

Regional Voting Schemes:
Review and Recommendation

for
Alberta Municipal Affairs

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1 Introduction

Alberta Municipal Affairs has been tasked by the Provincial Government to propose a voting scheme to be used in the Capital Region which consists of 25 municipalities. The population base in this region consists of just over a million people, of which the City of Edmonton has approximately 71% of the population. Traditional voting schemes tend to favor either “vote by population” or “vote by municipality”. Voting by population tends to favor Edmonton, whereas voting by municipality favors the large number of very small municipalities. A fair, simple and easy to understand voting scheme is needed.

The desire for the capital region is for all decisions to be made by consensus, but in cases where decisions have to be put to vote, a voting scheme needs to be in place to allow quick and efficient decision making.

Computronix was approached by Municipal Affairs to examine possible voting schemes and their associated pros and cons, and provide a recommendation of three schemes for consideration. This document reviews this challenge in detail and recommends three options.

1.1 Document Conventions

This document has references to “*Model(s)*” throughout the text that point to the “Municipality Voting Models.xls” spreadsheet. Each worksheet contains one model except for worksheet “4.1 & 4.2 - Double Majorities” which contains the Double Majority models. Each worksheet is labeled according to its model, and is referred to in the section of this document where it is applicable.

Samples of the worksheets are also included in the attached Appendix B.

2 The Challenge

Ultimately, the primary challenge faced by the Capital Region is the fact that one municipality (the City of Edmonton) contains the majority of the population of the region – a majority so great that any simplistic attempt to modify "representation by population" in voting creates enormous distortions. If you vote strictly by population, you have de facto rule by the City of Edmonton, with all other municipalities acting as an advisory council. If you vote strictly by "one municipality, one vote", less than 2.5% of the population can pass a proposal against the wishes of the other 97.5%. Even if you insist on a threshold larger than 50% to pass a proposal, you need to go over 71% with a vote by population before Edmonton requires even one more municipality to support it. For voting by municipality, even a threshold of 24 of 25 allows 30% of the population to pass a proposal opposed by Edmonton, with 70% of the population. However, requiring Edmonton to support any proposal gives Edmonton an effective veto.

This disparity in size will not go away. Even the most optimistic (from the viewpoint of population balance) forecasts of growth in the region see Edmonton as containing well over half of the population well past 2041.

Therefore, a mechanism must be found that involves something other than simple vote by population or municipality, that will be perceived as fair.

3 Evaluation Criteria

Three criteria have been given for evaluating voting systems: balance, fairness, and simplicity. To this we would like to add two more: stability, and what we will call “workability”. Since all of these are fairly vague terms, we should define them more fully.

3.1 Balance

Balance consists in recognizing both the weighting that must be given to sheer population mass, and the distinctiveness of each municipality.

Some ways of evaluating balance are:

- Which municipalities, or combinations of municipalities, can block a proposal? In our specific context, does Edmonton have veto power? If not, how few additional municipalities does Edmonton have to combine with to block a proposal? What combinations of municipalities other than Edmonton can block a proposal?
- Conversely, assuming that there is no point in a system where Edmonton can assure passage of a proposal by itself, how few additional municipalities does Edmonton have to combine with to ensure passage of a proposal? What combinations of municipalities other than Edmonton can ensure passage of a proposal?
- Are there any municipalities that become irrelevant to the discussion because their votes can never affect the result? If so, this will be perceived as an imbalanced system. In practice, this means that each municipality must at least theoretically be able to be the deciding vote for or against a proposal.

There are often distinct groups within any municipality. It is normally assumed that these interests have already been considered by the municipal representative, and his/her vote reflects a balance within his/her own municipality.

3.2 Fairness

This criterion is really nebulous, dealing entirely with perception. In general, it could be considered to be a corollary of “balance”, in the sense that a well-balanced approach will normally be seen as fair.

Even though this is nebulous, it is critically important. Any voting system that is not seen as fair will not be accepted. The real test of fairness is whether the “losers” in a vote will accept the result. Everyone grumbles a bit when they lose, but if they see the system as fair, they will abide by the decision. If someone else has to continuously “police” the municipalities to coerce them into implementing the result, that would be a symptom that the system itself is not fair.

On the other hand, we will never arrive at a perfectly fair system. What we want is a system that everyone is willing to live with, because they can see that they always have a few different ways to arrive at their desired result.

This is the biggest problem with any system that allows Edmonton to have a veto. At that point, the crux of any issue is getting Edmonton on-side. After that, additional negotiation may be needed to bring enough other municipalities around, but such a system always makes Edmonton the focus of attention.

A voting system that makes it too easy to exclude Edmonton will also be seen as unfair (at least by Edmonton), since it involves ignoring the representatives of over two-thirds of the regional population.

Therefore, we can say that a “fair” system will make it possible, but difficult, to pass a proposal without Edmonton's vote.

Likewise, a “fair” system will require a widespread acceptance by municipalities before a proposal can be passed. A system that allows a small number of municipalities to assure passage of a proposal will also be seen as unfair.

One situation that would cause a perception of unfairness is if a particular combination of municipalities always voted as a bloc, and another set was always “shut out” of the process. This would be especially true if the “shut out” group had something distinctive in common with each other. For example, if the counties (which are primarily rural and acreage-suburban) would be consistently on the losing side of votes, there would be a perception that the system was unfair.

3.3 Simplicity

A good voting system should be simple. There are four ways of viewing simplicity, each of which contributes to the suitability of a proposed system:

- Explainable - the voting system must be easy to explain to the general public, whether via the media or in other ways. An overly-complex system may be misunderstood, which will often result in perceptions of unfairness or imbalance.
- Verifiable - the voting system must be easy to apply accurately. There should be no ambiguity about the evaluation of the votes.
- Easily applicable – it aids in consensus-building if every delegate can mentally tally votes at any time to see how close they are to passing a proposal. An overly-complex system will cause much time and effort to be spent hashing over difficult issues, where it should be clear that sufficient support cannot be marshaled to pass a proposal, or conversely that there is little point in continuing to oppose a proposal, since it already has overwhelming support. If the result of a vote comes as a surprise to the people voting, it is likely that this criterion has been violated by the system.
- Low-cost - the voting system itself should not take a lot of time and effort to run. For an extreme negative example, if pass/fail thresholds or the composition of voting groups have to be negotiated for each issue, time and energy that should be used to reach consensus on the real issue would be used instead by reaching consensus on the details of the voting mechanism. Even if there were several pre-determined sets of voting parameters based on categorization of issues, time would have to be spent determining which category a particular issue fell into.

Note that this statement does not rule out these kinds of schemes, but only indicates that they are not low-cost.

Unfortunately, the simplest voting systems are ruled out by the need to bring balance to what is an intrinsically unbalanced situation. However, we must keep in mind that a voting system can easily get too complex to be useful.

3.4 Stability

A good voting system should not require constant adjusting to keep it in balance. Ideally, its distortions to “fairness” to achieve balance should phase themselves out if the underlying structural imbalance fixes itself.

A good voting system should not create sharp differences when populations change by only a small amount. This is important for two reasons:

- It appears unfair for a small change in population to produce a large change in vote weighting.
- It will cause less acceptance of the system from the start, because there are sharp differences in population growth predictions between different growth forecasting models. Therefore, a system that is seen to be very population-sensitive in any negative way will have less acceptance.

A poor voting system would be one where there would be frequent demands to renegotiate the entire system (replace it with something else) because it could not be adapted to changing demographics.

3.5 Workability

In general, workability is defined as “how easy it is to pass a measure.” For example, a scheme requiring complete unanimity to pass any proposal is probably unworkable – in practice, almost nothing would get done.

In some situations, you deliberately want to make it hard to pass a proposal (e.g. constitutional amendment formulas). This is done when the “status quo” is a highly-attractive option, and we actually want to avoid change unless there is overwhelming support for it.

However, as the Percy report states:

“A respect for local government autonomy leads these organizations [including the Alberta Capital Region Alliance] to operate through consensus rather than majority voting rules. Hence when issues involving conflict among members arise, in the absence of successful mediation, often no viable outcome can be achieved.”

Therefore, we must proceed on the understanding that our goal is to create a voting system that will increase, rather than decrease, the probability of reaching a viable outcome. Even though consensus will remain the preferred method of reaching agreement, we must provide a mechanism that can be used to reduce the time and effort required to reach that outcome, and that makes it possible to achieve that outcome in the

absence of complete consensus. This mechanism will then aid in the development of true consensus by making it clear to all involved by defining when significant support or opposition exists.

It is possible for a voting scheme to make it too easy to pass a proposal. When this happens, proposals can be “railroaded” through, but the system becomes unstable, because the opposing proposal can also be “railroaded” through. This is what has often happened with schemes for recall of representatives between elections – if they make it too easy to start recall proceedings, the system is destabilized.

4 Components of a Voting System

The four components that normally make up a voting system are:

1. Voting Entitlement: In the case under examination, it is clear that each municipality in the region will be entitled to vote. However, some voting systems may involve entitling other entities (parts of municipalities or groups of municipalities) to vote. It is assumed that any system that denies a vote to any municipality is unacceptable, and will not be considered.
2. Vote Weighting: This is an indicator of a multiplier attached to a given vote when tallying. In a “one municipality, one vote” system, the multiplier is 1, and in a “vote by population” system, the multiplier is the population of the municipality. Other weightings are possible.
3. Voting Unit: This is a different way of looking at vote weighting. Instead of multiplying one vote by a factor, you allow a representative to cast a number of votes, to arrive at the same balance. For example, in public company shareholder meetings, a shareholder votes each of his shares.

In theory, a given representative could split his votes, but in practice that rarely if ever happens, at least not in a situation where a proposal either passes or fails. There isn't any point in voting 60% for something and 40% against, if you want the proposal to pass. The only time that makes sense is if you have an issue that will do 3 of 10 options, and you must divide your votes among the options (i.e. each of your votes is only allowed to apply to one option) – after counting, the top 3 win.

For our purposes, we will not distinguish between Voting Units and Vote Weighting, because we will assume that all proposals are simple pass-fail.

4. Percentage Required for Passage: In voting systems where all parties have equal votes, adjusting the percentage required for passage is a simple way of increasing or reducing the difficulty of passing a proposal. In situations where there is a structural imbalance, like the one under consideration, adjusting the percentage required for passage may have the additional effect of redressing the imbalance. However, it must be noted that it only does so at the expense of increasing the difficulty of passing a proposal.

In practice, requiring less than or equal to 50% for passage of a proposal results in an unstable system, because the opposite proposal can also be passed. Therefore, only thresholds over 50% can be considered. Often, a threshold of “50% plus one” is referred to as a 50% threshold.

5 Mechanisms for Reducing Imbalance

While there are many different voting systems possible in the situation the Capital Region finds itself, they will always involve one or more of three mechanisms:

- Reducing the power of Edmonton's vote
- Enhancing the power of the other municipalities' votes
- Voting based on other criteria or "dimensions"

Many acceptable systems will involve combinations of these mechanisms.

5.1 Balancing the Effect of Edmonton's Population

There are two simple mechanisms for balancing the effect of Edmonton's population: arbitrary reduction, and vote dilution.

5.1.1 Arbitrary Reduction

To attempt to redress the structural imbalance within the Capital Region, we can simply reduce the power of Edmonton's population, by starting with a vote weighting based on population, and then arbitrarily reducing the weighting given to Edmonton.

We can adopt a vote weighting scheme that states that each municipality's vote is weighted by the minimum of its population or the sum of the populations of the largest N municipalities not including itself. In practice, Edmonton's weighting is the only one that will be adjusted.

For example, you can give Edmonton a weighting equal to the sum of the populations of the largest 20 municipalities, minus 1. Then, you have a situation where a vote can go against Edmonton if the 20 largest other municipalities (or other combinations that amount to the same population) are in agreement with each other.

You can adjust this (making it easier or harder to go against Edmonton) by changing the number of municipalities required.

Model(s): "1.1.1 - Arbitrary Reduction 15",
 "1.1.2 - Arbitrary Reduction 20", Sample included on B-1 (Appendx B-1)
 "1.1.3 - Arbitrary Reduction 24"

Criteria	Evaluation
Balance	<p>This is a crude but effective means of directly attacking the structural imbalance. By defining the reduction in Edmonton's vote weighting as a function of the populations of the other municipalities, you can have a self-adjusting system. Giving Edmonton the weight of somewhere between 15 and 24 other municipalities (always picking the most populous ones) would produce a reasonable balance.</p> <p>However, it means that Edmonton plus any one of the other large municipalities can pass an issue. For example, with a reduction using 15 municipalities and the 2006 figures, Edmonton plus any one of the</p>

Criteria	Evaluation
	<p>next 12 municipalities can pass an issue. As time goes on, the situation gets a little bit more balanced, but not much. Using a higher number of municipalities simply makes the imbalance worse.</p> <p>Increasing the pass threshold above 50% is ineffective, because it quickly allows Edmonton to block passage of a proposal.</p> <p>This system also lacks balance at the other end of the population spectrum. The smallest municipalities will be largely irrelevant except when Edmonton is to be overruled, and even then are only relevant if they are in the group used to adjust Edmonton's effective population, or have a population very near that of the smallest member of the group.</p>
Fairness	<p>This system would be perceived as fair as long as the number of municipalities required to balance Edmonton was high. Clearly, the more Edmonton's weighting is reduced, the less fair the system will appear. Below about 12 municipalities, it would become quite difficult to argue that the system was fair.</p>
Simplicity	<p>This system is reasonably simple. It is quite easy to explain, and it can be applied very accurately. While the exact population numbers would be difficult to add up mentally, it would not be difficult to see if enough municipalities were for or against a proposal to decide the issue. The system is low-cost, since a simple vote is all that is necessary.</p>
Stability	<p>This system is inherently stable. If Edmonton's share of the regional population decreases, the amount of arbitrary reduction will also decrease. As soon as Edmonton drops to somewhat less than half of the regional population, the system reverts to a simple "by population" vote.</p>
Workability	<p>This system can be made more or less workable by setting the number of municipalities in the adjusting formula appropriately. The smaller the number of municipalities used to calculate Edmonton's weighting, the easier it is to outvote Edmonton (of course, at the expense of fairness). A number of 20 would likely be about optimal - if you can get the biggest 20 municipalities on-side against Edmonton, that probably indicates very wide-spread consensus that should be acted upon.</p>

Table 1- Arbitrary Reduction Criteria

Because of its problems with balance at the low-population end of the spectrum, this system cannot be used alone. However, it may be able to be used in a simple combination with another system.

5.1.2 Vote Dilution

Another way to reduce the influence of Edmonton's vote is to “break up” Edmonton in some way. Then, Edmonton would have multiple delegates on the Regional board.

For example, Edmonton could send one delegate per ward, giving it six delegates. Each ward delegate would vote the population of his or her ward.

In essence, this changes the voting unit for Edmonton, while leaving the other municipalities with one voting unit each. Votes would be weighted by the population of the unit.

These wards would still be the largest voting units, since each has a population between 115,000 and 125,000. However, they are somewhat more in line with the populations of the other larger municipalities. If Edmonton increased the number of wards (12 has been proposed), the population of each ward would be roughly equivalent to the population of St. Albert, and smaller than that of Strathcona County.

Model(s): No models available.

Criteria	Evaluation
Balance	In terms of balance, this goes some way, since you now have six large units instead of one enormous one. As long as the wards do not vote as a bloc, you have attained some balance.
Fairness	This system could be seen as technically fair, in that you are still voting by population, without distortion. However, the real perception is likely to be that it is a whitewash of the situation, because most people and municipalities will likely assume that the Edmonton wards will vote as a bloc – especially on the most contentious issues. This system will always be open to the suspicion that Edmonton city council is dictating to all its delegates. It would be extremely difficult to prove that this was not happening. Even if a solid track record of non-block voting was established, the accusation would be made every time Edmonton “got its way”. Even when one or more wards voted against the others, accusations could be made of careful calculation and instructions to “maintain appearances”. In practice, this would be enough to kill this option, especially since there are many better options.
Simplicity	This system is simple - the only drawback is that it results in a total of 30 delegates instead of 25. If Edmonton increases the number of wards, the number of delegates would increase further.
Stability	The system is stable as long as Edmonton has far more population than any other municipality. However, it is not self-adjusting. If Edmonton, changes to a 12-ward system, the dynamics of this system change dramatically. However, as the population of the larger non-Edmonton municipalities increases, calls will be made for them to be “broken up” as well, leading to more and more representatives on the board.

Criteria	Evaluation
	Eventually, this becomes unworkable. There are no built-in mechanisms for phasing out this system if and when municipal populations become more balanced.
Workability	Technically, the system is workable by our definition, except for the perception identified in the discussion of fairness.

Table 2 - Vote Dilution Criteria

The perceived unfairness of this system basically removes it from consideration, even in combination with other systems.

5.2 Balancing the Effect of the Small Municipalities' Population

We can balance the effect of the small municipalities' population by assigning a larger proportion of votes to the smaller municipalities relative to that of the larger ones.

There are three simple ways in which voting units can be assigned.

5.2.1 Arbitrary Enhancement

We can simply augment all small municipalities' populations by assigning them the population of a municipality that marks a "threshold of smallness". For example, we can make the population of the smallest 12 municipalities equal to that of the 12th in size.

Unless we enhance almost all of the other municipalities, Edmonton will still be able to block passage of any proposal.

We would have to set the pass threshold at 70-75% to ensure that numerous municipalities must combine to pass a proposal.

Model(s): "2.1 Arbitrary Enhancement 12" Sample provided on B-2

Criteria	Evaluation
Balance	This system is not particularly balanced. Even with a threshold of 75%, Edmonton plus Strathcona County plus one other municipality can assure passage of a proposal. Edmonton by itself can block a proposal.
Fairness	Because of the lack of balance, this system would not be seen as fair.
Simplicity	The system is fairly simple.
Stability	The system is reasonably stable, although if a threshold of 75% was chosen, it may need to be reduced to 70% after a number of years.
Workability	It is too easy for a small number of municipalities to assure passage of a proposal. Also, Edmonton has an effective veto.

Table 3 – Arbitrary Enhancement Criteria

This system is not acceptable by itself, but might be useful in combination with others.

5.2.2 Voting Unit Granularity

We can enhance the power of the small municipalities’ votes by assigning each municipality a number of voting units based on a “per x of population or part thereof”. This increases the power of the smallest municipalities' votes, not just relative to Edmonton, but also relative to the other large municipalities.

The size of the voting unit can be determined from the number of the smallest municipalities that are needed to balance Edmonton’s vote.

Model(s): “2.2.1 Voting Unit 15”, Sample included on B-3
 “2.2.2 Voting Unit 16”,
 “2.2.3 Voting Unit 20”,
 “2.2.4 Voting Unit 24”

Criteria	Evaluation
Balance	<p>This system can be made to be quite well balanced. Edmonton’s influence is reduced, and the smallest municipalities are very relevant to the voting dynamics. We can determine the number of the smallest municipalities we want to be able to outweigh Edmonton’s vote, and adjust the voting unit until we get that result.</p> <p>Obviously, if we set the minimum number to be 24, then by definition Edmonton plus one other municipality is sufficient to pass a proposal, assuming we set the threshold at 50% plus 1. However, if we set the minimum number at 20, Edmonton would require 5 additional votes to pass a proposal. This would require either the next two municipalities in size, or as many as five additional municipalities.</p> <p>Going to a minimum number of 15, Edmonton would require 7 additional votes to pass a proposal. This would require either the next two municipalities in size PLUS three others, or up to seven others. On the whole then, the lower the number of municipalities that outweigh Edmonton’s vote, the greater the range of dynamics for passing proposals.</p>
Fairness	<p>Whether Edmonton sees this scheme as fair probably depends on the minimum number of small municipalities that can overrule it. The lower the number, the less chance that Edmonton sees this as fair.</p> <p>However, the higher the number of municipalities needed to overrule Edmonton, the fewer the number of municipalities Edmonton needs to get on side to pass a proposal. This will be perceived as unfair by the small municipalities.</p> <p>For example, if 15 municipalities can overrule Edmonton, it means that Edmonton can be overruled by an aggregate population of 40,915, which is 3.9% of the population of the region, or 5.5% of its own size.</p>

Criteria	Evaluation
	<p>Increasing the number of municipalities to 16 increases the "overruling population" to 53,433, which is 5.1% of the region, or 7.2% of its own size. However, Edmonton would only require 6 additional votes to pass a proposal.</p> <p>The largest municipalities outside of Edmonton may also perceive unfairness, caused by the fact that their weight is reduced as much or more than Edmonton's, and they are likely to argue that the reduction is to no real purpose. At a new census, a municipality could potentially have its number of votes drop from two to one, even if its population grows, since the size of the voting unit will likely have to be changed. Any municipality that has that happen is likely to perceive the system as being unfair.</p> <p>It turns out that a range of voting unit sizes can produce any particular balance result. In order to avoid "lobbying", we should simply define the voting unit as the minimum number required to achieve the balance. This gives each municipality the maximum number of votes. That should reduce the possibility that a municipality's number of votes goes down.</p>
Simplicity	<p>This system is simple - it is very easy to explain, and the number of votes per municipality is reasonably easy to calculate. Counting votes is simple, so it is not prone to errors, and it is easy to do a mental tally during negotiations.</p> <p>The system does not require significant effort to run on an ongoing basis, except when calculating the thresholds (see the discussion of stability).</p>
Stability	<p>The system is reasonably stable. After each census, the size of the voting unit must be adjusted to arrive at a balance, where the constant factor is the number of the smallest municipalities required to overrule Edmonton. In practice, this is simple as long as more than that number of municipalities has only 1 vote. When one or more of the "smallest" municipalities gets more than one vote, the calculation is a bit more difficult, and might require a bit of trial and error to find the minimum voting unit.</p>
Workability	<p>The system is workable by our definition.</p>

Table 4 - Voting Unit Granularity Criteria

On the whole, this system is good, provided the number of municipalities required to balance Edmonton can be agreed upon. This is a simple matter of a "zero-sum" game to be negotiated. The more municipalities required to balance Edmonton, the easier it is for Edmonton, both to avoid being overruled, and to combine to pass a proposal. The fewer municipalities required, the harder it is for Edmonton both ways.

5.2.3 Voting Unit by Population Range

Instead of having population ranges of fixed size, we can define unequal ranges.

If we define the ranges logarithmically, with each range twice the size of the previous one, we have:

Population Range	Votes
0-5,000	1
5,001-15,000	2
15,001-35,000	3
35,001-75,000	4
75,001-155,000	5
155,001-315,000	6
315,001-635,000	7
635,001-1,275,000	8

Table 5 – Logarithmic Ranges

This results in Edmonton having only 8 votes out of 54, or slightly more than one-seventh. As time goes on, Edmonton's share of the vote drops further, since all predictions are of the populations of the outlying municipalities to rise proportionally faster than Edmonton's.

If we use a Fibonacci sequence (the size of each range is the sum of the sizes of the previous two ranges), we have:

Population Range	Votes
0-5,000	1
5,001-10,000	2
10,001-20,000	3
20,001-35,000	4
35,001-60,000	5
60,001-100,000	6
100,001-165,000	7
165,001-270,000	8
270,001-440,000	9
440,001-715,000	10

Population Range	Votes
715,001-1,160,000	11
1,160,001-1,880,000	12

Table 6 - Fibonacci Sequence

This gives Edmonton a slightly higher proportion of the votes (more than one-sixth).

We could also modify the above scheme by fixing the sizes of the ranges over 100,000 population to 50,000, resulting in the following weightings:

Population Range	Votes
0-5,000	1
5,001-10,000	2
10,001-20,000	3
20,001-35,000	4
35,001-60,000	5
60,001-100,000	6
Over 100,000	6 plus 1 per additional 50,000 or part thereof

Table 7 – Modified Fibonacci

This gives Edmonton a higher proportion of the votes (more than one-quarter).

If we wish to increase Edmonton’s weighting without modifying the weightings of the other municipalities, we could use only the first five entries in the above table, and then using a linear weighting of one additional vote per 25,000 population. This gives:

Population Range	Votes
0-5,000	1
5,001-10,000	2
10,001-20,000	3
20,001-35,000	4
35,001-60,000	5
Over 60,000	5 plus 1 per additional 25,000 or part thereof

Table 8 - Modified Fibonacci 2

This now gives Edmonton just under 40% of the vote. While this improves the weighting given to Edmonton, now Edmonton plus Strathcona plus Parkland County can combine to assure passage of a proposal. This may not be seen as wide-enough support for the proposal, thereby introducing a perception of unfairness.

Therefore, probably the best set of population ranges to use would be something like those in Table 7.

Model(s): "2.3.1 Pop. Range - Doubling",
 "2.3.2 Pop. Range - Fibonacci",
 "2.3.3 Pop. Range - Modified" Sample provided on B-4
 "2.3.4 Pop. Range – Mod 2"

Criteria	Evaluation
Balance	Of the formulae examined, the second last one probably gives the best balance, with Edmonton having about one-quarter of the votes. This is a slightly smaller proportion than in the "Voting Unit Granularity" scheme, but not too much so. There are lots of "medium-sized" municipalities, so the number of possible municipalities that can pass a proposal is much higher than for the "Voting Unit Granularity" scheme.
Fairness	Because of its balance, the system can be seen as fair.
Simplicity	This system is even simpler than the previous one. The population ranges are easy to understand. Counting votes is simple, so it is not prone to errors, and it is easy to do a mental tally during negotiations.
Stability	The system is reasonably stable. The population ranges are not likely to ever need adjusting.
Workability	The system is workable by our definition.

Table 9 – Population Range Criteria

This is a very good system, primarily because of its simplicity and balance.

5.3 Other Dimensions

It is possible to base voting on an entirely different voting unit than population.

5.3.1 Incorporation Type

It has been suggested to use incorporation type to weight votes. The Capital Region contains 5 cities, 11 towns, 4 villages, and 5 counties. Differing incorporation types do imply differing responsibilities.

While incorporation type is a useful distinction, it is not as good as it might seem. There are some anomalies that are significant enough that they reduce the value of Incorporation Type as a distinguishing characteristic. The most obvious ones are:

- The population of Strathcona County is predominantly urban in the same way as that of St. Albert, but the urban area is not a separate municipality. Therefore, in many ways Strathcona County should be considered a city, not a county.
- The populations of Parkland, Sturgeon, and Leduc counties have a large proportion of acreage dwellers, who can be seen as suburban, whereas Lamont county is much more rural (in addition to being much smaller than the others).
- The cities of Edmonton and Ft. Saskatchewan have large amounts of heavy industry, as does Strathcona County, whereas the other cities and counties have much less.

Therefore, it is unlikely that incorporation type by itself would form a good basis for voting. However, in the absence of a better way of categorizing municipalities, it would make a good modifier of other systems, by requiring that at least one municipality of each type voted for a proposal.

5.3.2 Tax Base

We could base voting weights on a municipality's tax base by using the sum of the property values of all taxable properties in the municipality.

Issues will certainly arise that will involve cost or revenue-sharing between municipalities. Therefore, it seems reasonable to include the financial ability of each municipality as a factor in a voting scheme.

However, the use of the tax base has some serious drawbacks:

- It is not, by itself, a good indicator of financial ability, since many other factors (e.g. the need for costly infrastructure) can dramatically reduce the apparent advantage of a large tax base.
- The net financial value of various types of land (e.g. residential or industrial) varies greatly, so these things would have to be taken into account.
- Because of the size of some of the projects going on in the Capital Region, the tax base of a municipality can change dramatically over a short period of time. Since the completion date of these projects can slip, it is difficult, if not impossible, to predict when the tax base will change.

Therefore, we will not use the tax base, even in combination with other dimensions.

5.3.3 Affinity Groupings

Some attempts have been made to group municipalities by geographic area or by similarity in demographics. These could be useful, except that they are often so vague that their boundaries can be developed only by negotiation. Thus, they will be open to constant pressure to renegotiate.

Therefore, we will not consider them at this time.

5.4 Combinations

Combinations of the above mechanisms can be used to offset the weaknesses of one system with the strengths of another. In addition, other mechanisms that were not even worth consideration by themselves can play an important role in combinations. Some of these are:

- Direct vote by population
- One municipality, one vote

While these cannot be used alone, they may provide valuable mechanisms for combination voting.

5.4.1 Double Majority

The simplest combination voting system is to take the votes and weight them in two ways: one vote per municipality, and by population. A proposal must have the support of the majority of the municipalities, plus the majority of the population, to be passed.

Model(s): “4.1 & 4.2 – Double Majorities” Sample included on B-5

Criteria	Evaluation
Balance	This system produces a nice balance in terms of giving both Edmonton and small municipalities a say. However, it does not give any of the larger municipalities any more say than a small one, and it allows Edmonton to block passage of any proposal. Increasing the threshold of population to 75% addresses the problem of giving larger municipalities more say, but does not address the problem of Edmonton blocking a proposal.
Fairness	This system would likely be seen as fair by Edmonton (in fact, they have proposed a variant of it), but it is very likely that the other municipalities will see a scheme that allows Edmonton to block any proposal as unfair. In addition, this scheme can allow Edmonton plus the 12 smallest municipalities to pass a proposal that is opposed by the 12 largest municipalities outside of Edmonton. This will likely be seen as being unfair by those municipalities. This can be redressed somewhat by increasing the threshold of the population vote to 75%, which would mean that at least one of the second through fourth largest municipalities would also have to be “on-side” to pass a proposal.
Simplicity	This system is simple – it is very easy to explain, and the number of votes per municipality is easy to calculate. Counting votes is simple, so it is not prone to errors, and it is easy to do a mental tally during negotiations. The system does not take any effort to run.
Stability	The system is stable. The only “arbitrary” part of the system is the requirement for 75% of the population vote. All estimates of the population trends show Edmonton’s share of the population decreasing

	<p>somewhat, which makes the 75% requirement more stringent over time. Instead of Edmonton requiring at least one of the next largest municipalities (in addition to enough smaller ones), Edmonton may require two or more of them.</p>
Workability	<p>The system is workable by our definition. If the 75% population threshold starts making it too hard to pass a proposal as Edmonton’s share of the population decreases, the threshold can be reduced (to 70%, or even less). This drop will be infrequent enough that we don’t need to come up with a formula for it. A negotiation process every 20 years or so (triggered by the perception that the system is becoming unworkable) would be acceptable.</p>

Table 10 - Double Majority Criteria

5.4.2 Double Majority with Override

We could deal with the flaw of the previous system by specifying an outvote override. The formula would then be: the majority of the municipalities comprising x% of the population OR n% municipalities, where n was a reasonably large number (e.g. 80 to 85).

Model(s): “4.1 & 4.2 – Double Majorities” Sample included on B-5

Criteria	Evaluation
Balance	<p>This system produces a nice balance in terms of giving both Edmonton and small municipalities a say. Increasing the threshold of population to 75% addresses the problem of giving larger municipalities more say.</p>
Fairness	<p>Provided that the number of municipalities overriding Edmonton’s outvote is large (15-24), Edmonton would likely see this as fair, with the larger the number the better. The absolute population difference can be balanced by the argument that if so many municipalities are opposed to Edmonton, that carries real weight.</p>
Simplicity	<p>This system is also reasonably simple – it is very easy to explain, and the number of votes per municipality is easy to calculate. Counting votes is simple, so it is not prone to errors, and it is easy to do a mental tally during negotiations. The fact that you have two options to get a proposal to pass increases the possible dynamics during negotiations.</p>
Stability	<p>The system is stable, by the same reasoning as for the Double Majority system. The outvote override would automatically phase itself out as the population imbalance righted itself, since the number of municipalities required would comprise the population requirement.</p>

Workability	The system is workable by our definition, with the same caveat as for the Double Majority system.
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Table 11 - Double Majority with Override Criteria

A system with a requirement of 13 municipalities making up 75% of the population, or 20 municipalities (80% of the municipalities) would be a very attractive solution.

5.4.3 Arbitrary Reduction plus Arbitrary Enhancement

We can combine the Arbitrary Reduction and Arbitrary Enhancement mechanisms to create a system that is more balanced than either is by itself.

In practice, you would want the threshold of "small municipality" set at something that overlaps the threshold of the set of "large municipalities" used in the reduction of the weight of Edmonton's vote, to maximize the number of combinations of municipalities required to pass a proposal.

Model(s): "4.3.1 - ReduceEnhance - 15-10", Sample included on B-6
 "4.3.2 - ReduceEnhance - 20-15"

Criteria	Evaluation
Balance	<p>This provides a better balance for the small municipalities as well as Edmonton.</p> <p>However, it still means that Edmonton plus any one of the other large municipalities can assure passage of a proposal.</p> <p>Increasing the pass threshold above 50% is ineffective, because it quickly allows Edmonton to block passage of a proposal.</p>
Fairness	<p>The only unfairness in the system is the perception that Edmonton plus one other municipality can pass a proposal.</p>
Simplicity	<p>This system is somewhat more complex than others. It is more difficult to explain by virtue of the complexity of assigning weightings. It can be applied very accurately. While the exact population numbers would be difficult to add up mentally, it would not be difficult to see if enough municipalities were for or against a proposal to decide the issue. The system is low-cost, since a simple vote is all that is necessary.</p>
Stability	<p>This system is inherently stable. If Edmonton's share of the regional population decreases, the amount of arbitrary reduction will also decrease. As the populations of the smallest municipalities increase in relation to the largest of the "small" ones, their arbitrary enhancement decreases, except when the "index" municipality's population increases. Still, the system stays automatically within the bounds of what is perceived as fair.</p>

Workability	This system is reasonably workable, with the same considerations on threshold numbers as for the “Arbitrary Reduction” system above.
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Table 12 - Arbitrary Reduction plus Arbitrary Enhancement Criteria

On the whole, this scheme is attractive, but probably less so than the “Double Majority with Override” or the “Voting Unit Granularity” schemes, due to its complexity.

5.4.4 Double Majority Based on Incorporation Type

ACRA and the “Cooperative Municipal Partnership” have proposed a voting process combining the number of municipalities supporting a proposal with a weighted vote by incorporation type.

A two-thirds majority (17) of municipalities is required to pass a proposal.

Then, 50% or more of all of the following categories are required:

- Cities (5), where Edmonton gets 4 votes and each other city gets one vote, for a total requirement of 4 out of 8 votes, and
- Counties (5), where each county gets one vote, for a total requirement of 3 out of 5 votes, and
- Towns and villages (15), where each town or village gets one vote, for a total requirement of 8 out of 15 votes.

Model(s): “4.4 - Double Majority Inc. Type” Sample included on B-7

Criteria	Evaluation
Balance	This provides a particularly good balance, because it ensures widespread support for a proposal from all types of municipalities. It avoids the problem of Edmonton being able to block a proposal, while still ensuring that cities as a whole must be in favor.
Fairness	Any perceived unfairness in this system would come from the fact that the same population imbalance that exists between Edmonton and the other cities (a factor of between 12 and 50) also exists between the counties (a factor of between 2.5 and 21) and the towns and villages (a factor of between 1.3 and 31). Attempts to arbitrarily assign weights to the large municipalities of each type other than Cities will likely result in more calls for redress, unless a formula is used to assign weights. Also, see the discussion of the issues around using Incorporation Type as a basis for voting under section 5.3.1, above.
Simplicity	This system is quite simple in all respects.
Stability	The assignment of a weight of 4 to Edmonton in the Cities category would have to be revisited if a town changed to a city.

Workability	This system makes it more difficult to pass a proposal than most of the other systems do, because more widespread support must be obtained.
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Table 13 - Double Majority Based on Incorporation Type Criteria

On the whole, this is a very attractive system, where the only drawback is that indicated under the discussion on fairness.

5.4.5 Double Majority Based on Incorporation Type with Voting Units

The above mechanism can be modified by using voting units to produce the appropriate weightings of the votes in each incorporation type, considering towns and villages to be a single type.

The specific unit size in each case would be determined by answering the question, “How many of the smallest municipalities in this category should it take to balance the largest?” In this case, because 50% in each category is considered a pass, you don’t need to adjust the weightings to make the largest municipality have one less vote than the n smallest.

A reasonable calculation would involve the four smallest cities overriding the largest, the three smallest municipalities overriding the largest, and the 6 smallest towns/villages overriding the largest.

Model(s): “4.5 - Inc Type + Voting Unit”, Sample included on B-8

Criteria	Evaluation
Balance	The balance is, if anything, slightly better than the previous mechanism's.
Fairness	This system addresses the fairness issues of the other previous one.
Simplicity	This system is more complex than the previous one, basically providing the complexity of both systems combined. This will make the system harder to understand by the public, and harder to use as a measuring stick during negotiations.
Stability	The system is stable, except that the decision of how many small municipalities match the largest one is primarily based on an arbitrary perception of the balance between them. For example, if Stony Plain becomes a city rather than a town, then the population imbalances within the towns and villages becomes small enough that a voting units calculation is of dubious benefit - a “one municipality, one vote” mechanism is far better.
Workability	This system makes it slightly more difficult to pass a proposal than the previous one.

Table 14 - Double Majority Based on Incorporation Type with Voting Units Criteria

This is probably the most balanced and fair system considered, but at the cost of complexity.

6 Recommendations

The following three schemes are recommended as good options for a Capital Region voting scheme. They are not ranked in any order of preference.

6.1 Voting Unit By Population Range (Section 5.2.3, option 3)

A proposal must be passed by a 50%-plus-1 vote, based on the voting units shown in model "2.3.3 Pop. Range – Modified".

An additional requirement could be made that at least one municipality of each incorporation type (counting towns and villages as a single type) must vote for the proposal.

Model: "2.3.3 Pop. Range – Modified" Sample included on B-4

6.2 Double Majority with Override (Section 5.4.2)

A proposal must be passed by either 50% of the municipalities comprising 75% of the population, or over 80% of the municipalities.

An additional requirement could be made that at least one municipality of each incorporation type (counting towns and villages as a single type) must vote for the proposal, regardless of whether the 50/75 rule or the 80% rule was being used.

Model: "4.1 & 4.2 – Double Majorities" Sample included on B-5

6.3 Double Majority Based on Incorporation Type (Section 5.4.4)

A proposal must be passed by two-thirds of the municipalities, including at least 50% of each of the incorporation types (where towns and villages are considered one type, and Edmonton has 4 votes within the "cities" type).

Model: "4.4 Double Majority Inc. Type" Sample included on B-7

Appendix A: Voting Scheme Pro-Con Summary

The following table lists each of the schemes and a summary of their pros and cons based on the criteria evaluation from section 5 – Mechanisms for Reducing Imbalance.

No	Voting Scheme	Pro	Ambivalent	Con
5.1.1	Arbitrary Reduction	Simplicity, stability	Workability	Balance, fairness
5.1.2	Vote Dilution	Simplicity	Balance, workability	Fairness, stability
5.2.1	Arbitrary Enhancement	Simplicity	Stability	Balance, fairness, workability
5.2.2	Voting Unit Granularity	Balance, stability, workability	Fairness, simplicity	
5.2.3	Voting Unit by Population Range	Balance, fairness, simplicity, stability, workability		
5.4.1	Double Majority	Simplicity, stability, workability		Balance, fairness
5.4.2	Double Majority with Override	Balance, fairness, simplicity, stability, workability		
5.4.3	Arbitrary Reduction plus Arbitrary Enhancement	Stability	Simplicity, workability	Balance, fairness
5.4.4	Double Majority Based on Incorporation Type	Balance, simplicity	Fairness, stability, workability	
5.4.5	Double Majority Based on Incorporation Type with Voting Units	Balance, fairness	Stability, workability	Simplicity

Table 15 - Voting Scheme Summary

Appendix B: Voting Model Summaries

This section includes snapshots of the “Municipality Voting Models” spreadsheet. Where one or more models for a scheme are included in the spreadsheet, a single, representative copy is presented below. The numbering of the models reflects their sequence in section 5 Mechanisms for Reducing Imbalance above and is in the same order they are in the spreadsheet.

Note that this document is intended to be reviewed in conjunction with the spreadsheet. The sample below are included as a quick reference for convenience.

B-1 "1.1.2 - Arbitrary Reduction 20"

Arbitrary Reduction - Edmonton has Weight of Top 20 Municipalities

	Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	Reg. 2016 Weight	Muni. 2016 Pop.	2016 Muni. Rank	Muni. 2016 Weight
Cities	Edmonton	740,041	1	304,090	880,144	1	407,895	900,112	1	407,330
	Fort Saskatchewan	15,089	8	15,089	30,657	5	30,657	35,000	5	35,000
	St. Albert	57,787	3	57,787	79,085	3	79,085	79,085	3	79,085
	Leduc	17,021	7	17,021	22,062	7	22,062	22,582	7	22,582
	Spruce Grove	19,496	5	19,496	24,489	6	24,489	30,000	6	30,000
Counties	Strathcona	82,705	2	82,705	108,482	2	108,482	108,482	2	108,482
	Lamont	3,935	14	3,935	4,130	15	4,130	6,500	17	6,500
	Sturgeon	18,664	6	18,664	22,055	8	22,055	22,000	8	22,000
	Leduc	12,734	9	12,734	15,530	9	15,530	16,750	9	16,750
	Parkland	29,739	4	29,739	35,145	4	35,145	37,000	4	37,000
Towns	Lamont	1,675	18	1,675	1,935	20	1,935	7,500	16	7,500
	Bruderheim	1,215	20	1,215	2,778	17	2,778	2,778	21	2,778
	Morinville	6,775	12	6,775	10,138	12	10,138	10,138	13	10,138
	Gibbons	2,642	15	2,642	5,115	14	5,115	3,140	19	3,140
	Redwater	2,192	16	2,192	3,281	16	3,281	9,051	15	9,051
	Bon Accord	1,535	19	1,535	2,191	19	2,191	3,500	18	3,500
	Legal	1,193	21	1,193	1,718	21	1,718	1,718	22	1,718
	Beaumont	8,961	11	8,961	13,257	11	13,257	14,000	11	14,000
	Devon	6,256	13	6,256	7,858	13	7,858	14,000	12	14,000
	Calmar	1,959	17	1,959	2,461	18	2,461	10,000	14	10,000
Stony Plain	12,518	10	12,518	15,529	10	15,529	15,484	10	15,484	
Villages	Thorsby	945	22	945	1,153	22	1,153	3,000	20	3,000
	Warburg	621	23	621	735	23	735	1,000	24	1,000
	New Sarepta	410	25	410	486	25	486	1,200	23	1,200
	Wabamun	601	24	601	691	24	691	750	25	750
	Total:	1,046,709		610,758	1,291,105		818,856	1,354,770		861,988
	Edmonton Deficiency from 50% of vote:			1,289			1,533			23,664
	Threshold for Edmonton Veto:			50			50			53

B-2 "2.1 - Arbitrary Enhancement 12"

Arbitrary Enhancement - Smallest 12 have Weight of #13

	Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	Reg. 2016 Weight	Muni. 2016 Pop.	2016 Muni. Rank	Muni. 2016 Weight
Cities	Edmonton	740,041	1	740,041	880,144	1	880,144	900,112	1	900,112
	Fort Saskatchewan	15,089	8	15,089	30,657	5	30,657	35,000	5	35,000
	St. Albert	57,787	3	57,787	79,085	3	79,085	79,085	3	79,085
	Leduc	17,021	7	17,021	22,062	7	22,062	22,582	7	22,582
	Spruce Grove	19,496	5	19,496	24,489	6	24,489	30,000	6	30,000
Counties	Strathcona	82,705	2	82,705	108,482	2	108,482	108,482	2	108,482
	Lamont	3,935	14	6,256	4,130	15	7,858	6,500	17	10,138
	Sturgeon	18,664	6	18,664	22,055	8	22,055	22,000	8	22,000
	Leduc	12,734	9	12,734	15,530	9	15,530	16,750	9	16,750
	Parkland	29,739	4	29,739	35,145	4	35,145	37,000	4	37,000
Towns	Lamont	1,675	18	6,256	1,935	20	7,858	7,500	16	10,138
	Bruderheim	1,215	20	6,256	2,778	17	7,858	2,778	21	10,138
	Morinville	6,775	12	6,775	10,138	12	10,138	10,138	13	10,138
	Gibbons	2,642	15	6,256	5,115	14	7,858	3,140	19	10,138
	Redwater	2,192	16	6,256	3,281	16	7,858	9,051	15	10,138
	Bon Accord	1,535	19	6,256	2,191	19	7,858	3,500	18	10,138
	Legal	1,193	21	6,256	1,718	21	7,858	1,718	22	10,138
	Beaumont	8,961	11	8,961	13,257	11	13,257	14,000	11	14,000
	Devon	6,256	13	6,256	7,858	13	7,858	14,000	12	14,000
	Calmar	1,959	17	6,256	2,461	18	7,858	10,000	14	10,138
Stony Plain	12,518	10	12,518	15,529	10	15,529	15,484	10	15,484	
Villages	Thorsby	945	22	6,256	1,153	22	7,858	3,000	20	10,138
	Warburg	621	23	6,256	735	23	7,858	1,000	24	10,138
	New Sarepta	410	25	6,256	486	25	7,858	1,200	23	10,138
	Wabamun	601	24	6,256	691	24	7,858	750	25	10,138
	Total:	1,046,709		1,102,858	1,291,105		1,358,727	1,354,770		1,426,289
	Edmonton Deficiency from:									
	65% of vote:			n/a			3,029			26,976
	70% of vote:			31,960			70,965			98,290
	75% of vote:			87,103			138,901			169,605

B-3 "2.2.1 - Voting Unit 15"

Voting Unit Granularity - 15 Municipalities Outweigh Edmonton

	Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	2016 Reg. Weight	Muni. 2016 Pop.	2016 Muni. Rank	2016 Muni. Weight
Cities	Edmonton	740,041	1	14	880,144	1	14	900,112	1	14
	Fort Saskatchewan	15,089	8	1	30,657	5	1	35,000	5	1
	St. Albert	57,787	3	2	79,085	3	2	79,085	3	2
	Leduc	17,021	7	1	22,062	7	1	22,582	7	1
	Spruce Grove	19,496	5	1	24,489	6	1	30,000	6	1
Counties	Strathcona	82,705	2	2	108,482	2	2	108,482	2	2
	Lamont	3,935	14	1	4,130	15	1	6,500	17	1
	Sturgeon	18,664	6	1	22,055	8	1	22,000	8	1
	Leduc	12,734	9	1	15,530	9	1	16,750	9	1
	Parkland	29,739	4	1	35,145	4	1	37,000	4	1
Towns	Lamont	1,675	18	1	1,935	20	1	7,500	16	1
	Bruderheim	1,215	20	1	2,778	17	1	2,778	21	1
	Morinville	6,775	12	1	10,138	12	1	10,138	13	1
	Gibbons	2,642	15	1	5,115	14	1	3,140	19	1
	Redwater	2,192	16	1	3,281	16	1	9,051	15	1
	Bon Accord	1,535	19	1	2,191	19	1	3,500	18	1
	Legal	1,193	21	1	1,718	21	1	1,718	22	1
	Beaumont	8,961	11	1	13,257	11	1	14,000	11	1
	Devon	6,256	13	1	7,858	13	1	14,000	12	1
	Calmar	1,959	17	1	2,461	18	1	10,000	14	1
Stony Plain	12,518	10	1	15,529	10	1	15,484	10	1	
Villages	Thorsby	945	22	1	1,153	22	1	3,000	20	1
	Warburg	621	23	1	735	23	1	1,000	24	1
	New Sarepta	410	25	1	486	25	1	1,200	23	1
	Wabamun	601	24	1	691	24	1	750	25	1
	Total:	1,046,709		40	1,291,105		40	1,354,770		40
	Voting Unit:			52,861			62,868			64,294
	Voting Unit (min)			52,861			62,868			64,294
	Voting Unit (max)			56,926			67,703			69,239

B-4 "2.3.3 Pop. Range - Modified"

Population Ranges - Modified Fibonacci Sequence

Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	2016 Reg. Weight	Muni. 2016 Pop.	2016 Muni. Rank	2016 Muni. Weight	
Cities	Edmonton	740,041	1	19	880,144	1	22	900,112	1	23
	Fort Saskatchewan	15,089	8	3	30,657	5	4	35,000	5	4
	St. Albert	57,787	3	5	79,085	3	6	79,085	3	6
	Leduc	17,021	7	3	22,062	7	4	22,582	7	4
	Spruce Grove	19,496	5	3	24,489	6	4	30,000	6	4
Counties	Strathcona	82,705	2	6	108,482	2	7	108,482	2	7
	Lamont	3,935	14	1	4,130	15	1	6,500	17	2
	Sturgeon	18,664	6	3	22,055	8	4	22,000	8	4
	Leduc	12,734	9	3	15,530	9	3	16,750	9	3
	Parkland	29,739	4	4	35,145	4	5	37,000	4	5
Towns	Lamont	1,675	18	1	1,935	20	1	7,500	16	2
	Bruderheim	1,215	20	1	2,778	17	1	2,778	21	1
	Morinville	6,775	12	2	10,138	12	3	10,138	13	3
	Gibbons	2,642	15	1	5,115	14	2	3,140	19	1
	Redwater	2,192	16	1	3,281	16	1	9,051	15	2
	Bon Accord	1,535	19	1	2,191	19	1	3,500	18	1
	Legal	1,193	21	1	1,718	21	1	1,718	22	1
	Beaumont	8,961	11	2	13,257	11	3	14,000	11	3
	Devon	6,256	13	2	7,858	13	2	14,000	12	3
	Calmar	1,959	17	1	2,461	18	1	10,000	14	2
	Stony Plain	12,518	10	3	15,529	10	3	15,484	10	3
Villages	Thorsby	945	22	1	1,153	22	1	3,000	20	1
	Warburg	621	23	1	735	23	1	1,000	24	1
	New Sarepta	410	25	1	486	25	1	1,200	23	1
	Wabamun	601	24	1	691	24	1	750	25	1
Total:	1,046,709		70	1,291,105		83	1,354,770		88	
Edmonton % of total:	70.7		27.1	68.2		26.5	66.4		26.1	

B-5 "4.1 & 4.2 - Double Majorities"

Double Majority (optionally with Override)

	Municipality	2006 Pop.	2006 Rank	Reg. 2016 Pop.	2016 Reg. Rank	Muni. 2016 Pop.	2016 Muni. Rank	Reg. 2041 Pop.	2041 Reg. Rank	Muni. 2041 Pop.	2041 Muni. Rank
Cities	Edmonton	740,041	1	880,144	1	900,112	1	1,158,872	1	1,158,872	1
	Fort Saskatchewan	15,089	8	30,657	5	35,000	5	40,392	5	40,000	8
	St. Albert	57,787	3	79,085	3	79,085	3	110,901	3	110,901	3
	Leduc	17,021	7	22,062	7	22,582	7	33,077	7	46,147	6
	Spruce Grove	19,496	5	24,489	6	30,000	6	35,492	6	76,190	4
Counties	Strathcona	82,705	2	108,482	2	108,482	2	153,264	2	180,998	2
	Lamont	3,935	14	4,130	15	6,500	17	4,582	15	25,000	13
	Sturgeon	18,664	6	22,055	8	22,000	8	30,126	8	30,000	10
	Leduc	12,734	9	15,530	9	16,750	9	21,852	10	45,650	7
	Parkland	29,739	4	35,145	4	37,000	4	48,789	4	73,000	5
Towns	Lamont	1,675	18	1,935	20	7,500	16	2,446	20	22,063	15
	Bruderheim	1,215	20	2,778	17	2,778	21	3,835	17	3,835	21
	Morinville	6,775	12	10,138	12	10,138	13	14,373	12	14,373	17
	Gibbons	2,642	15	5,115	14	3,140	19	7,003	14	7,003	19
	Redwater	2,192	16	3,281	16	9,051	15	4,450	16	26,750	11
	Bon Accord	1,535	19	2,191	19	3,500	18	3,023	19	8,413	18
	Legal	1,193	21	1,718	21	1,718	22	2,276	21	2,276	23
	Beaumont	8,961	11	13,257	11	14,000	11	20,687	11	22,000	16
	Devon	6,256	13	7,858	13	14,000	12	11,389	13	26,000	12
	Calmar	1,959	17	2,461	18	10,000	14	3,566	18	25,000	14
Stony Plain	12,518	10	15,529	10	15,484	10	22,507	9	32,421	9	
Villages	Thorsby	945	22	1,153	22	3,000	20	1,622	22	5,000	20
	Warburg	621	23	735	23	1,000	24	1,004	23	2,000	24
	New Sarepta	410	25	486	25	1,200	23	664	25	2,400	22
	Wabamun	601	24	691	24	750	25	917	24	2,000	25
Total:	1,046,709		1,291,105		1,354,770		1,737,109		1,988,292		

Edmonton Only

Edmonton percent of population:	70.7	68.2	66.4	66.7	58.3
Edmonton deficiency from:					
70% of pop:	n/a	23,630	48,227	57,104	232,932
75% of pop:	44,991	88,185	115,966	143,960	332,347
80% of pop:	97,326	152,740	183,704	230,815	431,762

Edmonton + smallest 12 Muni's

Population of smallest 12:	18923	26674	50137	35388	116363
Edmonton + smallest 12:	758,964	906,818	950,249	1,194,260	1,275,235
% of total population:	72.5	70.2	70.1	68.7	64.1
Deficiency from:					
70% of pop:	n/a	n/a	n/a	21,716	116,569
75% of pop:	26,068	61,511	65,829	108,572	215,984
80% of pop:	78,403	126,066	133,567	195,427	315,399

For "Double Majority Override", the number of municipalities voting one way must exceed a set percentage (e.g. 80%) in order to overturn the "double majority" ruling.

B-6 "4.3.1 - ReduceEnhance - 15-10"

Arbitrary Reduction - 15 Municipalities, plus Arbitrary Enhancement to 10th Municipality

	Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	Reg. 2016 Weight	Muni. 2016 Pop.	2016 Muni. Rank	Muni. 2016 Weight
Cities	Edmonton	740,041	1	340,860	880,144	1	446,207	900,112	1	459,286
	Fort Saskatchewan	15,089	8	15,089	30,657	5	30,657	35,000	5	35,000
	St. Albert	57,787	3	57,787	79,085	3	79,085	79,085	3	79,085
	Leduc	17,021	7	17,021	22,062	7	22,062	22,582	7	22,582
	Spruce Grove	19,496	5	19,496	24,489	6	24,489	30,000	6	30,000
Counties	Strathcona	82,705	2	82,705	108,482	2	108,482	108,482	2	108,482
	Lamont	3,935	14	12,518	4,130	15	15,529	6,500	17	15,484
	Sturgeon	18,664	6	18,664	22,055	8	22,055	22,000	8	22,000
	Leduc	12,734	9	12,734	15,530	9	15,530	16,750	9	16,750
	Parkland	29,739	4	29,739	35,145	4	35,145	37,000	4	37,000
Towns	Lamont	1,675	18	12,518	1,935	20	15,529	7,500	16	15,484
	Bruderheim	1,215	20	12,518	2,778	17	15,529	2,778	21	15,484
	Morinville	6,775	12	12,518	10,138	12	15,529	10,138	13	15,484
	Gibbons	2,642	15	12,518	5,115	14	15,529	3,140	19	15,484
	Redwater	2,192	16	12,518	3,281	16	15,529	9,051	15	15,484
	Bon Accord	1,535	19	12,518	2,191	19	15,529	3,500	18	15,484
	Legal	1,193	21	12,518	1,718	21	15,529	1,718	22	15,484
	Beaumont	8,961	11	12,518	13,257	11	15,529	14,000	11	15,484
	Devon	6,256	13	12,518	7,858	13	15,529	14,000	12	15,484
	Calmar	1,959	17	12,518	2,461	18	15,529	10,000	14	15,484
Stony Plain	12,518	10	12,518	15,529	10	15,529	15,484	10	15,484	
Villages	Thorsby	945	22	12,518	1,153	22	15,529	3,000	20	15,484
	Warburg	621	23	12,518	735	23	15,529	1,000	24	15,484
	New Sarepta	410	25	12,518	486	25	15,529	1,200	23	15,484
	Wabamun	601	24	12,518	691	24	15,529	750	25	15,484
	Total:	1,046,709		794,383	1,291,105		1,032,176	1,354,770		1,057,929
	Edmonton Deficiency from 50% of vote:			56,332			69,881			69,679
	Threshold for Edmonton Veto:			57			57			57

B-7 "4.4 - Double Majority Inc. Type"

Double Majority based on Incorporation Type

	Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	2016 Reg. Weight	Muni. 2016 Pop.	2016 Muni. Rank	2016 Muni. Weight
Cities	Edmonton	740,041	1	4	880,144	1	4	900,112	1	4
	Fort Saskatchewan	15,089	5	1	30,657	3	1	35,000	3	1
	St. Albert	57,787	2	1	79,085	2	1	79,085	2	1
	Leduc	17,021	4	1	22,062	5	1	22,582	5	1
	Spruce Grove	19,496	3	1	24,489	4	1	30,000	4	1
	City Total:	849,434		8	1,036,437		8	1,066,779		8
Counties	Strathcona	82,705	1	1	108,482	1	1	108,482	1	1
	Lamont	3,935	5	1	4,130	5	1	6,500	5	1
	Sturgeon	18,664	3	1	22,055	3	1	22,000	3	1
	Leduc	12,734	4	1	15,530	4	1	16,750	4	1
	Parkland	29,739	2	1	35,145	2	1	37,000	2	1
County Total:	147,777		5	185,342		5	190,732		5	
Towns/Villages	Lamont	1,675	8	1	1,935	10	1	7,500	7	1
	Bruderheim	1,215	10	1	2,778	7	1	2,778	11	1
	Morinville	6,775	3	1	10,138	3	1	10,138	4	1
	Gibbons	2,642	5	1	5,115	5	1	3,140	9	1
	Redwater	2,192	6	1	3,281	6	1	9,051	6	1
	Bon Accord	1,535	9	1	2,191	9	1	3,500	8	1
	Legal	1,193	11	1	1,718	11	1	1,718	12	1
	Beaumont	8,961	2	1	13,257	2	1	14,000	2	1
	Devon	6,256	4	1	7,858	4	1	14,000	3	1
	Calmar	1,959	7	1	2,461	8	1	10,000	5	1
	Stony Plain	12,518	1	1	15,529	1	1	15,484	1	1
	Thorsby	945	12	1	1,153	12	1	3,000	10	1
	Warburg	621	13	1	735	13	1	1,000	14	1
	New Sarepta	410	15	1	486	15	1	1,200	13	1
Wabamun	601	14	1	691	14	1	750	15	1	
Town/Village Total:	49,498		15	2,512,884		15	2,612,281		15	

B-8 "4.5 - Inc Type + Voting Unit"

Incorporation Type + Voting Unit Granularity - 4 Cities Balance Edmonton, 3 Counties Balance Strathcona, 6 Towns/Villages Balance Stony Plain

	Municipality	2006 Pop.	2006 Rank	2006 Weight	Reg. 2016 Pop.	2016 Reg. Rank	2016 Reg. Weight	Muni. 2016 Pop.	2016 Muni. Rank	2016 Muni. Weight
Cities	Edmonton	740,041	1	4	880,144	1	4	900,112	1	4
	Fort Saskatchewan	15,089	5	1	30,657	3	1	35,000	3	1
	St. Albert	57,787	2	1	79,085	2	1	79,085	2	1
	Leduc	17,021	4	1	22,062	5	1	22,582	5	1
	Spruce Grove	19,496	3	1	24,489	4	1	30,000	4	1
	City Total:	849,434		8	1,036,437		8	1,066,779		8
	City Voting Unit:			185,011			220,036			225,028
Counties	Strathcona	82,705	1	3	108,482	1	3	108,482	1	3
	Lamont	3,935	5	1	4,130	5	1	6,500	5	1
	Sturgeon	18,664	3	1	22,055	3	1	22,000	3	1
	Leduc	12,734	4	1	15,530	4	1	16,750	4	1
	Parkland	29,739	2	2	35,145	2	1	37,000	2	2
	County Total:	147,777		8	185,342		7	190,732		8
	County Voting Unit:			27,569			36,161			36,161
Towns/Villages	Lamont	1,675	8	1	1,935	10	1	7,500	7	4
	Bruderheim	1,215	10	1	2,778	7	2	2,778	11	2
	Morinville	6,775	3	4	10,138	3	4	10,138	4	6
	Gibbons	2,642	5	2	5,115	5	2	3,140	9	2
	Redwater	2,192	6	2	3,281	6	2	9,051	6	5
	Bon Accord	1,535	9	1	2,191	9	1	3,500	8	2
	Legal	1,193	11	1	1,718	11	1	1,718	12	1
	Beaumont	8,961	2	5	13,257	2	6	14,000	2	8
	Devon	6,256	4	3	7,858	4	4	14,000	3	8
	Calmar	1,959	7	1	2,461	8	1	10,000	5	6
	Stony Plain	12,518	1	6	15,529	1	6	15,484	1	8
	Thorsby	945	12	1	1,153	12	1	3,000	10	2
	Warburg	621	13	1	735	13	1	1,000	14	1
	New Sarepta	410	15	1	486	15	1	1,200	13	1
Wabamun	601	14	1	691	14	1	750	15	1	
	Town/Village Total:	49,498		31	2,512,884		34	2,612,281		57
	Voting Unit:			2,087			2,589			1,936