper ballots exclusively. Counties must include in the sample ballots such samples as may be marked by ADA compliant components. Counties are advised to consult the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011 and any future revisions or directives that may apply to audits of electronic voting systems.

D. ClearBallot must ensure that the COTS printer used for ClearAccess must be configured to ensure that the printer settings cannot be changed by the voter at the polling place. The configuration must ensure that the printer settings can only be modified by authorized personnel.

E. ClearVote 2.3 implementations in Pennsylvania must use the ballot stock

recommended by the vendor in the TDP. Functional Examiner noted that the Lexmark MS521dn used with Clear Access jammed when used for printing two-sided ballots with heavier paper stock. This requires jurisdictions to ensure that they use the recommended ballot stock identified in the vendor TDP and test the ballot marking device with the same paper that will be used during election. All components must be tested during the L&A testing with the same ballot stock that will be used on Election Day. Clear Ballot must work with jurisdictions to ensure that the correct ballot stock is used, and the printer and scanner settings adhere to the identified values in TDP. ClearBallot must work with the jurisdictions to add training sessions during implementation to ensure that the quality of ballots is maintained while handling, before during and after elections.

F. All jurisdictions implementing the ClearVote 2.3 need to conduct a full Logic and Accuracy test on each device without fail and maintain evidence of Logic and Accuracy (L&A) testing in accordance with the statutory requirements for pre-election and post-election testing. The Department does not recommend fully automated L&A testing and discourages the use of preprinted ballots provided by vendors. All components being used on Election Day, including accessible devices and any Electronic Poll Books, must be part of the L&A testing.

G. ClearVote 2.3 is a paper-based system, and hence, implementation of the system for precinct or central count scanning is scalable. Jurisdictions should calculate the number of voting booths necessary to accommodate the number of registered voters in a precinct to avoid long lines. Jurisdictions must include the ClearAccess as an ADA-compliant device in configuring a precinct polling place. Jurisdictions must also take into consideration the ballot box capacities on polling place components when deciding on the number of voting booths.

H. All jurisdictions implementing the ClearVote 2.3 must implement administrative safeguards and proper chain of custody to facilitate the safety and security of electronic systems pursuant to the Guidance on Electronic Voting System Preparation and Security, September 2016.

I. Jurisdictions implementing the ClearVote 2.3 with the Central Count Tabulator as the primary system where voters drop marked ballots in a secure ballot box which are counted only at the central counting location using central scanners, must comply with Section 301(a) of Help America Vote Act of 2002. The mandate requires counties using central count paper-based systems to develop voting system specific voter education programs that inform voters of the effect of over voting and instruct voters on how to correct a ballot before it is cast, including instructions on obtaining a replacement ballot. Additionally, the mandate requires that the central count voting system must be designed to preserve voter confidentiality.

J. All jurisdictions implementing the ClearVote 2.3 must ensure that no default passwords are used on any devices and that all passwords are complex and secured. Counties must implement an audit process to review and ensure that no default passwords are used upon equipment install/reinstall and routinely change passwords (at least once prior to preparing for each primary and election) to avoid any password compromise. The passwords and permissions management must, at a minimum, comply to the password requirements outlined in NIST 800-63. This publication can be accessed at https://pages.nist.gov/800-63-3/sp800-63-3.html.

K. Jurisdictions implementing ClearVote 2.3 must ensure strict adherence to strong physical and administrative controls with respect to servers. It is imperative that root passwords (OS and database) are protected and only given to those in roles with a need to know. Jurisdictions must ensure proper operating system account creation based on roles and limit it to the minimum required access required to perform the assigned responsibility.

L. Jurisdictions implementing Clear Vote 2.3 must ensure implementation of a solid backup and recovery strategy of Design Server data assets.

M. Jurisdictions must work with ClearBallot and county Information Technology personnel to develop procedures and train all personnel on secure USB use. Counties must implement policies and procedures to ensure the use of only approved, designated, and clearly marked USB's for use in any component of the system. All users must be trained to use only the manufacturer recommended encrypted USB drives.

N. All jurisdictions implementing ClearVote 2.3 must configure the polling place components of the voting system to notify voters when they attempt to cast overvotes. This is to ensure that the system implementation adheres to the requirement of notifying the voter of overvotes as mandated by 25 P.S. § 3031.7(16).

O. Functional Examiner noted that Clear Ballot had not supplied the exact cage used to secure the rear ports for one of the Dell computers used during testing. Jurisdictions must ensure that all components are implemented with the correct cages to secure the rear ports. Due to apparent supply chain issues related to this part, the department recommends that a jurisdiction procures an adequate quantity of this part prior to implementing this version of the voting system.

P. All jurisdictions implementing ClearVote 2.3 must work with Clear Ballot to ensure that only the certified system configuration is installed on purchase, or any time a system component is replaced or upgraded. Jurisdictions must, as part of their user acceptance test, verify the implementation to ensure that the components, software and firmware belong to the certified system. Jurisdictions must also perform a trusted build validation as part of the election preparation activities and post-election canvass activities utilizing the vendor supplied methods of validation and verification of voting system integrity. A sample format that can be used for the attestation is added as Attachment C to this document.

Q. "ClearAudit," identified as a system component per the TDP, is not certified for use in Pennsylvania with ClearVote 2.3. This software was not presented to the Secretary for certification by Clear Ballot and is not included in the EAC certified system.

R. Jurisdictions can use the software functionality to evaluate questionable ballots, contests or selections to determine voter intent. Any decisions made during review of the ballot must be agreed upon by a team of at least two reviewers authorized by the election official. The election official can also consult the paper ballot to assist with determinations made during adjudication. Jurisdictions must always consider the voter-verified paper ballot as the ballot of record and in the event of a recount, the voter-verified paper ballots must be used for the count.

S. Jurisdictions implementing ClearVote 2.3 must work with ClearBallot to ensure that the implemented configuration is capable of operating for a period of at least two hours on backup power as required by the VVSG. If the system components don't include internal battery packs for reliable power, the Uninterruptible Power Supply (UPS) specified in the EAC certified configuration must be purchased and used at the polling places.

T. Jurisdictions using the services of Clear Ballot or a third-party vendor for election preparation activities must work with Clear Ballot or the vendor to ensure that systems used for ballot definition activities are considered part of the voting system and use certified voting system components. The systems used for ballot definition must be configured securely following conditions outlined in this report and following any Directives and Guidance issued by the Secretary. Any data transfer between the vendor and county must be done using encrypted physical media or a secure file transfer process. The file transfer and download must be tracked and audited to make sure that data has not been accessed by unauthorized personnel.

U. Jurisdictions must work with ClearBallot to ensure that the sip-and-puff devices are calibrated, and the devices work for completing a ballot marking session. Jurisdictions must use it during L&A testing to complete a ballot. The jurisdictions implementing the ClearVote 2.3 system must hold voter education sessions specifically addressed to voters using accessible devices, including sip-and-puff, and must clearly communicate the unavailability of the dual switches and allow enough sessions for the voters to get used to the sip-and-puff device for use on Election Day.

V. Jurisdictions implementing ClearVote 2.3 must implement the use of privacy sleeves to be used by voters carrying marked ballots between the ClearAccess ballot marking device and ClearCast precinct scanner. Poll worker training must emphasize the need for helping voters without violating their privacy. This must include but not be limited to having standard instructions for poll workers to use to guide a voter in casting their own ballot, or narrating the poll worker's actions, so that the voter understands what the poll worker is doing.

W. The ClearAccess printer allows the ballot stock to be secured inside the printer tray if it is less than 22 inches long. If the ballots are longer than 22 inches, ample care must be taken to make sure that the voter education materials instruct voters on how to insert ballot stock into the printer. Poll worker training must include sessions on identifying issues surrounding the insertion of the ballot and getting the printouts, without violating the privacy of the voter.

X. The USB port used for attaching the sip-and-puff device must be sealed with a tamper evident seal and must be opened for any session needed, and then resealed after the session. Poll worker training must include details around how to manage the device securely during Election Day.

Y. Jurisdictions must work with ClearBallot to thoroughly test and review the audio ballot instructions to ensure that the voters using an audio ballot can cast the ballot without requesting assistance.

Z. The electronic voting system must be physically secured while in transit, storage, or while in use at their respective locations. Unmonitored physical access to devices can lead to compromise, tampering, and/or planned attacks.

AA. Jurisdictions must implement processes and procedures involving management, monitoring and verification of seals, locks/keys, before, during and after the election.

BB. Jurisdictions must seal any unused ports on the voting system components using tamper evident seals even if the port is inside a locked compartment. Jurisdictions must work with Clear Ballot and use physical port blocking plugs to close unused ports whenever possible before placing the tamper evident seal. The Department also recommends using port blocking plugs for exposed ports for all components of the voting system housed in county offices. The port blocking plugs can be removed by authorized personnel when the port is needed. Jurisdictions must also implement a process to periodically verify the integrity of seals and tamper evident tapes.

CC. Jurisdictions must protect installations of the Clear Design and Clear Count on portable devices and must protect the laptops to prevent lost or stolen devices.

DD. Jurisdictions must implement processes to gather and safekeep system logs for each component of the voting system after each election. Consistent auditing of system logs and reports is vital to maintain system transparency and to ensure that any compromise or malfunction is observed and reported in a timely manner.

EE. Jurisdictions implementing ClearVote 2.3 must ensure that the USB devices and any other removable media used for election activities is maintained with strict chain of custody. There must be a process to manage the removable media inventory to avoid misplaced and lost media. The devices must be reformatted before use in each election. Appropriate steps must be taken to ensure that the format is a full reformat of the USB devices.

FF. Jurisdictions implementing ClearVote 2.3 must work with ClearBallot to ensure appropriate levels of training for election officials is planned on implementation. Counties must ensure that the training adheres to the "Minimum Training Requirements" specified in Attachment D of this document.

GG. Jurisdictions implementing ClearVote 2.3 must include voter and poll worker training as part of the implementation plan. The training must include hands on practice for both voters and poll workers. Specific consideration must be given to voters using assistive devices, and also to poll worker education to assist voters with disabilities. Refer to Attachment B, listing detailed recommendations for training during deployment noted by the Accessibility Examiner.

HH. Jurisdictions implementing ClearVote 2.3 must consider the following during voting booth set-up for serving voters requiring assistive devices:

- Voters with disabilities may have assistive technology that they use in their daily life which may need to be brought to the polling place. These technology/devices must be allowed at the polling place. The voting booth set

up must account for the requirements to keep the assistive technology or personal notes that they need to place within reach. They may also need room to place the printed ballot on a flat surface to use personal technology such as magnifiers or text readers to verify it.

- The path to the ClearCast precinct scanner should be as easy as possible, and ideally a straight line with no obstructions. The path should include ample room to turn a wheelchair if the machine is positioned with the screen facing the wall. The ADA standards suggest a minimum of 60x60 inches for this.

Refer to Attachment B, listing detailed recommendations for deployment noted by the Accessibility Examiner.

II. Clear Ballot must submit the following system education materials to the Department of State and must consent to the publication and use of the video on any websites hosted by any Pennsylvania counties and the Pennsylvania Secretary of the Commonwealth or publicly available social media platform. The videos must be closed captioned for the visually impaired.

- A video (in an electronic format) for voters that demonstrates how to cast a vote and ballot using the Voting System.

- A video (in an electronic format) for precinct election officials that demonstrates how to setup, operate, and shutdown the Voting System components on an Election Day. The video must demonstrate how to set up and operate the voting system accessible devices for use by voters.

- A "quick reference guide" for precinct election officials to consult on Election Day. The guide must be specific to the purchasing county's setup and use of the Voting System including accessible options.

- A "quick reference guide" with images that demonstrates to voters how to cast a vote. This must be provided in additional languages for any jurisdictions

required to meet thresholds in the Voting Rights Act.

JJ. Clear Ballot must adhere to the following reporting requirements and submit the following to the Secretary:

- Equipment Reporting. Reported field issues or anomalies that occur in Pennsylvania or elsewhere with any piece of equipment deployed in the Commonwealth of Pennsylvania must be reported within 3 days of the occurrence;

- Advisory Notices. System advisory notices issued for any piece of equipment deployed in the Commonwealth of Pennsylvania, regardless of whether the incident requiring the notice occurred in Pennsylvania;

- Ownership, Financing, Employees, Hosting Location. Any changes to information on the Supplier's employees and affiliates, locations, company size and ability to provide technical support simultaneously to several counties in the Commonwealth of Pennsylvania and other jurisdictions that use its Voting System. Additionally, Clear Ballot must provide information on foreign ownership/financing, data hosting, and production for any equipment or ancillary products, including any potential conflict of interest that may have developed for employees and affiliates;

- Security Measures and any updated security testing or risk/vulnerability assessments conducted by the Supplier or a third-party;

KK. Clear Ballot must adhere to the "Source Code and Escrow Items Obligations" specified in Attachment E of this document.

LL. Clear Ballot must work with jurisdictions to ensure that the system is configured to comply with all applicable requirements of the Code delineated in Article XI-A of the Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22.

MM. Jurisdictions implementing the ClearVote 2.3 and Clear Ballot must work together to implement the system under this certification and must comply with the conditions found in this report, and any directives issued by the Secretary of the Commonwealth regarding the use of this System, in accordance with Section 1105-A(a)-(b) of the Code, 25 P.S. § 3031.5(a)-(b). Clear Ballot must ensure that future releases of the voting system with enhanced security and accessibility features are presented for approval to the Secretary.

NN. In addition, pursuant to the Directive on Electronic Voting Systems issued by the Secretary of the Commonwealth on August 8, 2006, the Directive Concerning the Use, Implementation and Operation of Electronic Voting Systems by the County Boards of Elections issued on June 9, 2011, and Section 1105-A(d) of the Code, 25 P.S. § 3031.5(d), this certification and approval is valid only for ClearVote 2.3. If the vendor or a County Board of Elections makes any changes to the ClearVote 2.3 voting system subsequent to the date of its examination, it must immediately notify both the Pennsylvania Department of State and the relevant federal testing authority or laboratory, or their successors. Failure to do so may result in the decertification of the ClearVote 2.3 voting system in the Commonwealth of Pennsylvania.

OO. Jurisdictions implementing ClearVote 2.3 must review the Secretary's certification report for ClearVote 1.5 issued on March 22, 2019, for a detailed review of the accessibility examination approach, process and procedures and results. The accessibility examination of this release was limited to only an expert review of the enhancements done to the accessible ballot marking device, and any findings from the initial examination remain the same for the ClearVote 2.3 voting system.

PP. Jurisdictions implementing ClearVote 2.3 must ensure that personnel responsible for secure operations of the system components need to be familiar with the entire technical data package. Security topics are found in different sections of the TDP.

V. Recommendations

A. All jurisdictions implementing ClearVote 2.3 voting system should ensure that the system is correctly set up pursuant to all the recommendations of the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011, and Guidance on Electronic Voting System Preparation and Security, September 2016.

B. All jurisdictions implementing ClearVote 2.3 should take appropriate steps to ensure that voter education is part of the implementation plan.

C. All jurisdictions implementing the ClearVote 2.3 should ensure that precinct election officials and poll workers receive appropriate training and are comfortable using the system.

D. All jurisdictions considering purchase of the ClearVote 2.3 should review the System Limits as mentioned in the EAC certification scope added as Attachment A to this report.

E. The Secretary recommends that Clear Ballot and counties work with the Department on any changes to their voting equipment including, but not limited to, purchase and upgrades.

F. The Secretary recommends in-house ballot definition activities at a county location whenever possible. If an external vendor location is used, the county should implement oversight measures to ensure that election data, including ballot definition files and audit logs stored on devices outside of the county, are protected from unauthorized access.

VI. Conclusion

As a result of the examination, and after consultation with the Department's staff, counsel and the examiners, the Secretary of the Commonwealth concludes that the ClearVote 2.3 can be safely used by voters at elections as provided in the Code and meets all of the requirements set forth in the Code, **provided the voting system is implemented under the conditions listed in Section IV of this report**. Accordingly, the Secretary certifies ClearVote 2.3 for use in this Commonwealth.

The ClearAccess ballot marking device can accommodate 10-12 voters with disabilities per hour, or 20-60 voters an hour when used as the primary voting system, depending on size of the ballot. ClearCast precinct scanner can serve 45-60 voters per hour. The ClearCount system performance and speed depends on the COTS scanner used as part of the system. ClearBallot system documentation suggests that the central scanners Fujitsu fi-6400, fi-6800, fi-7180 , fi-7800 , fi-7900 can support large jurisdictions that have more than 100,000 voters. EAC certification scope identifies the sustained ballots per hour for each of the Clear Count COTS scanners.

Attachment A – EAC Certification Scope

Certificate and
Scope of Certificatio

United States Election Assistance Commission

Certificate of Conformance

Clear Ballot ClearVote 2.3

VVSG 2005 VER. 1

EAC CERTIFIED

The voting system identified on this certificate has been evaluated at an accredited voting system testing laboratory for conformance to the *Voluntary Voting System Guidelines Version 1.0 (VVSG 1.0)*. Components evaluated for this certification are detailed in the attached Scope of Certification document. This certificate applies only to the specific version and release of the product in its evaluated configuration. The evaluation has been verified by the EAC in accordance with the provisions of the EAC *Voting System Testing and Certification Program Manual* and the conclusions of the testing laboratory in the test report are consistent with the evidence adduced. This certificate is not an endorsement of the product by any agency of the U.S. Government and no warranty of the product is either expressed or implied.

Product Name: ClearVote

Model or Version: 2.3

Name of VSTL: Pro V&V

EAC Certification Number: CBG-CV-23

Date Issued: 10/31/2022

Mark A. Robbins

Executive Director

Scope of Certification Attached

Attachment B – Accessibility Examination Findings and Recommendations

Accessibility Examination Report for ClearVote 2.3

ClearBallot Update Report - 9-30-2019 -

Accessibility Examination Report Sections for ClearVote 1.4.5/1.5

A) Top positives

Top positives ClearVote.pdf

B) Top problems and Recommendations as listed in the Accessibility Examiner's Report

Top problems ClearVote.pdf

C) All observations from Accessibility Examination

All findings ClearVote.pdf

D) Additional Recommendations for Deployment from Accessibility Examiner Report

Recommendatiosn for deployment Clea