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County of Los Angeles’ Voting Solutions for All People (VSAP) Tally 2.1 Voting System

Staff Report

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Table of Contents

| | | |
|------|--|----|
| I. | Introduction..... | 1 |
| | 1. Scope..... | 1 |
| | 2. Summary of the Application | 1 |
| | 3. Contracting and Outsourcing | 2 |
| II. | Summary of the System | 2 |
| III. | Testing Information and Results | 3 |
| | 1. Background..... | 3 |
| | 2. Functional Testing Summary | 3 |
| | 3. Software (Source Code) Testing Summary..... | 4 |
| | 4. Security and Telecommunications Testing Summary | 7 |
| | 5. Volume Testing Summary..... | 10 |
| | 6. Accessibility, Usability and Privacy..... | 12 |
| | 7. Hardware Testing | 18 |
| IV. | Compliance with State and Federal Laws and Regulations | 19 |
| V. | Conclusion | 26 |

I. INTRODUCTION

1. Scope

This report presents the test results for all phases of the certification test of the County of Los Angeles' Voting Solutions for All People (VSAP) 2.1 voting system. The purpose of the testing is to test the compliance of the voting system with California and federal laws, including the California Voting System Standards (CVSS). Testing also uncovers other findings, which do not constitute non-compliance, and those findings are reported to the County of Los Angeles to address the issues procedurally. The procedures for mitigating any additional findings are made to the documentation, specifically the County of Los Angeles' VSAP 2.1 Use Procedures.

2. Summary of the Application

The County of Los Angeles submitted an application for the VSAP 2.1 voting system on February 27, 2020. The system is comprised of the following major components:

- a. Tally Version 2.2.2.31
- b. Ballot Marking Device (BMD) Version 1.6
- c. FormatOS Version 1.6.1
- d. BMD BASI Version 1.6
- e. BMD BESI Version 1.6
- f. BMD Manager (BMG) Version 1.5
- g. VSAP Ballot Layout (VBL) Version 1.1.3
- h. Enterprise Signing Authority (ESA) (commercial off-the-shelf- equipment [COTS], Version 1.0
- i. IBML - ImageTrac 6400 (COTS)

In addition to each of the aforementioned components, which includes the executable code and the source code, the County of Los Angeles was required to submit the following: (1) the technical documentation package (TDP); (2) all the hardware and software components, including all peripheral devices needed for all phases of testing; (3) and the VSAP 2.1 Use Procedures.

3. Contracting and Outsourcing

Upon receipt of a complete application, the Secretary of State released a Request for Quote (RFQ) for assistance with testing of the VSAP 2.1 voting system.

Through the formal California contracting process and pursuant to California Elections Code section 19285, the Secretary of State awarded a contract to SLI Compliance, a division of Gaming Laboratories International, LLC, to serve in the capacity as the state-approved testing agency or expert technician to examine the voting system. Hardware testing of the ballot marking devices was subcontracted by SLI to National Technical Systems (NTS) Laboratories.

II. SUMMARY OF THE SYSTEM

The VSAP 2.1 voting system consists of the following components:

- **Tally Version 2.2.2.31** —Hardware and software that captures and processes ballot images ensuring that votes on paper ballots are digitally represented and counted, storing the images as Cast Vote Records (CVRs).
- **Ballot Marking Device (BMD) Version 1.6**—The central component of the voting system and the main interface for the voter. It includes a touchscreen, an audio-tactile interface, a paper handler, a QR code scanner, a dual-switch input, and an integrated ballot box. The BMD is used by voters to generate, verify, and cast paper ballots.
- **FormatOS Version 1.6.1** – Application used to wipe new BMD devices.
- **BMD BASI Version 1.6** – Application software for the BMD.
- **BMD BESI Version 1.6** – Application for election software for BMD.
- **BMD Manager (BMG) Version 1.5** — Ballot marking device manager application for managing BMDs including software, ballot configurations, and post-election data.
- **VSAP Ballot Layout (VBL) Version 1.1.3**—Defines ballot print formats for BMD, Vote by Mail (VBM), Remote Accessible Vote by Mail (RAVBM) and Uniformed Overseas Citizens Absentee Voting Act (UOCAVA) ballots. VBL also generates data files and packages to configure the BMD, BMG, ISB, and Tally.
- **Enterprise Signing Authority (ESA) Version 1.0**—A cryptographic sub-system (hardware and software) that ensures components of the VSAP

conform to security standards and that the data passed to components is secure and authenticated.

- **IBML - ImageTrac 6400** – High speed scanner used in conjunction with Tally tabulation software.

III. TESTING INFORMATION AND RESULTS

1. Background

The Secretary of State staff in conjunction with SLI, oversaw all phases of testing of the system, including Functional, Software Testing (Source Code Review), Security and Telecommunications (Red Team Penetration Testing), Volume, and Accessibility, Usability and Privacy Testing, and Hardware Testing.

2. Functional Testing Summary

System Configuration:

The system is self-contained on an air gapped network, per the CVSS requirements. SLI performed the task of creating the Trusted Build of the VSAP 2.1 voting system. The artifacts produced, will be kept, and distributed by the Secretary of State. This version is solely for the use of Los Angeles County.

Functional Testing:

The Functional Testing consisted of following the Use Procedures to import the following four (4) test elections into the environment:

- Presidential Primary (2020 Election) – This election tested the limitations of ballot styles that can be used within the system, in addition to language support (audio and visual).
- General Election (Los Angeles County 2016)
- Recall Election (2003 Election) – This election tested the capacity to list 135 candidates.
- Special Election – A special election with two congressional districts and one municipality.

Temporary workers hand marked each of the ballots, including some marginal marks to test out stacking functionality. Additionally, ballots were cast using the ballot marking devices (BMD). Each election was tabulated using the IBML high speed scanner. A manual tally of the results was conducted, and the reporting results confirmed accurate.

A detailed report of the Functional Testing conducted on the system can be found on our website.

3. Software Testing (Source Code) Review Summary

The review was conducted by SLI. SLI evaluated the security and integrity of the voting system by identifying any security vulnerabilities that could be exploited to:

- Alter vote recording,
- Alter vote results,
- Alter critical data (such as audit logs), or
- Conduct a “denial of service” attack on the voting system.

SLI’s review of the VSAP 2.1 source code against the applicable standards of the CVSS in sections 5 and 7 determined the following discrepancies were found in the source code **Table 3A: VSAP 2.1 Source Code Findings:**

| Table 3A: VSAP 2.1 Source Code Findings | |
|--|---|
| 1 | catch()” issue, five instances (CVSS 5.2.5.a) |
| 2 | Known Language Vulnerability, one instance (CVSS 5.2.8.b.v) |
| 3 | Unused function issue, one instance (CVSS 5.2.7.e) |
| 4 | compArray issue, one instance (CVSS 5.2.5.a) |

Each of the findings have no impact on the functionality of the system, and therefore are deemed non-issues.

Additionally, SLI was tasked to evaluate the Source Code for previous findings in the VSAP 2.0 source code, classified as “low.” The corresponding numbers of the findings begin on page 82 of the [VSAP 2.0 Software Report and are identified as #15 - 25](#). The results are listed below in the following table **3B: VSAP 2.0 Source Code Findings (Review):**

3B: VSAP 2.0 Source Code Findings (Review):

| # | Finding | Staff Analysis | Severity |
|----|--|---|----------|
| 15 | Third-party code provides an attack vector and must be monitored for changes and reviewed when they occur. | Resolved - All systems leverage third party tools in one form or another. Los Angeles County continues to actively monitor all components for potential threats. If the need arises to address those threats, the County must apply to the Secretary of State's office to make any modifications to the system, pursuant to California Elections Code Section 19216. | Low |
| 16 | SQL database initialization seed data is entirely optional, and INSERT IGNORE can lead to unforeseen consequences. | Resolved - This issue is classified as resolved, as SLI's assessment determined there was no instance of the setting. | Low |
| 17 | Database creation sets only_full_group_by to null, creating the possibility of inconsistent data on select. | Resolved - This issue is classified as resolved, as SLI's assessment determined there was no instance of the setting. | Low |
| 18 | Static code analysis of Go source code. | Resolved - This finding is informational, as the tool used to assess the code scans for preferences in the code. Functionally, this finding has no impact on the system. | Low |
| 19 | Static code analysis of JavaScript source code. | Resolved - This finding is informational, as the tool used to assess the code scans for preferences in the code. Functionally, this finding has no impact on the system. | Low |
| 20 | Public vulnerability search. See sections 4.2, Published Vulnerabilities, and 5.1, Public | Resolved - The system is air gapped, thus reducing the attack surface. Los Angeles County continues to actively monitor all components for potential threats. If the need arises to address those threats, the County must apply to | Low |

3B: VSAP 2.0 Source Code Findings (Review):

| # | Finding | Staff Analysis | Severity |
|----|---|---|----------|
| | Vulnerability Search, for complete results. | the Secretary of State's office to make any modifications to the system, pursuant to California Elections Code Section 19216. | |
| 21 | <p>Description: The CA certificate and key are stored in tmp and set to 777 file permissions.</p> <p>Programmatic copy of the CA cert and key to the cluster machines makes sense as its going to be necessary for later steps in the process, but in this case the file is set to 777 permissions, which means that all users have all permissions on these files.</p> | Resolved - The County has procedures in place, including detailed documentation in the VBL Build Guide to remedy this issue. The issue is considered resolved. | Low |
| 22 | Point of origin is not taken into consideration with authentication entries. | Resolved - SLI's evaluation of the template file did not reveal usage of the standard syntax of "%" to signify the any host wild card for users being inserted into the database. This issue is considered resolved. | Low |
| 24 | Python 2 reaches end of life at the end of this year and will not be supported after 2019-12-31. Any future security vulnerabilities found in Python 2 will not be fixed. | Resolved - This issue is classified as resolved as the system's use of python code is now Python 3. | Low |

3B: VSAP 2.0 Source Code Findings (Review):

| # | Finding | Staff Analysis | Severity |
|----|---|---|----------|
| 25 | Calico container securityContext set to privileged = true. securityContext: true is set for the container Calico, which controls network functions. | Unresolved pending Action from Calico - This item is actively being monitored by the County and will be addressed in a future version pending action from Calico, a third-party tool used in the system. | Low |

A Source Code Review report, including the findings and vendor responses and/or mitigations can be found on our website.

4. Security and Telecommunications Testing (Red Team) Summary

Security and Telecommunications (Red Team Penetration) testing of the VSAP 2.1 system was conducted in July of 2020, by SLI. The Security and Telecommunications Testing resulted in four findings requiring a response and/or mitigation. Each is described in **Table 4A: Security Findings**:

| Table 4A: Security Findings | | |
|--|---|--|
| Finding | County Mitigation/Response | Staff Analysis |
| Access Control Authorization (BMD & BMG) | Full disk encryption will remedy this issue and the county has submitted a plan to implement full disk encryption. | Partially Addressed: The County of Los Angeles' plan for Full Disk Encryption is currently being evaluated by the Secretary of State's office. |
| Access Control Tally and VBL | Full disk encryption is planned for the VSAP Tally 3.0 release. We believe this will go a long way towards mitigating | Partially Addressed: The County of Los Angeles' |

Table 4A: Security Findings

| Finding | County Mitigation/Response | Staff Analysis |
|---|--|---|
| | <p>these concerns. During the process of addressing full disk encryption and FIPS, we will also be evaluating more robust options for secret storage across the system. Importantly, most of these secrets are generated during the install process (and the rest are loaded in from the ESA), so secrets are environment specific. This means that in order to extract production secrets, an attacker would need to gain access to the production environment.</p> | <p>plan for Full Disk Encryption is currently being evaluated by the Secretary of State’s office. Additionally, the county has until June 30, of 2021 to meet the FIPS requirement.</p> |
| <p>BMG Telecommunications Access Control</p> | <p>In response to the Use Conditions on the VSAP 2.0 Certificate, a plan for Full Disk Encryption implementation was submitted by Los Angeles RR/CC on July 24th.</p> | <p>Partially Addressed: The County of Los Angeles plan for Full Disk Encryption is currently being evaluated by the Secretary of State’s office.</p> |
| <p>Nessus Scan – 2 High Risk and 14 Medium, and 5 Low</p> | <p>Disallowing USB access to the system components, alongside the available physical security measures, logging, and use of paper ballots by all voters provide measures of security, technical, tactical, and strategic. The County diligently maintains the air gapped configuration of the system, too.</p> | <p>The results are mitigated by physical security measures as noted. Additionally, if the county addresses the findings by making updates, those updated must be verified, tested, and approved by the SOS.</p> |

Additionally, SLI was tasked to evaluate the VSAP 2.1 for previous findings in the VSAP 2.0 Security Report. The findings begin on page 17 of the [VSAP 2.0 Security and Telecommunications Report](#). The results are listed below in the following table **4B: VSAP 2.0 Security Findings (Review)**:

| Table 4B: VSAP 2.0 Security Findings (Review) | | |
|---|---|---|
| Finding | County Mitigation/Response | Staff Analysis |
| FIPS 140-2 Compliant Cryptographic Module Utilization | N/A | In Process – The County of Los Angeles has until June 30, of 2021 to meet the FIPS requirement. |
| Full Disk Encryption | The county has submitted a plan to the Secretary of State to implement Full Disk Encryption. | Partially Addressed: The County of Los Angeles plan for Full Disk Encryption is currently being evaluated by the Secretary of State's office |
| Dependency on Root Access | Reducing programmatic root access will require significant architecture changes to BMG. For now, as the Report shows, we successfully removed USB access to the system to better prevent an intruder from being able to access and thus leverage root access. | Partially Addressed: The results are mitigated by physical security measures as noted. Additionally, if the county addresses the findings by making updates, those updated must be verified, tested, and approved by the SOS. |
| Shared/Static Secrets | In response to the Use Conditions on the VSAP 2.0 | Partially Addressed: |

| Table 4B: VSAP 2.0 Security Findings (Review) | | |
|---|--|---|
| Finding | County Mitigation/Response | Staff Analysis |
| | Certificate, a plan for Full Disk Encryption implementation was submitted by Los Angeles RR/CC on July 24th. | The County of Los Angeles' plan for Full Disk Encryption is currently being evaluated by the Secretary of State's office. |

A detailed report of the Security and Telecommunications Testing (Red Team Penetration) can be found on or website.

5. Volume Testing Summary

The Volume Test simulates conditions in which the ballot marking devices would be used on Election Day. Fifty (50) BMD units were tested during the volume test, with nine (9) temporary workers marking and casting one hundred (100) ballots per device over 2.5 days. During the VSAP 2.0 Volume Test, the ballot marking devices experienced a jamming rate of 0.0096%. Some of the devices were later determined to have faulty gears within the printing units, resulting in those devices having the gears replaced. The Volume Test for VSAP 2.1 consisted of an even split of twenty-five (25) ballot marking devices impacted by the replacement gears in the printing unit and twenty -five (25) devices that did not require the gears to be replaced. The BMD devices were each loaded with the March 2020 Presidential Primary Election, including 13 languages, with complete audio files for the testers to choose from. The testing resulted in the following findings:

1. **Timid Feeds** – Out of the 5,000 ballots fed into the ballot marking device units during testing 149 experienced timid feeds or Ballot Page Metadata (BPM) errors warranting the ballot to be refeed into the device. The 149 timid feeds occurred in 23 of the 50 units. The BMD device by design gently pulls the ballot into the device, in a timid, push/pull manner. Testers would sometimes attempt to force feed the ballot or would pull the ballot back after the device began to gently pull the ballot into the device. When the tester did one of those two things, the BMD would appear to pull the ballot in, but immediately eject it. Clear instructions to voters and poll workers regarding the timid feed will mitigate the chances of this occurring.
2. **QR Code Errors** –

- a. Five BMDs encountered a “QR Code not Read” error upon initial insertion into the ballot box. In all instances, the ballots were tried on another device, and successfully read. Further examination of the ballots determined that the QR codes printed on the ballots, used to activate the voting session were slightly skewed when printed, thus causing random anomalies in some machines, but not others.
- b. One BMD unit, #40, would intermittently reject seemingly valid QR codes. When inserting the ballot, the feeder would start to take the ballot in, and then reject it. The BMD was restarted, but the device continued to reject the ballots. Preventative maintenance was also performed on the unit, but the unit continued to reject ballots. The device was removed from the test and taken for additional troubleshooting. The following diagnosis was given by the repair technician:

“The unit was taken to the Repair Center for further diagnosis. There it was found that scans from the unit had a grey vertical band present. The grey vertical band extends through the Ballot Page Metadata (BPM) code located in the upper left of the ballot paper and to the right of the BPM, and from the top (leading) edge of the ballot to the bottom edge of the ballot. The BMD software depends on being able to discern the leading edge of the ballot. Initiation of the scan of the BPM code, and detection of an attempt to insert the ballot skewed relative to the printer intake slot are two functions dependent on accurate leading edge discernment of the leading edge, causing the unit to reject the ballot. The grey band is on the edge of visibility to the unit’s software, meaning that if the band were darker in color it would result in a hard failure, thus rejection of every insertion attempt, and not the somewhat random behavior observed in the test, where only some fraction of attempted insertions lead to rejection.”

3. **Blank Screen & Paper Jam** – One device encountered a blank screen and paper jam after the tester inserted the ballot. The ballot was removed, following protocol, but the screen remained blank. After a hard reboot of the system, the tester was able to proceed without further incident.

Los Angeles County was required as a condition of certification of the VSAP 2.0 voting system to submit to our office a plan to improve the ballot marking device paper handling and remediate the jamming and misfeed rate of the ballot marking device. The former rate was 0.0096%, which was not acceptable as prescribed in the California Voting Systems Standards (CVSS), which has an allowable rate of no more than 0.002%. One device out of the 51 overall devices tested experienced a jam, thus bringing the paper handling rate to 0.0002%, which is within the allowable rate as prescribed by the CVSS. A detailed Volume Test report, including error logs can be found on our website.

6. Accessibility, Usability and Privacy Testing Summary

The Accessibility, Usability and Privacy testing took place over two days in July 2020. Eight (8) volunteer testers participated in the testing. Due to the COVID 19 pandemic, volunteers tested the device either at their homes, outside or at a local community center parking lot. The volunteers were from the Los Angeles County accessibility community. The BMD devices used for this test were programmed with the March 2020 Presidential Primary Election. Each volunteer tester was asked to complete two (2) voting sessions, using the BMD. Upon completion of the session, all volunteer testers were asked to participate in a post-test survey regarding their experience.

Voters consistently reported that they liked the BMD. Most test voters felt that they could independently vote, without assistance, and that their votes were recorded accurately. However, a few voters did note that there was some confusion with the system instructions. One test voter pointed out that the selection button on the tactile remote was the only button that did not have Braille signage near it and suggested that would be nice to have. Another voter felt the “More” button should be brighter to draw your attention to it. Multiple test voters felt the tactile buttons were too sensitive.

Los Angeles County provided the following responses in **Table 6: Accessibility Survey Results**:

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|---|---|
| Tester | Issue Category | Description | Response |
| 4 | Contest Audio | The tester felt that the different voices used in the audio could be confusing. | This will be taken into consideration. The audio files are treated as system and election configuration files therefore can be improved and updated at any time without affecting certification versions. |
| 4 | Contest Audio | The tester pointed out that the candidate names | The candidate’s audios are played every time that |

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|--|---|
| Tester | Issue Category | Description | Response |
| | | were not re-read (audio) when changing back and forth between contests. | the user navigates through them, moving between contests. |
| 4 | Contest Audio | The tester pointed out that the text of the contest (Yes/No) had to be touched on the screen for the audio to start. | This scenario occurs when the user is in the voting experience setting: Audio with Touchscreen, where the keypad shouldn't be used. There are two sets of Audios in the BMD for each Voting Experience: Audio with Touchscreen and Audio with Keypad. These are automatically set when the user selects their language. If the user selects their language with the touchscreen, the Audio with Touchscreen experience will be activated. On the other hand, if the user selects the language with the keypad, the experience of Audio with Keypad will be activated. |
| 4 | Contest Audio | Tester felt that the text of the proposition should be read first and | The layout was designed to avoid pagination on Yes/No contests |

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|--|---|
| Tester | Issue Category | Description | Response |
| | | then the contest options (Yes/No) after. | with large text proposition. The audio will be played in the same order as the text appears in the page layout. |
| 6 | Contest Audio | The tester felt the system was confusing because the tester had to select each contest option to have it read to them. | The candidate name is played when the voter navigates on it using the arrow buttons. To select the candidate, the voter must click the round button. The system was designed to give the voter the control of the candidate navigation, therefore on each candidate they can decide either to continue to the next candidate (down arrow), go back to previous candidate (up arrow) or select the candidate (round button). |
| 1 | Instructions | The tester noted that when there was more than one candidate, the instructions did not repeat when you switched between contests. For example, if they moved forward and then went | When the user goes back to a contest already navigated, the audio starts to read the number of contests, the name of the contests, the number of candidates that are allowed to be selected, and the |

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|---|--|
| Tester | Issue Category | Description | Response |
| | | back to make a change. | instructions to start reading the candidates. These instructions are the same instructions that are reproduced the first time that the user navigates into the contest. |
| 1 | Instructions | The tester inquired about adjusting the speed of the audio. | When the Audio with Keypad voting experience is activated, before showing the first contest to the voter, the system shows instructions on how to use the keypad, explaining each button, including the playback rate buttons. The voter is not able to start voting without going through these instructions. |
| 6 | Instructions | The tester felt the voting contest options were clear, but the System Help instructions were not. Once the tester knew how to adjust the rate settings, the tester thought it was easier to understand. | When the Audio with Keypad voting experience is activated, before showing the first contest to the voter, the system shows instructions on how to use the keypad, explaining each button, including the playback rate buttons. The voter is not able to start voting without |

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|--|--|
| Tester | Issue Category | Description | Response |
| | | | going through these instructions. |
| 1 | Keypad Sensitivity | The tester noted that the tactile switch seemed too sensitive and wanted to know if there was a way to adjust the sensitivity. | The specification in CVSS address that the force required to activate controls and keys shall be no greater than 5 lbs (22.2N). The system is designed to comply with the specification. |
| 2 | Keypad Sensitivity | The tester felt that the down arrow key on the assistive device was too sensitive. The tester felt it repeated too much. | The specification in CVSS address that the force required to activate controls and keys shall be no greater than 5 lbs (22.2N). The system is designed to comply with the specification. |
| 2 | Keypad Sensitivity | The tester was concerned that there was no braille for the selection button. | This button distinguishes itself by its unique round shape. The buttons that have braille are rectangular with a relief. |
| 5 | More Button | The tester felt the "More" button on the screen should be brighter. | This will be taken into consideration for future iteration. |
| 6 | More Button | The tester pointed out that the select button on the keypad could not be used to exit out of the "More" | The More button screen overlay appears only on the Audio with Touchscreen experience, so it is expected that it |

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|--|---|
| Tester | Issue Category | Description | Response |
| | | button screen overlay. | cannot be handled with the keypad. |
| 2 | Time Frame | The tester felt that the process to complete the ballot took longer than expected. | * 2 out of 8 testers (25%) felt that the time-frame was longer than expected. * 1 out of 8 testers (12.5%) felt that the time-frame was faster than expected. * 5 out of 8 testers (62.5%) felt that the time-frame was as expected. The majority of the voters agreed that the time-frame was as expected. |
| 6 | Time Frame | The tester felt the process took a little longer than expected. | * 2 out of 8 testers (25%) felt that the time-frame was longer than expected. * 1 out of 8 testers (12.5%) felt that the time-frame was faster than expected. * 5 out of 8 testers (62.5%) felt that the time-frame was as expected. The majority of the voters agreed that the time-frame was as expected. |
| 2 | Time Frame | The tester felt the latency response was annoying. | There are several latency responses in the system. VSAP Tally 2.1 is designed to |

| Table 6: Accessibility Survey Results | | | |
|--|-----------------------|--|---|
| Tester | Issue Category | Description | Response |
| | | | comply with CVSS requirements. |
| 6 | Contest Audio | The tester felt the system was confusing because the tester had to select each contest option to have it read to them. | The candidate name is played when the voter navigates on it using the arrow buttons. To select the candidate, the voter has to click the round button. The system was designed to give the voter the control of the candidate navigation, therefore on each candidate they can decide either to continue to the next candidate (down arrow), go back to the previous candidate (up arrow) or select the candidate (round button). |

A detailed Accessibility, Usability and Privacy Test Report, including the survey results, can be found on our website.

7. Hardware Testing Summary

NTS conducted Environmental and Dynamics Testing of the ballot marking devices. The devices were tested during the VSAP 2.0 testing efforts, however because of the replacement gears in some units, a sampling of units was tested

against the applicable Hardware Section of the CVSS. The ballot marking devices passed each phase of the hardware testing.

A detailed Hardware Testing report can be found on our website.

IV. COMPLIANCE WITH STATE AND FEDERAL LAWS AND REGULATIONS

1. Elections Code Requirements

Six (6) sections of the California Elections Code, Sections 19101, 19203, 19204, 19204.5, 19205, and 19270, describe in detail the requirements any voting system must meet in order to be approved for use in California elections. These sections are described in detail and analyzed for compliance below.

- a) §19101 (b) (1):** The machine or device and its software shall be suitable for the purpose for which it is intended.
 - The system meets this requirement. All phases of the testing, specially, Functional demonstrated this to be true.
- b) §19101 (b) (2):** The system shall preserve the secrecy of the ballot.
 - The system meets this requirement. Vote by Mail and BMD ballots can both be secretly cast.
- c) §19101 (b) (3):** The system shall be safe from fraud or manipulation.
 - The system meets this requirement.
- d) §19101 (b) (4):** The system shall be accessible to voters with disabilities pursuant to section 19242 and applicable federal laws.
 - The system meets this requirement. Accessibility conducted with voters during this and the previous tests efforts have demonstrated voters with accessibility needs have little or no trouble using the ballot marking devices.
- e) §19101 (b) (5):** The system shall be accessible to voters who require assistance in a language other than English if the language is one in which a ballot or ballot materials are required to be made available to voters pursuant to Section 14201 and applicable federal laws.
 - VSAP 2.1 supports all 14201 languages. The system is capable of adding additional languages, to produce ballots or ballot materials, and accessible audio files pursuant to Section 14201, utilizing system functionality and outside translation.

- f) **§19203:** The system shall use ballot paper that is of sufficient quality that it maintains its integrity and readability throughout the retention period specified in sections 1700 through 17306.
 - The system meets this requirement.
- g) **§19204:** The system shall not include procedures that allow a voter to produce, and leave the polling place with, a copy or facsimile of the ballot cast by that voter at that polling place.
 - The system meets this requirement as the ballot marking devices retain the ballots, in the integrated ballot box, upon casting.
- h) **§19204.5:** The Secretary of State shall not certify or conditionally approve a voting system that cannot facilitate the conduct of a ballot level comparison risk-limiting audit.
 - The system meets this requirement. The systems components in addition to processes and procedures, prepare ballots during the tabulation process for a risk-limiting audit.
- i) **§19205 (a):** No part of the voting system shall be connected to the internet at any time.
 - The system meets this requirement.
- j) **§19205 (b):** No part of the voting system shall electronically receive or transmit election data through an exterior communication network, including the public telephone system, if the communication originates from or terminates at a polling place, satellite location, or counting center.
 - The system meets this requirement.
- k) **§19205 (c):** No part of the voting system shall receive or transmit wireless communications or wireless data transfers.
 - The system meets this requirement.
- l) **§19270 (a):** The Secretary of State shall not certify or conditionally approve a direct recording electronic voting system unless the system includes an accessible voter verified paper audit trail.
 - The system meets this requirement.

2. Elections Code Review

- 1) **§305.5(b):** A paper cast vote record is a ballot only if the paper cast vote record is generated on a voting device or machine that complies with ballot layout requirements and is tabulated by a separate device from the device that created the paper cast vote record.
 - The system meets this requirement.
- 2) **§13109.7(a):** Notwithstanding Section 13109, for a period of three years commencing with the date that the county elections official for the County of Los Angeles declares that the voting system modernization project

underway in 2018 is complete and ready for operation, the county elections official for the County of Los Angeles shall conduct elections using the alternate ballot order described in Section 13109.8.

(b) The county elections official shall prepare a report regarding the effect of using the alternate ballot order for elections conducted during the time period described in subdivision (a). The report shall include, but not be limited to, the following information:

(1) Statistics and information on the cost of transitioning to the use of the alternate ballot order.

(2) The overall turnout of voters in the jurisdiction for each election conducted using the alternate ballot order.

(3) For different contests listed on the ballot, including, but not limited to, local offices and local ballot measures, state offices and state ballot measures, and federal offices, the following information:

(A) The turnout of voters for each contest.

(B) The number of overvotes and undervotes for each contest.

(C) The dropoff rates for each contest.

(4) Legislative recommendations.

(c) The report described in subdivision (b) shall, whenever possible, compare an election conducted pursuant to this section and using the alternate ballot order described in Section 13109.8 to similar elections conducted using the ballot order described in Section 13109 in the same jurisdiction or in a comparable jurisdiction.

(d) Three years after the declaration date described in subdivision (a), the county elections official shall submit the report described in subdivision (b) to the Secretary of State and to the Legislature in accordance with Section 9795 of the Government Code. The county elections official shall also post a publicly accessible copy of the report on the Internet Web site of the county elections official.

(e) Notwithstanding any other law, the county elections official may adjust ballot instructions to the extent necessary to comply with this section.

(f) Immediately after making the declaration described in subdivision (a), the county elections official shall post the declaration on his or her Internet Web site and send the declaration to the Secretary of State, the Secretary of the Senate, the Chief Clerk of the Assembly, and the Legislative Counsel.

(g) This section shall remain in effect only until the first January 1 that occurs at least four years after the declaration date described in subdivision (a), and as of that date is repealed.

- The system meets this requirement.

3) §15360: During the official canvass of every election in which a voting system is used, the official conducting the election shall conduct a public manual tally of the ballots tabulated by those devices cast in one percent of the precincts chosen at random by the elections official. If one percent

of the precincts should be less than one whole precinct, the tally shall be conducted in one precinct chosen at random by the elections official.

In addition to the one percent count, the elections official shall, for each race not included in the initial group of precincts, count one additional precinct. The manual tally shall apply only to the race not previously counted.

- The system fully supports this requirement.

- 4) §19300:** A voting machine shall, except at a direct primary election or any election at which a candidate for voter-nominated office is to appear on the ballot, permit the voter to vote for all the candidates of one party or in part for the candidates of one party and in part for the candidates of one or more other parties.

- The system meets this requirement.

- 5) §19301:** A voting machine shall provide in the general election for grouping under the name of the office to be voted on, all the candidates for the office with the designation of the parties, if any, by which they were respectively nominated.

The designation may be by usual or reasonable abbreviation of party names.

- The system meets this requirement.

- 6) §19302:** The labels on voting machines and the way in which candidates' names are grouped shall conform as nearly as possible to the form of ballot provided for in elections where voting machines are not used.

- The system meets this requirement.

- 7) §19303:** If the voting machine is so constructed that a voter can cast a vote in part for presidential electors of one party and in part for those of one or more other parties or those not nominated by any party, it may also be provided with: (a) one device for each party for voting for all the presidential electors of that party by one operation, (b) a ballot label therefore containing only the words "presidential electors" preceded by the name of the party and followed by the names of its candidates for the offices of President and Vice President, and (c) a registering device therefore which shall register the vote cast for the electors when thus voted collectively.

If a voting machine is so constructed that a voter can cast a vote in part for delegates to a national party convention of one party and in part for those of one or more other parties or those not nominated by any party, it may be provided with one device for each party for voting by one operation for each group of candidates to national conventions that may be voted for as a group according to the law governing presidential primaries.

No straight party voting device shall be used except for delegates to a national convention or for presidential electors.

- The system meets this requirement.

8) §19304: A write-in ballot shall be cast in its appropriate place on the machine, or it shall be void and not counted.

- The system supports this requirement.

9) §19320: Before preparing a voting machine for any general election, the elections official shall mail written notice to the chairperson of the county central committee of at least two of the principal political parties, stating the time and place where machines will be prepared. At the specified time, one representative of each of the political parties shall be afforded an opportunity to see that the machines are in proper condition for use in the election.

The party representatives shall be sworn to perform faithfully their duties but shall not interfere with the officials or assume any of their duties. When a machine has been so examined by the representatives, it shall be sealed with a numbered metal seal. The representatives shall certify to the number of the machines, whether all of the counters are set at zero (000), and the number registered on the protective counter and on the seal.

- The system supports this requirement.

10)§19321: The elections official shall affix ballot labels to the machines to correspond with the sample ballot for the election. He or she shall employ competent persons to assist him or her in affixing the labels and in putting the machines in order. Each machine shall be tested to ascertain whether it is operating properly.

- The system supports this requirement.

11)§19322: When a voting machine has been properly prepared for an election, it shall be locked against voting and sealed. After that initial preparation, a member of the precinct board or some duly authorized person, other than the one preparing the machines, shall inspect each machine and submit a written report. The report shall note the following: (1) Whether all of the registering counters are set at zero (000), (2) whether the machine is arranged in all respects in good order for the election, (3) whether the machine is locked, (4) the number on the protective counter, (5) the number on the seal. The keys shall be delivered to the election board together with a copy of the written report, made on the proper blanks, stating that the machine is in every way properly prepared for the election.

- The system supports this requirement.

12)§19340: Any member of a precinct board who has not previously attended a training class in the use of the voting machines and the duties of a board member shall be required to do so, unless appointed to fill an emergency vacancy.

- The system does not adversely impact this requirement.

13)§19341: The precinct board shall consist of one inspector and two judges who shall be appointed and compensated pursuant to the general election laws. One additional inspector or judge shall be appointed for each additional voting machine used in the polling place.

- The system does not adversely impact this requirement.

14)§19360: Before unsealing the envelope containing the keys and opening the doors concealing the counters the precinct board shall determine that the number on the seal on the machine and the number registered on the protective counter correspond to the numbers on the envelope.

Each member of the precinct board shall then carefully examine the counters to see that each registers zero (000). If the machine is provided with embossing, printing, or photography devices that record the readings of the counters the board shall, instead of opening the counter compartment, cause a “before election proof sheet” to be produced and determined by it that all counters register zero (000).

If any discrepancy is found in the numbers registered on the counters or the “before election proof sheet” the precinct board shall make, sign, and post a written statement attesting to this fact. In filling out the statement of return of votes cast, the precinct board shall subtract any number shown on the counter from the number shown on the counter at the close of the polls.

- The system supports this requirement.

15)§19361: The keys to the voting machines shall be delivered to the precinct board no later than twelve hours before the opening of the polls. They shall be in an envelope upon which is written the designation and location of the election precinct, the number of the voting machine, the number on the seal, and the number registered on the protective counter. The precinct board member receiving the key shall sign a receipt.

The envelope shall not be opened until at least two members of the precinct board are present to determine that the envelope has not been opened.

At the close of the polls the keys shall be placed in the envelope supplied by the official and the number of the machine, the number written on the envelope.

- The system supports this requirement.

16)§19362: The exterior of the voting machine and every part of the polling place shall be in plain view of the election precinct board and the poll watchers.

Each machine shall be at least four feet from the poll clerk’s table.

- The system supports this requirement.

3. Review of Federal Statutes or Regulations.

- a)** The Voting Rights Act (VRA) of 1965, as amended (42 U.S.C. 1973), requires all elections in certain covered jurisdictions to provide registration and voting materials and oral assistance in the language of a qualified language minority group in addition to English. Currently in California, there are ten VRA languages (English, Spanish, Chinese, Hindi, Japanese, Khmer, Korean, Tagalog, Thai, and Vietnamese) as prescribed under the law.
- The system meets this requirement. The system’s paper ballots can be easily printed in these languages, as well as any others. Further, BMD can be programmed to display the ballot in any of these languages on the touch screen interface and to provide audio instruction in any of these languages.
- b)** The National Voter Registration Act of 1993 (42 U.S.C. 1973gg and 11 CFR 8) allows for the casting of provisional ballots through Fail-Safe Voting procedures.
- The system meets this requirement. Provisional ballots can easily be cast with this system. The BMD only marks ballots (or verifies the marking of a ballot), it has no impact on provisional voting.
- c)** The Voting Accessibility for the Elderly and Handicapped Act of 1984 (42 U.S.C. 1973ee through 1973ee-6) requires each political subdivision conducting elections within each state to assure that all polling places for federal elections are accessible to elderly and handicapped voters, except in the case of an emergency as determined by the state’s chief election officer or unless the state’s chief election officer: (1) determines, by surveying all potential polling places, that no such place in the area is accessible or can be made temporarily accessible, and (2) assures that any handicapped voter assigned to an inaccessible polling place will, upon advance request under established state procedures, either be assigned to an accessible polling place or be provided an alternative means of casting a ballot on election day.
- This system supports this requirement.
- d)** The Retention of Voting Documentation (42 U.S.C. 1974 through 1974e) statute applies in all jurisdictions and to all elections in which a federal candidate is on a ballot. It requires elections officials to preserve for 22 months all records and papers which came into their possession relating to an application, registration, payment of a poll tax, or other act requisite to voting. Note: The US Department of Justice considers this law to cover all voter registration records, all poll lists and similar documents reflecting the identity of voters casting ballots at the polls, all applications for absentee ballots, all envelopes in which absentee ballots are returned for

tabulation, all documents containing oaths of voters, all documents relating to challenges to voters or absentee ballots, all tally sheets and canvass reports, all records reflecting the appointment of persons entitled to act as poll officials or poll watchers, and all computer programs used to tabulate votes electronically. In addition, it is the Department of Justice's view that the phrase "other act requisite to voting" requires the retention of the ballots themselves, at least in those jurisdictions where a voter's electoral preference is manifested by marking a piece of paper or by punching holes in a computer card.

- The system meets this requirement. All votes in this system are recorded on paper ballots that can be easily retained.

4. Help America Vote Act (HAVA) Requirements

The Help America Vote Act (HAVA) §301(a) mandates several requirements for voting systems, including:

- 1) The ability to verify the vote choices on the ballot before that ballot is cast and counted,
 - 2) Notification to the voter of over-votes on a ballot,
 - 3) Auditability with a permanent paper record of votes cast,
 - 4) Accessibility 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)
- This system supports these requirements in the following manner:
 - a) The paper ballots themselves lend themselves to visual inspection and verification.
 - b) The BMD provides its users with a ballot review screen prior to printing the ballot. Further, any voted ballot can be inserted into the unit for review and verification.
 - c) The BMD prevents over-voting a contest.
 - d) Because all ballots in this system are paper based, there is a fully auditable and permanent record of the election.
 - e) Deployment of the BMD in a precinct provides accessibility for persons with disabilities at the polling place.

V. CONCLUSION

The VSAP 2.1 voting system satisfactorily passed the Functional and Accessibility phases of testing. The Volume Test phase verified the fixes applied to the BMD have brought the devices well within an acceptable rate of paper handling as dictated by the CVSS. Finally, the county has addressed the findings

required as a condition of certification of the VSAP 2.0 voting system, specifically those tied to the Source Code and Security and Telecommunications Review.