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NATIONAL ELECTION DEFENSE
COALITION, CITIZENS FOR BETTER
ELECTIONS, RICH GARELLA, RACHEL
A. MURPHY, CAROLINE LEOPOLD,
STEPHEN STRAHS, KATHLEEN
BLANFORD, SHARON STRAUSS,
ANNE C. HANNA, RAPHAEL Y. RUBIN,
ROBERT F. WERNER, SANDRA
O'BRIEN-WERNER, THOMAS P.
BRUNO, JR., ROGER DREISBACH-
WILLIAMS, and JEFF R. FAUBERT,

Petitioners,

v.

KATHY BOOCKVAR, SECRETARY OF
THE COMMONWEALTH,

Respondent.

COMMONWEALTH COURT
OF PENNSYLVANIA

ORIGINAL JURISDICTION

Docket No.:

NOTICE TO PLEAD

You have been sued in court. If you wish to defend against the claims set forth in the following pages, you must take action within 30 days after this Petition and Notice are served by entering a written appearance personally or by an attorney and filing in writing with the Court your defenses or objections to the claims set forth against you. You are warned that if you fail to do so the case may proceed without you and a judgment may be entered against you by the Court without further notice for any claim or relief requested by the Petitioners.

YOU SHOULD TAKE THIS PAPER TO A LAWYER AT ONCE. IF YOU DO NOT HAVE A LAWYER OR CANNOT AFFORD ONE, GO TO OR TELEPHONE THE OFFICE SET FORTH BELOW TO FIND OUT WHERE YOU CAN GET LEGAL HELP.

**DAUPHIN COUNTY BAR ASSOCIATION
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Docket No.:

PETITION FOR REVIEW
ADDRESSED TO THE COURT'S ORIGINAL JURISDICTION

I. INTRODUCTION

1. This is a challenge to the Secretary of the Commonwealth's certification of the ExpressVote XL electronic voting machine on the grounds that it is insecure, unreliable, inaccessible to users with disabilities, and not remotely compliant with state ballot requirements, in violation of multiple provisions of the Pennsylvania Election Code and of voters' rights under the Pennsylvania Constitution.

2. In July 2019, before the machines were used in any election, some of the parties to this suit along with other concerned citizens (collectively, the "Petitioners") petitioned the Secretary of the Commonwealth of Pennsylvania ("the Secretary") to reconsider the certification of the machines. (*See* Exhibit A, Reexamination Request Petition ("Petition").) However, the Secretary gave little weight to their concerns and dismissed the petition in a largely perfunctory manner. (*See* Exhibit B, *Report Concerning the Reexamination Results of Election Systems and Software ExpressVote XL*, issued by Secretary Boockvar on September 3, 2019.)

3. Meanwhile, three Pennsylvania counties—Philadelphia County, Northampton County, and Cumberland County—relied on the Secretary's certification and spent millions of dollars buying these new machines, which had never before been used or tested in an actual election in Pennsylvania.

4. Many of the concerns the Petitioners raised came to fruition when the machines were debuted in Philadelphia and Northampton in the November 5, 2019 general election. The ExpressVote XL machine incorrectly tabulated votes in numerous contests, and voters reported many problems using the touchscreens and difficulty reading the machine-printed ballots to confirm they were correct.

5. Petitioners here (collectively “the Plaintiffs”)¹ are two non-profit groups — the National Election Defense Coalition (“NEDC”) and Citizens for Better Elections (“CBE”) — and individual members of the Pennsylvania electorate (“the Individual Plaintiffs”). NEDC and CBE include voting members of the Pennsylvania electorate within their organizations. Their core missions include helping members of the electorate exercise their right to vote in free and fair elections, and working to ensure that elections be conducted on systems that are secure, accessible, transparent, and auditable.

6. Plaintiffs challenge the Secretary’s certification, without adequate testing, of the ExpressVote XL electronic voting machine for use in Pennsylvania elections. The certification is in clear violation of the Pennsylvania Election Code’s substantive requirements for approving electronic voting machines, and impairs the rights of Pennsylvania citizens under the Pennsylvania Constitution to

¹ In order to distinguish between the Petitioners who petitioned the Secretary in July 2019 and the parties bringing this Petition for Review Addressed to the Court’s Original Jurisdiction, the latter are referred to herein as “Plaintiffs.”

free and equal elections, the free exercise of the right of suffrage, secrecy in voting, and equal protection under the law.

7. The Secretary certified the machines² even though they violate the Pennsylvania Election Code and do not, and will not, reliably and consistently record, tally, and secure the votes of Pennsylvania's citizens. Plaintiffs seek to compel the Secretary to comply with the requirements of the Pennsylvania Election Code and the Pennsylvania Constitution in order to protect the right to vote and the integrity of the election process.

8. The ExpressVote XL voting machines certified by the Secretary violate the Pennsylvania Election Code in multiple ways: (a) they lack adequate security and reliability measures to ensure that each vote cast is properly recorded and counted; (b) they do not allow for a voter's choices to be kept private; (c) they fail to offer equal access to all registered voters, particularly those with physical or cognitive disabilities, and (d) they use ballot cards that do not even remotely comply with the detailed requirements specified by the General Assembly in the Election Code.

9. Plaintiffs assert the following causes of action:

² The ExpressVote XL was originally certified by Acting Secretary of State Robert Torres. Respondent Kathy Boockvar was appointed Acting Secretary of the Commonwealth on January 5, 2019 and confirmed by the Senate on November 19, 2019.

Security and Reliability Violations

- Count I:** Violation of Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7(12), because the ExpressVote XL machines do not “[p]rovide acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards.”
- Count II:** Violation of Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7(13), because the ExpressVote XL machines do not routinely and consistently “record[] correctly and compute[] and tabulate[] accurately every valid vote registered”
- Count III:** Violation of Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7(11), because the ExpressVote XL machines are not “suitably designed and equipped to be capable of absolute accuracy.”

Voter Privacy and Secrecy Violations

- Count IV:** Violation of Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7(1), Section 1111-A of the Pennsylvania Election Code, 25 P.S. § 3031.11(b), and the Pennsylvania Constitution, Article VII Section 4, because the ExpressVote XL machines do not ensure “voting in absolute secrecy,” nor do they “prevent[] 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,” nor do they ensure “secrecy in voting [is] preserved.”

Accessibility Violations

- Count V:** Violation of Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7(5), because the ExpressVote XL machines are not accessible for individuals with disabilities in a manner that permits “each” voter “to vote for any person and any office for whom and for which he is lawfully entitled to vote” with the same opportunity for access and participation (including privacy and independence) as other voters.

Ballot Format Violations

- Count VI:** Violation of Section 1109-A of the Pennsylvania Election Code, 25 P.S. § 3031.9(e), because the ExpressVote XL machines do not allow for votes to “be printed on card or paper stock of the color of the party

of the voter [nor do they include] the appropriate party affiliation or independent status...on the ballot card.”

Violation of Section 1004 of the Pennsylvania Election Code 25 P.S. § 2964, because the ExpressVote XL machines “do not b[i]nd together [the ballots] in books of fifty, in such manner that each ballot may be detached and removed separately.”

Violation of Section 1112-A of the Pennsylvania Election Code, 25 P.S. §§ 3031.12 (b)(2)-(4), because the ExpressVote XL machines do not provide the voter an opportunity to “mak[e] a cross (X) or check (✓) mark or... a punch or mark sense mark in the square opposite the name” of the candidate or issue for which they are voting.

Violation of Section 1109-A of the Pennsylvania Election Code, 25 P.S. § 3031.9 (a)(2), because the ExpressVote XL machines do not provide a ballot card on which “the first ballot page shall list in the order that such political parties are entitled to priority on the ballot, the names of such political parties with designating arrows so as to indicate the voting square or position on the ballot card.”

Violations of the Pennsylvania Constitution’s Guarantee of the Free Exercise of the Right of Suffrage

Count VII: Violation of the Pennsylvania Constitution, Article I, Section 5, which guarantees free and equal elections and the free exercise of the right to suffrage.

Violation of Article I, Section 26, of the Pennsylvania Constitution, which prohibits discrimination against the civil right to vote.

10. Plaintiffs seek a declaration that the certification of the ExpressVote XL voting machine violates the aforementioned provisions of the Pennsylvania Election Code and the Pennsylvania Constitution.

11. Plaintiffs seek an Order directing the Secretary to decertify the ExpressVote XL voting machine for use in Pennsylvania.

II. JURISDICTION

12. The Court has original jurisdiction over this Petition for Review pursuant to 42 P.S. § 761(a).

III. PARTIES

13. Plaintiff National Election Defense Coalition (“NEDC”) is a D/B/A of Psephos, Inc., a nonpartisan 501(c)(3) organization, having the mission of guaranteeing everyone the right to vote and have their vote counted in a transparent and trustworthy electoral system. Psephos, Inc., doing business as NEDC, is incorporated in California and has organizational and associational standing by virtue of its mission and subscribers.

14. Plaintiff Citizens for Better Elections (“CBE”) is a Pennsylvania non-profit corporation whose mission is to ensure accurate, verifiable, and secure elections. CBE is incorporated in Pennsylvania and has organizational and associational standing by virtue of its mission and membership.

15. The Individual Plaintiffs are individuals who reside in and are registered to vote in Pennsylvania.

16. Plaintiff Rich Garella is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

17. Plaintiff Rachel A. Murphy is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

18. Plaintiff Caroline Leopold is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

19. Plaintiff Stephen Strahs is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

20. Plaintiff Kathleen Blanford is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

21. Plaintiff Sharon Strauss is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

22. Plaintiff Anne C. Hanna is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

23. Plaintiff Raphael Y. Rubin is an adult individual who resides in Philadelphia, Pennsylvania and is a duly qualified elector of Philadelphia County.

24. Plaintiff Robert F. Werner is an adult individual who resides in Easton, Pennsylvania and is a duly qualified elector of Northampton County.

25. Plaintiff Sandra O'Brien-Werner is an adult individual who resides in Easton, Pennsylvania and is a duly qualified elector of Northampton County.

26. Plaintiff Thomas P. Bruno is an adult individual who resides in Easton, Pennsylvania and is a duly qualified elector of Northampton County.

27. Plaintiff Roger Dreisbach-Williams is an adult individual who resides in Easton, Pennsylvania and is a duly qualified elector of Northampton County.

28. Plaintiff Jeff R. Faubert is an adult individual who resides in Hellertown, Pennsylvania and is a duly qualified elector of Northampton County.

29. The Individual Plaintiffs have been required to use the ExpressVote XL electronic voting machines that are the subject of this suit.

30. Each Individual Plaintiff cast a ballot in the November 5, 2019 election, each wants to cast a ballot in future elections, and each wants their future votes and the votes of all Pennsylvanians to be properly counted and tallied.

31. Respondent Kathy Boockvar was appointed Acting Secretary of the Commonwealth of Pennsylvania on January 5, 2019 and confirmed by the Senate on November 19, 2019. *See* Department of State <https://www.dos.pa.gov/about-us/pages/secretary-of-the-commonwealth.aspx> (last accessed December 2019). In this capacity, she leads the Pennsylvania Department of State and is charged with the general supervision and administration of Pennsylvania's election laws, including among other things, the duty "to examine and re-examine voting machines, and to approve or disapprove them for use in this State, in accordance with the provisions of [the Pennsylvania Election Code]", 25 P.S. § 2621. She is sued in her official capacity.

IV. FACTUAL ALLEGATIONS

A. The ES&S ExpressVote XL Voting Machine

32. The ExpressVote XL is a polling place voting device. It is one of several voting machines which were introduced in the last few years which are

commonly referred to as all-in-one hybrid voting machines. They are called “all-in-one” because they combine two tasks which are more often performed by two separate devices: marking a voter’s choices on a piece of paper, and tabulating votes from a piece of paper. In an all-in-one hybrid, these two voting processes are contained in a single device.

33. The ExpressVote XL voting machine looks like this:



34. A voter uses the ExpressVote XL by inserting into the device a 4.25-inch wide blank card made of thermal paper.

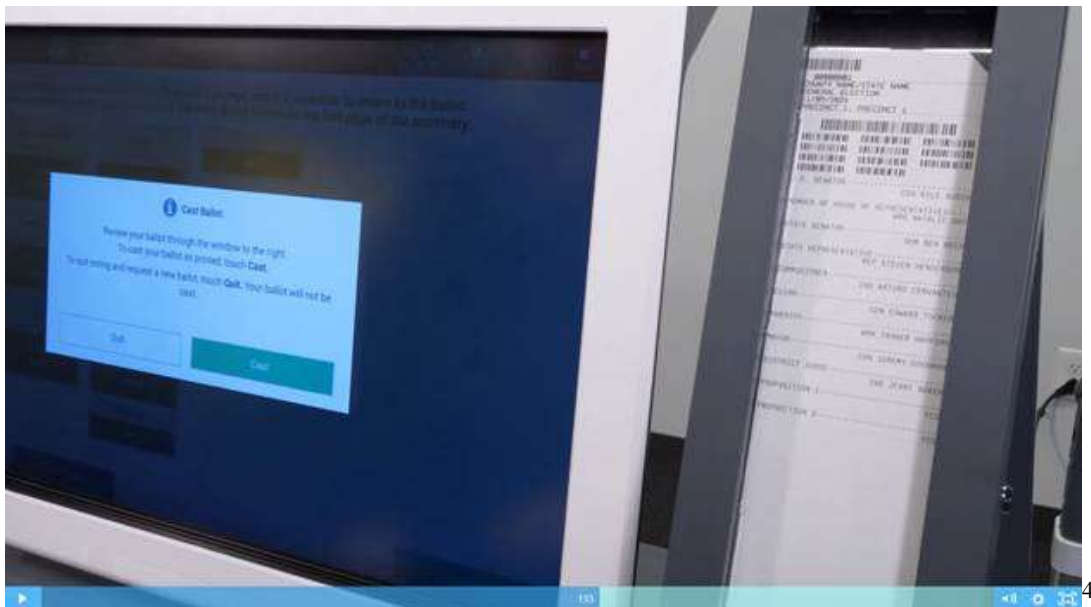
³ Election Systems & Software, <https://www.essvote.com/products/expressvote-xl/> (last visited December 2019).

35. The voter uses the device's touch-operated screen and/or assistive technology (headphones or alternative controller) to select choices in one or more contests in the current election.

36. When the voter selects the “Print” button, the device prints the choices on the paper using a thermal printer.

37. The device then scans the printed paper that it just printed using an optical scanner and holds the scanned data in its memory.

38. The device presents the printed paper to the voter inside an enclosed box with a glass window on top.



39. The voter reviews the printed paper and selects one of two options in the interface: either to cast the ballot, or to spoil it.

⁴ Election Systems & Software, <https://www.essvote.com/products/expressvote-xl/> (last visited December 2019).

40. If the voter chooses to cast the ballot, the device uses the data in its memory to add votes to the election tally and deposits the printed paper into a ballot container attached to the rear of the device.

41. If the voter chooses to spoil the ballot, then the device emits a repeating chime sound and displays instructions that the voter should wait for poll worker assistance.

42. Pennsylvania Election Code Section 1101-A, 25 P.S. § 3031.1, defines a “ballot” as: “ballot cards or paper ballots upon which a voter registers or records his vote or the apparatus by which the voter registers his vote electronically”

43. A ballot card is defined as a “a card which is compatible with automatic tabulating equipment and on which votes may be registered.”

Pennsylvania Election Code Section 1101-A, 25 P.S. § 3031.1.

44. The Pennsylvania Election Code defines a “paper ballot” as: “a printed paper ballot which conforms in layout and format to the voting device in use.” Pennsylvania Election Code Section 1101-A, 25 P.S. § 3031.1.

45. The paper used by the ExpressVote XL conforms to the Election Code’s definition of a “ballot card.”

46. The paper used by the ExpressVote XL is intended to be blank before printing, meaning that before one votes there will be no candidates listed on it.

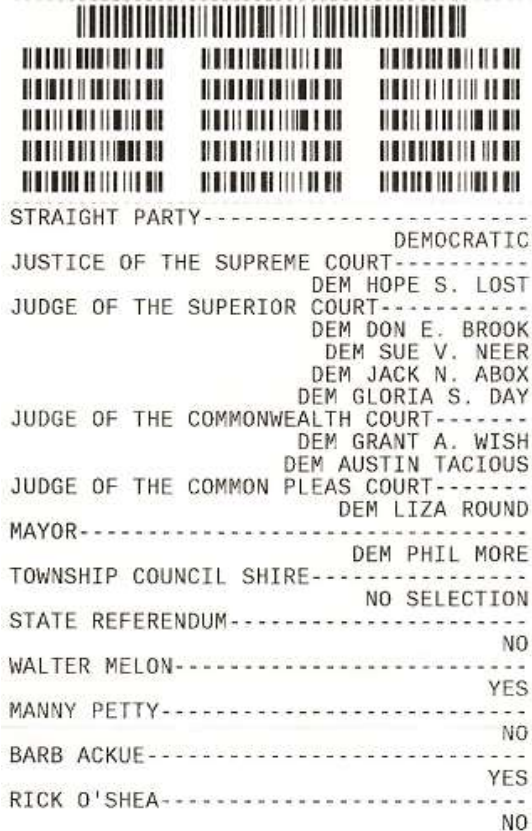
47. Therefore, the paper used by the ExpressVote XL does not conform to the Election Code's definition of a "*paper ballot*." (emphasis added).

48. On a phone call with the Secretary and members of the Pennsylvania Department of State on May 22, 2019, Deputy Secretary for Elections and Commissions Jonathan Marks stated that, using the definitions in the Election Code, the Commonwealth considers the paper used by the ExpressVote XL to be a "ballot card" and not a "paper ballot."

49. Once the ExpressVote XL prints on the ballot card, it contains three sections of content. At the top is general information about the current election (e.g., county, date, district). In the middle and near the top is a section containing one or more barcodes which are designed to encode information about the ballot and a voter's selections in a machine-readable format. Below the barcodes is a section containing one or more lines of text which is designed to provide a human-readable summary of a voter's selections.

50. Typically, the text lists a series of contests in the current election on the left and the corresponding selection, such as a candidate name, on the right. An example of a printed ballot card that was used in an April 26, 2018 demonstration of the ExpressVote XL machine at the Farm Show Complex in Harrisburg, Pennsylvania, is reproduced below:

ELECTIONWARE COUNTY/ELECTIONWARE STATE
PA GENERAL ELECTION DEMO
03/25/2018
PRECINCT 1, PRECINCT 1



STRAIGHT PARTY-----
DEMOCRATIC
JUSTICE OF THE SUPREME COURT-----
DEM HOPE S. LOST
JUDGE OF THE SUPERIOR COURT-----
DEM DON E. BROOK
DEM SUE V. NEER
DEM JACK N. ABOX
DEM GLORIA S. DAY
JUDGE OF THE COMMONWEALTH COURT-----
DEM GRANT A. WISH
DEM AUSTIN TACIOUS
JUDGE OF THE COMMON PLEAS COURT-----
DEM LIZA ROUND
MAYOR-----
DEM PHIL MORE
TOWNSHIP COUNCIL SHIRE-----
NO SELECTION
STATE REFERENDUM-----
NO
WALTER MELON-----
YES
MANNY PETTY-----
NO
BARB ACKUE-----
YES
RICK O'SHEA-----
NO

51. The machine is designed to tabulate each vote by scanning each barcode that is printed near the top of the ballot card.

52. The machine is not designed to tabulate from the touchscreen inputs, nor the human-readable text on the ballot card, only the barcodes.

B. Federal and State Certification Processes

53. On or around June 5, 2017, Election Systems & Software (“ES&S”) submitted a voting system, EVS 6.0.0.0, for federal certification by the U.S. Election Assistance Commission (“EAC”). EVS 6.0.0.0 is a suite that includes voting machines, hardware, and software. It included a new model of electronic

voting machine, the ExpressVote XL. This voting system, including the ExpressVote XL, was certified by the EAC on July 2, 2018.

54. From June 25 to June 29, 2018, the Secretary conducted an examination of ES&S EVS 6.0.0.0, including the ExpressVote XL voting machine. The examination included a “public demonstration and functional examination, accessibility examination and security testing.” *See* Penn. Sec’y of State, *Report Concerning the Examination Results of Election Systems & Software EVS 6021 with DS200 Precinct Scanner, DS450 and DS850 Central Scanners, ExpressVote HW 2.1 Marker and Tabulator, ExpressVote XL Tabulator and ElectionWare EMS* (Nov. 30, 2018) (“Original Certification Report”), at 2, attached hereto as Exhibit C.

55. The functional and accessibility examinations were performed in the Commonwealth Capital Complex in Harrisburg, Pennsylvania. The functional examination was “open to the public and was videotaped by Department staff.” *Id.* at 3.

56. The examiners “concluded that the EVS 6000 did not comply with Sections 1107-A(3) and (13) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(3) & (13), because the ExpressVote XL and ExpressVote 2.1 did not accurately implement the Pennsylvania Method (PA Method) of straight party voting and the general election results did not allow adjudicating two write-in votes from ExpressVote XL ballots.” *Id.*

57. ES&S made software modifications to address the problems identified by the examination and made another software change to address a problem experienced in a primary election in the State of Kansas. The revised system and software was submitted to the EAC for federal certification and to the Secretary for state certification as EVS 6.0.2.1.

58. ES&S EVS 6.0.2.1 is a suite that includes voting machines, hardware, and software. Its central components are the Electionware election management software (used by election workers), several different types of ballot marking devices, and several optical scanners. The ExpressVote XL all-in-one hybrid voting machine, which is the subject of this suit, was certified as part of EVS 6.0.2.1.

59. From September 25 to September 28, 2018, a follow-up examination was conducted at the Colorado offices of SLI Global Solutions. Staff from the Department of State observed the follow-up examination via web conference, and the follow-up examination was videotaped.

60. On November 30, 2018, the Secretary certified EVS 6.0.2.1, including the ExpressVote XL voting machine, for use in Pennsylvania elections.

61. On July 16, 2019, CBE and NEDC filed a Petition signed by 200 duly registered electors in the Commonwealth of Pennsylvania (including several of the Individual Plaintiffs), requesting a re-examination of the ExpressVote XL, along with a check for \$450. *See Exhibit A, Examination Request Petition.*

62. The Petition to the Secretary enumerated ten grounds for re-examination.

63. On August 22, 2019, undersigned counsel submitted a letter to the Executive Deputy Chief Counsel of the Pennsylvania Department of State regarding the pending re-examination process. *See* the August 22 letter attached hereto as Exhibit D.

64. The August 22 letter stated in part:

Our understanding is that, to this point, every single examination and reexamination conducted in Pennsylvania since at least 2005 has been conducted in public, with very limited breaks for discussions of proprietary information. This precedent of transparency was set with the Secretary’s process in addressing the very first petition to re-examine a previously certified system Since then, to the best of our knowledge, every single examination and reexamination—including the 2012 re-examinations spurred by the litigation in *Banfield v. Cortes*—has been open to members of the public Please advise us on your view as to whether the re-examination is subject to the Sunshine Act [and] your office’s plans with regard to public access to the reexamination

Id.

65. The Secretary’s office did not answer the August 22 letter.

66. On September 3, 2019, the Secretary issued a report titled *Report Concerning the Reexamination Results of Election Systems and Software ExpressVote XL* (“Report Concerning Reexamination”, attached hereto as Exhibit B) in response to the Petition.

67. The re-examination was conducted at the Colorado offices of SLI Compliance, a voting system test lab.

68. Neither the petitioners nor the public were invited to observe the re-examination.

69. The Secretary dismissed outright seven out of the ten grounds for re-examination brought by Petitioners. The Report Concerning Reexamination states, “After a thorough and considered review of the Petition, the Acting Secretary has determined that claims three through seven, nine, and ten amount to purely legal arguments which do not apply to reexamination or certification of an electronic voting system.” *See* Exhibit B at 1.

70. The seven grounds dismissed outright by the Secretary included the petitioners’ concerns that the ExpressVote XL lacks required measures to prevent ballot fraud, prevents voters from knowing their votes were recorded and counted correctly, does not provide acceptable accessibility for voters with disabilities, and requires procedures which may constitute unlawful assistance in voting, all in violation of the Pennsylvania Election Code.⁵

⁵ Although not a subject of this suit, the tenth ground alleged that the certification of the ExpressVote XL is in contravention of a federal settlement in the matter of *Stein v. Cortes*, which requires the Secretary to “direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.” *See* “Settlement Agreement,” docket entry no. 108, *Stein v. Cortes*, No. 16-cv-06287 (E.D. Pa. Nov. 28, 2018), attached hereto as Exhibit E.

71. At the direction of the Secretary, SLI Compliance examined only three of the deficiencies listed in the Petition.

72. The Report Concerning Reexamination concluded that the ExpressVote XL did not violate the Election Code, but listed several “additional conditions” that jurisdictions using the machine “must” implement. *See* Exhibit B at 11-12.

C. The ExpressVote XL’s Use in Pennsylvania Counties

73. Since its certification for use in Pennsylvania, the ExpressVote XL has been purchased or selected for purchase by Philadelphia, Northampton, and Cumberland counties.

74. As of December 2, 2019, Pennsylvania had approximately 8,536,368 registered voters.

75. Approximately 1,446,240 registered voters (16.94%) reside in Philadelphia, Northampton, and Cumberland counties.⁶

76. The ExpressVote XL was used for an election in Pennsylvania for the first time by Philadelphia and Northampton Counties during the general election on November 5, 2019. Cumberland County did not use the ExpressVote XL in the November 5, 2019 general election as they were not in possession of them yet.

77. The ExpressVote XL remains certified for use in Pennsylvania.

⁶ “Pennsylvania Department of State Voting and Election Statistics” <https://www.dos.pa.gov/VotingElections/OtherServicesEvents/VotingElectionStatistics/pages/votingelectionstatistics.aspx> (last visited December 2019).

78. Philadelphia, Northampton, and Cumberland Counties intend to use the ExpressVote XL as the primary voting machine for all elections in 2020, including the April 28, 2020 primary election and November 3, 2020 general election, and beyond.

D. The ExpressVote XL Does Not Provide Acceptable Ballot Security Procedures

i. Insecure Paper Path

79. The ExpressVote XL has a single paper path which exposes a ballot card to the same internal printer which printed the ballot prior to impoundment. This hardware configuration only exists in certain all-in-one hybrid voting machines.

80. After the ExpressVote XL prints a ballot card with a voter's selections, the ballot card travels along a single paper path, moving towards the voter.

81. The ballot card first moves to a scanner where it pauses as the barcodes on the ballot card are read.

82. Then the ballot card continues along the path into a metal display box with a transparent top so that the voter can see it.

83. Once the voter chooses to cast the ballot card, the paper travels along the same paper path in reverse, this time moving away from the voter. It passes the scanner, then passes the printer, and is then impounded in the ballot container.

84. The Secretary's "Report Concerning Reexamination" confirms that the ballot card travels past the print head a second time prior to impoundment. *See* Exhibit B at 7.

85. The printer is controlled by software. The print head is raised and lowered by software.

86. The printer outputs data sent to it by software.

87. Aside from software-controlled hardware, the ExpressVote XL does not possess additional hardware intended to physically restrict the movement of the print head or to prevent it from contacting the ballot card at a time when it should not be in physical proximity to the card.

88. The software controlling the printer could be modified, replaced, or circumvented by an attacker who is able to get malicious code onto the voting machine.

89. The hardware inside the ExpressVote XL that marks the ballot card and the hardware that scans the ballot card are connected by the same software.

90. This enables a hacked machine's software to "know" what was printed on the ballot card early in the process and to make use of that information later.

91. For example, if a voter selected no candidate in one contest, a hacked machine would know that there was an opportunity to add a vote in that contest.

The software would also know if a certain candidate had been selected by the voter and could target only those ballots while leaving others alone.

92. Intentional malfeasance is not necessary. The printer on a malfunctioning voting machine could modify or deface a ballot card prior to impoundment.

93. The Pennsylvania Election Code, Section 1101-A, 25 P.S. § 3031.1, requires that an electronic voting system “provide for a permanent physical record of each vote cast.”

94. The primary purpose of having a paper ballot during an election is to collect durable evidence of voter intent.

95. Vote totals can be tallied digitally, but original, voter-marked ballots provide backup evidence to validate those totals.

96. The ExpressVote XL’s inability to create and preserve reliable paper evidence therefore threatens fundamental election security.

97. The ExpressVote XL can change not only the software-managed totals, but also the physical evidence that would show if those totals are correct or not. In this way, ballots altered by tampering could be used as proof that totals were not changed, even when they were.

98. If ballots are altered prior to impoundment, the altered ballots would be the official ballots.

99. Therefore, the ExpressVote XL does not produce a trustworthy and independent physical record of the voter's intended vote that can be used to audit, or double check, the election results to ensure that they accurately reflect voters' intent.

100. No voter using an ExpressVote XL machine can ensure that the paper ballot that they review before officially casting their vote is the actual record being tabulated or impounded.

101. This is particularly true since the barcode is read by the machine *prior* to the voter reviewing and officially casting his or her ballot.

102. Because there is no permanent, trustworthy, and independent physical record that can be used to audit election results generated by the ExpressVote XL, there can be no assurance that either the Plaintiffs' votes or the votes of any other Pennsylvania voter in the effected counties have been accurately cast and counted in accordance with voter intent, or that the election results are absolutely accurate.

103. The ExpressVote XL indeed produces a piece of paper, which can be counted and recounted as many times as desired. However, this piece of paper is not guaranteed to be a permanent physical record of *the voter's vote*, but rather only a record of the machine's own output—that is, data from an unreadable barcode stored in the machine that the voter cannot verify to ensure it matches readable text of a voter's choices.

104. Furthermore, the ExpressVote XL violates Section 1107-A of the Election Code, 25 P.S. § 3031.7(12), which requires that a voting system “[p]rovide[] acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards.”

105. The principle of software independence states: “A voting system is software-independent if an undetected change or error in its software cannot cause an undetectable change or error in an election outcome.”⁷

106. Software independence is crucial to ensure the auditability of election results. In order to conduct an audit, the integrity of the audit trail is paramount to the audit itself.

107. For example, in a district that uses paper ballots, the paper ballots can easily be verified and trusted to ensure that the audit is based on proper evidence. This is a scenario where one sees complete “software independence” as the audit trail is created by the voter themselves.

108. In the present case, the ExpressVote XL is not software-independent because the ballots themselves are created electronically and can be incorrectly coded by the machine or tampered with by a third party *after* the voter has cast his vote.

⁷ “On the Notion of Software-Independence in Voting Systems,” Ronald Rivest and John Wack, *Philosophical Transactions of The Royal Society*, August 6, 2008, Page 1, available at <https://people.csail.mit.edu/rivest/RivestWack-OnTheNotionOfSoftwareIndependenceInVotingSystems.pdf>

109. The ExpressVote XL does not conform with the principle of software independence.

110. While the Election Code does not specifically contemplate all-in-one hybrid voting machines with the ability to handle and to mark on ballots, it is common sense that a voting machine should not have the ability to change votes after the voter has confirmed and cast her ballot.

111. The same reasoning is evident and explicitly stated in Pennsylvania Election Code Section 1222, 25 P.S. § 3062(a), “No person while handling the ballots shall have in his hand any pencil, pen, stamp or other means of marking or spoiling any ballot.”

112. Acceptable ballot security procedures to prevent tampering must include a similar restriction on any machine handling the ballots as it does on any person handling the ballots.

ii. Insecure Administrator Access Panel

113. The ExpressVote XL has an administrator access panel on the top of the machine, above the touchscreen, directly in the line of sight of voters.

114. The ExpressVote XL’s administrator access panel is readily available to voters while they are inside the private voting booth curtain.

115. No other voting machine certified for use in the Commonwealth has an access panel available to voters while they are hidden from the view of poll workers.

116. The access panel contains: (1) the on/off switch, (2) a “Supervisor Mode” switch which grants access to configuration and administrative features, (3) three USB ports, one occupied by the USB drive containing the election results and two which are open, (4) a CFLASH card containing the voting machine software is underneath a panel secured by screws.

117. The access panel is protected by a lock.

118. The lock can be picked quickly using tools which are easily obtained.

119. The locks on every ExpressVote XL in a given county are identically keyed.

120. A stolen or copied key from one district can be used in every other district for all future elections.

121. During the election on November 5, 2019 in Philadelphia, voters took photos of unlocked panels in at least three polling places.

122. A voting machine which provides voters with access to core system hardware and software while hidden from view does not provide acceptable ballot security procedures to prevent tampering.

iii. Insecure “Test Deck” feature

123. The ExpressVote XL has a feature called “Test Deck” which is designed to provide a means for an election official to test the election on each machine that will be used for voting.

124. The Test Deck allows the software used by the touchscreen device, where the software controls for the Test Deck feature are operated, to communicate with the software used for tabulation of the election results.

125. The Test Deck software can create and submit digital ballots for tabulation.

126. The Test Deck feature enables an ExpressVote XL to manufacture a series of digital ballots with various vote patterns and submit them to the tabulator software *without* printing or scanning any paper ballot cards.

127. The Test Deck feature demonstrates that the ballot marking device portion of the ExpressVote XL can send an all-digital vote to the tabulator portion of the ExpressVote XL without having to use a paper record.

128. The Test Deck feature demonstrates that no hardware or software feature prevents the ballot marking portion of the ExpressVote XL from submitting electronic votes directly to the tabulator portion of the ExpressVote XL without creating a paper record.

129. Northampton County used the Test Deck feature during its logic and accuracy tests on and around October 9, 2019.

130. A voting machine that can create electronic ballots for tabulation without creating a permanent physical record does not reliably provide for a permanent physical record of each vote cast and does not provide acceptable ballot security procedures to prevent tampering.

E. The Express Vote XL Fails to Provide All Voters with the Necessary Privacy and Absolute Secrecy in the Voting Process

131. The ExpressVote XL violates Section 1107-A of the Election Code, 25 P.S. § 3031.7 (1), which requires that a voting system:

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.

i. Chronological Ordering of Ballot Cards

132. The ExpressVote XL stores ballot cards in chronological order in a ballot container.

133. Ballots stored in chronological order may allow a poll worker or an election official who knows even partial details about the sequence of voters to violate the absolute secrecy of one or more voters.

134. Most precinct ballot scanners tabulate paper ballots or ballot cards and then let the papers fall into a large bin at random. Extracting the ballots from the bin mixes them further.

135. The ExpressVote XL machine slides ballot cards into a narrow, ballot-sized container, one after another, neatly stacked.

136. When the polls close, the entire ballot container is removed and the ballot cards remain in chronological order inside.

137. The Secretary's own Report Concerning Reexamination confirmed that the ballot cards are stored in chronological order. *See Exhibit B at 8-9.*

138. A voter's ballot could be determined by referencing the order of voters in the poll book or on the numbered list of voters, by counting from the first or last ballot in the set, or by counting from another identifiable ballot, such as one with a known write-in vote.

139. The Pennsylvania Election Code requires every polling place to maintain a numbered list of voters. Voter names are added to the list in the order that they check-in. The lists are returned, along with the ballots, to the county election office after the polls close.

140. In polling places with only one ExpressVote XL device available for voting, the order of the voter names on the numbered list of voters will match the order of the ballot cards in the ballot container.

141. In polling places with more than one ExpressVote XL device available for voting, if each device is used exclusively by voters from a single party during a primary election, the voter names on the numbered list of voters, when filtered by the party affiliation recorded on the list, will match the order of the order of the ballot cards in the ballot container.

142. Chronologically ordered ballots fail to protect a voter's right to a secret ballot.

143. The ability to link voters to their ballots and to know how they voted enables information harvesting, vote buying and selling, and voter coercion.

144. The Pennsylvania Department of State has long held the position that voting systems with chronologically ordered ballots violate voter secrecy.

145. Dr. Michael Shamos, statutory examiner for the Secretary of the Commonwealth from 1980 to 2010, testified to a U.S. Senate committee in 2007, “Even paper trail advocates recognize that scrolled paper trails make it easy, not just possible, to determine how every voter in a precinct voted. The first voter’s ballot is first on the tape; the last voter’s is last; and everyone else’s is sequential order in between. A simple comparison between the paper trail and the poll list gives away everyone’s vote, in violation of the Section 201 requirement of a secret ballot. Even if only two percent of the vote is audited, it means that two percent of the voters are at risk of having their votes revealed.”⁸

146. The voting system cannot depend on procedures by poll workers—which may not be consistently or correctly employed—to restore ballot secrecy. The Election Code requires in 25 P.S. § 3031.7(1) that the voting system *itself* must provide for the required degree of ballot secrecy.

ii. Voter Secrecy During Spoliation

147. Section 1107-A of the Election Code, 25 P.S. § 3031.7(10), requires that any voting system “that uses paper ballots or ballot cards to register the vote

⁸ Testimony before the U.S. Senate Committee on Rules and Administration, July 25, 2007, available at <http://euro.econ.cmu.edu/people/faculty/mshamos/Senate20070725.pdf> (last visited December 2019).

and automatic tabulating equipment to compute such votes . . . shall provide that a voter who spoils his ballot may obtain another ballot”

148. The combination of 25 P.S. § 3031.7(10)’s requirement that a voter be able to spoil their ballot, and 25 P.S. § 3031.7 (1)’s requirement that a voter be able to vote in “absolute secrecy” on a voting system that “prevents any person from seeing or knowing for whom any voter . . . has voted,” requires that a voter be able to spoil their ballot without any person seeing that ballot.

149. This right to secrecy when spoiling a ballot is consistent with section 301(a)(1)(A) (ii) of the federal Help America Vote Act of 2002 (HAVA), 52 U.S.C. § 21081(a)(1)(A)(ii), which requires that a voting system must:

provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error) ...

150. Voter secrecy is important even for a spoiled ballot. Among other factors, a voter might spoil a ballot to change or correct a vote for one particular candidate or issue, while desiring to protect the secrecy of votes for other candidates and issues.

151. The ExpressVote XL’s procedures for ballot spoliation and for physical review of a ballot fail to provide this required secrecy.

152. When any voter using the ExpressVote XL wants to spoil her ballot card or wants to handle the ballot card for physical review, the voter must select an option in the interface to “Quit” or “Spoil Ballot.”⁹

153. The ExpressVote XL then displays a spoliation message that can be configured by the jurisdiction.

154. In the Philadelphia County election on November 5, 2019, the spoliation message read: “Vote Session Canceled. Your ballot will be spoiled with no votes cast. A poll worker will be entering the booth to assist you.”

155. The ExpressVote XL then emits a chiming sound to alert a poll worker.

156. A poll worker must enter the voting booth, touch a designated location on the screen, enter an administrator password using an on-screen keypad, select the reason for the spoliation, and retrieve the ballot card from the windowed cartridge where it is held.

157. The ExpressVote XL does not allow a voter to spoil her ballot card without a poll worker entering the booth.

158. A poll worker must look at the ballot card while extracting it from the cartridge.

⁹ The exact text of the button is configurable and can be renamed by the jurisdiction.

159. The poll worker can see and know for whom the voter has voted or is voting.

160. Before the ballot card is extracted from the cartridge, it is a ballot which can be legally cast in the election. The voter has the right to change her mind, or she may have triggered the spoiling procedure inadvertently.

161. Upon extraction from the cartridge, the ballot card is a ballot which can still be reinserted and legally cast in the election.

162. The ExpressVote XL allows ejected ballots to be reinserted and cast.

163. The ejected ballot card remains a ballot which can be legally cast in the election until it is surrendered and marked “Spoiled” according to the procedures of the Pennsylvania Election Code.

164. The ExpressVote XL does not allow any voter to privately and independently correct an error through the issuance of a replacement ballot.

165. Pennsylvania Election Code § 1111-A, 25 P.S. § 3031.11 (b), provides that: “If any voter shall ask for further instructions concerning the manner of voting after entering the voting booth, any election officer may give him audible instructions *without entering such booth . . .*” (Emphasis added.)

166. The ExpressVote XL does not permit a voter to spoil the ballot without the poll worker entering the booth.

167. In the Report Concerning Reexamination, the Secretary “concluded that appropriate voter and poll worker training and instructions on the screen can ensure vote record secrecy.” *See* Exhibit B at 10.

168. Hoping that workers follow guidance and take precautions does not provide the level of secrecy that is mandated in the Pennsylvania Election Code.

169. A video taken at poll worker training on November 3, 2019 in Philadelphia County highlights the high probability that the legal procedures for spoiling a ballot will be violated and secrecy will not be maintained.¹⁰ The trainer explained the procedure to poll workers as follows:

Keep in mind that ballot is not yet spoiled. It is still very much active, okay so you have to give it back to the voter. But keep in mind, before even entering the curtain please announce yourself to the voter. We don't want the voter to feel like you are intruding on their privacy, so let them know you are coming in to spoil their ballot. Once you've done that, the paper ballot will eject out of the machine, you hand it back to the voter. Please do not look at their selections. As hard as that will be.

We're only human so we make mistakes. Maybe glance, I don't know. But if you do, don't tell nobody else, okay?

170. Section 1830 of the Pennsylvania Election Code, 25 P.S. § 3530 (“Unlawful assistance in voting”) specifies that any voter who “permit[s] another to accompany him into the voting compartment or voting machine booth” or “any

¹⁰ *See* YouTube.com “PWT Nov 3 Vid 1/5 Spoiling a ballot/audience laughs at expense of voters” <https://www.youtube.com/watch?v=GGK0JpnpJsE&t=110s> at 1:30. (last accessed December 11, 2019).

person who shall go into the voting compartment or voting machine booth with another while voting or be present therein while another is voting” is guilty of a misdemeanor and may be sentenced to pay a fine, imprisonment, or both.

171. A voting system in which a voter exercising the legal right to spoil the ballot risks criminal charges is not “safely . . . useable in the conduct of elections” as required by 25 P.S. § 3031.7 (11).

172. The spoliation procedure can reveal an administrator password to the voter.

173. During public demonstrations of the ExpressVote XL, several members of the public reported easily observing the administrator password used during the spoliation procedure.

174. If the password is not kept secret, it opens up the possibility that unauthorized personnel could use the password to access functions in the machine related to voting and tabulation.

175. A voting machine that reveals the administrator password to any voter who requests ballot spoliation does not provide “acceptable ballot security procedures” under 25 P.S. § 3031.7(12).

F. The ExpressVote XL Fails to Provide Adequate Accessibility to Voters with Disabilities

176. Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7(5), requires that a voting system “[p]ermits *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.” (Emphasis added.)

177. The requirement to permit “each” voter to vote for any person and any office for whom and for which he is lawfully entitled to vote includes voters with disabilities.

178. This “each” voter requirement is consistent with the Help America Vote Act of 2002 (HAVA), § 301(a), 52 U.S.C. § 21081(a)(3)(A), which requires that a voting machine “be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters,” and (to the extent that any HAVA Section 261 funds are involved in acquiring and or running the ExpressVote XL) HAVA section 261(b), 52 U.S.C. § 21021(b)(1), which provides that:

An eligible State and eligible unit of local government shall use the payment received under this part for— (1) making polling places . . . accessible to individuals with disabilities, including the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.

179. The Pennsylvania certification of ES&S EVS 6.0.2.1 included an accessibility testing report (“Accessibility Report”). See Original Certification Report, Exhibit C, at 67.¹¹

180. In a departure from similar accessibility testing conducted on all other voting machines since 2017, the ExpressVote XL was harshly reviewed by the accessibility test group, comprised of several voters with a range of disabilities.

181. According to the Accessibility Report, “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 is happening.” *Id.* at 70.

182. The Accessibility Report noted that:

None of the participants could verify the ballot in the glass cage and...(1) blind voters had no access to the ballot to use personal technology that would enable them to vote; (2) low vision voters could not position the ballot so they could read the small text; (3) other voters had problems reading the ballot because of glare and because the sides of the ballot were obscured by the cage; and (4) while 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 then call a poll worker in which of course violates the voter’s right to secrecy.

Id. at 74.

¹¹ The Accessibility Report was appended as Attachment B to the Original Certification Report and is not consecutively paginated. The pin cites to the Accessibility Report are to the PDF page in the 99-page Original Certification Report document.

183. Participants in the accessibility study found the ExpressVote XL made it difficult to cast write-in votes. For a vote for a write-in candidate to count, spelling must be perfect and “[a]ll of the participants knew that a misspelled write-in would not be counted, but could not figure out how to review what was typed.” *Id.* at 70-71, 86-87.

184. Furthermore, the ExpressVote XL did not allow participants to review any write-in votes through the audio ballot because the text of the write-in is not encoded in the barcodes printed on the ballot card. *Id.* at 73, 75, 88.

185. The Accessibility Report states that “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.” *Id.* at 73.

186. Voters relying on the audio ballot had significant issues with voting a “straight party” ticket.¹² If a voter selects a single candidate outside the straight-party ticket, the ExpressVote XL deselects all other candidates, without informing the audio-guided voter.

¹² Section § 1107-A of the Election Code, 25 P.S. § 3031.7(3), presently requires that a voting system: “Permits each voter...to vote a straight political party ticket...by one mark or act, to vote for all the candidates of one political party.” Act No. 2019-77, P.L. 552, S.B. 421 (Oct. 31, 2019), removed this requirement for elections held on or after April 28, 2020.

187. The Accessibility Report describes this problem as “not only a failure to vote independently, but identifying and solving the problem requires revealing their votes to a poll worker or assistant.” *Id.* at 68-69.

188. The audio ballot does not announce the party of each candidate.

189. The Accessibility Report states that the audio ballot also “does not announce the party of each candidate. This made it impossible to complete tasks based on party, including confirming straight party selections.” *Id.* at 83, 86.

190. The Secretary’s own Accessibility Report makes it clear that the ExpressVote XL is not accessible for individuals with disabilities in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters, and does not permit “each” voter to vote for to vote for any person and any office for whom and for which he is lawfully entitled to vote as required by 25 P.S. § 3031.7(5).

G. The ExpressVote XL Fails to Provide Voters with Ballots that are in the Proper Form Mandated by the Election Code

191. The General Assembly enacted detailed, specific requirements for ballot forms in the Election Code.

192. The Secretary is not authorized to waive or disregard statutory requirements of the Election Code.

193. The ExpressVote XL ballot forms violate the Pennsylvania Election Code in several ways: (1) the ballots are not printed on colors corresponding to the

voter's registered affiliation; (2) the ballots are not bound together in books of fifty for each district; (3) the ballots fail to allow for the proper marking by checkmark or "x" of a voter's choices; and (4) the positioning of the voter's choice next to a candidate or party preference is not in line with mandated procedure.

i. Failure to Color-Code

194. The Pennsylvania Election Code § 1109-A, 25 P.S. § 3031.9(e), requires that

In primary elections, the Secretary of the Commonwealth shall choose a color for each party eligible to have candidates on the ballot and a separate color for independent voters. The ballot cards or paper ballots and ballot pages shall be printed on card or paper stock of the color of the party of the voter and the appropriate party affiliation or independent status shall be printed on the ballot card

195. The ExpressVote XL ballots are not printed on colored paper.

196. All ExpressVote XL ballots used in Pennsylvania are printed on white paper.

197. When ballot cards are not on card or paper stock colored according to the party affiliation, the voter may tell the poll worker operating the ExpressVote XL a different party affiliation and cast fraudulent votes in another party's election, and the impounded ballot card would show no evidence of the fraud.

198. Colored card or paper stock with the party affiliation printed also reduces the chance that a poll worker will set the wrong ballot style for a voter by accident, causing her to cast a ballot in an election in which she is ineligible.

ii. Lack of Binding

199. The ExpressVote XL violates Section 1004 of the Pennsylvania Election Code, 25 P.S. § 2964:

All the ballots for the same election district shall be bound together in books of fifty, in such a manner that each ballot may be detached and removed separately. [...] The ballots for each party to be used at a primary shall be bound separately.

200. The ExpressVote Ballots are not bound together in books.

201. The ExpressVote XL ballots are loose sheets of paper.¹³

202. Binding ballots in books is an important security measure to prevent ballot theft, loss, and fraud.

203. The Pennsylvania Election Code specifies many procedures and requirements to ensure strict ballot inventory control. *See* 25 P.S. § 2971 (requiring county board to keep records of ballots printed and furnished, as well as unused ballots and cancelled ballots); 25 P.S. § 3154(c) (requiring county board to publicly account for extra official ballots); 25 P.S. § 3031.13 (requiring polling places using electronic voting system ballot cards for district tabulation to report, at the close of the polls, “the number of such ballots issued to electors” and to reconcile the ballot count with the numbered list of voters); 25 P.S. § 3059 (“No

¹³ When the Petition was submitted, the ballot cards used by the ExpressVote XL also lacked serially-numbered, perforated stubs. On November 27, 2019 the Governor of Pennsylvania signed 2019 Act 94 which removed the requirement for perforated stubs, but left the binding requirement unchanged. *See* <https://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2019&sessInd=0&act=94> (last visited December 2019).

official ballot shall be taken from any book of ballots, except by an election officer or clerk when a person desiring to vote has been found to be a qualified elector entitled to vote. Not more than one ballot shall be removed at any one time or given to an elector, except in the case of a spoiled ballot as provided by this act.”).

204. The reason for these procedures and requirements to strictly control the ballot inventory, and to be accountable for every official ballot issued in an election, is to protect the integrity of the election.

205. Bound ballots are less likely to be inadvertently misplaced or lost than unbound ballots.

206. Bound ballots make it less likely a voter will be given more than one ballot than unbound ballots.

207. Bound ballots are less easily stolen and removed from the polling place than unbound ballots.

208. A stolen ballot could be used to create forged ballots.

209. A stolen ballot could be marked with preferred votes and another voter could be induced or coerced into casting it.

210. If the paper evidence of the election is to be considered trustworthy, it must be demonstrated that no paper evidence has been added or removed.

211. The inability to control and reconcile the ballot inventory in an election casts doubt on the election results.

iii. Failure to Provide for Proper Ballot Marking

212. The ExpressVote XL violates Section 1112-A of the Pennsylvania Election Code, 25 P.S. § 3031.12(b)(2)-(4), which applies to districts using paper ballots or ballot cards.

213. The three procedures in 25 P.S. §§ 3031.12(b)(2-4) each specify that a voter shall vote on a ballot card by “making a cross (X) or check (✓) mark or by making a punch or mark sense mark in the square opposite the name” of the candidate, the party, the write-in position, or the answer to a ballot question.

214. The ExpressVote XL does not record a vote by making a cross or check mark, or a punch or mark sense mark.

215. On an ExpressVote XL ballot card there is no square opposite the name in which to place any mark. Instead a barcode is printed near the top of the ballot card, separate and far from the human-readable text. The barcodes are not even listed in the same order as the names are listed. Neither the human-readable text nor the barcodes comply with the mark requirement.

216. The type of mark and its position relative to the name is an important requirement for at least two major reasons. First, it allows the voter to verify that each vote matches her intent prior to casting the ballot card. Second, it enables the voter to see on the ballot card the choice that the voter selected, which is particularly important in categories where there are a large number of candidates

with more than one choice—if a voter makes a mistake, she will likely not catch it on the machine-printed ballot form.

iv. Positions on the Ballot Card

217. The ExpressVote XL violates 25 P.S. § 3031.9 (a)(2) which states that “the first ballot page shall list in the order that such political parties are entitled to priority on the ballot, the names of such political parties with designating arrows so as to indicate *the voting square or position on the ballot card* where the voter may insert by one mark or punch the straight party ticket of his choice.” (Emphasis added).

218. The ExpressVote XL does not indicate voting positions on the ballot card, nor does it use any “designating arrows.”

219. The ExpressVote XL does not list names of political parties in the order that they are entitled to priority on the ballot.

220. In fact, there are no fixed positions on the ballot card—the location of the barcode and human-readable text vary depending on the voter’s other selections.

221. Because the barcode contains the voter’s choices and the readable text at the bottom of the ballot is separate from those marks, it is impossible to know if they match and are therefore properly recording the voter’s choices. This inability to ensure a voter’s choice is in direct violation of the Election Code.

H. The Secretary’s Reexamination of the ExpressVote XL Did Not Resolve the Concerns Raised in the July 16, 2019 Petition

222. The Election Code requires that, during the certification process, each machine vendor demonstrate to the Secretary that its machine is capable of “absolute accuracy” and the counting of “every” valid vote. Pennsylvania Election Code § 1107-A (11), (13), 25 P.S. § 3031.7(11), (13). The Secretary of State is required to “examine” every machine, 25 P.S. § 3031.7, and ascertain if it meets the statutory standard of absolute accuracy, among others, and of having ballot security sufficient to “preclude . . . tampering.” Election Code § 1107-A(12), 25 P.S. § 3031.7(12).

223. If there are concerns that the Code has been violated by a certified machine, “the Secretary’s duty to re-examine [a voting machine] upon proper request is mandatory.” *Banfield v. Aichele*, 51 A.3d 300, 314 (Pa. Commw. Ct. 2012), *aff’d sub nom. Banfield v. Cortes*, 110 A.3d 155 (2015).

224. In this case, the Secretary’s re-examination procedures did not, and were not reasonably designed to, adequately determine whether the ExpressVote XL met the requirements of the Election Code for accuracy and security.

225. In the *Report Concerning Reexamination*, the Secretary dismissed seven out of the ten claims brought by Petitioners outright, such as concerns over accessibility for disabled individuals, stating that these grounds were “purely legal arguments which do not require reexamination.” See Exhibit B at 2.

226. For the remaining three claims, the Secretary noted that no violations would occur if the election staff and poll workers acted in accordance with certain “additional conditions” which, *inter alia*, focused mainly on the behavior of poll workers as opposed to the ExpressVote XL.

227. Regarding vote tampering, the Secretary stated that “the system documentation cited multiple procedures in place to ensure the XL is maintained, including: . . . poll worker selection, poll worker training, physical security of the polling place environment, physical security of the device” *Id.* at 7.

228. With regard to the allegation that the machines do not provide for voting in absolute secrecy, the Secretary stated that this was allegation was also baseless because

in accordance with recommended procedures, once an election has been closed, a poll worker will not be handling the paper vote summary records...The Examiners provided a recommendation suggesting that processes to randomize vote summary records should be performed at the county office in accordance with the Pennsylvania Election Code...In addition vote security is maintained when statutory procedures for commingling ballots is conducted prior to canvass and storage by the county board of elections.

Id. at 8-9.

229. With regard to the secrecy violations when spoiling a ballot, the Secretary reported that “appropriate voter and poll worker training and instructions on the screen can ensure vote record secrecy.” *Id.* at 10.

230. By resting the security of the machine on the precise following of instructions by poll workers who are capable of human error and who do not exist in a controlled environment, the Secretary's re-examination did not address the ExpressVote XL's violation of 25 P.S. §§ 3031.7(11), (12), (16), and (17) which state that, *inter alia*, each voting machine:

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... It shall be constructed so that every person is precluded from tampering with the tabulating element during the course of its operation.

231. The Pennsylvania Election Code requires that *the machine itself*, without intervention from anyone, "shall preclude every person"—including poll workers—from seeing the vote numbers, and "shall be constructed so that every person"—including poll workers—"is precluded" from tampering. The machine itself must be constructed to secure security and secrecy for each individual voter.

232. The Secretary's reliance on the hope that poll workers and voters follow instructions precisely does not satisfy the requirements of the Code.

233. The Secretary was required to review seriously the defects of the ExpressVote XL as outlined in the July 16, 2019 Petition and she failed to do so. Instead she did a cursory review which gave credence to few of the well-founded defects in the machine and dismissed the rest with less than thorough responses.

Consequently, the Secretary's re-examination did not remedy the deficiencies of the ExpressVote XL, which remains certified in Pennsylvania.

I. The ExpressVote XL Experienced Multiple Issues of Incorrect Tabulation of Votes During its Use in the November 5, 2019 Election in Philadelphia and Northampton Counties, Thereby Illustrating the Machine's Flaws

234. ExpressVote XL machines were used for the first time in Northampton and Philadelphia Counties, Pennsylvania, for the November 5, 2019 election.

235. Several major issues with the ExpressVote XL were reported on and after Election Day. These issues included:

- a. Machines stopped working or would not start up.
- b. Touchscreens were too sensitive or not sensitive enough.
- c. Touchscreens registered a vote for a candidate or other voting target the voter did not touch and did not intend to cast a vote for.
- d. Voters had trouble seeing the printed ballot inside the glass-topped box.
- e. Votes were incorrectly tabulated, resulting in the need to re-scan all ballots using high-speed scanners.
- f. Some machines showed no votes for certain candidates.
- g. Entire precincts reported no votes for certain candidates.

236. The process of ballot verification in Northampton and Philadelphia counties was difficult for many voters, with voters reporting the text being too small, faint, and/or hard to read.

237. In a survey of 150 Philadelphia voters in the November 2019 general election, approximately half said that they had difficulty viewing the printed ballot card because of size and quality of the text and/or lighting conditions in the polling place.

238. In a contest for County Judge in Northampton County, a Democratic candidate was initially shown to have received approximately 0 votes after polls closed on Election Night.¹⁴ This was an extremely unlikely result, given that straight-ticket party voting was available.

239. In fact, a machine recount conducted by election officials, from election night until the following morning using several borrowed optical scanners of different models than the ExpressVote XL, counted 26,142 votes for that candidate, and he was declared the winner.

240. The election-night recount allegedly addressed the *tabulation* problems on the ExpressVote XL. However, it did not and could not address the prevalent *ballot-marking* and *ballot-verification* problems. The secondary scanners were able to demonstrate that the ExpressVote XL printed 26,142 ballots

¹⁴ Election-night news reported up to 164 votes, perhaps due to some hand-counted absentee ballots.

indicating a vote for that candidate. The scanners cannot demonstrate that 26,142 Northampton County voters intended to vote for that candidate.

241. The failure to count votes correctly in the Northampton County general election indicates that the ExpressVote XL voting machine is not “capable of absolute accuracy” as required by Section 1107-A of the Election Code, 25 P.S. § 3031.7(11).

J. Petitioners Are Entitled To Injunctive Relief *Pendente Lite*

242. Plaintiffs will suffer irreparable harm if the ExpressVote XL continues to be used in Pennsylvania elections because their votes may be ignored, marked incorrectly, counted incorrectly, or susceptible to hackers and the election may result in the certification of winners who are not supported by the majority of voters.

243. Plaintiffs have no adequate remedy at law and the public interest would not be harmed and would instead be benefited by an injunction *pendente lite*.

244. The inaccuracy, unreliability, and lack of a voter verifiable record in this instance not only violates the Pennsylvania Election Code and Constitution, but also has eroded the public’s confidence in the election process. Audits and recounts can address flaws in how ballots are *counted*, but not in how they are *marked*. Furthermore, no audit or recount can address the problem of voters who decide not to vote due to frustration or long lines caused by machine failures, or

accusations of unreliability or tampering. The poor performance of the machines in the November 2019 election amply demonstrated this threat.

245. The balance of hardships weighs strongly in Plaintiffs' favor and against the Secretary since upcoming elections can be conducted easily in any manner that complies with Pennsylvania law, including the use of hand-marked paper ballots tabulated with optical scanners.

246. The public interest in protecting the right to vote, in preserving the integrity of the electoral process, and in having electronic voting systems that do not violate Pennsylvania's Constitution or statutory law weighs heavily in Plaintiffs' favor.

COUNT I: Failure to Provide Acceptable Security Procedures

Violation of Pennsylvania Election Code § 1107-A, 25 P.S. § 3031.7(12)

247. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

248. The Secretary's certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates the Pennsylvania Election Code Section 1101-A, 25 P.S. § 3031, as it does not "[p]rovide acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards."

COUNT II: Failure to Record and Tabulate Accurately

Violation of Pennsylvania Election Code § 1107-A, 25 P.S. § 3031.7(13)

249. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

250. The Secretary's certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates the Pennsylvania Election Code § 1107-A (13), 25 P.S. § 3031.7 (13), as the machines do not routinely and consistently "record[] correctly and compute[] and tabulate[] accurately every valid vote registered."

COUNT III: Failure to be Designed and Equipped for Absolute Accuracy

Violation of Pennsylvania Election Code § 1107-A (11), 25 P.S. § 3031.7(11)

251. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

252. The Secretary's certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates the Pennsylvania Election Code § 1107-A (11), 25 P.S. § 3031.7(11) as they are not "suitably designed and equipped to be capable of absolute accuracy."

COUNT IV: Voter Privacy and Secrecy

Violation of Pennsylvania Election Code § 1107-A, 25 P.S. § 3031.7(1), Section 1111-A of the Pennsylvania Election Code, 25 P.S. § 3031.11(b), and the Pennsylvania Constitution, Article VII § 4

253. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

254. The Secretary’s certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates the Pennsylvania Election Code § 1107-A, 25 P.S. § 3031.7 (1) and the Pennsylvania Constitution, Article VII, Section 4, as they are not capable of enabling “voting in absolute secrecy”, nor do they “prevent[] 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.”

255. The Secretary’s certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates the Pennsylvania Election Code § 1111-A, 25 P.S. § 3031.11 (b), because the ExpressVote XL machines require another person to enter the voting booth in order for a voter to exercise the right to spoil a ballot.

COUNT V: Accessibility

Violations of Pennsylvania Election Code § 1107-A, 25 P.S. § 3031.7(5)

256. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

257. The Secretary’s certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates the Pennsylvania Election Code § 1107-A, 25 P.S. § 3031.7(5), as they are not accessible for individuals with disabilities, and therefore do not permit “each” voter to vote for the candidates of their choice.

COUNT VI: Unlawful Ballot Format

Violation of Pennsylvania Election Code §§ 1004, 1109-A, and 1112-A, 25 P.S. §§ 3031.9(e), 3031.9(a)(2), and 3031.12 (b)(2)-(4)

258. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

259. The Secretary's certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates Section 1109-A of the Pennsylvania Election Code, because the ExpressVote XL machines do not allow for votes to "be printed on card or paper stock of the color of the party of the voter [nor do they include] the appropriate party affiliation or independent status...on the ballot card."

260. The Secretary's certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates Section 1004 of the Pennsylvania Election Code, 25 P.S. § 2964, because the ExpressVote XL machines "do not b[i]nd together [the ballots] in books of fifty in such a manner that each ballot may be detached and removed separately."

261. The Secretary's certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates Section 1112-A of the Pennsylvania Election Code, 25 P.S. § 3031.12 (b)(2)-(4), because the ExpressVote XL machines do not provide the voter an opportunity to "mak[e] a cross (X) or check

(✓) mark or... a punch or mark sense mark in the square opposite the name” of the candidate that they are voting for”

262. The Secretary’s certification for use in Pennsylvania elections of the ExpressVote XL Voting Machine violates 25 P.S. § 3031.9 (a)(2) which states that “the first ballot page shall list in the order that such political parties are entitled to priority on the ballot, the names of such political parties with designating arrows so as to indicate the voting square or position on the ballot card.”

**COUNT VII: Free and Equal Elections, Right to Free Exercise of Suffrage,
and Equal Protection in Right to Vote**

Violation of Pennsylvania Constitution Article I, §§ 5 and 26

263. Plaintiffs incorporate by reference as if fully set forth herein each of the preceding allegations.

264. Article I, Section 5 of the Pennsylvania Constitution protects the rights of all Pennsylvanians, including Plaintiffs, to vote by guaranteeing that “Elections shall be free and equal; and no power, civil or military, shall at any time interfere to prevent the free exercise of the right of suffrage.”

265. Article I, Section 26 of the Pennsylvania Constitution provides that “[n]either the Commonwealth nor any political subdivision thereof shall deny to any person the enjoyment of any civil right, nor discriminate against any person in the exercise of any civil right.”

266. The Secretary's certification of the ExpressVote XL machine and their subsequent use in Pennsylvania's elections has caused and will continue to cause violations of and interference with Plaintiffs' suffrage rights by making it likely that a significant number of votes will not be counted accurately, or at all.

267. The problems that were caused and which are likely to be caused by the certified voting systems create the risk that persons for whom the majority of voters have not cast their ballots will be declared the election winners and will take office, in contravention of the very essence of our democracy.

268. Plaintiffs' rights under Article I of the Pennsylvania Constitution include not only the right to have their own votes counted but also the right to see that the votes of their fellow citizens will be counted correctly, thereby assuring Plaintiffs that their votes will have the proper weight and that Pennsylvania's office holders are democratically elected.

269. The Secretary's certification of the ExpressVote XL threatens Plaintiffs' fundamental civil right to vote because the voting system's defects and security flaws create the risk that Plaintiffs, together with other Pennsylvania voters, have their votes rendered meaningless or, worse yet, deemed cast for a candidate for whom they did not vote.

270. Plaintiffs' equal protection rights under the Pennsylvania Constitution are likewise at risk because, while they are compelled to vote in counties using the ExpressVote XL, other registered voters in Pennsylvania may vote in precincts or

counties using voting systems, such as verifiable paper ballots that are counted by hand or by optical scanners, that do not suffer from the defects identified in this Petition.

271. The Secretary's Certification for use in Pennsylvania elections of the ExpressVote XL Voting Machines violates Article I §§ 5 and 26 of the Pennsylvania Constitution.

V. REQUEST FOR RELIEF

WHEREFORE, Plaintiffs respectfully request that this Honorable Court enter judgment in their favor and against Respondents and:

- a. Declare that, for all the reasons identified above, ExpressVote XL violates the Pennsylvania Constitution and the Pennsylvania Election Code;
- b. Preliminarily and permanently enjoin the Secretary to decertify the ExpressVote XL voting machine for use in Pennsylvania; and
- c. Award Plaintiffs reasonable attorneys' fees and costs; and
- d. Grant such other and further relief that this Honorable Court deems just and appropriate.

Respectfully submitted,

BAKER & HOSTETLER LLP

Dated: December 12, 2019

/s/John Murphy

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/s/Ronald Fein

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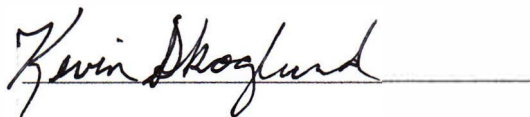
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Counsel for Petitioners

VERIFICATION

I, Kevin Skoglund, President and Chief Technologist for Citizens for Better Elections, verify that the facts set forth in the foregoing complaint are true and correct to the best of my information, knowledge and belief I understand that the statements contained herein are subject to the penalties of 18 P.S. § 4904 relating to unsworn falsification to authorities.

Dated: December 12, 2019

A handwritten signature in black ink, reading "Kevin Skoglund", is written over a horizontal line.

VERIFICATION

I, Susan Greenhalgh, Vice President of Programs and Policy for the National Election Defense Coalition, verify that the facts set forth in the foregoing complaint are true and correct to the best of my information, knowledge and belief I understand that the statements contained herein are subject to the penalties of 18 P.S. § 4904 relating to unsworn falsification to authorities.

Dated: December 12, 2019



CERTIFICATE OF COMPLIANCE

I certify that this filing complies with the provisions of the *Public Access Policy of the Unified Judicial System of Pennsylvania: Case Records of the Appellate and Trial Courts* that require filing confidential information and documents differently than non-confidential information and documents.

Submitted by: Plaintiffs National Election Defense Coalition, et. al.

Signature: /s/ John Murphy

Name: John Murphy

Attorney No.: PA 206307

CERTIFICATE OF SERVICE

I, John Murphy, certify that on December 12, 2019, I caused a true and correct copy of the foregoing Petition For Review Addressed To The Court's Original Jurisdiction to be served via certified mail, return receipt requested, and e-filing upon:

Secretary of the Commonwealth Kathy Boockvar
302 North Office Building, PA 17120
Harrisburg, PA 17120

and

Pennsylvania Office of Attorney General
Strawberry Square
Harrisburg, PA 17120

/s/John Murphy
John Murphy

EXHIBIT A



July 16, 2019

Honorable Kathy Boockvar
Acting Secretary of the Commonwealth
Pennsylvania Department of State
Bureau of Commissions, Elections and Legislation
302 North Office Building, 401 North Street
Harrisburg, PA 17120

Dear Secretary Boockvar,

Pursuant to 25 P.S. § 3031.5, on behalf of the undersigned electors of the Commonwealth of Pennsylvania, we hereby request a re-examination of the ES&S ExpressVote XL electronic voting machine. We enclose at least ten (10) certifications of duly registered electors in the Commonwealth of Pennsylvania who seek this re-examination. We have enclosed a check for \$450 payable to the Treasurer of the Commonwealth of Pennsylvania.

As you know, “[t]he Secretary’s duty to re-examine the machines upon proper request is mandatory.” *Banfield v. Aichele*, 51 A.3d 300, 314 (Commw. Ct. Penn. 2012), *aff’d sub nom. Banfield v. Cortes*, 110 A.3d 155 (2015).

We have attached a list of deficiencies in the ExpressVote XL which require attention during re-examination. We also note that the ES&S ExpressVote HW 2.1 used as a tabulator shares many of the same deficiencies as the ExpressVote XL.

We respectfully request that the Secretary of the Commonwealth re-examine the ExpressVote XL electronic voting machine and issue a report relating to the functionality of the system. We request that this re-examination be conducted expeditiously because several counties in the Commonwealth have chosen or are considering the ExpressVote XL, and all counties must act quickly to comply with the Department of State directive to select new voter-verifiable paper record voting systems no later than December 31, 2019.

If the Secretary of the Commonwealth determines that the attached deficiencies are compelling evidence to preemptively decertify the ExpressVote XL, we would withdraw our petition for re-examination.

Respectfully submitted,

Ronald A. Fein, Legal Director
John C. Bonifaz, President
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Susan Greenhalgh
Vice President of Policy and Program
National Election Defense Coalition

Kevin Skoglund
Chief Technologist
Citizens for Better Elections,
A member of the Protect Our Vote Philly Coalition

Petition Pages

**200 signatures by duly registered electors
in the Commonwealth of Pennsylvania**

From the counties:

**Philadelphia
Allegheny
Montgomery
Bucks
Delaware
Westmoreland
Northampton**

Attachment: ES&S ExpressVote XL Deficiencies

We seek re-examination of the ES&S ExpressVote XL voting machine on these grounds.

1. Tampering with Ballot Cards

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (12), which requires that a voting system:

“Provides acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards.”

Since the Pennsylvania Certification of ES&S EVS 6.0.2.1, security researchers discovered¹ that the ExpressVote XL exposes a ballot card cast by a voter to an internal printer prior to tabulation and impoundment. The internal printer is controlled exclusively by software which has the ability to tamper with the content of the ballot card. A malfunctioning or manipulated ExpressVote XL could add, modify, or invalidate votes *after* the voter has viewed, confirmed, and cast her ballot. It could change election outcomes without detection. This is a very high impact defect which affects the integrity and auditability of the voting system.

This defect violates the principle of software independence: “A voting system is software-independent if an undetected change or error in its software cannot cause an undetectable change or error in an election outcome.”² Software independence will be VVSG 2.0 Guideline 9.1 and is recognized as necessary for effective auditing. It is a “crucial” requirement for evidence-based elections as defined by Professors Philip Stark and David Wagner: “All three components are crucial. The risk-limiting audit relies on the integrity of the audit trail, which was created by the software-independent voting system (the voters themselves, in the case of paper ballots) and checked for integrity by

¹ References available at:

<https://freedom-to-tinker.com/2018/10/16/design-flaw-in-dominion-imagecast-evolution-voting-machine>
<https://freedom-to-tinker.com/2018/10/22/an-unverifiability-principle-for-voting-machines>
https://securiosa.com/posts/how_the_expressvote_xl_could_alter_ballots.html
https://securiosa.com/posts/how_expressvote_barcode_codes_could_be_modified.html

² “On the Notion of Software-Independence in Voting Systems,” Ronald Rivest and John Wack, *Philosophical Transactions of The Royal Society*, August 6, 2008, Page 1, available at <https://people.csail.mit.edu/rivest/RivestWack-OnTheNotionOfSoftwareIndependenceInVotingSystems.pdf>

the compliance audit.”³ Acceptable ballot security procedures to prevent tampering must include ensuring auditability and enabling evidence-based elections.

It is common sense that a voting machine should not have the ability to change votes after the voter has confirmed and cast her ballot. The same reasoning is evident and explicitly stated in § 1222, 25 P.S. § 3062 (a), “No person while handling the ballots shall have in his hand any pencil, pen, stamp or other means of marking or spoiling any ballot.” Acceptable ballot security procedures to prevent tampering must include a similar restriction on any machine while handling the ballots.

2. Chronological Ballot Storage

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (1), which requires that a voting system:

“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.”

The ExpressVote XL ballot container stores ballot cards in chronological order. It allows any poll worker or election official who knows even limited details about the sequence of voters to violate the absolute secrecy of one or more voters. A voter’s ballot could be determined by referencing the order of voters in the poll book or on the poll list, by counting from the first or last ballot in the set, or by counting from another identifiable ballot, such as one with a known write-in vote. This is a significant defect.

Chronologically ordered ballots fail to protect voters’ right to a secret ballot and enable information harvesting, vote buying and selling, and voter coercion.

The Pennsylvania Department of State has long held the position that voting systems with chronologically ordered ballots violate absolute secrecy. Dr. Michael Shamos, statutory examiner for the Secretary of the Commonwealth from 1980 to 2010, testified to a U.S. Senate committee in 2007, “Even paper trail advocates recognize that scrolled paper trails make it easy, not just possible, to determine how every voter in a precinct voted. The first voter’s ballot is first on the tape; the last voter’s is last; and everyone else’s is sequential order in between. A simple comparison between the paper trail and the poll list gives away everyone’s vote, in violation of the Section 201 requirement of a secret ballot. Even

³ “Evidence-Based Elections,” Philip Stark and David Wagner, *IEEE Security and Privacy*, May 8, 2012, Page 2, available at <https://www.stat.berkeley.edu/~stark/Preprints/evidenceVote12.pdf>

if only two percent of the vote is audited, it means that two percent of the voters are at risk of having their votes revealed.”⁴

The “Conditions of Certification” for ES&S EVS 6.0.2.1 do not require any procedures to randomize the order of ballot cards or to otherwise protect ballot secrecy. Even if procedures had been required, the voting system cannot depend on procedures—which may not be consistently or correctly employed—to restore ballot secrecy. The voting system itself must provide it.

3. Ballot Cards Colored by Party

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (e):

“In primary elections, the Secretary of the Commonwealth shall choose a color for each party eligible to have candidates on the ballot and a separate color for independent voters. The ballot cards or paper ballots and ballot pages shall be printed on card or paper stock of the color of the party of the voter and the appropriate party affiliation or independent status shall be printed on the ballot card or at the top of the paper ballot and on the ballot pages.”

The ballot cards used by the ExpressVote XL are made of solid white thermal paper. The card stock is not colored for each party. The ballot cards are blank and do not have the appropriate party affiliation or independent status printed on the ballot card.

In primary elections, the party affiliation of a voter is determined definitively when the voter checks in, signs the poll book, and is given a ballot card. Before the voter may vote, a poll worker must configure the ExpressVote XL to display the ballot style of the voter’s party. If ballot cards are not on colored card stock with the party affiliation, the voter can tell the poll worker a different party affiliation, cast fraudulent votes in another party’s election, and the impounded ballot card would show no evidence of the fraud. Colored card stock with the party affiliation printed also reduces the chance that a poll worker will set the wrong ballot style for a voter by accident.

It should be demonstrated that the required ballot cards are possible and that the ExpressVote XL is capable of using them.

⁴ Testimony before the U.S. Senate Committee on Rules and Administration, July 25, 2007, <http://euro.ecom.cmu.edu/people/faculty/mshamos/Senate20070725.pdf>

4. Serially Numbered Perforated Stubs

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (f):

“...Each ballot card shall have an attached serially numbered perforated stub, which shall be removed by an election officer before the ballot card is deposited in the district automatic tabulating equipment or in a secure ballot box. The name of the county, and a facsimile of the signature of the members of the county board shall be printed on the ballot card stub.”

The ExpressVote XL violates § 1112-A, 25 P.S. § 3031.12 (b)(6), which requires a procedure for a district using paper ballots or ballot cards:

“Following the completion of his vote, the voter shall leave the voting booth and return the ballot to the election officer by a means designed to insure its secrecy; upon removal of the stub of the ballot by the election officer, the voter shall insert the ballot into the district automatic tabulating equipment or, in the event district tabulation is not provided for by the voting system or such district tabulation equipment is inoperative for any reason, into a secure ballot box. No ballot card from which the stub has been detached shall be accepted by the election officer in charge of such equipment or ballot box, but it shall be marked “spoiled” and shall be placed in the envelope marked “Spoiled Ballots”.”

In addition, § 1113-A, 25 P.S. § 3031.13 (a) requires that, after the polls have been closed, the serially numbered stubs be used as evidence of the number of ballots issued to electors so that number may be announced in the polling place and recorded.

The ballot cards used by the ExpressVote XL do not have attached serially numbered perforated stubs. The ballot cards are blank and do not have a facsimile of the signature of the members of the county board printed on the ballot card stub.

The ExpressVote XL is designed such that a voter does not handle the ballot after the completion of her vote. The voter cannot leave the voting booth with the ballot card to return it to an election officer. The election officer does not have an opportunity to remove the stub. The election officer is not able to verify that the stub has not been detached from the ballot card in order to mark it as spoiled.

Without serially numbered stubs and signatures, any person could forge ballot cards. Forged ballot cards can be submitted for tabulation secretly and independently because, unlike most district tabulating equipment, the ExpressVote XL tabulator is inside a privacy curtain, where election workers cannot observe voter activity.

Serially numbered stubs prevent “chain voting.” Professor Doug Jones describes the fraud technique and the defense against it: “The organizer of the chain needs one valid ballot to begin with. He then marks this ballot and gives it to a voter willing to participate in the fraud. With each participant, the organizer instructs the participant to vote the pre-voted ballot and bring back a blank ballot from the polling place. Voters are paid for the blank ballot. The best defense against chain voting involves printing a unique serial number on a removable stub on each ballot. When ballots are issued to voters, the stub numbers should be recorded. No ballot should be accepted for deposit in the ballot box unless its stub number matches a recently issued number. Finally, to preserve the voter’s right to a secret ballot, the stub should be torn from the ballot before it is inserted in the ballot box.”⁵

It should be demonstrated that the required ballot cards are possible and that the ExpressVote XL is capable of using them.⁶

5. Valid Marks on a Ballot Card

The ExpressVote XL violates § 1112-A, 25 P.S. § 3031.12 (b)(2-4), which applies to districts using paper ballots or ballot cards.

The three procedures in § 3031.12 (b)(2-4) each specify that a voter shall vote on a ballot card by “making a cross (X) or check (✓) mark or by making a punch or mark sense mark in the square opposite the name” of the candidate, the party, the write-in position, or the answer to a ballot question. The type of mark and its position relative to the name is specified six times in total.

The ExpressVote XL does not make a cross or check mark or make a punch or mark sense mark, nor does it permit a voter to do so. On an ExpressVote ballot card there is no

⁵ “On Optical Mark-Sense Scanning,” Douglas W. Jones, in *Towards Trustworthy Elections*, 2010, Page 178, available at <http://homepage.cs.uiowa.edu/~jones/voting/OpticalMarkSenseScanning.pdf>

⁶ Upon information and belief, the ExpressVote XL could be made to use compliant ballot cards, as ES&S apparently offered serially numbered cards in Michigan. However, the machines certified and used in Pennsylvania do not use compliant ballot cards.

square opposite the name in which to place any mark. Instead a barcode is printed near the top of the ballot card, separate and far from the name. The barcodes are not even listed in the same order as the names are listed.

The type of mark and its position relative to the name is an important requirement. A valid mark next to a corresponding name allows the voter to verify that each vote matches her intent prior to casting the ballot card, ensuring the principle of “cast as intended.” A valid mark next to a corresponding name allows election officials or any person to easily observe, count, and audit the vote, without software or special equipment. The Election Code intends for the meaning of each vote to be transparent and software independent.

6. Indicated Voting Positions on Ballot Cards

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (a)(2).

“The pages placed on the voting device shall be of sufficient number to include, following the listing of particular candidates, the names of candidates for any nonpartisan offices and any measures for which a voter may be qualified to vote on a given election day, provided further that for municipal, general or special elections, the first ballot page shall list in the order that such political parties are entitled to priority on the ballot, the names of such political parties with designating arrows so as to indicate **the voting square or position on the ballot card** where the voter may insert by one mark or punch the straight party ticket of his choice.” (Emphasis added).

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (d).

“In partisan elections **the ballot cards shall include a voting square or position** whereby the voter may by one punch or mark record a straight party ticket vote for all the candidates of one party or may vote a split ticket for the candidates of his choice.” (Emphasis added).

The ExpressVote XL lists political parties on the touchscreen. If a voter makes a straight party choice, the ExpressVote XL will later record the selection by printing a barcode and human-readable text on the ballot card. This process does not meet the requirements.

An electronic voting machine is required to list the political parties with arrows to indicate positions *on the ballot card*. The ExpressVote XL does not indicate voting positions on the ballot card, nor does it use any “designating arrows.” In fact, there are no fixed positions on the ballot card—the location of the barcode and human-readable text will vary depending on the voter’s other selections.

7. Unlawful Assistance in Voting

The ExpressVote XL would require voters to violate § 1218, 25 P.S. § 3058 (a):

“No voter shall be permitted to receive any assistance in voting at any primary or election, unless there is recorded upon his registration card his declaration that, by reason of blindness, disability, or inability to read or write, he is unable to read the names on the ballot or on the voting machine labels, or that he has a physical disability which renders him unable to see or mark the ballot or operate the voting machine, or to enter the voting compartment or voting machine booth without assistance, the exact nature of such condition being recorded on such registration card, and unless the election officers are satisfied that he still suffers from the same condition.”

The ExpressVote XL would require election officers to violate § 1111-A, 25 P.S. § 3031.11 (b):

“At the polling place on the day of the election, each voter who desires shall be instructed, by means of appropriate diagrams and a model, in the operation of the voting device before he enters the voting booth. If any voter shall ask for further instructions concerning the manner of voting after entering the voting booth, any election officer may give him **audible instructions without entering such booth**, but no such election officer shall when giving such instructions in any manner request, suggest or seek to persuade or induce any such voter to vote any particular ticket or for any particular candidate or other person or for or against any particular question.” (Emphasis added).

The ExpressVote XL would require voters and election officers to violate § 1220, 25 P.S. § 3060 (a):

“... No elector shall be allowed to occupy a voting compartment or voting machine booth already occupied by another, except when giving assistance as permitted by this act.”

When any voter using the ExpressVote XL wants to spoil her ballot card or wants to handle the ballot card for physical review, they must select an option in the interface to “Quit.” The ExpressVote XL displays on screen (and reads into the audio ballot) the message: “Vote Session Canceled. Your ballot was canceled with no votes cast. Ask an election official for help.” The ExpressVote XL emits a chiming sound to alert a poll worker. A poll worker must enter the voting booth, touch a designated location on the screen, enter an administrator password using an on-screen keypad, and retrieve the ballot card from the windowed container where it is held.

All voters have the right to spoil their ballot card. (§ 1112-A, 25 P.S. § 3031.12 (b)(5): “Any voter who spoils his ballot may return it and secure another.”) A voting system is required to allow voters to spoil their ballot card. (§ 1107-A, 25 P.S. § 3031.7 (10): “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”.) The ExpressVote XL does not allow a voter to spoil her ballot card without a poll worker entering the booth in violation of the above requirements.

Voters with disabilities may wish to handle the ballot card to verify it using a magnifier or other personal assistive device. This is only possible with poll worker assistance and is only permitted if the voter has previously recorded their disability on their voter registration. Voters who have recorded a disability may “select a person” to enter the voting booth (§ 1218, 25 P.S. § 3058 (b)). This person could be a poll worker, but if another person has already been selected to assist, a poll worker entering the booth would violate the above requirements.

This deficiency has consequences for both the voter and the poll worker. § 1830, 25 P.S. § 3530 (“Unlawful assistance in voting”) specifies that any voter “who, without having made the declaration under oath or affirmation required by section 1218 of this act ... shall permit another to accompany him into the voting compartment or voting machine booth” or “any person who shall go into the voting compartment or voting machine booth with another while voting or be present therein while another is voting” is guilty of a misdemeanor and will be sentenced to pay a fine, imprisonment, or both.

8. Poll Workers in the Booth and Ballot Secrecy

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (1), which requires that a voting system:

“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.”

The ExpressVote XL violates the Help America Vote Act of 2002 (HAVA), § 301(a)(1)(A) (ii), which requires that a voting system shall:

“provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error)”

The previously described procedure for spoiling a ballot card on the ExpressVote XL allows the poll worker, upon entering the voting booth, to view the selections on the ballot card through the windowed container and while handling the ballot card. The poll worker will look directly at the ballot card while extracting it from the container. The poll worker can see and know for whom the voter has voted or is voting. The ExpressVote XL does not allow any voter to privately and independently correct an error through the issuance of a replacement ballot.

It is also noteworthy that this procedure reveals an administrator password to the voter. The poll worker enters the password in front of the voter using an on-screen keypad and each character is displayed in the input field as it is typed. During public demonstrations of the ExpressVote XL, several members of the public reported easily observing the administrator password used.

9. Accessibility

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7(5), which requires that a voting system:

“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.” (Emphasis added).

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7(3), which requires that a voting system:

“Permits **each** voter...to vote a straight political party ticket...by one mark or act, to vote for all the candidates of one political party for every office to be voted for, and every such mark or act shall be equivalent to and shall be counted as a vote for every candidate of the political party so marked including its candidates for presidential electors, except with respect to those offices as to which the voter has registered a vote for individual candidates of the same or another political party or political body, in which case the automatic tabulating equipment shall credit the vote for that office only for the candidate individually so selected, notwithstanding the fact that the voter may not have individually voted for the full number of candidates for that office for which he was entitled to vote.” (Emphasis added).

The ExpressVote XL violates the Help America Vote Act of 2002 (HAVA), § 301(a), which requires that a voting system shall:

1.A.i: “permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.”

1.A.ii: “provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error).”

3.A: “be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.”

To the extent that any HAVA Section 261 funds are involved, use of the ExpressVote XL also violates HAVA § 261 (b):

An eligible State and eligible unit of local government shall use the payment received under this part for— (1) making polling places . . . accessible to individuals with disabilities, including the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.

The Pennsylvania Certification of ES&S EVS 6.0.2.1 included an accessibility testing report on pages 68-94. The ExpressVote XL was harshly reviewed by the accessibility test group.

“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 is happening.” (Page 70)

“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.” (Page 74)

Participants in the accessibility study found the ExpressVote XL made it difficult to cast write-in votes. For a vote for a write-in candidate to count, spelling must be perfect and “[a]ll of the participants knew that a misspelled write-in would not be counted, but could not figure out how to review what was typed.” (Pages 70-71, 86-87). Furthermore, the ExpressVote XL did not allow participants to review any write-in votes through the audio ballot because the text of the write-in is not encoded in the barcodes printed on the ballot card. (Pages 73, 75, 88).

Voters relying on the audio ballot had significant issues with voting a “straight-party” ticket. If a voter selects a single candidate outside the straight-party ticket, the ExpressVote XL deselects all other candidates, without informing the audio-guided voter. The accessibility testing report describes this problem as “not only a failure to vote independently, but identifying and solving the problem requires revealing their votes to a poll worker or assistant.” (Pages 68-69). The audio ballot also “does not announce the party of each candidate. This made it impossible to

complete tasks based on party, including confirming straight party selections.” (Pages 83, 86).

The Pennsylvania Department of State’s accessibility testing report makes it clear that the ExpressVote XL is not accessible for individuals with disabilities “in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.” Most importantly for these voters, it does not “permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.”

10. The *Stein* Settlement

The ExpressVote XL violates the settlement in *Stein v. Cortes*:⁷

- “2. The Secretary will only certify new voting systems for use in Pennsylvania if they meet these criteria:
 - a. The ballot on which each vote is recorded is paper;
 - b. They produce a voter-verifiable record of each vote; and
 - c. They are capable of supporting a robust pre-certification auditing process.
- 3. The Secretary will continue to direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.”

The ExpressVote XL does not provide the voter a paper ballot, as that term is defined by 25 P.S. § 3031.1. Instead, it provides a “ballot card.” A paper ballot is a piece of paper with the options pre-printed, whereas a ballot card only prints a voter’s selection on blank piece of paper. *See id.* (defining paper ballot as “a printed paper ballot which conforms in layout and format to the voting device in use” and ballot card as “a card which is compatible with automatic tabulating equipment and on which votes may be registered”).

Because the ExpressVote XL does not provide a paper ballot, Pennsylvania voters in counties using the ExpressVote XL will not receive a voter-verifiable paper ballot in 2020, in contravention of the *Stein* settlement’s requirement that the Secretary “direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.”

⁷ *Stein v. Cortes*, No. 16-cv-06287, ECF No. 108 (E.D. Pa. Nov. 28, 2018), available at <http://bit.ly/SteinSettlement>.

EXHIBIT B

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF STATE

**REPORT CONCERNING THE REEXAMINATION RESULTS OF
ELECTIONS SYSTEMS AND SOFTWARE EXPRESSVOTE XL**

Issued By:

A handwritten signature in black ink, reading "Kathy Boockvar", written over a horizontal line.

Kathy Boockvar

Acting Secretary of the Commonwealth

September 3, 2019

REEXAMINATION RESULTS OF ELECTION SYSTEMS AND SOFTWARE EXPRESSVOTE XL

I. INTRODUCTION

Article XI-A of the Pennsylvania Election Code, 25 P.S. §§ 3031.1 *et seq.* (the “Code”), authorizes the use of electronic voting systems. Section 1105-A of the Code, 25 P.S. § 3031.5(a), allows any ten or more qualified electors of Pennsylvania to request a reexamination of an electronic voting system certified by the Secretary of the Commonwealth (“Secretary”). On July 17, 2019, the Acting Secretary of the Commonwealth (“Acting Secretary”) received a Petition to Reexamine the ExpressVote XL (the “Petition”). A copy of that Petition is attached hereto as Appendix A.

The ExpressVote XL was initially examined and certified as part of the ES&S EVS 6021 electronic voting system to both federal and state voting system standards by the Election Assistance Commission (“EAC”) on November 12, 2018 and by the Secretary of the Commonwealth on November 30, 2018.

The Petition sets forth ten claims for why the Acting Secretary should de-certify the ExpressVote XL (XL). After a thorough and considered review of the Petition, the Acting Secretary has determined that claims three through seven, nine, and ten amount to purely legal arguments which do not apply to reexamination or certification of an electronic voting system. With respect to claims one, two, and eight, the Acting Secretary, in consultation with the Department of State’s expert voting system examiner, reexamined the XL and concluded that the XL meets the requirements of Section 1107-A of the Pennsylvania Election Code, 25 P.S. § 3031.7, and can be safely used to conduct elections in the Commonwealth.

To satisfy the Secretary’s statutory obligation to reexamine the XL system based on claims one, two, and eight in the Petition, the Pennsylvania Department of State (“Department”) entered into an agreement with expert professional consultant SLI Compliance (“SLI”) to conduct a focused reexamination of the XL. Jesse Peterson, Security Specialist, and Mike Santos, Senior Test Manager, served as the examiners (“Examiners”).

The off-site reexamination was conducted at the laboratory of SLI Compliance located in Wheat Ridge, Colorado. The Department was represented by Sindhu Ramachandran, Voting System Analyst, for the reexamination on August 7 and 8, 2019. The Examiners then provided findings from the examination, and the test results and conclusion have been included in further sections of this report.

II. THE EXPRESSVOTE XL VOTING SYSTEM

ExpressVote XL

ExpressVote XL is a polling place voting device that provides touch screen vote capture which incorporates printing of a voter's selections as a paper voter-verifiable record and tabulation scanning into a single unit. The system uses a touch-operated screen and/or assistive technology to capture a voter's choices. The integrated thermal printer prints the voter's choices on a voter-verifiable paper vote summary record and the system scans and saves an image of the printed vote summary record. The vote summary record is the voter-verifiable paper record with plain text words of the votes to be cast, which, once cast, will be retained as the official vote record and used for audits and/or recounts.

The software/firmware version of ExpressVote XL certified as part of the EVS 6021 system is 1.0.1.0 and the hardware version is 1.0.

Test Materials

Test support materials utilized during the examination included:

- Two ExpressVote XL devices
- CFAST cards for both ExpressVote XL devices
- Thermal receipt paper for the Expressvote XL
- Activation card stock for processing vote summary records on the ExpressVote XL
- CFAST Cards
- USB thumb drives

- Pens to modify marks

III. REEXAMINATION APPROACH

A. Approach Summary

The reexamination focused on the alleged violations of Sections 1107-A(1) and (12) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(1) & (12), relating to vote record secrecy and security, set forth in items one, two, and eight of the petition. The Examiner evaluated the petition and relevant system documentation to develop test protocols for the examination. All hardware necessary to perform the reexamination was supplied by ES&S. Software and firmware for the EVS 6021 voting system was obtained from the Voting System Test Lab ("VSTL") that performed the EAC certification test campaign. The Examiner installed the firmware using the appropriate media and process for installation.

The test protocols separated the requirements for the reexamination into three main areas of test execution: (1) Security Analysis and Evaluation; (2) Functional Testing; and (3) Documentation Review.

1. Security Analysis and Evaluation

The Examiners performed security analysis of the XL, with special consideration to the items set forth in the Petition. The Examiners' security specialist reviewed the system to evaluate the system's security protocols. In order to gather details for the functional test execution, SLI included a review of internal security, functional and architectural diagrams, software specification, as well as ExpressVote XL hardware schematic documentation. The analysis was done to reexamine the system architecture and operations and to plan a comprehensive approach to analyze and evaluate each allegation. The Examiners also utilized the vulnerability assessment performed during the initial examination of the EVS

6021 voting system. This evaluation was used during test planning to identify the specific test cases to be executed during the functional testing and documentation review phases.

2. Functional Testing

The functional testing phase involved SLI personnel executing test cases identified during the security analysis and evaluation. This phase provided a means to assess the security and functional properties of the voting system under examination to ascertain whether they provide acceptable security procedures to prevent tampering with or substitution of vote summary records, as required by the Pennsylvania Election Code at 25 P.S. § 3031.7(12). The Examiner also used the functional testing to evaluate compliance of the system to the Pennsylvania Election Code requirement at 25 P.S. § 3031.7(1) to ascertain whether the system provides for processes and procedures to maintain the secrecy of a voter's ballot.

3. Documentation Review

The documentation review phase consisted of reviewing the ES&S EVS 6021 voting system documentation to verify that appropriate processes and procedures are in place to provide acceptable security and privacy as required by 25 P.S. §§ 3031.7(1) and (12).

IV. Examination Results and Discussion

A. Examination Results and Discussion regarding Allegation #1

The Petition's allegation number one alleges that the XL violates Section 1107-A(12) of the Pennsylvania Election Code, 25 P.S. § 3031.7(12), which requires that a voting system "provides acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards," because it does not provide acceptable procedures to prevent tampering.

As detailed below, The Examiner evaluated these claims and determined through security analysis and evaluation, functional testing, and documentation review that the XL **does not** violate Section 1107-A(12) of the Pennsylvania Election Code because it has

protocols and mechanisms to provide for acceptable security procedures to prevent tampering with or substitution of the vote summary records. The results of the Examiner's documentation review and testing are summarized in the following paragraphs of this section.

1. Security Analysis and Evaluation

The security specialist reviewed the internal security, functional and architectural diagrams, software specifications, as well as the XL hardware schematic documentation. The Examiners also utilized the vulnerability assessment performed during the initial examination of the EVS 6021 voting system. The Examiners gathered information about the system security protocols in place to prevent undetectable malicious manipulation of the XL, as well as information about the programmatic and physical access controls in place to prevent tampering. The Examiners then used the information gathered during this evaluation to identify specific test cases to be executed during the functional testing and documentation review phases.

2. Functional Testing

The XL was set up following all the physical security measures described in the relevant system documentation. The Examiners reviewed and tested each of the physical security measures in place, which demonstrated that different system access points and the CFAST cards could not be reached without proper keys and tools. The Examiners then performed a hash code validation successfully, confirming that the installed image matched the certified image.

The Examiners installed the trusted build and loaded a test general election on the XL devices used for the testing effort. The security specialist tried to penetrate the system using the system access points/ports and was unsuccessful. The Examiner also performed a hash code validation on the XL after the tests to confirm that the trusted build firmware was still present on the device. The Examiners confirmed that any modifications to the files on the CFAST cards would be identified as a mismatch during hash code validation and hence

any unauthorized changes would be detected.

The Examiners demonstrated the XL voting process and reviewed the system schematics and software actions. The voting process was demonstrated as follows: the terminal is opened for voting and the voter inserts a blank activation card. The voter selects the candidate choices and then selects the "Print" button. The XL prints the voter's choices on a paper vote summary record using the thermal printer. The vote summary record is then scanned and presented to the voter via the front facing voter verification window. The voter reviews and verifies the vote summary record and selects the "Cast" button. The system then saves and tabulates the votes and deposits the printed vote summary record into the collection bin without being re-scanned. During the examination of the system it was observed that the location of the print head, after the initial print, allows the vote summary record to pass to the collection bin without making contact with the print head again during the vote summary record deposit process.

The Examiners also carefully evaluated the voting process to identify any distinct cues during the printing process and observed that the printing process was audible and thus detectable. Hence, a successful attempt to activate the printer to print on the vote summary record after the voter verifies his or her selections would be heard.

The Examiners also attempted to change the tabulation of the vote by modifying the bar code on the paper vote summary record after verification by the voter but were unsuccessful. Attempts were also made to insert and tabulate modified bar codes by the system and those attempts too were unsuccessful.

3. Documentation Review

The Examiners conducted documentation review to determine if there are acceptable security processes in place to prevent unauthorized access or tampering, and to determine if there are mechanisms in place to identify if any unauthorized or malicious acts have taken place. The system documentation cited multiple procedures in place to ensure that the security of the XL is maintained, including: warehouse security for storage/maintenance/transportation, poll worker selection, poll worker training, physical

security of the polling place environment, physical security of the device (keys, security screws, tape, other tamper resistant/evident items), USB security, bar code security, programmatic security of the XL, as well as system auditing. The Examiner reported that the system executables and bar codes have mechanisms in place to detect unauthorized modification. Configuration of the paper vote summary record also allows the voter-verifiable text to be formatted with options to leave no blank lines between contest and selections, which prevents malicious software from leaving out a voter's selections and/or filling them in after a voter reviews their vote summary record.

B. Examination Results and Discussion regarding Allegation #2

The Petition's allegation number two alleges that the XL violates Section 1107-A(1) of the Pennsylvania Election Code, 25 P.S. § 3031.7(1), which requires that a voting system "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," because it stores the voter verified paper records in chronological order.

As detailed below, the Examiners evaluated these claims and determined through security analysis and evaluation, functional testing, and documentation review that the XL **does not** violate Section 1107-A(1) of the Pennsylvania Election Code because, when used in accordance with statutory and recommended procedures for maintaining proper chain of custody and canvassing votes, it provides for voting in "absolute secrecy," with exception for voters who are receiving assistance.

1. Security Analysis and Evaluation

The security specialist reviewed the internal security, functional and architectural diagrams, software specifications, as well as the XL hardware schematic documentation. The Examiners also utilized the vulnerability assessment performed during the initial examination of the EVS 6021 voting system. The Examiners gathered information about the system security protocols and procedures in place to prevent and detect unauthorized access to the ballot bin and to maintain voter secrecy during the process of voting and after the close of polls. The Examiners then used the information gathered during this evaluation to

identify specific test cases to be executed during the functional testing and documentation review phases.

2. Functional Testing

The Examiners completed vote sessions and demonstrated the actions at close of polls by the poll worker. The Examiners concluded that in accordance with recommended procedures, once an election has been closed, a poll worker will not be handling the paper vote summary records which are sealed in the collection bins. The Examiners provided a recommendation suggesting that processes to randomize vote summary records should be performed at the county office in accordance with the Pennsylvania Election Code, which will be a required condition for use of this system.

3. Documentation Review

The Examiners concluded that system documentation identifies procedures recommended by the vendor during implementation and operation to prevent violation of vote record secrecy, including: physical security to prevent and/or detect unauthorized attempts to access the paper vote summary records, assigning voters in a relatively equal distribution among multiple devices, as well as assigning multiple officials from different parties to handle vote record collection bins. In addition, vote record secrecy is maintained when statutory procedures for commingling ballots is conducted prior to canvass and storage by the county board of elections.

C. Examination Results and Discussion regarding Allegation #8

The Petition's allegation number eight alleges that the XL violates Section 1107-A(1) of the Pennsylvania Election Code, 25 P.S. § 3031.7(1), which requires that a voting system "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," because it requires a voter to request assistance from a poll worker during the process of "spoiling" the paper vote summary record when the voter made an error during the process of voting.

As detailed below, the Examiners evaluated these claims and determined through security analysis and evaluation, functional testing, and documentation review that the XL **does not** violate Section 1107-A(1) of the Pennsylvania Election Code because, when used in the context of proper statutory and recommended procedures for polling place setup and poll worker training, it provides for voting in “absolute secrecy,” with exception for voters who are receiving assistance in the voting booth.

1. Security Analysis and Evaluation

The security specialist reviewed the internal security, functional and architectural diagrams, software specifications, as well as the XL hardware schematic documentation. The Examiners also utilized the vulnerability assessment performed during the initial examination of the EVS 6021 voting system. The Examiners gathered information about the system security protocols and procedures in place to prevent unauthorized access to the paper vote summary records and to preclude unauthorized access to the system administration screen used during the process of assisting voters who need to spoil their ballots before they are cast. The Examiners also evaluated what, if any, malicious activity could be accomplished if an unauthorized person or persons learned the passcode used to access the system administration screen. The Examiners then used the information gathered during this evaluation to identify specific test cases to be executed during the functional testing and documentation review phases.

2. Functional Testing

To test this Petition item, the Examiners demonstrated the process of spoiling a vote summary record and concluded that appropriate voter and poll worker training and instructions on the screen can ensure vote record secrecy. This will also be made a condition of this recertification report. The allegation about the password compromise was also reviewed and the Examiners determined that a compromise of all the characters of the supervisor password would be very difficult, and an audible chime sounds after three failed attempts to enter the password. The Examiners noted that even if the password was known to an unauthorized person, they would not be able to access any functions related to voting

or tabulation and any actions performed by the session user are recoverable. The Examiners also noted that the position of the poll worker during the process doesn't lend itself to easily viewing the voter's choices, and also pointed out that since the voter has decided to spoil the vote summary record it is not his/her final intended vote selection.

3. Documentation Review

The Examiners concluded that the system documentation identifies multiple procedures to protect voter privacy and prevent the compromise of the supervisor password. Please refer to Section V, Additional Conditions for Certification, for details regarding the required procedures.

V. Additional Conditions for Certification

Given the results of the reexamination that occurred in August 2019, and the findings and recommendations of the Examiners, **the Acting Secretary of the Commonwealth maintains the certification of the XL subject to the following additional conditions:**

A. Jurisdictions selecting the XL must implement proper poll closing and vote record transportation procedures to ensure that collection bins containing paper vote summary records 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 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(e) of the Election Code, 25 P.S. § 3146.8(e).

B. Jurisdictions implementing the XL must ensure that vote summary record instructions include specific voter and poll worker instructions added on the screen detailing spoiling procedures and cues to protect voter privacy. In addition, poll worker training must:

- Emphasize the need to obscure any view of the paper vote summary record during the process of spoiling the record;

- Educate poll workers on the proper steps to be taken when they respond to a voter request for spoiling the vote summary record to ensure that the secrecy of the spoiled record is maintained. These steps include ensuring that the voter intends to spoil the record, has read the instructions on the screen and has been informed by the poll worker how to prevent inadvertent view of the vote summary record before the poll worker enters inside the privacy curtain;

VI. Conclusion

As a result of the reexamination, and after consultation with the Department's staff, counsel and the Examiners, the Acting Secretary of the Commonwealth concludes that the ExpressVote XL certified as part of the EVS 6021 voting system 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 Election Code, provided the voting system is implemented under the conditions listed in Section IV of the initial certification report released on November 30, 2018 and the conditions listed in Section V of this report. Accordingly, the Acting Secretary maintains the certification of EVS 6021 - ExpressVote XL for use in this Commonwealth.

Appendix A



July 16, 2019

Honorable Kathy Boockvar
Acting Secretary of the Commonwealth
Pennsylvania Department of State
Bureau of Commissions, Elections and Legislation
302 North Office Building, 401 North Street
Harrisburg, PA 17120

Dear Secretary Boockvar,

Pursuant to 25 P.S. § 3031.5, on behalf of the undersigned electors of the Commonwealth of Pennsylvania, we hereby request a re-examination of the ES&S ExpressVote XL electronic voting machine. We enclose at least ten (10) certifications of duly registered electors in the Commonwealth of Pennsylvania who seek this re-examination. We have enclosed a check for \$450 payable to the Treasurer of the Commonwealth of Pennsylvania.

As you know, “[t]he Secretary’s duty to re-examine the machines upon proper request is mandatory.” *Banfield v. Aichele*, 51 A.3d 300, 314 (Commw. Ct. Penn. 2012), *aff’d sub nom. Banfield v. Cortes*, 110 A.3d 155 (2015).

We have attached a list of deficiencies in the ExpressVote XL which require attention during re-examination. We also note that the ES&S ExpressVote HW 2.1 used as a tabulator shares many of the same deficiencies as the ExpressVote XL.

We respectfully request that the Secretary of the Commonwealth re-examine the ExpressVote XL electronic voting machine and issue a report relating to the functionality of the system. We request that this re-examination be conducted expeditiously because several counties in the Commonwealth have chosen or are considering the ExpressVote XL, and all counties must act quickly to comply with the Department of State directive to select new voter-verifiable paper record voting systems no later than December 31, 2019.

If the Secretary of the Commonwealth determines that the attached deficiencies are compelling evidence to preemptively decertify the ExpressVote XL, we would withdraw our petition for re-examination.

Respectfully submitted,

Ronald A. Fein, Legal Director
John C. Bonifaz, President
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Vice President of Policy and Program
National Election Defense Coalition

Kevin Skoglund
Chief Technologist
Citizens for Better Elections,
A member of the Protect Our Vote Philly Coalition

Petition Pages

**200 signatures by duly registered electors
in the Commonwealth of Pennsylvania**

From the counties:

**Philadelphia
Allegheny
Montgomery
Bucks
Delaware
Westmoreland
Northampton**

Attachment: ES&S ExpressVote XL Deficiencies

We seek re-examination of the ES&S ExpressVote XL voting machine on these grounds.

1. Tampering with Ballot Cards

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (12), which requires that a voting system:

“Provides acceptable ballot security procedures and impoundment of ballots to prevent tampering with or substitution of any ballots or ballot cards.”

Since the Pennsylvania Certification of ES&S EVS 6.0.2.1, security researchers discovered¹ that the ExpressVote XL exposes a ballot card cast by a voter to an internal printer prior to tabulation and impoundment. The internal printer is controlled exclusively by software which has the ability to tamper with the content of the ballot card. A malfunctioning or manipulated ExpressVote XL could add, modify, or invalidate votes *after* the voter has viewed, confirmed, and cast her ballot. It could change election outcomes without detection. This is a very high impact defect which affects the integrity and auditability of the voting system.

This defect violates the principle of software independence: “A voting system is software-independent if an undetected change or error in its software cannot cause an undetectable change or error in an election outcome.”² Software independence will be VVSG 2.0 Guideline 9.1 and is recognized as necessary for effective auditing. It is a “crucial” requirement for evidence-based elections as defined by Professors Philip Stark and David Wagner: “All three components are crucial. The risk-limiting audit relies on the integrity of the audit trail, which was created by the software-independent voting system (the voters themselves, in the case of paper ballots) and checked for integrity by

¹ References available at:

<https://freedom-to-tinker.com/2018/10/16/design-flaw-in-dominion-imagecast-evolution-voting-machine>
<https://freedom-to-tinker.com/2018/10/22/an-unverifiability-principle-for-voting-machines>
https://securiosa.com/posts/how_the_expressvote_xl Could_alter_ballots.html
https://securiosa.com/posts/how_expressvote_barcode Could_be_modified.html

² “On the Notion of Software-Independence in Voting Systems,” Ronald Rivest and John Wack, *Philosophical Transactions of The Royal Society*, August 6, 2008, Page 1, available at <https://people.csail.mit.edu/rivest/RivestWack-OnTheNotionOfSoftwareIndependenceInVotingSystems.pdf>

the compliance audit.”³ Acceptable ballot security procedures to prevent tampering must include ensuring auditability and enabling evidence-based elections.

It is common sense that a voting machine should not have the ability to change votes after the voter has confirmed and cast her ballot. The same reasoning is evident and explicitly stated in § 1222, 25 P.S. § 3062 (a), “No person while handling the ballots shall have in his hand any pencil, pen, stamp or other means of marking or spoiling any ballot.” Acceptable ballot security procedures to prevent tampering must include a similar restriction on any machine while handling the ballots.

2. Chronological Ballot Storage

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (1), which requires that a voting system:

“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.”

The ExpressVote XL ballot container stores ballot cards in chronological order. It allows any poll worker or election official who knows even limited details about the sequence of voters to violate the absolute secrecy of one or more voters. A voter’s ballot could be determined by referencing the order of voters in the poll book or on the poll list, by counting from the first or last ballot in the set, or by counting from another identifiable ballot, such as one with a known write-in vote. This is a significant defect. Chronologically ordered ballots fail to protect voters’ right to a secret ballot and enable information harvesting, vote buying and selling, and voter coercion.

The Pennsylvania Department of State has long held the position that voting systems with chronologically ordered ballots violate absolute secrecy. Dr. Michael Shamos, statutory examiner for the Secretary of the Commonwealth from 1980 to 2010, testified to a U.S. Senate committee in 2007, “Even paper trail advocates recognize that scrolled paper trails make it easy, not just possible, to determine how every voter in a precinct voted. The first voter’s ballot is first on the tape; the last voter’s is last; and everyone else’s is sequential order in between. A simple comparison between the paper trail and the poll list gives away everyone’s vote, in violation of the Section 201 requirement of a secret ballot. Even

³ “Evidence-Based Elections,” Philip Stark and David Wagner, *IEEE Security and Privacy*, May 8, 2012, Page 2, available at <https://www.stat.berkeley.edu/~stark/Preprints/evidenceVote12.pdf>

if only two percent of the vote is audited, it means that two percent of the voters are at risk of having their votes revealed.”⁴

The “Conditions of Certification” for ES&S EVS 6.0.2.1 do not require any procedures to randomize the order of ballot cards or to otherwise protect ballot secrecy. Even if procedures had been required, the voting system cannot depend on procedures—which may not be consistently or correctly employed—to restore ballot secrecy. The voting system itself must provide it.

3. Ballot Cards Colored by Party

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (e):

“In primary elections, the Secretary of the Commonwealth shall choose a color for each party eligible to have candidates on the ballot and a separate color for independent voters. The ballot cards or paper ballots and ballot pages shall be printed on card or paper stock of the color of the party of the voter and the appropriate party affiliation or independent status shall be printed on the ballot card or at the top of the paper ballot and on the ballot pages.”

The ballot cards used by the ExpressVote XL are made of solid white thermal paper. The card stock is not colored for each party. The ballot cards are blank and do not have the appropriate party affiliation or independent status printed on the ballot card.

In primary elections, the party affiliation of a voter is determined definitively when the voter checks in, signs the poll book, and is given a ballot card. Before the voter may vote, a poll worker must configure the ExpressVote XL to display the ballot style of the voter’s party. If ballot cards are not on colored card stock with the party affiliation, the voter can tell the poll worker a different party affiliation, cast fraudulent votes in another party’s election, and the impounded ballot card would show no evidence of the fraud. Colored card stock with the party affiliation printed also reduces the chance that a poll worker will set the wrong ballot style for a voter by accident.

It should be demonstrated that the required ballot cards are possible and that the ExpressVote XL is capable of using them.

⁴ Testimony before the U.S. Senate Committee on Rules and Administration, July 25, 2007, <http://euro.econ.cmu.edu/people/faculty/mshamos/Senate20070725.pdf>

4. Serially Numbered Perforated Stubs

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (f):

“...Each ballot card shall have an attached serially numbered perforated stub, which shall be removed by an election officer before the ballot card is deposited in the district automatic tabulating equipment or in a secure ballot box. The name of the county, and a facsimile of the signature of the members of the county board shall be printed on the ballot card stub.”

The ExpressVote XL violates § 1112-A, 25 P.S. § 3031.12 (b)(6), which requires a procedure for a district using paper ballots or ballot cards:

“Following the completion of his vote, the voter shall leave the voting booth and return the ballot to the election officer by a means designed to insure its secrecy; upon removal of the stub of the ballot by the election officer, the voter shall insert the ballot into the district automatic tabulating equipment or, in the event district tabulation is not provided for by the voting system or such district tabulation equipment is inoperative for any reason, into a secure ballot box. No ballot card from which the stub has been detached shall be accepted by the election officer in charge of such equipment or ballot box, but it shall be marked “spoiled” and shall be placed in the envelope marked “Spoiled Ballots”.”

In addition, § 1113-A, 25 P.S. § 3031.13 (a) requires that, after the polls have been closed, the serially numbered stubs be used as evidence of the number of ballots issued to electors so that number may be announced in the polling place and recorded.

The ballot cards used by the ExpressVote XL do not have attached serially numbered perforated stubs. The ballot cards are blank and do not have a facsimile of the signature of the members of the county board printed on the ballot card stub.

The ExpressVote XL is designed such that a voter does not handle the ballot after the completion of her vote. The voter cannot leave the voting booth with the ballot card to return it to an election officer. The election officer does not have an opportunity to remove the stub. The election officer is not able to verify that the stub has not been detached from the ballot card in order to mark it as spoiled.

Without serially numbered stubs and signatures, any person could forge ballot cards. Forged ballot cards can be submitted for tabulation secretly and independently because, unlike most district tabulating equipment, the ExpressVote XL tabulator is inside a privacy curtain, where election workers cannot observe voter activity.

Serially numbered stubs prevent “chain voting.” Professor Doug Jones describes the fraud technique and the defense against it: “The organizer of the chain needs one valid ballot to begin with. He then marks this ballot and gives it to a voter willing to participate in the fraud. With each participant, the organizer instructs the participant to vote the pre-voted ballot and bring back a blank ballot from the polling place. Voters are paid for the blank ballot. The best defense against chain voting involves printing a unique serial number on a removable stub on each ballot. When ballots are issued to voters, the stub numbers should be recorded. No ballot should be accepted for deposit in the ballot box unless its stub number matches a recently issued number. Finally, to preserve the voter’s right to a secret ballot, the stub should be torn from the ballot before it is inserted in the ballot box.”⁵

It should be demonstrated that the required ballot cards are possible and that the ExpressVote XL is capable of using them.⁶

5. Valid Marks on a Ballot Card

The ExpressVote XL violates § 1112-A, 25 P.S. § 3031.12 (b)(2-4), which applies to districts using paper ballots or ballot cards.

The three procedures in § 3031.12 (b)(2-4) each specify that a voter shall vote on a ballot card by “making a cross (X) or check (✓) mark or by making a punch or mark sense mark in the square opposite the name” of the candidate, the party, the write-in position, or the answer to a ballot question. The type of mark and its position relative to the name is specified six times in total.

The ExpressVote XL does not make a cross or check mark or make a punch or mark sense mark, nor does it permit a voter to do so. On an ExpressVote ballot card there is no

⁵ “On Optical Mark-Sense Scanning,” Douglas W. Jones, in *Towards Trustworthy Elections*, 2010, Page 178, available at <http://homepage.cs.uiowa.edu/~jones/voting/OpticalMarkSenseScanning.pdf>

⁶ Upon information and belief, the ExpressVote XL could be made to use compliant ballot cards, as ES&S apparently offered serially numbered cards in Michigan. However, the machines certified and used in Pennsylvania do not use compliant ballot cards.

square opposite the name in which to place any mark. Instead a barcode is printed near the top of the ballot card, separate and far from the name. The barcodes are not even listed in the same order as the names are listed.

The type of mark and its position relative to the name is an important requirement. A valid mark next to a corresponding name allows the voter to verify that each vote matches her intent prior to casting the ballot card, ensuring the principle of “cast as intended.” A valid mark next to a corresponding name allows election officials or any person to easily observe, count, and audit the vote, without software or special equipment. The Election Code intends for the meaning of each vote to be transparent and software independent.

6. Indicated Voting Positions on Ballot Cards

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (a)(2).

“The pages placed on the voting device shall be of sufficient number to include, following the listing of particular candidates, the names of candidates for any nonpartisan offices and any measures for which a voter may be qualified to vote on a given election day, provided further that for municipal, general or special elections, the first ballot page shall list in the order that such political parties are entitled to priority on the ballot, the names of such political parties with designating arrows so as to indicate **the voting square or position on the ballot card** where the voter may insert by one mark or punch the straight party ticket of his choice.” (Emphasis added).

The ExpressVote XL violates § 1109-A, 25 P.S. § 3031.9 (d).

“In partisan elections **the ballot cards shall include a voting square or position** whereby the voter may by one punch or mark record a straight party ticket vote for all the candidates of one party or may vote a split ticket for the candidates of his choice.” (Emphasis added).

The ExpressVote XL lists political parties on the touchscreen. If a voter makes a straight party choice, the ExpressVote XL will later record the selection by printing a barcode and human-readable text on the ballot card. This process does not meet the requirements.

An electronic voting machine is required to list the political parties with arrows to indicate positions *on the ballot card*. The ExpressVote XL does not indicate voting positions on the ballot card, nor does it use any “designating arrows.” In fact, there are no fixed positions on the ballot card—the location of the barcode and human-readable text will vary depending on the voter’s other selections.

7. Unlawful Assistance in Voting

The ExpressVote XL would require voters to violate § 1218, 25 P.S. § 3058 (a):

“No voter shall be permitted to receive any assistance in voting at any primary or election, unless there is recorded upon his registration card his declaration that, by reason of blindness, disability, or inability to read or write, he is unable to read the names on the ballot or on the voting machine labels, or that he has a physical disability which renders him unable to see or mark the ballot or operate the voting machine, or to enter the voting compartment or voting machine booth without assistance, the exact nature of such condition being recorded on such registration card, and unless the election officers are satisfied that he still suffers from the same condition.”

The ExpressVote XL would require election officers to violate § 1111-A, 25 P.S. § 3031.11 (b):

“At the polling place on the day of the election, each voter who desires shall be instructed, by means of appropriate diagrams and a model, in the operation of the voting device before he enters the voting booth. If any voter shall ask for further instructions concerning the manner of voting after entering the voting booth, any election officer may give him **audible instructions without entering such booth**, but no such election officer shall when giving such instructions in any manner request, suggest or seek to persuade or induce any such voter to vote any particular ticket or for any particular candidate or other person or for or against any particular question.” (Emphasis added).

The ExpressVote XL would require voters and election officers to violate § 1220, 25 P.S. § 3060 (a):

“... No elector shall be allowed to occupy a voting compartment or voting machine booth already occupied by another, except when giving assistance as permitted by this act.”

When any voter using the ExpressVote XL wants to spoil her ballot card or wants to handle the ballot card for physical review, they must select an option in the interface to “Quit.” The ExpressVote XL displays on screen (and reads into the audio ballot) the message: “Vote Session Canceled. Your ballot was canceled with no votes cast. Ask an election official for help.” The ExpressVote XL emits a chiming sound to alert a poll worker. A poll worker must enter the voting booth, touch a designated location on the screen, enter an administrator password using an on-screen keypad, and retrieve the ballot card from the windowed container where it is held.

All voters have the right to spoil their ballot card. (§ 1112-A, 25 P.S. § 3031.12 (b)(5): “Any voter who spoils his ballot may return it and secure another.”) A voting system is required to allow voters to spoil their ballot card. (§ 1107-A, 25 P.S. § 3031.7 (10): “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”.) The ExpressVote XL does not allow a voter to spoil her ballot card without a poll worker entering the booth in violation of the above requirements.

Voters with disabilities may wish to handle the ballot card to verify it using a magnifier or other personal assistive device. This is only possible with poll worker assistance and is only permitted if the voter has previously recorded their disability on their voter registration. Voters who have recorded a disability may “select a person” to enter the voting booth (§ 1218, 25 P.S. § 3058 (b)). This person could be a poll worker, but if another person has already been selected to assist, a poll worker entering the booth would violate the above requirements.

This deficiency has consequences for both the voter and the poll worker. § 1830, 25 P.S. § 3530 (“Unlawful assistance in voting”) specifies that any voter “who, without having made the declaration under oath or affirmation required by section 1218 of this act ... shall permit another to accompany him into the voting compartment or voting machine booth” or “any person who shall go into the voting compartment or voting machine booth with another while voting or be present therein while another is voting” is guilty of a misdemeanor and will be sentenced to pay a fine, imprisonment, or both.

8. Poll Workers in the Booth and Ballot Secrecy

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7 (1), which requires that a voting system:

“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.”

The ExpressVote XL violates the Help America Vote Act of 2002 (HAVA), § 301(a)(1)(A) (ii), which requires that a voting system shall:

“provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error)”

The previously described procedure for spoiling a ballot card on the ExpressVote XL allows the poll worker, upon entering the voting booth, to view the selections on the ballot card through the windowed container and while handling the ballot card. The poll worker will look directly at the ballot card while extracting it from the container. The poll worker can see and know for whom the voter has voted or is voting. The ExpressVote XL does not allow any voter to privately and independently correct an error through the issuance of a replacement ballot.

It is also noteworthy that this procedure reveals an administrator password to the voter. The poll worker enters the password in front of the voter using an on-screen keypad and each character is displayed in the input field as it is typed. During public demonstrations of the ExpressVote XL, several members of the public reported easily observing the administrator password used.

9. Accessibility

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7(5), which requires that a voting system:

“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.” (Emphasis added).

The ExpressVote XL violates § 1107-A, 25 P.S. § 3031.7(3), which requires that a voting system:

“Permits **each** voter...to vote a straight political party ticket...by one mark or act, to vote for all the candidates of one political party for every office to be voted for, and every such mark or act shall be equivalent to and shall be counted as a vote for every candidate of the political party so marked including its candidates for presidential electors, except with respect to those offices as to which the voter has registered a vote for individual candidates of the same or another political party or political body, in which case the automatic tabulating equipment shall credit the vote for that office only for the candidate individually so selected, notwithstanding the fact that the voter may not have individually voted for the full number of candidates for that office for which he was entitled to vote.” (Emphasis added).

The ExpressVote XL violates the Help America Vote Act of 2002 (HAVA), § 301(a), which requires that a voting system shall:

1.A.i: “permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.”

1.A.ii: “provide the voter with the opportunity (in a private and independent manner) to change the ballot or correct any error before the ballot is cast and counted (including the opportunity to correct the error through the issuance of a replacement ballot if the voter was otherwise unable to change the ballot or correct any error).”

3.A: “be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.”

To the extent that any HAVA Section 261 funds are involved, use of the ExpressVote XL also violates HAVA § 261 (b):

An eligible State and eligible unit of local government shall use the payment received under this part for— (1) making polling places . . . accessible to individuals with disabilities, including the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.

The Pennsylvania Certification of ES&S EVS 6.0.2.1 included an accessibility testing report on pages 68-94. The ExpressVote XL was harshly reviewed by the accessibility test group.

“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 is happening.” (Page 70)

“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.” (Page 74)

Participants in the accessibility study found the ExpressVote XL made it difficult to cast write-in votes. For a vote for a write-in candidate to count, spelling must be perfect and “[a]ll of the participants knew that a misspelled write-in would not be counted, but could not figure out how to review what was typed.” (Pages 70-71, 86-87). Furthermore, the ExpressVote XL did not allow participants to review any write-in votes through the audio ballot because the text of the write-in is not encoded in the barcodes printed on the ballot card. (Pages 73, 75, 88).

Voters relying on the audio ballot had significant issues with voting a “straight-party” ticket. If a voter selects a single candidate outside the straight-party ticket, the ExpressVote XL deselects all other candidates, without informing the audio-guided voter. The accessibility testing report describes this problem as “not only a failure to vote independently, but identifying and solving the problem requires revealing their votes to a poll worker or assistant.” (Pages 68-69). The audio ballot also “does not announce the party of each candidate. This made it impossible to

complete tasks based on party, including confirming straight party selections.” (Pages 83, 86).

The Pennsylvania Department of State’s accessibility testing report makes it clear that the ExpressVote XL is not accessible for individuals with disabilities “in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters.” Most importantly for these voters, it does not “permit the voter to verify (in a private and independent manner) the votes selected by the voter on the ballot before the ballot is cast and counted.”

10. The *Stein* Settlement

The ExpressVote XL violates the settlement in *Stein v. Cortes*:⁷

“2. The Secretary will only certify new voting systems for use in Pennsylvania if they meet these criteria:

- a. The ballot on which each vote is recorded is paper;
- b. They produce a voter-verifiable record of each vote; and
- c. They are capable of supporting a robust pre-certification auditing process.

3. The Secretary will continue to direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.”

The ExpressVote XL does not provide the voter a paper ballot, as that term is defined by 25 P.S. § 3031.1. Instead, it provides a “ballot card.” A paper ballot is a piece of paper with the options pre-printed, whereas a ballot card only prints a voter’s selection on blank piece of paper. *See id.* (defining paper ballot as “a printed paper ballot which conforms in layout and format to the voting device in use” and ballot card as “a card which is compatible with automatic tabulating equipment and on which votes may be registered”).

Because the ExpressVote XL does not provide a paper ballot, Pennsylvania voters in counties using the ExpressVote XL will not receive a voter-verifiable paper ballot in 2020, in contravention of the *Stein* settlement’s requirement that the Secretary “direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.”

⁷ *Stein v. Cortes*, No. 16-cv-06287, ECF No. 108 (E.D. Pa. Nov. 28, 2018), available at <http://bit.ly/SteinSettlement>.

EXHIBIT C

**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF STATE**

**REPORT CONCERNING THE EXAMINATION RESULTS OF
ELECTIONS SYSTEMS AND SOFTWARE EVS 6021 WITH DS200
PRECINCT SCANNER, DS450 AND DS850 CENTRAL SCANNERS,
EXPRESSVOTE HW 2.1 MARKER AND TABULATOR,
EXPRESSVOTE XL TABULATOR AND ELECTIONWARE EMS**



Issued By:

A handwritten signature in dark ink, appearing to read "Robert Torres", written over a horizontal line.

**Robert Torres
Acting Secretary of the Commonwealth
November 30, 2018**

**EXAMINATION RESULTS OF ELECTION SYSTEMS AND SOFTWARE EVS
6021 WITH DS200 PRECINCT SCANNER, DS450 AND DS850 CENTRAL
SCANNERS, EXPRESSVOTE HW 2.1 MARKER AND TABULATOR
EXPRESSVOTE XL TABULATOR AND ELECTIONWARE EMS**

I. INTRODUCTION

Article XI-A of the Pennsylvania Election Code, 25 P.S. §§ 3031.1 *et seq.*, authorizes the use of electronic voting systems. Section 1105-A of the Pennsylvania Election Code, 25 P.S. § 3031.5, requires that the Secretary of the Commonwealth (Secretary) examine all electronic voting systems used in any election in Pennsylvania and that the Secretary make and file a report stating whether, in his opinion, the electronic voting system can be safely used by voters and meets all applicable requirements of the Election Code.

Upon the request of Election Systems and Software (ES&S), the Department of State's Bureau of Commissions, Elections and Legislation (Department) scheduled an examination for June 25, 2018 of EVS 6.0.0.0 (EVS 6000). The system presented for certification in Pennsylvania included the following components - Electionware® (Electionware) election management software used in conjunction with the following components: 1) the ExpressVote XL™ (ExpressVote XL) hybrid paper-based polling place voting device; 2) the ExpressVote® Hardware 2.1 (ExpressVote 2.1) a hybrid paper-based polling place voting device that provides touch screen vote capture that can be configured as a ballot marking device (BMD) or a BMD and tabulation unit; 3) DS200® (DS200) precinct scanner; 4) DS450®(DS450) central scanner; and 5) DS850® high speed central scanner.

The Secretary of the Commonwealth (Secretary) appointed SLI Global Solutions and Center for Civic Design (CCD) as professional consultants to conduct an examination of EVS 6000. The examination process included a public demonstration and functional examination (functional examination), accessibility examination and security testing. The functional and accessibility examinations were performed in Room G24A/B of the Commonwealth Capitol Complex - Finance Building, 613 North Street, Harrisburg, PA 17120. Mike Santos, Senior Test Manager, and Kyle Johnson, Senior Test Engineer, (Functional Examiner) of SLI Global Solutions, conducted the functional examination of the

EVS 6000 pursuant to Section 1105-A(a) of the Election Code, 25 P.S. § 3031.5(a). Whitney Quesenbery, Denis Anson and Colin Macarthur (Accessibility Examiner) representing CCD performed an accessibility examination of the EVS 6000 system. The examinations commenced on June 25, 2018, and lasted approximately four days. Jonathan Marks, Commissioner of the Bureau of Commissions, Elections and Legislation; Kathryn Boockvar, Senior Advisor to the Governor on Election Modernization; Jessica Myers, Deputy Director, Office of Policy; Kathleen Kotula, Executive Deputy Chief Counsel, Office of Chief Counsel; and Sindhu Ramachandran, Voting Systems Analyst, represented the Secretary of the Commonwealth. Steve Pearson, Senior Vice-President of Certification, Benjamin Swartz and TJ Burns, State Certification Managers, represented ES&S. Additional staff members from the Department also attended the examination. The functional examination was open to the public and was videotaped by Department staff. Security testing of the EVS 6000 system was performed at SLI facilities located at 4720 Independence Street, Wheat Ridge, Colorado, prior to the functional examination. Mike Santos, Senior Test Manager, and Jesse Peterson, Security Specialist, at SLI Global Solutions, served as the Security Examiner for the EVS 6000 security testing. The Functional Examiner concluded that the EVS 6000 did not comply with Sections 1107-A(3) and (13) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(3) & (13), because the ExpressVote XL and ExpressVote 2.1 did not accurately implement the Pennsylvania Method (PA Method) of straight party voting and the general election results did not allow adjudicating two write-in votes from ExpressVote XL ballots. The security testing identified the need to modify the hardening procedures on Electionware for a more secure installation.

Thereafter, ES&S incorporated corrections for the issues identified during the EVS 6000 examination and a performance enhancement fix to a field anomaly noted during the use of the system in a primary election in the State of Kansas, and re-submitted the new release, EVS 6.0.2.1 (EVS 6021), to both the U.S. Election Assistance Commission (EAC) for federal approval and the Department for state certification. The system components remained the same and the only change in the new release was the software enhancements to remediate the identified anomalies. The Functional Examiner performed a follow-up

examination of EVS 6021 on September 25 through 28, 2018, at SLI Global Solutions located in Wheat Ridge, Colorado. Department staff observed the examination via web conference. The examination was videotaped by SLI and the video is on file at the Department. The Security Examiner validated that the hardening procedures were modified for a secure installation. Since the software changes made to the EVS 6021 system were specifically to remediate the identified anomalies in EVS 6000 and did not impact accessibility of the system, it was determined that the results of the accessibility examination conducted as part of the EVS 6000 examination may be utilized for EVS 6021 certification.

II. THE EVS 6021 VOTING SYSTEM

EVS 6021 is a paper-based 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 ADA component. The system hardware components include: ExpressVote XL™ Full-Faced Universal Voting System, ExpressVote Universal Voting System hardware 2.1, DS450 High-Throughput Central Tabulator, DS850 High-Speed Central Tabulator and DS200 Precinct-Based Tabulator¹.

The following is a description of the EVS 6021 components summarized from Section 2.0 (System Overview) of the Test Report for Examination of EVS 6021 (Report id - PES-002-FTR-01), prepared by the Functional Examiner and the System Overview document submitted by ES&S as part of the Technical Data Package (TDP).

¹ The EAC certified system also includes ExpressTouch Electronic Universal Voting System and ExpressVote Universal Voting System hardware 1.0, but those components are not part of the system presented for certification in Pennsylvania.

Electionware®

Electionware election management software is an end-to-end election management software application that provides election definition, 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.

ExpressVote XL™

ExpressVote XL 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 (CVR), and tabulation scanning into a single unit. 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 vote summary cards 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 can print the vote summary card once they are ready to cast the vote. Once printed, the ExpressVote XL internally processes the vote summary card for tabulation. The tabulated vote summary card is deposited into a removable, secure card container attached to the ExpressVote XL cart.

ExpressVote® Hardware 2.1

ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1) is a hybrid paper-based polling place voting device that provides touch screen vote capture and incorporates the printing of the voter's selections as a Cast Vote Record (CVR), and tabulation scanning into a single unit. This system, capable of serving all voters, can operate in either marker or tabulator mode, depending on the configuration that is selected in

Electionware. In marker mode, the voter marks a ballot and prints the vote summary card using the internal thermal printer. The vote summary card is then scanned on DS200 precinct scanner or the central scanners DS450 or DS850. When utilized as a tabulator, the ExpressVote 2.1 provides the capability of tabulating printed vote summary cards. ExpressVote 2.1 incorporates an attached removable, secure container to hold the ballots, allowing the voters to cast the ballots. ExpressVote as a Tabulator uses a Master Media USB device for Poll Open and Poll Close functions.

DS200®

DS200 is a polling place paper-based 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 CVR's to be saved on USB media. DS200 scans and tabulates hand marked paper ballots and ballot cards produced from ExpressVote 2.1. It also has a touch screen for voter communication, an integrated thermal printer for printing reports and internal battery backup.

DS450®

DS450 is a central scanner and tabulator that simultaneously scans the front and back of a hand marked paper ballots and/or vote summary cards from ExpressVote and ExpressVote XL in any of four orientations for conversion of voter selection marks to electronic CVR's. 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®

DS850 is a central scanner and tabulator that simultaneously scans the front and back of hand marked paper ballots and/or vote summary cards from ExpressVote and ExpressVote XL in any of four orientations for conversion of voter selection marks to

electronic CVR's. 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 higher throughput than DS450.

The following is a listing of the software/firmware components that comprise the entire ES&S 6021 system:

Manufacturer Software/Firmware

The ES&S EVS 6.0.2.1 voting system consists of the following software and firmware components:

Application	Version
Electionware – Client/Server	5.0.2.0
Event Log Service	1.6.0.0
Removable Media Service	1.5.0.0
DS450	3.1.0.0
DS850	3.1.0.0
DS200	2.17.0.0
ExpressVote HW2.1	2.4.3.0
ExpressVote XL	1.0.1.0
Optional Utility: ExpressLink	1.4.0.0
Optional Utility: Toolbox	3.3.0.0

- **Electionware** Election database creation, media programming and tally/reporting software
- **DS450** Central Count scanner and tabulator, Central Tabulator firmware
- **DS850** Central Count scanner and tabulator, Central Tabulator firmware
- **DS200** Precinct scanner and tabulator, Precinct Tabulator firmware
- **ExpressVote HW2.1** Precinct ballot marker and/or Precinct scanner and tabulator, Universal Voting System firmware
- **ExpressVote XL** Precinct ballot marker and/or Precinct scanner and tabulator, using a full-face touchscreen and Universal Voting System firmware
- **ExpressLink™** standalone application that interfaces with voter registration (e.g. electronic Pollbook) systems and the ExpressVote Activation Card Printer to print the ballot activation code on an ExpressVote and ExpressVote XLcards

- **Electionware Toolbox** set of utilities that can be integrated into the Electionware EMS to enhance the software usability experience and streamline various processes. These add-on utilities include Test Deck and Text to Speech.

COTS Software/Firmware

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

Hardware

Below is a listing of the hardware components that comprise the entire ES&S EVS 6.0.2.1 system categorized by system functionality:

Hardware	HW Revision
ExpressVote Universal Voting System	2.1
DS200 Precinct-based Scanner and Tabulator	1.2, 1.3
DS450 Scanner and Tabulator	1.0
DS850 Scanner and Tabulator	1.0
ExpressVote XL Full-Faced Universal Voting System	1.0
ExpressVote Rolling Kiosk	1.0
ExpressVote Voting Booth	N/A
ExpressVote ADA Table	N/A
DS200 Collapsible Ballot Box	1.0
DS200 Plastic Ballot Box	1.2, 1.3, 1.4, 1.5
DS200 Metal Ballot Box	1.0, 1.1, 1.2
DS450 Cart	N/A
DS850 Cart	N/A
Universal Voting Console	1.0

Test Materials

Test support materials utilized during the examination included:

- Thermal receipt paper for the **ExpressVote 2.1 Marking Only**, **ExpressVote 2.1 Marking and Tabulating**, and the **ExpressVote XL**.
- Ballot card stock for processing ballots on the **ExpressVote 2.1 Marking Only**, **ExpressVote 2.1 Marking and Tabulating**, and the **ExpressVote XL**.
- Ballot stock, for printing of ballots to be processed by the **DS200**, **DS450** and **DS850**
- Activation cards
- Smart cards
- USB thumb drives
- Ballot pens
- Printer paper rolls

III. EXAMINATION APPROACH, PROCEDURES AND RESULTS

A. Examination Approach

To ascertain whether EVS 6021 can be safely used by voters at elections in the Commonwealth and meets all the requirements of the Pennsylvania Election Code, the Examiners developed test protocols for the examination. The initial functional examination of EVS 6000 determined that the system did not comply with Sections 1107-A(3) and (13), 25 P.S. §§ 3031.7(3) & (13). The Examiners also observed that system documentation for validating the installed components and hardening procedures needed to be updated for a secure implementation. After the initial examination for PA state certification in June 2018, EVS 6000 field use in the State of Kansas's primary elections also identified performance anomalies that necessitated remediation. The Examiners then performed a follow-up examination of EVS 6021 to confirm that the anomalies identified in EVS 60000 were corrected and the system complies with all the requirements of the Pennsylvania Election Code. The examination approach followed for EVS 6000 and EVS 6021 is discussed in the below sections.

EVS 6000 Examination Approach

Functional Examination

The test protocols separated the requirements of Article XI-A of the Pennsylvania Election Code, Sections 1101-A to 1122-A, 25 P.S. §§ 3031.1 - 3031.22, into six main areas of test execution: (1) Source Code Review; (2) Documentation Review; (3) System Level Testing; (4) Security/Penetration Testing; (5) Privacy Analysis; and (6) Usability Analysis.

Source Code Review was performed prior to the functional examination to determine if there are any vulnerabilities found that would warrant additional security examination.

Documentation Review was performed to verify that the portions of the Pennsylvania Election Code, which reference documentation detail, are sufficiently met by the ES&S EVS 6000 documentation. The Functional Examiner validated compliance of the system to the following sections of the Election Code during the documentation review.

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

System Level Analysis examined the ES&S EVS 6000 voting system in terms of conducting an election. The Functional Examiner created election definitions using Electionware and populated the voting devices (ExpressVote XL - Tabulator, ExpressVote 2.1 - Ballot Marking Device and Tabulator, DS200 – Precinct Scanner, DS450 Central Count Scanner and DS850 Central Count Scanner) with election definitions using transport

media. Votes were captured and ballots were printed and tabulated via ExpressVote XL and ExpressVote 2.1 configured as tabulator. Ballots were marked manually as well as via the ExpressVote 2.1 in marking mode, then tabulated through the polling place DS200 scanner. All ballots (hand marked paper ballots, ExpressVote 2.1 in marking mode, ExpressVote 2.1 in tabulator mode, and ExpressVote XL) created were then tabulated through the DS450 and DS850. Tabulation results for ExpressVote 2.1 in Tabulator mode, ExpressVote XL, DS200, DS450 and DS850 were then processed into Electionware, write-in votes were adjudicated, and reports were generated with results for the election. The results reports were validated against the expected results of the voted ballots.

All components of the EVS 6000 system were exercised to verify that they meet all pertinent requirements of the Pennsylvania Election Code. The test cases were designed to ascertain compliance to the following sections of the Election Code:

- 1101-A, 25 P.S. § 3031.1, requiring an electronic voting system to provide for a permanent physical record of all votes cast;
- 1107-A(2), 25 P.S. § 3031.7(2), requiring an electronic voting system to permit voting on both candidates and ballot questions, according to the official ballot;
- 1107-A(3), 25 P.S. § 3031.7(3), requiring an electronic voting system to permit straight party voting, including the "Pennsylvania method" of straight party voting;
- 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;
- 1107-A(5), 25 P.S. § 3031.7(5), requiring an electronic voting system to permit a voter to enter write-in votes;
- 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;
- 1107-A(7), 25 P.S. § 3031.7(7), requiring an electronic voting system to prevent over-votes;
- 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;
- 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; and

- 1107-A(10), 25 P.S. § 3031.7(10), requiring an electronic voting system that registers votes electronically to permit voters to change their votes up until taking the final step to register the vote, and for systems that use paper ballots or ballot cards, permits a voter to get a new ballot in the case of a spoiled ballot, and to mark and cancel the spoiled ballot;
- Parts of 1107-A(16), 25 P.S. § 3031.7(16), requiring an electronic voting system which provides for district-level tabulation to include (i) a public counter to register how many ballots are submitted to be counted; (iv) will not tabulate an over-vote, with an option to notify a voter of an over-vote if used during voting hours; and (v) generates a printed record that counters are set to zero before voting commences; and
- Parts of 1107-A(17), 25 P.S. § 3031.7(17), requiring an electronic voting system which provides for central-count tabulation to (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 reports.

The Functional Examiner also used the System Level Testing to further evaluate the design and accuracy aspects of the system as required by Sections 1107-A(11) and (13), 25 P.S. §§ 3031.7(11) & (13), through his use at public demonstration, even though the requirements were already validated in the documentation review phase by reviewing EAC certification reports.

The Security/Penetration Analysis examined the voting system's compliance with the requirements of the Pennsylvania Election Code by analyzing physical security procedures and impoundment of ballots. Precinct tabulation devices were installed for delivery to the precinct, and the Functional Examiner analyzed the pertinent security procedures performed on each device to ascertain compliance to 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. The Functional Examiner also used the security analysis phase of testing to validate

compliance to parts of Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17) that relate to system security.

The Privacy Analysis examined the voting system's compliance to Section 1107-A(1) of the Election Code, 25 P.S. § 3031.7(1), requiring that an electronic voting system provide for absolute secrecy of the vote, by analyzing how the polling place devices met the pertinent privacy requirements.

The Usability analysis evaluated the compliance of the voting system to Sections 1107-A(14) and (15), 25 P.S. §§ 3031.7(14) & (15). The results from the tests were used by the Functional Examiner to supplement his conclusions from the documentation review phase.

Accessibility Examination

The accessibility examination was designed to provide insight and information on each voting system's usability and accessibility, especially for voters with disabilities and for poll workers responsible for managing the system on Election Day. 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:

- **Expert review** 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.
- **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.
- **Election officials and poll workers** tested the accessibility features to evaluate how they would be activated during an election. They commented on the system based on their experience.

The testing team constructed a typical PA ballot, with a mix of contest types and variation in the number of candidates to be voted for each contest. The Accessibility Examiner conducted an expert review, observed 7 voters with disabilities, and worked with 10 poll workers in a guided review of the systems. Voters alternated between using the ExpressVote/DS200 and ExpressVote XL and some voters tried both systems.

Security Testing

The Security testing provided a means to assess the required security properties of the voting system under examination and ascertain compliance with the Pennsylvania Election Code requirements, including 25 P.S. §§ 3031.7(11), (12), (16), & (17). The security tests specifically addressed confidentiality, vote anonymity, integrity, availability, and auditability of the voting systems. 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 used in a live election.

EVS 6021 Examination Approach

EVS 6021 is a release to correct the anomalies noted in EVS 6000 system. The examiners evaluated the changes submitted by ES&S and developed test protocols to validate the modifications to EVS 6000 to ensure that the fixes resolved the identified anomalies and that the modified system maintained compliance with all the Pennsylvania Election Code requirements.

Functional Examination

The Functional Examiner and Department agreed that the test approach must include Source Code Review, System Level Testing and Documentation review. Security/Penetration, Privacy and Usability analysis results were leveraged from the EVS 6000 examination since those aspects of the system remained unaffected by the isolated code changes made to the system.

Source code review was done to determine if there were any vulnerabilities that warranted additional testing. System Level Testing examined EVS 6021 in terms of conducting a general election and closed primary election. The election runs were to (a) test and confirm that the anomalies identified during EVS 6000 examination were remediated and (b) to perform regression testing of all components of the system. The election runs allowed the Functional Examiner to ascertain that compliance with the Election Code requirements determined during the System Level Testing of EVS 6000 is maintained in the new release. The Documentation review was conducted to ensure that the system documentation for EVS 6021 provided accurate validation procedures for verifying installation of correct system components.

Accessibility Examination

The Department of State in consultation with the Accessibility Examiner decided that the findings from EVS 6000 Accessibility Examination could be used for EVS 6021, since there were no hardware changes and the isolated code changes were for performance improvements and fixing the anomalies identified during EVS 6000 Functional Examination.

Security Testing

The Security Examiner evaluated the system changes, specifically the changes to the Electionware hardening scripts to confirm that the script changes would secure the Election Management installation further.

B. Examination Process and Procedures

The examination process and procedures followed for EVS 6000 and EVS 6021 examinations are listed in the below sections. The final determination in this report is based on the combined analysis of the results and conclusions from both examinations.

EVS 6000 Examination

Functional Examination

The public demonstration and functional examination portion commenced on June 25, 2018, at Room G24A/B of the Commonwealth Capitol Complex - Finance Building, 613 North Street, Harrisburg PA 17120. The test execution tasks took approximately two and one-half days. Members of the public were allowed as observers for the examination. The Functional Examiner performed System Level Testing, Security/Penetration Testing and Privacy and Usability Analysis during the examination. Source code and Documentation review were completed prior to the public examination at SLI lab facilities in Wheat Ridge, Colorado.

ES&S supplied all the hardware equipment required for the examination. All software and firmware necessary to perform the examination was received directly from the Voting System Test Laboratories (VSTL) that tested the voting system for EAC certification. The trusted build of the software and firmware for each device being evaluated were installed using the appropriate media for installation. The hash codes for all system components were captured using the process listed in the manufacturer's Technical Data Package (TDP) by the Functional Examiner with assistance from ES&S representative. 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 scripts.

The Functional Examiner created the election definition using Electionware and prepared the precinct tabulation device DS200, polling place vote capture devices ExpressVote XL and Express Vote 2.1 and central scanners DS450 and DS850 using transport media. The polling place was set up using ExpressVote XL, ExpressVote 2.1 Marker, ExpressVote 2.1 Tabulator and DS200. A primary and general election were then run using polling place devices and central scanners. Ballots were tabulated via the polling place tabulation devices and central scanners. Results were then tabulated using Electionware and validated against expected results.

Accessibility Examination

The accessibility examination portion commenced on June 25, 2018, at Room

G24A/B of the Commonwealth Capitol Complex - Finance Building, 613 North Street, Harrisburg, PA 17120. The examination lasted approximately three days followed by a debrief meeting on June 28, 2018 with DOS and CCD to discuss initial findings. The examination included expert review by the Accessibility Examiner, sessions with 3 poll worker groups from Dauphin County, PA, and sessions with 7 voters with disabilities using different assistive devices for voting. The voter sessions each took approximately an hour and the poll worker sessions took approximately 90 minutes each. ES&S supplied the hardware and supplies for the Accessibility Examination. The equipment was prepared for the examination by loading the required election definition using transport media. The Accessibility Examiner prepared voting scenarios for each voting session to allow comparison of results between each session. The scenarios were constructed to provide a structured opportunity to explore how the system works in all interaction modes, using:

- visual touch screen with default settings;
- visual touch screen with text size and contrast changes;
- audio and the tactile keypad;
- audio and the visual touch screen; and
- audio or visual display with the dual switch.

Both the ballot contents and the instructions for marking the ballot were designed to exercise different types of interactions (navigation in ballot, navigation in contest, undervotes, overvotes, straight party). The ballot included both very short contests, and those long enough to potentially fill more than one screen, even at the default text size.

Expert Review by Accessibility Examiner

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

Sessions with voters

The voter sessions all took about an hour. They included:

- An opening interview about their previous voting experience and the types of assistive technology they used in both daily life and in voting.
- Orientation to the system with an opportunity for voters to ask questions about any assistive technology available. For example, one participant asked if she would be able to use her own audio to connect directly to her hearing aids.
- Voting a ballot, following instructions given verbally by the Accessibility Examiner. Voters were encouraged to give feedback 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.
- A closing interview about their reactions to the experience of using the voting system.

Sessions with poll worker groups

The sessions took 60-90 minutes, depending on how many people were in each group. The session included:

- A brief orientation to the voting system and the access features, similar to the way a poll worker trainer might introduce the system.
- The poll workers each then marked a ballot, tried out the access features if they wanted, and were given an opportunity to read the “During Election Day” instructions provided with the system
- The Accessibility Examiner presented them with 6 scenarios of different access needs and asked them to help set up the system for one of the facilitators acting as the voter in each of the scenarios.

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 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
- **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.

Security Testing

The Security Testing was done at SLI lab facilities in Wheat Ridge, Colorado. The Security Examiner received the hardware devices from ES&S and the software and firmware was obtained from the Voting System Test Lab (VSTL) which tested the system for EAC certification testing. 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. The Security Examiner evaluated each component of the EVS 6000 system and the system as a whole for interactions between components. These test suites covered areas of confidentiality, vote anonymity, integrity, availability, and auditability of the voting systems.

The requirements associated to each area of testing were applied to the EVS 6000 system in the following manner. The Security Examiner did a review of the EAC testing reports of the system and also executed tests for a cross section of VVSG 2005 requirements to reconfirm compliance. The Security Examiner then designed tests that included in depth verification and validation of reports, audit logs and physical access controls for each of the components of the voting system. The physical security examination included security seals, lock/key combinations, measures for collection of voting in the event of an extended power outage, ballot box and system access points. Tests were done to ensure that election results, media used, reports and audit logs were protected from attempts to decrypt, manipulate or corrupt election data. The Security Examiner also created a vulnerability assessment and performed penetration testing of the EVS 6000 system.

ES&S EVS 6021 examination

Functional Examination

The follow-up examination commenced on September 25, 2018, at SLI Global Solutions facility, 4720 Independence Street, Wheat Ridge, Colorado, and was observed by Department staff in a conference room in BCEL, 210 North Office Building, 401 North Street, Harrisburg, Pennsylvania via web conference. ES&S supplied all the hardware equipment required for the examination. All software and firmware necessary to perform the examination was received directly from the VSTL that tested the voting system for EAC certification. The Functional Examiner installed and/or verified the Trusted Build for each system component. A primary and general election were then run using ExpressVote XL, ExpressVote 2.1 (Marker and Tabulator), DS200, DS450 and DS850. Results were then tabulated and validated against expected results. The Functional Examiner performed the Source Code and Documentation Review before the witnessed examination.

Security Testing

The follow-up Security testing verified the changes to the documentation for appropriately hardening the Electionware EMS for secure installation.

C. Examination Results

EVS 60000 Functional Examination

On July 16, 2018, the Functional Examiner issued his draft report for the testing of EVS 6000 with a recommendation that the system was not in compliance with Sections 1107-A(3) and (13) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(3) & (13). The report noted the following concerns for PA method implementation:

- 1) On the ExpressVote XL, when voting a straight party ballot and the voter modified a straight party contest that was a “vote for no more than N” and has “N” candidates for the selected party, with a write-in candidate, the voter was incorrectly notified that they were attempting to overvote. In fact, following the PA method implementation, the “N” straight party selected candidates should have been deselected and the voter should have been able to proceed with the write-in.
- 2) On the ExpressVote 2.1, in the general election, an issue was encountered when voting a straight party ballot and the voter modified a straight party contest that was a “vote for no more than N” and had less than “N” candidates for the selected party. In this scenario, the ExpressVote 2.1 continuously instantiated the PA method any time when the marks on the ballot were the same candidate selections as the straight party selection, irrespective of whether it was the first time a selection was made in the contest after straight party voting or not.

The Functional Examiner noted that the test results were not as expected for the tests executed to verify compliance to Section 1107-A(3), 25 P.S. § 3031.7(13); since an issue was encountered when a general election ballot was scanned through the ExpressVote XL but scanned at an unexpected orientation such that the implemented image area capture parameters were too tight and that Electionware was unable to parse two write-ins from the ballot image, so those write-ins could not be adjudicated.

The Functional Examiner also noted that the EVS 6000 system TDP needed to be

updated to provide accurate validation procedures for verifying installation of correct system components. The EVS 6000 documentation did not accurately reflect system verification procedures for ExpressVote 2.1.

The Functional Examiner's report indicated successful completion of tests executed to ascertain compliance to all other requirements mandated by the Pennsylvania Election Code. The Examiner report for EVS 6000 (Test Report – PES-002-FTR-01) included details of the test cases, execution and successful completion. The following section is a summary of the results of the examination as set forth in fuller detail in the Examiner's Report.

1. Source Code Review

Source Code Review for EVS 6000 was performed, with a focus on determining whether any vulnerabilities could be found. The Functional Examiner reported that the code review was completed with no identified malicious software, cryptographic software, process control or password management vulnerabilities. The Examiner concluded that no deficiencies were found during source code review.

2. Documentation Review

The Documentation Review testing performed by the Functional Examiner demonstrates that the EVS 6000 meets the relevant requirements of the Pennsylvania Election Code. The Examiner reviewed the "Test Report for EAC 2005 VVSG Certification Testing of ES&S EVS 6.0.0.0 Voting System" (report number ESS-7001-CTR-01).

The review of the EAC test reports by the Functional Examiner and the EAC certifications submitted by ES&S satisfy the requirements of Section 1105-A(a) of the Election Code, 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), or VSTL as such authorities are now called, as meeting the applicable performance and test standards established by the federal government.

Functional Examiner concluded that the design requirements of Sections 1107-A(11) and (14) of the Pennsylvania Election Code, 25 P.S. §§ 3031.7(11) & (14), are met by the combination of EAC hardware Non-Operating Environmental Tests, which included bench handling, vibration, low temperature, high temperature, humidity and product safety tests. The system accuracy testing during EAC certification testing provided confirmation of system accuracy as required by Section 1107-A(11) of the Pennsylvania Election Code, 25 P.S. § 3031.7(11).

The system summative usability test reports were accepted by the EAC as part of the Federal Certification. This, along with the Functional Examiner's use of the system, demonstrates that the system can be readily learned and hence satisfied the usability requirement of Section 1107-A(15) of the Pennsylvania Election Code, 25 P.S. § 3031.7(15).

3. System Level Testing

As set forth in the examination approach, System Level Testing was divided into two separate tests, a closed primary election and a general election. The ballots defined had contests with voting variations supported in Pennsylvania.

A closed primary election consisting of two parties (Republican, Democratic), three precincts, and 16 contests (14 partisan contests and 2 referendums - 8 "Vote for One", 1 "Vote for no more than Two", 3 "Vote for no more than Three", 1 "Vote for no more than Four" and 1 "Vote for no more than Fifteen") was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. Referendum contests were added to test the generation of non-partisan ballots. The Functional Examiner validated compliance of the system to Sections 1101-A and 1107-A(2), (5)-(11), 25 P.S. §§ 3031.1, 3031.7(2), (5)-(11). No issues or anomalies were experienced during these tests, and the objective criteria established in the test protocols were met.

A general election consisting of four parties (Republican, Democratic, Green and Libertarian), three precincts (one of which was a split precinct), and 16 contests (13 partisan contests, 1 non-partisan and 2 retention contests, 9 "Vote for One", 1 "Vote for no more

than Two”, 3 “Vote for no more than Three”, and 1 “Vote for no more than Fifteen”) was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. The Functional Examiner examined the compliance of the system to Sections 1101-A and 1107-A(2)-(8), (10)-(11) and (13), 25 P.S. §§ 3031.1, 3031.7(2)-(8), (10)-(11) & (13).

The Functional Examiner included test cases to validate Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17), that mandate voting systems to generate zero proof reports and correctly handle over-votes during the election runs. The remainder of the requirements of 25 P.S. §§ 3031.7(16) and (17) were validated by the Functional Examiner during the Security/Penetration Analysis.

Election definitions for both primary and general elections were created within Electionware, and transport media was created to populate ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. Polls were opened and ballots were marked manually, as well as electronically via the ExpressVote 2.1 in Marking mode, then tabulated through the polling place DS200 scanner. Ballots were marked and tabulated utilizing the polling place ExpressVote 2.1 in Tabulator mode and the ExpressVote XL devices. All ballots (hand marked, ExpressVote 2.1 in Marking mode, ExpressVote 2.1 in Tabulator mode, and ExpressVote XL) created were then tabulated through the DS450 and DS850. Thus, each ballot was tabulated three times.

The Functional Examiner used English and Spanish ballots for the test. Reports were generated after closing polls and results were validated against expected results. Each specific hardware and software component was tested for compliance with the required sections of the Election Code.

The EVS 6000 is a paper-based system and paper ballots provide a permanent physical record of each vote cast adhering to Section 1101-A, 25 P.S. § 3031.1. Hand marked paper ballots and ExpressVote 2.1 in marker mode allow voters to use the precinct scanner DS200 for tabulation. ExpressVote 2.1 in tabulator mode and ExpressVote XL create a paper ballot based on a voter’s selections, which is tabulated when the voter affirms that he/she is ready to cast a vote.

The primary and general election definitions were created using Electionware and loaded to polling place devices and central scanners, which provided assurance that the system can perform ballot creation activities. The Functional Examiner successfully added contests including straight party, parties, choices, precincts, districts, ballot styles, referendum questions and retention contests with appropriate candidates and choices. The ExpressVote 2.1 (marker and tabulator), ExpressVote XL and DS200 components of the EVS 6000 successfully permitted votes for "1 of 1," "N of M," and "Question" contests for a standard and ADA voting session. The Functional Examiner also exercised a straight party vote to confirm that all appropriate candidates were selected. The Functional Examiner thus concluded that the system is in compliance with Section 1107-A(2), 25 P.S. § 3031.7(2).

Each of the applicable components of EVS 6000 allowed the test voter to cast a write-in vote and demonstrated compliance with Section 1107-A(5), 25 P.S. § 3031.7(5).

EVS 6000 meets the requirements for Section 1107-A(6), 25 P.S. § 3031.7(6), because the test voters cast votes on different ballot styles for candidates and questions and the ExpressVote 2.1 and ExpressVote XL displayed only contests for which the voter was entitled to vote.

The system's compliance to Section 1107-A(7), 25 P.S. § 3031.7(7), was demonstrated since DS200 has the capability to indicate overvotes for any office and the voter has the ability to either spoil the ballot or cast the ballot with overvotes if the voter decides to do so. ExpressVote XL and ExpressVote 2.1 (marker and tabulator) did not allow overvotes. The Functional Examiner also noted that the system allowed undervotes, but warned the user about the undervote when configured to do so.

The successful validation of the election results shows that central scanners DS450 and DS850, as well as precinct tabulator DS200, include the capability to reject all choices recorded on the ballot for an office or question if the number of choices exceeds the number for which the voter is entitled to vote, adhering to Section 1107-A(8), 25 P.S. § 3031.7(8).

The EVS 6000 complies with Section 1107-A(9), 25 P.S. § 3031.7(9), because test

voters in the closed primary election were only able to vote for referendum questions and candidates seeking the nomination of their party.

Adherence to Section 1107-A(10), 25 P.S. § 3031.7(10), was demonstrated for both ADA and standard voting sessions. ExpressVote 2.1 and ExpressVote XL allowed the voters to review their ballots before printing for tabulation on DS200 or central scanners DS450 or DS850. The Functional Examiner attempted to change votes on ExpressVote 2.1 and ExpressVote XL for candidates within the contest, as well as after leaving the contest and then returning to other contests and while reviewing the summary screen. The tests demonstrated that ExpressVote and ExpressVote XL allowed changing the selections until the voter decides to print or cast the ballot. The DS200 precinct scanner of EVS 6000 provides the voter with a caution message when the ballot contains potential errors, such as the presence of overvotes or undervotes. The voter is also presented an error report on the screen when the tabulator detects potential errors. The voter can either decide to affirm their intent by casting the ballot, or they can spoil the ballot and fill out another ballot.

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

The Functional Examiner validated via test cases during the primary and general election that the tabulating devices DS200, DS450 and DS850 generated zero proof reports only before ballots were cast, the system rejected all votes for the contest in an overvote situation, and produced a results report when appropriately configured as required under Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17). The Functional Examiner confirmed that the zero-proof report cannot be generated on demand after a ballot is cast.

Ballots were marked by hand including write-in votes during the general election to examine the system's ability to properly enact the PA method. The DS200, DS450 and DS850 demonstrated compliance to Sections 1107-A(3) and (4), 25 P.S. §§ 3031.7(3) & (4), by appropriately tabulating the votes. The Functional Examiner identified anomalies in the

implementation of the PA Method on ExpressVote 2.1 and Expressvote XL.

The voting variations used for the examination included write-in votes to ensure that all components of the system will identify the appropriate write-ins and allow the election official to tabulate all cast votes, including write-in votes. On the ExpressVote XL and Electionware, an issue was encountered when a ballot was scanned through the XL but scanned at an unexpected orientation such that the implemented image area capture parameters were too tight; consequently, the Electionware was unable to parse two write-in votes from the ballot image, so the votes could not be adjudicated. The Functional Examiner hence concluded that EVS 6000 did not comply to Section 1107-A(13), 25 P.S. § 3031.7(13).

4. Security/Penetration Analysis

The Functional Examiner adopted a strategy to review each pertinent requirement for this test individually and then created test cases to address it in either in a documentation review, a functional test, or both.

Precinct tabulation devices and ballot marking devices were configured for delivery to a polling place from warehouse including all seals and locks recommended by the manufacturer. The central scanners were configured for operation in a county office. The devices were inspected for the ability to be tampered with: the inspection examined ports, outer case and memory devices to confirm that they are all secure and the locks and seals are tamper proof and evident. The Functional Examiner also examined the components of the EVS 6000 system for password management of administrative functions and ensured that the system counter could not be reset by unauthorized persons. In addition, the Functional Examiner also reviewed “ES&S System Security Specification” document for ballot security procedures at the polling place and central location to ensure that the manufacturer recommended the required steps for configuring the EVS 6000 securely for the election. Based on the tests, the Functional Examiner concluded that that the system complies to Section 1107-A(12), 25 P.S. § 3031.7(12).

The Functional Examiner included test cases during the Security/Penetration analysis phase of the testing to evaluate the security requirements mandated by Sections 1107-A(16) and (17), 25 P.S. §§ 3031.7(16) & (17). The Functional Examiner validated that the tabulation devices ExpressVote XL, ExpressVote 2.1 (tabulator) and DS200 had a visible public counter and the system prevented authorized and unauthorized users any access to vote data while polls are open. Tests were completed to determine that USB ports do not allow any data or information to be transferred to the ExpressVote XL, ExpressVote 2.1 (tabulator) and DS200 and no maintenance, poll worker or administrative modes allow tampering with the tabulating element. The system did not allow polls to be opened without running a zeroproof report and the content of the report showed that all candidate positions, each question and the public counter were all set to zero. The functionality of the system to generate the close of polls report was verified and the report contents were analyzed to ensure that it contained the total number of ballots tabulated and total number of votes for each candidate and question on the ballot. Based on the above tests and the test cases executed while running the elections, the Functional Examiner concluded that EVS 6000 complies with all requirements mandated by 25 P.S. §§ 3031.7(16) and (17).

5. Privacy Analysis

The Functional Examiner reviewed and inspected the privacy aspects of EVS 6000 system to determine compliance with Section 1101-A(1) of the Election Code, 25 P.S. § 3031.7(1). The Functional Examiner determined that the components of the system used at the polling place comply with 25 P.S. § 3031.7(1) by review of system documentation and physical inspection. Central scanners were physically examined by the Functional Examiner for adequate visual secrecy. The Functional Examiner also verified that no voter data, including stored ballot images are tied back to any specific voter in a manner that would compromise voter secrecy.

6. Usability Analysis

The Functional Examiner determined that EVS 6000 demonstrated compliance with the usability requirements of Section 1107-A(14) and (15) of the Election Code, 25 P.S. §§

3031.7(14) & (15), by reviewing appropriate EAC certification reports and from his experience of using all the functionalities of the system during the examination.

EVS 60000 Accessibility Examination

The tests included examiner review, sessions with voters and poll workers. A summary of the test details and findings is discussed in this section.

Examiner Review

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 by the Accessibility Examiner gave a chance to make sure they understand how the system and accessibility features work and to note anything that could inform preparation for other testing.

Voter Sessions

The following voter population was represented in the test sessions:

- 2 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 (also a non-voter because not yet a citizen).

Age Ranges: 35 thru 70. All but one (a 70-year old) were in the 35-60 year-old age range.

Counties: Allegheny, Bucks, Cumberland, Dauphin, and Philadelphia

The voters had a range of voting habits. One was a non-voter. One last voted in the 2016 Presidential election. Two last voted in November 2017, and three who voted in the May 2018 Primary.

Poll worker Sessions

Poll workers were invited to come in teams. We had three sessions with poll worker teams of 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 election judge
- had limited experience serving voters with disabilities

The examiner compiled the findings from the examiner review, voter sessions and poll worker sessions into positives, annoyances, problem solving, needs assistance and show stoppers.

This section depicts the summarized findings of the most significant issues identified, and the Accessibility Examiner's analysis and recommendations. Attachment B of this document lists these issues in fuller detail and also describes all the observations from the Accessibility Examination.

Automatic selection and deselection and accompanying audio navigation- Some voters using audio ballots were confused by the automatic selection and deselection that is part of the straight party voting. The Accessibility Examiner noted that the audio ballot did not announce all deselections and deselections may not always be visible on screen if the contest has a long list of candidates. The Accessibility Examiner noted that in some cases this issue may lead to voters casting ballots without knowing all their choices. The problem was exacerbated by the inability

of a blind voter to successfully validate the printed ballot on the ballot viewing window on ExpressVote XL. The Accessibility Examiner also noted that the system doesn't allow deselecting all candidates in a contest, if there is an eligible candidate selected by straight party vote. Due to the confusion in selection/deselection, the voters using audio ballot were not able to perceive and understand the system behavior, leading voters into time-consuming problem solving that takes away from their primary task of voting and may lead to requesting assistance. The Accessibility Examiner noted that even though the voting systems must legally comply with the PA method of straight party voting, the interaction should fully inform the voter of what happened including number and names of the candidates being selected/deselected on screen as well as audio ballot.

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 is happening. This may cause the need to ask for assistance. The Accessibility Examiner recommended that all instructions must be reviewed thoroughly and have consistent language without unnecessarily repetitive instruction.

Verification is possible, but challenging – The Accessibility Examiner tested whether verification can be part of the normal course of voting for voters with disabilities and noted the results for both ExpressVote 2.1 and ExpressVote XL.

ExpressVote 2.1 – If configured as marker (without tabulation) the system ejects the ballot after printing and the ballot can be scanned in the DS200 to complete the voting process. This allows voters to review the paper ballot and also makes it possible to use personal devices like magnifiers or text readers to read the paper ballot. The ballot also can be reinserted into the ExpressVote 2.1 for review. The review by reinserting the ballot did not read back the write-in options to the voter. The Accessibility Examiner also suggested that the verification may require the ballots to be moved to a stable surface for review using magnifiers or text readers. The

examiner also noted that removing the ballot from the ExpressVote 2.1 system requires some force and some voters may require assistance.

ExpressVote XL – allows the voter to validate the paper ballot thru a glass window before casting. The Accessibility Examiner noted that this presents a problem for verification for users especially who require personal assistive devices for verification.

Despite these challenges, it is the opinion of the voters and experts that these systems are much more useable and accessible than the current ADA voting systems used in Pennsylvania and allowed most voters to vote independently.

EVS 60000 Security Examination

As mentioned in the Examination Approach section of this document, the Security Examiner defined the Security Testing to be 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. The examiner analyzed the test results and summarized any identified deficiencies into 4 major categories documentation, source code, hardware, and functional. The Security Examiner then evaluated the physical security, software hardening and existing system controls in place prior to identifying items that require remediation before the system is certified for use in Pennsylvania. The examiner also provided recommendations on secure implementation and deployment.

EVS 6021 Examination Results

EVS 6021 Functional Examination

As identified in the test approach section of this document the follow-up examination of EVS 6021 included Source Code Review, Documentation Review and System Level Testing.

1. Source Code Review

A Source Code Review for the code modifications for EVS 6021 was performed,

with a focus on determining whether any vulnerabilities could be found. It was concluded that the code review was completed with no malicious software, cryptographic software, process control or password management vulnerabilities being found. The Functional Examiner concluded that no deficiencies were found during source code review.

2. Documentation Review

The Functional Examiner reviewed ES&S submitted documentation for system validation procedures. The Functional Examiner concluded that system documentation was updated to provide accurate procedures for verifying installation of correct system components on the ExpressVote 2.1.

3. System Level Testing

The System Level Testing was divided into two tests, a primary election and general election. The Functional Examiner included test cases to specifically test the PA method anomalies identified during EVS 6000 testing as part of the general election.

A closed primary election consisting of two parties (Republican, Democratic), three precincts, and 16 contests (14 partisan contests and 2 referendums - 8 “Vote for One”, 1 “Vote for no more than Two”, 3 “Vote for no more than Three”, 1 “Vote for no more than Four” and 1 “Vote for no more than Fifteen”) was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850. Referendum contests were added to test the generation of non-partisan ballots. The Functional Examiner validated compliance of the system to Sections 1101-A and 1107-A(2), (5)-(11) and (13), 25 P.S. §§ 3031.1, 3031.7(2), (5)-(11) & (13). No issues or anomalies were experienced during these tests, and the objective criteria established in the test protocols were met.

A general election consisting of four parties (Republican, Democratic, Green and Libertarian), three precincts (one of which was a split precinct), and 16 contests (13 partisan contests, 1 non-partisan and 2 retention referendum, 9 “Vote for One”, 1 “Vote for no more than Two”, 3 “Vote for no more than Three”, and 1 “Vote for no more than Fifteen”) was run utilizing Electionware, ExpressVote 2.1, ExpressVote XL, DS200, DS450 and DS850.

The Functional Examiner examined the compliance of the system to Sections 1101-A and 1107-A(2)-(8), (10)-(11) and (13), 25 P.S. §§ 3031.1, 3031.7(2)-(8), (10)-(11) & (13).

The Functional Examiner created election definitions and executed appropriate test cases on all components of EVS 6021 to ensure that the modified system satisfies all requirements of the Pennsylvania Election Code. The Functional Examiner used English and Spanish ballots for the test. Reports were generated after closing polls and results were validated against expected results. Each specific hardware and software component was tested for compliance with the required sections of the Election Code.

Ballots were marked on ExpressVote XL and ExpressVote 2.1 to examine the system's ability to properly effectuate the PA method of straight party voting. The test cases included different voting patterns that selected either a candidate from the same political party, a different political party or a write in when the contest had a full slate of candidates or less than full slate of candidates. The issue found on ExpressVote 2.1 and ExpressVote XL during Examination of EVS 6.0.0.0, were verified to be resolved. The votes were tabulated accurately following the PA method rules. The Functional Examiner concluded that the EVS 6021 complies with Section 1107-A(3), 25 P.S. § 3031.7(3), since the components ExpressVoteXL, ExpressVote 2.1, DS20, DS 450 and DS 850 all handled the PA method test cases done as part of the general election test appropriately.

The issue found during the examination of EVS 6.0.0.0, on the ExpressVote XL and Electionware, when a ballot was scanned through the XL but scanned at an unexpected orientation such that the implemented image area capture parameters were too tight, that Electionware was unable to parse two write-ins from the ballot image, so could not be adjudicated, was verified to be resolved. To validate this, the Functional Examiner imported the scanned ballot data from the EVS 6000 to EVS 6021 Electionware and the write-ins were visible to be adjudicated appropriately.

The Functional Examiner confirmed with appropriate test cases and voting patterns that EVS 6021 maintains compliance to Sections 1101-A and 1107-A(2), (4)-(11) and (16)-

(17), 25 P.S. §§ 3031.1, 3031.7(2), (4)-(11), & (16)-(17), via tests cases in a similar manner as done during the EVS 6021 examination.

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

EVS 6021 was certified by EAC on November 12, 2018, and hence compiles with Section 1105-A(a) of the Election Code, 25 P.S. § 3031.5(a), which requires that a voting system must be examined and approved by a federally recognized independent testing authority (ITA), or VSTL as such authorities are now called. The final EAC certification scope is added to this report as Attachment A.

Additional Security/Penetration Analysis, Privacy and Usability results were not conducted during the EVS 6021 examination since the test cases validated during these tests were not affected by the isolated modification done to the OVI-VC to adequately handle the PA method.

The Functional Examiner identified that the following 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, and use and maintenance aspects of a voting system:

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

- 25 P.S. § 3031.20;
- 25 P.S. § 3031.21; and
- 25 P.S. § 3031.22.

After all the testing activities, the Examiners and Department concluded that the EVS 6021 demonstrates compliance with all 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. The conclusion was drawn based on the examination of EVS 6021 in conjunction with the EVS 6000 examination.

D. Observations

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

1. The ExpressVote XL and ExpressVote 2.1 doesn't intuitively allow a voter to deselect all candidates after straight party voting if there is an eligible candidate selected by straight party vote. This will make it difficult for a voter to vote for no candidate in a contest after voting straight party. The system presents the voter with a pop-up message suggesting that the voter cannot deselect all candidates when using the straight party option to mark the ballot. The voter must undo their straight party selection and mark individual contests if they intend to cast a "no vote" in a contest.
2. The system presented for examination had undervote warnings turned on for straight party contest on ExpressVote XL and ExpressVote 2.1. This may make the voter believe that there is a need to make a selection in that contest.
3. ES&S EVS 6021 does not support cumulative voting.
4. The system allows a configuration on ExpressVote 2.1 as tabulator where the voter can proceed to cast a vote without reviewing the paper ballot. If the system is configured to do so, the voter after reviewing the ballot on the ExpressVote 2.1 screen, can cast the ballot. With this configuration, the voter doesn't have the opportunity to verify the paper ballot before casting the vote.

5. The ExpressVote XL can be configured without the vote summary and review screen.

6. The Functional Examiner noted that ExpressVote XL must be configured to print terminal level reports to be compliant with the requirements mandated by 25 P.S. § 3031.7(16) when only one device is used at a polling place.

7. The configuration of the system complying with the Pennsylvania Election Code requirements including the PA method will require the use of appropriate selections of configurable parameters.

8. The USB devices and other portable media used with the voting system components need to be reformatted or replaced with new media before every Election use. The vendor recommendations only suggest a reformat, but doesn't specify that it needs to be a full reformat.

IV. Conditions for Certification

Given the results of the examination that occurred in June and September 2018, and the findings of the Examiners as set forth in his reports, **the Secretary of the Commonwealth certifies the EVS 6021 subject to the following conditions:**

A. Pennsylvania counties using the EVS 6021 must comply with the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011, and any future revisions or directives. In particular, Pennsylvania counties must adhere to item four (4) of the directive when setting up and positioning the ExpressVote 2.1 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(1) of the Election Code, 25 P.S. § 3031.7(1)).

B. No components of the EVS 6021 shall be connected to any modem or network interface, including the Internet, at any time, except when a standalone local area wired

network configuration 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 6021, including wireless LAN cards, network adapters, etc. must be uninstalled or disabled prior to delivery or upon delivery of the voting equipment to a county board of elections.

C. Because EVS 6021 is a paper-based system, counties using the EVS 6021 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 via a manual count of the voter marked paper ballots exclusively. Counties must include in the sample ballots such samples as may be marked by ADA compliant components. Counties are advised to consult the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011 and any future revisions or directives that may apply to audits of electronic voting systems.

D. All jurisdictions implementing the EVS 6021 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. Counties must ensure that the L&A test cases include all applicable scenarios of PA straight party method identified in Attachment C to the Directive for electronic voting systems published by BCEL on September 11, 2017.

E. EVS 6021 is a paper-based system, and hence, implementation of the system for precinct or central count scanning is scalable. Jurisdictions should calculate the number of voting booths necessary to accommodate the number of registered voters in a precinct to

avoid long lines. Jurisdictions must include the ExpressVote 2.1 or ExpressVote XL as an ADA compliant device in configuring a precinct polling place. Jurisdictions must also take into consideration the ballot box capacities on polling place components when deciding on the number of voting booths. Jurisdictions must also take into consideration that ExpressVote XL and ExpressVote 2.1 as a tabulator requires the ballot bin to be changed or emptied after about 300 ballots. For DS200 ballot box capacities, jurisdictions can refer to DS200 operators guide from ES&S.

F. All jurisdictions implementing the EVS 6021 must implement administrative safeguards and proper chain of custody to facilitate the safety and security of electronic systems pursuant to the Guidance on electronic Voting System Preparation and Security, September 2016.

G. Jurisdictions implementing the EVS 6021 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.

H. All jurisdictions implementing the EVS 6021 must ensure that no default passwords are used on any devices and that all passwords are complex and secured. Counties must implement an audit process to review and ensure that no default passwords are used upon equipment install/reinstall and routinely change passwords (at least once prior to preparing for each primary and election) to avoid any password compromise. The passwords and permissions management must at a minimum comply to the password requirements outlined in NIST 800-63. This publication can be accessed at <https://pages.nist.gov/800-63-3/sp800-63-3.html>

I. All jurisdictions implementing EVS 6021 must configure the polling place components of the voting system to notify voters when they attempt to cast overvotes. The

DS200 tabulation device options must be set to “Query Voter Preference” for overvoted hand marked paper ballot. 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).

J. All jurisdictions implementing EVS 6021 must work with ES&S to ensure that only the certified system configuration is installed on purchase or anytime a system component is replaced or upgraded. Jurisdictions must as part of their user acceptance test verify the implementation to ensure that the components, software and firmware belong to the certified system. Jurisdictions must also perform a trusted build validation as part of the election preparation activities and post-election canvass activities utilizing the vendor supplied methods of validation and verification of voting system integrity. A sample format that can be used for the attestation is added Attachment C to this document.

K. ExpressVote 1.0 and ExpressTouch devices are not certified for use in Pennsylvania with EVS 6021. These devices were not presented to the Secretary for certification by ES&S.

L. 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 review of the ballot must be agreed upon by a team of at least two reviewers authorized by the election official. The election official can also consult the paper ballot to assist with determinations made during adjudication. In the event of a recount, the voter verified paper ballots must be used for the count.

M. Jurisdictions implementing EVS 6021 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.

N. 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 use certified voting system components. The systems used for ballot definition must be configured securely following conditions outlined in this report and following any Directives and Guidance issued by the Secretary. Any data transfer between the vendor and county must be done using encrypted physical media or 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.

O. 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:

- The audio ballot must fully inform the voter what has happened and how to select/deselect their choices
- The feedback messages must explain to voters what is happening, including the number and names of candidates being deselected
- The audio ballot must provide feedback on the reason for the changes in any selections and the interaction with straight-party choices.
- The audio ballot instructions on messages on the system must have the specific information for the task or screen before the general, repeated instructions.

P. Jurisdictions must make voters aware that voting straight party is optional via clear instructions on paper, on screen and on audio ballots. This is to ensure that the voter doesn't assume that he/she must make a selection for the straight party contest. The ballot instructions must be approved by the Department and follow any directives and/or guidance issued by the Department.

Q. The ExpressVote XL and ExpressVote 2.1 components of the EVS 6021 system does not allow the voter to deselect all candidates after voting straight party as noted

on Page 36, Observation 1 of this document. Jurisdictions must ensure that the message used in the pop up window to the voter is clear enough to communicate the system behavior to the voters. The message content must be approved by the Department and follow any directives and/or guidance issued by the Department.

R. Jurisdictions implementing ExpressVote XL must ensure that the configuration allows voters to review their vote selections on the screen and on the printed ballot card before it is cast.

S. Jurisdictions implementing the ExpressVote 2.1 as a Tabulator must ensure that the system is implemented in a configuration that allows physical review of the printed paper ballot, before casting the vote. The system **must not** be configured to have the voter validate the selections on the screen and “Autocast” the ballot, thus causing a situation where the voter has not verified what was printed on the paper ballot. The system must be configured to always return the marked ballot card (“Always Return Card” option) to the voter for review before tabulation.

T. Jurisdictions implementing ExpressVoteXL and ExpressVote 2.1 as 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 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.

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

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

W. 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 that can be removed by authorized personnel when the port is needed.

X. Jurisdictions using standalone installation of the EMS server on portable devices must protect the laptops to prevent lost or stolen device.

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

Z. Jurisdictions implementing EVS 6021 must ensure that the USB devices and any other removable media used for election activities is maintained with strict chain of custody. There must be a process to manage the removable media inventory to avoid misplaced and lost media. The devices must be reformatted before use in each election. Appropriate steps must be taken to ensure that the format is a full reformat of the USB devices.

AA. Jurisdictions implementing EVS 6021 must work with ES&S to ensure appropriate levels of training for election officials is planned on implementation. Counties must ensure that the trainings adhere to the “Minimum Training Requirements” specified in Attachment D of this document.

BB. Jurisdictions implementing EVS 6021 must include voter and poll worker training as part of the implementation plan. The training must include hands on practice for both voters and poll workers. Specific consideration must be given to voters using assistive devices and also poll worker education to assist voters with disabilities. Refer to Appendix B, listing detailed recommendations for deployment noted by the Accessibility Examiner.

CC. Jurisdictions implementing EVS 6021 must consider the following during

voting booth set up for serving voters requiring assistive devices

- 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.
- For the ExpressVote, 2.1 as marker, 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.

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

DD. 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 publicly available social media platform. The videos must be closed captioned for the visually impaired.

- A video (in an electronic format) for voters that demonstrates how to cast a vote and ballot using the Voting System.
- A video (in an electronic format) for precinct election officials that demonstrates how to setup, operate, and shutdown the Voting System components on an Election Day. The video must demonstrate how to set up and operate the voting system accessible devices for use by voters.
- A “quick reference guide” for precinct election officials to consult on Election Day. The guide must be specific to the purchasing county’s setup and use of the Voting System including accessible options.

- A “quick reference guide” with images that demonstrates to voters how to cast a vote. Must be provided in additional languages for any jurisdictions required to meet thresholds in the Voting Rights Act.
- EE. ES&S must adhere to the following reporting requirements and submit the following to the Secretary:
- **Equipment Reporting.** Reported field issues or anomalies that occur in Pennsylvania or elsewhere with any piece of equipment deployed in the Commonwealth of Pennsylvania within 3 days of the occurrence;
 - **Advisory Notices.** System advisory notices issued for any piece of equipment deployed in the Commonwealth of Pennsylvania regardless of whether the incident behind the notice occurred in Pennsylvania;
 - **Ownership, Financing, Employees, Hosting Location.** Any changes to information on the Supplier’s employees and affiliates, locations, company size and ability to provide technical support simultaneously to several counties in the Commonwealth of Pennsylvania and other jurisdictions that use its Voting System. Additionally, 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;
 - **Security Measures and any updated security testing or risk/vulnerability assessments** conducted by the Supplier or a third-party;
 - **SOC 2 Reporting** – ES&S shall provide the Secretary with its annual American Institute of Certified Public Accountants (AICPA) Attestation Standard (AT) Sec. 101 Service Organization Control (“SOC”) 2, Type 2 certification (AT Sec. 101 SOC 2, Type 2), or an equivalent certification approved by the Commonwealth. Equivalent certifications include, but are not

limited to: International Organization of Standards (ISO) 2700x certification; certification under the Federal Information Security Management Act (FISMA); and AT Sec. 101 SOC 3 (SysTrust/WebTrust) certification.

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

GG. 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.

HH. Jurisdictions implementing the EVS 6021 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.

II. In addition, pursuant to the Directive on Electronic Voting Systems issued by the Secretary of the Commonwealth on August 8, 2006, the Directive Concerning the Use, Implementation and Operation of Electronic Voting Systems by the County Boards of Elections issued on June 9, 2011 and Section 1105-A(d) of the Pennsylvania Election Code, 25 P.S. § 3031.5(d), this certification and approval is valid only for EVS 6021. If the vendor or a County Board of Elections makes any changes to the EVS 6021 Voting System subsequent to the date of its examination, it must immediately notify both the Pennsylvania Department of State and the relevant federal testing authority or laboratory, or their successors. Failure to do so may result in the decertification of the EVS 6021 Voting System in the Commonwealth of Pennsylvania.

V. Recommendations

- A. All jurisdictions implementing EVS 6021 Voting System should ensure that the system is correctly set up pursuant to all the recommendations of the Directive Concerning the Use, Implementation and Operations of Electronic Voting Systems by the County Boards of Elections issued by the Secretary of the Commonwealth on June 9, 2011 and Guidance on Electronic Voting System Preparation and Security, September 2016.
- B. All jurisdictions implementing EVS 6021 should take appropriate steps to ensure that voter education is part of the implementation plan.
- C. All jurisdictions implementing the EVS 6021 should ensure that precinct election officials and poll workers receive appropriate training and are comfortable using the system.
- D. All jurisdictions considering purchase of the EVS 6021 should review the System Limits as mentioned in the EAC certification scope added as Attachment A to this report.
- E. 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.
- F. Secretary recommends in-house ballot definition activities at a county location whenever possible. If an external vendor location is used, the county should implement oversight measures to ensure that election data including ballot definition files and audit logs stored on devices outside of the county are protected from unauthorized access.

VI. Conclusion

As a result of the examination, and after consultation with the Department's staff, counsel and the examiners, the Secretary of the Commonwealth concludes that the EVS 6021 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 Election Code, **provided the voting system is implemented under the conditions listed in Section IV of this report.**

Accordingly, the Secretary certifies EVS 6021 for use in this Commonwealth.

The ExpressVote XL and ExpressVote 2.1 can accommodate 10-12 voters with disabilities during an election day or 20-60 voters an hour when used as the primary voting system depending on size of the ballot. DS200 can serve 120-180 voters per hour. The ExpressVote XL and ExpressVote 2.1 ballot box will hold approximately 300 ballots and DS 200 ballot boxes can hold 1250 to 3000, 19-inch ballots depending on the type of ballot box used. After the capacity is reached the poll workers will need to change the ballot box or empty the contents to a secure box and replace the ballot box.

Attachment A – EAC Certification Scope



**EVS6021_Scope&Ce
rt.pdf**



United States Election Assistance Commission

Certificate of Conformance

ES&S EVS 6.0.2.1



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 (VMSG 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: 6.0.2.1

Name of VSTL: SLI Compliance

EAC Certification Number: ESSEVS6021

Date Issued: November 12, 2018

Executive Director

Scope of Certification Attached

Manufacturer: Election Systems & Software
System Name: EVS 6.0.2.1
Certificate: ESSEVS6021

Laboratory: SLI Compliance
Standard: VVSG 1.0 (2005)
Date: November 12, 2018



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 6.0.2.1 voting system is a modification of the ES&S EVS 6.0.0.0 voting system, certified on July 2, 2018, which contains limited changes to the Electionware application. The ES&S EVS 6.0.2.1 voting system is composed of software applications, central count location devices and polling place devices with accompanying firmware, and COTS hardware and software.

Electionware®

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 of five software groups: Define, Design, Deliver, Results and Manage.

ExpressVote XL™

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

ExpressTouch®

ExpressTouch Electronic Universal Voting System (ExpressTouch) is a DRE voting system which supports electronic vote capture for all individuals at the polling place.

ExpressVote® Hardware 1.0

ExpressVote Universal Voting System Hardware 1.0 (ExpressVote HW1.0) 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 scanners.

ExpressVote® Hardware 2.1

ExpressVote Universal Voting System Hardware 2.1 (ExpressVote HW2.1) 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, and tabulation scanning into a single unit. ExpressVote HW2.1 is capable of operating in either marker or tabulator mode, depending on the configurable mode that is selected in Electionware.

There are two separate versions of the ExpressVote hardware version 2.1: 2.1.0.0 and version 2.1.2.0 (6.4 & 6.8). Please note that all future references to ExpressVote HW 2.1 as used throughout the document refers to both hardware versions.

DS200®

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).

DS450®

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®

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).

Event Log Service (ELS)

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)

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 ES&S applications such as Electionware can use that information for media validation purposes.

Configurations

Within the scope of the ES&S EVS 6.0.2.1 voting system, three unique configurations are supported, in order to accommodate limitations of components with the ES&S EVS 6.0.2.1 voting system.

Configuration A

ES&S EVS 6.0.2.1: Test Configuration A is comprised of the entire suite of voting system products.

- Electionware
- ExpressVote Marker (HW 1.0)
- ExpressVote Marker/Tabulator (HW 2.1)
- ExpressVote XL
- ExpressTouch
- DS200
- DS450
- DS850

Configuration B

- Electionware
- ExpressVote Marker (HW 1.0)
- ExpressVote Marker/Tabulator (HW 2.1)
- DS200
- DS450
- DS850

Configuration C

- Electionware
- ExpressVote XL

Mark Definition

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

Tested Marking Devices

Bic Grip Roller Pen

Language Capability

EVS 6.0.2.1 supports English, Spanish, Chinese (Cantonese), Korean, Japanese, Hindi, Bengali, Vietnamese, Tagalog, Creole, Russian, and French. Configuration C also supports Punjabi and Gujarati.

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	5.0.2.0			
ES&S Event Log Service	1.6.0.0			
Removable Media Service	1.5.0.0			
ExpressVote HW 1.0	1.5.1.0	1.0		Paper-based vote capture and selection device
ExpressVote Previewer (1.0)	1.5.1.0			
ExpressVote HW 2.1	2.4.3.0	2.1.0.0 2.1.2.0		Hybrid paper-based vote capture and selection device and precinct count tabulator
ExpressVote Previewer (2.1)	2.4.3.0			
DS200	2.17.0.0	1.2.1, 1.2.3, 1.3		Precinct Count Tabulator
DS450	3.1.0.0	1.0		Central Count Scanner and Tabulator
DS850	3.1.0.0	1.0		Central Count Scanner and Tabulator
ExpressVote XL	1.0.1.0	1.0		Hybrid full-faced paper-based vote capture and selection device and precinct count tabulator
ExpressTouch	1.0.0.0	1.0		DRE
ExpressVote Rolling Kiosk		1.0	98-00049	Portable Voting Booth
Voting Booth		N/A	98-00051	Stationary Voting Booth
ExpressVote Single Table		N/A	87033	Voting Table for One Unit
ExpressVote Double Table		N/A	87032	Voting Table for Two Units
ADA Table		N/A	87031	Voting Table for One Unit

System Component	Software or Firmware Version	Hardware Version	Model	Comments
DS200 Ballot Box		1.0	98-00009	Collapsible Ballot Box
DS200 Ballot Box		1.2, 1.3, 1.4, 1.5	57521	Plastic ballot box
DS200 Ballot Box		1.0, 1.1, 1.2	76245	Metal ballot box
DS200 Tote Bin		1.0	00074	Tote Bin Ballot Box
DS450 Cart		N/A	3002	
DS850 Cart		N/A	6823	
Universal Voting Console		1.0	98-00077	Detachable ADA support peripheral
Tabletop Easel		N/A	14040	
ExpressTouch Voting Booth		N/A	98-00081	Stationary Voting Booth
SecureSetup	2.0.0.1			Proprietary Hardening Script

COTS Software

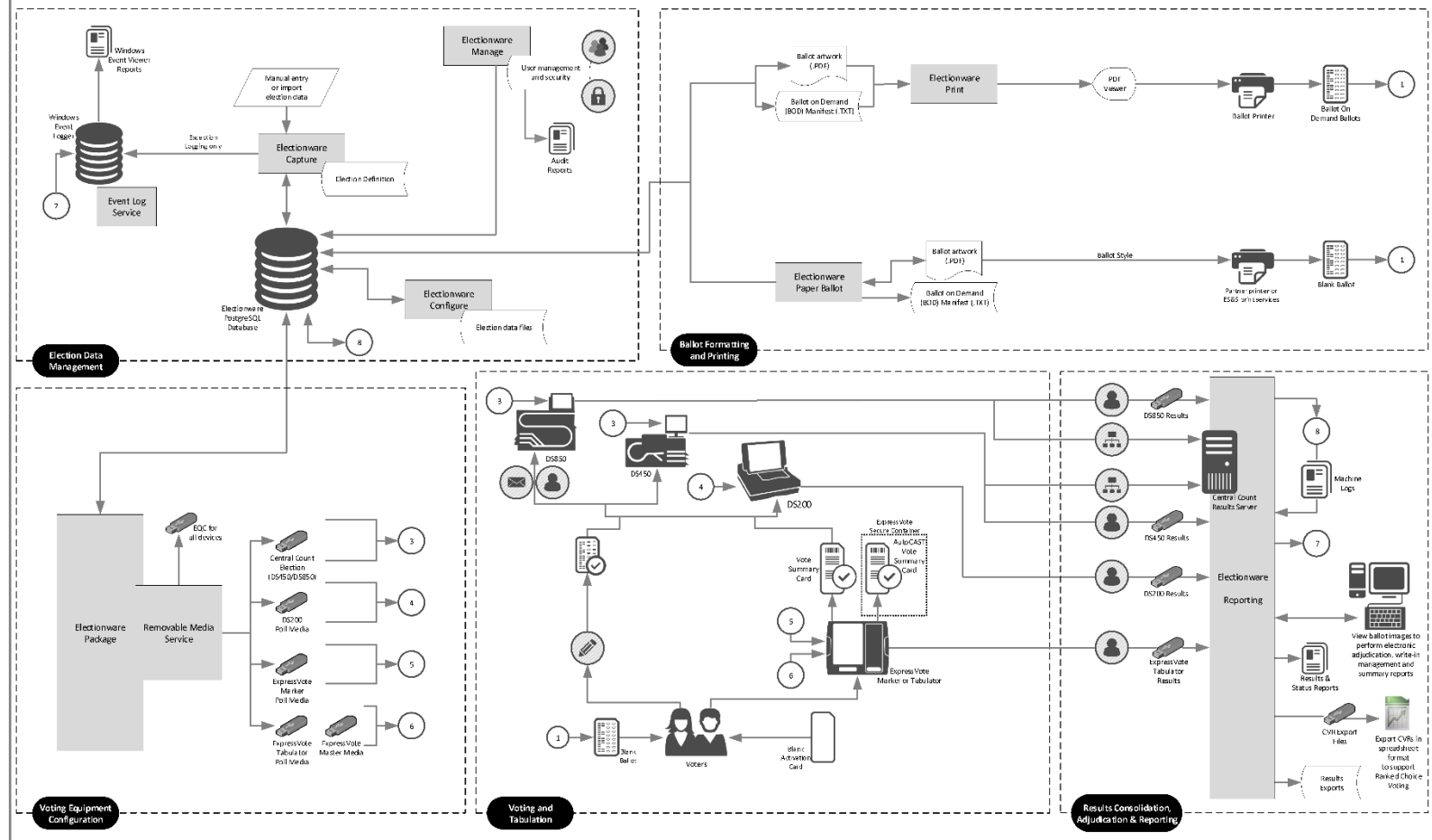
Manufacturer	Application	Version
Microsoft Corporation	Server 2008	R2 w/ SP1 (64-bit)
Microsoft Corporation	Windows 7 Professional	SP1 (64-bit)
Microsoft Corporation	WSUS Microsoft Windows Offline Update Utility	11.1.1
Symantec	Endpoint Protection	14.0.1 (64-bit)
Symantec	Symantec Endpoint Protection Intelligent Updater (File-Based Protection)	20180116-002-core3sds5i64.exe
Symantec	Symantec Endpoint Protection Intelligent Updater (Network-Based Protection)	20180115-040-IPS_IU_SEP_14RU1.exe
Symantec	Symantec Endpoint Protection Intelligent Updater (Behavior-Based Protection)	20180108-003-SONAR_IU_SEP.exe
Cerberus	CerberusFTP Server – Enterprise	9.0.3.1 (64-bit)
Adobe	Acrobat	XI
Microsoft Corporation	Visual C++ Redistributable	vc_redist.x86.exe (32-bit)
RSA Security	RSA BSAFE Crypto-C ME for Windows 32-bit	4.1
OpenSSL	OpenSSL	2.0.12
OpenSSL	OpenSSL	2.0.16
OpenSSL	OpenSSL	1.02d
OpenSSL	OpenSSL	1.02h
OpenSSL	OpenSSL	1.02k

COTS Hardware

Manufacturer	Hardware	Model/Version
EMS Server		
EMS Client or Standalone Workstation		
Innodisk	USB EDC H2SE (1GB) for ExpressVote 1.0	DEEUH 1-01GI72AC1SB
Innodisk	USB EDC H2SE (16GB) for ExpressVote 2.1	DEEUH 1-16GI72AC1SB
Delkin	USB Flash Drive	512MB, 1 GB, 2 GB, 4 GB, 8 GB
Delkin	Validation USB Flash Drive	16 GB

Delkin	USB Embedded 2.0 Module Flash Drive	MY16MGFSY-RA000-D / 16 GB
Delkin	Compact Flash Memory Card	1 GB
Delkin	Compact Flash Memory Card Reader/Writer	6381
Delkin	CFAST Card	2GB, 4GB
Delkin	CFAST Card Reader/Writer	DDREADER-48
CardLogix	Smart Card	CLXSU128kC7/ AED C7
SCM Microsystems	Smart Card Writer	SCR3310
Avid	Headphones	86002
Zebra Technologies	QR code scanner (Integrated)	DS457-SR20009
Symbol	QR Code scanner (External)	DS9208
Dell	DS450 Report Printer	S2810dn
OKI	DS450 and DS850 Report Printer	B431dn/B431d
OKI	DS450 and DS850 Audit Printer	Microline 420
APC	DS450 UPS	Back-UPS Pro 1500
APC	DS850 UPS	Back-UPS RS 1500 or Pro 1500
Tripp Lite	DS450 and DS850 Surge Protector	Spike Cube
Seiko Instruments	Thermal Printer	LTPD-347B
NCR/Nashua	Paper Roll	2320
Fujitsu	Thermal Printer	FTP-62GDSL001/ FTP-63GMCL153



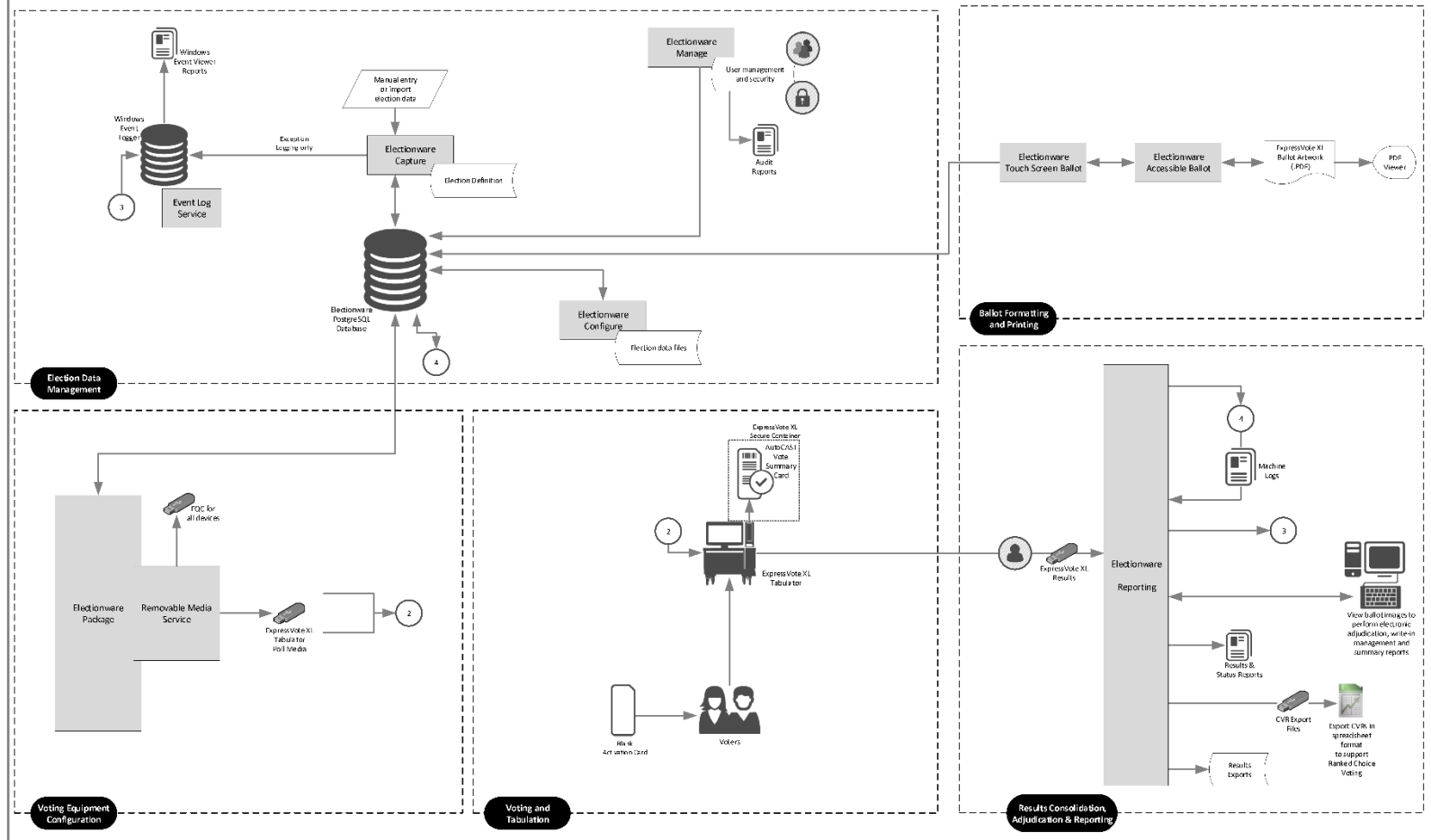


Election Systems & Software: EVS 6.0.2.1 – System Configuration – Configuration C

Rev. 1.0

Dept. Certification

Date: 09.05.2018



System Limitations

This table depicts the limits the system has been tested and certified to meet.

System Characteristic	Boundary or Limitation	Limiting Component
Max. precincts allowed in an election	9,900	Electionware
Max. ballot styles in an election	15,000	Electionware
Max. candidates allowed per election	10,000	Electionware
Max. contests allowed in an election	10,000	Electionware
Max. number of parties allowed	General election: 75 Primary election: 30	Electionware
Max. District Types/Groups	25	Electionware
Max. districts of a given type	250	Electionware
Max. Contests allowed per ballot style	500	N/A
Max. Reporting Groups in an election	14	Electionware
Max. candidates allowed per contest	230	Electionware
Max. "Vote For" per contest	230	Electionware
Max. ballots per batch	1,500	DS450/DS850

Component Limitations:

Electionware

1. Electionware capacities exceed the boundaries and limitations documented for ES&S voting equipment and election reporting software. For this reason, ballot tabulator limitations define the boundaries and capabilities of Electionware system.
2. Electionware software field limits were calculated using default text sizes 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 limits lower than those listed in the System Overview.
3. The Electionware Export Ballot Images function is limited to 250 districts per export.
4. Electionware is limited to the language special characters listed in the System Overview. Language special characters other than those on this list may not appear properly when viewed on equipment displays or reports.

5. The Straight Party feature must not be used in conjunction with the Single or Multiple Target Cross Endorsement features.
6. The 'MasterFile.txt' and the 'Votes File.txt' do not support results for elections that contain multiple sheets or multiple ExpressVote cards per voter. These files can be produced using the Electionware > Reporting > Tools > Export Results menu option. This menu option is available when the Rules Profile is set to "Illinois".

Paper Ballot Limitations

1. The paper ballot code channel, which is the series of black boxes that appear between the timing track and ballot contents, 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. If Sequence is used as a ballot style ID, it must be unique election-wide and the Split code will always be 1. In this case the practical style limit would be 16,300.
3. The ExpressVote activation card has a limited ballot ID based on the 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.

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 ES&S ExpressVote are never approached during testing.

ExpressVote XL

1. ExpressVote XL capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting systems. 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 ES&S 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. ExpressVote XL does not support Massachusetts Group Vote.
4. ExpressVote XL does not support Universal Primary Contest.
5. ExpressVote XL does not support Multiple Target Cross Endorsement.
6. ExpressVote XL does not support Reviewer or Judges Initials boxes.
7. ExpressVote XL does not support multi-card ballots.
8. 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.
9. ExpressVote XL does not support Team Write-In.

ExpressTouch

1. ExpressTouch capacities exceed all documented limitations for the ES&S election management, vote tabulation and reporting systems. 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, 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.
6. ExpressTouch does not support Team Write-In.

DS200

1. The ES&S 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 at least three 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 Standard (provide definition of how supported)	Yes	Configuration B only
Primary: Open Blanket (provide definition of how supported)	No	
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	
Write-in: Identification of write-ins for resolution at central count	Yes	
Primary Presidential Delegation Nominations & Slates:		

Feature/Characteristic	Yes/No	Comment
Primary Presidential Delegation Nominations: Displayed delegate slates for each presidential party	No	
Slate & Group Voting: one selection votes the slate.	No	
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	
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	It is possible to list the number of voters.
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	
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 2 nd 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 2 nd 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		

Feature/Characteristic	Yes/No	Comment
Ranked Order Voting: Voters can write in a ranked vote.	No	
Ranked Order Voting: A ballot stops being counting when all ranked choices have been eliminated	No	
Ranked Order Voting: A ballot with a skipped rank counts the vote for the next rank.	No	
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.	No	
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		
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	

Feature/Characteristic	Yes/No	Comment
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, ExpressTouch, ExpressVote HW2.1, ExpressVote XL
Central counting device	Yes	DS450 and/or DS850

Baseline Certification Engineering Change Order's (ECO)

There are not any ECO's certified with the voting system.

Attachment B – Accessibility Examination Findings and Recommendations

A) Top problems and Recommendations as listed in the accessibility examiner's report



Top problems.pdf

B) All observations from Accessibility Examination



All
observations.pdf

C) Recommendations for Deployment from Accessibility Examiner report



Recommendations
for deployment.pdf

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. Deselections 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 VWSG 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	<p>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.</p> <ul style="list-style-type: none"> • 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. <p>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.</p> <p>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.</p>	XL	Set up
Keypads	<p>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.</p> <ul style="list-style-type: none"> • On the XL, the jack is on the keypad 	Both	Needs assistance

Function	Observation	System	Severity
	<ul style="list-style-type: none"> On the EV, it is on the front of the device below the screen <p>However, on both systems:</p> <ul style="list-style-type: none"> 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. <p>A blind advocate participant suggested that a raised headset icon would be an easily recognized symbol to solve this problem</p>		
Messages	<p>Some of the participants thought a screen required them to take action when it didn't</p> <ul style="list-style-type: none"> 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	<p>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.</p> <ul style="list-style-type: none"> • 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. <p>However, the EV audio does announce when a multi-select contest is “fully voted,” which participants who heard this message found helpful.</p>	Both	<p>Annoyance</p> <p>Or</p> <p>Problem solving</p>
Display	<p>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.</p>	Both	<p>Annoyance</p> <p>Or</p> <p>Problem solving</p>

Problems

Function	Observation	System	Severity
Display	<p>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.</p>	EV	<p>Potential</p> <p>Show stopper</p>

Function	Observation	System	Severity
Display	<p>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.</p> <ul style="list-style-type: none"> 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	<p>The Home key works in different ways, depending on where the cursor is on the screen.</p> <ul style="list-style-type: none"> 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. <p>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.</p>	Both	Problem-solving
Keypads	<p>There were some concerns about the number of the keys:</p> <ul style="list-style-type: none"> [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)	<p>There is no option to ask the system to spell out a candidate name.</p> <ul style="list-style-type: none"> 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	<p>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.</p> <p>On the full-face ballot, this was visually confusing because it showed a candidate selected in the “wrong” column.</p>	XL	Problem solving
Ballot (Audio)	<p>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.</p> <p>One voter suggested announcing “You selected” <i>before</i> the name of the candidate in these cases.</p>	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)	<p>Several participants, including poll workers, hesitated at the screen for straight party, wondering if you had to select a party to continue.</p> <p>Better instructions or an option for "No straight party selection" would be helpful</p>	EV XL (large)	Problem solving
Ballot (Straight Party)	<p>The interaction with changing straight party selections was confusing in several ways:</p> <ul style="list-style-type: none"> Trying to select just one candidate from a group selected by straight party produced inconsistent results, depending on the exact configuration of the candidates. <ul style="list-style-type: none"> If a participant tries to deselect a candidate, it resulted in that candidate being selected and others deselected. If they tried 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. <ul style="list-style-type: none"> 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)	<p>Not being able to clear all selections on a contest with an available straight party option was very confusing.</p> <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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	<p>Voters used to the Danaher Shouptronics expected to find a “Vote” button available to them at any time.</p> <ul style="list-style-type: none"> 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	<p>On the XL, blind participants were not sure what was happening during the printing process.</p> <ul style="list-style-type: none"> 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	<p>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.</p> <ul style="list-style-type: none"> 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	<p>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.</p> <ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> • 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	<p>None of the participants were able to verify their paper ballot on the XL.</p> <ul style="list-style-type: none"> • 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.

Attachment C – Implementation Attestation



Implementation
attestation.pdf



Voting System Implementation Attestation

System Name: _____

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)
ES&S Event Log Service				
Removable Media Service				
ExpressVote HW 2.1				
ExpressVote Previewer (2.1)				
DS200				
DS450				
DS850				
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 6021 system. Any ancillary components like switches, ballot boxes, charging carts sold on this contract are EAC certified components of the EVS 6021 electronic voting system. (Attach a list of items sold on this contract.)

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

Vendor Representative Signature: _____

Vendor Representative Name: _____ **Title:** _____

Telephone: _____ **Email:** _____

County Representative Signature: _____

County Representative Name: _____ **Title:** _____

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 the Supplier'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:
 - i. programming of all voting units and ancillary devices;
 - ii. tabulating results during the unofficial and official canvass;
 - iii. ensuring accuracy and integrity of results;
 - iv. preparing polling places and setting up the system for election day operation;
 - v. Training on accessibility options of the voting system
 - vi. Election day operating procedures;
 - vii. auditing procedures;
 - viii. conducting a recount;
 - ix. preserving records;
 - x. printing, designing, and formatting election reports;
 - xi. troubleshooting common issues;
 - xii. safeguarding and preventing tampering and unauthorized access to all parts of the Voting System; and

Attachment E – Source Code Escrow Obligations for ES&S

The Supplier 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). The Supplier must pay all costs associated with 1) placing the codes in escrow and 2) verifying that the Supplier 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 Members, the Supplier 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 the Supplier, Supplier 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 Supplier.
- 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.
- d. Obtaining source code. Supplier agrees that upon the occurrence of any event or circumstance which demonstrates with reasonable certainty the inability or unwillingness of Supplier 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 Supplier Property placed in escrow from the escrow agent.

EXHIBIT D

Kathleen Kotula, Esq.
Executive Deputy Chief Counsel
Pennsylvania Department of State
306 North Office Building
401 North Street
Harrisburg, PA 17120

August 22, 2019

RE: Petition to re-examine ExpressVote XL

Dear Ms. Kotula,

On behalf of the petitioners who requested re-examination of the ExpressVote XL under 25 P.S. § 3031.5, I am writing to follow up on our telephone communications beginning August 14, 2019 and concluding August 21, 2019. While we appreciate that the Department plans to expeditiously re-examine the ExpressVote XL as requested in our July 16, 2019 petition, we have serious concerns about the process as we understand it from you.

Our understanding is that, to this point, every single examination and re-examination conducted in Pennsylvania since at least 2005 has been conducted in public, with very limited breaks for discussions of proprietary information. This precedent of transparency was set with the Secretary's process in addressing the very first petition to re-examine a previously certified system, the 2005 petition to re-examine the Unilect Patriot.¹ According to the report prepared for the Secretary on this re-examination, "[a] limited number of members of the public and the press were permitted to attend the reexamination, as was a representative of the requesting electors."² The voting system was decertified in May 2005.

Since then, to the best of our knowledge, every single examination and re-examination—including the 2012 re-examinations spurred by the litigation in

¹ See Michael Ian Shamos, *UniLect Corporation Patriot Voting System: An Evaluation Prepared for the Secretary of the Commonwealth of Pennsylvania* (Apr. 2005), <http://bit.ly/2L42POb>, at 2.

² *Id.* at 6.

*Banfield v. Cortes*³—has been open to members of the public. Petition signer Mary Beth Kuznik has personally attended over 20 examinations since 2005.

Apart from your office's own past practice and the requirements of the Sunshine Act,⁴ conducting the re-examination in secret would violate your office's recent agreement settling a federal constitutional lawsuit against the Secretary's office in *Stein v. Cortes*.⁵ Paragraph 4 of that settlement agreement provides:

To ensure that new voting systems meet the criteria set forth [in the settlement], and to work collaboratively to further the parties' shared goal of promoting reliable and secure voting in Pennsylvania, a designee of Plaintiffs will be invited to observe the certification process. To that end:

a. The Secretary shall ensure that the Plaintiffs are made aware of all currently scheduled, and future scheduled, Commonwealth on-site certification testing for Voting Systems;

b. Plaintiffs will appoint a person to attend any and/or all on-site certification testing undertaken by or on behalf of the Secretary, and the representative may provide written or oral comments to the Secretary concerning the certification of any Voting Systems at breaks during the on-site certification testing or within a reasonable period after completion of the on-site testing

As your office has neither notified the *Stein* plaintiffs' counsel nor their designated representative (Professor J. Alex Halderman) of the time and place of the re-examination, nor invited them to observe the process and provide comments, your office appears to be proceeding in violation of the *Stein* settlement.

Please advise us on your view as to whether the re-examination is subject to the Sunshine Act; your office's plans with regard to public access to the re-examination; and your office's plan for compliance with the *Stein* settlement.

³ *Banfield v. Aichele*, 51 A.3d 300, 314 (Commw. Ct. Penn. 2012), *aff'd sub nom. Banfield v. Cortes*, 110 A.3d 155 (2015).

⁴ 65 P.S. §§ 701 *et seq.*

⁵ *Stein v. Cortes*, No. 16-cv-06287, ECF No. 108 (E.D. Pa. Nov. 28, 2018), *available at* <http://bit.ly/SteinSettlement>.

We hope that your office will conduct the re-examination in a manner that will avoid the need for litigation regarding the procedures.

Sincerely,

Ronald A. Fein, Legal Director
John C. Bonifaz, President
Free Speech For People
1320 Centre St. #405
Newton, MA 02459
(617) 244-0234
rfein@freespeechforpeople.org
jbonifaz@freespeechforpeople.org

cc: Ilann Maazel, Emery Celli Brinckerhoff& Abady

EXHIBIT E

EMERY CELLI BRINCKERHOFF & ABADY LLP

RICHARD D. EMERY
ANDREW G. CELLI, JR.
MATTHEW D. BRINCKERHOFF
JONATHAN S. ABADY
EARL S. WARD
ILANN M. MAAZEL
HAL R. LIEBERMAN
DANIEL J. KORNSTEIN
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DIANE L. HOUK
JESSICA CLARKE

ALISON FRICK
DAVID LEBOWITZ
DOUGLAS E. LIEB
ALANNA KAUFMAN
EMMA L. FREEMAN
DAVID BERMAN
ASHOK CHANDRAN

DANIEL TREIMAN

November 28, 2018

By ECF

The Honorable Paul S. Diamond
United States District Judge
Eastern District of Pennsylvania
Philadelphia, PA 19106

Re: Stein v. Cortes, No. 2:16-CV-6287-PD

Your Honor:

We represent Plaintiffs in this matter. We are pleased to report that the parties have settled this case (*see* Settlement Agreement, attached as Ex. A).

Pursuant to paragraph 13 of the Settlement Agreement, the parties will shortly submit a proposed Stipulation and Order dismissing the case but retaining jurisdiction to enforce the terms of the Settlement Agreement.

Respectfully,

/s/

Ilann M. Maazel

c. All counsel of record (by ECF)

Exhibit A

**UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA**

**JILL STEIN, RANDALL REITZ, ROBIN HOWE,
SHANNON KNIGHT, EMILY COOK, and
KIMBERLY KUPKA,**

Plaintiffs,

No. 16-CV-6287

v.

**PEDRO A. CORTÉS, in his official capacity as
Secretary of the Commonwealth; and JONATHAN
MARKS, in his official capacity as Commissioner
of the Bureau of Commissions, Elections, and
Legislation,**

Defendants.

SETTLEMENT AGREEMENT AND RELEASE

I. INTRODUCTION

1. This private settlement agreement and release (the “Agreement”) is entered into as of the date of the last signatory (“Effective Date”), among the plaintiffs, Jill Stein, Randall Reitz, Robin Howe, Shannon Knight, and Emily Cook;¹ and defendants Robert Torres, in his official capacity as Acting Secretary of the Commonwealth,² and Jonathan Marks, in his official capacity as Commissioner of the Bureau of Commissions, Elections and Legislation.

¹ Plaintiff Kimberly Kupka withdrew from this action by the filing of a Notice of Withdrawal with this Honorable Court on August 29, 2018.

² Defendant Pedro A. Cortes resigned the position of Secretary of the Commonwealth on October 10, 2017; Robert Torres was designated to serve as Acting Secretary of the Commonwealth on the same day.

II. VOTER-VERIFIABLE PAPER BALLOTS FOR EVERY VOTER

2. The Secretary will only certify new voting systems for use in Pennsylvania if they meet these criteria:

- a. The ballot on which each vote is recorded is paper³;
- b. They produce a voter-verifiable record of each vote; and
- c. They are capable of supporting a robust pre-certification auditing process.

3. The Secretary will continue to direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.

4. To ensure that new voting systems meet the criteria set forth in Paragraphs #2-3, and to work collaboratively to further the parties' shared goal of promoting reliable and secure voting in Pennsylvania, a designee of Plaintiffs will be invited to observe the certification process. To that end:

- a. The Secretary shall ensure that the Plaintiffs are made aware of all currently scheduled, and future scheduled, Commonwealth on-site certification testing for Voting Systems;
- b. Plaintiffs will appoint a person to attend any and/or all on-site certification testing undertaken by or on behalf of the Secretary, and the representative may provide written or oral comments to the Secretary concerning the certification of any Voting Systems at breaks during the on-site certification testing or within a reasonable period after completion of the on-site testing; and

³ A VVPAT receipt generated by a DRE machine is not a paper ballot.

- c. To the extent there are periods during the on-site testing when proprietary information must be discussed among the vendor, the contracted testing examiner(s) and the Department of State, Plaintiffs' representative will be excused from the testing room.

III. ROBUST PRE-CERTIFICATION AUDITING

5. The Secretary will direct each county to audit all unofficial election results using robust pre-certification audit methods to be determined based on the recommendations of a Work Group established by the Secretary, consistent with applicable statutory authority and the following principles:

- a. Pre-certification. Audits must be completed before the election results are certified.
- b. Automatic. Audits must happen automatically, without a request from voters or candidates.
- c. Best Practices. Audits shall be conducted consistent with best practices in the field.
- d. Escalation. If the initial audit fails to rule out a possible outcome-altering error with the requisite level of confidence, additional measures must be undertaken to ensure that there are no outcome-altering errors in the vote.

6. The Work Group shall be formed by January 1, 2019, and shall complete its written report by January 1, 2020.

7. Plaintiffs shall have the right to designate up to ten percent (10%) of the members of the Work Group, and at a minimum one person.

8. The Secretary shall direct that pilot auditing occur in 2021, and that auditing be fully implemented by the 2022 general election.

IV. ATTORNEYS' FEES

9. Defendants will pay to Plaintiffs \$150,000.00 (One Hundred Fifty Thousand Dollars) in reasonable attorneys' fees and costs incurred in litigating this action through the execution of the agreement. Said payment is a complete settlement of all fees and costs, and encompasses all fees and costs related to Plaintiffs' and their agents' participation in the process of certification of voting machines as delineated in this agreement, as well as Plaintiffs' and their agents' participation in the Work Group delineated in this agreement. Said payment will be paid by means of one check made payable to the law firm of "Emery Celli Brinckerhoff & Abady LLP, as attorney." Defendants will submit the appropriate paperwork for issuance of the check to the Pennsylvania Bureau of Risk Insurance Management no later than 30 days after full execution of this Agreement.

V. ENFORCEMENT

10. The parties agree that this Agreement between the parties must be considered a private settlement agreement, does not require court approval, and that the parties are not seeking Court approval.

11. The parties agree that this Agreement may not be construed by either Party as a Consent Decree, nor shall any Party argue before any Court of competent jurisdiction, federal or state, that this Agreement is a Consent Decree.

12. Should any Court determine during the term of the private settlement agreement that this Agreement is a Consent Decree, then the private agreement is voided and the parties agree that a petition to reopen the case may be filed.

13. The Court shall retain jurisdiction to enforce the terms of this private Settlement Agreement. The parties agree to request the Court to enter an Order dismissing this case, but retaining jurisdiction solely to enforce the terms of this private Settlement Agreement.

14. Prior to seeking specific performance from the Court, if Plaintiffs have a reasonable basis to believe that Defendants are in non-compliance with a material term of this Agreement, Plaintiffs will notify the Defendants in writing of the specific compliance issue(s). This notice shall identify with particularity the basis of the claim that the Defendants are not in compliance and the specific provisions of this Agreement that are implicated.

15. Within thirty (30) days of receipt of the notification, the Defendants will provide a good-faith written response to the Plaintiffs' notification with a full factual explanation: (a) as to why the Defendants believe they are in compliance with the Agreement; or (b) of possible non-compliance and a statement of the Defendants' plans to ensure full compliance.

VI. NOTICE

16. All notices required under this Agreement will be sent via electronic mail and overnight mail or overnight courier to the following people:

If to the Plaintiffs:

Emery Celli Brinckerhoff & Abady LLP
c/o Ilann M. Maazel
600 Fifth Avenue, 10th Floor
New York, NY 10020
imaazel@ecbalaw.com

If to the Defendants:

Department of State
c/o Timothy E. Gates
Office of Chief Counsel
306 North Office Building
401 North Street
Harrisburg, PA 17120-0500

tgates@pa.gov

VII. RELEASE AND DISCHARGE

17. In consideration of the terms and conditions called for herein, the Plaintiffs release and completely and forever discharge the Defendants, the Department of State, the Secretary of the Commonwealth, and the Commonwealth of Pennsylvania, their agents, attorneys, servants, representatives, and employees, past and present, and their past, present and future agents, attorneys, servants, representatives, and employees and all other persons with whom any of the former have been, are now or may hereinafter be affiliated, of and from any and all past or present claims, demands, obligations, actions, causes of action, rights, damages, costs, expenses, and any claims for compensation or punitive or other damages of any type which relates to the subject matter of this civil action. This release shall not prevent Plaintiffs from seeking court enforcement of the Agreement.

18. Plaintiffs expressly waive any and all claims which relate to the subject matter of this civil action, but of which the Plaintiffs do not know or suspect to exist, whether through ignorance, oversight, error, negligence or otherwise, and which if known would materially affect the Plaintiffs' decision to execute this Agreement.

19. All parties acknowledge that they have had the opportunity to consult with counsel, and further acknowledge that they fully understand and agree to the terms of this Agreement.

VIII. NO ADMISSION

20. It is understood and agreed that this settlement is a compromise of highly disputed claims, entered into to avoid further litigation. Nothing contained herein shall constitute or be construed to constitute an admission by any part of the merits of claims or defenses which were,

or which might have been, asserted by an opposing party in the course of litigating the captioned action. Nor shall anything contained herein constitute or be construed to constitute a concession by any party that it would not have prevailed on claims or defenses which were, or which might have been, asserted by it in the course of litigating the captioned action. The settlement has no precedential value and may not be cited or relied upon by any person in any proceeding for any purpose. It is not to be construed as an admission of liability on the part of any party being released hereunder, any such liability being expressly denied.

IX. MISCELLANEOUS PROVISIONS

21. Plaintiffs represent and warrant that besides themselves, no other person or entity has or has any interest in the claims referred to in this Agreement, except as otherwise set forth herein; and that they have the sole right and exclusive authority to execute this Agreement.

22. This Agreement contains the entire agreement between the parties with regard to the matters set forth herein and supersedes any and all prior agreements between the parties relating to all or part of the subject matter of this Agreement, and shall be binding upon and inure to the benefit of the successors and assigns of each from the Effective Date of this Agreement until December 31, 2022 (Expiration Date).

23. This Agreement shall be construed and interpreted according to the law of the Commonwealth of Pennsylvania.

24. If, subsequent to the Effective Date of this Agreement, any provision or term of this agreement is held to be invalid, illegal, unenforceable or in conflict with the law in any jurisdiction, the validity and legality of the remaining provisions will not be affected or impaired thereby.

25. Any headings or subheadings used herein are for reference purposes only and do not affect the substantive provisions of the Agreement.

26. This Agreement may be executed in counterparts, and a facsimile or .pdf signature shall be deemed to be, and have the same force and effect as, an original signature.

X. STIPULATION OF DISMISSAL

27. The parties agree that they will sign and submit a stipulation of dismissal with prejudice pursuant to Fed.R.Civ.P 41(a)(1)(A)(ii) to the Court at the expiration of this Agreement.

Counsel for Plaintiffs:

Ilann M. Maazel, Esq.
Douglas E. Lieb, Esq.
Emery Celli Brinckerhoff & Abady LLP
600 Fifth Avenue, 10th Floor
New York, NY 10020
(212) 763-5000

Date: November __, 2018


John G. Papianou, Esq.
Montgomery McCracken Walker & Rhoads
1735 Market Street
Philadelphia, PA 19103
(215) 772-7389

Date: November __, 2018

Counsel for Defendants:

Sue Ann Unger, Esq.
Senior Deputy Attorney General
Stephen Kovatis, Esq.
Senior Deputy Attorney General
1600 Arch Street, Suite 300
Philadelphia, PA 19103
(215) 560-2127

Date: November __, 2018


Timothy Gates, Esq.
Chief Counsel
Kathleen Kotula, Esq.
Executive Deputy Chief Counsel
Pennsylvania Department of State
306 North Office building
401 North Street
Harrisburg, PA 17120
(717) 783-0736

Date: November 28, 2018

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Counsel for Plaintiffs:

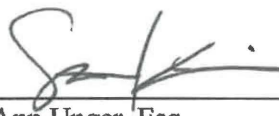
Ilann M. Maazel, Esq.
Douglas E. Lieb, Esq.
Emery Celli Brinckerhoff & Abady LLP
600 Fifth Avenue, 10th Floor
New York, NY 10020
(212) 763-5000

Date: November __, 2018

John G. Papianou, Esq.
Montgomery McCracken Walker & Rhoads
1735 Market Street
Philadelphia, PA 19103
(215) 772-7389

Date: November __, 2018

Counsel for Defendants:



Sue Ann Unger, Esq.
Senior Deputy Attorney General
Stephen Kovatis, Esq.
Senior Deputy Attorney General
1600 Arch Street, Suite 300
Philadelphia, PA 19103
(215) 560-2127

Date: November 28, 2018

Timothy Gates, Esq.
Chief Counsel
Kathleen Kotula, Esq.
Executive Deputy Chief Counsel
Pennsylvania Department of State
306 North Office building
401 North Street
Harrisburg, PA 17120
(717) 783-0736

Date: November __, 2018


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26. This Agreement may be executed in counterparts, and a facsimile or .pdf signature shall be deemed to be, and have the same force and effect as, an original signature.

X. STIPULATION OF DISMISSAL

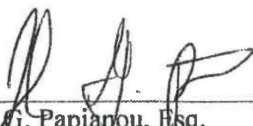
27. The parties agree that they will sign and submit a stipulation of dismissal with prejudice pursuant to Fed.R.Civ.P 41(a)(1)(A)(ii) to the Court at the expiration of this Agreement.

Counsel for Plaintiffs:



Ilann M. Maazel, Esq.
Douglas E. Lieb, Esq.
Emery Celli Brinckerhoff & Abady LLP
600 Fifth Avenue, 10th Floor
New York, NY 10020
(212) 763-5000

Date: November 28, 2018



John G. Papiagou, Esq.
Montgomery McCracken Walker & Rhoads
1735 Market Street
Philadelphia, PA 19103
(215) 772-7389

Date: November 28, 2018

Counsel for Defendants:

Sue Ann Unger, Esq.
Senior Deputy Attorney General
Stephen Kovatis, Esq.
Senior Deputy Attorney General
1600 Arch Street, Suite 300
Philadelphia, PA 19103
(215) 560-2127

Date: November __, 2018

Timothy Gates, Esq.
Chief Counsel
Kathleen Kotula, Esq.
Executive Deputy Chief Counsel
Pennsylvania Department of State
306 North Office building
401 North Street
Harrisburg, PA 17120
(717) 783-0736

Date: November __, 2018

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

NATIONAL ELECTION DEFENSE COALITION, et al., : New Case
Petitioner v. BOOCKVAR, KATHY :
:

PROOF OF SERVICE

I hereby certify that this 12th day of December, 2019, I have served the attached document(s) to the persons on the date(s) and in the manner(s) stated below, which service satisfies the requirements of Pa.R.A.P. 121:

Service

Served: Attorney General
Service Method: eService
Service Date: 12/12/2019
Address: Strawberry Square
16th Floor
Harrisburg, PA 17120
Phone: (71-7) -787-3391

Served: KATHY BOOCKVAR
Service Method: First Class Mail
Service Date: 12/12/2019
Address: Secretary of the Commonwealth
302 North Office Building
Harrisburg, PA 17120
Phone: --
Representing: Respondent KATHY BOOCKVAR

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

/s/ John Frank Murphy

(Signature of Person Serving)

Person Serving: Murphy, John Frank
Attorney Registration No: 206307
Law Firm: Baker & Hostetler LLP
Address: Baker Hostetler Llp
2929 Arch St Fl 12
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Representing: Petitioner BLANFORD, KATHLEEN
Petitioner BRUNO, THOMAS
Petitioner CITIZENS FOR BETTER ELECTIONS
Petitioner DREISBACH-WILLIAMS, ROGER
Petitioner FAUBERT, JEFF
Petitioner GARELLA, RICH
Petitioner HANNA, ANNE
Petitioner LEOPOLD, CAROLINE
Petitioner MURPHY, RACHEL
Petitioner NATIONAL ELECTION DEFENSE COALITION
Petitioner O'BRIEN-WERNER, SANDRA
Petitioner RUBIN, RAPHAEL
Petitioner STRAHS, STEPHEN
Petitioner STRAUSS, SHARON
Petitioner WERNER, ROBERT