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Zoe Dzineku
Beverly Athens
James A. Pope
Mark Paton
Commissioners

Board of Election Commissioners Meeting
Wednesday August 11, 2021
Zoom Meeting - Recorded
5:30 PM

1. **Roll Call and Attendance**
   Start Time 5:52

   Meeting called to order by Chairwoman Dzineku. Three Commissioners present: Chairwoman Dzineku, Vice-Chair Pope and Commissioner Paton. Commissioner Anthes was unable to attend.

2. **Old Business**

   Motion by Vice-Chair James Pope, seconded by Chairwoman Dzineku to accept the minutes of the July 12, 2021 and July 27, 2021 meetings. Motion passes (3 yea, 1 absent). (Note: approval of minutes approved at end of meeting.)

3. **New Business**

   a. Presentation by Election Commission's Expert Professor Charles Stewart on analysis and recommendations for administration of 2021 municipal elections, including possible sub districting, options for polling locations by district, and recommendations for in person early voting.

      Professor Stewart presented his report and findings to the Election Commission. Professor Stewart first discussed his analysis and recommendations regarding in-person early voting. Professor Stewart stated that, under state law, municipalities are required to designate one central polling location. Professor Stewart recommended that the City designate one central polling location, such as the Lowell Senior Center, that should be open for voters for the ten-day period permitted under the approved legislation. Professor Stewart recommended that the hours for early voting should be the same as in the 2020 state elections. Professor Stewart also recommended that, in addition to the central early-voting polling location, that the City hold satellite early voting polling locations throughout the City during the evenings like the City conducted in 2016. Professor Stewart recommended that there be eight days of satellite in-person early voting, with each district hosting one evening of early voting at a polling location within the district. For the preliminary, Professor Stewart noted that only four districts will have a preliminary. As a result, two days of satellite early in-person early voting could be offered for each district.

      Professor Stewart presented his analysis and recommendations regarding polling locations for the 2021 municipal elections. Professor Stewart based his analysis on four major criteria: access and distance to polling places, clarity to voters, simplicity of administration of the election, and the capacity of facilities. Professor Stewart analysis also took into account the number of poll pads the

City would have to administer the election. Professor Stewart recommended that a polling location have two poll pads per polling location to process voters with two to three in reserve in the event of an issue on Election Day. Professor Stewart, referring to the City's District map, reviewed each of the districts, the polling locations the Election Commission cited in the prior meeting, and the proximity of voters to the locations.

Professor Stewart stated that his analysis noted that having two polling locations in each district did not necessarily improve voter access. Professor Stewart noted as an example District 5. Professor Stewart noted that the proposed second location, the Lowell Housing Authority facility, more voters actually live closer to the Butler School than the center. Thus, designated it as a second polling location would promote confusion and increase the distance voters would travel, contrary to the usual goals of adding polling locations. Professor Stewart presented his recommendations regarding polling day locations in his report.

MOTION by Vice-Chairman Pope to accept Professor Stewart's Report, seconded by Commissioner Paton. Motion passes (3 yea, 1 absent).

- A copy of Professor Stewart's Report is included with these meeting minutes. -

b. Discussion on polling locations for City's eight municipal districts for 2021 municipal elections; a vote may be taken to establish polling locations and/or to establish subdistricts.

Chairwoman Dzineku stated that she had hoped that polling locations could have been set up so voters could go to vote where they have voted in the previous election. Commissioner Paton inquired if more polling locations were added there would not be enough poll pads based on Professor Stewart's recommendations. Mr. Veloso stated that was correct. Chairwoman Dzineku inquired if more could be purchased with the grant the City obtained. Mr. Veloso stated that the poll pads were purchased with a grant he obtained from the Center for Technology and Civic Life, and that the number of poll pads purchased was based on the recommendation of the vendor, LHS Associates. Mr. Veloso stated that the grant had now expired. Mr. Veloso noted that LHS may have older generation poll pads available for lease, but that the technology may not be the same as the ones the City bought. Mr. Veloso also noted that the City obtained the Grant through an application he submitted to CTCL.

Chairwoman Dzineku asked Professor Stewart whether the polling locations he recommended would be sufficient to ensure a fair and successful election. Professor answered that the polling locations he recommended would ensure a fair and successful election. Professor Stewart emphasized that the City should also engage in an educational campaign to the public educating them on their polling locations. Professor Stewart also emphasized the value of early in-person voting and vote by mail voting which would greatly help with voter participation. All these factors would ensure a fair and successful election.

MOTION by Commissioner Pope, Seconded by Chairwoman Dzineku to designate the following polling locations for the City of Lowell's Preliminary Election, as set forth in Professor Stewart's Report on Page 11. The Election Commission would choose Scenario A for polling locations in District 4:

District 1: Pawtucketville Memorial Elementary School Gym and McAvinnue School

District 2: Robinson School
District 3: Reilly School
District 4: Lowell High School and Rogers School Gymnasium
District 5: Butler Middle School
District 6: Morey School
District 7: Senior Center
District 8: James Daley School and LDS or Charter School.

Motion passes (3 yea, 1 absent).

c. Discussion on early in-person voting hours and location (s) for 2021 preliminary election; a vote may be taken to establish such hours and locations.

The commissioners were informed that state law requires that there be a central location designated for early in-person voting. The Lowell Senior Center was used in the 2020 election. Professor Stuart informed the commissioners that he recommends that the city uses the full ten days prior to the municipal elections and that the hours be the same as used in last year's elections. Weekdays would have the same hours as City Hall operations, and weekends would be from 9-3. Professor Stewart also recommended that a satellite in-person early voting, with each district hosting evenings of early voting at another polling location within the district. The commissioner's agreed with Professor Stewart's recommendations.

MOTION by Vice-Chair Pope seconded by Commissioner Paton to designate the Lowell Senior Center as the central location for early in-person voting for the 2021 municipal election for the following days and times:

<u>September 21, 2021 Municipal Preliminary</u>

Wednesday, September 8, 2021: 8:00 AM – 5:00 PM
Thursday, September 9, 2021: 8:00 AM – 5:00 PM
Friday, September 10, 2021: 8:00 AM – 12:00 PM (noon)
Saturday, September 11, 2021: 9:00 AM – 3:00 PM
Sunday, September 12, 2021: 9:00 AM – 3:00 PM
Monday, September 13, 2021: 8:00 AM – 5:00 PM
Tuesday, September 14, 2021: 8:00 AM – 8:00 PM
Wednesday, September 15, 2021: 8:00 AM – 5:00 PM
Thursday, September 16, 2021: 8:00 AM – 5:00 PM
Friday, September 17, 2021: 8:00 AM – 12:00 PM (noon)

<u>November 2, 2021 Municipal Election</u>

Wednesday, October 20, 2021: 8:00 AM – 5:00 PM
Thursday, October 21, 2021: 8:00 AM – 5:00 PM
Friday, October 22, 2021: 8:00 AM – 12:00 PM (noon)
Saturday, October 23, 2021: 9:00 AM – 3:00 PM
Sunday, October 24, 2021: 9:00 AM – 3:00 PM
Monday, October 25, 2021: 8:00 AM – 5:00 PM
Tuesday, October 26, 2021: 8:00 AM – 8:00 PM
Wednesday, October 27, 2021: 8:00 AM – 5:00 PM
Thursday, October 28, 2021: 8:00 AM – 5:00 PM
Friday, October 29, 2021: 8:00 AM – 12:00 PM (noon)

Motion passes (3 yea, 1 absent).

Mr. Veloso informed the commissioners that he will work on identifying satellite in-person early voting polling locations for the preliminary and municipal elections for the next meeting.

4. **Adjournment**

MOTION by Chairwoman Dzineku, Seconded by Vice-Chairman Pope to adjourn. Motion passes (3 yea, 1 absent).

Meeting ended at 7:29 PM.

Report to Lowell Election and Census Commission
On Creating Subdistricts and Early Voting for the 2021 Municipal Election

Charles Stewart III
August 9, 2021

Following up on the meeting of the Lowell Election and Census Commission on August 3, 2021, I have been asked to write a report addressing three questions pertaining to potentially subdividing the eight city council districts and to suggest a plan for early voting for both the preliminary and general elections.

My recommendation can be summarized as follows:

1. **Election Day voting.** I propose that in the municipal election, the City employ 11 polling places, as follows.
   District 1: Pawtucketville Memorial and McAvinnue
   District 2: Robinson
   District 3: Reilly
   District 4: Lowell High School and *either* Rogers *or* Greenhalge
   District 5: Butler
   District 6: Morey
   District 7: Senior Center
   District 8: Daley and LDS or Charter School
   In addition, for the preliminary election, I propose that the City employ the same sites in Districts 2, 3, 4, and 7, with the same number of Poll Pads as will be used for the municipal election.

2. **Early voting.** I propose that Lowell conduct a "rotating" early voting program like the one used in the 2016 presidential election. For each business day of the 10-day early voting period, the City should offer early voting at a central location during regular business hours, presumably at the Senior Center. In addition, for an eight-day period, the City should sponsor additional early voting opportunities in each city council district for the municipal election. For the preliminary election, the City may wish to hold two early voting sessions in each of the districts that will have an election. In the geographically larger districts with only one polling place recommended (Districts 2, 3, and 5) I would recommend choosing a location away from that polling place, such as the alternative polling place that was not chosen. For the districts with two polling places (Districts 1, 4, and 8) or that are compact (Districts 6 and 7), a location in the center of the district—possibly the recommended polling place itself—would be preferable.

The remainder of this report provides a justification for these recommendations.

Subdividing the eight districts

I was asked to address three specific questions related to subdividing the eight districts to administer the election:

1. Of the eight city council districts, which districts do I recommend splitting and what would be the basis for the split?
2. In the specific case of District 4, do I recommend splitting it into three sub-districts?
3. In the specific case of District 8, does it make sense of have another "new" site? Relatedly, would it be helpful to have both the Bailey and Daley Schools as sites.

Although the preliminary election will involve contests only in city council Districts 2, 3, 4, and 7, I address all eight districts, understanding that the Commission may want to prioritize making plans for these four districts first. However, it needs to be understood that decisions made for the preliminary election effectively lock into place decisions for the municipal election. It would be ill-advised to change or close a polling place used for the preliminary in the municipal election.

The constraint of Poll Pads

Before proceeding, there is one important constraint that may bind in deciding whether and how to divide districts: the number of Poll Pads. *I understand that the City has arranged to have 36 Poll Pads available for the municipal election.* If that is the case, and the City arranges to rent no additional Poll Pads, then that acts as a hard constraint against which we must plan. The remainder of this report assumes the number of Poll Pads is fixed. If the City can arrange for the use of additional Poll Pads, then of course the constraint would no longer be binding. However, whether additional Poll Pads can be rented, a minimum of two should be deployed at each polling location.

The number of Poll Pads in a polling place must be allocated based on a "standard of service." A standard of service is how long of a wait is considered tolerable on Election Day. Holding all else constant, the more Poll Pads allocated to a polling place, the shorter the wait, and vice versa. It must also be emphasized that wait times are very "non-linear." That is, small changes in the number of Poll Pads or the arrival rates of voters can have dramatic effects on how long voters wait, or maybe none at all. This non-linearity can lead to the phenomenon called the "elbow of death" when planning for the number of check-in stations or voting machines in a polling place of a fixed six. It is possible to get in a situation where even a small increase in the number of voters or small decrease in equipment can transition the polling place from running smoothly to hopelessly backlogged.

To make the correct allocation decisions, we can use software tools that estimate likely wait times in terms of (1) the number of voters and (2) how long it takes to check in a voter. Because this is the first time Lowell has run a municipal election with districts and because there is uncertainty about how many voters will vote early (in person or by mail), it would be prudent to make allocation decisions conservatively. Research shows that the most potent election-administration factor that undermines voter confidence in elections is waiting a long time to vote.

If travel times and distances can be kept to reasonable levels, I would recommend prioritizing keeping wait times down over additional reductions in travel distances.

Four factors to consider in subdividing districts

There are four major issues of concern in subdividing the districts, which to some degree contradict each other. They are:

1. **Access and distance to polling places.** Scientific research has demonstrated that moving polling places away from voters has a small but measurable effect on the likelihood of voters turning out to vote. Access is a related consideration, as voters do not fly point-to-point from their homes to polling places. Travel paths need to be considered, as do obstructions. In the case of Lowell, two major obstructions are the Merrimack River and the closure of the Central Street bridge to southbound traffic.
2. **Clarity to voters.** Voters must know with certainty where they are assigned to vote. Because voters are creatures of habit, there is a premium on minimizing the closure or movement of polling places. Voters who voted in the most recent presidential election will often assume that subsequent elections will use the same polling places, especially those who are infrequent voters. For new voters, or voters who do not remember where they last voted, reaching out to voters proactively with clear instructions is critical. Finally, voters are increasingly relying on the Internet to find where to vote. Online polling place locator tools that are maintained by the City and the state must be accurate.
3. **Simplicity of administration.** Poll workers must be able to tell if a voter has shown up at the correct location and is given the correct ballot. Poll workers must also be able to clearly direct voters who show up at the wrong location where they should go. Furthermore, simplicity for the election department staff must be kept in mind. The more options that must be accounted for in preparing for the election, the more likely a mistake will be made; alternatively, the more effort that must go into double-checking preparations for the election take away from other tasks that must be accomplished. In short, there is a premium on keeping to past practices and keeping the number of options to a minimum.
4. **Capacity of facilities.** The facilities must be able to handle the flow of voters so that the voting is orderly and voters do not wait too long. The benchmark that no voter should have to wait longer than 30 minutes to vote, which was articulated in the 2014 report of the Presidential Commission on Election Administration, has been widely accepted for federal elections. However, in low-turnout elections, such as municipal elections, waits of longer than 10 minutes are likely to be considered unacceptable. Finally, in the context of COVID, a priority is placed on the size and physical layout of facilities, to allow for physical distancing, air flow, and traffic flow. (The need to limit time indoors with others because of COVID also is a factor in keeping wait times to a minimum.)

I will assess the options in light of these four considerations. But first, I characterize the situation that faced Lowell voters in the 2020 presidential election.

The 2020 presidential election as a benchmark

The 2020 presidential election can serve as a benchmark. It is the highest turnout election in Lowell's history; with only a couple of exceptions, all the locations being considered for Election Day voting were used in the 2020 presidential election. In Appendix A, I have reported some summary statistics for each polling place used in that election. Most pertinent for our purposes are the following statistics:

- Except for the Immaculate Conception Church, all polling places accommodated either two or three precincts. The average was 2.5
- The average distance between registered voters and their assigned polling location was 0.50 miles. (All distances are calculated based on straight lines.) The distance exceeded three-quarters of a mile in only two cases, Bailey (1.19 miles) and Pawtucketville Memorial (0.86 miles). In six cases it was approximately a third of a mile.
- The average number of registered voters was 4,587, ranging from 1,792 at Immaculate Conception to 6,273 at Daley.

One polling location per district

I next calculate the same set of statistics assuming one polling location for each district in the municipal election. The results are presented in Appendix B. Here are the statistics that correspond to the 2020 presidential election benchmark:

- Most polling places accommodated either 5 or 6 precincts, with Morey having 7 and Lowell High School 9. The average is 6.3, up from 2.5 in the presidential election. The polling places vary considerably in the mix of whole precincts and those that would have to be subdivided.
- The average distance between registered voters and their assigned polling location is 0.59 miles, up from 0.50 miles. The district with the maximum distance is District 1 (Pawtucketville Memorial) at 0.83 miles. Overall, 56.3% of voters would vote at the same location as the presidential election, 30.2% would vote at a location further away, and 13.5% would vote at a closer location.
- The average number of registered voters per location is 8,028, up from 4,587 in the presidential election. This number ranges from 6,623 in District 3 (Reilly) to 8,817 in District 5 (Butler.

Estimated wait times with one location per district with one polling location

To keep wait times to a minimum, we need to calculate how many Poll Pads will be needed to handle the anticipated traffic. Estimates of wait times can be calculated using established methods that have been in widespread use for over half a century in the private sector.[1] To use

[1] I discuss the use of queuing models to help estimate and manage wait times in polling places in the report, "Managing Polling Place Resources," http://web.mit.edu/vtp/Managing%20Polling%20Place%20Resources.pdf. The report was updated for the pandemic in the report, "What Queuing Theory Says about Managing Polling Places

these methods, we need to specify (1) how many voters are likely to appear at the polling places on Election Day and (2) how long it takes to check in a voter. With these parameters specified, we can calculate the number of Poll Pads needed to be deployed in each polling place to keep wait times within acceptable limits.

I used the Caltech/MIT Voting Technology polling place resource allocation tool to estimate what wait times would be if we were to assign enough Poll Pads to each single polling place in each district to keep maximum wait times less than 10 minutes. To use the tool, we need to plug in (1) the average number of voters per hour and (2) the average time it takes to check in voters. Here is how I arrived at my estimate of these quantities.

1. **Voters per hour.** This calculation requires four steps. The first three are (1) estimate total turnout for each district, (2) estimate the fraction of voters in a district who will vote early, either in person or by mail, and (3) divide the result by 13, the number of hours the polls are open. The fourth step involves specifying a surge factor, to account for the busiest times of day that can result in a backlog of voters that cannot be resolved.
    a. *Estimate total turnout.* I have assumed that 25% of registered voters in each district will vote. This is a conservative (i.e., high) estimate, intended to work in a margin of error. In the 2017 municipal election, 13,981 of Lowell's 65,683 registered voters cast a ballot, for a 21.3% turnout rate. Turnout for the preliminary was much less, 5,598 voters, for a 9.5% turnout rate. Because decisions about the number of polling places must be consistent for both the preliminary and municipal election, I use the higher turnout rate for the municipal election.
    b. *Estimate how many voters will vote early.* Lowell has never had early voting for a municipal election, so there is no directly comparable experience to go on here. Just over half of Lowell's voters cast ballots early in the 2020 presidential election, while approximately a quarter did so in the 2016 presidential election. It is unlikely that early voting will be as high in the preliminary or municipal election as it was in the 2020 presidential election, although it will likely be greater than in the 2016 election. Therefore, I chose the half-way point and assumed 32.5% will vote early in the municipal election.
    c. *Specify a surge factor.* The queuing models employed in this exercise assume that the arrival rates of voters are, on average, equal across the day. It is well established that there are spikes at times, most often at the opening of polls, when a queue of voters has formed before opening. This pre-opening queue must be processed before anyone who arrived after polls opened can vote. If the opening surge is not accounted for, estimates using these tools will be unreasonably optimistic, producing potentially disastrous results. Based on research I have conducted in many settings, I have found that, on average, arrivals in the first hour of voting (including the queue that has formed before the doors open) amount to 175% of the average hourly arrival rate for the whole day. Therefore, when I calculate the average hourly arrival rate at each polling place, I will perform the modeling exercise using an amount that is 175% the hourly average.

Amid COVID-19," http://electionlab.mit.edu/sites/default/files/2020-08/WhatQueueingMeansPollingPlacesCOVID19.pdf.

2. *Check-in time.* Based on observations of elections in Massachusetts and many other states, I assume it takes 1 minutes to check in each voter.

Finally, in performing these calculations, I must specify a service standard, which comes in two parts. The first is the acceptable upper limit of a wait time. The second is the acceptable percentage of voters who exceed this upper limit. I recommend the City adopt a 10-minute wait time limit. I set the acceptable percentage of voters who exceed this limit at 5%, which is the limit I regularly set when consulting with state and local election officials.

I report my calculations in Appendix C. The analysis reveals that for all but two of the districts, 2 (Robinson) and 3 (Reilly), 4 Poll Pads would be necessary to maintain a ten-minute service standard. The overall estimate suggests that one polling place per district would require 30 Poll Pads total, which is well within the City's supply.

Two polling locations per district

I estimated the effects of dividing each district in two, along the lines discussed at the most recent Election Commission meeting. The exceptions were Districts 5 and 6, which remain with one polling location. For purposes of this exercise, I used the LHA site on Chelmsford Avenue as the second site in District 4 and the LDS Church on Princeton Boulevard as the second site for District 7. I report the detailed results of distances to the polling places in Appendix D. To summarize:

- The polling places end up accommodating a highly variable number of precincts, ranging from 2 at Pawtucketville Memorial (District 1), Robinson (District 2), Reilly (District 3), and Daley (District 8) to 7 at Morey. The average is 3.6. The polling places vary considerably in the mix of whole precincts and those that would have to be subdivided.
- The average distance between registered voters and their assigned polling location is 0.49 miles, down only somewhat when each district had a single polling place. If we consider each district separately, District 1 remains the district with the longest average distances, at 0.63 miles, down from 0.83 with just one polling place. The district with the shortest distances is District 4, at a third of a mile, down from just over half a mile. Overall, two-thirds of voters would vote at the same location compared to having only one polling place per district, one-quarter would be at a polling place that is closer, and a small number would be further away.
- The average number of registered voters at each polling place is 4,587, ranging from 1,539 for Greenhalge's District 4 location (Greenhalge would have a total of 5,705 across its two locations) to 6,977 at the Senior Center (District 7).

Estimated wait times with two polling locations per district

The analysis is detailed in Appendix E. Note that I have planned for no fewer than two Poll Pads per polling location, to provide redundancy within the location should one be temporarily un-operational or (more likely) a voter with a check-in problem takes much longer to process. Thus,

I have added an additional Poll Pad for each polling place that has a recommendation of only 1 based simply on the number of arrivals.

In summary, increasing the number of polling places reduces the number of voters in any given location, which reduces the need for Poll Pads in almost every location. The exception is Districts 6 and 7, which continue to have one polling location, and therefore the same Poll Pad requirements. However, note that the total number of Poll Pads that are needed goes up overall. One location per district requires a total of 30 Poll Pads in the field. With two locations per district, the City would need a total of 35 in the field.

Adding a third polling place in Districts 3 and 4.

It has been suggested that a third polling place could be added in District 4, to allow for the construction on the Central Street bridge, and District 3, to accommodate voters in the southwest part of the district who are further away from the two proposed places in the district, which are in its northern half. Appendix F contains the same tables as before that summarize distances and numbers of voters, focusing on Districts 3 and 4.

Adding the Pyne School to District 3 and assigning voters from Precinct 11-3 to vote there would benefit 88% of those voters, from the perspective of proximity.[2] Immaculate Conception would drop from 3,888 registered voters to 1,937 and Pyne would pick up 1,951.

Adding the Rogers School gymnasium to District 4 and assigning voters from 4-3, 10-2, and 10-3 to vote there would benefit almost all the affected voters in those precincts. The result would be to drop the number of registered voters at the high school from 6,555 to 3,831; Rogers would take 2,600 voters.

Estimated wait times with additional polling locations in Districts 3 and 4

The Poll Pad allocation analysis with third polling places added to Districts 3 and 4 is detailed in Appendix G. The addition of a third polling place to Districts 3 and 4 would require 37 Poll Pads, which is more than the City currently has to deploy. The City would have to accept either a 20- or 30-minute standard in order to justify the addition of third polling places to both of these districts, which I would recommend against, or obtain more Poll Pads.

Closer analysis indicates that adding a third polling place is expensive in terms of Poll Pad allocation, especially adding the Pyne School for District 3. With only two polling places in District 3, Immaculate Conception needs 2 Poll Pads to handle the 656 voters who are estimated to vote during the day. Adding Pyne shifts 329 anticipated voters over to Pyne, leaving 327 estimated to vote at Immaculate Conception. However, Immaculate Conception would still need 2 Poll Pads to handle these voters. Pyne would also need 2 Poll Pads. Thus, adding Pyne doubles the number of Poll Pads needed to serve the same number of voters.

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[2] Most voters in Ward 1, Precinct 3 live closer either to Immaculate Conception or Riley, and so that precinct would not be a candidate to assign to Pyne.

In District 4, the addition of Rogers would shift an estimated 439 voters from the high school. If these voters had remained at the high school, it would have needed 3 Poll Pads to handle them. By adding Rogers, the high school can comfortably be reduced to 2 Poll Pads. However, Rogers needs 2 Poll Pads not 1. Thus, adding Rogers increases the number of Poll Pads needed to serve the same number of voters by one.

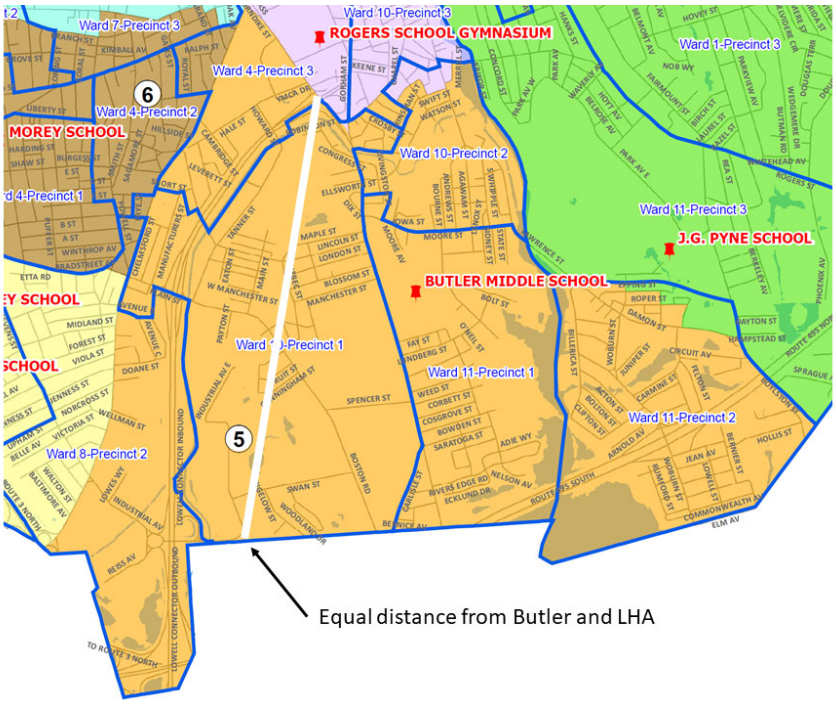
Summary

Returning to the four criteria I introduced above, here is a summary of the analysis related to these criteria.

Access. Distance from a voter to a polling place is the best metric to use in assessing access. From the perspective of distance traveled, Districts 1 and 8 would each clearly benefit from an additional polling place. District 4 would also benefit, but the district is already very compact; even leaving District 4 with only one polling place, voters in the district would travel a distance that is close to the citywide average. Adding polling places in Districts 2, 3, 5, 6, and 7 would decrease average distances by very small amounts.

Adding a second polling place to most districts would decrease average distances by very small amounts because the City is constrained in allocating voters to polling places based on the current precincts they live in. When a polling place is added, some voters who are assigned to the second polling place will end up going to a polling place that is further away, thus limiting the distance gains from adding a second polling place.

District 5 provides the best example of this. In the accompanying figure, I have drawn a white line that indicates the boundary between voters who are closer to the LHA facility and those who are closer to Butler. It is likely that if the LHA facility were chosen as a second polling location, voters in 10-1 would be assigned to vote there. However, voters in 10-1 who live to the right of the white line live closer to Butler. Two-thirds of the residents of 10-1 live to the right of the line, that is, closer to Butler. (It should also be noted that precinct 10-1 was assigned to vote at Butler in the presidential election.)



District 4 has two access issues that are less related to distance and more related to travel barriers. The first is the Merrimack River, which bisects the district and requires voters from the two precincts in Ward 5 to access Lowell High School by one of two bridges. The second issue is construction on the Central Street bridge which has closed the south-bound lane and resulted in a significant detour around it. The barrier imposed by the Merrimack River would argue in favor in adding a location at the Greenhalge School. The bridge closing would argue for an additional location in the south of the district, at Rogers. However, the compactness of the district calls into question the advisability of placing three polling places in District 4. In other words, although there are barriers imposed by the bridge construction and the Merrimack River, the detours needed to access the high school add relatively short distances compared to the distances that voters in other districts need to travel in less densely populated parts of the City.

Based on distance issues, I would recommend adding the McAvinnue School as a second location in District 1 and a second location in District 8 if the LDS church or the charter school can be used as polling locations. Adding a second location in District 8 at the Bailey School would do little to alleviate distance concerns in District 8 if neither the LDS church or the charter school were available. Indeed, doing so could exacerbate travel distance issues if Ward 8, Precinct 3 voters are assigned to Bailey, since most voters in that precinct live closer to Daley than to Bailey. (This is an example of the problem I discussed with District 5 as an illustration.) I would further recommend adding a second location in District 4, either at Greenhalge or Rogers, but not both.

Clarity to voters. The measure to help focus on the issue of clarity is the percentage of voters who are assigned to the same polling location as they were for the presidential election. With a single polling place, just over half of voters (56.0%) would vote in the same place. The range across districts is 47.9% for District 4 to 67.7% for District 8. Adding a second polling place

would raise the citywide rate to 68.3%, but it would create large disparities across districts. All voters in District 2 and 98% of voters in District 1 would be assigned to their previous polling location. On the other hand, the percentage assigned to their previous polling place in District 5 would plummet to 26.8%. The reason for this result in District 5 is that half the voters who would likely be assigned to vote at the LHA facility, in 10-1, voted previously at Butler.

Therefore, there are no silver bullets that would allow many more voters to be assigned to where they previously voted, given how the districts and precincts overlap each other. Because we are constrained to assign whole blocs of voters to polling places based on the precincts they live in, there are no strong arguments in favor of adding polling places to reduce likely confusion to voters; there is a strong argument for not adding the LHA facility, for that very reason.

Simplicity of administration. The minimum number of polling places would be the easiest for the City to administer. A single polling place in each district would conserve Poll Pads, make the assignment of voters to polling places easier, make it easier to accurately ensure that voters have been assigned to the proper polling place and given the correct information, reduce the number of poll workers who need to be trained and deployed, etc.

On the other hand, the elections department has trained large numbers of poll workers in the past and organized more polling places than have been considered in this report. The leadership of the election department undoubtedly has detailed information about management of his office that I don't have which would inform the question of how many polling places could be effectively managed in light of all the other tasks his office must undertake to conduct the election. Taking the view from 30,000 feet, the number of polling places discussed in this report, including placing two polling places in most districts, would not tax the department more than it is been taxed before.

At the same time, as more polling places are deployed, there are more combinations of districts-plus-precincts that must be double-checked on the poll lists to ensure that voters are informed of their polling place and that the Poll Pads and paper lists are properly prepared. These details must be done perfectly. The commission should remember that increasing the number of polling places is not administratively costless.

Capacity of facilities. All the information conveyed to me by the election staff and the commission indicates that the facilities that have been discussed are sufficient to hold safe and secure elections. The main capacity issue is that of Poll Pads. With 36 available and the need to hold 3 or 4 in reserve, any plan that is implemented cannot require more than 32 or 33 Poll Pads, given current plans. Knowing that voters will base their judgments of the success of Election Day on whether they experience delays, it is important that the City adopt a service standard that voters not wait longer than 10 minutes to vote. This recommendation creates a binding constraint on the number of polling places that can be chosen. If the Commission decides to offer Election Day voting at more polling places than are laid out in this plan, it should only do so conditional on having enough Poll Pads to staff the polling places sufficiently.

Final conclusion about Election Day locations

Based on all these considerations, my recommendation is that the City employ 11 polling places for the municipal election and that the polling places designated for Districts 2, 3, 4, and 7 be used for the preliminary. I further recommend that the full complement of Poll Pads be deployed to the polling places used in the preliminary, even though turnout levels are likely to be lower than for the municipal election, to give the workers and City experience in working with these configurations.

Dist.	Location	Precincts
1	Pawtucketville Memorial	6-2, 6-3
1	McAvinnue	5-1*, 5-2*, 5-3*, 6-1, 7-1*
2	**Robinson**	**5-2*, 5-3*, 9-1, 9-2, 9-3**
3	**Reilly**	**1-1, 1-2, 1-3, 11-2*, 11-3**
4	**Lowell High**	**See below**
4	**Rogers *or* Greenhalge**	
5	Butler	4-3*, 8-2*, 10-1*, 10-2*, 11-1, 11-2* 11-3*
6	Morey	3-2*, 3-3*, 4-1, 4-2, 4-3*, 7-3*, 8-2*, 8-3*, 10-1*
7	**Senior Center**	**2-1*, 2-2*, 2-3*, 3-2*, 7-1*, 7-2, 7-3***
8	Daley	8-2*, 8-3*
8	LDS or Charter School	3-1, 3-2*, 3-3*, 8-1
		*Indicates precincts split between districts
		Bold indicates district with preliminary elections

Assignment of Precincts Depending on whether Rogers or Greenhalge Is Chosen as the Second Location in District 4	
Scenario A: Rogers is the second location	
Location	Precinct
Lowell High	2-1, 2-2, 2-3*, 5-1*, 5-2*, 5-3*
Rogers	4-3*, 10-2*, 10-3*
Scenario B: Greenhalge is the second location	
Location	Precinct
Lowell High	2-1, 2-2, 2-3*, 4-3*, 10-2*, 10-3*
Greenhalge	5-1*, 5-2*, 5-3*

Recommendations for Early voting

Early in-person voting provides an opportunity for the City to "bring the election to the voters" and to take pressure off Election Day itself. Lowell voters have proven eager to vote early in the 2016 and 2020 presidential elections. They are likely to do so in the upcoming municipal election, although likely at lower rates than seen in the presidential election.

State law requires Lowell to have an early voting site that is centrally located in the City. Therefore, I would recommend that the City hold early voting during the allowed ten-day period at City Hall or the Senior Center during weekday business hours of the early voting period.

Lowell has also held "rotating" early voting sessions, moving early voting through the City, into the neighborhoods, daily during the early voting period. This is a successful model that could be emulated for the municipal election. To reinforce the new system of electing city councilors, I recommend distributing early voting evenly among the city council districts. With eight districts and ten days of early voting, this suggests that early voting would not be held on two of those days during the ten-day period.

Furthermore, because of concerns that the Election Day polling places will be further away from some Lowell voters than they are used to, I would suggest that the locations be chosen to ameliorate these concerns as much as possible. For instance, in the geographically larger districts with only one polling place (Districts 2, 3, and 5), the City should offer early voting at a location away from the chosen polling place in that districts, such as the alternative polling place that was not chosen. For the districts with two polling places (Districts 1, 4, and 8) or that are compact (Districts 6 and 7), a location in the center of the district—possibly the polling place itself—would be preferable.

The preliminary election will feature voting in only four districts. Although turnout will likely be light, I would recommend nonetheless following the municipal election model, by offering early voting at a central location for the entire ten-day period and by offering district-focused early voting across eight days. To do so, each district would see early voting twice.

Appendix A. Polling Places in the 2020 Presidential Election

Location	Current District	Number of precincts in 2020	Avg. distance (miles)	Registered Voters
BAILEY SCHOOL	8	2	1.19	3,620
BUTLER MIDDLE SCHOOL	5	2	0.45	3,960
GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	2	3	0.38	5,838
IMMACULATE CONCEPTION CHURCH	3	1	0.38	1,792
J.G. PYNE SCHOOL	3	2	0.57	4,006
JAMES DALEY SCHOOL	8	3	0.61	6,273
LOWELL HIGH SCHOOL CAFETERIA	4	3	0.31	5,935
MCAVINNNUE SCHOOL	1	2	0.37	4,116
MOREY SCHOOL	6	3	0.31	5,233
PAWTUCKETVILLE MEMORIAL ELEMENTARY SCHOOL GYMNASIUM	1	2	0.86	4,569
REILLY SCHOOL	3	2	0.48	4,917
ROBINSON SCHOOL	2	2	0.49	4,321
ROGERS SCHOOL GYMNASIUM	4	3	0.37	4,777
SENIOR CENTER	7	3	0.41	4,865
TOTAL		33	0.50	64,222
	Average	2.5		4,587

Appendix B. Statistics of Polling Places in the Municipal Election with Only One Polling Place Per District

		Number of Precincts in 2021				Change in Distance Compared to 2020 Polling Place			Registered Voters
Location	Dist.	Whole	Split	Total	Avg. distance (miles)	Closer	No change	Further	Total
PAWTUCKETVILLE MEMORIAL ELEMENTARY SCHOOL GYMNASIUM	1	3	3	6	0.83	9.5%	52.3%	38.3%	8,817
ROBINSON SCHOOL*	2	3	2	5	0.46	9.2%	51.0%	39.8%	8,487
REILLY SCHOOL	3	4	1	5	0.69	4.9%	55.9%	39.2%	8,805
LOWELL HIGH SCHOOL CAFETERIA	4	2	7	9	0.56	0.1%	49.0%	50.9%	7,994
BUTLER MIDDLE SCHOOL	5	2	4	6	0.61	10.5%	49.5%	40.1%	8,048
MOREY SCHOOL	6	2	5	7	0.35	21.1%	68.6%	10.3%	6,624
SENIOR CENTER	7	2	4	6	0.40	33.5%	59.1%	7.4%	6,977
JAMES DALEY SCHOOL	8	3	3	6	0.71	24.1%	67.7%	8.2%	8,464
TOTAL	Avg.	2.8	2.6	6.3	0.59	13.5%	56.3%	30.2%	64,224
								Avg.	8,028

*Results are virtually identical if the Greenhalge School is chosen

Appendix C. Required Allocation of Poll Pads to Polling Places Assuming One Polling Place Per District

Dist.	Location	Registered voters	Estimated turnout	Hourly average	With surge factor	Poll Pads Required
1	PAWTUCKETVILLE MEMORIAL ELEMENTARY SCHOOL GYMNASIUM	8,817	1,487.9	114.5	200.3	4
2	ROBINSON SCHOOL	8,487	1,432.2	110.2	192.8	4
3	REILLY SCHOOL	8,805	1,485.8	114.3	200.0	4
4	LOWELL HIGH SCHOOL CAFETERIA	7,997	1,349.5	103.8	181.7	4
5	BUTLER MIDDLE SCHOOL	8,048	1,358.1	104.5	182.8	4
6	MOREY SCHOOL	6,623	1,117.6	86.0	150.5	3
7	SENIOR CENTER	6,980	1,177.9	90.6	158.6	3
8	JAMES DALEY SCHOOL	8,464	1,428.3	109.9	192.3	4
					Total	30

Appendix D. Statistics of Polling Places in the Municipal Election with Two Polling Places Per District

		Number of Precincts				Distance Compared to One Polling Place			
Location	Dist.	Whole	Split	Total	Avg. distance (miles)	Closer	No change	Further	Registered Voters
MCAVINNNUE SCHOOL	1	1	3	4	0.38	79.2%	1.1%	19.7%	4,248
PAWTUCKETVILLE MEMORIAL ELEMENTARY SCHOOL GYMNASIUM	1	2	0	2	0.86	0.0%	100.0%	0.0%	4,569
District 1	**1**	**3**	**3**	**6**	**0.63**	**38.2%**	**52.3%**	**9.5%**	**8,817**
GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	2	1	2	3	0.28	80.7%	0.5%	18.8%	4,166
ROBINSON SCHOOL	2	2	0	2	0.49	0.0%	100.0%	0.0%	4,321
District 2	**2**	**3**	**2**	**5**	**0.39**	**39.6%**	**51.1%**	**9.2%**	**8,487**
IMMACULATE CONCEPTION CHURCH	3	2	1	3	0.75	69.8%	0.2%	30.0%	3,888
REILLY SCHOOL	3	2	0	2	0.48	0.0%	100.0%	0.0%	4,917
District 3	**3**	**4**	**1**	**5**	**0.60**	**30.8%**	**55.9%**	**13.2%**	**8,805**
GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	4	0	3	3	0.57	99.7%	0.0%	0.3%	1,539
LOWELL HIGH SCHOOL CAFETERIA	4	1	5	6	0.46	0.0%	100.0%	0.0%	6,455
District 4	**4**	**1**	**8**	**9**	**0.48**	**19.2%**	**80.7%**	**0.0%**	**7,994**
BUTLER MIDDLE SCHOOL	5	1	2	3	0.60	0.0%	100.0%	0.0%	5,341
LHA	5	1	2	3	0.55	51.0%	0.3%	48.7%	2,707

		Number of Precincts				Distance Compared to One Polling Place			
Location	Dist.	Whole	Split	Total	Avg. distance (miles)	Closer	No change	Further	Registered Voters
District 5	**5**	**2**	**4**	**6**	**0.58**	**17.1%**	**66.5%**	**16.4%**	**8,048**
MOREY SCHOOL	6	2	5	7	0.35	0.0%	100.0%	0.0%	6,624
District 6	**6**	**2**	**5**	**7**	**0.35**	**0.0%**	**100.0%**	**0.0%**	**6,624**
SENIOR CENTER	7	2	4	6	0.40	0.0%	100.0%	0.0%	6,977
District 7	**7**	**2**	**4**	**6**	**0.40**	**0.0%**	**100.0%**	**0.0%**	**6,977**
JAMES DALEY SCHOOL	8	1	1	2	0.44	0.0%	100.0%	1.0%	3,903
LDS Church	8	2	2	4	0.46	97.4%	0.0%	2.6%	4,561
District 8	**8**	**3**	**3**	**6**	**0.45**	**52.5%**	**46.1%**	**1.4%**	**8,464**
TOTAL	**Average**	**2.5**	**3.8**	**6.3**	**0.49**	**26.2%**	**67.3%**	**7.6%**	**64,222**

Appendix E. Required Allocation of Poll Pads to Polling Places Assuming Two Polling Places Per District

Dist.	Location	Registered voters	Estimated turnout	Hourly average	With surge factor	Poll Pads Required
1	MCAVINNNUE SCHOOL	4,248	716.9	55.1	96.5	2
1	PAWTUCKETVILLE MEMORIAL ELEMENTARY SCHOOL GYMNASIUM	4,569	771.0	59.3	103.8	3
2	GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	4,166	703.0	54.1	94.6	2
2	ROBINSON SCHOOL	4,321	729.2	56.1	98.2	2
3	IMMACULATE CONCEPTION CHURCH	3,888	656.1	50.5	88.3	2
3	REILLY SCHOOL	4,917	829.7	63.8	111.7	3
4	GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	1,539	259.7	20.0	35.0	1
4	LOWELL HIGH SCHOOL CAFETERIA	6,455	1,089.3	83.8	146.6	3
5	BUTLER MIDDLE SCHOOL	5,341	901.3	69.3	121.3	3
5	LHA	2,707	456.8	35.1	61.5	2
6	MOREY SCHOOL	6,624	1,117.8	86.0	150.5	3
7	SENIOR CENTER	6,977	1,177.4	90.6	158.5	3
8	JAMES DALEY SCHOOL	3,903	658.6	50.7	88.7	2
8	LDS Church	4,561	769.7	59.2	103.6	3
					Subtotal	34
					Additional Poll Pads	1
					Total	35

Appendix F. Statistics of Polling Places in the Municipal Election with Two Polling Places Per District Plus a Third Polling Place in Districts 3 and 4

With 2 polling places

		Number of Precincts				Distance Compared to One Polling Place			
Location	Dist.	Whole	Split	Total	Avg. distance (miles)	Closer	No change	Further	Registered Voters
IMMACULATE CONCEPTION CHURCH	3	2	1	3	0.75	69.8%	0.2%	30.0%	3,888
REILLY SCHOOL	3	2	0	2	0.48	0.0%	100.0%	0.0%	4,917
District 3	**3**	**4**	**1**	**5**	**0.60**	**30.8%**	**55.9%**	**13.2%**	**8,805**
GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	4	0	3	3	0.57	99.7%	0.0%	0.3%	1,539
LOWELL HIGH SCHOOL CAFETERIA	4	1	5	6	0.46	0.0%	100.0%	0.0%	6,455
District 4	**4**	**1**	**8**	**9**	**0.48**	**19.2%**	**80.7%**	**0.0%**	**7,994**

With 3 polling places

		Number of Precincts				Distance Compared to One Polling Place			
Location	Dist.	Whole	Split	Total	Avg. distance (miles)	Closer	No change	Further	Registered Voters
IMMACULATE CONCEPTION CHURCH	3	1	1	2	0.48	81.7%	0.0%	18.3%	1,937
J.G. PYNE SCHOOL	3	1	0	1	0.64	88.3%	0.5%	11.2%	1,951
REILLY SCHOOL	3	2	0	2	0.48	0.0%	100.0%	0.0%	4,917
District 3	**3**	**4**	**1**	**5**	**0.52**	**30.8%**	**55.9%**	**13.2%**	**8,805**
GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	4	0	3	3	0.57	99.7%	0.0%	0.3%	1,539
LOWELL HIGH SCHOOL CAFETERIA	4	1	2	3	0.28	0.0%	100.0%	0.0%	3,831
ROGERS SCHOOL	4	0	3	3	0.23	99.7%	0.1%	0.2%	2,624
District 4	**4**	**1**	**8**	**9**	**0.32**	**19.2%**	**80.7%**	**0.0%**	**7,994**

Appendix G. Required Allocation of Poll Pads to Polling Places Assuming Two Polling Places Per District plus a Third Polling Place in Districts 3 and 4

Dist.	Location	Registered voters	Estimated turnout	Hourly average	With surge factor	Poll Pads Required
1	MCAVINNNUE SCHOOL	4,248	716.9	55.1	96.5	2
1	PAWTUCKETVILLE MEMORIAL ELEMENTARY SCHOOL GYMNASIUM	4,569	771.0	59.3	103.8	3
2	GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	4,166	703.0	54.1	94.6	2
2	ROBINSON SCHOOL	4,321	729.2	56.1	98.2	2
3	IMMACULATE CONCEPTION CHURCH	1,937	326.9	25.1	44.0	2
3	J.G. PYNE SCHOOL	1,951	329.2	25.3	44.3	2
3	REILLY SCHOOL	4,917	829.7	63.8	111.7	3
4	GREENHALGE ELEMENTARY SCHOOL GYMNASIUM	1,539	259.7	20.0	35.0	1
4	LOWELL HIGH SCHOOL CAFETERIA	3,831	646.5	49.7	87.0	2
4	ROGERS SCHOOL	2,600	438.8	33.8	59.1	2
5	BUTLER MIDDLE SCHOOL	5,341	901.3	69.3	121.3	3
5	LHA	2,707	456.8	35.1	61.5	2
6	MOREY SCHOOL	6,624	1,117.8	86.0	150.5	3
7	SENIOR CENTER	6,977	1,177.4	90.6	158.5	3
8	JAMES DALEY SCHOOL	3,903	658.6	50.7	88.7	2
8	LDS Church	4,561	769.7	59.2	103.6	3
					Subtotal	37
					Additional Poll Pads	1
					Total	38