Development of Appropriate Test Markings for Optical Scan Voting Machines

Phase 1: Ballot Scanning and Collection
NIST Contract SB1341-10-SE-0745
Revision of May 2, 2011, 3:50 PM
by
Mitch Trachtenberg

1. OVERVIEW

The National Institute of Standards and Technology has been asked to develop a standard set of reference markings representative of the types of marks that voters make on each common type of optical scan / marksense ballot.

As the first step in that development process, during September and December 2010, I scanned over 300,000 ballots at three elections offices. The first 100,000 were scanned at the Clark County, Washington Elections Office in Vancouver, WA. An additional 110,000 ballots were scanned at the Snohomish County, Washington Elections Office in Everett, WA. A final 105,000 were scanned at the Champaign County, IL Elections Office in Urbana, IL.

Where available, ballots which had been duplicated by elections officials were scanned, and the reasons for duplication have been noted. These scans have been sent to NIST on a set of 1 TB SATA drives.

I have also collected publicly available ballots from the 2008 Minnesota United States Senate election, Ann Arbor, Michigan’s November 2006 election and the Humboldt County (California) Election Transparency Project.

In subsequent parts of this project, the frequency of various types of ballot markings will be determined and a potential reference set of marks will be developed.

2. EXISTING COLLECTIONS

Minnesota’s collection of ballot scans from their 2008 Senate recount are provided on a single DVD. These scans are at 100 dpi, bilevel. Oval targets are used on these ballots. Part of a typical scan is reproduced in Appendix A.
Scans from three Humboldt County, California elections are included on the 1 TB drive labeled “overflow.” These scans are 150 dpi color, but compressed.

Scans from the November 2010 Humboldt County election are submitted on the drives from the December 2010 Champaign County scanning.

Michael Traugott of the University of Michigan has allowed release of his collection of Ann Arbor ballot scans. These scans are 100 dpi, with oval targets. They are in the Ann Arbor folder of the 1 TB drive labeled “overflow.” Part of a typical scan is reproduced in Appendix B.

3. SCANNING

3.1 Scanning Procedure

Ballots from the three participating counties were scanned with two identical Kodak i4200 scanners. These scanners were connected to two computers running Windows 7 with Kodak’s i4000 Series scanner drivers, version 1.33, dated 6/1/2010. Scanning was performed via Kodak’s Capture Desktop Software, version 1.2. *

All enhancements (streak filter, sharpening, etc.) were disabled, adjustments were left at their default positions, and the driver was set to deliver 300 dpi “superior” JPG color files. (In Champaign, the intermediate TIFF files from which the Kodak system generated JPG files were taken directly.) Image data was between 2 and 10 megabytes per ballot side, generally depending upon the amount of printed text. This quality level generated images which vary no more than minimally from completely uncompressed images.

Screenshots of the Kodak dialog box settings are in Appendix C.

Our throughput averaged about 12 000 to 14 000 double sided ballots per full eight hour day.

For comparison purposes, a small number of ballots were scanned at 400 dpi. A comparison of an arrow scanned at 300 and 400 dpi is in Appendix D.

*Certain commercial equipment, instruments, or materials are identified in this paper in order to specify procedures and data sources adequately. Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that the materials or equipment identified are necessarily the best available for the purpose.
The Clark County ballots are for use with Hart Intercivic’s vote counting system and use rectangular vote targets. The Clark County ballots were double-sided 21.6 cm x 35.6 cm ("legal" size) heavy white paper, printed in black.

The Snohomish County ballots are for use with the Dominion/Sequoia vote counting system and use “broken arrow” vote targets. The ballots were printed in black on white card stock. The ballot as cast by the voter has a width of 17.1 cm and a height of 40.1 cm.

The Champaign County ballots are for use with Champaign’s ES&S vote counting system and use oval vote targets. As Champaign’s November turnout is below 100,000, Champaign ballots were scanned from two elections, November 2008 and the February 2008 primary. More than 82,000 ballots were scanned from the November election; these were double sided 21.6 cm x 35.6 cm ("legal" size) heavy white paper, printed in black. Another 23,000 ballots from the preceding primary were scanned as well; these were primarily black on white, but had a colored stripe down the front right side, with different colors used for different parties. The paper from the primary election seemed to be of a somewhat higher quality than that in the November election, though Champaign County had not requested any change in paper.

Scanning and inspection was performed by four persons during regular office hours at the Washington state elections offices. At Champaign, County Clerk Mark Shelden allowed us to stay evenings and to come in on weekends as well. (Time logs and approximate ballots per day information has been provided to NIST.)

Mr. Shelden, as well as Tim Likness, Elections Supervisor for Clark County and Garth Fell, Elections Manager for Snohomish County, were very generous with their time in setting us up with ballots and answering our questions.

Every ballot was hand-inspected for marks which might not be visible or easily interpreted on the scans, and logs of such marks were generated. We cast a wide net, resulting in notations for roughly one percent of inspected ballots. Most notations were for food or beverage stains. Scanning was completed at each site in nine work days or less. Elections office staff were not involved in the scanning itself, though they were helpful and cooperative throughout.

3.2 Unusual Ballots

All ballots were inspected for unusual situations which might not be easily interpreted off of a scan. In Vancouver, fewer than 500 ballots were singled out as being problematic. Of these, 75% to 80% were singled out for various stains. Some stains were clearly identifiable
as from food or coffee, but the majority were not further identifiable. Other ballots were singled out for burn marks, scotch tape, glue remnants, tears, creases, and so on. Among the notations:

- dirt, dirt smudge, dirty fingerprints
- food, coffee, oil, unknown stains
- cigarette burns, unknown burns
- crayon
- scotch tape, scotch tape over smashed bug
- yellow sticky paper
- glitter pen, shimmer ink
- cat threw up (though not verifiable)

Glitter pen was detected on only six ballots of the 100,000. For better or worse, most other markings are about as easy to make sense of from scans as from the original ballots. Complete scanning logs are provided, with the reasons for flagging ballots from a particular batch written on the back.

In Snohomish County, more ballots were singled out, because we also singled out ballots that had any sort of curiosity to them, including colored inks, poorly made marks, and so on. Glitter pen was only detected on six of the Snohomish County ballots.

In addition to ballots with the problems noted in the Clark County list above, we noted many ballots with print problems in Snohomish County. In many cases the ballots appeared to have tracks from rollers involved in the printing process. In other cases, there was substantial bleed through from one part of the folded ballot to another, especially around the Presidential race. This was light enough that it probably posed no problem to the counting equipment, but it was noticeable.

We also noted ballots which were damaged near the folds, and noted several cases where yellow bleed through artifacts were left on ballots which had been stored in contact with heavily inked ballots.

Finally, because the Snohomish County ballots use “broken arrow” style, we noted several cases where ball point pens had appeared to damage the tips of the printed arrows, seeming to scrape some ink away. While this almost certainly did not cause any problems with counting equipment, it is worth noting that the landmarks can be damaged by writing instruments.

Ballots which were noted as unusual were removed from main scanning batches and scanned as “exception batches,” immediately before or after their main batch.
Examples from Everett ballots which we pulled aside, but which did not carry an Everett duplication label are reproduced in Appendix E, renamed with explanations of why we separated them:

- circled.jpg
- cutatfold.jpg
- foodstain.jpg
- heavyerasure.jpg
- largecheckmarks.jpg
- redink.jpg
- shortlines.jpg
- unmarkedwritein.jpg

The complete set of separated items is available in the log files.

As mentioned earlier, the ballots in Champaign were notably cleaner than those in the two Washington Counties. However, because they were not legally required to be preserved but had instead been kept by Mr. Shelden because he felt they might serve as a resource at some point, they were stored in rubber-banded stacks in round garbage cans. This resulted in some ballot batches being bent or otherwise damaged such that scanning was not feasible. We were, however, able to scan more than 81,000 of the 84,000 ballots cast in November, and we have no reason to believe that the markings on the remaining November ballots would vary from the markings on those we scanned. We were also able to scan 23,000 ballots from the primary and 800 ballots from November which were “spoiled” by the voter. These ballots were marked “SPOILED” and retrieved from the voter, who was then issued a new ballot.

As in Snohomish County, we set aside all ballots that we felt could be characterized as “unusual,” including those which were marked in unusual ways.

Probably because the majority of Champaign ballots were cast at precincts, Champaign’s ballots had far fewer stains and tears than those from the two Washington State mail-in counties. In addition, there were very few (< 20) remade ballots.

Champaign County provided pens to voters labeled with the phrase “FILL THE OVAL” and an example of a filled oval. This was Mr. Shelden’s idea. Perhaps because of these pens, we noticed many ballots which were voted with both filled ovals and x’s through the filled ovals. There is no way to know whether the x’s were inked before or after the ovals were filled.
Only one of the ballots we scanned at Champaign had been marked with glitter pen. Paul Miller, Senior Technology/Policy Analyst for the Washington Secretary of State, suggests that the more frequent use of unusual writing implements on the Washington state ballots can reasonably be attributed to Washington state’s use of vote-by-mail; at polling places, the elections department can provide appropriate writing implements.

A sampling of the major types of unusual marks from Champaign County is reproduced in Appendix F, named with explanations of why they are unusual. The largest group of ballots which we separated out were labeled as having “roller marks” or “printer marks” -- they appear to have picked up some extraneous print or lines from contact with wet ink on surfaces.

Some Champaign County ballots were marked via the AutoMARK marking device. This device prints marks for the voter after the voter interacts with a computer interface. The marks made by the Automark are easily distinguished from those made directly by voters, and an example image of an Automark-marked ballot is included in the list below.

- ambig-x.tif (a crossed out vote in a race with only one choice)
- automark.tif (an example of the appearance of an Automark marked ballot)
- borderline-miss.tif (a poorly marked ballot)
- circles.tif
- initialed-correction.tif
- no-is-how-i-vote.tif (a voter’s indication of their vote)
- overmarked.tif (vote marks extending to column boundary)
- printed-with-white-spot.tif (a poorly printed ballot)
- punch-through-front.tif and punch-through-back.tif
- race-crossed-out.tif (a voter eliminating a race)
- roller-marks-overprint.tif (a poorly printed ballot)
- tear-back.tif and tear-front.tif (a torn ballot)
- underline-party.tif (a voter consistently underlining the party)
- x-and-fill.tif (a voter both filling the oval and marking an X)
- yellow-artifact-center-gray.tif (yellow aging from contacting ink?)
- yes-at-end.tif (a voter writes after the end of the contests)

3.3 Streaking

Many of the ballot images show narrow vertical colored streaks lightening black regions. These might have been hidden by enabling Kodak’s “streak filter,” but this would simply
have masked their existence, while the image data would still have reflected the streaks seen by the optics. An example of the streaking is in Appendix G.

A Kodak representative confirmed that these streaks were due to dust in the scanning process. Most paper dust that causes this streaking is on the outer side of the scanner’s glass, and is easily removed between batches. However, dust also accumulates over time on the inside of the scanning glass, which requires removal of the glass for cleaning. Dust also lands, rarely, in the interior of the scanner’s camera units, which necessitates removal of the camera units.

Kodak made a service call at the start of our Champaign scanning and removed and cleaned the camera units of our scanners. We did not call them, however, at the previous two sites. Even after Kodak’s service call, dust remained a substantial problem at Champaign, possibly due to low humidity. We set up a humidifier and did very frequent cleaning of glass, but dust reaccumulated rapidly.

The streaks are easily detected as narrow vertical colored strips interrupting black regions. They are not anticipated to have a major impact on our mark analysis.

Their impact on the average intensity or tint of a marked area will be highest in the Clark County ballots, where heavy black rectangles bound the vote opportunity. A typical streak, where present, lightens dark regions in a vertical strip of one or two pixels in width. For comparison, the thickness of the riser in the letter “i” in the Hart ballot instruction text is three pixels, and a Hart vote box is 100 pixels wide.

Because the intended first step in classifying marks will be to determine the average intensity and tint of each vote opportunity region, a thick streak, especially if lined up with the edge of a vote opportunity, could potentially cause an extremely light or thin vote or hesitation mark to be missed. We will be careful to check for such cases.

In Snohomish County, where broken-arrow style vote opportunities are used, we will be characterizing marks based on whether the lines filling in between arrows contain gaps. We will be careful to ensure that any analysis used cannot be fooled by the presence of a streak.

As the classification of marks proceeds, we will report any impact of the streaking on the classification process.
3.4 Skewing

The scans are generally oriented close to vertically, but not perfectly so. No deskewing will be applied to the images, but by comparing the location of landmarks on each ballot image with the corresponding location of the landmarks on a completely unrotated image, we will be able to adjust the locations which we crop when isolating individual vote opportunities. Except in the very rare (or possibly nonexistent) case of rotations of more than 1.5 degrees we will not deskew the vote marks themselves.

3.5 Duplicated Ballots

In Clark County, duplicated ballot originals were not available for the November 2008 election. They had either been discarded or misplaced, but were not locatable in the ballot set made available. The elections office kindly provided some duplicated originals from their February 2010 special election.

According to Tim Likness, Clark County’s Elections Supervisor, the primary reason for which Clark County would duplicate ballots was damage in the bar coded regions of the ballot. The damage might take the form of markings, creases, or tears.

A less obvious reason for ballot duplication was the return of a ballot for the wrong precinct. Because Washington state uses vote-by-mail, ballots do not stay within a given polling place. Once ballots are mailed to voters, voters may end up with the wrong ballot. For example, two voters from different precincts may seek to fill out their ballots together, and may each return their friend’s ballot in their return envelope. In such cases, the elections office redoes the parts of the ballot which pertain to the correct precinct onto a ballot of the correct type for the precinct.

Clark County ballots were not duplicated when overvotes were located, but were kept by the elections office in separate batches and went through a resolution process. In our logs, batches containing such ballots are indicated as RES OV (Resolution Overvote), while most batches are indicated as AUTO. Other batches were labeled RES WI (Resolution Write In) and RES MISC (Resolution for Miscellaneous Reasons).

Fragments from typical duplicated ballots from Vancouver’s August 2009 election are found in Appendix H, where they are named with an explanation:

- creaseline/bottomrightbarcode.jpg
- inkbarcode.jpg
Snohomish County had a much larger set of duplicated ballots, 16,000 out of a mail-in turnout of 317,537. Approximately 40% of these were duplicated due to a voter’s having crossed out a candidate, as they are instructed to do if they make an error. Snohomish County’s existing machines cannot resolve voter intent in such cases, so new ballots are prepared from these ballots. The new ballots are each given a serial number enabling them to be tracked to the duplicated original; the ballots differ from the original in being printed with room for this serial number and staff initials in the instruction area. They are easily identifiable as special cases.

As with Clark, any ballots with visible damage to a bar coded area are duplicated. We also encountered many Snohomish duplicated ballots which appeared to have been cut improperly, leading to registration marks appearing up to approximately 3 mm into the ballot. Neither Snohomish County Elections Manager Garth Fell nor any of us could find anything else wrong with many of these ballots, so we all concluded that they had been duplicated due to the poor cuts.

Examples from Snohomish duplicated ballot originals are in Appendix I, named with explanations:

- dupbounds.jpg (arrows marked beyond normal range)
- dupbrokenline.jpg (incomplete arrow)
- dupconsistenterror.jpg
- dupcrossout.jpg
- dupcrossoutcomment.jpg
- duptorn.jpg
- dupwriteinquestion.jpg (write in without filled arrow)

We did not scan the duplicate ballots generated by the elections office, as these were not filled out by voters, and were done with proper form by elections office staff. The upper region of these ballots was distinctly different than the upper area of originals, printed with blank spaces for elections office staff to fill in.

Snohomish County uses the sample ballot as a Provisional Ballot. The voter indicates their choices on the sample ballot, which is printed on colored paper and looks nothing like the
Sequoia/Dominion ballot. If the provisional is accepted, it is duplicated onto an Sequoia/Dominion ballot.

The same approach is used for ballots which arrive from other jurisdictions and for federal write-in ballots.

Mr. Fell notes that if a voter uses a consistent pattern in marking their ballot, but one which is not properly read by the equipment, the ballot is duplicated with properly marked arrows. The Washington Secretary of State has a heavily illustrated 81 page document entitled “Voter Intent, Statewide Standards on What is a Vote” at the following address:


Other reasons included general sloppiness in filling out the ballot, very light markings, torn ballots, improper color of marks, erasures, and marks going outside of the broken-arrow’s fill-in zone. A small group of duplicated originals (perhaps ten) were stored in large plastic bags due to their having been submitted with either heavy soaking or unknown and malevolent-looking stains.

Mr. Fell felt that the 5% duplication rate for this election was on the high side of normal, and estimated that 2% to 5% of ballots in the county are duplicated in most races. The duplication rate may have been higher than average because this was a Presidential race and therefore attracted infrequent voters.

During the extraction of voting arrows from Snohomish ballots, we will be able to determine which such ballots were overvoted. At that point, we will further characterize the remainder of these duplicated ballots to provide percentages of the remaining causes of duplication.

In Champaign County, very few ballots were remade by the elections staff. In general, improperly filled out ballots or damaged ballots are marked “spoiled” at the precinct and the voter is issued a new ballot.

An example of a ballot remade due to an ink spill is found in Appendix J, along with a scan of the envelope in which the ballot was kept.
4. BALLOTS PER DAY

4.1 VANCOUVER

Figures are approximate.

- 10 000 Tuesday 9/7
- 14 000 Wednesday 9/8
- 14 000 Thursday 9/9
- 14 000 Friday 9/10
- 14 000 Monday 9/13
- 15 000 Tuesday 9/14
- 14 000 Thursday 9/16
- 5 000 Friday 9/17

4.2 EVERETT

- 6 000 Monday 9/20
- 13 000 Tuesday 9/21
- 15 000 Wednesday 9/22
- 15 000 Thursday 9/23
- 15 000 Friday 9/24
- 15 000 Monday 9/27
- 15 000 Tuesday 9/28
- 15 000 Wednesday 9/29
- 2 000 Thursday 9/30

4.3 Champaign

- 3 000 Monday 12/6 (screening of ballots, scanning paused)
- 1 500 Tuesday 12/7 (screening of ballots, scanning paused)
- 16 000 Wednesday 12/8
- 19 000 Thursday 12/8
- 15 000 Friday 12/10
- 12 000 Saturday 12/11
- 14 000 Monday 12/13
- 18 000 Tuesday 12/14
- 7 000 Wednesday 12/15
5. TIME LOGS

Time logs have been provided to NIST.

6. NEXT STEPS

I have already begun the process of extracting vote opportunities from the ballots and storing them as fields within Postgresql database tables. The individual mark regions are each represented with 20 to 30 kB of data. The database is initially being populated with identifiers for the ballot from which the mark came, the mark’s x and y offsets into its ballot image, the mark region’s average red, green, and blue intensities, and the number of pixels the mark spans horizontally and vertically. This information should allow further analyses to focus on marks which do not neatly fill their regions with black.
### State General Election Ballot

**Anoka County, Minnesota**

**November 4, 2003**

#### Instructions to Voters:
- To vote, completely fill in the oval next to your choice.

#### Federal Offices

<table>
<thead>
<tr>
<th>President and Vice-President</th>
<th>Constitution Amendment</th>
<th>City Offices</th>
<th>City of Andover</th>
</tr>
</thead>
<tbody>
<tr>
<td>John McCain</td>
<td></td>
<td>Mayor</td>
<td></td>
</tr>
<tr>
<td>Sarah Palin</td>
<td></td>
<td>Mike Damkieke</td>
<td></td>
</tr>
<tr>
<td>Barack Obama</td>
<td></td>
<td>Rosella Konsethy</td>
<td></td>
</tr>
<tr>
<td>Joe Biden</td>
<td></td>
<td>Richard Edward Hinkle</td>
<td></td>
</tr>
<tr>
<td>Cynthia McHenry</td>
<td></td>
<td>Eric Koppene</td>
<td></td>
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<tr>
<td>Alexis Climenho</td>
<td></td>
<td>Nancy</td>
<td></td>
</tr>
<tr>
<td>Roger Galeiro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allison Kleyweg</td>
<td>Clean Water, Wildlife, Cultural, Heritage, and Natural Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ralph Rasker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matt Gonzalez</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bob Basinski</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mike Bresnahan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doreen Baldwin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darrell Castle</td>
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#### County Offices

<table>
<thead>
<tr>
<th>U.S. Senator, District 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norm Coleman</td>
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<table>
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<tr>
<th>U.S. Senator, District 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Franken</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>U.S. Representative, District 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michele Bachmann</td>
</tr>
<tr>
<td>El Tinklberg</td>
</tr>
</tbody>
</table>

### State Offices

<table>
<thead>
<tr>
<th>State Representative, District 4A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michele Frazier</td>
</tr>
<tr>
<td>Ted Sieker</td>
</tr>
<tr>
<td>Steve Stivers</td>
</tr>
</tbody>
</table>

**Vote Front and Back of Ballot**

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A1
Appendix C – Kodak i4200 Dialog Box Settings
Appendix C – Kodak i4200 Dialog Box Settings
Appendix C – Kodak i4200 Dialog Box Settings
Appendix E – Listed scan fragments from Everett / Snohomish County

largecheckmarks.jpg

redink.jpg

shortlines.jpg
Appendix E – Listed scan fragments from Everett / Snohomish County

unmarkedwritein.jpg
Appendix F – Listed scan fragments from Urbana, Champaign County

ambig-x.tif

automark.tif (size doubled)

borderline-miss.tif
Appendix F – Listed scan fragments from Urbana, Champaign County

circles.tif

initialed-correction.tif

no-is-how-i-vote.tif
Appendix F – Listed scan fragments from Urbana, Champaign County

overmarked.tif

<table>
<thead>
<tr>
<th>United States</th>
<th>Champaign County</th>
</tr>
</thead>
</table>
| **Representative in Congress**
  15th Congressional District
  Two Year Term
  Vote for up to 1 |
| **State's Attorney**
  Four Year Term
  Vote for up to 1 |
| Steve Cox
  Democratic |
| Julia R. Rietz
  Democratic |
| Timothy V. Johnson
  Republican |
| Janie Miller-Jones
  Republican |

printed-with-white-spot-champaign-county.tif

<table>
<thead>
<tr>
<th>Champaign County</th>
</tr>
</thead>
</table>
| **Auditor**
  Four Year Term
  Vote for up to 1 |
| Tony Fabri
  Democratic |
| Brad Jones
  Republican |
Appendix F – Listed scan fragments from Urbana, Champaign County

**DARKEN THE OVAL**

In the oval (⊙) to the left of your choice. To cast a write-in, in the left of the blank space provided and write the candidate’s name on, refer to the card of instruction posted in the voting booth. If mark this ballot, return it to the Election Judge and obtain

- Steve Cox, Democratic
- John P. Johnson, Republican
- Donald E. Wotan, Democratic
- Julia R. Rietz, Republican
- Jennifer Miller-Jones, Republican
- James Benslet
- Ron Bensyl, Republican
- Tony Fabri, Democratic

**Champaign County Forest Preserve District**

*Vote on the Proposition with respect to all or any of the Judges listed on this ballot. No Judge listed is running against any other Judge. The sole question is whether each Judge shall be retained in his present office.*

- 4th Judicial District

**Proposed Call For A Constitutional Convention**

This proposal deals with a call for a state constitutional convention. The last such convention was held in 1969-70, and a new Constitution was adopted in 1970. The 1970 Illinois Constitution requires that the question of calling a convention be placed before the voters every 20 years. In 1988 the electorate rejected the call for a constitutional convention, with 75% voting against calling a convention and 25% voting in favor of calling a convention. If you believe the 1970 Illinois Constitution needs to be revised through the convention process, vote "YES" on the question of calling a constitutional convention. If you believe that a constitutional convention is not necessary, or that changes can be accomplished through other means, vote "NO" on the calling of a constitutional convention.

- 4th Judicial District

**Judicial Candidates Seeking Retention in Office**

- Judicial Circuit?
  - YES
  - NO

- Judge Of The Circuit Court
  - YES
  - NO

- Judge Of The Circuit Court
  - YES
  - NO

**State of Illinois**

- Proposed Call For A Constitutional Convention
  - YES
  - NO

**Representative in the General Assembly**

- 103rd State Representative District
  - Vote for up to 1

- County Board Member
  - County Board District 2
  - Vote for up to 1

- Auditor
  - Vote for up to 1

**Tomes of Illinois**

- State’s Attorney
  - Vote for up to 1

- Champaign County

- Champaign County

- State’s Attorney
  - Vote for up to 1

- Champaign County

- 4th Judicial District
Appendix F – Listed scan fragments from Urbana, Champaign County

roller-marks-overprint.tif

tear-back.tif and tear-front.tif

underline-party.tif
Appendix F – Listed scan fragments from Urbana, Champaign County

x-and-fill.tif

<table>
<thead>
<tr>
<th>President and Vice President of the United States</th>
<th>Representative in Congress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barack Obama&lt;br&gt;Joe Biden&lt;br&gt;Democratic</td>
<td>Steve Cox&lt;br&gt;Democratic</td>
</tr>
<tr>
<td>Four Year Term&lt;br&gt;Vote for up to 1</td>
<td>15th Congressional District&lt;br&gt;Two Year Term&lt;br&gt;Vote for up to 1</td>
</tr>
<tr>
<td></td>
<td>Timothy V. Johnson&lt;br&gt;Republican</td>
</tr>
</tbody>
</table>

yellow-artifact-center-gray.tif (double size)

Champaign County

Auditor<br>Four Year Term<br>Vote for up to 1

yes-at-end.tif

YES

NO

End Of Ballot

Yes
Appendix G – Example of streaking during scanning

dust-streaks-against-black.jpg

dust-streak-through-magnified-mark.png
Appendix H – Listed scan fragments from Vancouver, Clark County

creaselowerrightbarcode.jpg

inkbarcode.jpg

stickybarcode.jpg (no visible evidence of stickiness)
Appendix H – Listed scan fragments from Vancouver, Clark County

tornbybarcode.jpg

OFFICIAL BALLOT
CLARK COUNTY, WASHINGTON
PRIMARY AND SPECIAL ELECTION
August 18, 2009

wrongprecinct.jpg

Envelope 625.01
Ballot 925.01
Transfer

PR BB ad
Appendix I – Scan fragments from Duplicated Ballots, Everett, Snohomish County

dupbounds.jpg (a sample “duplicated” label)

dupbounds.jpg (problem region)
Appendix I – Scan fragments from Duplicated Ballots, Everett, Snohomish County

dupbrokenline.jpg

I

dupconsistenterror.jpg

II

 dupcrossout.jpg

III

 dupcrossoutcomment.jpg

IV

 I2
Appendix I – Scan fragments from Duplicated Ballots, Everett, Snohomish County
Appendix J – Example of Champaign “Remade” Ballot

[Image of a filled out voting envelope with the words “Remade Ballot” written on it]