pennsylvania
DEPARTMENT OF STATE

Report Concerning the Examination Results of Election Systems & Software EVS 6.5.0.0 with DS200 and DS300 Precinct Scanners, ExpressVote 2.1 and 3.0 Ballot Marking Device, ExpressVote XL Hybrid BMD, DS450, DS850, and DS950 Central Count Tabulators, and ElectionWare EMS

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Contents

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 Election Code.

Upon the request of Election Systems & Software (ES&S, Vendor), the Department of State's Bureau of Elections (Department) scheduled an examination for June 23, 2025, of the EVS 6.5.0.0 voting system. The voting system presented for certification in Pennsylvania included the ElectionWare election management software used in conjunction with the following components:

1) DS200 precinct scanner;
2) DS300 precinct scanner;
3) ExpressVote Hardware 2.1 ballot marking device;
4) ExpressVote Hardware 3.0 ballot marking device;
5) ExpressVote XL hybrid ballot marking device and tabulator;
6) DS450 central scanner;
7) DS850 high speed central scanner;
8) DS950 high speed central scanner;

The 6.5.0.0 release of EVS includes an updated 3.0 hardware version of the ExpressVote ballot marking device with improved screen and usability features, in addition to a variety of other hardware, usability, and security improvements to the overall system. The ExpressVote Tabulator has been removed, and ExpressVote devices in the 6.5.0.0 release only function as ballot marking devices.

The Secretary appointed Pro V&V, Inc. as professional consultants to conduct the examination of EVS 6.5.0.0. The examination process included a public demonstration, functional examination, and security testing. Department staff also consulted with Whitney Quesenbery from the Center for Civic Design as the accessibility examiner to discuss pertinent changes from previously certified releases and examine the new ExpressVote 3.0 ballot marking device.

The functional examination was performed in Room 114A of the Commonwealth Keystone Building, 400 North Street, Harrisburg, PA 17120. Stephen Han, Program Manager, and Michael Walker, Program Manager, of Pro V&V's Voting Systems Test Laboratory (Functional Examiners) conducted the functional examination of EVS 6.5.0.0 pursuant to Section 1105-A(a) of the Election Code, 25 P.S. § 303l.5(a). The examinations commenced on June 23, 2025, and lasted approximately two days. In attendance during the examination were the following additional persons:

- Sindhu Ramachandran, Chief of the Division of Election Security and Technology, representing the Secretary of the Commonwealth;
- Casey Brady, Voting Systems Analyst, representing the Secretary of the Commonwealth;
- Brandon McCulloch, Elections Analyst, representing the Secretary of the Commonwealth;
- Ben Swartz, Principal State Certification Manager, representing ES&S; and

Additional staff members from the Department also attended portions of the examination. The functional examination was open to the public and the public demonstration portion of the examination was recorded by Commonwealth Media Services staff and placed on the Department's website (https://www.pa.gov/agencies/dos/resources/voting-and-elections-resources/voting-systems). Security testing of the EVS 6.5.0.0 system was performed at Pro V&V's facilities located at 6705 Odyssey Drive Suite C, Huntsville, Alabama separate from the functional examination.

II. The EVS 6.5.0.0 Voting System

EVS 6.5.0.0 components considered for use in Pennsylvania provide a paper-based optical scan voting system that provides end-to-end election support; from defining an election to generating final reports. The system is comprised of both precinct and central count tabulators and Universal Voting System and/or Ballot Marking Devices as American with Disabilities Act (ADA) components. The following is a description of EVS 6.5.0.0 components summarized from the System Overview section of the Functional Examiner's Test Report TR-01-03-PA-001-EVS6500 and the EVS 6.5.0.0 System Overview document submitted by ES&S as part of the Technical Data Package (TDP).

A. ElectionWare

ElectionWare is an end-to-end election management software application that provides election definition creation, ballot formation, equipment configuration, result consolidation, adjudication and report creation. ElectionWare is composed of five software groups: Define, Design, Deliver, Results, and Manage. ElectionWare can be configured as a Standalone EMS Workstation or as a closed Local Area network with EMS server and client/s.

B. DS200

DS200 is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans and tabulates the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR) to be saved on USB media. DS200 scans and tabulates hand-marked paper ballots and machine-marked paper ballots produced from the ExpressVote ballot marking devices and ExpressVote XL. It also has a touch screen for voter communication, an integrated thermal printer for printing reports and an internal battery backup.

C. DS300

DS300 is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans and tabulates the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR) to be saved on USB media. DS300 scans and tabulates hand-marked paper ballots and machine-marked paper ballots produced from the ExpressVote ballot marking devices and ExpressVote XL. It also has a touch screen for voter communication, an integrated thermal printer for printing reports and an internal battery backup.

D. ExpressVote Hardware 2.1

ExpressVote HW2.1 is a paper-based ballot marking device that provides touch screen vote or assistive device navigation and capture that incorporates the printing of the voter's selections on an independent voter-verifiable paper ballot using a thermal printer, to be scanned for tabulation in any one of the ES&S polling place or central tabulators. The use of the ExpressVote 2.1 as a hybrid ballot marking device has been discontinued in the EAC

certification of EVS 6.5.0.0. Use of the ExpressVote 2.1 as a tabulator with EVS 6.5.0.0 is not permitted.

E. ExpressVote Hardware 3.0

ExpressVote HW3.0 is a paper-based ballot marking device that provides touch screen vote or assistive device navigation and capture that incorporates the printing of the voter's selections on an independent voter-verifiable paper ballot using a thermal printer, to be scanned for tabulation in any one of the ES&S polling place or central tabulators.

F. ExpressVote XL

ExpressVote XL is a hybrid paper-based polling place voting device that provides touch screen or assistive device navigation and vote capture that incorporates in a single unit the printing of the voter's selections on a paper ballot, verification of selections by the voter, and the scanning and tabulation of the voter's ballot. The screen provides a display of the full ballot. This device can serve all voters, including those with special needs, allowing all voters to cast paper ballots autonomously. Voters navigate ballot selections using the touch screen, detachable UVC keypad or ADA support peripherals, such as a sip and puff device. ExpressVote XL guides voters through the ballot selection process with screen prompts, symbols and ballot audio. The voter's ballot selections are then printed on a paper ballot for the voter to review before casting their vote. Once printed, the ExpressVote XL, when configured as a tabulator, internally processes the ballot for tabulation. The ballot is printed, reviewed by the voter, tabulated (if the voter confirms her intention to cast that ballot), and deposited into a removable, secure card container attached to the ExpressVote XL cart.

ExpressVote XL can also be configured as a ballot marker device only (rather than as a ballot marker and tabulator), in which case the voter marks a ballot and the voter's ballot selections are printed on a paper ballot that is then ejected from the voting device so that it can be carried to a separate scanner/tabulator. The paper ballot must then either be inserted into an ES&S polling place or central count tabulator for tabulation.

G. DS450

DS450 is a central scanner and tabulator that simultaneously scans the front and back of hand-marked paper ballots and/or machine-marked paper ballots from the ExpressVote ballot marking devices and ExpressVote XL in any of four orientations to capture a digital image of each ballot and convert voter selection marks to electronic Cast Vote Records. It sorts tabulated ballots into discrete output bins without interrupting scanning. The tabulation results can be physically transported using USB drives, or the device may be configured to transmit tabulation results to the results server through a closed network connection.

H. DS850

DS850 is a central scanner and tabulator that simultaneously scans the front and back of hand-marked paper ballots and/or machine-marked paper ballots from the ExpressVote ballot marking devices and ExpressVote XL in any of four orientations to capture a digital image of each ballot and convert voter selection marks to electronic Cast Vote Records. It sorts tabulated ballots into discrete output bins without interrupting scanning. The tabulation results can be physically transported using USB drives, or the device may be configured to transmit tabulation results to the results server through a closed network connection. DS850 provides much higher throughput compared to DS450.

I. DS950

DS950 is a central scanner and tabulator that simultaneously scans the front and back of hand-marked paper ballots and/or machine-marked paper ballots from the ExpressVote ballot marking devices and ExpressVote XL in any of four orientations to capture a digital image of each ballot and convert voter selection marks to electronic Cast Vote Records. It sorts tabulated ballots into discrete output bins without interrupting scanning. The tabulation results can be physically transported using USB drives, or the device may be configured to transmit tabulation results to the results server through a closed network connection. DS950 provides slightly higher throughput compared to DS850.

J. Manufacturer Software and Firmware

The EVS 6.5.0.0 Voting System consists of the following software and firmware components:

Application	Version
ElectionWare – Client/Server	6.5.0.0
ElectionWare Additional Reporting	1.1.0.1
Event Log Service	3.0.0.0
Removable Media Service	3.0.0.0
ExpressLink	3.0.0.0
Toolbox	4.5.0.0
DS450	4.4.0.0
DS850	4.4.0.0
DS950	4.4.0.0
DS200	3.2.0.0
DS300	3.2.0.0
ExpressVote HW 2.1	4.4.0.0
ExpressVote HW 3.0	4.4.0.0
ExpressVote XL	4.4.0.0

K. Manufacturer Hardware

Below is a high-level listing of the hardware components that comprise the entire EVS 6.5.0.0 system categorized by system functionality:

Hardware	Hardware Revision
ExpressVote HW 2.1	2.1
ExpressVote HW 3.0	3.0
ExpressVote XL	1.0
DS200 Precinct Scanner and Tabulator	1.2, 1.3
DS300 Precinct Scanner and Tabulator	1.0
DS450 Central Count Scanner and Tabulator	1.0
DS850 Central Count Scanner and Tabulator	1.0
DS950 Central Count Scanner and Tabulator	1.1
ExpressVote Rolling Kiosk	1.0
DS200/DS300 Collapsible Ballot Box	1.0, 1.1
DS200/DS300 Plastic Ballot Box	1.2, 1.3, 1.4, 1.5

L. COTS Software and Firmware

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

III. Examination Approach

To ascertain whether EVS 6.5.0.0 can be securely used by voters at elections in the Commonwealth and whether it meets all the requirements put forth in the Election Code, the Examiners developed test protocols for the examination. The Examination was broadly divided into three categories; a Functional Examination, Security Testing, and an Accessibility Examination.

A. Functional Examination Approach

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 areas of test execution:

1) Physical Configuration Audit

The Physical Configuration Audit for this campaign was performed 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 validated compliance of the system to the following sections of the Election Code during this documentation review:

- Section 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);
- Section 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;
- Section 1107-A(13), 25 P.S. § 3031.7(13), requiring an electronic voting system to correctly tabulate every vote;
- Section 1107-A(14), 25 P.S. § 3031.7(14), requiring an electronic voting system to be safely transportable;
- Section 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;

2) Functional Configuration Audit

The Functional Configuration Audit (FCA) encompassed an examination to verify that the system hardware and software perform all the functions necessary to meet the defined requirements as set forth in the Pennsylvania Election Code. 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 and validate compliance to the following sections of the Pennsylvania Election Code:

- Section 1101-A, 25 P.S. § 3031.1, requiring an electronic voting system to provide for a permanent physical record of all votes cast;

- 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.
- 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.
- 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.
- 25 P.S. § 3031.7(7) - If it is of a type that registers the vote electronically, the voting system shall preclude each voter from voting for more people for any office than he is entitled to vote for or upon any question more than once.
- 25 P.S. § 3031.7(10) - If it is of a type that registers the vote electronically, the voting system shall permit each voter to change his vote for any candidate or upon any question appearing on the official ballot up to the time that he takes the final step to register his vote and to have his vote computed. If it is of a type that uses paper ballots or ballot cards to register the vote and automatic tabulating equipment to compute such votes, the system shall provide that a voter who spoils his ballot may obtain another ballot; any ballot thus returned shall be immediately cancelled and at the close of the polls shall be enclosed in an envelope marked "Spoiled" which shall be sealed and returned to the county board.
- Section 1107-A(12), 25 P.S. § 3031.7(12), requiring an electronic voting system to provide acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards; and
- 25 P.S. § 3031.7(16), requiring an electronic voting system which provides for precinct level tabulation to: (i) display a public counter of ballots entered for tabulation, visible from outside of the automatic tabulating equipment during operation, (ii) require a lock, or locks, by the use of which all operation of the tabulation element of the automatic tabulating equipment is absolutely prevented immediately after the polls are closed (iii) preclude every person from seeing or knowing the number of votes theretofore registered for any candidate or question and preclude every person from tampering with the tabulating element, (iv) preclude tabulation of an over-vote, and (v) print a record at the beginning of its operation that verifies that counters are set to zero before processing ballots, and print at the finish of its operation of the total number of voters whose ballots have been tabulated, the total number of votes cast for each candidate whose name appears on the ballot, and the total number of votes cast for, or against, any question appearing on the ballot.
- 25 P.S. § 3031.7(17), requiring an electronic voting system which provides for central count tabulation to (i) preclude tampering with the tabulating element during the course of operation, (ii) preclude tabulation of an over-vote; and (iii) indicate that counters are set to zero before processing ballots, either by district or with the capability to generate cumulative report;

3) System Integration Testing

System Integration Testing is a system level test for the integrated operation of both hardware and software. The System Integration Test 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 ties. System Integration evaluated the following sections of the election code for compliance:

- Section 1107-A(4), 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;
- Section 1107-A(6), 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;
- Section 1107-A(8), 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; and
- Section 1107-A(9), 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.

B. Security Testing Approach

Security Testing provided a means to assess the required security properties of the voting system under examination and ascertain compliance with PA Election Code requirements, including 25 P.S. §§ 3031.7(11), (12), (16) and (17). A complete security evaluation was performed on the system. The security tests were based on the PA Election Code and PA Voting System Security Standard, published as Attachment E to the Directive for Electronic Voting Systems. The Security Examiner (Pro V&V Labs) conducted the penetration evaluation in two phases: Testing Assessment and Penetration Testing.

1) Testing Assessment

The primary goal of the Testing Assessment was to prioritize threats and maximize effectiveness of testing efforts throughout the penetration testing process. This phase was referred to as the planning and discovery phase. During this time, the Examiner assessed potential ways to subvert the voting system's security. The Security Examiner also conducted a vulnerability assessment and penetration testing against systems that were configured and secured in the same manner that would be when used in a live election.

2) Penetration Testing

The focus of Penetration Testing was to seek out and exploit vulnerabilities in the voting system identified during Testing Assessment that might be used to change the outcome of an election, to interfere with voters' ability to cast ballots or have their votes counted accurately during an election, or to compromise the secrecy of vote. The test evaluated whether the voting system under examination possesses the security properties to be successfully used in Pennsylvania.

C. Accessibility Examination Approach

The Department of State, in consult with the Whitney Quesenbery of the Center for Civic Design, found that the conclusions taken from the EVS 6.0.2.1, 6.1.0.0, and 6.3.0.0 releases' Accessibility Examinations can also be extended to EVS 6.5.0.0, since there were only minor hardware or software changes to any accessibility features. The only new equipment not included in any Accessibility Examination prior is the ExpressVote 3.0. Accessibility Examiner reviewed the changes and new equipment for EVS 6.5.0.0 and issued observations that will be included with reports from the previous releases' accessibility examinations.

The accessibility examination was designed to provide insights about each voting system's usability and accessibility especially for voters with disabilities, as well as how effectively the system could be deployed by poll workers and voters. The Accessibility Examination included a team of three examiners with accessibility, usability and election process experience collectively referred as Accessibility Examiner. The examination process was divided into three parts:

1) Expert Review by Accessibility Examiner

Expert review of the system was performed by the Accessibility Examiner, using scenarios based on personas of people with disabilities from National Institute of Standards and Technology (NIST) and their professional experience.

2) Usability Review with Voters with Disabilities

Voters with disabilities used the system voting a reasonable length PA ballot and completed a questionnaire about their experience. The Accessibility Examiner observed and made notes.

3) Election Process Experience with Poll Workers

Election officials and poll workers tested the accessibility features to evaluate how they would be activated during an election during a review of the system guided by the Accessibility Examiner. They commented on the system based on their experience.

IV. Examination Processes and Procedures

The procedures and processes used during the examination of EVS 6.5.0.0 are listed in the sections below. The final recommendations contained later in this report are based on combined analyses of the results and conclusions from all examinations.

A. Functional Examination Processes and Procedures

ES&S supplied all required equipment, including any software or firmware to be tested during the examination. All software and firmware required to perform the examination was already on hand since Pro V&V was the Voting System Test Laboratory (VSTL) that tested the voting system during certification through the Election Assistance Commission. All trusted builds of the software and firmware of each device were installed using the appropriate media and methodologies for installation.

The hash codes for all components of the system were captured by the Functional Examiner with assistance from an ES&S representative by using the process listed in the manufacturer's Technical Data Package (TDP). The Functional Examiner further compared and confirmed that all the captured hash codes matched the hash codes for the EAC certified system executables before executing the test cases or continuing with the examination.

The public demonstration and functional examination portions of the testing commenced on June 23, 2025, in Room 114/OA Training Room of the Keystone Building at 400 North Street, Harrisburg PA 17120, adjacent to the Capitol Complex. Members of the public were allowed and encouraged as observers for the duration of the examination, and public notice of the date and time of the examination and the public demonstration was provided in advance on the Department of State website. The execution of all testing tasks took approximately 2 days. The functional examiner performed the hash validation component of the Physical Configuration Audit, all components of the Functional Configuration Audit and System Integration testing onsite during the public examination. The documentation review portion of the Physical Configuration Audit was completed prior to the public examination at Pro V&V test lab facilities in Huntsville, AL.

1) Physical Configuration Audit

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. During execution of the PCA, the components of the EVS 6.5.0.0 system 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. If any of the software was unable to be verified, the Trusted Build of the software was installed on the component.

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

ElectionWare Election Management System (EMS)

- EMS Standalone - Dell Latitude 5530 – S/N: JPSLPL3
  - Installed Applications: ElectionWare, ElectionWare Additional Reporting, ES&S Event Log Service, and Removable Media Services.
- EMS Printer – Brother HL-L6400DW – S/N: U64185F1N343283

DS950 Central Scanner and Tabulator (DS950):

- DS950 central scanner and tabulator with cart – S/N: DS9521060542
- Printer – Brother HL-EX415DW – S/N: U67062M3N260601
- UPS – CyberPower CP1500 – S/N: CXXLU2000319

DS850 Central Scanner and Tabulator (DS850):

- DS850 central scanner and tabulator with cart – S/N: DS85094200009
- Printer – OKI B432DN – S/N: AK89034528CO
- UPS – APC Back-UPS1500 – S/N: 4B1938P03646

DS450 Central Scanner and Tabulator (DS450):

- DS450 central scanner and tabulator with cart – S/N: DS4516033010
- Printer – OKI B431dn – S/N: AK49006747AO
- UPS – APC Back-UPS1500 – S/N: 4B1938P03646

DS300 Poll Place Scanner and Tabulator (DS300)

- DS300 Poll Place Scanner and Tabulator – S/N: DS3022390019
- DS300 Plastic Ballot Box – ES&S Part # 57300

DS200 Poll Place Scanner and Tabulator (DS200)

- DS200 Poll Place Scanner and Tabulator – S/N: DS0319340098
- Hard-sided lid/carrying case with wheels and extendable handle – part # 98-00045
- DS300/DS200 Plastic Ballot Box – ES&S Part # 57521

ExpressVote Hardware 2.1 (ExpressVote HW2.1)

- ExpressVote Hardware 2.1 – S/N: EV0218361624
- Audio-Tactile Interface (ATI) – ES&S Part # 97-00168
- AVID headphones – ES&S Part # 86002
- Two-position rocker switch assistive technology – ES&S Part # E213438

ExpressVote Hardware 3.0 (ExpressVote HW3.0)

- ExpressVote Hardware 3.0 – S/N: EV0325310829
- Audio-Tactile Interface (ATI) – ES&S Part # 97-00617
- AVID headphones – ES&S Part # 86002
- Two-position rocker switch assistive technology – ES&S Part # E213438

ExpressVote XL Full-Face Universal Voting System (ExpressVote XL)

- ExpressVote Hardware 3.0 – S/N: EV0325310829
- Universal Voting Console (UVC) – ES&S Part # 98-00077
- AVID headphones – ES&S Part # 86002

2) Functional Configuration Audit

This testing included all proprietary components and COTS components (software, hardware, and peripherals) in a configuration consistent with the system's intended use. 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. For software system tests, the tests were designed according to the stated design objective without consideration of its functional specification. Specifically, the Functional Configuration Audit for the EVS 6.5.0.0 campaign consisted of executing the following test cases for each listed component:

ElectionWare Election Management System

- Evaluation of Election Management System (EMS)
- PA-ESS6500-TC-001 Adjudication of General Election
- PA-ESS6500-TC-002 Adjudication of Open Primary Election
- PA-ESS6500-TC-003 Write-in Management

DS200 and DS300 Polling Place Scanner and Tabulator

- 02 – 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter
- 05 – 25 P.S. § 3031.7(5) Selection of Candidate and Write-in
- 07– 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions
- 10 – 25 P.S. § 3031.7(10) Ballot Review and Change
- 16 – 25 P.S. § 3031.7(16) Public Counter, No Reopening of Polls, Media Security with Tamper Proof Locks and Zero Proof and Tally Reports
- PA-EVS6500-TC-004 Undervote Checking

DS450, DS850, and DS950 Central Scanner and Tabulator

- 02 – 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter
- 05 – 25 P.S. § 3031.7(5) Selection of Candidate and Write-in
- 07– 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions
- 17 – 25 P.S. § 3031.7(17) Public Counter, No Reopening of Polls, Media Security with Tamper Proof Locks and Zero Proof and Tally Reports

ExpressPoll HW 2.1, ExpressPoll HW 3.0, and ExpressVote XL Ballot Marking Devices

- 01 – 25 P.S. § 3031.7(1) Voter Secrecy (ADA Voter)
- 02 – 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter (Regular/ADA)
- 05 – 25 P.S. § 3031.7(5) Selection of Candidate and Write-in

- 07– 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions (Regular/ADA
- 10 – 25 P.S. § 3031.7(10) Ballot Review and Change (Regular/ADA)

ExpressVote XL Hybrid Ballot Marking Device

- 01 – 25 P.S. § 3031.7(1) Voter Secrecy (ADA Voter)
- 02 – 25 P.S. § 3031.7(2) Selection of Candidates and Questions by Voter (Regular/ADA)
- 05 – 25 P.S. § 3031.7(5) Selection of Candidate and Write-in
- 07– 25 P.S. § 3031.7(7) Attempt to Over Vote Contests and Questions (Regular/ADA)
- 10 – 25 P.S. § 3031.7(10) Ballot Review and Change (Regular/ADA)
- 16 – 25 P.S. § 3031.7(16) Public Counter, No Reopening of Polls, Media Security with Tamper Proof Locks and Zero Proof and Tally Reports
- PA-EVS6500-TC-005 Undervote Checking

3) System Integration Test

During the System Integration testing, one General Election and one Primary Election were exercised on the voting system. The Functional Examiner created the election definition using ElectionWare, and ES&S USB removable media was used to transfer those elections to DS200, DS300, DS450, DS850, DS950, ExpressVote HW 2.1 and 3.0, and ExpressVote XL units. The polls were opened, and zero reports were printed and verified where applicable. Hand-marked paper ballots and ballots marked electronically via the ExpressVote 2.1 and 3.0 were cast and tabulated through the DS450, DS850, and DS950 central tabulation equipment and DS200 and DS300 precinct count optical scan tabulators.

The ExpressVote XL was used to create and tabulate electronically marked ballots. Those ballots were also scanned and tabulated on all the polling place and central count tabulators. Polls were closed, and results reports were generated with results for the election. The result reports were confirmed to match the expected results of the voted ballots. Adjudication and Write-in Management were then performed in ElectionWare on both General and Primary elections to demonstrate the adjudication capabilities of the EVS 6.5.0.0 voting system. Examiner used English, Spanish, and Simplified Chinese ballots for both General and Primary elections.

General Election System Integration Testing

For the General Election testing, the testing team determined the test ballot parameters and constructed a typical PA ballot 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. The individual contests consisted of a mix of contest types and variation in the number of candidates to be voted for each contest. Fifteen of the contests are in all ballot styles. The other six are split between at least two of the precincts with a maximum of twenty different contests spread across the three precincts. All voting variations supported by the Commonwealth of Pennsylvania are defined in this election. The voting variations included the following:

- Partisan contest
- Non-Partisan contest
- N of M contest
- Referendum contest
- Retention Contest
- Write-In voting
- Split Precinct
- Cross-Party Nominated

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 System Integration Testing

For the Primary Election testing, the testing team determined the test ballot parameters and constructed a typical PA ballot for a closed primary for two parties in three precincts. This election contains thirty-five contests compiled into six ballot styles. Each ballot style contains fifteen contests. The voting variations included in the testing are as follows:

- Partisan contest
- Non-Partisan contest
- 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.

B. Security Testing Processes and Procedures

The Security Testing was done at Pro V&V lab facilities in Huntsville, Alabama. The Security Examiner received the hardware devices from ES&S and already had the software and firmware since Pro V&V served as the Examiner for EAC certification. The Examiner installed the Trusted Build prior to the evaluation using the appropriate media for installation. The Security Testing is comprised of a series of test suites which are utilized for verifying that a voting system will correspond to applicable security requirements within the Pennsylvania Election Code and PA Security Standards, requiring testing of the following security categories:

1) Documentation Review;

2) Design;

3) Software Security – Software;

4) Access Control;

5) Encryption, Network, Audit Logging;

6) Physical Security and;

7) Penetration Testing.

The requirements associated to each area of testing were applied to the EVS 6.5.0.0 system in the following manner. Examiner conducted penetration testing as an attempt to bypass or break the security of the system or device under examination. Penetration testing was conducted without the confines of a pre-determined test suite and relied on the experience and expertise of Pro V&V's knowledge of the system, the component devices and associated vulnerabilities, and the ability to exploit those vulnerabilities.

Testing for this campaign was divided into two distinct but united efforts: Testing 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 Physical Configuration Audit.

1) Testing Assessment

The objective of the Testing Assessment phase of Security testing was to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats. To assess system integrity, Pro V&V developed specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP using the following methodology:

1) Planning and Preparation
    a. Identify Rules and Assumptions for the attack
    b. Set Test Goals
2) Asset Identification: Identifies the components in need of protection
3) Threat Identification: Identifies who or what constitutes a threat, as well as from where and why.
4) Risk Assessment
    a. Describe Vulnerabilities: Identifies the weaknesses and assets that are exposed.
    b. Determine Likelihood: Quantifies the chance that a threat will successfully exploit a potential vulnerability.
    c. Determine Impact: Quantifies the maximum effect a threat has after exploiting a potential vulnerability.
    d. Determine Risk: Calculates a relative score based on likelihood and impact for each potential vulnerability.
5) Discovery Testing
    a. Information Gathering and Scanning
    b. Perform Preliminary Assessment
    c. Vulnerability Analysis
6) Develop Plan of Action for Penetration Testing attack

2) Penetration Testing

Once the Testing Assessment phase of Security Testing had been completed, the results were used to conduct Penetration Testing. Test scenarios were selected and prioritized based on threat / vulnerability pairs derived from conducting the risk assessment of the system. The risk assessment was conducted to gather sufficient analysis to support the selection and prioritization of threat vulnerability pairs used in penetration testing. The risk assessment was used to produce EVS 6.5.0.0 product component-based (L1) matrices showing malicious opportunity hot spots. A matrix was created for each L1 component, with each matrix representing a qualitative measure of vulnerability exploit opportunity in the systems. These hot spots were used to research and identify potential technical vulnerabilities to be targeted during 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 voting system use procedures in back-office and in-precinct environments.

C. Accessibility Examination Processes and Procedures

Whitney Quesenbery of the Center for Civic Design, serving as the Accessibility Examiner, reviewed the changes between the previously certified versions and EVS 6.5.0.0. Department staff also facilitated discussion and a demonstration of the new ExpressVote Hardware 3.0 via teleconference with the Accessibility Examiner and ES&S; Quesenbery provided her insights in an Accessibility Report which will be included in the Examination Results portion of this certification report. A summary of test details is provided below.

The accessibility examination portion for EVS 6.0.2.1 commenced on June 25, 2018, at Room G24A/B of the Commonwealth Capitol Complex - Finance Building. The examination lasted approximately three days followed by a debrief meeting on June 28, 2018, with DOS and the Center for Civic Design to discuss initial findings. The examination included expert review by the Accessibility Examiner, sessions with 3 poll worker groups from Dauphin County, and sessions with 7 voters with disabilities using different accessible devices for voting.

1) Expert Review by Accessibility Examiner

The Accessibility Examiner conducted a review of the voting system under examination prior to sessions with voters and poll workers. The Accessibility Examination team included both accessibility and usability expertise to ensure background and knowledge of the issues for accessible voting. The Accessibility Examiner had experience working with people with a wide variety of disabilities and their impact on daily life, knowledge of the range and use of assistive technologies that voters with disabilities might rely on for access, experience conducting usability evaluations with voters and strong knowledge of best practices and design principles for digital technology and voting systems. The expert review gave the examiners a chance to make sure they understand how the system and accessibility features works and to note anything they want to watch for during other testing.

2) Usability Review with Voters with Disabilities

During the 6.0.2.1 accessibility examination, the Accessibility Examiner used the same ballot and instructions to be used for voter review, for their expert review, so they would be familiar with the interaction voters would experience.

Sessions with Voters

The following voter population with ages was represented in the test sessions:

- 2 voters blind from birth;
- 1 acquired blindness;
- 1 very low vision;
- 1 low vision & hard of hearing using a personal assistive device;
- 1 cognitive disability;
- 1 limited mobility ESL speaker;

The voters' age ranged from 35 through 70 years old, and were from Allegheny, Bucks, Cumberland, Dauphin, and Philadelphia counties.

Each voter session took about an hour. They included:

1. An opening interview about their previous voting experience and the types of assistive technologies they use in daily life and in voting.
2. A very basic orientation to the system with opportunities for voters to ask questions about any assistive technologies available.
3. Set-up of the machine using the provided assistive access features based on the needs of the individual voter. Where a blind voter would typically use the provided or personal headset to listen to the audio instructions, the tests used an external speaker so that the testers could inquire about the voters understanding of the instructions.
4. Voting a ballot, following voting instructions given verbally by the facilitator, where necessary, and by reading them. Voters were encouraged to give feedback about their experiences, both positive and negative, as they went through the ballot. The Accessibility Examiner and the voters discussed any feedback and questions that occurred during the voting sessions and re-evaluated any findings as necessary. \
5. A closing interview including a questionnaire about their voting experience and reactions to the system.

3) Election Process Experience with Poll Workers

During the 6.0.2.1 accessibility examination, the Accessibility Examiner used the same ballot and instructions to be used for poll worker review, for their expert review, so they would be familiar with the interaction voters would experience.

Sessions with Poll Worker Groups

Poll workers were invited to come in teams, in three separate sessions of differing team sizes. The team sizes were 2, 3 and 5 for a total of 10 people. These poll workers:

- were from Dauphin County;
- had between one and twenty-four years of experience and included one Judge of Elections; and
- had limited experience serving voters with disabilities.

Each poll worker session took approximately one hour, depending on the group size and provided the most activity variability. Each session included:

1) A brief orientation to the voting systems and the accessibility features, similar to a poll worker training.
2) An opportunity for the poll workers to review vendor-provided instructions before trying the system. They marked ballots and experimented with the accessibility features.
3) An opportunity for the poll workers to interact with roll-played voters in two to six different access-needs scenarios, depending on the size of the group and available time. Each scenario involved an examiner roll-playing as a voter with an unspecified disability. In some scenarios, the voter didn't immediately identify their disability. Since this was not intended to test the poll-worker's ability to determine appropriate accommodations, each simulated voter provided information about the accommodations they needed, in general language. This sometimes required the poll worker to ask the voter what additional assistance she or he might need. Then the poll worker activated the necessary accessibility features for the voter.

The Accessibility Examiner took notes about aspects of the system that worked well and problems they encountered during all three phases of the examination. The issues were then categorized as follows based on their impact on a voter's ability to vote independently and privately:

- Positives – things that voters mentioned as meeting or exceeding their expectations;
- Annoyances – things voters mentioned as problems, but which did not significantly slow their progress in marking their ballot;
- Problem solving – instances where voters hesitated and had to figure out how to complete an action or task, but were able to do so on their own, by exploring the system or relying on past experience with technology;
- Needs assistance - problems that could only be solved with help, such as instructions or assistance from a poll worker; and

- Show stoppers - problems that could prevent successful independent and private voting, even with good knowledge about how to use the system and accessibility features.

The Accessibility Examiner then compiled the findings including categorizations from the examination into a report submitted to the Secretary.

V. Examination Results

The Examiner's Test Report for Functional Testing for EVS 6.5.0.0 (TR-01-03-PA-001-EVS6500) included details of the test cases, execution, and successful completion. The Examiner's Security Testing and Evaluation Report for EVS 6.5.0.0 (TR-01-03-PA-EVS6500-PEN) included details of the penetration testing planning, methodology, and execution results. The Accessibility Examiner's Accessibility Report for ES&S EVS 6.5.0.0 included observations and recommendations for ways the system could be configured to improve accessibility.

The following Sections contain a summary of all results of the examination as explained in fuller detail in the respective Examiners' Reports.

A. Functional Examination Results

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 EVS 6.5.0.0 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) Physical Configuration Audit

Functional Examiner concluded that the following election code requirements were met by EVS 6.5.0.0 voting system and were addressed as part of the PCA and documentation review:

- 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).

2) Functional Configuration Audit

The test cases for ElectionWare, DS200, DS300, DS450, DS850, ExpressVote HW 2.1, ExpressVote HW 3.0, and ExpressVote XL were all performed successfully, and results were verified. The Functional Examiner also noted that the paper ballots will allow statistical recounts as required by Sections 1117-A, 25 P.S. § 3031.17. Test cases utilized during the performance of the Functional Configuration Audit are included below:

Statutory Requirement and Test Case Explanation	**Device Tested**
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.	ExpressVote HW 2.1 ExpressVote HW 3.0 ExpressVote XL

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.	
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 selection of partisan candidates in multiple contests for vote for one, "N of M" contest, and ballot questions. Functional Examiner also validated that all the votes were counted appropriately on DS200, DS300, DS450, DS850, DS950, and ExpressVote XL.	ExpressVote HW 2.1 ExpressVote HW 3.0 ExpressVote XL DS200 DS300 DS450 DS850 DS950
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 Integration Testing was used to further confirm that the candidates were presented with the correct contests that they were eligible to vote.	ExpressVote HW 2.1 ExpressVote HW 3.0 ExpressVote XL DS200 DS300 DS450 DS850 DS950
25 P.S. § 3031.7(7) - If it is of a type that registers the vote electronically, the voting system shall preclude each voter from voting for more people for any office than he is entitled to vote for or upon any question more than once. Functional Examiner tested to confirm that ExpressVote HW2.1 and 3.0 ballot marking devices prevented overvotes, DS200 and DS300 precinct tabulators warned voters for overvotes if configured, and DS450, DS850, and DS950 central count tabulators did not count any votes for a contest that was overvoted.	ExpressVote HW 2.1 ExpressVote HW 3.0 ExpressVote XL DS200 DS300 DS450 DS850 DS950
25 P.S. § 3031.7(10) - If it is of a type that registers the vote electronically, the voting system shall permit each voter to change his vote for any candidate or upon any question appearing on the official ballot up to the time that he takes the final step to register his vote and to have his vote computed. If it is of a type that uses paper ballots or ballot cards to register the vote and automatic tabulating equipment to compute such	ExpressVote HW 2.1 ExpressVote HW 3.0 ExpressVote XL DS200 DS300

votes, the system shall provide that a voter who spoils his ballot may obtain another ballot; any ballot thus returned shall be immediately cancelled and at the close of the polls shall be enclosed in an envelope marked "Spoiled" which shall be sealed and returned to the county board. Functional Examiner tested to confirm that ExpressVote ballot marking devices and ExpressVote XL 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.	
25 P.S. § 3031.7(16) - If the voting system is of a type which provides for the computation and tabulation of votes at the district level, the district component of the automatic tabulating equipment shall include the following mechanisms or capabilities: (i) A public counter, the register of which is visible from the outside of the automatic tabulating equipment component into which the ballots are entered, which shall show during any period of operation the total number of ballots entered for computation and tabulation. (ii) A lock, or locks, by the use of which all operation of the tabulation element of the automatic tabulating equipment is absolutely prevented immediately after the polls are closed or where the tabulation of votes is completed. (iii) It shall be so constructed and controlled that, during the progress of voting, it shall preclude every person from seeing or knowing the number of votes theretofore registered for any candidate or question; and it shall preclude every person from tampering with the tabulating element. (iv) If the number of choices recorded for any office or on any question exceeds the number for which the voter is entitled to vote, it shall reject all choices recorded on the ballot for that office or question, provided, that if used during the period of voting it may also have the capacity to indicate to a voter that he has improperly voted for more candidates for any office than he is entitled to vote for, and in such case it shall have the capacity to permit the voter to mark a new ballot or to forego his opportunity to make such correction. (v) It shall be equipped with an element which generates a printed record at the beginning of its operation which verifies that the tabulating elements for each candidate position and each question and the public counter are all set to zero and with an element which generates a printed record at the finish of its operation of the total number of voters whose ballots have been tabulated, the	DS200 DS300 ExpressVote XL

total number of votes cast for each candidate whose name appears on the ballot, and the total number of votes cast for, or against, any question appearing on the ballot. Functional Examiner validated that the voting device does not allow the reopening of the polls and is able to produce a "Zero Proof" and "Tally Report". The voting device has a visible public counter and the counter increments correctly.	
25 P.S. § 3031.7(17) - If the voting system is of a type which provides for the computation and tabulation of all votes at a central counting center or if it provides for the tabulation of district totals at such a central counting center, the central automatic tabulating equipment shall include the following mechanisms or capabilities: (i) It shall be constructed so that every person is precluded from tampering with the tabulating element during the course of its operation. (ii) If the number of choices for any office or on any question exceeds the number for which the voter is entitled to vote, it shall reject all choices recorded on the ballot for that office or question. (iii) It shall have a means by which to verify that the counters for each candidate position and for each question are all set to zero and shall be able to generate a printed record of each election district showing the total number of voters whose ballots have been tabulated, the total number of votes cast for each candidate whose name appears on the ballot, and the total number of votes cast for, or against, any question appearing on the ballot. It may also be capable of generating cumulative election reports. Functional Examiner validated that the voting device does not allow the reopening of the polls and is able to produce a "Zero Proof" and "Tally Report". The voting device has a visible public counter and the counter increments correctly.	DS450 DS850 DS950

Functional Examiner concluded that the following additional election code requirements were met by EVS 6.5.0.0 voting system and were addressed as part of the FCA:

- 1101-A, 25 P.S. § 3031.1; and
- 1107-A(12), 25 P.S. § 3031.7(12);

The Functional Examiner identified that the following requirements within Article XI-A of the Pennsylvania Election 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, use and maintenance aspects of a voting, that a jurisdiction would be tasked with following:25 P.S. § 3031.2, 3031.3, 3031.4, 3031.6, 3031.8, 3031.9, 3031.10, 3031.11, 3031.12, 3031.13, 3031.14, 3031.15, 3031.16, 3031.18, 3031.19, 3031.20, 3031.21, and 3031.22.

3) System Integration Test

During execution of the test procedure, it was verified that the EVS 6.5.0.0 voting system successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

Functional Examiner concluded that EVS 6.5.0.0 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), 21 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 during the physical configuration audit documentation review were further validated by the successful tabulation and validation of the primary and general elections run by the Functional Examiner.

System Integration testing verified that the system as an aggregate is capable of conducting a full election, from creation of the election definition to creation of media used to conduct in-person and central count polling activities, and accumulation and publishing of the election's final results.

B. Security Testing Results

The Examiner states in Section VII: Conclusion of their Security Testing and Evaluation report that "The EVS 6500 system, as presented for testing, successfully met the requirements contained within Attachment E to the Directive for Electronic Voting Systems - PA Voting System Security Standard. Based on the test findings, Pro V&V recommends the EVS 6500 system be considered safe and secure for use by voters at elections."

C. Accessibility Examination Results

The Accessibility Examiner compiled the findings including categorizations from the examination into a report submitted to the Secretary. This report, as well as the original report from the in-person 6.0.2.1 Accessibility Examination and reports from EVS 6.1.0.0, 6.3.0.0, and 6.5.0.0 from the Accessibility Examiner are provided with this report as Attachment B.

VI. Observations

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

- EVS 6.5.0.0 does not support cumulative voting.
- Straight party voting is no longer a part of the electoral process in the Commonwealth of Pennsylvania, so any observations included pertaining to it are no longer relevant.
- The ADA compliant ballot marking devices, ExpressVote and ExpressVote XL, presented as part of the EVS 6.5.0,0 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 device.
- Observations/Findings identified during the Accessibility Examinations for EVS 6.0.2.1, 6.1.0.0, and 6.3.0.0 are provided in Appendix B.
- If they are not new, the USB devices and other portable media used with the voting system components need to be reformatted before each election.

The ExpressVote HW 2.1, ExpressVote HW 3.0, and ExpressVote XL can accommodate 10-12 voters using assistive devices or 20-60 voters an hour when used as the primary voting system, depending on the size of the ballot. The DS200 can serve 120-180 voters per hour depending on the length of the ballot. The DS300 can serve 180-240 voters per hour depending on the length of the ballot. ExpressVote XL ballot box will hold approximately 300 ballots. DS200 and DS300 precinct tabulators allow a maximum of 5,000 ballots cast per session after which the units will need to have another TM inserted to continue the tabulation process. DS200 and DS300 ballot boxes will hold approximately 1250 to 3000 19-inch ballots.

All testing of EVS 6.5.0.0 was performed using executables verified by hash validation to be from the EAC Trusted Build, in association with the appropriate hardware version as declared for EVS 6.5.0.0

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

After all testing activities, the examiners and Department concluded that EVS 6.5.0.0 demonstrates compliance with all applicable requirements as delineated in Article XI-A of the Pennsylvania Election Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22

VII. Conditions for Certification

Based on the results of the examination that occurred in June 2025 and the reported findings of the Examiners as set forth in their reports, the Secretary of the Commonwealth certifies EVS 6.5.0.0 for sale and use in Commonwealth elections subject to the following conditions:

A. Pennsylvania counties using EVS 6.5.0.0 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 (the "Use Directive"), any subsequent revisions of the Use Directive, and any other applicable directives currently in effect or issued in the future. Specifically, Pennsylvania counties must adhere to item four (4) of the Use Directive when setting up and positioning the ExpressVote 2.1, ExpressVote 3.0, and ExpressVote XL 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 Election Code, 25 P.S. § 3031.7(1)).
B. Equipment Reporting by jurisdictions. Reported field issues or anomalies that occur in Pennsylvania or elsewhere with any piece of equipment deployed in the Commonwealth of Pennsylvania must be relayed to the Department of State by each jurisdiction EVS 6.5.0.0 is used in as laid out in the Directive Regarding the Uniform Reporting of Voting System Malfunctions to the Department of State issued September 22, 2023.
C. No components of EVS 6.5.0.0 shall be connected to any modem or network interface, including the Internet, at any time. A standalone local area wired network configuration may be considered, 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 EVS 6.5.0.0, including wireless LAN cards or network adapters, must be uninstalled or disabled prior to shipping to a County Board of Elections.
D. Regional Results, included in the EAC certified components of EVS 6.5.0.0 is not certified for use in Pennsylvania.
E. Because EVS 6.5.0.0 is a paper-based system, counties using EVS 6.5.0.0 must comply at a minimum with Section 1117-A of the Election 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 exclusively via a manual count of the voter marked paper ballots. 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, any subsequent revisions of that Directive, and any other directives that may apply to audits of electronic voting systems.

F. All jurisdictions implementing EVS 6.5.0.0 need to carry out 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 automated L&A testing and discourages the use of preprinted ballots provided by vendors. All components being used on election day, including any Electronic Poll Books being used, must be part of the L&A testing.

G. EVS 6.5.0.0 is a paper-based system, and hence, implementation of the system for precinct or central count scanning is scalable. Jurisdictions must calculate the number of voting booths and the number of ballots necessary to accommodate the number of registered voters in a precinct to avoid long lines. Jurisdictions must include the ExpressVote 2.1, ExpressVote 3.0, or ExpressVote XL as an ADA compliant device in configuring a precinct polling place. Jurisdictions must also take into consideration scanning speed and ballot box and transport media capacities of polling place components when deciding on the number of voting booths. Jurisdictions must also take into consideration that the ExpressVote XL when used as a tabulator, requires the ballot bin to be changed or emptied after about 300 ballots. For DS200 and DS300 ballot box capacities, jurisdictions can refer to the DS200 and DS300 operators guides from ES&S.

H. All jurisdictions implementing EVS 6.5.0.0 must implement administrative safeguards and proper chain of custody, and document the same, to facilitate the safety and security of electronic systems pursuant to the Guidance on electronic Voting System Preparation and Security, October 2020, and any subsequent revisions or directives.

I. Jurisdictions implementing EVS 6.5.0.0 with the Central Count Tabulator as the primary system, where votes 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 EVS 6.5.0.0 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 the possibility of any password compromise. The passwords and permissions management must at a minimum comply with the password requirements outlined in NIST 800-63. This publication can be accessed at https://pages.nist.gov/800-63-3/.

K. Jurisdictions implementing EVS 6.5.0.0 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. All jurisdictions implementing EVS 6.5.0.0 must configure the polling place components of the voting system to notify voters when they attempt to cast overvotes. The DS200 and DS300 tabulation device options must be set to "Query Voter Preference" for overvoted hand-marked paper ballots. 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).

M. All jurisdictions implementing EVS 6.5.0.0 must work with ES&S to ensure that only the certified system configuration is installed both on first purchase, as well as 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. Any time the system is installed after the first purchase or an upgrade is completed, the vendor and the county must complete the implementation attestation and must make a copy available to the Secretary on request. A sample format that can be used for the attestation is included as Attachment C to this document.

N. ExpressVote 1.0 and ExpressTouch devices are not certified for use in Pennsylvania with EVS 6.5.0.0. These devices were not presented to the Secretary for certification by ES&S.

O. ES&S must work with the jurisdictions implementing EVS 6.5.0.0 to ensure that the system has been hardened for a secure implementation. Jurisdictions must implement processes to ensure that all components of the voting system have been hardened per the instructions in the TDP.

P. Jurisdictions can make use of the ElectionWare adjudication functionality to adjudicate write-ins and evaluate questionable ballots, contests, or selections to determine voter intent. Any decisions made during the adjudication process must be agreed upon by a team of at least two reviewers authorized by the election official following Election Code requirements. The election official must, when necessary, consult the paper ballot to assist with determinations made during adjudication. In the event of a recount, the voter verifiable paper ballots must be used for the count.

Q. Jurisdictions implementing EVS 6.5.0.0 must work with ES&S 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.

R. Jurisdictions using the services of ES&S or a third-party vendor for election preparation activities must work with ES&S or the vendor to ensure that systems used for ballot definition activities are considered part of the voting system, and they must use certified voting system components. The systems used for ballot definition must be configured securely following conditions outlined in this report and following any applicable 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.
S. ExpressVote XL Condition - Jurisdictions implementing ExpressVote XL must ensure that the configuration allows voters to review their vote selections on the screen and on the marked paper ballot before it is cast.
T. ExpressVote XL Condition - Jurisdictions selecting the ExpressVote XL must implement proper poll closing and vote record transportation procedures so that collection bins containing marked paper ballots are sealed and transported with proper chain of custody to the county office. Poll worker training must include the details of the procedures to ensure that collection bins remain 30 sealed until delivered to the county office. Collection bins must be opened in the presence of board of election members and must be commingled before canvass and storage, in a manner consistent with the procedure outlined for the canvassing of absentee ballots under Section 1308(g) of the Election Code, 25 P.S. § 3146.8.
U. ExpressVote XL Condition - Jurisdictions implementing ExpressVote XL as a tabulator must ensure that the system is configured to generate a printed report at the close of polls. The report must at a minimum indicate the total number of voters whose ballots have been tabulated, the total number of votes cast for each candidate whose name appears on the ballot, and the total number of votes cast for, or against, any question appearing on the ballot.
V. ES&S must ensure that any implementations in Pennsylvania counties must appropriately indicate that the ExpressVote or ExpressVote XL BMDs are printing the ballot and the final messaging on the ballot marking device must instruct the voter on how to complete the voting process. Any references to “casting the ballot” must not be present. The changes must be done during implementation by ES&S support personnel and verified by county election officials.
W. Jurisdictions must have appropriate instructions on the ExpressVote or ExpressVote XL ballot marking devices to ensure that the voter reviews the entire ballot before printing the ballot.
X. Jurisdictions must work with ES&S to ensure that the entire audio ballot including audio rates and volumes on the audio ballot are tested before deploying to polling places. Jurisdictions must also ensure that poll worker training includes potential situations and questions from voters using the audio ballot.
Y. Jurisdictions must work with ES&S during the ballot definition to ensure that voters using assistive devices have clear instructions for the write-in process. The onscreen instructions must be adjusted to have the audio ballot explain the process. The audio

instructions must include instructions on how to navigate and find the write-in keyboard.

Z. Jurisdictions must work with ES&S to thoroughly test and review audio ballot instructions to ensure that the voters using an audio ballot can cast the ballot without requesting assistance. Jurisdictions must consider the following while reviewing the ballot:
   i. The audio ballot must fully inform the voter what has happened and is occurring, and how to select/deselect their choices;
   ii. The feedback messages must explain to voters what is happening, including the number and names of candidates being deselected;
   iii. The audio ballot must provide feedback on the reason for the changes in any selections; and
   iv. The audio ballot instructions regarding messages on the system must communicate the specific information for the task or screen displayed before the general, repeated instructions.

AA. ExpressVote XL Condition - Jurisdictions implementing the ExpressVote XL must ensure that the on-screen instructions for ExpressVote XL include specific voter and poll worker instructions detailing spoiling procedures and cues to protect voter privacy. In addition, poll worker training must:
   i. Emphasize the need to obscure any view of the marked paper ballot during the process of spoiling the ballot;
   ii. Educate poll workers on the proper steps to be taken when they respond to a voter request for spoiling a marked paper ballot to ensure that the secrecy of the spoiled record is maintained. These steps include ensuring that the voter intends to spoil the ballot, and has read the instructions on the screen and has been informed by the poll worker how to prevent inadvertent view of the marked paper ballot before the poll worker enters inside the privacy curtain;

BB. Jurisdictions implementing EVS 6.5.0.0 must include poll worker training as part of the implementation plan. The training must include hands on practice for poll workers. Poll workers must be provided with instructions on how to offer support to help voters get started with (or re-familiarize themselves with) the key layout of the devices and functions as necessary. Follow-on training for replacement poll workers, and refresher training, must also be considered. Specific consideration must be given to voters using assistive devices and also poll worker education to assist voters with disabilities. Refer to Attachment B, listing detailed recommendations for deployment noted by the Accessibility Examiner.

CC. Jurisdictions implementing EVS 6.5.0.0 must include voter training as part of the implementation plan. The training must include hands-on practice for voters. As part of voter-education and outreach efforts, specific consideration must be given to voters using assistive devices. These voters must be provided with the opportunity to use the system tactile keypad in advance of election day so that the voters will know how to use the system effectively.

DD. ExpressVote XL Condition - Jurisdictions implementing ExpressVote XL must configure election administration options in ElectionWare to set printed ballots to use the largest text size for all elections.

EE. Jurisdictions must implement ExpressVote 2.1 and ExpressVote 3.0 by configuring it in such a way to ensure that only one contest is displayed per screen.

FF. Jurisdictions implementing EVS 6.5.0.0 must consider the following during voting booth set up for serving voters requiring assistive devices:

i. A table or stand for voters using the tactile keypad who do not use wheelchairs with trays that can hold the keypad to relieve fatigue and make it easier to use with both hands.

ii. Voters with disabilities may have assistive technology or personal notes that they need to be placed 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.

iii. For the ExpressVote 2.1 or ExpressVote 3.0 configured as a marker where the voter has to complete the voting process by scanning the ballot on a precinct scanner, the path to the scanner should be as easy as possible, ideally a straight line with no obstructions. The path should include ample room to turn and maneuver a wheelchair if the machine is positioned with the screen facing the wall. The ADA standards suggest a minimum of 60 x 60 inches for this. Refer to Appendix B, listing detailed recommendations for deployment noted by the Accessibility Examiner.

GG. The electronic voting system must be physically secured and protected while in transit, storage, and while in use at their respective locations. Unmonitored physical access to devices can lead to compromise, tampering, and/or planned attacks. Pennsylvania counties using EVS 6.5.0.0 must comply with the Directive Concerning Access to Electronic Voting Systems, including but not limited to the Imaging of Software and Memory Files, Access to Related Internal Components, and the Consequences to County Boards of Allowing Such Access issued by the Secretary of the Commonwealth on July 8, 2021, any subsequent revisions of the Directive, and any other applicable directives currently in effect or issued in the future.

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

II. 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 ES&S 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 components of the voting system housed in county office which can be removed by authorized personnel when the port is needed.

JJ. Jurisdictions utilizing the standalone installation of the EMS server must take necessary steps to protect the laptops from accidental loss or theft. Suggested

mitigations include but are not limited to - cable locks, tamper evident seals, proper password management which utilizes passwords of sufficient strength in each election, as well as locking containers. All standalone ElectionWare instances should remain in a protected environment protected by sufficient security mitigations to prevent unauthorized access. The chain of custody for the standalone EMS systems must be maintained by the jurisdiction at all times, and periodic auditing of the system's chain of custody procedures are required. Jurisdictions must implement processes to determine exact ElectionWare system usage by election official for enhanced auditability.

KK. 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, reported and resolved in a timely manner.

LL. Jurisdictions implementing EVS 6.5.0.0 must ensure that the USB devices and any other removable media used for election activities are maintained with strict chains 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. Jurisdictions implementing EVS 6.5.0.0 must implement policy and procedures to ensure the use of ONLY approved, designated, and clearly marked USB's for use in any component of the system. The system is heavily dependent on USB for intra-component transfer of data assets.

MM. Jurisdictions implementing EVS 6.5.0.0 must work with ES&S to ensure that appropriate levels of training for election officials are planned and undertaken on implementation. Counties must ensure that training adheres to the "Minimum Training Requirements" specified in Attachment D of this document.

NN. Central Scanning configuration condition –Jurisdictions implementing EVS 6.5.0.0 with the Central Count Tabulator DS450, DS850, or DS950 as the primary system where votes 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.

OO. ES&S 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 any publicly available social media platform. The videos must be closed captioned for the hearing impaired.

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

ii. 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.

iii. 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.

iv. 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 language thresholds requirements of the Voting Rights Act.

PP. ES&S must adhere to the following reporting requirements and submit the following to the Secretary:

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

ii. Advisory Notices. System advisory notices issued for any piece of equipment deployed in the Commonwealth of Pennsylvania regardless of whether the incident behind the notice occurred in Pennsylvania or elsewhere;

iii. 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, ES&S 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;

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

QQ. ES&S must adhere to the "Source Code and Escrow Items Obligations" specified in Attachment F of this document.

RR. ES&S must work with jurisdictions to ensure that the system is configured to comply with all applicable requirements of the Pennsylvania Election Code delineated in Section Article XI-A of the Pennsylvania Election Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 – 3031.22.

SS. Jurisdictions implementing EVS 6.5.0.0 and ES&S 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 Election Code, 25 P.S. § 3031.5(a)-(b). ES&S must ensure that future releases of the voting system with enhanced security and accessibility features are presented for approval to the Secretary.

TT. ES&S must work with counties and the Department of State to ensure that the system can integrate with Pennsylvania Department of State's Election Night Reporting (ENR) system.

UU. 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 Pennsylvania Election Code, 25 P.S. § 3031.5(d), this certification and approval is valid only for EVS 6.5.0.0. If the vendor or a County Board of Elections makes any changes to the EVS 6.5.0.0 Voting System after 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 EVS 6.5.0.0 Voting System in the Commonwealth of Pennsylvania.

VV. ES&S must work with counties and Department of State to ensure that the counties are trained on generating the reports from ElectionWare required for results certification audits.

WW. Jurisdictions implementing EVS 6.5.0.0 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.

XX. ExpressVote XL Condition - Counties implementing ExpressVote XL, must configure screens to ensure that the screen titles and text on each screen clearly identifies to the voter about what the specific voting step that is being performed, specifically the review screen must tell the voter that they are reviewing their selections.

YY. Counties implementing ExpressVote 2.1 must configure devices only as ballot marking devices. Use of the ExpressVote 2.1 as a tabulator with EVS 6.5.0.0 is not permitted.

The Secretary's certification for EVS 6.5.0.0 is predicated on the EAC final certification decision dated 7/24/2024. The final EAC certification report is appended to this certification report as Attachment A.

VIII. Recommendations

A. All jurisdictions implementing EVS 6.5.0.0 should take appropriate steps to ensure that voter education is part of the implementation plan.
B. All jurisdictions implementing EVS 6.5.0.0 should ensure that precinct election officials and poll workers receive appropriate training and is comfortable using the system.
C. All jurisdictions considering purchase of the EVS 6.5.0.0 voting system should review the System Limits as mentioned in the EAC certification scope added as Attachment A to this report.
D. The Secretary recommends that ES&S and counties work with the Department on any changes to their voting equipment including, but not limited to, purchase and upgrades.
E. Secretary recommends in-house ballot definition activities at county location whenever possible. If an external vendor location is used the county should implement checks and balances to ensure that election data including ballot definition files and audit logs stored on devices outside of the county is protected from unauthorized access.
F. Secretary recommends configuring the election with only one contest being displayed on each screen presented to the voter on the ExpressVote HW2.1 and 3.0 ballot marking devices. This is to ensure that all screens presented to the voter is similar and voters don't need to adapt to the situation that there may be multiple contests displayed on a screen.

IX. Conclusion

As a result of the examination, and after consultation with the Department's staff and the Examiners, the Secretary of the Commonwealth concludes that EVS 6.5.0.0 can be safely used by voters at elections as provided in the Pennsylvania Election Code and meets all of the requirements set forth in the Code, provided the voting system is implemented with the conditions listed in Section IV of this report. Accordingly, the Secretary certifies EVS 6.5.0.0 for use in this Commonwealth.

X. Attachment A – EAC Certification Scope

ESS EVS 6500
Certificate and Scop

United States Election Assistance Commission

Certificate of Conformance

ES&S EVS 6.5.0.0

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: EVS

Model or Version: 6.5.0.0

Name of VSTL: Pro V&V

EAC Certification Number: ESSEVS6500

Date Issued: 07/24/2024

Brianna Schletz

Executive Director

Scope of Certification Attached

Manufacturer: *Election Systems & Software*
System Name: *EVS 6.5.0.0*
Certificate: *ESSEVS6500*

Laboratory: *Pro V&V*
Standard: *VVSG 1.0*
Date: *9/24/2024 **

Scope of Certification

This document describes the scope of the validation and certification of the system defined above. Any use, configuration changes, revision changes, additions or subtractions from the described system are not included in this evaluation.

Significance of EAC Certification

An EAC certification is an official recognition that a voting system (in a specific configuration or configurations) has been tested to and has met an identified set of Federal voting system standards. An EAC certification is **not**:

- An endorsement of a Manufacturer, voting system, or any of the system's components.
- A Federal warranty of the voting system or any of its components.
- A determination that a voting system, when fielded, will be operated in a manner that meets all HAVA requirements.
- A substitute for State or local certification and testing.
- A determination that the system is ready for use in an election.
- A determination that any particular component of a certified system is itself certified for use outside the certified configuration.

Representation of EAC Certification

Manufacturers may not represent or imply that a voting system is certified unless it has received a Certificate of Conformance for that system. Statements regarding EAC certification in brochures, on Web sites, on displays, and in advertising/sales literature must be made solely in reference to specific systems. Any action by a Manufacturer to suggest EAC endorsement of its product or organization is strictly prohibited and may result in a Manufacturer's suspension or other action pursuant to Federal civil and criminal law.

System Overview

The ES&S EVS 6.5.0.0 voting system is a modification of the EVS 6.4.0.0 voting system, certified on August 18, 2023. The EVS 6.5.0.0 voting system introduces ExpressVote version 3.0, and also contains modifications to Electionware, ExpressVote versions 1.0 and 2.1, ExpressVote XL, DS200, DS300, DS450, DS850, and DS950. EVS 6.5.0.0 is composed of software applications, central count location devices and polling place devices with accompanying firmware, and COTS hardware and software:

Electionware® election management software is an end-to-end election management software application that provides election definition creation, ballot formation, equipment configuration, result consolidation, adjudication, and report creation. Electionware is composed

** This scope has initial issued in July 2024. It has been updated in September 2024, to reflect an updated version number following an Engineering Change Order.*

of five software groups: Define, Design, Deliver, Results, and Manage. This release of Electionware also includes the Additional Reporting module.

ExpressVote® XL is a hybrid paper-based polling place voting device that provides a full-face touch screen vote capture interface that incorporates the printing of the voter's selections as a cast vote record and tabulation scanning into a single unit.

ExpressTouch® is a DRE voting system which supports electronic vote capture for all individuals at the polling place.

ExpressVote® Hardware 1.0 is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, to be scanned for tabulation in any one of the ES&S precinct or central tabulators.

ExpressVote® Hardware 2.1 is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, to be scanned for tabulation in any one of the ES&S precinct or central tabulators. There are two separate versions of ExpressVote HW2.1: version 2.1.0.0 and version 2.1.2.0.

ExpressVote® Hardware 3.0 is a hybrid paper-based polling place voting device that provides touch screen vote capture that incorporates the printing of the voter's selections as a cast vote record, to be scanned for tabulation in any one of the ES&S precinct or central tabulators.

DS200® is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic cast vote records (CVR).

DS300® is a polling place paper-based voting system, specifically a digital scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic cast vote records (CVR).

DS450® is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

DS850® is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

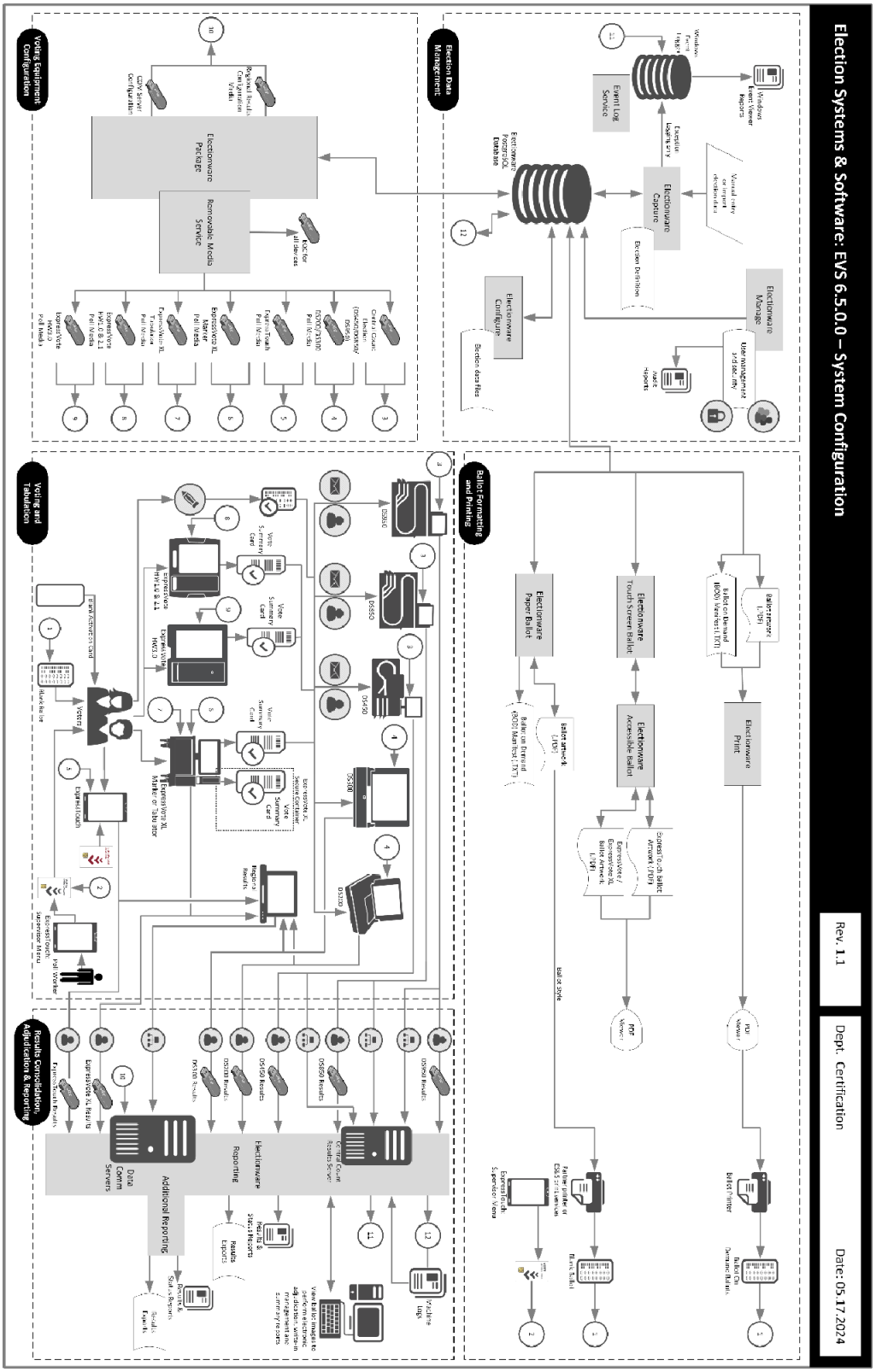
DS950® is a central scanner and tabulator that simultaneously scans the front and back of a paper ballot and/or vote summary card in any of four orientations for conversion of voter selection marks to electronic Cast Vote Records (CVR).

Event Log Service (ELS) monitors and logs users' interactions with the election management system. Events that happen when a connection to the database is not available are logged to the Windows operating system log through the ELS.

Removable Media Service (RMS) is a utility that runs in the background of the Windows operating system. RMS reads specific information from any attached USB devices so that an ES&S application such as Electionware can use that information for media validation purposes.

Electionware® Regional Results (Regional Results) is a standalone application that is deployed at Regional Sending Sites. For more efficient results reporting, the Regional Results software then securely transmits the encrypted unofficial results collection files over a customer dedicated network.

System Diagram



Certified System before Modification (If applicable):

EVS 6.4.0.0

Changes addressed by modification for EVS 6.5.0.0

Hardware

New Hardware

ExpressVote 3.0: The ExpressVote is a vote capture device designed for all voters, with independent voter-verifiable paper record that is digitally scanned for tabulation on a compatible ES&S tabulator.

Hardware Modifications

- **ExpressVote XL**: added/updated the following components:
    - Introduced the motherboard revision 2.0 to replace end-of-life parts.
    - Added a smart card reader for multi-factor authentication (reserved for future use).
    - Added an 8GB CFast 2 (data) card for customers with large volume elections (optional).
    - Added a re-engineered Paper Path Module (PPM) ground strap.

Software/Firmware Changes

Cross-Product Changes

- Added support for additional languages on printed ballots and for the ExpressVote. Impacted products:
    - Electionware
    - ExpressVote
- Added support for scanning a 2D barcode containing voter selections generated by a third-party application. Impacted products:
    - Electionware
    - ExpressVote
- Replaced all purchased fonts with open-source equivalents. Impacted products:
    - Voting System
- Implemented recommended security enhancements based on third-party security review. Impacted products:
    - Voting System

DS300

- Added the option to validate the application files on-demand from the administrative menu.

Electionware

- Added a results export XML using the common data format.

    - Results Exporting
- Added the Additional Reporting module with a live results dashboard
    - Reporting
- Added the ability to lay out the ExpressVote XL touch screen ballot in a column-by-column display similar to the Column Portrait layout available in Paper Ballot
    - ExpressVote XL

Mark Definition

ES&S' declared mark recognition for the DS200, DS300, DS450, DS850 and DS950 is a mark across the oval that is 0.02" long x 0.03" wide at any direction.

Tested Marking Devices:

Bic Grip Roller Ball Pen

Language Capability

System fully supports English, Spanish, Chinese, Korean, Japanese, Hindi, Bengali, Vietnamese, Tagalog, Creole, Russian, French, Punjabi.

The following languages are supported, but not by polling place tabulators: Gujarati, Arabic, Armenian, Burmese, Khmer, Hmong, Indonesian, Ilocano, Laotian, Mien, Mongolian, Nepali, Persian, Syriac, Tamil, Telegu, Thai, Urdu.

Proprietary Components Included

This section provides information describing the components and revision level of the primary components included in this Certification.

System Component	Software or Firmware Version	Hardware Version	Model	Comments
Electionware	6.5.0.0			Election management software that provides end-to-end election management activities
Electionware Additional Reporting	1.1.0.1*			Additional Reporting module with a live results dashboard.
ES&S Event Log Service (ELS)	3.0.0.0			Logs users' interactions with EMS
Removable Media Service (RMS)	3.0.0.0			Utility that runs in the background of the Windows operating system
Regional Results	1.7.0.0			Standalone application that is deployed at Regional Sending Sites.
DS200	3.2.0.0	1.2, 1.3		Poll Place Scanner and Tabulator that scans voter selections from both sides of the ballot simultaneously
DS300	3.2.0.0	1.0		Poll Place Scanner and Tabulator that scans voter selections from

System Component	Software or Firmware Version	Hardware Version	Model	Comments
				both sides of the ballot simultaneously
DS200/DS300 Ballot Box		1.0, 1.1	98-00009	Collapsible Ballot Box
DS200/DS300 Ballot Box		1.0	98-00110	Collapsible Ballot Box
DS200/DS300 Ballot Box		1.2, 1.3, 1.4, 1.5	57521	Plastic Ballot Box
DS200/DS300 Tote Bin		1.0	00074	Tote Bin Ballot Box
DS200/DS300 Ballot Trolley			212516	Ballot Trolley Ballot Box
DS200 Metal Ballot Box		1.0, 1.1, 1.2	76245	Metal Ballot Box
DS200/DS300 Ballot Tote Bag			60	Ballot Tote Bag
DS200/DS300 Carrying Case			90282	Soft-sided carrying case
DS200/DS300 Carrying Case			98-00045	Hard-sided lid/carrying case with wheels and extendable handle
DS200/DS300 Carrying Case			94052	Hard-sided carrying case (suitcase)
DS300 Ballot Box		1.0	57300	Plastic Ballot Box
DS450	4.4.0.0	1.0		Central Count Scanner and Tabulator
DS450 Cart			3002	
DS850	4.4.0.0	1.0		Central Count Scanner and Tabulator
DS850 Cart			6823	Metal cart for DS850 only
DS950	4.4.0.0	1.1		Central Count Scanner and Tabulator
Central Count Cart			7898	Metal cart for DS450/DS850/DS950
ExpressVote XL	4.4.0.0	1.0		Hybrid full face paper-based vote capture and selection device and precinct count tabulator
ExpressTouch	4.4.0.0	1.0		DRE
ExpressVote HW1.0	4.4.0.0	1.0		Hybrid paper-based vote capture and selection device
ExpressVote HW2.1	4.4.0.0	2.1.0.0, 2.1.2.0		Hybrid paper-based vote capture and selection device
ExpressVote 3.0	4.4.0.0	3.0		Hybrid paper-based vote capture and selection device
ExpressVote Carrying Case			98-00050	Soft-sided carrying case
ExpressVote Rolling Kiosk		1.0	98-00049	Portable Voting Booth
ExpressVote 3.0 Carrying Case			98-00120	Soft-sided carrying case

System Component	Software or Firmware Version	Hardware Version	Model	Comments
Voting Booth			98-00051	Stationary Voting Booth
ExpressVote Ben Franklin Booth			00380, 00381 (adaptor)	Sitting and Standing Voting Booth
Dual Express Cart			41402	Portable Voting Booth
Quad Express Cart			41404	Portable Voting Booth
Voting Booth Workstation			87035	Stationary voting booth
MXB ExpressVote Voting Booth			95000	Sitting and Standing Voting Booth
ExpressVote Single Table			87033	Voting Table for One Unit
ExpressVote Double Table			87032	Voting Table for Two Units
ADA Table			87031	Voting Table for One Unit
ExpressVote Audio-Tactile Keypad	1.0.0.0		97-00168	Audio-Tactile Keypad
ExpressVote 3.0 Audio-Tactile Keypad			97-00617	Audio-Tactile Keypad
Universal Voting Console (UVC)		2.0	98-00077	Detachable ADA support peripheral
ExpressTouch Tabletop Easel			14040	
ExpressTouch Carrying Case			14041	Soft-sided carrying case
ExpressTouch Voting Booth			98-00081	Stationary Voting Booth
Secure Setup	6.5.0.0			Proprietary Hardening Script

**Note that the initial certification of EVS 6.5.0.0 featured Electionware Additional Reporting version 1.1.0.0. An Engineering Change Order, ECO-1188, produced an update to version 1.1.0.1*

COTS Software

Manufacturer	Application	Version
Microsoft Corporation	Windows 10 Enterprise LTSC	WIN10_6500.iso
Microsoft Corporation	Windows Server 2022	WIN2022_6500.iso
Microsoft Corporation	Windows Updates (Software updates included in the OS image)	Package date: WIN10_6500.iso – 02/28/23 WIN2022_6500.iso – 02/28/23
Microsoft Corporation	Windows Defender Antivirus (Configured within the OS image)	N/A
Dell	TPM Utility	DellTpm2.0_Fw1.3.2.8_V1_ 64.exe
Cisco	Router firmware	1.0.03.29
Cisco	Rommon	ASA 5506-X (1.1.18) ASA 5508-X (1.1.18) ASA FPR-1010 (N/A)
Cisco	ASA Firmware	ASA 5506-X (9.16.4) ASA 5508-X (9.16.4) ASA FPR1010 (9.19.1)

Manufacturer	Application	Version
Kiwi Syslog Server	Remote Event Log Monitoring	9.8.1
Amyuni	Amyuni PDF Generator	5.5
Cerberus	Cerberus FTP Server – Professional	12.1 (64-bit)
Sumatra	Sumatra PDF Viewer	3.1.2 (64-bit)
Legion of the Bouncy Castle Inc.	Bouncy Castle FIPS Java API	1.0.2.1
Yubico Login for Windows	Dual Factor Authentication YubiKey USB keys for dual factor authentication (optional)	Yubico-Login-for-Windows- 2.0.3-win64.msi
WS FTP	Secure file transfer	12.8.0

COTS Hardware

Manufacturer	Hardware	Model/Version
Dell	EMS Server	PowerEdge T430, T440, T630, T550, R540
Dell	Regional Results Data Comm Server	PowerEdge T430, T440, T630, T550, R540
Dell	EMS Client or Standalone Workstation	Latitude 5520, 5530, 5580 (32GB Ram) OptiPlex 5040, 5050, 7020, XE3, XE4
Dell	Trusted Platform Module (TPM) Chip 2.0	Security device
Dell	Regional Results Client	Latitude 5520, 5530, 5580
Toshiba	Regional Results Client	Tecra A50-C
Innodisk	USB EDC H2SE (16GB) for ExpressVote 2.1	DEEUH1-16GI72AC1SB
Delkin	2.0 USB Flash Drive (512MB, 1GB, 2GB, 4GB, 8GB)	N/A
Delkin	3.0 USB Flash Drive (4GB, 8GB, 16GB, 32GB)	6206, 6207, 6208, 6209
Delkin	3.0 USB Flash Drive (256GB) data transfer	6210
Delkin	USB Embedded 2.0 Module Flash Drive for ExpressVote HW1.0	MY08TQJ7A-RA000-D 8 GB MY16TNK7A-RA042-D/ 16 GB
Delkin	USB Embedded 2.0 Module Flash Drive for ExpressVote HW2.1	MY16TNK7A-RA042-D/ 16 GB
Delkin	Compact Flash Memory Card (1GB)	CE0GTFHHK-FD038-D
Delkin	Compact Flash Memory Card (4GB)	CE04TQSF3-XX000-D
Delkin	Secure CF Card (2GB)	CE02TLQCK-FD000-D
Delkin	Secure CF Card (4GB)	CE04TLQCK-FD042-D
Delkin	CFast Memory Card (4GB)	BE04TRSJG-3N042-D
Delkin	Compact Flash Memory Card Reader/Writer	6381
Delkin	CFAST Card (2GB, 4GB)	380-00006 – 2GB, 380-00007 – 4GB
Delkin	CFAST Card (8GB)	380-010014-00, 380-10024-00
Delkin	CFAST Card Reader/Writer	67417
Cisco Firewall	Regional Results Security Firewall	ASA-5506-X, ASA-5508-X, ASA FPR-1010
Cisco Router	Regional Results VPN Router	RV340
D-link	network switch (1 GB Min)	DSG-1005G
YubiKey USB drive	Multi factor Authentication (optional)	5A series
Lexar	CFAST Card Reader/Writer	LRWCR1TBNA
CardLogix	Smart Card	CLXSU128kC7/ AED C7
SCM Microsystems	Smart Card Writer	SCR3310
Avid	Headphones	86002
iEi	Smart Card Reader	91-10041-00

Manufacturer	Hardware	Model/Version
Zebra Technologies	QR code scanner (Integrated)	DS457-SR20009, DS457-SR20004ZZWW, SE3307WA
Symbol	QR Code scanner (External)	DS9208
Brother	DS450, DS850, DS950 Report Printer	B6400, HL-EX415DWVS
Dell	DS450 Report Printer	S2810dn
OKI	DS450, DS850, and DS950 Report Printer	B431dn, B431d, B432DN
OKI	DS450 and DS850 Audit Printer	Microline 420
APC	DS450 UPS	Back-UPS Pro 1500, Smart-UPS 1500
APC	DS850 UPS	Back-UPS RS 1500, Pro 1500
CyberPower	DS850 and DS950 UPS	OR1500PFCLCD
CyberPower	DS450, DS850, and DS950 UPS	CP1500PFCLCD
Tripp Lite	DS450 Surge Protector	SPIKECUBE
Seiko Instruments	Thermal Printer	LTPD-347B
NCR/Nashua	Paper Roll	2320
Fujitsu	Thermal Printer	FTP-62GDSL001, FTP-63GMCL153
HP	Ink cartridge for DS450/DS850 ballot number imprinting	87002
HP	Ink cartridge for DS950 ballot number imprinting	HP C6195A
TDS	Ink cartridge for DS200/DS300 ballot stamping	2278
HP	Ink cartridge for DS300 risk-limiting audit number imprinting	370-00538
Pivot	Vote Summary Card Only Suppression Tray	97-00359

System Limitations

This table provides the system limits that have been verified during testing.

System Characteristic	Boundary or Limitation	Limiting Component
Max. precincts allowed in an election	9,999	Electionware
Max. candidates allowed per election	10,000	Electionware
Max. contests allowed in an election	10,000	Electionware
Max. contests allowed per ballot style	500 or # of positions on ballot	N/A
Max. candidates (ballot choices) allowed per contest	230	Electionware
Max. number of parties allowed	General election: 75 Primary election: 30 (including nonpartisan party)	Electionware
Max. 'vote for' per contest	230	Electionware
Ballot formats	All paper ballots used in an election must be the same length. Voteable paper ballots must contain the same number of rows	Ballot scanning equipment
Max. ballot styles	15,000	Electionware
Max. ballots per batch	1,500	DS450/DS850/DS950
Max. precinct types/groups	25 (arbitrary)	Electionware
Max. precincts of a given type	250 (arbitrary)	Electionware
Max. reporting groups	14	Electionware

System Characteristic	Boundary or Limitation	Limiting Component
Max. connections	18 client connections	Electionware

Component Limitations

ExpressVote

1. ExpressVote capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System and ballot tabulator limitations define the boundaries and capabilities of the ExpressVote system as the maximum capacities of the ExpressVote are never approached during testing.
2. ExpressVote does not support Massachusetts Group Vote.
3. ExpressVote does not support Universal Primary Contest.
4. ExpressVote does not support Multiple Target Cross Endorsement.
5. ExpressVote does not support 19-inch cards with ballot stubs.
6. ExpressVote vote summary cards using the high-capacity barcode are limited to 630 or fewer oval positions.
7. ExpressVote does not support open primary elections in conjunction with high-capacity barcodes.

ExpressVote XL

1. ExpressVote XL capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System and ballot tabulator limitations define the boundaries and capabilities of the ExpressVote XL system as the maximum capacities of the ExpressVote XL are never approached during testing.
2. ExpressVote XL does not offer open primary support based on the ES&S definition of Open Primary, which is the ability to select a party and vote based on that party.
3. In a General election, one ExpressVote XL screen can hold 32 party columns if set up as columns or 16 party rows if set up as rows.
4. ExpressVote XL does not support Massachusetts Group Vote.
5. ExpressVote XL does not support Universal Primary Contest.
6. ExpressVote XL does not support 17-inch cards with ballot stubs or 19-inch cards with ballot stubs.
7. ExpressVote XL vote summary cards using the high-capacity barcode are limited to 630 or fewer oval positions.

ExpressTouch

1. ExpressTouch capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting system. For this reason, Election Management System limitations define the boundaries and capabilities of the

ExpressTouch system as the maximum capacities of the ES&S ExpressTouch are never approached during testing.

2. ExpressTouch does not offer open primary support based on the ES&S definition of Open Primary, which is the ability to select a party and vote based on that party.
3. ExpressTouch does not support Massachusetts Group Vote.
4. ExpressTouch does not support Universal Primary Contest.
5. ExpressTouch does not support Multiple Target Cross Endorsement.

Electionware

1. Electionware software field limits were calculated based on an average character width for ballot and report elements. Some uses and conditions, such as magnified ballot views or combining elements on printed media or ballot displays, may result in field limits (and associated warnings) lower than those listed. Check printed media and displays before finalizing the election.
2. The Electionware Export Ballot Images function is limited to 250 districts per export.
3. Electionware supports the language and special characters listed in the System Overview, Attachment 1. Language special characters other than those on this list may not appear properly when viewed on equipment displays or reports.

Electionware Paper Ballot

1. The paper ballot code channel, which is the series of black boxes that appear between the timing track and ballot contests, limits the number of available ballot variations depending on how a jurisdiction uses this code to differentiate ballots. The code can be used to differentiate ballots using three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30), or Split (available codes 1-18).
2. For paper ballots, if Sequence is used as a ballot style ID, it must be unique electionwide and Split code will always be 1. In this case, the practical style limit would be 16,300.
3. The ExpressVote activation card has a ballot ID consisting of three different fields defined as: Sequence (available codes 1-16,300), Type (available codes 1-30), or Split (available codes 1-18).
4. Grid Portrait and Grid Landscape ballot types are New York specific and not for general use.

DS200

1. The DS200 configured for an early vote station does not support precinct level results reporting. An election summary report of tabulated vote totals is supported.
2. The DS200 storage limitation for write-in ballot images is 3,600 images. Each ballot image includes a single ballot face, or one side of one page.
3. Write-in image review requires a minimum 1GB of onboard RAM.

4. To successfully use the write-in report, ballots must span three or more vertical columns. If the column is greater than 1/3 of the ballot width (two columns or less), the write-in image will be too wide to print on the tabulator report tape.

DS300

1. The DS300 configured for an early vote station does not support precinct-level results reporting. An election summary report of tabulated vote totals is supported.
2. The DS300 storage limitation for write-in ballot images is 3,600 images. Each ballot image includes a single ballot face, or one side of one page.
3. To successfully use the write-in report, ballots must span three or more vertical columns. If the column is greater than 1/3 of the ballot width (two columns or less), the write-in image will be too wide to print on the tabulator report tape.

Functionality

VVSG 1.0 Supported Functionality Declaration

Feature/Characteristic	Yes/No	Comment
Voter Verified Paper Audit Trails		
VVPAT	No	
Accessibility		
Forward Approach	Yes	
Parallel (Side) Approach	Yes	
Closed Primary		
Primary: Closed	Yes	
Open Primary		
Primary: Open	Yes	ExpressVote XL and ExpressTouch do not offer open primary support based on the ES&S definition of Open Primary, which is the ability to select a party and vote based on that party.
Partisan & Non-Partisan:		
Partisan & Non-Partisan: Vote for 1 of N race	Yes	
Partisan & Non-Partisan: Multi-member (“vote for N of M”) board races	Yes	
Partisan & Non-Partisan: “vote for 1” race with a single candidate and write-in voting	Yes	
Partisan & Non-Partisan “vote for 1” race with no declared candidates and write-in voting	Yes	
Write-In Voting:		
Write-in Voting: System default is a voting position identified for write-ins.	Yes	
Write-in Voting: Without selecting a write in position.	Yes	
Write-in: With No Declared Candidates	Yes	

Feature/Characteristic	Yes/No	Comment
Write-in: Identification of write-ins for resolution at central count	Yes	
Primary Presidential Delegation Nominations & Slates:		
Primary Presidential Delegation Nominations: Displayed delegate slates for each presidential party	Yes	
Slate & Group Voting: one selection votes the slate.	Yes	
Ballot Rotation:		
Rotation of Names within an Office; define all supported rotation methods for location on the ballot and vote tabulation/reporting	Yes	
Straight Party Voting:		
Straight Party: A single selection for partisan races in a general election	Yes	
Straight Party: Vote for each candidate individually	Yes	
Straight Party: Modify straight party selections with crossover votes	Yes	
Straight Party: A race without a candidate for one party	Yes	
Straight Party: "N of M race (where "N">1)	Yes	
Straight Party: Excludes a partisan contest from the straight party selection	Yes	
Cross-Party Endorsement:		
Cross party endorsements, multiple parties endorse one candidate.	Yes	ExpressVote and ExpressTouch do not support Multiple Target Cross Endorsement.
Split Precincts:		
Split Precincts: Multiple ballot styles	Yes	
Split Precincts: P & M system support splits with correct contests and ballot identification of each split	Yes	
Split Precincts: DRE matches voter to all applicable races.	Yes	
Split Precincts: Reporting of voter counts (# of voters) to the precinct split level; Reporting of vote totals is to the precinct level	Yes	
Vote N of M:		
Vote for N of M: Counts each selected candidate if the maximum is not exceeded.	Yes	
Vote for N of M: Invalidates all candidates in an overvote (paper)	Yes	
Recall Issues, with options:		
Recall Issues with Options: Simple Yes/No with separate race/election. (Vote Yes or No Question)	No	
Recall Issues with Options: Retain is the first option, Replacement candidate for the second or more options (Vote 1 of M)	No	

Feature/Characteristic	Yes/No	Comment
Recall Issues with Options: Two contests with access to a second contest conditional upon a specific vote in contest one. (Must vote Yes to vote in 2nd contest.)	No	
Recall Issues with Options: Two contests with access to a second contest conditional upon any vote in contest one. (Must vote Yes to vote in 2nd contest.)	No	
Cumulative Voting		
Cumulative Voting: Voters are permitted to cast, as many votes as there are seats to be filled for one or more candidates. Voters are not limited to giving only one vote to a candidate. Instead, they can put multiple votes on one or more candidate.	No	
Ranked Order Voting		
Ranked Order Voting: Voters can write in a ranked vote.	Yes	Ballots can be formatted for Ranked Order Voting and the system supports export of CVR data for processing of Ranked Order Voting Rounds
Ranked Order Voting: A ballot stops being counted when all ranked choices have been eliminated	Yes	Ballots can be formatted for Ranked Order Voting and the system supports export of CVR data for processing of Ranked Order Voting Rounds
Ranked Order Voting: A ballot with a skipped rank counts the vote for the next rank.	Yes	Ballots can be formatted for Ranked Order Voting and the system supports export of CVR data for processing of Ranked Order Voting Rounds
Ranked Order Voting: Voters rank candidates in a contest in order of choice. A candidate receiving a majority of the first choice votes wins. If no candidate receives a majority of first choice votes, the last place candidate is deleted, each ballot cast for the deleted candidate counts for the second choice candidate listed on the ballot. The process of eliminating the last place candidate and recounting the ballots continues until one candidate receives a majority of the vote	No	
Ranked Order Voting: A ballot with two choices ranked the same, stops being counted at the point of two similarly ranked choices.	Yes	Ballots can be formatted for Ranked Order Voting and the system supports export of CVR data for processing of Ranked Order Voting Rounds
Ranked Order Voting: The total number of votes for two or more candidates with the least votes is less than the votes of the candidate with the next highest number of votes, the candidates with the least votes are eliminated simultaneously and their votes transferred to the next-ranked continuing candidate.	No	
Provisional or Challenged Ballots		

Feature/Characteristic	Yes/No	Comment
Provisional/Challenged Ballots: A voted provisional ballots is identified but not included in the tabulation, but can be added in the central count.	Yes	
Provisional/Challenged Ballots: A voted provisional ballots is included in the tabulation, but is identified and can be subtracted in the central count	Yes	
Provisional/Challenged Ballots: Provisional ballots maintain the secrecy of the ballot.	Yes	
Overvotes (must support for specific type of voting system)		
Overvotes: P & M: Overvote invalidates the vote. Define how overvotes are counted.	Yes	
Overvotes: DRE: Prevented from or requires correction of overvoting.	Yes	
Overvotes: If a system does not prevent overvotes, it must count them. Define how overvotes are counted.	Yes	
Overvotes: DRE systems that provide a method to data enter absentee votes must account for overvotes.	Yes	
Undervotes		
Undervotes: System counts undervotes cast for accounting purposes	Yes	
Blank Ballots		
Totally Blank Ballots: Any blank ballot alert is tested.	Yes	
Totally Blank Ballots: If blank ballots are not immediately processed, there must be a provision to recognize and accept them	Yes	
Totally Blank Ballots: If operators can access a blank ballot, there must be a provision for resolution.	Yes	
Networking		
Wide Area Network – Use of Modems	No	
Wide Area Network – Use of Wireless	No	
Local Area Network – Use of TCP/IP	No	
Local Area Network – Use of Infrared	No	
Local Area Network – Use of Wireless	No	
FIPS 140-2 validated cryptographic module	Yes	
Used as (if applicable):		
Precinct counting device	Yes	DS200, DS300, ExpressTouch, ExpressVote XL
Central counting device	Yes	DS450, DS850, DS950

Baseline Certification Engineering Change Orders (ECO)

This table depicts the ECOs certified with the voting system:

Change ID	Date	Component	Description	Inclusion
ECO 1160	12/7/2023	USB Media	Release of new light blue USB 3.0 Flash Drives (4GB & 8GB)	Minor
ECO 1162	12/5/2023	DS300 Ballot Bin	Release of a field repair kit for the DS300 Ballot Bin Handle. (091-10053-00)	Minor
ECO 1154	3/8/2024	DS300 Ballot Box	Physical and performance enhancements.	Minor
ECO 1156	2/14/2024	DS950	Addition of an extension to the sensor arm which will trigger the sensor sooner when lowering tray.	Minor
ESS-1168	4/4/24	ExpressVote XL	Introduction of latest ESD mitigation	Minor
ESS-1165	5/15/24	Tote Bin for DS200 and DS300	Security update to the tote bin	Minor
ECO 1174	4/3/2024	DS300	1. Add motor cradle bracket under thermal report printer 2. Update geometry of report printer door	Minor
ESS-1176	4/25/24	DS850	Add Brother HL-EX415DWVS Printer	Minor
ESS-1177	4/25/24	DS450	Add Brother HL-EX415DWVS Printer	Minor
ESS-1178	4/25/24	DS950	Add Brother HL-EX415DWVS Printer	Minor

XI. Attachment B - Recommendations from Accessibility Examiner

Accessibility Report for EVS 6500.pdf

Accessibility Examination EVS 61(

Top Problems EVS 6021.pdf

All Accessibility Observations 6021.p

Recommendations for Deployment EVS

Accessibility report for ES&S EVS 6500

The Pennsylvania Department of State identified the following features of the ES&S ExpressVote 3 and ExpressVote XL to be reviewed for accessibility:

- A “Menu” button on the right side of the header, used to access personalization features, instead of separate buttons for text size, language, display, and help.
- New hardware case for the ExpressVote
- Adjustments to the screen display and spacing due to the new hardware.

The accessibility reviews were conducted in a video conference call with an ES&S representative operating the system and answering questions to clarify how the features work.

During the demo, the screens were displayed in reverse contrast (white text on a dark background) for some of the interactions to reduce glare, but were also reviewed in the default colors.

ExpressVote

New hardware case for the ExpressVote 3

The front of the new case is similar to the previous one, with the screen on the left, the ballot slot and visual instructions on the right, and plug jacks for assistive accessories on the bottom.

Accessibility accessory jacks. There are two jacks, one for assistive technology input devices and one for headphones. They are positioned in easy reach for voters, now on the surface of the front bezel instead of recesses in a well. Both have a raised icon that can be felt by touch.

This change should not affect voters and may make it easier to identify the two jacks by feel.

Adjustable screen angle. The case is now supported by an arm stand that allows the screen angle to be easily adjusted. This is a helpful improvement, making it easier to position the screen to view from different angles or avoid glare.

In the demo, it appeared easy for a poll worker to change the viewing angle without lifting the case or using excessive force. Poll worker training should include information about the stand and how to adjust it.

Smaller footprint. The new case appears to be smaller and lighter than previous versions. If so, this would make it easier to use for curbside voting. It could also allow poll workers to position the case for voters more easily, for example, on a wheelchair tray or by adjusting its location on a table for better reach.

New menu button for customizations

Customization buttons for text size, display, language selection, and help are now available only through a menu button. Although this makes the top of the screen cleaner and allows more room for the jurisdiction and elections, it hides important access features.

Both poll worker training and voter education should include reminders of the text size and display features, and how to access them.

Contest layout and spacing

The default layout for contests is to arrange them in 3 newspaper-style columns. The election can also be programmed to use 2 columns. The gutter between columns and the vertical space between contests can be adjusted.

In previous reviews of the ExpressVote 2 interaction, some voters testing the system had trouble identifying the boundaries of a contest. This is especially true in high contrast, where there is less visual difference between the contest header and the candidate list.

In “assistive mode” with larger text, a single contest is displayed on a screen. This display mode makes it easier to focus on one contest at a time and is a better interface for voters with some visual and cognitive disabilities.

Local offices should

- Program the election with wider gutter space between the contests for better visual separation.
- Program the election using just two columns, making the screen less cluttered.
- Use voter education and poll worker training to suggest using assistive mode with its display of a single contest per screen.

ExpressVote XL

No changes were made in the ExpressVote XL that directly impacted accessibility, but this report notes some aspects of the system that could be improved.

Contest layout

The ExpressVote XL's default layout is a grid, with contests displayed in columns and candidate names displayed in rows.

In large print or assistive mode, however, a single contest is displayed on each screen. Many voters can benefit from this less-cluttered display and the ability to focus on a single contest per screen.

County election offices can use voter education and poll worker training to suggest using this mode as an easier way for some people to vote.

Contest header in large text/assistive mode

One design issue in this mode is that the text in the contest header is centered on the entire screen, not just the area needed for the contest. Nothing in the design for either the color or white-on-black contrast display helps call attention to the name of the contest and information such as the number of candidates to be elected.

In previous reviews of the ExpressVote XL, voters testing the system focused on the list of candidates sometimes did not see the contest heading information in the middle of the screen.

For future releases of the ExpressVote XL, we suggest moving the contest header text to the left to align with the candidate names, increasing the text size, or using other visual design to make this information more visible.

All observations

The issues reported here also showed up in the feedback questionnaire responses: voters who had problems rated that aspect of the voting system lower on the satisfaction scale. For example, issues learning the tactile keys was mirrored in lower ratings for how easy the instructions are to follow. Lower ratings were usually accompanied by an explanation, included in this list.

These issues are a combination of statements and questions made by the voters and observations of voter behavior.

Severity scale

In both the expert review and observations of voters with disabilities, we took notes about aspects of the system that worked well and problems they encountered. We categorized these issues based on their impact on a voter's ability to vote independently and privately.

- **Positives** – things that voters mentioned as meeting or exceeding their expectations
- **Annoyances** – things voters mentioned as problems, but which did not significantly slow their progress in marking their ballot
- **Problem solving** – instances where voters had to pause to figure out how to complete an action or task, but were able to do so on their own, by exploring the system or relying on past experience with technology
- **Needs assistance** - problems that could only be solved with help, such as instructions or assistance from a poll worker
- **Likely to prevent independent voting for voters with some disabilities** - problems that could prevent successful independent and private voting, even with good knowledge about how to use the system and accessibility features

Positives

Function	Observation	System	Severity
Tactile keypad	More technology-savvy blind voters had few problems with the keypad layouts. P7, who had never used a voting system before immediately knew how to use the arrow keys and adjusted the speech rate to ~150 wpm. Although they could use both keypads, they preferred the layout and button feel of the ExpressVote, saying that having all the voice controls on the right was easier to understand, remember, and use.	Both	Positives
Audio	Voters said the undervote message for each contest is informative and helpful, without feeling coercive.	Both	Positives
Audio	Voters appreciated the announcement of when a contest is fully voted.	Both	Positives
Audio	The voice is very clear and easy to understand at normal speed and when accelerated or slowed.	Both	Positives
Messages	Language on undervote screen is improved over earlier version. No longer seems coercive. Informs of undervote, but also says to use the right arrow to move on.	Both	Positives
Review	When using the review screen, if the voter needs to return to a contest to correct a vote, on return, the focus is on the contest where it left, rather than at the top of the ballot, though it reads the top of ballot instructions. This makes navigation more efficient.	Both	Positives
Write-In	Voters can exit the write-in process using the Right arrow to hear the letters entered, then reenter the write-in process. This preserves the letters entered, and reads them aloud to the voter, so corrections can be made.	Both	Positives

Function	Observation	System	Severity
Write-in	P7 quickly mastered the write-in process, and clearly understood the process, though she indicated that she had never used this type of device before. She likened the input to her Amazon Fire TV remote. This illustrates the importance of using modes of operation that are common in everyday life when designing voting machines.	Both	Positives
Write-in	P2, a voter with low vision was able to correct a write-in using the touch-screen independently and without prompting.	XL	Positives
Text size	P2 indicated that the text size of the assisted voter interface was large enough for him	XL	Positives

Problems

Function	Observation	System	Severity
Orient and navigate	Visual indication of machine focus on the EV (when navigating contest) is faint. Voters in front of the screen had trouble seeing the dotted outline. When voters lost track of where they were, or entered top-of-screen navigation, they had to experiment to find their place.	EV	Problem Solving
Orient and navigate	On the XL in large text/assistive mode, the contest titles are centered on the large screen, the names are along the left edge, and the next button is at the lower right. This made it hard for a low-vision voter to find the title and buttons. P2 suggested that they should be all aligned the same way "I would center these more."	XL	Problem Solving

Function	Observation	System	Severity
Orient and navigate	The visual labels on the XL keypad are slightly raised black text on a black background. Most voters did not notice them until they were pointed out. (The EV keypad has white labels on a dark grey background and did not have this problem).	XL	Problem Solving
Orient and navigate	In the review screen, audio instructions say to hear the contests by pressing the "up AND down" arrows. Because many computer commands require multiple keys be pressed at once, this was confusing. Should say "Press the Up OR Down" to navigate	Both	Problem Solving
Orient and navigate	On the review screen, many voters did not discover that they could go directly back to a contest by touching it or pressing ENTER when it was highlighted. Instead they simply went “back” until they reached the contest and then navigated though all contests to return to the review screen.	XL	Problem Solving
Orient and navigate	On the XL keypad, one voter with mild cognitive issues was noticeably confused by the navigation keys. Several times, she used the left arrow (back) key instead of the down arrow (next item) key.	XL	Problem Solving
Orient and navigate	On the XL, the “next” buttons on the contest screens are blue with right arrows, but green on the dialogs with no arrows. The audio says to use the green button. One participant repeatedly tried to use the green square select button on the keypad.	XL	Problem Solving
Orient and navigate	On the review screen, which occupied two screens on the EV, voters expected the down-arrow to scroll to the next screen of information, which it does not.	EV	Problem solving
Write in	Depending on how the voter chose to navigate and which input method being used, some had comments about their preferences, for example whether the alphabet starts over with each letter or maintained position in the alphabet or the order of special keys, backspace and space.	Both	Annoyances

Function	Observation	System	Severity
Write-in	In the write-in process, the up or down arrows must be pressed and released for each letter change. P6 commented that it would be helpful to be able to hold the up or down arrow down to move quickly through the alphabet and that the keys were stiff and physically taxing to use	XL / Both	Annoyance
Write-in	P6, a voter with a mild cognitive disability had significant problems using the keypad to enter a write-in, using the tactile keys visually. She repeatedly used the left arrow key to try to move horizontally through the letters, cancelling her input. She persisted through at least 4 attempts before successfully entering a write-in	XL / Both	Problem solving
Write-in	In the beginning, P6 used the down arrow exclusively to move between letters, using the wrap-around feature to return to the earlier letters. Only later, with experience, did she start to use the up-arrow.	XL / Both	Problem solving
Write-in	On the write-in screen, there is no way to review he letters that have been entered. If the voter is distracted, they may need a cue to remind where they are in the process. The only solution found is to exit the write-in process, using the right-arrow to accept the entry, to hear the letters entered, then reenter the write-in process. This preserves the letters entered, and reads them aloud to the voter, so corrections can be made. There is no indication in the instructions or on-screen that this option is available.	Both	Problem solving
Write-in	When pressing the left arrow from the write-in screen, all input is canceled without warning. A warning screen would avoid this mistake.	Both	May prevent successful voting

Function	Observation	System	Severity
Review navigation	Of our test voters, only one discovered that selecting a contest on the review screen would take the voter directly to that contest. All of the other voters use the Left arrow to scroll back through the ballot. This was easy in our short ballot, but would be a problem on long ones The instructions indicate that selecting the contest will navigate there, but voters did not remember it. This behavior was observed in sighted voters as well as those with low-vision or blindness.	Both	Problem Solving/Needs Assistance
Review navigation	Audio feedback reads the full text of the referendum back to voter on the review screen, though the visual ballot only has the title. There does not appear to be a way to skip this reading but still hear who you voted for.	Both	Problem Solving
Review > Print	On the XL, there is a final undervote message displayed when leaving the review screen. It says "continue and cast". It should say "Continue and Print" since it does not cast, but does print the ballot. Cast is an additional step.	XL	Problem Solving
Ballot marking	On the screen, candidate blocks include a small box in the upper-right corner that looked like an interactive checkbox. Some voters believed that they had to touch this box, and had trouble positioning their finger precisely, especially near the right side bezel. The visual check is important so that color is not the only indicator that a candidate is selected, but the display design is confusing.	Both	Problem Solving
Keypad	Although they could use it, voters found the XL keypad annoying, “big and clunky,” cluttered, and not as responsive as that of the EV. One said “All these buttons are a tactile nightmare’ even though the EV has the same buttons	XL	Annoyances

Function	Observation	System	Severity
Audio	Several voters commented about the amount of information provided all at once, without pauses to locate each key being described when using assisted voting. This "fire-hose" of information could result in listening fatigue, so that important information is missed. This was especially true on the initial orientation to the keypad	Both	Annoyances
Audio	Although the system knows immediately if the voter activates either the tactile keypad or the dual-switch, the auditory instructions always provide instructions for both, contributing to the listening fatigue	XL Both?	Annoyances
Audio	Pressing a button (for volume or speech rate) during the orientation to the keyboard restarted the instructions. “Darn, I pushed it and it took me all the way back here!”	Both	Annoyances
Audio	"There should be a way to spell candidate's names in the main ballot, so that names like Schmidt and Schmitt can be differentiated." This is common behavior in screen readers, and expected by blind voters.	Both	Annoyances
Audio	On first use of the keypad, the auditory instructions say to "Press continue to use assisted voting." It does not say that Continue is the right arrow key, and this instruction comes before the orientation to the keypad. Throughout the interface, the auditory instructions say to use the right arrow. Why not here?	XL	Problem Solving
Audio	Voters repeatedly listened through instructions on using dual switch input, although it was not needed. Voters tend not to interrupt verbal instruction, especially in a new system where they are worried about missing information.	XL	Problem Solving
Text size	On the EV screen, the default text is very small, and difficult to read as the letters are fuzzy.	EV	Annoyances

Function	Observation	System	Severity
Settings	When using the EV, P3 used the touch-screen, but had to move closer to read the small print. When asked if she would like to use large-print, she declined, but when shown the large print, said that it would be better. This demonstrates the tendency to assume that the "default" is the "right way" to interact rather than expecting the technology to adapt to their needs.	EV	Needs assistance
Touch	The screen of the XL did not respond to either the stylus provided by the vendor nor to an iPad stylus. Both of these worked on the EV without difficulty. This required the use of a knuckle to make selections on screen for low-hand-function voting, which will not be available to all voters. For example, many mouth-stick users have stylus tips which will not activate the XL.	XL	Needs assistance
Touch	The screen responds to brief touches (click equivalent), but does not respond to longer touches. This can make use difficult for voters with severe tremor or motor control issues who used sustained press to make selections.	Both	Problem solving
Floor space	XL lacks adequate knee space for person in wheelchair to get close. P6 was able to lean forward to use the machine, but a voter with a spinal cord injury would lack the trunk strength to do this. This lack of knee space could require such a voter to use the keypad, even if the touch-screen was preferable	XL	Problem solving

Top problems

The examination identified three problems that could reduce the ability of people with disabilities to vote independently and privately.

1. Automatic selection and deselection

What happened

- Voters were confused by the automatic selection and deselection that is part of straight party voting.
    - When you make a manual selection to override your straight party, all the straight party choices are deselected automatically. The XL does not completely announce the deselections. Deselects may not be visible onscreen, if happen on a screen.
    - If you want to vote for no one, you cannot deselect all candidates if there's an eligible candidate selected by straight party vote.
    - Touching a straight party candidate (for emphasis or deselection), deselected the other candidates.
- In some cases, this led voters to cast a ballot without knowing all of the candidates that had been selected. This problem is exacerbated by the inability of any of our voters or poll-workers to successfully validate the printed ballot on the XL.
- Voters marking choices manually, with no straight party selection, were *always* clear what was selected and deselected.

Why this is a problem

The system relies on voters both perceiving the change in selections and understanding why those changes happened.

The effect is that the voting system appears to act in inconsistent ways, forcing voters into time-consuming problem-solving that takes them away from their primary task of voting.

Depending on how easily they can use the technology or how confused they are about what is happening, some voters would have to ask for assistance. This is not only a failure to vote independently, but identifying and solving the problem requires revealing their votes to a poll worker or assistant.

This problem affected voters with a variety of disabilities.

Type of disability	Impact of the problem
Cognitive	Seemingly unpredictable and inconsistent machine response can be confusing and frustrating.
Low vision	Changes to selections may be made out of their view because they are made off-screen or because they are not focused on the part of the screen where the change happens.
Low literacy	Voters with low digital or reading literacy also have a narrow range of focus and can miss cues on different parts of the screen
Blind or very low vision	Because the audio does not announce the deselections, changes to candidates higher on the list are not identified unless the voter cycles back through the list. If they don't cycle back, they may never notice the problem.

Recommendations

Legally, the machines must comply with the Pennsylvania Method, but that interaction should happen in ways that fully inform the voter of what has happened, and how to express their preferences.

- Put voters in control and do not allow the system to make any automatic selections or deselections after straight-party voting selections are applied..
- Improve the feedback messages to tell voters what is happening – including number and names of the candidates being deselected.

- Provide feedback on the reason for the changes in selections and the interaction with straight-party choices.

2. Inconsistency in navigation

In both the visual and audio navigation, there were enough small problems of inconsistency or poor instructions to create a cumulative effect. This issue is most serious for voters using the audio ballot without the visual display.

Every participant had at least one problem, despite relatively high election knowledge and digital experience, suggesting that the issue would be more severe for voters without these personal resources to help them understand what it happening.

What happened

Small inconsistencies in the navigation patterns or the audio instructions forced participants to stop and figure out what was wrong or how to do something.

Many of these small issues caused them to need to ask for assistance – easy to do in the examination, but much harder in a polling place.

In some cases, their attempts to guess at a solution caused even more problems.

Example: reviewing and correcting a write-in

An example of this cascading of problems occurred when blind voters tried to write in the name of a candidate. Throughout the system, voters can push the left arrow key to review their previous selection. As a result, two voters used the left arrow to try to review what they'd typed in a write-in. When they pushed the key, they exited the write-in screen and lost the characters they had typed.

This problem was compounded by other challenges of using the tactile keypad for write-ins:

- Using the tactile keypad to enter text is a slow process requiring voters to scan through the alphabet one letter at a time to spell a name.
- When they were not sure of the letters that had been selected, or wanted to check their spelling, they could not find a way to do this.
- All of the participants knew that a misspelled write-in would not be counted, but could not figure out how to review what was typed.
- If they had not listened carefully to the full instructions or had not cycled through all 26 letters, they did not know that there was a backspace key.

Example: Overvote messages

Throughout the system, voters can push the right and up/down arrows to proceed forward. But when the user attempts a selection that would result in an overvote, the error message is shown on a new screen, without audio notification of the change of context. The only way to move forward after the message is using the *left* arrow.

The problem was hardest on people using the audio ballot:

- The instructions on the error message include general instructions for navigating within the contest, so it's not clear that the user must use the left (back) arrow to return to the contest.
- These instructions included using the up and down arrows to move through the contest.
- When voters tried using the arrows immediately a message announced that the up and down arrows did not work here, but then repeated the instructions to use the arrows to deselect a candidate before selecting a new one.

Example: Button labeling

Buttons for different actions in different screens sometimes have the same labels.

- On the XL, the “Cast” button on the review screen prints the ballot for review. The “Cast” button on subsequent screens actually casts ballot into the built-in box.
- The audio narration often doesn’t use the same words as the on-screen buttons. On the XL, it says “print” your ballot instead of “casting it.”

Why this is a problem

People who use assistive technology rely on quickly learning patterns for basic navigation. An example is this comment from a voter: “If it is true to what it did before, I should be able to push the arrow to move to the next issue.”

Breaking these patterns is a usability problem that is amplified for voters using the audio ballot or with cognitive limitations. In both cases, they have fewer resources to perceive and solve the problem.

These problems often happen in the middle of the ballot where assistance could also violate privacy.

Recommendations

Many of these problems were relatively easy to find during the expert review, and confirmed through observing voters.

- Examine all audio instructions on messages to be sure critical information is in an order that puts specific information for the current task or screen before general, repeated instructions.
- No destructive action should ever take place without explicit confirmation from the voter. In the example above, the system could save write-in entry until the voter leaves that contest so that moving back to the contest using the left-arrow is not destructive. It could also warn voters when partially completed write-in entries will be discarded.

Review the visual interface to make sure buttons that do similar things have the same label. Also use key words like “cast” and “print” consistently throughout the system. Better usability testing with voters with a range of

disabilities during system development would have prevented many of these problems.

3. Verification is possible, but challenging

The move to voting systems with paper ballots provides voters with an opportunity to verify their ballot. We wanted to know whether verification can be part of the normal course of voting for voters with disabilities on systems being examined.

What happened

In this examination, we tested systems with two different models for paper handling and verification.

Model 1. Voters can handle the printed ballot

In this model, tested on the ExpressVote, the system ejects the ballot after printing, so it can be cast in the ES&S scanner. This method requires voters to handle the ballot, but also makes it possible for voters to use personal technology such as magnifiers or text readers to read the paper ballot.

- All our participants were able to verify the ballot if they wanted to.
- 2 blind voters tried using personal text readers and were generally successful, though one with more difficulty.
- Voters with vision were able to read the small text with difficulty.

The ballot can be read back to the screen by reinserting it and reviewing (but not changing) selections.

- Some participants tried reviewing their ballots this way and were happy with it.
- 1 blind voter, who had struggled to enter a write-in and wanted to confirm what was on the ballot, found that the actual text of the write-in is not included in the review because it is not encoded in the paper ballot barcodes.

Although we were not able to test with voters with limited dexterity, we believe:

- Most would be able to move the ballot to a stable surface for examination
- The ballot requires some force to remove it from the system. We did not test the amount of force required, but some voters might require assistance.

Model 2. The ballot is presented behind glass

In this model, tested on the ExpressVote XL, the system prints the ballot, displays it under a glass panel, and then casts the ballot by automatically depositing the paper ballot in a container while it records the vote electronically. This means that voters do not have to handle the ballot, but also makes it impossible for voters to use personal technology such as magnifiers or text readers to read the paper ballot.

Some of the participants were surprised that they did not get the ballot back when they pressed "cast." As the ballot went into the XL ballot box, one voter said, "It didn't come out!"

- None of the participants could verify the ballot in the glass cage:
  - Blind voters had no access to the ballot to use personal technology
  - Low vision voters could not position the ballot so they could read the small text
  - Other voters had problems reading the ballot because of glare and because the sides of the ballot were obscured by the cage.
- Although it is possible to have the ballot ejected to handle it while verifying, the procedure is unclear and it requires voters to tell the system they want to "Quit" and call a poll worker.

Why this is a problem

The purpose of accessible voting options is to give people with disabilities the same opportunity to mark, verify and cast their ballot as other voters.

Recommendations

- Require the paper ballot to include an encoding of write-in text so it can be read back when the ballot is reinserted.
- Change the process for ejecting a ballot on the XL (or the auto-cast option on the ExpressVote) so that it can be done independently by the voter.
- Ensure that the systems with an auto-cast capability are set up so that they can work for people with no use of their hands.

All observations

Positives

Function	Observation	System	Severity
Keypads	The layout of the primary navigation keys was familiar to all participants who use tactile controls.	Both	Positives
Audio	The audio running when the voter approaches the system tells them how and where to insert the ballot making it possible for them to start the voting session independently. This included (on the Express Vote) giving instructions to correct the orientation of the ballot	EV	Positives
Audio	Several participants said the synthesized voices are clear and easy to hear, with enough volume.	Both	Positives
Audio	The range of speech speeds provided was adequate, though some of our voters indicated that they would prefer faster speech.	Both	Positives
Display	Blind voters liked the option to hide the visual display or not at any time. (This feature is not available on the XL.)	EV	Positive
Display	The XL screen can be physically adjusted to change the angle of the screen to make it easier to reach or remove glare.	XL	Positive
Audio / Display	One voter favorably compared the option for simultaneous, synchronized audio and visual display to the system she currently uses, where this is not an option. Note: Synchronized audio and video is required in VVSG 1.0+	Both	Positive

Function	Observation	System	Severity
Audio messages	Some of the messages were helpful and elicited comments. For example, after checking a vote by going from the review screen to the contest and then back to the review screen, one participant liked that the audio confirmed what screen it was on.	EV	Positives
Navigation	The “out-and-back” navigation from the review screen to a contest and back was helpful and made it easy to quickly correct a selection.	Both	Positives
Messages	A blind participant liked the message about not having seen all of the candidates in a contest, so that she didn’t miss anyone.	EV	Positives

Ambiguous issues

Function	Observation	System	Severity
Keypads	The XL keypad is used by poll workers to activate the ballot. Even though ballot activation buttons appear on screen, the poll worker has to use the keypad to continue. • The advantage is that every XL system will have a tactile keypad available and working, • The disadvantage is that this means it can be difficult to handle while giving it to a voter. A longer cord would make it easier to hand the keypad to a voter without having to pass it under the screen and around the support structure. There should be easy to reach racks to place the keypad in between uses, rather than balancing it on the top of the base of the machine.	XL	Set up
Keypads	Both systems have an audio jack that is positioned so a voter can easily plug in their own headset and can be found by feel. • On the XL, the jack is on the keypad	Both	Needs assistance

Function	Observation	System	Severity
	• On the EV, it is on the front of the device below the screen However, on both systems: • The labels are black text on a white strip and not tactilely discernable. • The jacks can easily be confused with the similarly labeled jack for the dual switch or other personal technology. A blind advocate participant suggested that a raised headset icon would be an easily recognized symbol to solve this problem		
Messages	Some of the participants thought a screen required them to take action when it didn't • Selecting a party. One poll worker asked if it was possible to vote without a straight party when they reached the straight party screen • The undervote warning screen led several voters to believe that they were forced to vote the full count. They did not listen long enough to know that they could go forward from that screen. • Trying to not vote for anyone, a participant tried putting in a blank write-in. They felt the process seems to be forcing a vote, commenting, "I guess you have to put something."	Both	Problem solving
Keypads	On the XL, voters felt that the keypad was "busy," containing too many keys. While the Braille labels were easily read their positioning was not always clearly related to the controls.	XL	Annoyance
Keypads	On the XL, the buttons may trigger twice, making them too "responsive." Voters with a mild tremor might, for example, move back two contests, not just one. A small latency in the key response coding would prevent this.	XL	Annoyance

Function	Observation	System	Severity
Messages	Both systems gave users a message if they had undervoted as they left a contest. This is a generic message which inserts the name of the contest, but not how many candidates can be or have already been selected. • The message itself was initially confusing, but then easily understood. • Once the message was understood, it quickly became mildly annoying. • The same message is repeated as the voter leaves the review screen. Some of the participants took this as a strong nudge to fully vote in every contest. However, the EV audio does announce when a multi-select contest is "fully voted," which participants who heard this message found helpful.	Both	Annoyance Or Problem solving
Display	We have not done a detailed analysis, but we noticed several places where button labels were not consistent between the two systems. This is not a problem for a voter using just one system, but adds to the complexity of creating voter education and poll worker materials across the state, or for voters who move between counties using different systems.	Both	Annoyance Or Problem solving

Problems

Function	Observation	System	Severity
Display	The EV screen cannot be physically adjusted to change the angle of the screen to make it easier to reach or remove glare. There is a stand on the back of the device, but it is not adjustable.	EV	Potential Show stopper

Function	Observation	System	Severity
Display	The visual cues for the location of the cursor (the indication of what's currently selected) are difficult to interpret, especially for people with low vision. • On the XL, the dotted-line perimeter was not visible at all for participants with low vision and difficult to see for others. • On the EV, using the same background color for the cursor location and selected candidates was confusing. Voters thought the item with focus was selected and would try to deselect it, resulting in the candidate being selected.	Both	Potential Show stopper
Keypads	The labels on the XL tactile keypad are black on black making them almost impossible for anyone to read.	XL	Need assistance
Display	On the XL, the transition between screens was very subtle and participants often changed screens without noticing. Having the contest title in the center of the screen and the contests at the far left added to the problem. A low-vision users said, "I saw some shaded areas here (on the left) but thought that these were from the previous vote. I thought the middle was where I was voting now." (The shaded area is actually the current contest."	XL	Problem solving
Display	In several places, the button labels are inconsistent within a system, especially error messages. These small inconsistencies are magnified for a voter who cannot see the screen, where the position of the button or any icons on them are additional cues.	Both	Annoyance or Problem solving
Keypads	Some of the Braille labels on the EV tactile keypad are abbreviated, making them difficult to	EV	Need assistance

Function	Observation	System	Severity
	understand: “TPO” for Tempo, the label on volume, and “PS” for pause		
Keypads	One participant (P5) was concerned that the controls on the EV tactile keypad are too small for some blind users with limited feeling in their fingers, for example from diabetic-related blindness.	EV	Need assistance
Keypads	Using the XL, a low vision voter tried to follow instructions to press the “square” button. Unfortunately, there are two, and he ended up in the keypad tutorial rather than having pressed select.	XL	Needs assistance or Problem solving
Keypads	The Home key works in different ways, depending on where the cursor is on the screen. • From the list of selections, it goes back to the contest header to begin reading again from the top of the page. • From the contest header, it goes back to the first (straight-party) contest. For the blind voter (the intended user of this button), there is no clear indication of where the cursor is currently located, so it is not possible to predict the action.	Both	Problem-solving
Keypads	There were some concerns about the number of the keys: • [P3] Thought the XL pad has too many keys • [P6] thought the EV pad had too many keys and was too small	Both	Annoyances
Keypads	The “Repeat” key only repeats the last action or audio instruction. Several participants wanted to use this to go back to the top of the contest.	Both	Annoyance
Keypads	There is a key to blank the screen on the [EV] but not the [XL].	EV	Annoyance

Function	Observation	System	Severity
Keypads	The Home button on the EV is used like the Info on the XL, so the label is not helpful.	EV	Annoyance
Keypads	Audio instructions are on the initial screen. If the voter decides that they would like audio after they get to the ballot, the audio is silent until the voter changes selections.	EV	Annoyance
Keypads	There is no feedback when the volume or tempo buttons are pressed. A sound or confirmation (such as “volume up” or “tempo faster”) would be helpful. On the XL, the volume keys announce “Volume up/down.”	EV	Annoyance
Keypads	When the audio is paused, a participant was confused when the audio did not begin again when she navigated to a new contest. “If I move to another candidate or contest, it should start speaking again without having to press Pause again (to restart it)”	EV	Annoyance
Keypads (Audio)	The audio includes instructions for the dual switch and sip-and-puff, even if no device is plugged into the jack. An ideal system would detect input device and adjust the audio to the combination of controls.	Both	Annoyance
Keypads (Audio)	The audio reads all instructions for using the keypads even if the voter is using the touch screen. An ideal system would detect this and adjust the audio to the combination of controls to avoid the lengthy instructions that are not needed.	Both	Annoyance
Ballot Text size	On the XL, selecting “Large Text” changes the screen to a contest-by-contest display, but does not make the text size very much larger. This forces low vision users who simply need slightly larger text into using the audio ballot.	XL	Showstopper

Function	Observation	System	Severity
	One participant with very low vision put his face so close to the screen that he accidentally made selections with his nose.		
Ballot Layout	Reading the judicial retention instructions and the referendum question, the line length is so long that participants had to swivel their head to visually track across a line of text.	XL	Annoyance
Ballot Layout	The layout of the contest on the very wide screen meant that the title of the contest (centered on the screen) and the number of selections was very far from the list of candidates(on the left margin).	XL	Annoyance
Ballot (Audio)	The audio on the XL does not announce the party of each candidate. This made it impossible to complete tasks based on party, including confirming straight party selections. "I'd assume that is the Democrat because I picked them for straight party." [P3]	XL	Show stopper
Ballot (Audio)	If a voter attempted to make too many selections on a vote-for-N-of-M contest (overvote), a message informs them of the problem. It was not clear to blind voters that they were on a separate message screen. The audio on the overvote message includes the general instructions for using the arrow keys, even though these keys are not active on the message. The message about how to return to the contest screen comes after the general instructions, where voters missed it They needed either extensive problems solving or support to get back to the contest.	XL Both?	Needs assistance
Ballot (Audio)	In the audio announcement of each contest, the information about how many can be selected is easy to miss, and the information about how many candidates have already been selected is	Both	Problem solving

Function	Observation	System	Severity
	either missing, or placed at the end of the standard instructions where none of the participants heard it. This is especially important if a straight party option was selected. Changing the order of the instructions would make it easier for blind voters to keep track of their progress		
Ballot (Audio)	After returning to the contest from the overvote message, participants were confused that the last candidate was not selected and had to puzzle their way through the problem	Both	Problem solving
Ballot (Audio)	There is no option to ask the system to spell out a candidate name. • This is not normally a problem, but could make it difficult to distinguish candidates with very similar-sounding names (Smith and Schmidt, for example). • This capability is a standard feature of screen readers, so voters who use that technology may expect it.	Both	Annoyance
Ballot	A candidate endorsed by both parties was only visually identified as being from one of them. The straight party logic, however, selected here for each of the two parties. On the full-face ballot, this was visually confusing because it showed a candidate selected in the "wrong" column.	XL	Problem solving
Ballot (Audio)	Listening to the list of candidates, participants often skipped to the next one as soon as they heard the name, sometimes missing the announcement that the candidate was selected. One voter suggested announcing "You selected" *before* the name of the candidate in these cases.	Both	Annoyance

Function	Observation	System	Severity
Ballot (Audio)	When the voter has reached the last choice, the audio announces this, but pressing the down-arrow does nothing. A participant suggested that it should repeat "Last choice" or "You have heard all of the choices."	XL	Annoyance
Ballot (Straight Party)	Several participants, including poll workers, hesitated at the screen for straight party, wondering if you had to select a party to continue. Better instructions or an option for "No straight party selection" would be helpful	EV XL (large)	Problem solving
Ballot (Straight Party)	The interaction with changing straight party selections was confusing in several ways: • Trying to select just one candidate from a group selected by straight party produced inconsistent results, depending on the exact configuration of the candidates. o If a participant tries to deselect a candidate, it resulted in that candidate being selected and others deselected. o If they tied to select a candidate from another party, all of the straight party selections were deselected, even if the new selection was within the number of options available. • Participants using the audio ballot did not always notice when candidates were deselected, especially if they were higher in the list when the deselection occurred. o When multiple candidates were deselected by this process, only the first was announced on the XL. • Participants using the audio ballot were surprised to hear that other candidates were deselected and only found that out when	Both	Problem solving Or Needs assistance

Function	Observation	System	Severity
	they reviewed the contest or were told they overvoted.		
Ballot (Straight Party)	Not being able to clear all selections on a contest with an available straight party option was very confusing. • One participant described it as having candidates "popping up" and was unable to figure out why this was so. • One participant did not understand why she was not able to deselect a candidate, not understanding that it was related to her straight party selection. • 2 participants created a write-in for "None" as a way of being able to clear all candidates and vote for no one. • When participants deselected all the straight party options, the resulting alert message was very confusing. Several participants did not figure out that the problem was related to straight party voting. o None of the participants wanted to go back, change their straight party choice and recreate their selections to vote for no one, as the message suggested. • On the XL, this would be a show-stopper for someone using the audio ballot because party affiliations were not read out. o One voter described her current voting machine as having a clear way to vote for none on each contest.	Both	Needs assistance Or Show stopper
Write-in	When trying to enter a write-in, participants paused and had to figure out how to actually select the write-in choice to enter a name, in many cases needing assistance. On the EV, the audio narration does not explain that you must push the select key to enter a write-in.	Both	Needs assistance

Function	Observation	System	Severity
Write-in	One participant did not see where the candidate name was written on the contest screen.	XL	Needs assistance
Write-in (Audio)	Using the tactile keypad and audio, it was not clear how to correct a misspelling because participants did not realize that there were keys for space, backspace and so on. The initial audio instructions don't mention the backspace and space keys.	Both	Needs assistance
Write-in (Audio)	The Info (XL) or Home (EV) button makes the system read what's been entered, but no participants found this even though they wanted it.	Both	Needs assistance
Write-in (Audio + Visual)	When returning to the write-in screen with an entry already made, there is no indication of where the cursor is placed, that is, where the next character will be entered.	Both	Needs assistance
Write-in (Audio)	Participants struggled to find the "Space" button (located after punctuation and backspace buttons in the scanning sequence).	Both	Problem solving
Write-in	On the ExpressVote, the buttons for leaving the write-in are visually opposite to the location of the keys on the keypads: • Accept: left on screen, right on keys • Cancel: right on screen, left on keys	EV	Annoyance
Write-in (Audio)	Participants struggled to find the backspace button to erase a letter. One tried using the left arrow, which took her back to the contest, and destroyed all the text she had already typed.	Both	Problem solving or Show stopper
Review screen	The judicial retention and ballot measures had uninformative headings: • The judicial retention contest did not list the name of the judge to be retained. • The ballot measure did not have a short identifier or title, nor show the full text.	Both	Problem solving

Function	Observation	System	Severity
Review screen	A participant with a cognitive disability was initially confused by the review screen. She had never seen something like this. But after looking at it, was able to explain it reasonably well.	XL	Problem solving
Review screen	Using the audio ballot, a participant went back to the contest to check who she had voted for in a contest, even though it was displayed (and read) on the review screen itself.	EV	Annoyance
Review screen	When voter returns to ballot measure from the review screen to change or confirm a vote, they are always returned to the top measure of the review screen, and have to "down arrow" through the ballot to get back to where they were. Participants assumed they would be returned to the ballot measure they had departed from.	XL	Annoyance
Review screen	Participants were surprised to get a message about undervoted contests after completing the review screen. For some, it made it feel that they were required to completely vote all contests.	Both	Annoyance Or Problem solving
Print, verify, cast	If you eject the ballot and then reinsert it to verify what has been printed, the content of the write-in is lost, because the text entered is not encoded in a barcode, and the system is not reading the text through OCR. • This means that it is not possible for a blind or low-vision voter to completely verify their ballot using just the voting system. • Two participants tried reading the ballot using personal technology. The one who used this technology found it easy. The other struggled, but was successful.	Both	Show stopper

Function	Observation	System	Severity
Print, verify, cast	Voters used to the Danaher Shouptronics expected to find a "Vote" button available to them at any time. • Using the XL in full-face mode means that there is no navigation between screens, so that there is a button to print and cast the ballot always available. • This is an issue that will require voter education.	EV	Problem solving
Print, verify, cast	On the XL, blind participants were not sure what was happening during the printing process. • They understood that something would print. • They heard the printer. • But they did not know where the ballot was or what to do next.	XL	Problem solving
Print, verify, cast	On the XL, it was not clear how to get to the print button. At this point in the process, participants wanted clarity and accuracy. • One participant thought the down arrow should get to the print button, but the correct control is the right arrow.	XL	Problem solving or Needs assistance
Print, verify, cast	On the XL, it was not clear how participants could get their ballot back so they could verify it. This concern was raised even when the XL was the first or only system they used, so it is not simply a comparison to the EV. • The process to review the printed ballot requires that the ballot be "cancelled" to eject it from the machine. It can then be read back in after verification, but there is no audio (or onscreen) description of this process. • One participant thought "Quit" was how to say she was done voting.	XL	Problem solving or Needs assistance Or Show stopper

Function	Observation	System	Severity
	• Another could not figure it out, and ended up casting their ballot without verifying. • There is no indication in the audio that this is an option for blind or low vision voters who don't want to "cancel" their ballot, but just review it manually.		
Print, verify, cast	None of the participants were able to verify their paper ballot on the XL. • The ballot is partially obscured by the cover. • The ballot is behind glass making it harder to see. • The text is too small. • Several participants never saw the ballot to verify.	XL	Show stopper
Print, verify, cast	On the ExpressVote, most participants simply followed the instructions to complete the printing and verifying process, but a few were confused because it wasn't clear that the ballot would be returned to them.	EV	Problem solving
Scanner	There are no audio instructions to help a blind or low-vision voter insert and cast their ballot	DS200	Needs assistance
Scanner	There is no way for a blind or low vision voter to read any of the messages on the scanner. This is a low-frequency problem when using the EV because there are no overvotes possible on the ballot, and the scanner was programmed to ignore undervotes. However, it is possible to cast a blank ballot.	DS200	Needs assistance
Scanner	There is no audio equivalent to the final screen to communicate that the ballot has been cast. Blind participants heard the ballot drop into the box, but in a noisy polling place or when there is a pile of ballots already in the box this sound would not be available.	DS200	Needs assistance

Recommendations for deployment

The participants – and examiners – saw the systems being tested for the first time during the examination. Many voters will also try using a new system for the first time in the voting booth, so our test was realistic for Pennsylvania voters.

The problems we encountered also suggest ideas for how election officials can support voters and poll workers as they introduce the new system and design their processes and procedures.

The recommendations here are based on observations of how both poll workers and voters used the system and direct suggestions they made.

Advance training and hands-on practice

The need for an introduction and a chance to try out the system before Election Day was the strongest recommendation from every poll worker participant. As an election judge said, when we asked what he would tell his poll workers, "Go to the training!"

Poll workers felt strongly that any new system – particularly these digital interfaces – would be intimidating to voters and fellow poll workers who were not used to computers. They recommended:

- Longer training sessions for poll workers to give them more time to familiarize themselves with a new system.
- Opportunities for hands-on experience, including scenarios for different situations they might have to handle.
- An aggressive voter education program to give voters a chance to try out the new system.
- Outreach to voters with disabilities, including those who regularly vote with assistance to let them know about the capabilities of a new system that might help them.

- Instructions or a practice system in the polling place, especially in districts with many older people.

Training to support voters with disabilities

Poll workers may not be familiar with how to help people with disabilities. Most of the poll worker participants said that they had no blind or disabled voters in their polling places, although one pointed out that the features on these systems might enable their “assisted voters” to try voting independently.

In addition to a good training module on ways to help voters with disabilities, the training should focus on how to give instructions before and during a voting session to avoid compromising the privacy. For example:

- A “what if” troubleshooting guide could include specific questions to ask and prompts that poll workers can use to help a voter with problem solving without looking at the screen.
- Give poll workers guidance on where to stand while supporting voters. For example, standing behind the ExpressVote and facing the voter would make it clear that they are not looking at the screen.
- Using the procedures for initiating a voting session, including the screens to select a language or acknowledge that assistive technology has been activated, to make sure that the voter has found the basic navigation keys on the keypad. On the ExpressVote, there is a screen with a diagram of the keys that the poll worker can review with the voter (reading the instructions to be sure they are consistent and accurate).

Poll worker procedures

Poll workers procedures can also help bridge any information gaps for voters, with instructions embedded in the voting process.

- Tell voters how to insert their ballot: identify the corner notch and the location of the slot, and tell them the ballot is inserted directly into the machine, not just slid forward.
- Remind voters to check both the review screen and their paper ballot before casting.
- Tell voters that if they make a mistake, they can get a new ballot.
- Instruct voters to insert their ballot with the corner notch on the bottom right so others can't see their selections. The ballot can be inserted into the scanner in any orientation.

Support for voters using the tactile keypad or dual switch and audio ballot might include:

- A keypad they can try out before entering the voting booth.
- Instructions for how to use the keypad in both Braille and large print. The illustration on the ExpressVote help screen could be the basis for these instructions.

As a voter approaches the voting station, poll workers can help voters adjust the voting system or attach personal assistive technology:

- Help voters get positioned at the voting system so they can reach all controls. The XL screen can be adjusted to change its angle for a closer approach, adapting to standing or sitting postures, and avoiding glare.
- Provide assistance plugging in personal headsets or switches with verbal instructions or by doing it for the voter.
    - A voter with a disability is likely to know how to plug in their personal headset or switch, but they will not know the location of the jacks on the machine.

- Make sure voters are oriented and know where all parts of the voting system are, including the privacy shields. The ExpressVote includes a dedicated key on the tactile keypad to blank the screen.
- Remind voters how to cast their ballot and how to know when they are done.

Voting booth setup

Voters with disabilities may have 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.

- work well with the printed ballot layout

For the ExpressVote, the path to the scanner should be as easy as possible, 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.

XII. Attachment C – Acceptance Testing Attestation

Voting System Implementation Attestation

System Name: ES&S EVS 6.5.0.0

County: _____

Date Installed/Upgraded: _____

The below hardware/software was installed and verified on the system implemented:

System Component	Software or Firmware Version	Hardware Version	Model	Comments
ElectionWare				(Please specify the implementation, single device (desktop/laptop), Client/server)
Event Log Service				
Removable Media Service				
ElectionWare Additional Reporting				
ExpressVote HW 2.1				
ExpressVote HW 3.0				
DS200				

DS300				
DS450				
DS850				
DS950				
ExpressVote XL				
ExpressLink				
Toolbox				

Further to the key hardware/software components listed above, any of the COTS software installed on the voting system adheres to the EAC certificate of conformance for the EVS 6.5.0.0 system. Any ancillary components sold under this contract, such as switches, ballot boxes, and charging carts, are EAC-certified components of the EVS 6.5.0.0 voting system. (Attach a list of all ancillary components sold under this contract.)

ES&S also has validated that the system components have been installed and hardened in accordance with the EAC-certified system hardening instructions, and that no software other than the voting system software has been installed on any of the components.

ES&S and the county confirm that the system implementation adheres to the conditions of certification identified in the Secretary of the Commonwealth's system certification report dated "XX/XX/XX" (the "Report"), and that any deployment of the system for election activities will follow all conditions set forth in the Report.

Vendor Representative Signature: _____

Vendor Representative Name:_____ Title:_____

Telephone:_____ Email:_____

County Representative Signature:_____
County Representative Name:_____Title:_____

XIII. Attachment D – Minimum Training Requirements

ES&S must provide training and training materials as set forth below prior to the first use of the voting system in a primary or general election.

A) A demonstration of and training on the setup and operation of the Voting System to the purchasing county's board of elections' members and staff and the county's precinct election officials.
B) A training session on the Voting System's election management system and/or EPBs for the purchasing county's board of elections' members and no less than two and no more than six staff members chosen by the board of elections. The training sessions must afford the board members and its staff the opportunity to learn how to setup and program an election, and if applicable design and layout ballots independently of ES&S's assistance and support.
C) A training session on the following subjects for the purchasing county's board of elections' members and no less than two and no more than six staff members chosen by the board of elections:
    a. programming of all voting units and ancillary devices;
    b. tabulating results during the unofficial and official canvass;
    c. ensuring accuracy and integrity of results;
    d. preparing polling places and setting up the system for election day operation;
    e. Training on accessibility options of the voting system;
    f. Election day operating procedures;
    g. auditing procedures;
    h. conducting a recount;
    i. preserving records;
    j. printing, designing, and formatting election reports;
    k. troubleshooting common issues;
    l. safeguarding and preventing tampering and unauthorized access to all parts of the Voting System; and
    m. Post-election care, maintenance, and storage.
D) Any and all system manuals necessary to allow a purchasing county to operate the Voting System independently of the ES&S's assistance and support.
E) Training materials for a purchasing county's board of elections to use when training its precinct election officials on how to setup, operate, and close down the Voting System on Election Day

XIV. Attachment E – Escrow Obligations

ES&S must maintain an escrow agreement covering all source codes of the Voting System and/or EPB for a period of ten years from the date of delivery to and acceptance by a purchasing county board of elections. The Pennsylvania Secretary of the Commonwealth shall have the right to access the source codes in escrow subject to the conditions specified below in Section D(8)(d). ES&S must pay all costs associated with 1) placing the codes in escrow and 2) verifying that ES&S has placed the codes in escrow (note: the escrow agent conducts this verification and charges a separate fee for this service).

a. Source code. Simultaneously with delivery of the Voting System and/or EPB software to purchasing jurisdictions, ES&S shall deliver a true, accurate and complete copy of all source codes relating to the software to an escrow agent.
b. Escrow. To the extent that Voting System and/or EPB software and/or any perpetually licensed software include application software or other materials generally licensed by ES&S, ES&S agrees to place in escrow with an escrow agent copies of the most current version of the source code for the applicable software that is included as a part of the Services, including all updates, improvements, and enhancements thereof from time to time developed by ES&S.
c. Escrow agreement, An escrow agreement must be executed by the parties, with terms acceptable to the Commonwealth prior to deposit of any source code into escrow. ES&S shall provide a copy of the escrow agreement to the Department for review prior to execution of the agreement and depositing of any source code.
d. Obtaining source code. ES&S agrees that upon the occurrence of any event or circumstance which demonstrates with reasonable certainty the inability or unwillingness of ES&S to fulfill its obligations to Commonwealth under this Contract, Commonwealth shall be able to obtain the source code of the then-current source codes related to Voting Systems software, EPB software, and/or any ES&S Property placed in escrow from the escrow agent