

2016 Annual Report of the Chief Electoral Officer

District 21 Summerside-Wilmot By-Election
October 17th, 2016

Plebiscite on Democratic Renewal
October 29th-November 7th, 2016



April 18, 2017

The Honourable Buck Watts
Speaker of the Legislative Assembly
Province of Prince Edward Island

Honourable Speaker:

I am pleased to submit my annual report on electoral events which took place in 2016.

This report includes an overview of a by-election in District 21 Summerside-Wilmot and a follow up report on the 2016 Plebiscite on Democratic Renewal with a Voting Integrity Audit Report on the entire voting process during the plebiscite.

I respectfully request this report be submitted to the Legislative Assembly during the next sitting of the 65th General Assembly of Prince Edward Island.

Respectfully,

A handwritten signature in blue ink, appearing to read 'G. B. McLeod'.

Gary B. McLeod
Chief Electoral Officer
Province of Prince Edward Island



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Message from the Chief Electoral Officer for PEI

This report covers electoral events organized and administered by Elections PEI in 2016 which include the District 21 Summerside-Wilmot By-Election and the 2016 Plebiscite on Democratic Renewal and will supplement the Interim Report provided in November 2016 on the plebiscite.

In August, 2016, a vacancy was created in District 21 with the resignation of the MLA for the District, Janice Sherry. A writ of election was issued for a by-election scheduled for October 17, 2016 to elect a Member to the Legislative Assembly to fill this vacancy. Complete details of the by-election are included in this report.

The Plebiscite on Democratic Renewal was conducted as a result of recommendation to administer a plebiscite as put forward to the Legislative Assembly by the Committee on Democratic Renewal. The Plebiscite was legislated to take place between October 29th and November 7th, 2016 and was to utilize electronic and in-person paper ballot voting. An interim report was produced immediately after the plebiscite was over which showed the overall results. This report covers more in-depth look at the overall process of the plebiscite, financial reports and includes an independent audit report which was compiled during the plebiscite as required by legislation.

One historic part of this plebiscite was permitting 16 and 17 years old residents of PEI to vote. This was the first time in Canada this was authorized and the turn-out for this age

group was similar to the overall turnout of the plebiscite.

I would like to thank the entire election team who participated in the By-Election and Plebiscite. Their dedication and commitment to the process attributed to the success of the election events.

Gary B. McLeod
Chief Electoral Officer

Section 1

District 21 Summerside-Wilmot By-Election October 17, 2016



**Member elected to the 65th General Assembly
of
Prince Edward Island
as a result of a By-Election in District 21 Summerside-Wilmot
October 17, 2016**

District 21

Summerside-Wilmot

Chris Palmer

(Liberal)

2016 Provincial By-Election District 21 Summerside-Wilmot

RETURNING OFFICER HEADQUARTERS

For the District 21 Summerside-Wilmot By-Election, voting was offered at the Office of the Returning Officer during office hours, beginning on October 5, 2016 until October 15, 2016. This allowed for increased voting opportunities for those who could not attend the polling locations on either advance polling days or Election Day.

REGISTER OF ELECTORS

Pursuant to Section 24.1(2) of the *Election Act*, it was determined a confirmation of electors was not required for the by-election as the Register of Electors was being maintained and current for the Plebiscite on Democratic Renewal which was scheduled to begin on October 29th.

ONLINE REGISTRATION

An online registration portal was implemented which allowed electors to check online to see if they were registered on the Register of Electors. Voters could verify the information was correct, or submit updates.

IDENTIFICATION AT THE POLLS

To improve the integrity of the voting process, the requirement for identification at the polls was put in place which required electors to show either one piece of identification with their name and current address, or to show two pieces which satisfied both criteria. A list of acceptable identification was on the voter information cards, the online registration portal and at the polls for reference.

PROCESS AT THE POLL

The by-election saw the implementation of a new in-person voting process which was designed to streamline the time it took the voter to enter the polling location, cast their ballot and leave. This was achieved by the use of technology for an electronic voters list, on-site registration and re-issuing replacement Voter Information Cards. The separation of poll clerk and the ballot management by the Deputy Returning Officer improved voter movement within the poll. There was little to no waiting at the polls to vote. Voters provided positive comments and this process will be reviewed for future consideration.

ADVANCE POLL DAYS

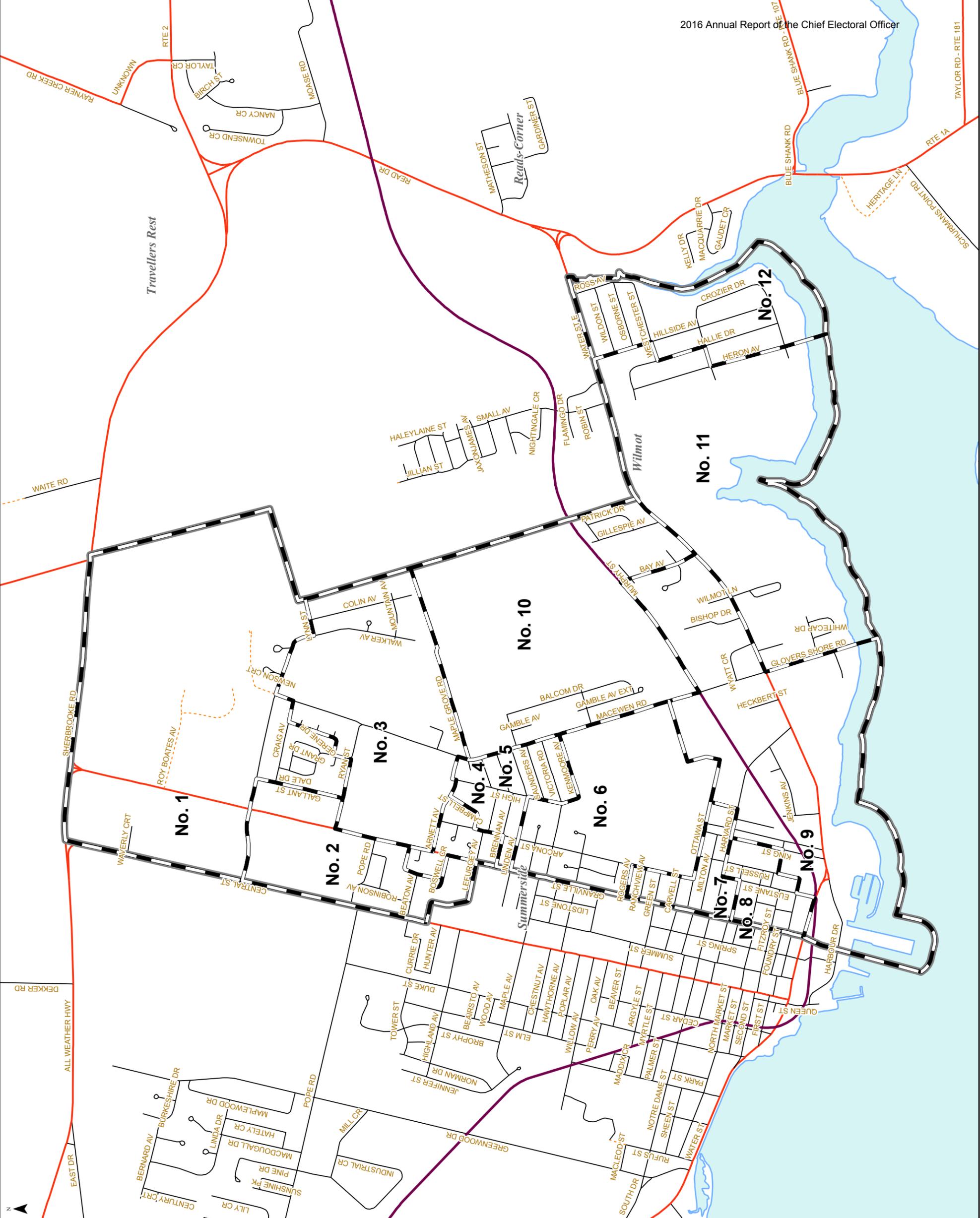
During the 3 day advance polls, 758 voters (19.68%) cast their ballot, while an additional 149 voters used the RO Office or a mobile poll to vote. With the exception of the Thanksgiving holiday, due to inclement weather, the advance polls reported steady elector turnout.

ORDINARY POLLING DAY

Election Day saw two voting locations available for electors with the option to vote at any poll at either location. This increased access for voters.

REPORTING OF RESULTS

After the close of the polls, one poll location delayed reporting the poll results which delayed the overall reporting of the results. It was determined the reporting protocol was not adhered to as instructed. This will be addressed in future training sessions.



**Provincial Electoral District
No. 21 Summerside - Wilmot**

Electoral District Description

Commencing at the intersection of the east boundary of township line # 17 and the Sherbrooke Road; thence westwardly along said road to Central Street; thence southwardly along said street to Lefurgey Avenue; thence eastwardly along said avenue to Granville Street; thence southwardly along said street and an extension thereof to Summerside Harbour; thence eastwardly along said harbour and Wilmot River to Reads Creek; thence northwardly along said creek to Water Street East; thence westwardly along said street to township line # 17; thence northwardly along said township line to the Sherbrooke Road to the point of commencement

Polling Divisions

- No. 1 North Granville
- No. 2 Roy Boates Avenue
- No. 3 MacEwen Road North
- No. 4 Lefurgey Avenue
- No. 5 High Street
- No. 6 Gerri Lynn Crescent
- No. 7 Milton Avenue
- No. 8 Russell Street
- No. 9 Harvard Street East
- No. 10 Balcom Drive
- No. 11 Gillespies Creek
- No. 12 Hillside Avenue

Legend:



Note: The maps are designed as a general index of the electoral district divisions and are not intended to be used for measurements or for legal purposes.

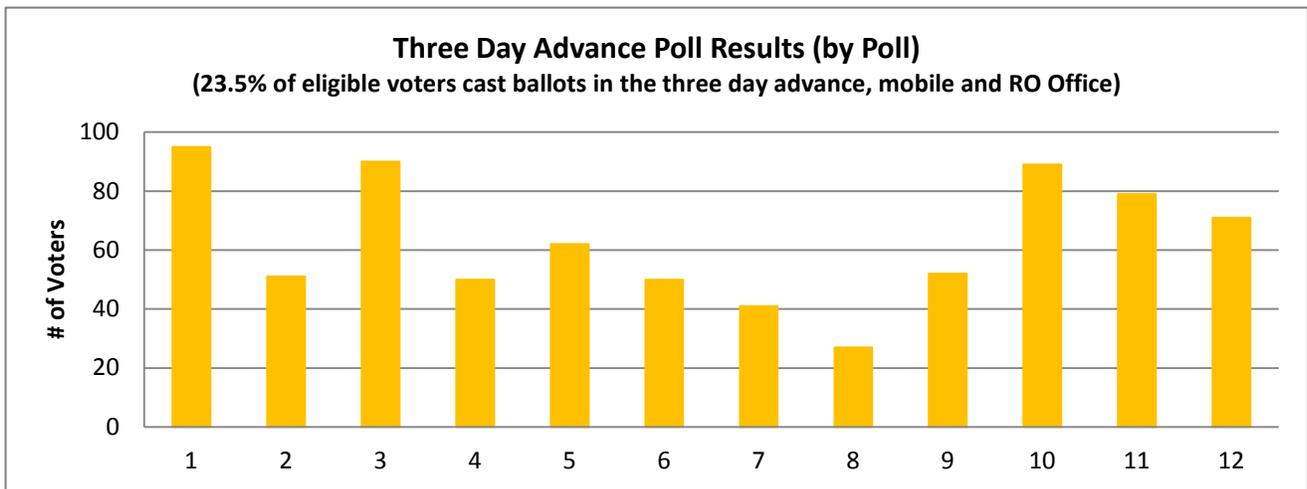


District No. 21 Summerside-Wilmot

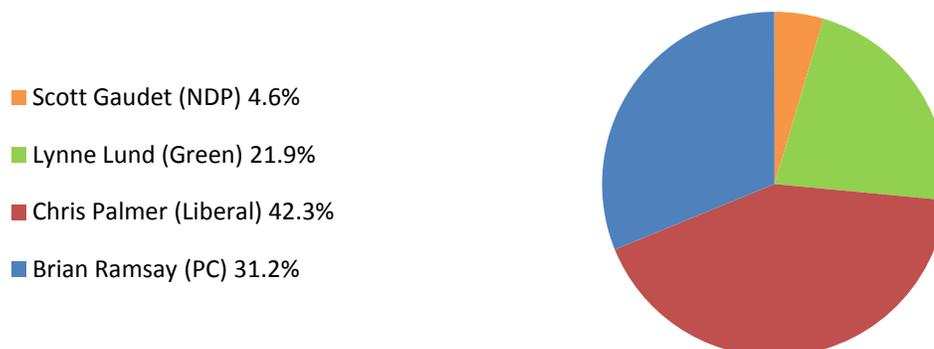
Returning Officer - Gary Simpson

No.	POLLING DIVISION	Number of Electors	Number of Ballots Cast	(NDP) Scott GAUDET	(Green) Lynn LUND	(Liberal) Chris PALMER	(PC) Brian RAMSAY	Rejected Ballots
	Advance **		907	37	131	460	276	4
1	North Granville	426	107	3	19	41	44	
2	Roy Boates Ave	287	68	9	11	23	23	1
3	MacEwen Rd North	404	150	5	45	58	42	
4	LeFurgey Ave	250	59	3	11	27	18	
5	High Street	304	129	4	29	40	56	
6	Gerri Lynn Cres	266	114	7	37	45	25	
7	Milton Ave	260	82	6	30	20	26	
8	Russell Street	206	86	5	29	26	26	
9	Harvard Street East	322	107	11	29	30	37	
10	Balcom Drive	400	173	5	39	78	51	
11	Gillespies Creek	351	157	5	39	60	52	1
12	Hillside Ave	376	178	7	57	70	44	
TOTALS		3852	2317	107	506	978	720	6

** Advance include the three day advance polls, mail in ballots, hospital polls and voting at the Office of the Returning Officer

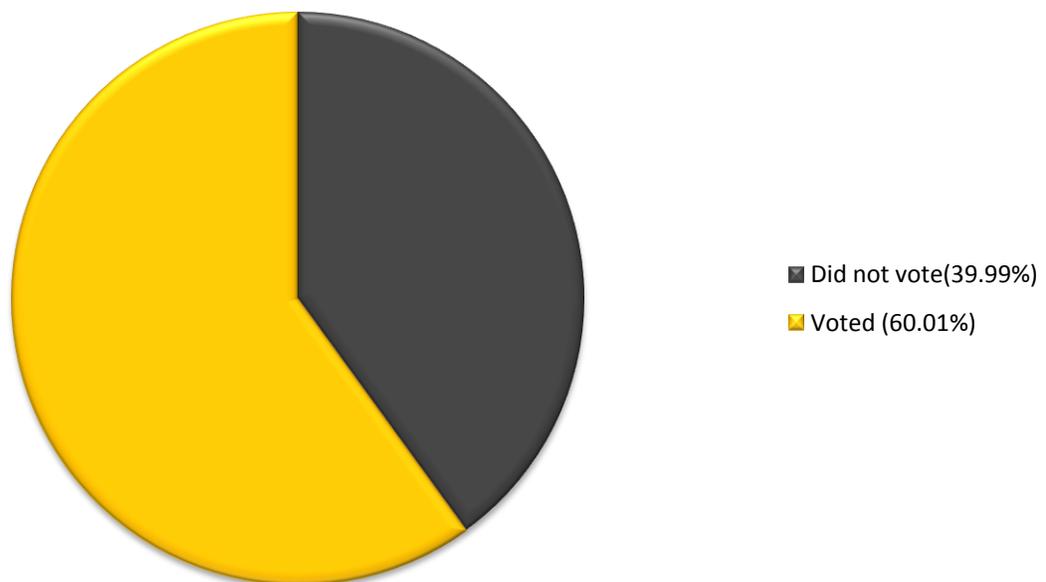


Popular Vote for each Candidate

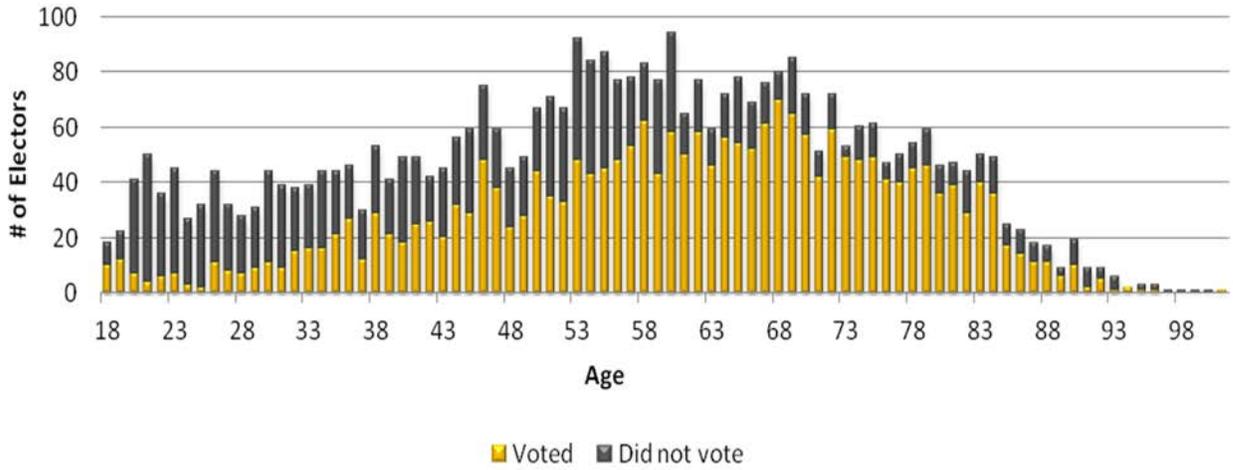


Voter Turnout

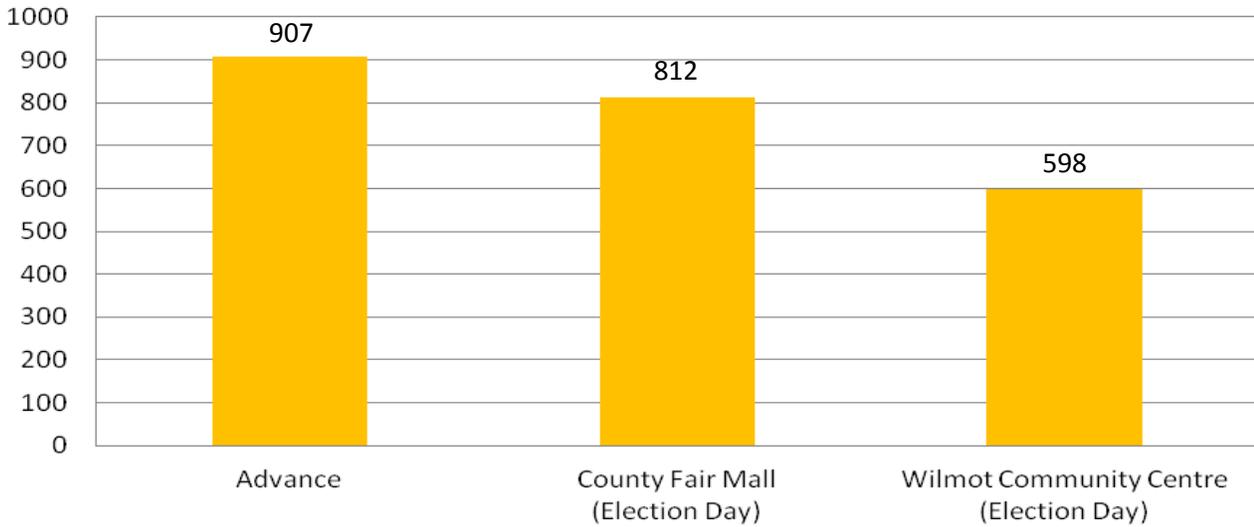
Poll	Confirmed Electors	Number of Voters	Voter Turnout
001 - North Granville	426	245	57.51%
002 - Roy Boates Avenue	287	124	43.21%
003 - MacEwen Road North	404	251	62.13%
004 - LeFurgey Avenue	250	117	46.80%
005 - High Street	304	195	64.14%
006 - Gerri Lynn Crescent	266	172	64.66%
007 - Milton Avenue	260	127	48.85%
008 - Russell Street	206	117	56.80%
009 - Harvard Street East	322	171	53.11%
010 - Balcom Drive	400	286	71.50%
011 - Gillespies Creek	351	245	69.80%
012 - Hillside Avenue	376	262	69.68%
Total	3,853	2,312	60.01%



Voters by Age



Voted by location



** Advance Counts include Mobile, Hospital and voting at the Office of the Returning Officer



Candidate / Party Expenses and Reimbursement

District	Candidate	# of Electors	# of Votes	%	Advertising	Office	Wages	Total	Max Spending Limit	Reimbursement
21 - Summerside-Wilmot	LUND, Lynne	3,852	506	21.9	\$2,720	\$600	\$3,050	\$6,370	\$10,054	\$3,000
Green Party of PEI		3,852			\$1,307	\$2,102		\$3,409	\$34,475	



Candidate / Party Expenses and Reimbursement

District	Candidate	# of Electors	# of Votes	%	Advertising	Office	Wages	Total	Max Spending Limit	Reimbursement
21 - Summerside-Wilmot	PALMER, Chris	3,852	978	42.3	\$4,953	\$2,734		\$7,687	\$10,054	\$3,000
Liberal Party of PEI		3,852	978		\$25,582			\$25,582	\$34,475	



Candidate / Party Expenses and Reimbursement

District	Candidate	# of Electors	# of Votes	%	Advertising	Office	Wages	Total	Max Spending Limit	Reimbursement
21 - Summerside-Wilmot	GAUDET, Scott	3,852	107	4.6	\$1,966	\$800		\$2,766	\$10,054	\$0
NDP of PEI		3,852							\$34,475	



Candidate / Party Expenses and Reimbursement

District	Candidate	# of Electors	# of Votes	%	Advertising	Office	Wages	Total	Max Spending Limit	Reimbursement
21 - Summerside-Wilmot	RAMSAY, Brian	3,852	720	31.2	\$7,262	\$2,639		\$9,901	\$10,054	\$3,000
PC Party of PEI		3,852			\$9,500			\$9,500	\$34,475	

of votes - for the candidate

% - percentage of votes received by the candidate (popular vote)

Advertising - all forms of advertising including signs, radio, tv and news print

Office - all office related expenses such as rent, telephone, meeting space, hospitality

Max spending limit based on \$2.61 per elector for Candidates and \$8.95 per elector for Parties (Section 18(2) *Election Expense Act*)

Reimbursed based on candidate having 15% or more of the popular vote. Rate of \$1.118 per eligible elector to a minimum of \$1500 and maximum of \$3000.

As filed with Elections PEI March 1, 2017

By-Election District 21 Summerside-Wilmot
Elections PEI expenses

Administration	\$3,935
Postage	\$1,807
Equipment	\$2,166
Material & Supplies	\$7,495
Document Printing	\$8,101
Advertising	\$363
Professional Services	\$1,162
Salaries	
Office of the Returning Officer	\$11,160
(28) Election Poll Workers	\$11,637
Travel	\$2,442
	\$50,268
Total	
<hr/>	
Candidate Reimbursement	\$9,000
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Total Election Expense	\$59,268
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Total number of registered voters on Ordinary Polling Day	3852
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Cost per registered voter	\$15.39
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Section 2

Plebiscite on Democratic Renewal October 29th to November 7th, 2016 Summary of Events

Summary of Final Results

Registered Voters: 102464

Number of votes cast: 37354

Turnout: 36.5%

Threshold for majority support: 18,521

ROUND 1		
	First-Past-The-Post (the current system)	11567 votes
	Mixed Member Proportional Representation	10757 votes
	Dual Member Proportional Representation	7951 votes
	Preferential Voting	3944 votes
	First-Past-The-Post Plus Leaders	2821 votes
	Eliminated First-Past-The-Post Plus Leaders due to: lowest 1st preference	
ROUND 2		
	First-Past-The-Post (the current system)	13108 (+1541)
	Mixed Member Proportional Representation	11153 (+396)
	Dual Member Proportional Representation	8224 (+273)
	Preferential Voting	4216 (+272)
	Exhausted votes	339 (+339) votes
	Eliminated Preferential Voting due to: lowest 1st preference	
ROUND 3		
	First-Past-The-Post (the current system)	14466 (+1358)
	Mixed Member Proportional Representation	12780 (+1627)
	Dual Member Proportional Representation	8948 (+724)
	Exhausted votes	846 (+507) votes
	Eliminated Dual Member Proportional Representation due to: lowest 1st preference	
ROUND 4		
	Mixed Member Proportional Representation	19418 (+6638)
	First-Past-The-Post (the current system)	15869 (+1403)
	Exhausted votes	1753 (+907)
	Majority Support: Mixed Member Proportional Representation due to: highest 1st	
Final Summary		
	Mixed Member Proportional Representation	19418 votes
	First-Past-The-Post (the current system)	15869 votes
	Exhausted votes	1753 votes

Definitions

Preferential Voting : An electoral system where voters rank all the options on a single ballot according to preference. Voters may rank as few or as many as they wish. To receive majority support an electoral system must receive more than 50% of valid votes.

Excluded: An option is "*excluded*" from consideration if it has the lowest amount of votes and another round of counting is required, if no other option reached more than 50% support to achieve the threshold. Excluded votes are then redistributed based on the voter's next preference.

Exhausted: A vote or ballot is "*exhausted*" following the voters choice being "*excluded*", if there were no further preferences ranked on the voters' ballot or if their next preferred option has already been *excluded*.

Threshold: The number of valid ballots divided by 2, rounded down to the lowest whole number plus 1.

Interpreting the Results

The results of the 2016 Plebiscite on Democratic Renewal have been further broken down to be reported by District and Age Range. Special items to note are the breakdown of the results show only recorded *valid votes*. Rejected ballots are not reported in the results reports, but have been noted in the Summary of Results.

Rounds of Counting

Round 1

Shows all valid votes cast as indicated by their first preference.

Rounds 2-3

Show the **total votes** per option in each round of counting followed by a summary of the number of votes which were redistributed from the previous round. The total votes can be calculated by adding the number of redistributed votes for each option to the previous round totals. Exhausted votes do not carry forward into further rounds of counting.

Round 4

Mixed Member Proportional has reached the threshold of more than 50% of valid votes. No further rounds of counting are required.

Plebiscite Voter Turnout

Eligible electors	102,464
Total voter turnout	37,354* (36.5%)
Valid ballots cast	37,040
Rejected Ballots	317

* Three (3) voters were missed during the recording of votes at the polls. Ballots for these voters were recorded at tabulation.

Overall Turnout by channel

Internet	30,277
Telephone	3513
In-person paper ballot	3564

Total number of preferences ranked per ballot

# of choices	Total Ballots
Ranked 1	7677
Ranked 2	6554
Ranked 3	2030
Ranked 4	442
Ranked 5	20337
Total	37040



2016 Plebiscite on Democratic Renewal

Voter Turnout by District

District #	District Name	Registered Voters	Voted*	Turnout
1	Souris-Elmira	3107	924	29.74%
2	Georgetown-St. Peters	3656	1207	33.01%
3	Montague-Kilmuir	3093	1033	33.40%
4	Belfast-Murray River	3153	1132	35.90%
5	Vernon River-Stratford	3487	1321	37.87%
6	Stratford-Kinlock	5486	2341	42.67%
7	Morell-Mermaid	3741	1387	37.08%
8	Tracadie-Hillsborough Park	3930	1410	35.88%
9	York-Oyster Bed	5147	1986	38.56%
10	Charlottetown-Sherwood	3908	1679	42.96%
11	Charlottetown-Parkdale	3439	1373	39.92%
12	Charlottetown-Victoria Park	2973	1236	41.57%
13	Charlottetown-Brighton	3260	1569	48.13%
14	Charlottetown-Lewis Point	3877	1634	42.15%
15	West Royalty-Springvale	4705	1907	40.53%
16	Cornwall-Meadowbank	4007	1694	42.28%
17	Kellys Cross- Cumberland	4605	1979	42.98%
18	Rustico-Emerald	4042	1580	39.09%
19	Borden-Kinkora	4158	1460	35.10%
20	Kensington-Malpeque	4585	1574	34.33%
21	Summerside-Wilmot	3907	1310	33.53%
22	Summerside-St. Eleanors	4131	1241	30.04%
23	Tyne Valley-Linkletter	3493	990	28.34%
24	Evangeline-Miscouche	2698	813	30.13%
25	O'Leary-Inverness	3359	901	26.82%
26	Alberton-Roseville	3561	935	26.26%
27	Tignish-Palmer Road	2956	738	24.97%
		102,464	37,354	36.45%

* Voted numbers include all spoiled ballots

SUMMARY OF THE PLEBISCITE ON DEMOCRATIC RENEWAL

The Plebiscite on Democratic Renewal provided additional challenges for Election PEI outside of the normal administration of an election event. The Committee on Democratic Renewal made several recommendations in how the plebiscite process was to be conducted. Some of these processes had not been used at the Provincial level across Canada and were expanded on with the previous Interim Report provided to the Legislative Assembly in November, 2016.

One of the recommendations which was not reported on in the previous report was the requirement for Elections PEI to conduct the public education for the plebiscite. There were several portions of conducting an educational campaign which included communicating:

- a. to allow 16 and 17 year olds their right to vote in this event;
- b. what a plebiscite is;
- c. an accurate but brief description of the five options being considered;
- d. the three options available for voting (internet, telephone and in-person);
- e. the results and how they would be tabulated using a preferential voting system;
- f. that voters were required to be registered to be able to vote.

Elections PEI hired a communications specialist to coordinate and manage all aspects of the public education. A strategy was developed to use a variety of media to promote the plebiscite, in both Official Languages, including using traditional print, radio and television along with using various social media platforms. The question being asked of Islanders was **“Is it time for change?”**

Legislation was amended to allow for 16 and 17 year old PEI residents to be placed on the Register of Electors and be authorized to vote in the plebiscite. This was the first time in Canada a person 16 and 17 years of age would be permitted to vote in a provincial election event. In an attempt to inform the 16 and 17 year old residents, during the presentations at the schools, information was distributed regarding getting this age group to get registered to be able to vote. Young Voter Registration forms were distributed with the assistance of the Public School Board, the French Language School Board and the private schools. Based on information received from these schools, there are approximately 3,400 students who were over the age of 16 on November 7, 2016. It could not be determined how many of those would not qualify as being Canadian citizens or those who have not lived in PEI for the required six (6) months. At the time of the end of the voting period, there were 2,068 registered voters between the ages of 16 and 17. There were 667 votes cast by this age group for 32.16% of registered 16 and 17 year old voters.

WEBSITE

During the summer months, a website in both English and French was developed for the plebiscite (www.yourchoicepei.ca). The website had videos explaining the concepts of the five options, the voting methods and included information on who was qualified and how to get registered to vote. All public education sessions were advertised including all media releases in which the plebiscite or information regarding the plebiscite was mentioned.



PUBLIC PRESENTATIONS

To assist in conducting the public education seminars across PEI, two UPEI Political Science post secondary students were hired. Over the summer and fall, there were 73 presentations conducted at various locations and facilities across the entire Island. In addition, 21 school presentations were completed along with 6 webinar presentations. Several of these presentations were conducted in French for the francophone community. Examples of where these presentations took place include farmers markets, malls, community centers and events, municipal buildings and exhibitions such as the Biz2Biz at the Eastlink Center.



Van wrapped to promote plebiscite



Public presentations at the Confederation Court Mall

MEDIA PRESENTATIONS

Presentations were made using local TV, Radio and newspapers. In total, 33 television commercials, 649 radio commercials and 4 newspaper advertisements were made over the four weeks leading up to the end of the plebiscite. Other forms of presentations were made on a daily basis included social media posts on Facebook, Twitter and YouTube.

BROCHURE

A brochure was developed which outlined the principals of the five (5) electoral systems being considered in the plebiscite. The brochure also included additional information such as the qualifications as to who may vote (PEI residents who are at least 16 years of age by November 7, 2016), the method a person may vote (internet, telephone or in-person), as well as how to get registered with Elections PEI to be able to vote.

CHIEF ELECTORAL OFFICER OF PEI

It is a time for change? That's the question facing Island voters. The possible future of how Members of the Legislative Assembly are elected could change with the fall plebiscite. New voting options will be used which include voting by internet and telephone in addition to polling locations which will use paper ballots. 16 and 17 year olds involvement in the future of how PEI will be governed. The Plebiscite on Democratic Renewal is an important step in the democracy of Prince Edward Island and encourage Islanders to review the options and cast your vote in this election.

Chief Electoral Officer of PEI - Gary McLeod

VOTING OPTIONS

INTERNET/ TELEPHONE VOTING
Saturday, October 29, 2016 12:00 noon - Monday, November 7, 2016 until 7:00 p.m.
 Voting can take place any time during this time period. A person is only able to vote once during the plebiscite.

ELECTRONIC VOTING
 Access to the internet with applicable devices - smartphone - tablet - laptop

TELEPHONE VOTING
 Any land-line telephone

IN PERSON VOTING (PAPER BALLOT)
Friday, November 4, 2016 6:00 p.m. - 9:00 p.m.
Saturday, November 5, 2016 10:00 a.m. - 6:00 p.m.
 Polls will be open across the Island for 2 days of in-person voting. Islanders will be able to vote at any polling location regardless of where they live. You will be required to bring your Voter Information Card (VIC) with you to be able to vote. If you do not have a VIC, you may register at the polling station.

To vote or register in person, you will be required to produce identification (ID). The quickest and easiest form of ID is to produce your PEI Driver's License/ Voluntary ID card. If you do not have a Driver's License you can provide 2 pieces of ID from the list of Acceptable IDs found at www.pselections.ca.

IS IT TIME FOR CHANGE?



PEI's Choice, It's Your Voice!

P.E.I.'S CHOICE, IT'S YOUR VOICE!

The fall plebiscite will have an opportunity to express their opinion on the electoral system used to elect Members to the Legislative Assembly (MLA).

In July 2015, the Government of PEI issued a White Paper on Democratic Renewal, as part of a commitment in the Speech from the Throne. To initiate and support a thorough and comprehensive examination of ways in which to strengthen our electoral system, our representatives, and the role and functioning of the Legislative Assembly.

A special committee of the Legislative Assembly was tasked with exploring alternatives to PEI's First Past the Post voting system. After months of study and consultation with Islanders on potential options, the committee presented recommendations. As a result, a plebiscite (vote) on these options will take place in the fall of 2016.

For the first time in Island history, 16 and 17 year olds will now have the chance to have an influence on the future of elections on PEI. Their choice in the plebiscite will have a direct impact once they become of voting age at the next provincial election.

All Islanders will be able to vote on-line, by telephone, or in the traditional manner at a polling station.

Islanders will be asked to rank, in order of preference, their preferred options: First Past the Post (PEI's current system), First Past the Post (Proportional), Preferential Voting and two options for proportional representation: Dual Member and Mixed Member.

This brochure provides a brief explanation of each option. For additional information, Islanders are encouraged to visit the plebiscite website at www.pselections.ca or the Elections PEI website at www.electionspei.ca or call 1-888-234-8683 (VOTE).

"To initiate and support a thorough and comprehensive examination of ways in which to strengthen our electoral system, our representatives, and the role and functioning of the Legislative Assembly."

• yourchoicepei.ca •
• electionspei.ca •

• yourchoicepei.ca •

• [democratic renewal](http://democraticrenewal.ca) •
• electionspei.ca •
• yourchoicepei.ca •
• 1-888-234-8683 (VOTE) •

FIRST-PAST-THE-POST

It is the current system where the most popular candidate is elected

Prince Edward Island's current electoral system is known as First Past The Post. Voters mark one 'X' on the ballot for their candidate of choice.

The candidate in each district receiving the most votes is elected. The political party that elects the most members would form government.

Currently, there are 27 MLAs - 16 Liberal, 4 Progressive Conservatives and 7 Green. All of the members were elected because they had the most votes in their districts.

Historic results in PEI using the First Past The Post system have created majority governments; however, minority or coalition governments are possible.

The First Past The Post is used in Canada, the United States, the United Kingdom, and in India.

DUAL MEMBER PROPORTIONAL (DMP)

It is a proportional system where two local MLAs are elected per district

In each district, voters would mark a single 'X' for the party of their preference. Each party may run a maximum of two candidates per district who appear on the ballot in order as decided by the party. In every district, the most popular party wins the first seat, as in the First Past The Post system. The second seat for every district is assigned so that the party distribution in the legislative Assembly matches the province-wide popular vote. These seats, assigned proportionally from the number of seats available, are given to the candidates where the party did the best. If a party receives three extra seats, generally their top three candidates would be elected.

Under this system, Islanders would most often be represented by two MLAs from two different parties. Based on results in other jurisdictions, which use proportional systems, which are assigned in minority or coalition governments, while majority governments are possible.

This system developed specifically for PEI and is not used anywhere else.

MIXED MEMBER PROPORTIONAL (MMP)

It is a proportional system where one local MLA is elected per district and other MLAs are elected for the province

An MMP ballot will be in two parts. In the first part, using the First Past The Post system, a voter would mark a single 'X' for their preferred candidate. Two thirds of the MLAs will be elected this way and will become a representative for a district. On the second part of the ballot, a voter would mark a single 'X' for their preferred party by voting for a candidate on a party list. One third of the MLAs would be elected this way. The result of the second part of the ballot determines the percentage of popular vote for each party.

This second vote assigns seats to parties by attempting to make up for any difference in what a party would be assigned proportionally and the number of seats won through First Past The Post. List candidates would represent the entire province.

Based on results in other countries like Scotland, Germany and New Zealand, proportional systems often result in minority or coalition governments, while majority governments are possible.

PREFERENTIAL VOTING (PV)

It is a system where candidates are ranked and must have more than 50% of votes to win

In Preferential Voting system, voters rank the candidates on the ballot by their preference; the number 1 is placed beside their first choice, the number 2 beside their second choice and so on until all the candidates on the ballot have been ranked. A voter may choose to rank in many or in few preferences, as they want.

The winning candidate must have a majority of all the candidates he or she has more than 50% after the first count; the candidate who received the fewest votes is excluded. The ballots for the excluded candidate are then redistributed between the remaining candidates based on the next ranked candidate on those ballots. A new count is completed and if no candidate has received more than 50% support, the process continues until one candidate has a majority of the support.

Preferential Voting is used in other countries like Australia and in the Republic of Ireland.

While a majority government is likely, coalition and minority governments would still be possible.

All voters of PEI have a critical role to play in this exercise of democracy. This is your chance to influence the future of the election process on Prince Edward Island!

For additional information, visit the plebiscite website at www.pselections.ca or electionspei.ca or call 1-888-234-8683 (VOTE). Your ballot number remains your request.

PEI's Choice, It's Your Voice!

• yourchoicepei.ca •
• electionspei.ca •

• yourchoicepei.ca •

The brochure was available at all public education events. To further inform the public, the brochure was mailed to every residence in Prince Edward Island by Canada Post during the first week of October.

INTERNET/TELEPHONE and IN-PERSON VOTING

One of the recommendations of the Committee on Democratic Renewal was the use of electronic voting be used to maximize both access and convenience providing standards for security, accuracy, privacy, integrity, cost-effectiveness and auditability could be assured. The access and convenience depended on the voter's willingness to accept alternatives to the traditional voting method. With over 80% of those who voted using the internet or telephone to vote, both access and convenience were shown as acceptable methods to vote. An audit process was required to ensure adequate standards were in place for security, accuracy, privacy and integrity. The cost-effectiveness can be determined based on a comparison using the 2015 Provincial General Election.

This is the first time internet and telephone voting has ever been used in a provincial election event in Canada. There have been many opinions and papers written on using the internet for voting with security issues being a major concern. There are several factors which have to be mitigated to ensure the integrity of the voting process is not compromised. There will always be risks associated with any form of online activity but with the plebiscite, it was felt the risk could be mitigated and managed to support using these alternative voting methods. The electronic voting period took place over a 10 day period from 12 noon October 29 to 7:00 p.m. November 7, 2016. There were two (2) days for in-person voting, November 4th from 4:00 p.m. to 9:00 p.m. and on November 5th from 10:00 a.m. to 8:00 p.m.

One of the main reasons for using electronic voting was for accessibility. This was the most popular method to vote. A breakdown of online voting locations can be found in the chart below.

Country	# of Votes
Canada	29649
Unknown *	279
United States	260
United Kingdom	16
Australia	9
Germany	9
Switzerland	7
France	5
Hong Kong	4
Sweden	4
Barbados	3
Cambodia	3
Costa Rica	3
New Zealand	3
Spain	3
Aruba	2

Country	# of Votes
Hungary	2
Italy	2
Mexico	2
Antigua and Barbuda	1
Belgium	1
Belize	1
Bermuda	1
Denmark	1
Guyana	1
Ireland	1
Japan	1
Kazakhstan	1
Korea, Republic of	1
Malawi	1
Singapore	1
TOTAL	30277

*Country of IP origin could not be determined

Over the 10 day voting process, there were a total of 33,790 persons who used the internet or telephone voting process. As a result, there were eligible voters across the world who voted during the plebiscite. In total, voting took place from 30 different countries.

All registered voters received a Voter Information Card either in the mail or by email which contained the three methods of voting options along with a unique personal identification number (PIN). Voters then had the option of voting on the internet, by telephone or in-person.

Internet - Voters were directed to a website which allowed them to enter in their personal credentials (date of birth and the unique PIN). Once the authentication of the credentials had been confirmed by the system, voters were then presented with an electronic ballot to complete and submit. Once submitted, the voter then received confirmation their vote had been accepted.

Telephone - Those voters who wished to vote by telephone were directed to call a specific number and then were directed to enter their personal credentials (date of birth and PIN) using the telephone key pad. Once the authentication of the credentials had been confirmed by the system, computer generated voice commands were given directing the voter to select their options using the key pad. Once the voter’s options were confirmed, the voter then received a confirmation code advising their vote had been accepted.

In-Person - Voters were given the opportunity to vote in the traditional manner using a paper ballot over a two day period. There were 22 polling locations across PEI designated for in-person voting, using schools as the primary location. Voters were provided with a ballot which, when completed, was placed in a ballot box. At the completion of the two (2) days of in-person voting, all ballot boxes were returned to Elections PEI Office in Charlottetown for tabulation of the ballots.

Electronic Ballot

ELECTORAL SYSTEM OPTIONS	1st Choice	2nd Choice	3rd Choice	4th Choice	5th Choice
Dual Member Proportional Representation	<input type="radio"/>				
First-Past-The-Post (the current system)	<input type="radio"/>				
First-Past-The-Post Plus Leaders	<input type="radio"/>				
Mixed Member Proportional Representation	<input type="radio"/>				
Preferential Voting	<input type="radio"/>				

INSTRUCTIONS TO VOTERS:

- To vote, completely fill in the oval to the right of your choice(s), like this:
- Please use a blue or black pen only.
- Fill in no more than one oval per electoral system option.
- Fill in no more than one oval per column.
- If you make a mistake, ask for a new ballot.

Paper Ballot

On Sunday, November 6th, the paper ballots were tabulated using a high speed scanner and an electronic file was generated. At the end of the voting period on Monday, November 7th, this electronic file was merged with the electronic file generated from the internet and telephone voting to produce the results of the voting. An algorithm, which had been previously tested and approved, was then applied to the results to obtain a preferential voting result.

PREFERENTIAL VOTING

Although preferential voting was one of the five options being considered in this plebiscite, it was also the method of counting put forward by the legislation on how the votes were to be counted to determine the option with the most votes. The use of a preferential ballot to determine the results is not common in Canada. Some Provinces in western Canada used this method in the 1950's but then returned to the traditional first-past-the-post system. The Province of Ontario has recently authorized municipalities to utilize preferential voting in the next municipal elections should they wish to use this type of electoral system. Candidates would then require a majority of votes to be elected. In conducting research on this type of voting process, there are many different but similar voting systems around the world and no two processes use the same guidelines for how the process will work. A Ballots, Counting and Reporting Policy was put in place by Elections PEI for this plebiscite which provided the guidelines to be followed by all election workers (including all vendors and audit team) in the calculating the electoral options with the most votes. With the aid of the high speed tabulation of the paper votes to produce an electronic file, combining this electronic file with the results from the electronic voting, the results were produced shortly after the close of the voting period. This entire process was carefully reviewed by the audit team to ensure accuracy of the votes being counted.

AUDIT TEAM

One major component to ensure adequate standards for security, accuracy, privacy and the integrity of the voting process was to put together an independent audit team to oversee the entire process from start to finish. Mr. Harry Neufeld, the former Chief Electoral Officer for British Columbia was appointed to coordinate the audit process. Three (3) additional members of the team came from other electoral management bodies across Canada who had expertise in various fields of electoral management. Terms of reference were developed for the audit team to follow to ensure all standards which were identified could be achieved.

The audit team has produced a report, which is included in Section 3 of this report. Highlights of the report are listed below.

- Electronic voting, both via telephone and on the internet, was managed in a way that was secure, performed well, remained accessible 24 hours per day, and prevented voters from casting ballot with unintentional errors;
- Adequate controls, appropriate to the level of risk presented in a non-binding provincial plebiscite, were in place to limit the possibility of unauthorized or duplicate voting and to detect such illegal acts after the fact, while permitting every eligible island voter the choice of voting by telephone, on the internet, or in-person with a paper ballot that was available at every polling place established in the province;
- A combination of paper ballot adjudication procedures and special computer processing measures ensured that there was an accurate and reliable integration of all valid paper ballots voting choices with the electronic ballots cast; and
- The results of the count of the preferential ballot voting results accurately reflected all of the valid ballots cast during the plebiscite.

An overall assessment of the plebiscite's voting integrity can be found on page 19 of the Voting Integrity Audit Report.

EXPENSES

The cost of conducting any election event is normally measured based on the cost per voter. In the 2015 Provincial General Election, the total cost of the election was \$1,242,855 which included \$184,803 in reimbursements for candidate expenses to the political parties. With 100,343 registered voters, the cost per registered voter was \$12.38 for the last provincial general election. With the removal of the reimbursements, the cost is reduced to \$1,058,052 or **\$10.54 per registered voter**.

The total cost of the 2016 Plebiscite on Democratic Renewal was \$640,428. With 102,464 registered voters, the cost was **\$6.25 per registered voter**.

Plebiscite on Democratic Renewal Elections PEI expenses	
Administration	\$29,036
Postage	\$74,636
Equipment	\$57,467
Material & Supplies	\$22,606
Document Printing	\$50,173
Advertising	\$51,840
Professional Services	\$161,825
Salaries (Call Center, Public Education, Poll Workers, Office Staff)	\$174,397
Travel	\$18,448
Total Plebiscite Expense	\$640,428
<hr/>	
Total number of registered voters	102,464
<hr/>	
Cost per registered voter	\$6.25

Call Center	\$30,663
Public Education	\$71,823
VIC (mailing/printing)	\$100,161
Internet Voting	\$106,112
Audit	\$57,734
In-Person Voting (not including salaries)	\$99,538
Salaries	\$174,397
Total	\$640,428

Section 3

Plebiscite on Democratic Renewal October 29th to November 7th, 2016 Voting Integrity Audit Report

**PRINCE EDWARD ISLAND
2016 PLEBISCITE ON DEMOCRATIC RENEWAL**

**VOTING INTEGRITY
AUDIT REPORT**

November 30, 2016

INDEPENDENT TECHNICAL PANEL ON VOTING INTEGRITY

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Executive Summary

The 2016 Prince Edward Island (PEI) plebiscite on democratic renewal will be noted in Canada's electoral history as a result of several pioneering innovations it featured.

This public consultation marked the first Canadian vote on electoral system reform options involving a ranked-choice preferential ballot. PEI's 2016 plebiscite was also the first province-wide electoral event where sixteen and seventeen year-olds were given legal franchise rights and encouraged to register and vote.

But the most noteworthy feature of this event was that it marked the first instance of province-wide voting administration in Canada where two days of traditional in-person paper ballot voting was supplemented with an overlapping 10-day period of electronic voting options — registered voters could cast their plebiscite ballots by telephone or online via the internet at any time of the day or night from noon on October 29th until 7 p.m. on the evening of November 7th.

Providing multiple channels of voting over a sustained period, which unquestionably increases voter accessibility and convenience and appreciably broadens citizens' access to their democratic voting rights, carries some increased risks for electoral integrity. New risks needed to be acknowledged, accepted and/or mitigated. The potential for new kinds of voting fraud needed to be anticipated and minimized in order to sustain public trust in the overall voting system.

In recognition of the additional risks being introduced, the rules for the plebiscite included the following clause in section 12 of its regulations:

The Chief Electoral Officer shall cause an audit to be conducted to ensure the integrity of the alternative voting process.

This document is a report on the audit activity that was undertaken to meet the legal requirement set out in the *Provincial Electoral System Plebiscite Regulations* which were established under the province's amended *Plebiscites Act*. This report was prepared by the four members of the Independent Technical Panel on Voting Integrity (ITPVI), each of whom was appointed by the Chief Electoral Officer (CEO) of PEI during the summer of 2016 and present on Prince Edward Island during critical portions of the plebiscite voting period. (See Appendix 'A' for the panel's terms of reference, and Appendix 'J' for background information on the ITPVI members.)

Audit planning and process preparation activities began in early September 2016. Testing of the electronic voting, paper ballot scanning, integration of digitally scanned paper ballots with electronic ballots, and the process for electronic vote counting of preferential ballot choices was conducted

between mid-September and late October. This report was prepared as a result of observations (both in-person and electronically) taken during the plebiscite voting period, but was largely informed by the three rounds of detailed testing activities that immediately preceded that period. As required by the terms of reference that guided the audit team, a preliminary draft of this report was provided to the Chief Electoral Officer of Prince Edward Island in advance of the public announcement of the voting results for the plebiscite on the evening of November 7th, 2016.

In general, the conclusion reached by the ITPVI was that the plebiscite voting process maintained a high level of integrity. This outcome was reached despite the fact that the expanded range of voting choices carried significant new risks. Some of these risks were impossible to fully mitigate, and it is possible that some limited breaches of electoral integrity occurred that could not be detected. In the PEI CEO's own words as quoted in local media during the event:

"This is not a fool-proof system, and that's one of the risks that we have right now."

Every reasonable effort was made to keep electronic voting methods secure, to prevent voters from voting more than once, to ensure only eligible voters were permitted to register and vote, to count only valid ballots, and to do so in a way that accurately reflected the choice-ranked preferences marked on all valid paper and electronic ballots cast by participating PEI voters.

It is the unanimous opinion of the four members of the Independent Technical Panel on Voting Integrity that, with regards to the PEI 2016 Plebiscite on Democratic Renewal:

- Electronic voting, both via telephone and on the internet, was managed in way that was secure, performed well, remained accessible 24 hours per day, and prevented voters from casting ballots with unintentional errors;
- Adequate controls, appropriate to the level of risk presented in a non-binding provincial plebiscite, were in place to limit the possibility of unauthorized or duplicate voting and to detect such illegal acts after the fact, while permitting every eligible Island voter the choice of voting by telephone, on the internet, or in-person with a paper ballot that was available at every polling place established in the province;
- A combination of paper ballot adjudication procedures and special computer processing measures ensured that there was an accurate and reliable integration of all valid paper ballot voting choices with the electronic ballots cast; and
- The results of the count of preferential ballot voting results accurately reflected all of the valid ballots cast during the plebiscite.

1. Introduction

The 2016 plebiscite on democratic renewal held on Prince Edward Island was formally initiated in July 2015 when the newly-elected provincial government issued a White Paper on Democratic Renewal.

Electoral reform had been a topic of considerable debate during the political campaign that preceded the provincial general election held on May 4, 2015.

The White Paper called for a Special Legislative Committee to undertake a public engagement process to define a plebiscite question, requiring that question be based on a choice between three basic electoral system options — the current first-past-the-post (FPTP) system, a preferential ‘ranked ballot’ voting system, or a proportional representation system.

A five-member multi-party committee was struck and it conducted two rounds of public hearings around the Island between October 2015 and April 2016. A formal report was provided to the Legislative Assembly after each round.

In summary, the recommendations of the Special Committee of the Legislative Assembly on Democratic Renewal were:

- A plebiscite should be held in November 2016, preceded by a six-month educational campaign.
- The plebiscite question should take the form of a ranked ballot, with voters free to rank as many or as few of five available electoral system options.

(Two variations of FPTP and two proportional systems were identified by the committee as needing to appear on the plebiscite ballot.)

- Eligibility to vote in the plebiscite should be extended to 16 and 17 year-olds.
- Electronic voting should be utilized in the plebiscite.
- Elections PEI should be tasked with providing “clear and impartial information about the plebiscite voting process, the date of a plebiscite, a plebiscite question, and the content of the choices appearing on a plebiscite ballot.”

The PEI *Election Act* and the *Plebiscites Act* were both amended in May 2016 to provide legal authority to implement the committee’s recommendations, and the *Provincial Electoral System Plebiscite Regulations* were prepared following those enactments. On June 28, 2016 an Order in Council was passed by the Cabinet of the PEI Provincial government that brought the regulations into force, formally set out the 10-day period for online and telephone voting (October 29th thru November 7th), and the two-day period for in-person voting (November 4th and 5th).

That Order directed that:

“. . . the Chief Electoral Officer supervise and conduct the plebiscite using the processes, procedures, technology and equipment necessary for the taking of the vote in accordance with this order and as prescribed by regulations.”

Section 12 of the plebiscite regulations called for the Chief Electoral Officer to “cause an audit to be conducted to ensure the integrity of the alternative voting process”. The alternative voting process was defined in the regulations as the telephone and internet electronic voting methods that were to be made available.

In response to the audit requirement, the CEO commissioned a former Chief Electoral Officer of British Columbia, who had previous experience auditing internet and telephone election processes, to become the coordinator for an “Independent Technical Panel on Voting Integrity” (ITPVI) that would be established specifically for the 2016 plebiscite.

Terms of Reference were drawn up for the ITPVI, which was more generally referred to as the ‘plebiscite audit team’. PEI’s Chief Electoral Officer shared these terms of reference (see Appendix ‘A’) with various other Chief Electoral Officers from jurisdictions across Canada, along with a request that they consider volunteering an experienced IT resource, with a solid grounding in election administration, to take on the role of supporting the electoral integrity audit and critically examining and reviewing the electronic voting and vote counting processes in the PEI plebiscite. By the third week in August, three personnel had been identified to work with the commissioned audit coordinator and plan the approach to undertaking the integrity review. (See Appendix ‘J’ for further information of each of the members of the audit panel. See Appendix ‘B’ for a copy of the Audit Plan the team prepared.)

During the summer of 2016, the Chief Electoral Officer for Prince Edward Island undertook a competitive procurement process to determine who the vendors would be for the electronic voting services and for the scanning and digitization services needed for the paper ballots. Simply Voting Inc., based in Montreal, Quebec was awarded the contract for electronic voting services. Election Systems and Software (ES&S), based in Pickering, Ontario was awarded the contract for scanning and digitization services for the paper ballots.

Two other vendors with existing contractual arrangements with Elections PEI were required to integrate their services with Simply Voting and ES&S. DataFix, the Toronto-based vendor of an election management software application called VoterView, needed to tightly integrate their voter registration information and electronic ‘strike-off’ functions with Simply Voting. Gilmore Doculink, based in Ottawa, needed to integrate with DataFix and Simply Voting in order to accurately manage the production and mailing of paper-based ‘voter information cards’ (VICs) which were in the form of a letter, inserted in a

sealed envelope, and individually sent to each registered voter in PEI informing them of the three channels of voting available, the respective time frames for each channel, the specific credentials needed to vote via the internet or by telephone, and the ID requirements, as well as the closest location, for in-person voting.

The audit team needed to extensively engage with Simply Voting and ES&S in the pre-plebiscite period to conduct end-to-end tests of the intended voting system. The extent to which Simply Voting and ES&S integrated their services, and the depth of technical integration between the DataFix VoterView application and the Simply Voting electronic voting services application, was critical to the success of the plebiscite voting operations. Performance, capacity and stability of each system component were considered to be critical success factors in the provision of the electronic voting and vote counting services on which Elections PEI was depending.

Elections PEI consists of only three permanent staff — the Chief Electoral Officer, a Deputy CEO and a Manager of Elections Operations. The ITPVI was concerned, from its very earliest meetings, about the substantial levels of risk being generated by having many new electoral processes introduced under the direction of such a small group of full-time election administrators. Without the dedication and sustained level of highly effective leadership provided by these Election Management Body (EMB) core personnel, the successful delivery of an electoral event of this sophistication and complexity would simply not have occurred.

2. The Concept of Electoral Integrity

Electoral integrity has been described as:

“. . . having an administrative ‘system’ with controls in place to ensure only eligible voters vote, they only vote once, their vote is kept secret, their ballot choices are counted accurately, and the entire process is sufficiently transparent that all of this can be seen as being accomplished.”¹

There is always risk of non-compliance with the legislation, policies, guidelines and practices that are meant to be exercised in the administration of an electoral event. These can either deliberately or

¹ See page 59 in Volume II of the *Report on the Conduct of the October 8, 2013 Provincial General Election and Recommendations for Legislative Change*, published by the Chief Electoral Officer of Nova Scotia, April 2014.

inadvertently get ignored. As such, integrity of an electoral process can be compromised, and the voting results questioned, when such compliance risks materialize.

A key strategy in managing electoral integrity is developing an understanding the real risks and establishing appropriate procedural and technical controls necessary to manage related matters to an acceptable level of residual risk. Responsible risk assessment needs to clearly outline initial risk, probability, impact, mitigation measures and residual risk net of mitigation. This is especially important if attempting to compare relative risk between jurisdictions and between different types of electoral events within one jurisdiction. This report intends to make it clear that the probability and impact of a risk manifesting itself will differ considerably depending on the electoral context.

Canadian electoral law and the detailed policies associated with its administration have supported evolution of a highly institutionalized approach in applying a broad range of controls to effectively manage procedural risks. Through 150 years of elections in Canada, key 'traditional' risks have been well defined. They are discussed in more detail in Section 11 of this report and can also be found in a summary table in Appendix 'G'.

Complicating the task of managing electoral integrity is the fact that complex controls can quickly begin to affect the accessibility and convenience of voting, can become very costly and can also be extremely inefficient to implement. An appropriate equilibrium between accessibility, convenience, efficiency and integrity needs to be sought. The telephone and internet voting options provided to voters in the PEI plebiscite added additional integrity concerns. These are also discussed in more detail in Section 11 and summarized in the table at Appendix 'G'.

Combining several forms of electronic voting (telephone, internet) with an option to vote with a 'traditional' paper ballot adds new considerations for the prevention of duplicate voting:

- Can someone vote multiple times, undetected, by using both online methods and a paper ballot?
- Can someone vote simultaneously from a desktop computer and a smart phone? By telephone and online via the internet? By mobile phone from the polling booth once they have received a paper ballot?²

Conducting a preferential vote, with ballot choices being rank-ordered by the voter, with the voting result calculation potentially requiring multiple rounds of vote counting in order for a particular option

² While the initial scope of the ITPVI was only alternative voting methods, there was a realization by the audit team members that the paper ballot voting and voter strike-off procedures also needed to be considered in the integrity equation.

to obtain the required majority threshold, brought an additional level of complexity to the PEI plebiscite process.

It was widely understood that any question regarding the integrity of this first province-wide use of electronic voting in an electoral event would have an adverse effect on public trust in any future use of computerized voting technology in similar contexts.

The audit team spent considerable effort in testing voting and counting processes in the six weeks prior to the start of the plebiscite, and made recommendations for changes needed to ensure those processes were accurately documented and conducted in accordance with legislation, regulations and established policy. (See Appendix 'D' for the *Ballot Counting and Reporting Policy* established by the PEI Chief Electoral Officer.)

In stating that the 2016 PEI plebiscite was conducted with a high level of integrity, it is important to note that the ITPVI does not necessarily endorse the use of multi-channel electronic and paper ballot voting methods. Each election, referendum or plebiscite requires a separate situational analysis and risk assessment prior to the adoption of new voting methods. The reasons for this note of caution are described more fully in Section 11 of this report.

3. Controls in the E-Voting Application Environment

Elections PEI conducted a formal procurement process, through which they chose Simply Voting Inc. as the vendor that would provide telephone and online internet voting services during the plebiscite.

The audit team conducted a cloud service provider technical risk assessment (see Appendix 'H') on the Simply Voting computing services environment. That risk assessment determined that there was a medium security risk posture associated with the use of Simply Voting Inc. A medium security risk posture means that the system could be somewhat attractive to cyber attackers and required sufficient controls and assurances in terms of technical compliance requirements to mitigate that risk.

While conducting this assessment, the team took into account the size of the organization and the stakes involved in the outcome of the electoral event. If this event was an election for MLAs or MPs, or a binding referendum or plebiscite where the outcome had significant monetary or political power implications for a particular person, group or organization, the assessment would have come out as a high risk security posture.

The audit team reviewed the physical and logical security controls of the e-voting application and the location in which it is housed, recognizing that this was paramount to ensuring the integrity of the application environment and therefore the integrity of the process and of the votes cast using this system. These controls took the form of documentation pertaining to security certification and accreditations of the data centre in which the application was being housed as well as other security audits and tests conducted on the application. The audit team was satisfied that reasonable and appropriate measures were taken to secure the data centre and the application that provided the plebiscite's telephone and internet voting services.

A code review of the Simply Voting application was not done. The audit team's coordinator felt that testing the inputs and outputs of the system was sufficient for this audit given the nature and risk assessment results for this particular event. In addition, the monetary costs and time requirements associated with a comprehensive code review was considered prohibitive for a small electoral jurisdiction such as PEI. Based on discussions with the coordinator, the Chief Electoral Officer for PEI excluded the conduct of any code review of the Simply Voting application from the ITPVI's scope of assignment responsibilities when its Terms of Reference were drawn up. It should be noted, however, that Simply Voting Inc. was entirely open to the concept of a detailed code review being done on their e-voting software application, and has had previous clients conduct such a review.

The team conducted multiple tests of the e-voting system. These included attempting to cast multiple votes through a variety of means, changing selections, and abandoning ballots. All scenarios completed as expected and there were no integrity issues whatsoever were found during these tests.

In advance of the plebiscite voting period, several load tests were performed by Simply Voting and these were witnessed by members of the audit team. Load tests were conducted in conjunction with integration tests with VoterView system components. The final test conducted had a peak load of 600 requests per second, well beyond the anticipated load expected for this event. No performance, capacity or integration issues were noted.

4. Controls for Access to Electronic Voting Methods

Elections PEI and Simply Voting made use of 'two-factor authentication' for each voter to prove their identity when voting online or by telephone. The first of the two factors was an 8-digit PIN (personal identification number) that was mailed in a sealed envelope and included on each voter information card (VIC), which was a number that voter needed to *have* in order to cast an electronic ballot. The second authentication factor was the voter's date of birth, which was not included in the VIC

communication. Typically, the second factor is a piece of information only the individual it pertained to would *know*. This second factor often is referred to as a 'shared secret'.

If the voter had an email address in the register, the VIC with the PIN could be emailed to them instead of being sent via regular mail. Voters who registered to vote after the voting period began were given the option of getting their VIC mailed or emailed to them up until noon on October 31, 2016, after which the VIC had to be emailed to the voter.

Regular mail and electronic mail as delivery methods for the PIN raised concerns for some people, as this combination is not always considered secure or reliable. It also raised questions about the possible abuse of a misdirected VIC. This is one of the main reasons for adopting a robust 'shared secret'. It is the auditors' opinion that using a date of birth as a shared secret presented a risk. Many people's dates of birth are in the public domain through social media sites like Facebook, LinkedIn, Twitter, Instagram, etc. Even if the user has not entered their date of birth as part of their profile on social media, well-meaning friends and family often wish the person a happy birthday through public social media posts. A more trusted shared secret should be considered in any potential future use of electronic voting on PEI.

Another issue using date of birth is that there were, in fact, some cases that came to the attention of the audit team in which a voter birth date was incorrect in PEI's register of electors, barring the voter from voting electronically until they contacted Elections PEI with the accurate information.

The PEI Chief Electoral Officer had considered and investigated other options for a more robust shared secret. While Elections PEI has access to all driver license data, not every Islander has a driver's license. Choosing the driver's license number as the shared secret for alternative voting would have excluded both internet and telephone voting from being available for thousands of unlicensed voters. Another option considered was using the provincial Personal Health Number (PHN). This would have been a more universal and secure shared secret between Elections PEI and the voter, however this was determined not to be available due to an interpretation by Prince Edward Island's Department of Health and Wellness regarding the restrictions set out in the *Provincial Health Number Act* and the *Health Information Act*. These Acts were passed to protect individual's health information and the provisions of the Acts were interpreted by Departmental officials as restricting Elections PEI from making any use of the PHN for voting purposes.

The presence of online voter registration (OVR) allowed unregistered voters wanting to cast a ballot to conveniently register without filling out any forms in person. They then had the ability to conveniently cast their ballot online or by phone once their registration application had been processed and accepted, and a VIC was emailed to them. Elections PEI has a comprehensive list of valid pieces of identification acceptable as ID for purposes of registering and in-person voting. When registering online this proof of ID must be submitted along with the registration. This registration would then be checked by an

Elections PEI employee before they would be added to the register and sent a PIN. The lack of a physical presence of these documents opens up the possibility of fake registrations being submitted with identification that appears to be legitimate, but in fact is not legitimate. This would allow the person who submitted that registration to be sent a PIN to vote online or by phone when their registration was not legitimate. There were no cases of this being detected and reported to Elections PEI or the audit team, but such a scenario remained a potential risk.

Another concern with mailing the PIN to the address on the Register is that one person in the household could vote for all members of the household if that person knew the birthdates of other eligible voters in the household and had access to their VIC letters. This is a valid concern, but it must also be noted that most election management bodies accept and are comfortable with this risk in the case of mail-in (special or absentee) ballots. While the risk is higher in this case, it was still considered to be an acceptable risk. This risk was mitigated through the threat of prosecution in any cases of one person voting on behalf of other persons, of whom the election management body became aware. This would normally be the result of a voter claiming their PIN had been used by someone else as a result of not being able to cast an electronic ballot. There was only one complaint of this happening during the PEI plebiscite.

The security of regular mail in high-density housing is also considered to be a risk with mailing voters their PIN. This would be a large compromise of integrity if an individual were able to obtain some or all VICs for everyone registered to vote in an apartment building, was then able to determine each voters' birthdate, and then vote on behalf of all these voters. This risk was accepted by Elections PEI. The IPTVI team conducted an informal/unscientific test by obtaining 20 VICs that had been returned to Elections PEI, by Canada Post, marked as 'undeliverable'. Each team member was given 5 of these VIC's and given 10 minutes apiece to determine the date of birth for each VIC given to them. The team was able to determine only one date of birth of these 20 VICs. It should be noted that the team had limited social media contacts that resided in PEI. Given the small community nature of the Island, it is entirely possible that an Islander would have access to more voter data on social media sites, which would increase the number of dates of birth found.

Simply Voting has a management tool that allows the contracting election management body to manage the PINs that are sent to users. With the integration to the VoterView voter registry application, any voters deleted from VoterView would automatically have their PIN deleted from the Simply Voting system, preventing them from using that PIN to vote. PIN resets are available as part of the Simply Voting system, giving the voter a new PIN that would then replace their old PIN and inactivate the old PIN so it could not be used. If a voter was marked as having voted, and they claimed that they in fact did not vote, Elections PEI defined a process by which those voters would fill out a paper form in person at a poll with the poll supervisor. The form acknowledged that they understood the consequences of their

claim, they would be given a new paper ballot to be able to vote, and that a police investigation would be started to find out who used their PIN to vote. Elections PEI made the policy decision that a new PIN would not be issued to these voters to allow them to vote online or by phone. Once the two days of in-person voting was complete and this option was no longer possible, the voter would have to visit the Elections PEI office in Charlottetown to complete the form and obtain a paper ballot, and they would need to immediately vote while at the Elections PEI office. Each such marked ballot was put in a 'tendered ballot' envelope for consideration during the tabulation and counting of other paper ballots. This process only worked for Elections PEI because of the province's compact geography. Access to the PIN reset and re-assignment functionality in the Simply Voting system was restricted to only two elections officials in Elections PEI, preventing unauthorized people from manipulating any PINs.

5. Controls on Access to Paper Ballot Voting

One of the key issues to ensuring integrity in any electoral event is having effective methods to ensure that each voter is only allowed to vote only once. Elections PEI uses a DataFix application called VoterView as their election management, voter registry and electronic voter strike-off system.

Due to the fact there was a legal requirement to support three different voting channels, it was important to ensure that a voter was 'struck from the list' just as soon as they had voted electronically, or at the exact moment they were issued a paper ballot. VoterView has application programming interfaces (APIs) that Simply Voting leveraged and the combined functions were used to strike-off participating voters from the electronic voters list in real-time — whether they voted electronically or in-person using a paper ballot. (See Appendix 'E' – Sample Audit Oversight Reports)

Voters who decided to vote by attending a polling place and casting a paper ballot were requested to bring their Voter Information Card (VIC) with them. Each VIC contained the name and address of residence for the individual registered voter to whom it was sent. Upon entry to the polling place, the voter was greeted by an Information Clerk who checked that the voter had a VIC and then checked that they presented requisite ID. For an elector with acceptable ID, the Information Clerk initialed the VIC and sent the voter to Poll Clerk. The Poll Clerk took the VIC, scanned it to bring up the voter's electronic registration record, filled out the backside of the ballot with the voter's district and age range, struck the voter from the list in VoterView, and then gave the voter the ballot inside a privacy folder. The voter was then instructed on how their ballot should be properly marked once behind a voting screen. The voter then went behind a voting privacy screen and marked their ballot, placed it back into the privacy folder and then dropped their ballot into the ballot box under the supervision of a Ballot Box Deputy Returning Officer (DRO). The privacy folder was returned to the DRO in this process.

Should the voter not have a VIC, they were referred to a Registration Clerk who either found or registered the voter using the VoterView application as needed, and then manually generated a new VIC for that voter. The voter was then directed to the Poll Clerk to be struck from the electronic voters list and given their ballot.

The audit team identified the potential for a duplicate ballot being cast if internet connectivity was down at an in-person voting location, which would prevent electronic strike-offs from occurring during the outage. There was a process in place for offline electronic strike-offs to still occur in such a scenario; however, it remained possible for a voter to vote online or via telephone while also voting via a paper ballot during the time period when an internet connection at a polling place was lost. The PEI CEO was prepared to suspend internet voting during in-person voting if real-time electronic strike-offs at polling locations was interrupted for an extended period of time.

There would, additionally, be a record of any violations after the fact and an investigation could be conducted at that time. This was a fact that the CEO reminded PEI voters of in an interview with a major national broadcaster during the plebiscite voting period. It was agreed by audit team members that there would be a low likelihood of duplicate voting occurring as a result of such outages. There were no power or internet connectivity outages reported during the two days polling places were open for in-person voting during the 2016 PEI plebiscite.

A voter could potentially also vote twice if there was a failure on behalf of the poll worker to strike the voter from the system upon giving them a ballot. This scenario, caused purely by an administrative error, would not be detectable after the fact, which reinforces the need to recruit and train responsible staff.

It was the audit team's opinion that, provided administrative procedures were properly followed by electoral workers as instructed, the controls associated with casting a paper ballot during the PEI plebiscite were at least as stringent as those associated with casting an internet or telephone vote. While some administrative errors were detected as evidenced by small discrepancies in a handful of polling places between number of ballots received versus the number of ballots indicated on the VoterView application to have been cast (see table at end of Appendix 'I'), the extremely small margin of error was deemed to have been acceptable. Stricter ballot controls in the polling places would mitigate the possibility of this exposure being exploited on a larger scale.

See Appendix 'F' – Plebiscite Statistics, for detailed control counts collected.

6. Controls in the Process of Digitizing Paper Ballots

The scope of the assessment of the Independent Technical Panel on Voting Integrity, insofar as it pertained to paper ballots, formally began at the point in administration of the electoral process where paper ballots cast by voters in the two days of paper ballot voting were delivered to the Elections PEI offices in Charlottetown after close of the polls on the second day of paper voting, and were digitized by a tabulating/scanning machine.

The ITPVI reviewed and tested this ballot digitizing process in detail in advance, developing guidelines and audit controls to be used when reviewing and accounting for input and output at each step. This was accomplished through extensive discussions with the CEO and ES&S who would conduct the scanning and supporting adjudication process, and with Simply Voting who would eventually receive digitized output that needed to be integrated with the collected electronic votes before performing the voting results calculations.

Control counts from the in-person polls, collected in the VoterView application during the process of looking up and striking-off voters issued paper ballots, set the expectation for how many ballots were to be received from the polls. (See Appendix 'E' – Sample Audit Oversight Reports)

The fact that high speed scanning technology would digitize and capture a 'data record' of each ballot, in addition to a scanned image of that ballot, and that each of these images and records could be cross-checked against each other was seen as a positive control. A random selection of paper ballots, data records and image scans were matched in testing to assure the accuracy and reliability of the optical character recognition process and image scanning. No integrity issues were discovered.

Paper ballots delivered to Elections PEI offices were scanned in batches per ballot box by ES&S. Ballots in each batch were either successfully scanned, storing an image and digital record of each successive valid ballot, or 'ejected' into a separate bin, meaning that (for a specific reason to be determined by the CEO-appointed adjudication team) the ballot had not met the pre-set criteria required to be successfully scanned.

In one early case, it was deemed that the ballot was too damaged (torn) to be read. Upon visual inspection, it was also clear that the ballot was an 'overvote', rating each option as number one choice. This ballot was rejected, as elector intent could not be determined. Ballots 'ejected' by the scanner were sent for immediate review by the waiting adjudication team. (See Section 7 – 'Controls in the Adjudication of Questionable Paper Ballots' for further information on the process followed.)

There were periodic discrepancies with the VoterView count of voters struck-off at in-person polls versus the number of paper ballots received, which were attributed to the following possibilities:

1. A Poll Clerk looked up a voter on the system, provided that voter with a ballot, but did not click on the button that would strike-off that voter from the electronic voters list. (This would result in more ballots than voters struck from the list for that polling location.)
2. A voter left the poll with their ballot or, for whatever reason decided to not complete the ballot and place it in the ballot box (the ballot could have been returned to the Poll Clerk, submitted as spoiled without a replacement requested, or disposed of inside or outside of the voting location.)

As many iterations of reprocessing ballots into the scanner for each mobile poll and regular polling location ballot box were conducted as necessary. All of the ballots 'ejected' into a separate bin on the scanning tabulator, were immediately passed to the adjudication team. The adjudication team either corrected or replaced some questionable ballots, which would then be accepted as scanned when re-submitted, or they determined particular ballots needed to be rejected and set aside, for a reason set out in the CEO's policy document. (See Appendix 'D' to review these policies.) Control counts showed that the total ballots digitized would equal the sum of those successfully scanned in the first pass, in addition to ejected ballots 'replaced' or 'fixed' and successfully scanned in a subsequent pass. Control counts also showed that the total number of ballots digitized, plus ballots formally rejected, was equal to the number of ballots received from the polling place.

As part of the testing of the controls on paper ballot scanning, and the digitizing of paper ballots, the audit team designed and pre-tested a control batch of 100 paper ballots testing all the scenarios to be detected by the scanner and producing a specific result. This same control test was executed numerous times in advance of the plebiscite, successfully producing the same result in every case. This test was also run immediately before and after the paper ballot scanning process at Elections PEI was conducted on November 6th. While the audit team could not verify the tabulating scanner's computer source code, this was the most practical way of ensuring that the software and hardware performed consistently and produced the same final result against a standard test batch on the day of the count as it did during pre-plebiscite testing rounds.

What materialized as a frequently occurring error was attributed to poor printing quality control of the paper ballots produced by the PEI Queen's Printer. Between 30% and 50% of ballots ejected during scanning were due to printing defects affecting the guide marks pre-printed around the perimeter of the 8.5 X 11-inch ballot paper. These guide marks were required for the scanner to complete accurate optical character recognition and digitize the ballot. Unfortunately, the adjudication team needed to deal with hundreds of ballots that simply needed these guide marks to be darkened with a black marker.

This contributed to the fact that it took five hours to process 3,567 paper ballots. It is important to note that processing 35,000 votes in this way would have taken 50+ hours. This is a situation that could have, and should have been avoided with more rigorous quality controls at the time of printing.

See Appendix 'F' – Plebiscite Statistics, for detailed control counts collected.

7. Controls in the Adjudication of Questionable Paper Ballots

Ballots that met an 'overvote' condition with more than one selection made in any of the five columns for ranking the options, or in the district or age columns on the back side of the ballot, were automatically 'ejected' to a separate bin on the tabulating scanner and sent for review by the adjudication team. In addition, any ballot that did not have one of the 27 electoral districts marked in the district column on the back side of the ballot was automatically ejected for review.

An 'overvote' on the front side of the ballot would be an indication of a marking error made by the voter; an overvote or undervote (blank field) on the back side of the ballot would be the result of a Poll Clerk making an error during the process of preparing the ballot for the voter.

In some cases, a ballot would be ejected into the review bin if the voter had written words across the ballot which made them indecipherable as a voting choice. Sometimes voters will express their political opinions by writing on their ballots as a form of protest — any ballot that had markings on it that could be used to identify the voter who made those markings was legally required to be formally rejected and not included in the vote count.

The adjudication team's intended role was to determine whether a ballot needed to be rejected, or whether it could be replaced with a ballot that had appropriate markings that indicated the voter's clear voting intention. Ballots that were only missing the electoral district were also to be replaced, with the electoral district marked as being the one the polling place was located in. Rejected ballots for each polling place were placed in an envelope that was marked specifically for that polling place. Ballots that had replacements issued would be given a sequential number that corresponded to the replacement ballot. Once the replacement ballot had been accepted by the scanning tabulator, it would be attached to the ballot it replaced. The adjudication team carefully applied the formal business rules that were articulated in the CEO's ballot counting policies, which were supplemented with examples for 19 different scenarios where ballots were not marked in a usual manner. The scenarios had been reviewed by the Chief Electoral Officer and the range covered all possible combinations of potential paper ballot marking errors that could be made by voting officials and voters.

The policies for the adjudication team were adjusted as the process of actual adjudication was performed for questionable paper ballots, largely in response to the far greater volume of problematic

ballots than had been expected. After the first ballot box was counted and fully adjudicated, the process was changed from replacing ballots that did not have the electoral district filled in to simply completing the electoral district selection on the original ballot and then running that ballot through the scanning tabulator again rather than replacing it. About halfway through the processing of ballot boxes, the process was also changed for those ballots where the only issue was that the voter had missed properly marking a selection circle. To save time, the adjudication team simply filled in the choice the elector had marked poorly and re-submitted the ballot to be run through the scanning tabulator rather than replacing that entire ballot with a new one. These decisions were made to make the process faster, and a similar process was followed to correct the large number of ballots that were ejected because of the ballot printing issue where registration marks were incomplete.

The total number of ballots that were formally rejected during the adjudication process was 100. A total of 289 ballots were replaced with a new ballot that was marked in a manner that accurately reflected the voter's intention. In addition, 154 ballots were corrected due to the absence of an indication of the district from which the ballot was cast. All replaced and corrected ballots were accepted and included in the results.

See Appendix 'F' – Plebiscite Statistics, for detailed control counts collected.

8. Controls during Integration of Paper Votes with E-votes

Valid ballots digitized by ES&S were passed on a secure storage media device to Simply Voting. A copy of the data was then provided to the audit team, as well as to the Elections PEI CEO. Simply Voting then processed the digitized ballot data records through a ballot amalgamation algorithm, which adjusted the file to correct ballots with duplicate choices, make gap corrections in the numbering of choices, reject abstain (blank) votes, and make rejections for first choice overvotes. A pre- and post-processing data comparison spreadsheet, and a processing overview report was then provided to the Elections PEI CEO as well as to the audit team. The audit team then verified that the paper ballot data had been processed correctly by using its own algorithm run against the same dataset of digitized valid ballots. The audit team found that the results of Simply Voting's algorithm exactly matched the results of the program they had independently developed using the policies and 19 ballot scenarios that had been approved by the Elections PEI CEO.

Once the Elections PEI CEO signed-off on the Simply Voting amalgamation report, the digitized valid paper ballots were ready to be integrated with the telephone and internet e-votes to create one set of all valid ballots, thereby allowing the results to be calculated on all plebiscite ballots cast. The above

process occurred immediately after voting ended, following the 5-minute grace period for logged-in voters, at 7:05 p.m. on November 7, 2016.

There were 105 duplicate choices corrected, 116 gaps corrected, 51 abstain ballots rejected, and zero rejects for overvotes processed in Simply Voting's amalgamation algorithm, out of a total of 3,467 digitized paper ballot records.

See Appendix 'F' – Plebiscite Statistics, for detailed control counts collected.

9. Controls During the Compilation of Voting Results

Simply Voting provided the computer algorithm used for iterative results processing of the combined internet, telephone and digitized paper ballots and counts of their ranked preferential votes. A control report showed results for each counting iteration, clearly demonstrating the preferential vote counts as they progressed. The iterative process of how these preferential vote count results were calculated is as follows:

- The first iteration through the results calculation algorithm is a straight count of preference votes for each option. If a 50% +1 majority vote for any option is achieved, the process is complete.
- Failing a clear 50% +1 majority vote for any option on count iteration #1, the vote option with the lowest vote tally is dropped off and a second iteration of counting is required.
- A second iteration through the results calculation algorithm applies next preference votes from the dropped option to the remaining four choices. If no further preferences are specified beyond the dropped ballot option, then that ballot becomes 'exhausted' and added to the exhausted ballot count. At this point the count of votes for choices 1 to 4, plus the exhausted ballot count, equals the number of valid ballots initially provided.
- Failing a clear 50% +1 majority vote for any option on count iteration #2, the vote option with the lowest vote tally is again dropped off and a third iteration of counting is required.
- A third iteration through the results calculation algorithm applies next preference votes from the last dropped option to the remaining three choices. If no further preferences are specified beyond the dropped ballot option, then that ballot becomes exhausted and added to the exhausted ballot count. At this point the count of votes for choices 1 to 3 plus the exhausted ballot count equals valid ballots initially provided.

- Failing a clear 50%+1 majority threshold vote for any option on counting iteration #3, the vote option with the lowest vote tally is again dropped off and a fourth and final iteration required.
- A final iteration through the results calculation algorithm applies preference votes from the last dropped option to the remaining two choices. If no further preferences are specified beyond the dropped ballot option, then that ballot becomes exhausted and added to the exhausted ballot count. At this point the count of votes for choices 1 and 2 plus exhausted ballot count equals the total valid ballots initially provided.

Manual intervention would only be necessary in this process if there were a situation where two voting options were tied at the end of a voting round, in which a case established policies required a need for a manual random draw to be held under the supervision of the Chief Electoral Officer to determine which option would proceed to the next iteration.

The ITPVI reviewed, tested and confirmed this counting process in detail in advance of the plebiscite voting period. An independently designed computer model, mirroring the required calculation of the voting results through the potentially multiple iterations, was prepared by an audit team member so that the ITPVI could cross-check the accuracy of the calculated results prior to confirming their integrity and accuracy to the CEO.

These vote counting processes were observed by the ITPVI members following the close of voting on November 7th. A copy of the raw voting data was provided to the audit team, who then ran it through their own computing model. Audit team members ultimately confirmed to the CEO that the plebiscite voting results reported by Simply Voting were fully accurate. That confirmation happened just before 8:00 p.m. on November 7th, slightly less than an hour after voting ended. The Chief Electoral Officer then proceeded to prepare the results for posting on the Elections PEI website and to finalize a press release regarding the plebiscite voting outcome.

Plebiscite vote counting processes and controls are illustrated in Appendix 'C' – Plebiscite Process Maps - Integrated E-Count Audit Reporting Points.

See Appendix 'E' – Sample Audit Oversight Reports – Sample Voting Results Calculations.

See the Elections PEI website for the official results of the 2016 Plebiscite:

(<http://www.electionspei.ca/plebisciteresults>).

10. Overall Assessment of the Plebiscite's Voting Integrity

The audit team was guided in this assessment by the principles of electoral integrity that are highlighted throughout this document.

The findings of the ITPVI are as follows:

1. The technical environments provided by Simply Voting, DataFix (VoterView) and ES&S were appropriately robust and secure.
2. Elections PEI sufficiently mitigated the risk associated with ensuring that only eligible voters were permitted to vote, whether they used a paper ballot method or took advantage of the 'alternate' internet and telephone voting options that were offered.
3. Elections PEI ensured that its poll workers, and that three critical service providers (Simply Voting, DataFix and Election Systems & Software) all took appropriate steps to ensure that individual voters' plebiscite voting choices were kept secret.
4. The control totals between major process steps established and monitored by the audit team flagged a few minor anomalies, most due to administrative errors. Miscellaneous instances, where the audit team felt a need to question or intervene, are discussed in Appendix 'I' – Issues Experienced.
5. The telephone voting method, while as secure, reliable and consistent in performance as the internet voting method, was less effective for the plebiscite ballot and the preferential voting method. With a touch tone phone, voters were asked to identify themselves with a PIN that had been mailed to them and indicate their date of birth. They then listened to numerous prompts and pressed particular keys to select and confirm their voting choices. Only 9.4% of participating voters used the telephone voting option.
6. The internet voting method proved to be the most popular approach Islanders used to cast ballots during the plebiscite — 81.05 % of participating voters used this method. Voters were asked for the PIN, which was provided on their VIC letter, in addition to their birth date. They were then taken to a screen to cast their votes in rank preference order. It should be noted that this method of voting virtually eliminated the chance of voter error as it eliminated the possibility of rejected ballots due to overvotes and did not allow any numbering gaps. These issues were all prevented by real-time validation.
7. The paper ballot voting method of voting proved to be the second most popular approach Islanders used during the plebiscite — 9.54% of plebiscite ballots were cast using this method. In-person voting required the voter to produce both their VIC and valid identification at the poll before being issued a ballot. The audit team noted that the preferential question posed in the plebiscite and the nature of the voting options was significantly more complex than a 'normal' election ballot. The adjudication team needed at paper ballot digitization encountered a

significant amount of evidence that voters struggled with using a paper ballot for preferential voting.

8. Electronic 'voter strike-off' to prevent duplicate voting was accomplished through use of VoterView as the central strike-off source and Simply Voting's use of application programming interfaces with VoterView to invalidate voter PINs in real-time. The audit team tried a wide variety of methods to circumvent this process and was satisfied there were no means by which a voter could cast multiple votes either through a single channel or using multiple channels at the same time. One vote was always allowed to go through while all subsequent vote attempts were denied.
9. Multiple test runs of the scanning and processing of paper ballots conducted by the audit team, working in conjunction with ES&S, confirmed the robustness of the systems performing these functions. There were no instances, during testing or while counting actual plebiscite ballots, where the root cause of a ballot scanning issues could not be clearly identified. Issues that arose were all related to the printing or marking of the paper ballot, most frequently because of voter errors.
10. Ballots not able to be read by the scanning tabulator were effectively directed to and addressed by the assigned adjudication team. Controls counts were in place to detect discrepancies. Before the plebiscite voting period began, business rules were created for the adjudication team to guide their detailed interpretation of ballots that were incorrectly marked. The adjudication team consistently applied these business rules to determine the voters' intent. The original ballot was corrected and re-submitted to the scanning tabulator in the case of simple errors; a new 'replacement' ballot was created and tabulated in cases of more complex errors; or the original ballot was formally rejected if the adjudication team was unable to clearly determine the intent of the voter.
11. The transfer of paper ballot data from ES&S to Simply Voting for processing was observed to be conducted effectively and efficiently. Controls counts were in place to detect discrepancies. Once the paper ballots were scanned and tabulated a file of these results was provided to Simply Voting to integrate with the alternate voting results at the beginning of the final counting process. The audit team reviewed the business rules that were applied to the ES&S tabulated file and were satisfied the appropriate actions were being taken based upon the policies and business rules laid out by Elections PEI. The audit team compared the results of the tabulated paper ballot votes with the anticipated results that would be generated from the integration of the paper ballots through the Simply Voting algorithm and was satisfied that the policies and business rules were all applied appropriately and consistently.
12. The audit team was satisfied that the counting process accurately counted all ballots as cast. Once the paper ballots were integrated, the Simply Voting application conducted the preferential vote result calculation rounds. During testing, the audit team compared the Simply Voting results from the test plebiscite, which was conducted using all three voting methods,

with the anticipated results that were determined manually. A control point was established by the audit team that cross-checked the counting rounds and the final tally and demonstrated that the count results reported by Simply Voting were fully accurate.

13. Elections PEI was transparent about the extent of the risks and controls in its administrative system, and established what it believed to be an appropriate balance between accessibility, convenience, efficiency and integrity in the 2016 plebiscite on democratic renewal.
14. Some risks, such as opportunities for voter coercion with the alternative electronic voting methods, and the security of end-user devices used for online voting, were impossible to fully mitigate. There were no reports of voter coercion during the event. It is also possible, but highly unlikely that a threat actor would have invested the time and required resources in intervening in the fair process by orchestrating an end-user device targeted breach. (In other words, develop a sophisticated virus that would switch votes submitted from a home computer in an undetectable manner.)

The overall conclusion reached by the audit team was that the environment and processes within which the plebiscite was conducted provided convenient options for Islanders to vote, provided a high degree of assurance that the event was conducted fairly, and produced an outcome that accurately reflected the votes that were cast by the PEI citizens who participated in the plebiscite.

The team also would like to volunteer several observations that are admittedly beyond the scope of what was requested in meeting the Terms of Reference of the Independent Technical Panel on Voting Integrity:

- a. Nothing that the audit team observed would support that there were systemic or procedural barriers to vote that would have contributed to the low voter turnout experienced.
- b. In team members' visits and discussions with electoral workers and Islanders in general, a lot was heard about the considerable difficulty experienced in understanding the plebiscite voting choices presented.
- c. When asked whether they were going to vote in the plebiscite, numerous Islanders told members of the audit team that they found the concept of deciding their rank order preferences among five different electoral systems to be too complex — and that they would simply let other Islanders decide on their behalf.
- d. There was one particular oft-repeated comment that struck the audit team as very troubling, — "I'm not going to vote because I would prefer things remain exactly as they are."
- e. Elections PEI is severely understaffed and does not have a sufficient core of full-time dedicated employees to meet the legislated mandate of the agency. This introduced plebiscite administration risks that were near-to-impossible to mitigate, and PEI legislators should be

aware that a spectacular electoral failure will inevitably occur in their province if this situation is not properly addressed.

- f. Either through extremely skillful management, or large amounts of good fortune (and likely a combination of both), Elections PEI selected four separate vendors who worked very successfully as partners with their client, and with each other, in supplying mission-critical delivery components for the ground-breaking provincial electoral event known as the 2016 PEI Plebiscite on Democratic Renewal.

11. Considerations for Applying E-Voting Options in Canadian Public Elections

The experience of the PEI Plebiscite demonstrated that there are many demographics that appreciate and will take immediate advantage of electronic voting service offerings if they are made available. Reaction in the press and on social media regarding online and telephone voting was predominantly positive. There were no significant violations of trust observed or detected through to the close of the alternative voting methods offered.

Canadians are very fortunate that across all jurisdictions there exists a high level of public confidence that election risks are managed responsibly and that processes and controls are in place to deliver a trusted and accurate result from electoral events conducted by their election management bodies (EMBs). Procedural controls around manual, paper ballot voting processes have evolved over the last 150 years of Canadian elections. EMBs and legislatures have worked diligently to ensure integrity is maintained through the evolution of our electoral process. In some cases, a certain level of risk has been accepted for sake of accessibility, convenience and efficiency (e.g. mail-in voting options).

Supporters of online voting laud the effectiveness, efficiency, convenience and accessibility of online voting. Giving a qualified voter the opportunity to cast their vote online or by telephone 24 hours a day for a number of days during an electoral event should finally remove most temporal or physical barriers to voting. During the PEI plebiscite voters bragged on social media about being able to vote from afar (China, California), late at night or early in the morning even while in a completely different time zone. The need to respond to preserve the voting rights of an increasingly mobile, constantly occupied or preoccupied, and increasingly tech-literate citizenry will continue to put pressures on EMBs to expand existing opportunities and open up new channels for voting access.

From the perspective of an EMB, online voting promises considerable efficiencies. There is less pressure to hire, train, manage and pay a large army of electoral workers to administer voting and counting; to rent physical premises in which to house polling stations; to deploy people, furniture, office supplies and

technology to physical premises for election day; to engage temporary personnel to set up everything early in the morning and tear everything down after the close of polls late that evening.

This needs to be tempered by the reality that there are very few jurisdictions who have introduced online voting while completely removing opportunities to vote using a paper ballot.

Detractors of online voting are adamant that they require an evidence-based review of the ability of an online voting system to deliver the same level of trust and integrity — consistently and reliably — as is assured with in-person voting in an observable environment. Many believe this is simply not possible today given that even national security agencies, with billion dollar budgets, seem to be at the mercy of hackers. There are also e-voting detractors among key stakeholders in the electoral process, including political parties, candidates and opinion-leading voters.

It is incumbent upon election management bodies who are faced with making a decision about introducing an online voting option, or who are otherwise mandated to provide one, to consciously detail the major risks involved. This includes carefully enumerating the probability and likely impact of each risk being realized, the controls that can be put in place to mitigate the various risks, and then being totally transparent in their recognition of remaining residual risks.

It is also obligatory that election management bodies determine the threat/risk profile, and the anticipated risk tolerance for each type of electoral event for each of their major stakeholder groups — their legislative body, political parties, candidates, voters, interest groups and media outlets. The threat/risk profile, and determination of what is acceptable in terms of risk when conducting a non-binding provincial plebiscite for example, is very different than what would be accepted for conducting a provincial or federal parliamentary election.

Hotly disputed contests, where extreme distrust and dislike exists between ultra-partisan participants, force EMBs to weigh the threat, risk and capability of multiple types of actors to intervene in differing possible ways in compromising the integrity of the electoral process. This is of particular concern when the possibility exists of state-sponsored, large conglomerate-sponsored or any other well-funded threat actors. This is not the context of a municipal or territorial election, and was not considered a threat for the non-binding plebiscite on electoral reform conducted in PEI in 2016. However, this may very well be the context for a federal or provincial binding referendum or parliamentary election, depending on the then-current political climate.

Appendix 'G' highlights traditional risks and controls experienced in a paper ballot electoral event showing which controls have evolved to mitigate understood risks to an acceptable level. Appendix 'G' also shows the additional risks and controls associated with online electronic voting. The following are some conclusions of note in the context of implementing internet and telephone voting:

1. Trusted digital voter identification and authentication is a requisite additional control. An irrefutable digital identity is the first safeguard in ensuring that eligible voters can vote (and can vote only once), and in ensuring that ineligible voters are not permitted to vote. Establishing this identity with a robust 'shared secret' is a mandatory prerequisite.
2. The onus is on the buyers, designers, developers, maintainers and operators of any electronic voting system to demonstrate rigor in the specifications, certifications, accreditations, testing and operation of the e-voting system to ensure it is able to mitigate the full range of risks to a reasonable and acceptable level. This has to be achieved to a level of satisfaction regarding both hardware and software risk mitigation. The remaining level of risk needs to be accepted by all stakeholders.
3. With the elimination of the controls that were previously implemented in manually controlled voting processes (refer Appendix 'G': Controls C1 – C5), traditional risks are not as fully mitigated as before. In fact, the following risks are difficult to mitigate in any meaningful way:
 - a. Vote buying / vote secrecy ("I'll just take a selfie in front of my screen")
 - b. Voter coercion (Unless reported, it is impossible to determine if a vote is being coerced)
4. The risk of a voter voting with stolen credentials can only be partially mitigated by effective voters list management and the implementation of a trusted digital voter identification and authentication scheme. Digital voter identification must be robust, but it must also be easily managed so as not to become a barrier to voting because it is overly complex for a voter to use as seldom as once every four years.
5. The additional risks of compromised end-user hardware or software, or a broad regional or national attack on internet infrastructure, remain unmitigated.

The onus is also completely on the online electronic voting system implementer to ensure that controls are established within the e-voting system that meet the legislative requirements of the jurisdiction, and provide an adequate level of transparency for all stakeholders. Simply depositing electronic votes into a 'black-box' where they are stored and counted is unlikely to meet stakeholder demands for maintaining a high level of public confidence, unlikely to publicly show that voting risks are continuing to be managed responsibly, and unlikely to prove to candidates and political parties that the electoral process and controls continue to deliver a trusted and accurate result.

The additional controls, many of which are non-trivial in terms of level of effort, diligence and costs required for implementation, need to be adjusted to a level appropriate to the risk profile of the political

environment and the context in which electoral event is contested. Election management bodies, legislatures, political parties, candidates and voters all need to fully understand and accept these risks, which may differ significantly from one event to another.

During the audit planning for the PEI plebiscite, on September 20, 2016 a submission was made by Brian Lack, the President of Simply Voting Inc., to the federal Special Committee on Electoral Reform. Several observers brought the content of Brian Lack's submission to the attention of the audit team. Members of the ITPVI were impressed by the commitment to voting integrity and democratic process principles Mr. Lack expressed in his conclusion:

*“Despite the fact that Simply Voting is a major Canadian internet voting vendor, its recommendation is **against the use of internet voting for federal elections**. The heightened threat level of a federal election pushes the security of internet voting past its limits and poses too much of a risk.”*

(See Appendix 'K' to read the full three-page submission made to the Special Committee by Simply Voting Inc.)

While electronic voting by telephone and the internet definitely promises increased accessibility, convenience and efficiency, the ITPVI advises proceeding with caution and prudence. There is a need to maintain an acute level of awareness of the risks to electoral integrity that these new voting methods present. The implications of a breach of the public trust that exists today suggests strongly that internet and telephone voting in Canadian provincial and federal parliamentary elections be considered channels that should be limited to use only by absentee voters for the immediate foreseeable future. Out-of-country, out-of-province, stationed military, disabled and homebound voters all have considerable difficulty with exercising their franchise rights under current absentee voting provisions. The risks associated with providing telephone and internet voting opportunities for this relatively small but important sub-set of voters are likely manageable even within the very short term.

It is important that leaders in Canadian electoral administration manage public expectations and articulate their concerns about the fact that a perfectly secure and fool-proof electronic voting system does not yet exist.

12. Appendices

Appendix A – ITPVI Terms of Reference (p.27)

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Terms of Reference

E-Voting & E-Counting Integrity Audit— 2016 Prince Edward Island Plebiscite on Electoral Reform

Independent Technical Panel on Voting Integrity

Members of an Independent Technical Panel on Voting Integrity will be formally appointed by the Chief Electoral Officer of Prince Edward Island during the period of mid-July to mid-August 2016.

The mandate of this panel will be to plan, prepare and conduct a professional audit and assessment of internet and telephone voting processes, as well as electronic vote counting processes, which have been legally mandated to be used in the 2016 Prince Edward Island (PEI) plebiscite on electoral reform. Uninterrupted plebiscite e-voting is scheduled to be held on the Island starting on Saturday, October 29th at 12 noon and ending on Monday, November 7th at 7 p.m. Telephone and internet voting will be supplemented with an ability for eligible persons to vote using a paper ballot at designated locations around the Island between 4 and 9 p.m. on November 4th, and from 10 a.m. to 9 p.m. on November 5th.

It is intended that the audit team will be made up of four persons with advanced electoral administration understanding and experience as well as significant managerial and technical knowledge that is directly associated with the application of information technology to the delivery of electoral events.

This document sets out the general terms of reference for the Independent Technical Panel on Voting Integrity and provides background information and context with regard to the intended role and function of the panel, the collective range of skills required by the panel members, and the respective timeframes for deliverables the panel will need to collectively produce over a four-month period.

Reason for Panel’s Formation

The Chief Electoral Officer of Prince Edward Island has initiated the assembly of the Independent Technical Panel on Voting Integrity in response to the requirements of Section 12 of the *Provincial Electoral System Plebiscite Regulations* which were developed following 2016 amendments to the *Plebiscites Act*.

The plebiscite regulations establish a legal requirement for an audit of the electronic voting and vote counting systems that are mandated to be used in the 2016 plebiscite vote. Section 12 states:

12. The Chief Electoral Officer shall cause an audit to be conducted to ensure the integrity of the alternative voting process.

The alternative voting process is defined in section 1 of the plebiscite regulations as follows:

1. In these regulations,

(a) “alternative voting” means voting by Internet or telephone;

[...]

(f) “Internet ballot” means a ballot in digital image that includes all the voting choices available to an elector at the plebiscite and the spaces in which an elector may mark a vote electronically;

[...]

(o) “telephone ballot” means a set of audio instructions that describes all the voting choices available to an elector at the plebiscite and includes a direction to electors to mark their ballots by depressing numbers on the touch-tone keypad of a telephone;

Paper-based plebiscite ballots, which will be available to eligible voters on November 4th and 5th, will be centrally collected after the close of paper-ballot voting and then digitally scanned using special ballot tabulating machines. An electronic version of preferential ballot choices from those paper-based ballots will be combined with internet and telephone ballot choices prior to a potential multi-round calculation of the preferential voting results for the plebiscite.

Before the PEI Chief Electoral Officer (CEO) makes the plebiscite voting results public, the Independent Technical Panel on Voting Integrity is required to formally report to the CEO regarding the results of their performed audit and indicate clearly whether it is the opinion of the panel that they are reliable. This will require a well-planned and timely development of a verbal presentation by the panel, supplemented by a detailed written assessment, which reports on the overall integrity of the electronic voting and counting processes used during the plebiscite. It will be critical that the panel clearly express to the CEO any concerns they have about any aspect of internet voting, telephone voting or electronic vote counting that might put the validity of the voting results in question.

Voting results are expected to be publicly announced by the CEO within 24 hours following the official close of voting at 7 PM on Monday evening, November 7th.

Background Information on PEI’s 2016 Plebiscite on Electoral Reform

The 2016 plebiscite on electoral reform will mark the second time citizens in PEI have been asked to vote on the topic of electoral reform during the 21st Century.

The previous plebiscite was held on November 28, 2005 with a voting choice between a mixed-member proportional system (MMP) and the existing first-past-the-post (FPTP) electoral system. The majority of Islanders who participated in that plebiscite voted to maintain the FPTP system.

Following the 2005 plebiscite an ongoing public debate has suggested the MMP electoral system alternative to the *status quo* had not been well understood by PEI's citizens and that a very short period of campaign activities had not allowed Islanders to make an informed decision. The voting turnout rate of 33% was seen as indicative of the general public's lack of understanding about the plebiscite question, especially when compared to the traditionally high participation levels (80%+) that characterize citizen engagement during PEI's provincial elections.

During the summer of 2015 the government of PEI established a special committee of the legislative assembly to consider alternative voting systems, and announced that the committee's recommended alternatives would be presented to Islanders for consideration in a new plebiscite vote.

Following public consultations, on April 15, 2016 the Special Committee on Democratic Renewal recommended that a plebiscite vote be conducted in November 2016, and that voters should be permitted to use a preferential ballot to rank order their choice (one being most preferred) among five electoral system options.

Those five electoral system options, in alphabetical order, are:

- Dual Member Proportional Representation,
- First-Past-the-Post (the current system),
- First-Past-the-Post Plus Leaders,
- Mixed Member Proportional Representation, and
- Preferential Voting.

Additionally, the legislature's special committee recommended that telephone and internet electronic voting should be made available during the plebiscite and that 16 and 17 year-old PEI citizens should be allowed to register and vote in the plebiscite. These suggestions were made with the intention of supporting increased levels of voter participation "provided that standards for security, accuracy, privacy, integrity, cost-effectiveness, and auditability can be assured"³.

During April and May 2016, the Legislative Assembly of PEI approved amendments the *Plebiscites Act* and the *Election Act* that would allow the plebiscite to proceed in the manner recommended by the Special Committee on Democratic Renewal. This permitted the Executive Council of the government of PEI to prepare new *Provincial Electoral System Plebiscite Regulations* which came into effect on July 9, 2016. These regulations enable the 2016 electoral reform plebiscite to be undertaken using a preferential ballot, sets out the exact ballot question to be used, mandates the provision of electronic voting to supplement paper-ballot voting, and permits both registration as voters, and voting in the plebiscite, by 16 and 17-year old PEI citizens.

³ Legislative Assembly of Prince Edward Island, Special Committee on Democratic Renewal, second report, *Recommendation in Response to the White Paper on Democratic Renewal – A Plebiscite Question*, April 15, 2016, recommendation #5, p. 4. Available online at: http://www.assembly.pe.ca/sittings/2016spring/reports/23_1_2016-15-04-report.pdf

While the regulations were being prepared, Elections PEI conducted a formal procurement for electronic voting services, including electronic vote counting which will require integration of the paper-based vote choices captured in an electronic form with ballot scanning tabulator machines. Simply Voting, Inc., a services vendor based in Montreal, was selected to be awarded the e-voting and e-counting contract as a result of the open bidding procurement process that had been undertaken.

Panel Membership

The CEO for PEI intends that the Independent Technical Panel on Voting Integrity will have a total of four members.

The panel will be led by a coordinator, who is an independent consultant, who was commissioned for the role by the CEO for PEI. The coordinator was selected based on his extensive previous experience in election administration and information technology work with Canadian and international election management bodies (EMBs), and his experience as a third-party auditor in political party leadership contests that employed telephone and internet voting methods.

The other three members of the panel will be senior information technology (IT) management personnel from various Canadian EMBs selected through partnership agreements negotiated between the Chief Electoral Officer for PEI and Chief Electoral Officers for three other Canadian jurisdictions. The EMB-IT personnel selected will be jointly assigned to the Independent Technical Panel on Voting Integrity by the Chief Electoral Officer for their 'home' jurisdiction and by the CEO for PEI.

Panel Members' Term of Membership

The coordinator for the Independent Technical Panel on Voting Integrity will have the longest term of panel membership, starting in late June 2016 and ending in late December 2016. This term was established in a contractual agreement with the coordinator when he was commissioned for the role by the CEO for PEI, and was based on an understanding that the responsibilities would involve approximately seven weeks of dedicated audit team coordination effort during the six-month term.

The remaining three panel members, who will be selected information technology management professionals from other Canadian election management bodies, will have a maximum four-month term of membership on the panel. That term will begin in mid-August 2016 and end in mid-December 2016, and is expected to involve between 100 and 120 hours of dedicated audit-related work effort by each of these three panel members — approximately three weeks of time required over a four-month appointment period.

Once the term of membership is completed by each panel member, they will have no further obligations regarding the PEI Plebiscite or be required to perform any further analysis of the integrity of its electronic voting and electronic counting processes.

However, each member of the panel will need to respect ongoing requirements for non-disclosure of any proprietary technical information they may become aware of as a result of their audit activities and

interactions with the voting technology vendor. In addition, there may be a requirement for discretion, or even complete confidentiality, with regard to disclosing the details of certain operational aspects regarding the plebiscite's internal operations. Any such restrictions will be documented in advance, and will involve a signed agreement between the parties concerned, prior to the sharing of any particularly sensitive information with panel members.

Goals of the Panel

The *primary* goal of the Independent Technical Panel on Voting Integrity is to provide the Chief Electoral Officer of PEI with a structured technical assessment of the electronic voting and vote counting systems that are used in PEI's 2016 plebiscite on electoral reform. The focus of this assessment will be on the extent to which the combined systems uphold standard process integrity features expected in a modern democratic electoral process and within the Canadian political and cultural context.

This assessment will be based on results from the panel's pre-vote testing of the various automated systems being used, the panel's monitoring of those various systems during the plebiscite voting period, and the panel's implementation of pre-scripted integrity check verifications during vote choice integration (when all paper-based, telephone-based and internet-based preferential ballot choices are combined) and within each round of preferential voting result tabulations. The panel's assessment will be delivered both verbally, and in a written document, to the CEO of PEI as soon as possible after voting closes and the voting results tabulation has been completed.

If any members of the audit panel find a serious flaw with any aspect of the electronic voting or vote counting systems as they proceed through their various assessment steps, they will immediately advise the panel's coordinator. The coordinator will, in turn, take immediate steps to advise the CEO of the problem so that corrective action, wherever possible, can be taken at the earliest opportunity.

The *secondary* goal of the panel is to provide the CEO of PEI, and informally to his professional colleagues across Canada, with a technical practitioners' assessment (based on actual production observation) of why a combination of internet, telephone and paper-based voting arrangements would or would not be appropriate to use in Canadian public elections. Such an assessment is of great interest to the wider electoral administration community in Canada, and the Chief Electoral Officer of Prince Edward Island may very well face a direct question following the Island's November vote asking: "If this approach worked for our plebiscite, why can't it work for our next provincial election?"

In addition, there are several *tertiary* goals for members of the Independent Technical Panel on Voting Integrity. These include:

- Development of a professional consensus by Canadian EMB technical authorities regarding the operational and integrity opportunities/challenges related to internet and telephone based electronic voting within the Canadian political and cultural context;
- Development of a shared understanding of public communication challenges associated with explaining voting result calculations based on the unique vote counting methods

and successive ‘rounds’ of calculation involved with tabulating preferential ballot choices;

- Prototyping an integrity analysis framework, and development of standard audit requirements that will need to be associated with any move toward electronic voting and scanned ballot choice counting processes for public elections in Canada; and
- Development of a practical understanding within the Canadian electoral administration community about the logistical and voting integrity challenges that are associated with providing multi-channel voting opportunities which retain an option of voting with a paper ballot for those voters who are unwilling or unable to use electronic voting methods.

Major Audit Project Deliverables of the Independent Technical Panel on Voting Integrity

Members of the panel, as they are each appointed, will be contacted by the panel’s coordinator and provided with a range of briefing materials to review.

Once the entire team has been appointed, and each member has had the opportunity to read through the briefing materials regarding the plebiscite and related audit issues, the panel will have a series of tele-conference calls to discuss and develop a consensus regarding their agreed approach for undertaking the audit process. Further communications via e-mail between the members will occur between conference calls to collect details necessary for developing a useful and practical approach to covering all the elements necessary to professionally perform the e-voting and e-counting audit. The panel’s coordinator will develop and circulate an iterative, and increasingly detailed, outline of the audit project plan based on these tele-conference discussions and shared e-mail conversations.

All the panel members should be fully briefed on their role, understand and agree on the high-level schedule and scope of their assignment, and be fully engaged in finalizing the audit plan development process by September 29th, 2016.

The first major deliverable of the Independent Technical Panel on Voting Integrity will be their detailed audit project plan. It is expected that this plan will be developed using standard project management methods and that it will clearly document what work is to be done, by whom, in what timeframe and with what specific outputs. It is expected that the structure and outline of intended content for the panel’s formal audit report will need to be developed as part of the overall audit plan.

The detailed work plan will be documented by the coordinator, agreed to by the panel members via an iterative review process, and then submitted to the CEO for PEI for his understanding, approval and formal sign-off. The Audit Project Plan should be signed-off by no later than October 21st, 2016.

The second major deliverable of the panel will be the audit report that structures and records the results of planned audit measurements and activities, the content of which will be developed in accordance with the plan the panel agreed to and prepared in advance of the plebiscite vote. The formal report of the panel must evaluate whether the overall system of e-voting and electronic vote tabulation used in the plebiscite had any vulnerabilities that could not be mitigated, and describe these vulnerabilities in language a non-technical person can easily understand. This will require a critical review the data structures of the systems used, and an understanding of how content is internally communicated between systems will being kept secure. This level of analysis will require the full cooperation of the e-voting services vendor with regard to describing how standard voting integrity features (secrecy of the vote, each voter needing to be registered, registered voters only voting once, votes counted exactly as cast, same number of votes recorded as participating voters, no votes lost, etc.) are managed. During the actual e-voting period, it is envisioned that members of the panel will undertake various measures of the performance, security and reliability of e-voting systems and ballot tabulation systems being used. Depending on the technical arrangements of e-voting system chosen, it may be possible for 'audit' votes to be cast which can be extracted before voting results are completed. If such features do not exist, it may be necessary for each member of the panel to have access to 'seeded' registration records for the purpose of testing integrity features. (This level of assessment detail will be identified in the audit project plan described above.) Some of the specific system features that will need to be tested include: a) availability of e-voting only during the defined alternative voting period; b) the availability of all combinations of vote rank-ordering; c) the inability for an individual voter to vote multiple times via any combination of paper ballot, internet ballot and telephone ballot access requested concurrently or in sequence; d) the accurate and timely 'strike-off' of voters from the register, preventing duplicate voting; e) the reasonable ability for a voter to complete a vote they start before the voting deadline; f) the performance and responsiveness of the e-voting system; and g) the system's ability to recover from a partial or interrupted e-voting transaction. It is a requirement that a verbal summary presentation regarding the panel's report be provided to the Chief Electoral Officer by the coordinator before the plebiscite voting results are scheduled to be publicly released, and that a draft of the full written audit report of the panel be provided to the CEO for PEI at the conclusion of that presentation.

The third major deliverable the Independent Technical Panel on Voting Integrity is expected to produce is a full-panel debrief with the Chief Electoral Officer for PEI following the plebiscite's conclusion. There will be a broad range of observations made by panel members in the weeks they are exposed to the full spectrum of technical and operational functions associated with the e-voting and e-counting approaches being used for the PEI plebiscite on electoral reform. It is expected that panel members will develop an acute overall assessment of the challenges involved with moving to e-voting and will identify particular risks that were demonstrated in the combined use of traditional paper ballot voting along with internet and telephone voting. The coordinator will discuss with panel members what topics should be included when verbally debriefing PEI's Chief Electoral Officer. This joint debriefing session will be scheduled to follow the plebiscite, but is to occur no later than mid-December 2016. It is envisioned that the Chief Electoral Officer will be asked by legislators, the media and opinion leaders in PEI about whether the application of internet, telephone e-voting services could be integrated with the use of paper ballot voting at subsequent general elections in the province.

Scope / Jurisdiction of the Panel

Areas of audit focus for the Independent Technical Panel on Voting Integrity will be confined to:

- The telephone voting system;
- The internet voting system;
- The electronic 'voter strike-off' process used to prevent duplicate voting;
- The scanning system used to record paper ballot voting choices;
- The ballot results integration process, used to combine telephone votes, internet votes and paper ballot votes; and
- The preferential ballot voting results calculation process.

Areas that are to remain outside the panel's areas of concern during their audit review include:

- The content of proprietary voting system software source code owned by the electronic voting services vendor;
- The content of proprietary software source code developed by the voting services vendor for ordering and counting e-votes as well as the method of integrating digitized voting choices that are represented by the scanned paper ballots;
- The voter registration process and technology used prior to voting, or at the time of voting;
- The public education process used by Elections PEI to inform voters about the electoral system options they are expected to rank in order of preference when marking their plebiscite ballot;
- The public education process used by Elections PEI with regard to the options voters have when they make one or more selections on their preferential ballot; and
- The process used by Elections PEI to communicate to the public how plebiscite voting results get calculated, and further explanations regarding factors that determine the number of counting 'rounds' needed to establish the 'winning' electoral system option.

Members of the Independent Technical Panel on Voting Integrity will act as agents of the Chief Electoral Officer, and will each have a formal letter of introduction from the CEO for PEI. This letter should be used by panel members should they find themselves in any situation where their authority to monitor a process or question a procedure is challenged by a plebiscite official or by personnel working for the electronic voting services vendor, Simply Voting, Inc.

Engagement of the Electronic Voting Services Vendor

Simply Voting Inc., the electronic voting services vendor contractually selected by Elections PEI, will be advised by the Chief Electoral Officer to be fully cooperative with members of the Independent Technical Panel on Voting Integrity.

This cooperation will not include the disclosure of any proprietary source code. Other information, which may be considered sensitive by the vendor, may only be shared following the panel members signature on a non-disclosure agreement. Such arrangements will be the responsibility of the audit panel coordinator to manage.

Any lack of cooperation with panel members on the part of Simply Voting, Inc. is to be reported to the audit coordinator. If necessary, the coordinator will escalate the issue to the PEI Chief Electoral Officer for resolution.

Independence of the Panel

The Independent Technical Panel on Voting Integrity will act with independence from both Elections PEI and Simply Voting, Inc., and shall act as a trusted 'third party' whose interest is to evaluate and ensure that the PEI 2016 plebiscite on electoral reform is conducted with a high level of electoral process integrity.

While the panel is established at the request of the Chief Electoral Officer for PEI, and according to a plan signed-off by that same CEO, it shall operate independently according to the mandate described in these Terms of Reference and in accordance with internationally accepted principles of electoral professionalism that are associated with electoral democracy.

The audit work conducted by the panel shall be reported on with complete honesty and candor. Any risks that are not appropriately mitigated, and any demonstrated failures of electoral process integrity, are to be highlighted in the verbal and written reports provided to the CEO of PEI by the Independent Technical Panel on Voting Integrity.

Resources and Budget

Elections PEI will ensure that meeting rooms will be made available to the panel during the time that they are working together in the city of Charlottetown, PEI. Other equipment, such as laptop computers, internet access, e-mail and Skype communication accounts, as well as shared electronic file storage arrangements, will be the responsibility of the panel coordinator to arrange.

Except for the contracted services being provided by the panel's coordinator, members of the Independent Technical Panel on Voting Integrity are to be compensated as per the usual arrangements for the professional position they hold within a Canadian EMB.

Elections PEI will compensate the reasonable travel and living costs of all panel members in accordance with the provincial guidelines used for public servants in PEI.

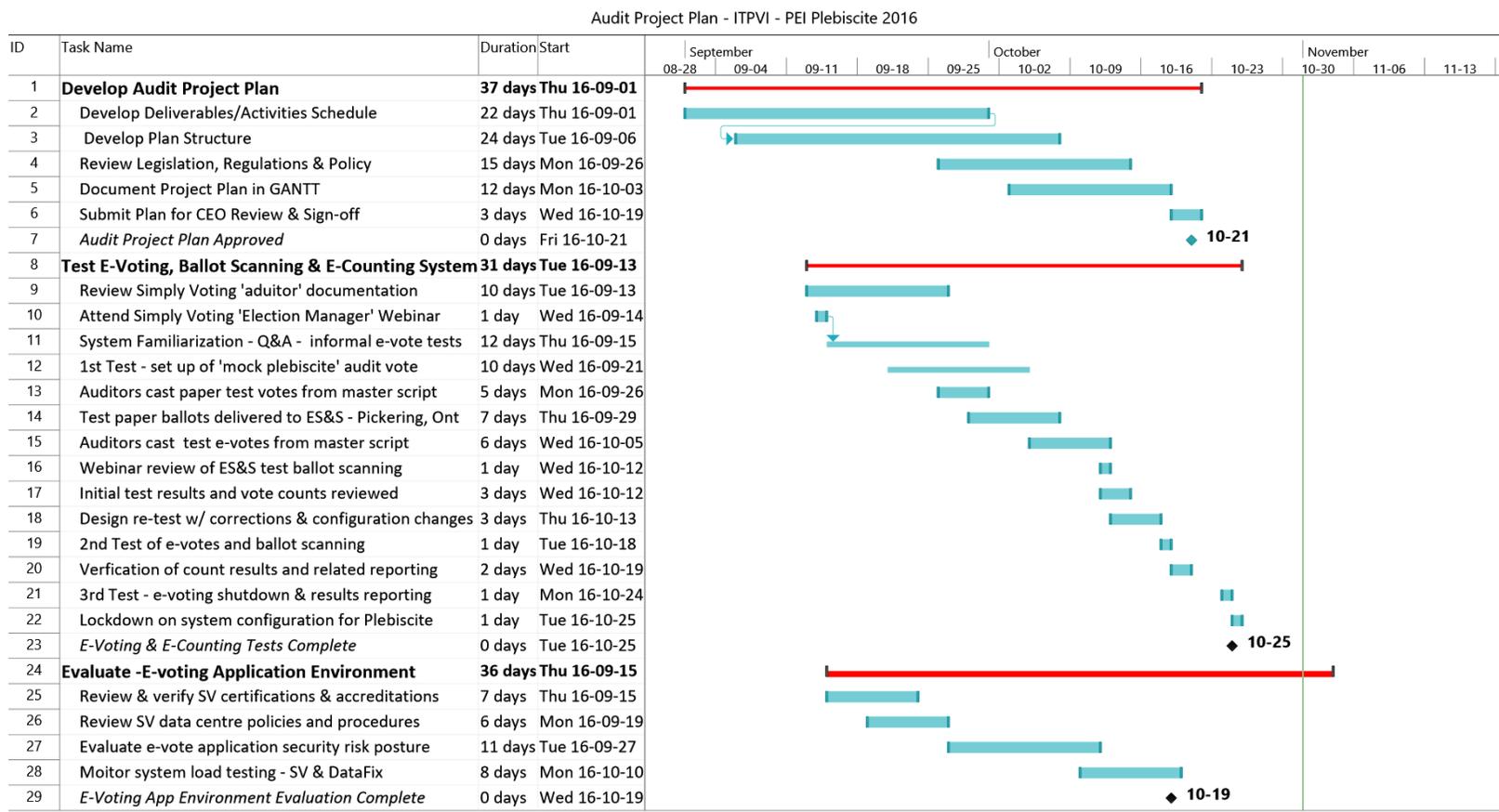
Governance Arrangements of the Panel

To the maximum extent possible, decision-making by the panel will be on the basis of full consensus of all members.

Where a consensus cannot be achieved, a majority vote of the panel's members will become the basis of decision.

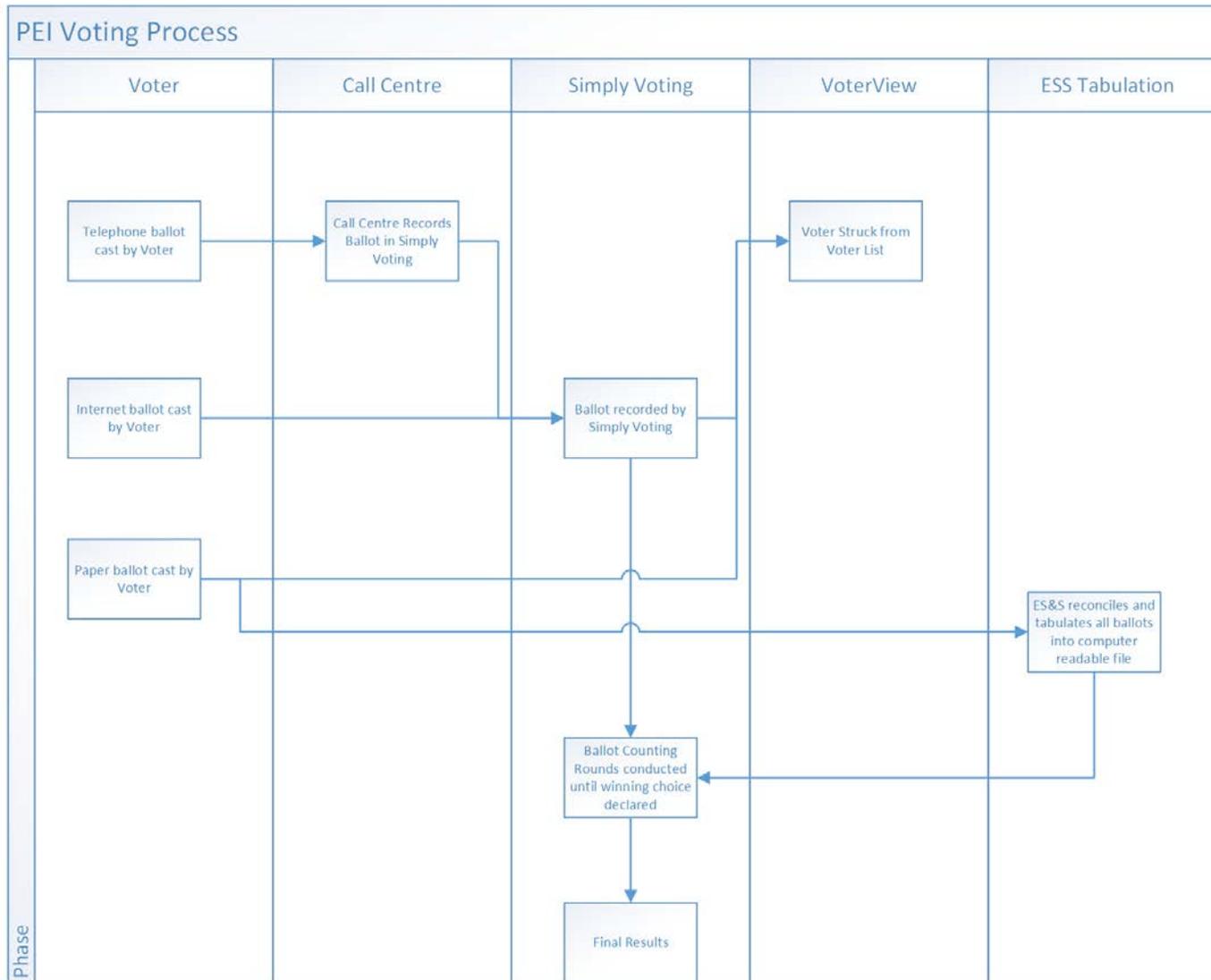
Whenever a vote on a decision is required, a quorum of three members of the panel must be present when the vote is taken. Voting decisions will be made with a verbal or physical indication of support (or lack thereof) for a proposed policy, position or approach that needs to be decided by the panel.

Because of the time-sensitive nature of the audit activities that will be conducted by the panel, it shall be agreed by all concerned that each member of the Independent Technical Panel on Voting Integrity must give their audit work priority over other work and personal responsibilities during the period immediately before, during and immediately after the 2016 Prince Edward Island plebiscite on electoral reform, which will be held from October 29th thru November 7th, 2016.

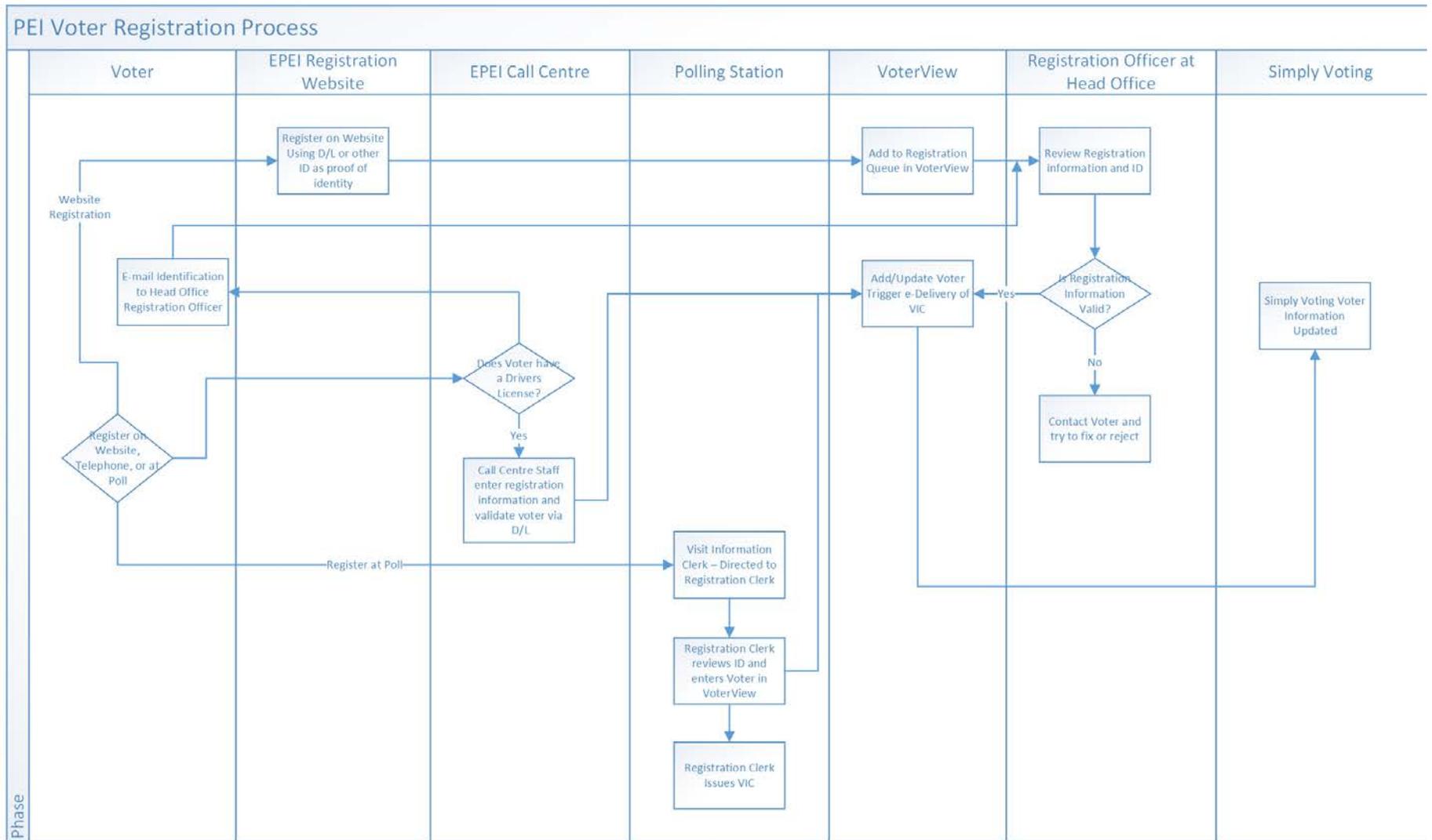


Appendix B – Audit Plan for the 2016 PEI Plebiscite

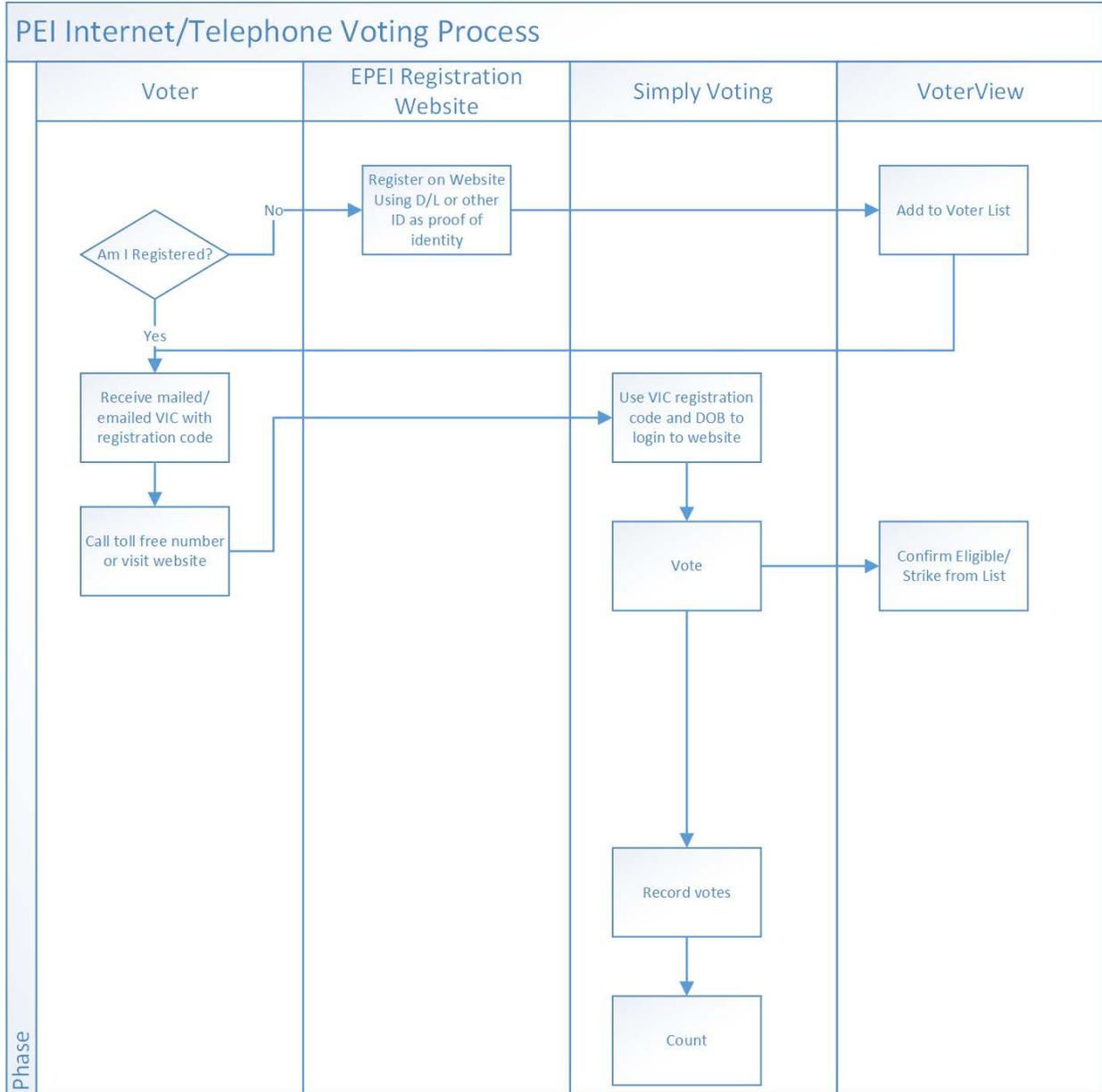
Appendix C – Plebiscite Process Maps



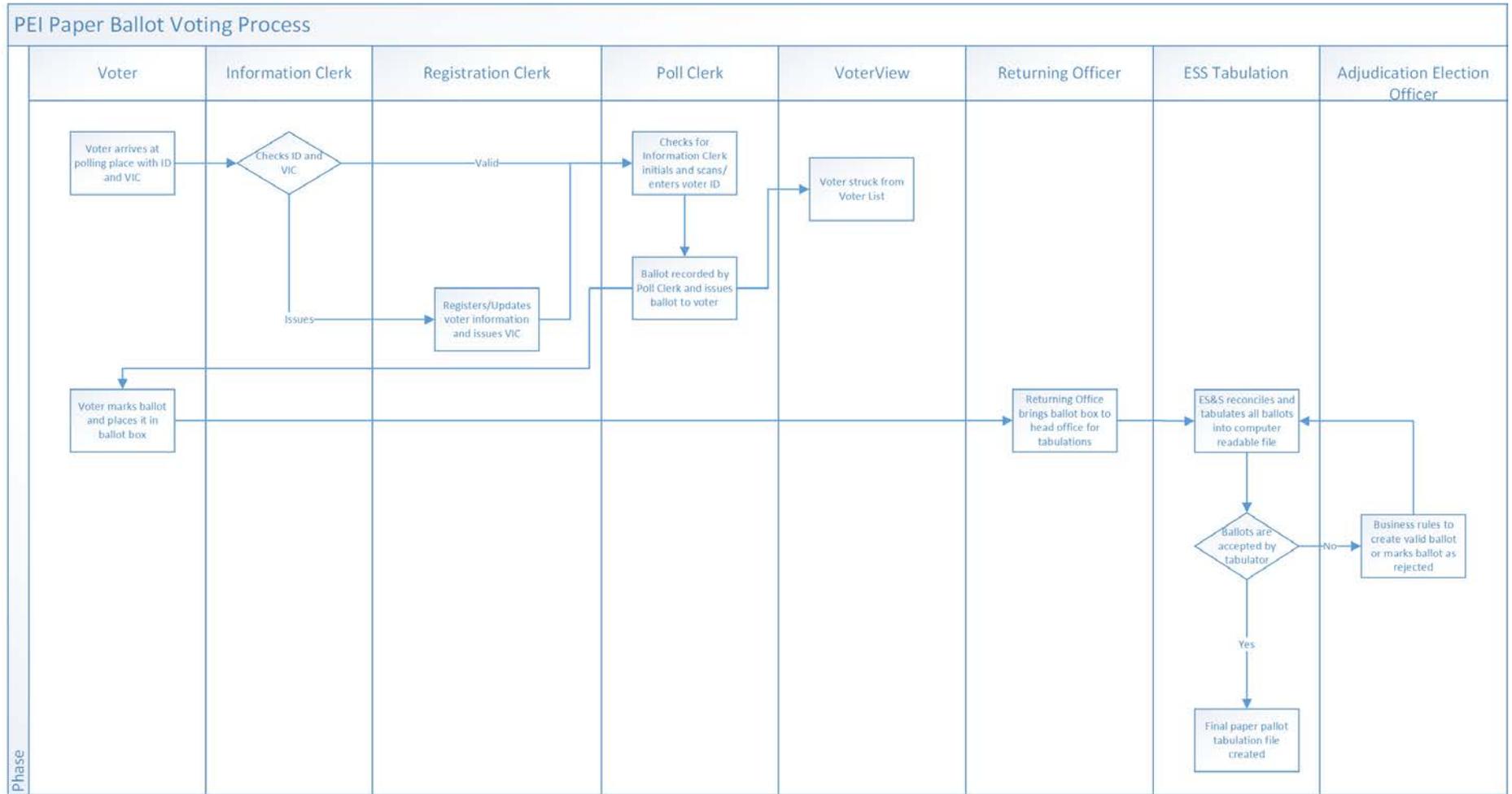
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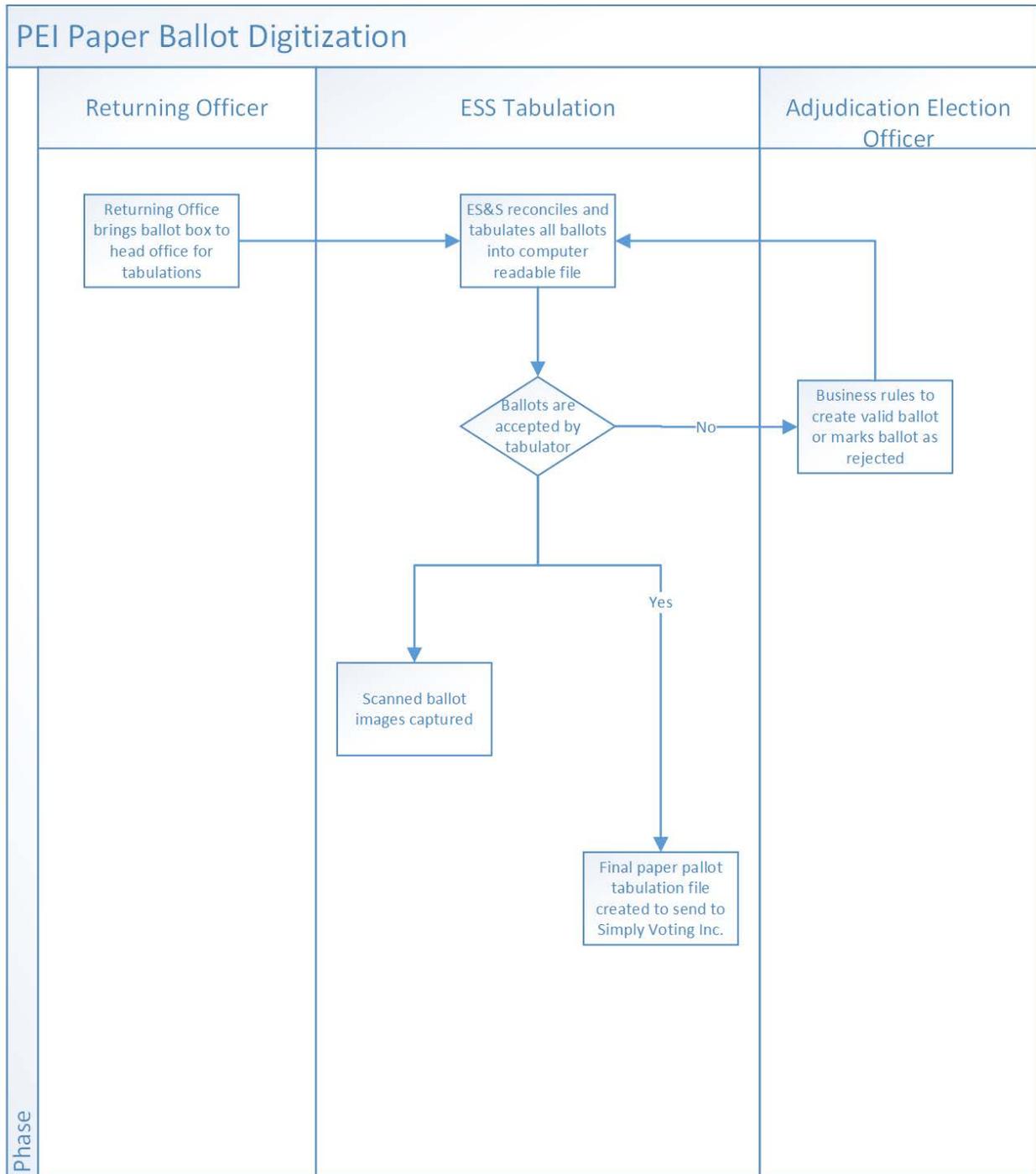
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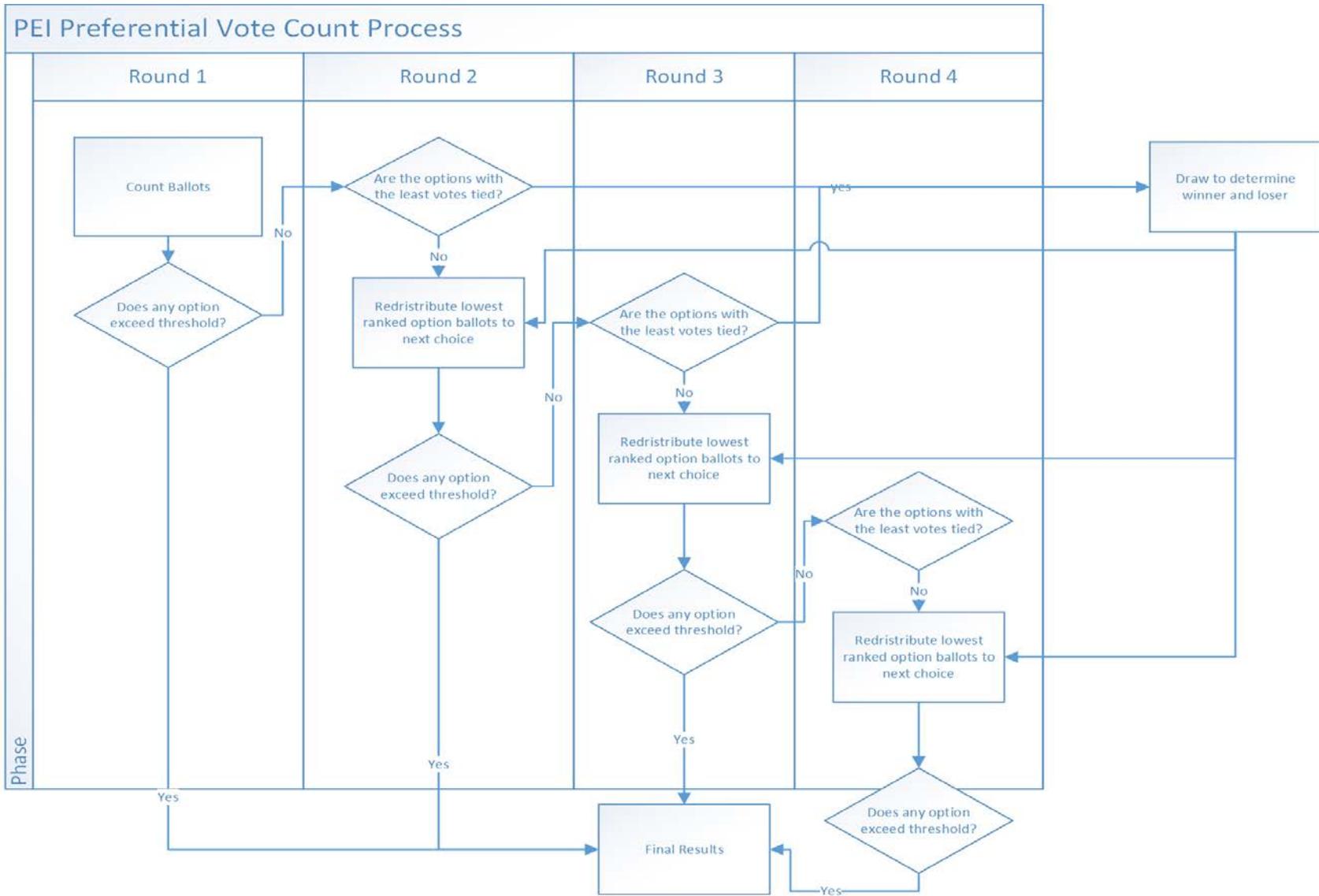
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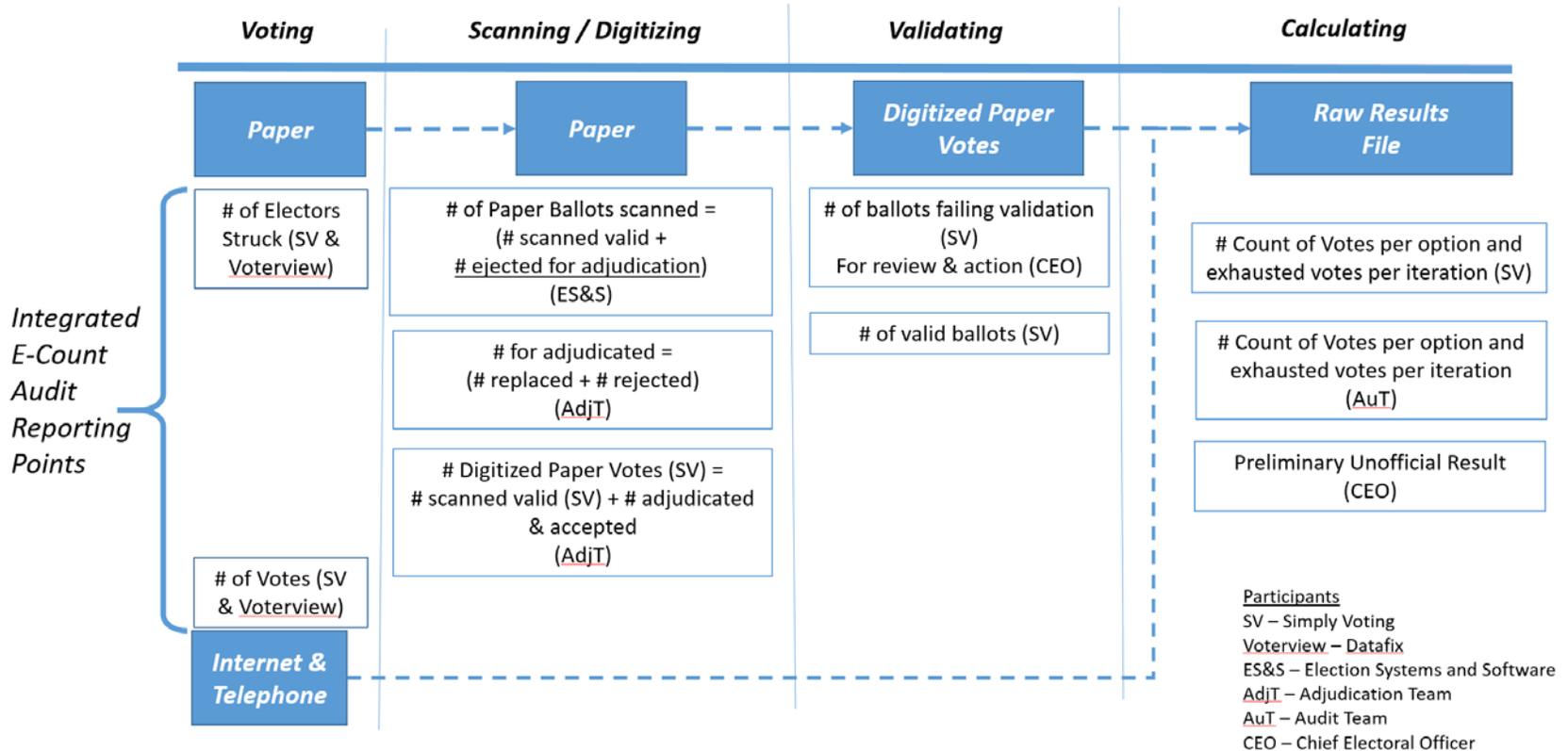
Appendix C - continued



Phase



PEI Plebiscite Independent Technical Panel on Voting Integrity E-Voting and E-Counting



Appendix D - Ballots, Counting and Reporting Policies

[Document begins on following page.]

Ballots, Counting and Reporting Policy

Section 1: Requirements for Ballots

1. All ballots will communicate:

- a) The name of the Plebiscite “2016 Plebiscite on Democratic Renewal” ;
- b) Instructions on how to mark the ballot to rank voting preferences, including:

“You may choose as many, or as few, of the five electoral system options as you want”;

- c) How to complete the ballot (i.e. where and how to place their preference ranking or marks);

- d) The Elections PEI name or logo;



- e) The dates and time of the alternative voting period for electronic ballots is:

**Saturday, October 29, 2016 starting at 12:00 noon until Monday,
November 7, 2016 at 7:00 p.m.**

Note: The ability to log in to the voting website via the internet or telephone will automatically shutdown at 7:00 p.m. Voters who are already logged in to the system at 7:00 p.m. will be granted a five (5) minute grace period in which to cast their ballot. At 7:05 p.m., ballots will no longer be accepted.

- f) The dates and times of the in-person voting period for paper ballots is:

**Friday, November 4, 2016 from 4:00 p.m. until 9:00 p.m. and
Saturday, November 5, 2016 from 10:00 a.m. until 8:00 p.m.**

- g) The question which will be printed or otherwise communicated on each ballot will be:

“Rank the following electoral system options in your order of preference, 1 through 5 (with “1” being your most preferred and “5” being your least preferred):

_____ Dual Member Proportional Representation

_____ First-Past-The-Post (the current system)

_____ First-Past-The-Post Plus Leaders

_____ Mixed Member Proportional Representation

_____ Preferential Voting

Section 2: Security of the Ballots

1. All ballots, both electronic and paper, must be kept secure and inaccessible until the start of the voting period.
 - a) Paper ballots will be printed in accordance with the directions and specifications provided by ES&S in order to permit ballot scanning.
 - b) Paper ballots will be distributed by the Chief Electoral Officer to the Returning Officer for each District prior to the in-person voting days.
 - c) Electronic ballots will remain under the control of Simply Voting Inc. and will only be made available to those voters who have provided the correct credentials to be able to vote during the alternative voting period.
 - d) Ballots will be made available to the audit team (Independent Technical Panel on Voting Integrity) as and when requested by the team’s coordinator for audit control purposes.

2. At the conclusion of the voting process, all paper ballots will be kept secured as legislated by the *Election Act*. Electronic ballots will be kept secure by Simply Voting Inc. under the direction of the Chief Electoral Officer.

Section 3: Calculation of the Threshold

1. A plebiscite option must receive a majority of the votes in order to win; this is called the “threshold”.
2. The majority “threshold” is calculated according to the following policy definitions:
 - i. The number of valid ballots being counted once all the electronic and paper ballots have been merged. Rejected ballots do not count towards the threshold.
 - ii. Divide the number of valid ballots by 2 and then add +1 to achieve the threshold. If there is a fraction, it is rounded down before adding the +1. The threshold remains fixed and will never change from round to round of counting.

Section 4: How Rankings Will Be Interpreted:

1. Ranking for Preferential Voting will be counted as follows:
 - i. “1” indicating the highest ranking and first choice preference, “2” indicating the second choice preference, and so on, with “5” indicating the lowest ranking and last choice preference.
2. If a voter gives the same option more than one ranking, only the highest of those rankings will be considered.
3. If a voter gives two options the same ranking and it is not possible to determine which option is the voter’s preference, neither option will be considered and only earlier ranked options will be used.

4. If a voter skips a ranking, the next highest ranking will be considered and the option skipped will not be considered.
5. A voter can rank as many or as few options as they wish. If a voter only ranks one option, that option would be the voter's first choice preference.
6. If a ballot is to be redistributed but the next preference has been excluded or no further options have been indicated, the ballot becomes exhausted.
7. If a voter marks one single preference marking (i.e. a check mark, 'X' or any other identifiable marking) which clearly identifies one of the options, that option will be considered the voter's first choice preference.

Section 5: What Constitutes a Rejected Ballot?

1. If a voter gives two or more options the same ranking and it is not possible to determine which option is the voter's preference, the ballot will be rejected.
2. If a voter gives one option more than one ranking, as indicated in Section 4.2, and no other option can be determined, the ballot will be rejected.
3. If there are any markings which appear on the ballot which could identify the elector, the ballot will be rejected.
4. If unable to determine
 - i. which option the elector voted for; or
 - ii. the order of their preferences,the ballot will be rejected.
5. If a voter does not rank any option, the ballot will be rejected as no vote choice was made.

Section 6: Paper Ballots Processing

1. The in-person paper ballots are to be centrally processed by Sunday, November 6th at 8:00 p.m. and an electronic tabulating system (optical scanner) will be used to process these ballots and transform the paper ballot voting choices into an electronic file. This scanning and electronic file creation will take place in the Office of the Chief Electoral Officer.
2. The voting choices indicated on the paper ballot processing are to remain secured until they are integrated with the electronic voting choices.
3. In the event that any paper ballots have been completed in such a manner that the electronic tabulating system cannot identify the order of options preferred or it appears to be a ballot that should be rejected, the following procedures must take place:
 - i. An adjudication election officer, as appointed by the Chief Electoral Officer, will examine each ballot which cannot be electronically read, to determine the voting intentions of the voter.
 - ii. The guidelines in Section 4 and Section 5 will be used to determine whether or not the ballot should be rejected.
 - iii. Once the intentions of an acceptable ballot have been determined, a duplicate ballot will be completed by the adjudication election officer to simulate the original ballot. This ballot will be marked as a duplicate ballot and both the original ballot and duplicate ballot will be marked with an identical marking to permit for tracking of all ballots including the count of valid and rejected ballots.
 - iv. The duplicate ballot will then be scanned by the electronic tabulating system.
 - v. The original ballot, which was determined to be valid but needed to have a duplicate set of marks completed on a blank plebiscite ballot in order for it to be successfully scanned, will be placed in an envelope and sealed. The adjudication election officer will indicate the actions taken on the outside of the envelope and initial the descriptive comments. An additional election officer, also appointed by the Chief Electoral Officer, must witness and initial this process and also initial the descriptive comments on the outside of the envelope.

- vi. All ballots which are rejected must be placed in a ballot box established for this purpose, and a running tally must be maintained of the number of physical ballots which have been rejected.

Section 7: Electronic Ballot Tabulation

1. Electronic ballots are to be counted following the conclusion of the Alternative Voting Period which is legislated to be at 7:00 p.m. on November 7th, 2016. This process will be conducted by the election systems officer (Simply Voting Inc.).
2. The paper ballot ranked choices will be integrated and combined with the ranked choices from the electronic voting processes (internet and telephone votes) to form one set of preliminary counting results. The counting of the ballots cannot proceed until both the electronic and paper ballot ranked choices have been successfully integrated into a single electronic file.
3. In the first round of counting, votes are counted according to the first choice preference indicated on the ballots.
4. If an option receives enough votes to meet or exceed the threshold after the first or any round of counting, that option will be declared the winner and counting ends.
5. If no option has enough votes to meet or exceed the threshold after the first count, the option with the least number of votes is excluded. These ballots are then redistributed to the remaining options according to the next ranking on these excluded ballots.
6. The steps described above are repeated in subsequent rounds of counting until an option has enough votes to meet or exceed the threshold.
7. If two options remain and neither has a majority, the option with the least number of votes will be excluded and redistributed.
8. If only one option remains after all ballots have been redistributed, this option will be declared the winner, regardless of whether or not the voting threshold has been achieved.

Section 8: Reporting of Results

1. Upon the completion of the integration of the paper and electronic ballot results, all ballots will be counted using a preferential vote counting process as described in Section 7. This process will include various “rounds” of counting until one option reaches the majority threshold as described in Section 3. Initial reporting for each “Round” of counting must be documented the following:
 - i. In “**Round 1**” (initial count)
 - 1- The number of valid ballots cast per District;
 - 2- The number of valid ballots cast across PEI;
 - 3- The number of votes for each option across PEI;
 - 4- The number of rejected ballots;
 - 5- If the “threshold” is reached by any option.
 - 6- The option which is being excluded after this round of counting.
 - ii. In “**Round 2**” (if required):
 - 1- The number of votes being redistributed for each remaining option;
 - 2- The number of votes for each option across PEI;
 - 3- The number of ballots exhausted;
 - 4- If the “threshold” is reached by any option.
 - 5- The option which is being excluded after this round of counting.
 - iii. In “**Round 3**” (if required):
 - 1- The number of votes being redistributed for each remaining option;
 - 2- The number of votes for each option across PEI;
 - 3- The number of ballots exhausted;
 - 4- If the “threshold” is reached by any option.
 - 5- The option which is being excluded after this round of counting.
 - iv. In “**Round 4**” (if required):
 - 1- The number of votes being redistributed for each remaining option

- 2- The number of votes for each option across PEI;
 - 3- The number of ballots exhausted;
 - 4- If the “threshold” is reached by any option.
 - 5- The option which is being excluded after this round of counting.
2. Once all rounds of counting have been completed, the electronic version of the scanned paper ballots, results will be distributed to the coordinator for the Independent Technical Panel on Voting Integrity who will verify the process and report to the Chief Electoral Officer.
 3. All results will be provided by Simply Voting Inc.
 4. Results will be made public on Tuesday, November 8, 2016 by the Chief Electoral Officer.

Section 9: Tie Breaking Process

1. If, after any round of counting, it cannot be determined which option should be excluded because the two options with the least number of votes are tied, then a random draw will take place.
2. The Chief Electoral Officer will appoint an election officer to adjudicate a tie-breaking process by a random draw.
 3. A second election officer, appointed by the Chief Electoral Officer, will witness the draw-based tie-breaking process.
4. The adjudicating election officer will proceed using the following guidelines:
 - i. The name of each tied option will be hand written on a piece of paper.
 - ii. All paper used must be of the exact same size, weight and type.
 - iii. The paper must be folded in half after the name of the option is recorded.
 - iv. The folded pieces of paper with the options written on them are to be placed in an opaque container and mixed together.
 - v. The witness election officer will draw one piece of paper from the opaque container and hand it to the adjudicating officer. The name of the option recorded on this piece of paper will be declared, by the adjudicating officer, the winning option. This will be immediately documented on the paper drawn from the container and initialed by both the adjudicating and witness election officers.

- vi. For confirmation, the witness election officer will draw the remaining piece of paper out of the opaque container to verify the second or any additional tied option was included in the draw. This option will then be excluded in the next round of counting.
- vii. The adjudicator will document the winning option on an envelope and place both pieces of paper with the tied options recorded on them in the envelope and seal it.
- viii. Both the adjudicating and witness election official must initial the documentation and envelope.
- ix. The adjudicating election officer will immediately advise the CEO of the winning option.
- x. The CEO will communicate to Simply Voting Inc. the results of the tie breaking process and the electronic results will be updated accordingly.
- xi. The envelope with the documentation regarding the winning option, decided in a tie-breaking draw process, will be secured with the paper ballots.

Section 11: Retention of Ballots

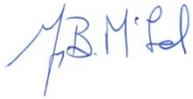
1. All ballots and election documentation, including the detailed voting results as per the rounds of ballot counting, will be retained in accordance with section 114 of the *Election Act*.

Section 12: Independent Technical Panel on Voting Integrity

1. All voting processes will be evaluated by the Independent Technical Panel on Voting (Audit Team) and this panel will present a report to the Chief Electoral Officer before, during and after the voting period as per the Terms of Reference established for this panel. The Audit Team will focus on the following areas of concern:

- a) Telephone voting system;

- b) Internet voting system;
- c) Electronic “voter strike-off” system used to prevent duplicate voting;
- d) Optical scanning system (tabulator) used to record paper voting choices;
- e) Ballot results integration process used to combine telephone, internet and paper ballot votes; and
- f) Preferential ballot voting results calculation process.

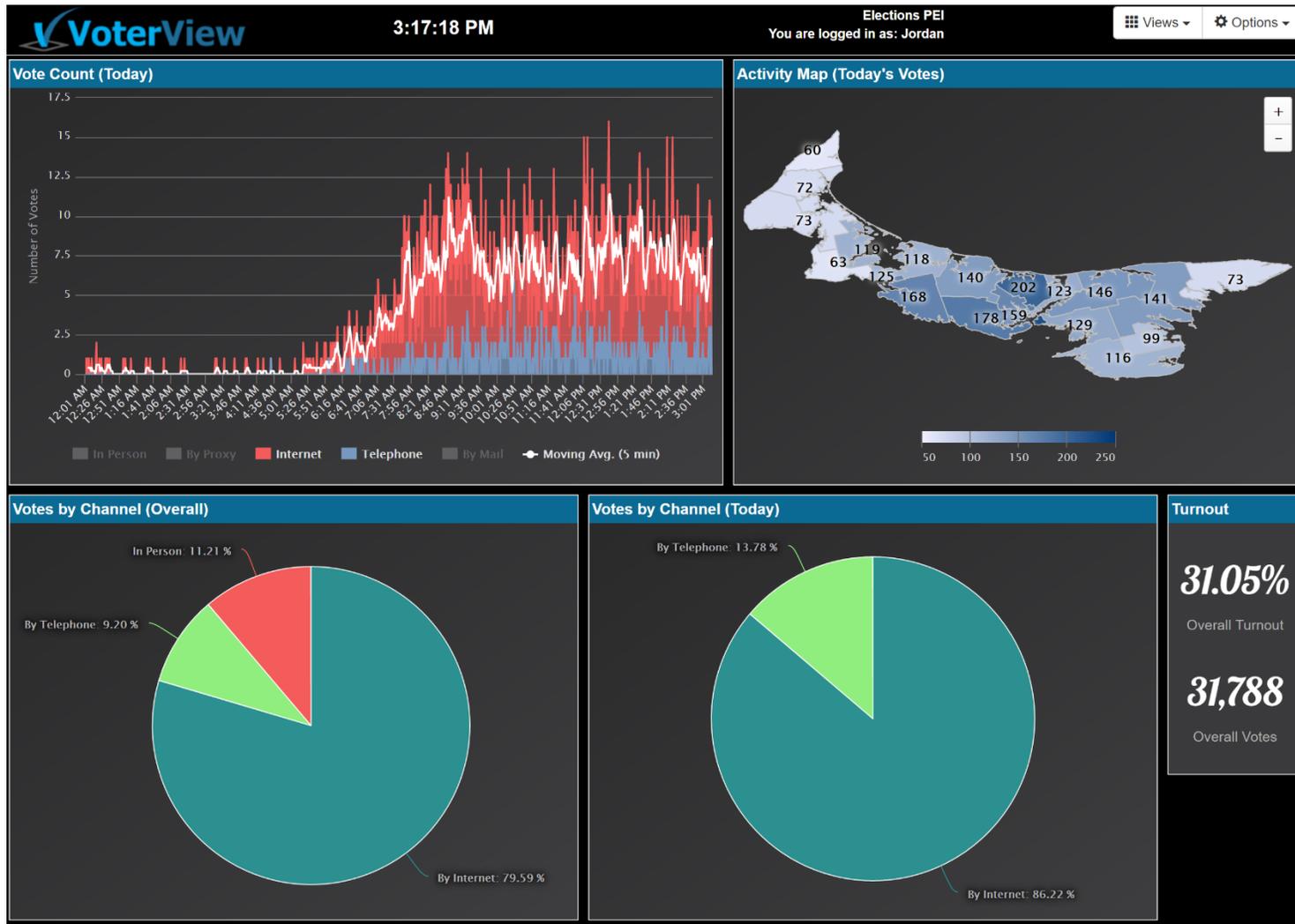


Gary B. McLeod
Chief Electoral Officer
Province of Prince Edward Island

October 19, 2016

Appendix E – Sample Audit Oversight Reports

VoterView Dashboard



Simply Voting Activity Log – Internet Votes sorted by IP

Activity Log

The activity log is an audit trail of all significant activity related to this election. The possible types of activity are [explained in detail](#) on the Help page. You can click on *ip lookup* next to each IP address to see the associated hostname. In the case of a vote event, the Elector ID is listed as well. For telephone voting, there will be a phone number instead of an IP address.

Find Log Records

Search Term

9716 results on 98 pages: << < Page 2 > >>

Timestamp	Username	IP Address	Activity	Elector ID
2016-10-30 14:43:45		142.163.117.187 [ip lookup]	Internet vote	47930
2016-11-01 13:33:56		142.163.117.199 [ip lookup]	Internet vote	28696
2016-10-31 10:29:29		142.163.117.204 [ip lookup]	Internet vote	34760
2016-11-01 13:47:45		142.163.117.49 [ip lookup]	Internet vote	12207
2016-10-31 07:17:45		142.163.117.68 [ip lookup]	Internet vote	120000
2016-11-01 13:48:15		142.163.117.7 [ip lookup]	Internet vote	24231
2016-10-30 09:40:27		142.163.117.8 [ip lookup]	Internet vote	31387
2016-10-30 09:42:04		142.163.117.8 [ip lookup]	Internet vote	31398
2016-10-31 14:44:07		142.163.117.86 [ip lookup]	Internet vote	52344
2016-10-31 14:03:27		142.163.117.86 [ip lookup]	Internet vote	110602
2016-10-31 12:53:42		142.163.206.15 [ip lookup]	Internet vote	20748
2016-10-30 11:49:08		142.163.206.150 [ip lookup]	Internet vote	20121
2016-11-01 10:10:12		142.163.206.169 [ip lookup]	Internet vote	46882
2016-10-31 10:42:38		142.163.206.18 [ip lookup]	Internet vote	119911
2016-11-01 12:30:48		142.163.206.184 [ip lookup]	Internet vote	36289
2016-10-31 10:41:55		142.163.206.184 [ip lookup]	Internet vote	14660
2016-11-01 10:39:13		142.163.206.214 [ip lookup]	Internet vote	40218
2016-10-31 19:10:27		142.163.206.219 [ip lookup]	Internet vote	28155
2016-11-02 08:58:25		142.163.206.219 [ip lookup]	Internet vote	16111
2016-10-31 16:17:13		142.163.206.223 [ip lookup]	Internet vote	119991

Sample Paper Ballot Digitization

Receipt	Electoral System Options
#P-10550503	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting, Dual Member Proportional Representation, First-Past-The-Post (the current system)
#P-1103c658	Mixed Member Proportional Representation, Preferential Voting, Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-121fb5a2	Preferential Voting, Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation
#P-13d5494c	Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting
#P-14c9cb9e	Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting
#P-15a962e9	Mixed Member Proportional Representation, Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-167c23da	Preferential Voting, Dual Member Proportional Representation, First-Past-The-Post (the current system)
#P-1761a186	Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-187925f6	First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation
#P-1930cb99	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting
#P-1fad74f	First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-204ca7dc	Dual Member Proportional Representation
#P-21fe43aa	First-Past-The-Post (the current system)
#P-226d625c	First-Past-The-Post Plus Leaders
#P-234cb73d	Mixed Member Proportional Representation
#P-24c15767	Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation
#P-2521627d	Mixed Member Proportional Representation, Preferential Voting
#P-26c97503	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation
#P-27c6ff12	First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-28813db8	Dual Member Proportional Representation, First-Past-The-Post (the current system)
#P-291f093d	Preferential Voting
#P-2f45702	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting
#P-301e020e	Mixed Member Proportional Representation
#P-317c64bb	First-Past-The-Post Plus Leaders
#P-320b3218	First-Past-The-Post (the current system)
#P-339f0b06	Dual Member Proportional Representation
#P-34c00d29	First-Past-The-Post Plus Leaders, First-Past-The-Post (the current system)
#P-3559a0c6	First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-36161f3	First-Past-The-Post Plus Leaders, Preferential Voting, Mixed Member Proportional Representation
#P-36741352	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting
#P-376435de	First-Past-The-Post Plus Leaders, Preferential Voting, Mixed Member Proportional Representation
#P-384f1772	Preferential Voting, Mixed Member Proportional Representation, First-Past-The-Post Plus Leaders
#P-39714a27	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Dual Member Proportional Representation, First-Past-The-Post (the current system)
#P-40de8a10	First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Dual Member Proportional Representation
#P-4186cfc4	First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Dual Member Proportional Representation
#P-42c9cfe4	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation, Preferential Voting, Dual Member Proportional Representation, First-Past-The-Post (the current system)
#P-438d1153	First-Past-The-Post (the current system), Preferential Voting, First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation
#P-44001f2b	Mixed Member Proportional Representation, Preferential Voting, Dual Member Proportional Representation, First-Past-The-Post (the current system), First-Past-The-Post Plus Leaders
#P-451a9e50	First-Past-The-Post Plus Leaders, First-Past-The-Post (the current system)
#P-46028f9e	Mixed Member Proportional Representation
#P-4708070e	Dual Member Proportional Representation, First-Past-The-Post (the current system)
#P-48c2e015	First-Past-The-Post Plus Leaders, Mixed Member Proportional Representation

Sample Paper Ballot/E-Vote Data File Integration

[2nd Test] 2016 Plebiscite on Democratic Renewal

Tabulated Ballot Report

Summary

Records processed: 99
Records loaded: 0
Accepted: 93
Normal: 75 A B C D E district age range
Blank age range: 2 district undervote
Blank district: 2 undervote age range
Corrected: 15
Corrected with gap(s): 12 A undervote undervote B C district age range
Corrected with duplicate(s): 3 A A B undervote undervote district age range
Corrected with overvote(s): 0 A B overvote C undervote district age range

Execution time: 0.0153 seconds
Dry run: YES
Rejected: 6
o Data error - 1st choice: 0
o Data error - 2nd choice: 0
o Data error - 3rd choice: 0
o Data error - 4th choice: 0
o Data error - 5th choice: 0
o Data error - district: 0
o Data error - age range: 0
o Invalid overvote: 2 overvote A B undervote undervote district age range
o Abstains: 4 undervote undervote undervote undervote undervote district age range

Sample - Voting Results Calculations

ROUND 1		
	First-Past-The-Post Plus Leaders	51 votes
	First-Past-The-Post (the current system)	45 votes
	Dual Member Proportional Representation	40 votes
	Mixed Member Proportional Representation	30 votes
	Preferential Voting	20 votes
	Eliminated Preferential Voting due to: lowest 1st preference	
ROUND 2		
	First-Past-The-Post Plus Leaders	54 (+3) votes
	First-Past-The-Post (the current system)	48 (+3) votes
	Dual Member Proportional Representation	47 (+7) votes
	Mixed Member Proportional Representation	34 (+4) votes
	Exhausted votes	3 (+3) votes
	Eliminated Mixed Member Proportional Representation due to: lowest 1st preference	
ROUND 3		
	First-Past-The-Post Plus Leaders	73 (+19) votes
	Dual Member Proportional Representation	53 (+6) votes
	First-Past-The-Post (the current system)	48 votes
	Exhausted votes	12 (+9) votes
	Eliminated First-Past-The-Post (the current system) due to: lowest 1st preference	
ROUND 4		
	First-Past-The-Post Plus Leaders	93 (+20) votes
	Dual Member Proportional Representation	73 (+20) votes
	Exhausted votes	20 (+8) votes
	Eliminated Dual Member Proportional Representation due to: lowest 1st preference	
ROUND 5		
	First-Past-The-Post Plus Leaders	134 (+41) votes
	Exhausted votes	52 (+32) votes
	Winner: First-Past-The-Post Plus Leaders due to: highest 1st preference	
ROUND 6		
	First-Past-The-Post Plus Leaders	Elected 134 votes
	Exhausted votes	52 votes

Appendix F – Plebiscite Statistics

Metric	Number
Number of voter registrations processed during plebiscite voting period	840
Number of voters struck off as having voted cast a paper ballot	3,564
Number of paper ballots cast at voting locations	3,564
Number of 'tendered ballots' cast	1
Number of telephone votes cast	3,513
Number of internet votes cast	30,277
Number of e-votes rejected during vote count (abstains)	166
Number of paper ballots rejected during adjudication	100
Number of scanned paper ballots rejected during data file integration (abstains)	51
Number of scanned paper ballots having data values adjusted during data file integration	216

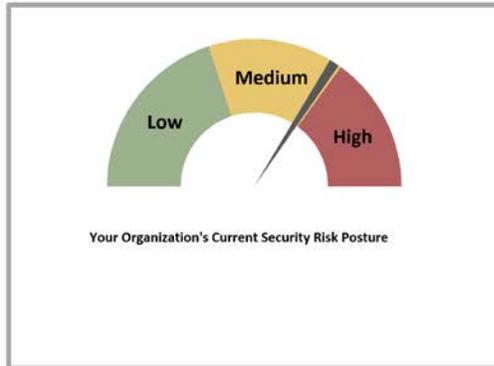
Appendix G - Integrity Risks and Controls

Voting Integrity
High Level Risks and
Controls

Traditional Risks		Traditional Controls								Additional Controls
		C1. Controlled access in-person voting environment that is fully observable by candidates' agents, election officials third parties.	C2. Election officers are paired together and oversee each other while conducting integrity controls associated with each voting transaction.	C3. Ballot paper stays in a restricted area under the responsibility of an election officer, from issuance to placement in ballot box. (Enhanced with counterfeit controls)	C4. Continuous voting transaction from proof of entitlement to placement of ballot in the ballot box.	C5. Voter marks their ballot behind a privacy screen and, after election officer checks ballot validity, places it in ballot box.	C6. Effective voter's list management.	C7. Training, supervision and administrative process quality control measures.	C8. Voters' access to offices, staff and information.	Additional Controls
R1. Ballot box stuffing		X	X	X	X					
R2. Stolen ballots		X	X	X	X					
R3. Counterfeit ballots		X	X	X	X					
R4. Vote buying		X	X	X	X	X	X	X		
R5. Voter coercion		X		X		X	X	X		
R6. Allowing non-entitled voter to vote		X	X				X	X		
R7. Denying entitled voter access to ballot			X				X	X	X	
R8. Incorrect or insufficient documentation (audit trail)										
R9. Compromised vote secrecy						X				
R10. Rejected ballots (administratively caused)			X	X					X	
R11. Non-compliance with procedures		X							X	
R12. Voters receiving more than one ballot		X	X				X	X		
Additional Risks with Online Voting										
AR1. Preserving secrecy of vote.										
AR2. Proof of vote acceptance/inclusion in vote count										
AR3. Voting with stolen credentials										
AR4. Compromised voter hardware / software										Lack of available controls ---->
AR5. Compromised election management hardware/software										
AR6. Focused hacking attempts during electoral event										
AR7. Broad regional or national attack on internet infrastructure										Lack of available controls ---->
AR8. Compromises to system access and usability										

Appendix H – Technical Risk Assessment

Risk Table



Low Security Risk Posture

Organizations with a low security risk posture are either in a position that is less attractive to cyber attackers, or they can accept more risk on their security controls and processes in terms of less restrictive compliance requirements and no clear business drivers.

They have high risk tolerance. However, it does not necessarily mean they are more comfortable with risk. They may be unable to afford the right technologies, or stakeholders would prefer to invest in the business rather than security.

Medium Security Risk Posture

Organizations with a medium security risk posture are somewhat attractive to cyber attackers and require strong security risk controls and assurance in terms of a certain level of compliance requirements and some business drivers.

They have medium risk tolerance. Usually, they will leverage best practices as their baseline and balance the cost and security risks when designing and implementing security solutions.

High Security Risk Posture

Organizations with a high security risk posture are highly attractive to cyber attackers and require very strong and solid security risk governance, management, and assurance in terms of high-level compliance requirements and strong business drivers.

They have low risk tolerance. Usually, they take a proactive approach and leverage strong security intelligence to support their analysis. Information security is one of the critical topics on their board rooms' agenda.

CSAE 3416 Type 1 Certificate



SSL Server Test

SSL Server Test: pei.simplyvoting.com (Powered by Qualys SSL Labs)

<https://www.ssllabs.com/ssltest/analyze.html?d=pei.simplyvoting.com>



[Home](#) [Projects](#) [Qualys.com](#) [Contact](#)

You are here: [Home](#) > [Projects](#) > [SSL Server Test](#) > pei.simplyvoting.com

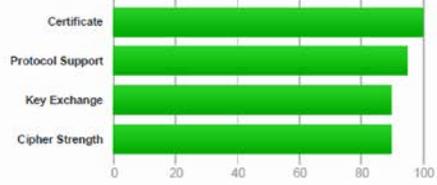
SSL Report: pei.simplyvoting.com (69.10.139.189)

Assessed on: Thu, 08 Sep 2016 12:55:47 UTC | [Hide](#) | [Clear cache](#)

[Scan Another »](#)

Summary

Overall Rating



Visit our [documentation page](#) for more information, configuration guides, and books. Known issues are documented [here](#).

Statement from Audit Team on Technical Risk Assessment

In addition to the certifications and tests listed above, the audit team reviewed other confidential and proprietary reports regarding a variety of tests and audits that had been completed on the physical and logical infrastructures on which the Simply Voting and VoterView applications reside. The audit team was satisfied that reasonable and appropriate controls were in place to manage the risks associated with this particular electoral event.

The audit team also observed a variety of plebiscite-specific load and stress tests conducted on the Simply Voting system and its integration with the VoterView system. These tests satisfied the auditors that the integrated systems could adequately handle the maximum anticipated loads that might be experienced during the event.

Finally, the audit team extensively tested the online and telephone voting methods and applied a variety of methods to test the integrity of the system. The team conducted three test plebiscites and carefully monitored results of the paper ballot scanning and tabulation process, the e-vote and scanned vote file integration process, and the multi-round preferential vote calculation process. Through these tests and validations, the audit team did not identify any technical issues with the system or its specific configuration for the PEI plebiscite.

Appendix I – Plebiscite Issues Experienced

Receipt Code

When a voter casts their vote via internet voting or telephone voting, the Simply Voting application issues a receipt code. In the initial iteration of the application, this receipt code could be used by the voter after voting was completed to validate both how they voted and how the vote had been counted.

In the Simply Voting application the receipt code is tied to the ballot, but it is not tied to the voter record in the database. Due to secrecy of vote legal issues encountered by the CEO shortly before the system's final configuration, this feature was modified to permit use of the receipt code after the plebiscite voting closed only to determine that a particular ballot had been counted. The receipt code caused some degree of voter confusion. Many voters did not know what the code was or how it was to be used. The audit team noted many social media posts that displayed this receipt code in a picture showing the voter had cast their online ballot, which would have seriously violated voting secrecy if the original display feature had been retained. Better communication around the receipt code and how it is to be used is recommended for any future events using this technology.

Suspicious Activity

Simply Voting generated Suspicious Activity Reports throughout the online voting period. These reports were investigated by both the ITPVI team and Elections PEI. No serious issues were discovered as a result of activity reported, with most instances being many votes being cast from one IP address. Such addresses frequently turned out to be large office complexes with a single IP address. Numerous Islanders took the opportunity to vote from their work locations, according to these reports.

Telephone Voting — Waiting Too Long Causing Voter Confusion

When voters used the telephone voting option it was found that if the voter waited too long (between 4 and 5 seconds) after their choices were presented and then entered their selection, the system did not accept their selection and prompted with a message stating “I did not hear you” suggesting that voice interaction was possible when keypad inputs were necessary. The system then went on and listed the options again. If the voter waited too long to enter their selections repeatedly, the system disconnected them without recording their vote choices. This caused voter confusion and generated calls to the Call Centre.

Turnout

Despite the convenience of the alternate electronic methods of voting, overall turnout was low. A total of 81.05% of participating voters cast their ballot via the internet, 9.4% voted via telephone, while 9.55% cast their vote via the traditional paper ballot. Overall only 36.46% of registered PEI voters participated in voting during the plebiscite.

The vast majority of those Islanders that did vote took advantage of the convenience the alternate voting methods provided. Numerous social media “get out and vote” campaigns were observed, encouraging voters to use internet voting. The *Young Voters of Prince Edward Island* group encouraged youth to get out and vote and then take a selfie and post it on social media.

Administrative Errors

1. Poll Clerks frequently did not properly mark the electoral district or the age range on the back side of the paper ballots, often putting a check mark or an ‘x’ that the scanner could not read. In some instances, the electoral district was not marked at all.
2. A Poll Clerk was observed issuing a new ballot to someone who had “messed their ballot up”. However, the “messed up” ballot had already been put into the ballot box. This voter was allowed to vote twice.
3. In three polls, (see table on next page) there were more ballots than there were voters struck from the list. It is most likely that poll clerks did not strike a voter from the list once they were given a ballot. (This could actually result in a double vote, as it set up a condition where the voter could have voted by phone, or online, as well without being detected.)
4. In five polls (see table below) there were more voters struck from the list than there were ballots in the ballot box. Possible scenarios for this could be:
 - Voter left the poll with the ballot.
 - Voter spoiled their ballot, handed it back to the Poll Clerk, and did not get a replacement.
5. The audit team was unable to reconcile the total number of ballots scanned with the number of ballots received. There were two more ballots scanned than received. The audit team is of the belief that 2 ballots were inadvertently scanned twice.

District	Voters Marked as Struck-Off in VoterView	Paper Ballots Received	Voter Strike-Offs Over(+) / Under(-)
Mobile Poll 1	347	346	1
District 2	98	102	-4
District 4	76	77	-1
District 5	56	55	1
District 12-14	365	362	3
District 15	131	130	1
District 16	243	248	-5
District 21-22	248	243	5
Total Over			11
Total Under			-10
Net			1

NOTE: Totals in all other polling locations showed an exact match between the number of paper ballots issued compared to the number of voters indicated as struck-off in VoterView.

Appendix J – ITPVI Team Biographies

Jordan ARENDT is Elections Saskatchewan’s Director of Information Technology, and has served in that position since October of 2013.

Over the past three years Jordan has been involved in a variety of projects including the build and development of a permanent register of voters, field staff payment systems, computing infrastructure modernization, poll open application, and of course the biggest project of them all — the 28th Provincial General Election.

Jordan earned a Bachelor of Science, majoring in Computer Science from the University of Regina. Over the course of his 25 years in the Information Technology field he has obtained a variety of industry certifications including Microsoft Certified Systems Engineer, ITIL certifications, and TOGAF 9, among others.

Jacques MAILLOUX is the Executive Director, Voting Services Modernization (VSM) with Elections Canada and is based in Ottawa. He has been with Elections Canada for 3 years, having been appointed Chief Information Officer (CIO) in October 2013. Since then he has provided support to modernization of the machinery used in the 42nd General Election in 2015. In March 2016 Jacques was given the mandate under the Electoral Services Modernization Strategy to oversee the Voting Services Modernization program. This program has the mandate of delivering modernized voting solutions and services to significantly enhance the voting experience for Canadian electors.

Prior to joining Elections Canada, Jacques was Chief Information Officer of the Canadian International Development Agency.

Harry NEUFELD is an electoral management consultant based in Calgary, Alberta. He has been professionally involved with supporting the management of election administration since 1982.

In June 2010 Harry completed an eight-year statutory term as the Chief Electoral Officer for the province of British Columbia. He previously held senior electoral management positions with Elections Canada and the United Nations.

Mr. Neufeld has worked as an electoral consultant for more than 15 years of his career, assisting international agencies and election management bodies around the globe. His consulting assignments have included audits of electoral process integrity for political party leadership elections that featured the use of internet and telephone-based electronic voting.

Harry coordinated the audit activities of the Independent Technical Panel on Voting Integrity for the 2016 PEI plebiscite under a commission from the Chief Electoral Officer of Prince Edward Island.

Ryan PHILLIPS is a Business Analyst with Elections Alberta, and has held that position since 2014.

At Elections Alberta, Mr. Phillips provides day-to-day operational and technology support and has an ongoing engagement in providing the information management associated with specific election administration components. Ryan has also assisted with multiple inter-provincial observation and audit missions.

In 2011 Ryan graduated with honours from the Northern Alberta Institute of Technology's Digital Media and Information Technology program. Ryan also holds a Project Management Certificate from the Northern Alberta Institute of Technology (NAIT), and recently became an alumnus of the inaugural Canadian Society of Election Officials Training (CSEOT) program.

Appendix K – Simply Voting Inc. Submission to the Federal Special Committee on Electoral Reform

[Document begins on the following page.]

Simply Voting submission to the Special Committee on Electoral Reform

Submitted by Brian Lack on September 20, 2016

Background

1. Simply Voting Inc. is a full-service provider of secure, internet voting based in Montreal. It serves over 1000 customers from varied sectors including universities, associations, unions, political parties, and First Nations. On any given day of the year it is running approximately 100 concurrent voting events and has never suffered a security incident.
2. Of particular relevance to this committee, Simply Voting has delivered internet and telephone voting to several municipalities during the 2014 Ontario municipal elections and will be running the upcoming PEI Plebiscite on Democratic Renewal on our platform, the latter being the first province-wide internet vote in North America.
3. Brian Lack, President and founder of Simply Voting Inc. first developed Simply Voting's online voting system in 2003 and holds a B.Sc. From McGill University in Computer Science.

An Elevated Threat

4. Currently internet voting is being used in Canada for municipal elections in Ontario and Nova Scotia. This application of voting technology has been a success, more municipalities are coming on board each election cycle and it is anticipated that more provinces will allow municipal internet voting in the future.
5. However, as the significance of the voting event increases, so does the danger of an attack. Economic and political powers wielded by federal governments are far greater than those wielded by municipal governments. Campaign budgets for federal elections run in the tens of millions of dollars¹, dwarfing municipal campaigns. With much higher stakes, the candidates, parties, supporters, interest groups and even organized crime direct far more resources towards influencing the outcome and may be tempted to target the voting system.

[1] https://en.wikipedia.org/wiki/Federal_political_financing_in_Canada

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6. At the federal level, external actors become interested in the outcome as well. International organized crime, hacker groups such as Anonymous, Russia, China, and even the U.S. National Security Agency all have powerful cyberwarfare capabilities. The Arizona and Illinois online voter registration systems were recently hacked, allegedly by foreign actors, which is a clear example of this threat².
 7. With a significant amount of technological resources applied, an actor may take advantage of the following vulnerabilities of internet voting. These vulnerabilities exist due to the limitations of web technology in general, irrespective of the particular internet voting system being used.

Targeted Malware

8. Malware is a malicious program that does something on the infected computer against the computer owner's wishes and without their knowledge. Some malware, such as the Stuxnet worm which destroyed centrifuges of Iran's nuclear program³, is engineered with a specific target and purpose in mind. Malware can be engineered specifically to hijack a particular vote on a particular internet voting system. When the voter signs on to the internet voting system from an infected computer and clicks on Candidate A, the malware would silently submit a vote for candidate B. The voter would never know the difference.
9. To be successful in affecting the outcome of the vote, enough eligible voters' computers must be infected with the malware. The malware could either be a self-propagating virus or the attacker could make use of a "Botnet". A "Botnet" is a number of personal computers infected with a type of computer virus that allows a single hacker to take control of all the computers. Large Botnets comprised of hundreds of thousands of computers are known to exist⁴. They are often used for spamming, denial-of-service attacks, and fraudulent activity. The operator of a Botnet could easily install the malware of his choosing across the computers.

[2] <http://www.theverge.com/2016/8/29/12692756/voter-registration-hack-arizona-illinois-election-security>

[3] <https://en.wikipedia.org/wiki/Stuxnet>

[4] <https://en.wikipedia.org/wiki/Botnet>



10. No matter how advanced the internet voting system’s security may be, the computers on which the voting occurs are not secure. This type of attack is very difficult to detect let alone stop, unless personalized voting codes are used which undermine the convenience and accessibility that internet voting promises.

Zero-Day Vulnerabilities

11. Leading internet voting systems follow best practices in internet security and are generally protected against known hacking techniques. The true danger is from unknown hacking techniques, known as “zero-day”. Cybercriminals and intelligence agencies discover, collect and exploit zero-day vulnerabilities, which could be used to gain access to servers or decrypt encrypted data⁵. For example, the Stuxnet worm mentioned above made use of several zero-day vulnerabilities to effectively attack its target.

12. It is extremely difficult for any online service to protect itself against unknown vulnerabilities, and no server on the internet is truly 100% secure. When a zero-day vulnerability is exploited it risks becoming known to the security community and therefore becoming less potent. Actors would not “waste” a zero-day hack on a low-value target. Yet a federal election is undoubtedly a high value target.

Conclusion

13. Despite the fact that Simply Voting is a major Canadian internet voting vendor, its recommendation is **against the use of internet voting for federal elections**. The heightened threat level of a federal election pushes the security of internet voting past its limits and poses too much of a risk.

14. However, it should be noted that plebiscites, territory elections, municipal elections and First Nations elections are all **excellent applications for internet voting** where existing security measures are extremely high compared to the level of threat. If this committee were to conclude that internet voting is not safe enough for federal elections, it would be important to qualify that recommendation and not characterize the technology as flawed or unusable in general.

[5] [https://en.wikipedia.org/wiki/Zero-day_\(computing\)](https://en.wikipedia.org/wiki/Zero-day_(computing))

