Connecting the North End to Downtown: A Route for Cyclists

Please Note: This document was prepared quite some time ago when I had much less sophisticated tools for analysis available. It should not be used to draw specific conclusions, especially about cost, but does paint a general picture of the idea of repurposing some of our roadways as a less expensive and less intrusive means of creating better bike lanes.

David Fright

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Introduction

On November 3'rd, 2010, the HRM=s municipal council began a process to investigate the development of a cross-town bicycle route that will connect the North End to Downtown. I think this is a laudable goal. In order to assist in the development of such a route, I have prepared in the following pages an analysis of some of the things I think we should keep in mind in choosing the best possible route for cyclists as a means of traveling between the North End and the Downtown.1

One of the most important things to consider is the threat posed to bicyclists by motor-vehicles. Bicyclists need to be aware of all the vehicles which surround them. Unlike motorists, each motor-vehicle represents a serious risk of injury or death to a bicyclist. Bicyclists are less protected and they are also less visible. If there are fifty parked cars along side a road, there are fifty serious threats you need to be aware of as a cyclist. These dangers are only compounded at intersections.

The health of bicyclists traveling along any proposed route is another important consideration. Vehicles are responsible for a large amount of the air-pollution found within cities. As the point of origin, the places surrounding automobiles will have the highest concentrations of these pollutants. Bicycling is a physically strenuous activity, calling particularly on the cardiovascular and respiratory systems. Because of this, it is a good form of exercise and has many health benefits. However, performing such exercise in the presence of relatively high-concentrations of pollutants likely carries health risks of its own, thereby mitigating the benefits of such exercise.

Finally, we will also need to consider the recreational aspects of bicycling and non-motorized transportation. Bicycling can be highly enjoyable. Mountain Biking can be a thrilling experience for those wanting to push their limits. A leisurely bike-ride, on the other hand, can be highly relaxing. Bicycling is an excellent form of exercise, providing the opportunity to moderately increase a person=s heart-rate and respiration over sustained periods of time. Bicycling can also be a social activity, and it is a popular among families for both the young and old alike.

In considering each of these issues, we will ultimately be seeking to answer the questions whether bicycles can safely share the road with motor-vehicle traffic or whether it is even desirable for them to do so? While it may prove preferable for bicyclists to be separated from motor-vehicle traffic, the cost of doing so may be prohibitive. We will, therefore, also consider the relative costs of constructing such a route. Will it prove to be more or less costly than the alternatives?

Isleville Street

1 Chronicle-Herald "New Bike Route Proposed for Halifax."
http://www.cbc.ca/canada/nova-scotia/story/2010/11/03/ns-halifax-bicycle-path.html

Isleville Street, in conjunction with Fuller Terrace and Maynard Street, runs from Duffus Street, in the North End, to Cogswell Street, across from the Citadel. It is close to the Nova Scotia Community College=s Institute of Technology Campus, and its proximity to the Halifax Common and the Citadel places it within reach of the downtown and the West End. It is a quiet street which mostly provides access for local traffic to residential properties and connecting side-streets.2

The easiest, and potentially least expensive, way of constructing a motor-free bicycle route between the North End and Downtown would be to simply take measures to limit access to this length of road to local vehicular traffic so that it can be primarily used by alternative vehicles such as bicycles, scooters, carts, roller-blades, and skis. There are few major intersections along this entire stretch, which I will refer to as Isleville Street, and there aren't a lot of businesses nearby that would be entirely dependant on it for parking. Limiting the use of Isleville Street to motorized traffic will not cause as much inconvenience as limiting the flow of traffic along more heavily used roads such as Agricola Street. However, it would provide substantial benefits to bicyclists who would no longer have to contend with motorized traffic or suffer the negative health effects of breathing the pollution emitted by them. By repurposing an underused roadway as a bikeway, the costs will also likely be much lower than expanding or altering a busier roadway like Agricola.

Bikes only vs. Sharing the Road

As we have discussed, motor-vehicles can pose a significant threat to bicyclists. Most people I know who ride their bike on roads within the HRM have had close encounters with motor-vehicles or have suffered actual injuries ranging from bumps and bruises to broken arms. While a collision between two motor-vehicles at moderate speeds will pose little risk of death to their drivers, a collision between a motor-vehicle and a bicycle, even at low speeds, can be potentially fatal to its rider. Taking these concerns into consideration, we will now look at whether bicycles can safety share the road with motor-vehicles or if it would be preferable to keep the two separated.

<u>Safety</u>

One of the biggest dangers posed to bicyclists by motorized vehicles are from those parked on the side of the road. A parked car might pull out suddenly, or someone might open a door right in front of you. Even with a bike lane, it is not possible to ignore any of the cars around you.

Another significant danger posed to bicyclists is from cars passing along side them in traffic. Many roads within the HRM are quite narrow. Even with no bicycles on the road, there is little room for two cars to pass each other in opposite directions when there are vehicles parked on the side of a road such as Agricola. A bicyclist traveling along such a route is therefore surrounded by potential dangers. At any moment, a car-door could open on your right and knock you into the stream of cars traveling on your left. While I enjoy mountain biking, a potentially risky activity, I will not ride my bike in traffic. I consider the dangers too great. Instead, I prefer to walk or take the bus. Even with a painted bike lane in place, I would not ride my bike alongside motorized traffic.

2 See Appendix "A."

Health

While bicycling along the roads, I have often observed that after a car has gone by I am able to see my breath whereas before I was not. Probably a lot of this is has to do with the water-vapor emitted by the vehicle or the temperature of the air rather than the toxicity of the substances released by the vehicle being so great that I am able to see it on my breath. However, this example does demonstrate that motor-vehicles have a strong effect on the air in their immediate vicinity.

At one point, I lived in an apartment on the fifth floor of a building along a busy inner-city road. The road was hemmed in by buildings of this size on either side so that there was little room for the emissions from the vehicles to dissipate other than by traveling straight upwards. Shortly after moving into the apartment, I began to notice a Ablack film@ that would appear along the window sills. It looked like a kind of dust, but any attempt to wipe it off would only smear it. The only way to get rid of it was to use a strong degreaser, which I had to do on a weekly basis. There were no other sources of pollution in the area, so it had to be coming from the cars traveling along the road.

Motor-vehicles release carbon particles into the air, as well as carbon-monoxide and sulfur-dioxide, among other things. Each year, thousands of tires are disposed of in the province of Nova Scotia. As tires wear, the rubber which once belonged to them is released into the environment. Some of it is released in large pieces, while other parts of it are released in much finer particles which can be breathed in. It would not be healthy to breathe such things in at any time, and this is especially true during times of heavy exercise and deep respiration.

A Bike-Friendly Environment

A cross-town bicycle route does not need to serve only as a transportation corridor between the North End and the Downtown for bicycle enthusiasts; it can also serve to provide recreational opportunities for families, casual riders, and even cross-country skiers in the winter. I enjoy mountain biking, but I won't ride along a road that is shared with motorized-traffic. A route with limited access for motor-vehicles would provide a much more relaxing environment for cyclists than a route in which the road is shared. Instead of 50 parked cars along a stretch of road, perhaps there will be one or two. It would also be easier for the drivers of motor-vehicles. Along a limited-access route, each driver would be expecting to encounter bicyclists. Those not comfortable with this would have the alternative of taking another route.

A bicycle route separated from the flow of motorized traffic would create a much more pleasant environment in which to ride. There would be less noise, less pollution, and fewer dangers to worry about. Such a route can therefore be used for enjoyment as well as transportation to a greater extent. As a place for recreation and enjoyment, it might also be possible for it to serve as a pedestrian route or a place for cross-country skiers in the winter. It would also be a place that is suitable for children. Bicyclists could ride side-by-side as opposed to single-file. Families with young children would be able to use it to take bike rides together, and it would provide a healthier and safer environment for people looking to use it as a means of exercise. In recent years, bicycle-trailers have become increasingly popular. I have seen them used to transport construction

materials, recyclables, lawn-care equipment, cleaning supplies, and even children. Bicycling is a very efficient, cost-effective, and environmentally friendly way of providing transportation. A separate bicycle route would also be much more conducive to use by such activities, and may even allow for use of it by other forms of alternative transportation such as gas-powered or electric scooters and carts such as those used by seniors.

Conclusions

A cross-town bicycle route that the separate from the flow of motorized traffic would clearly be the preferable option. It would be safer, healthier, and would provide a more leisurely environment for cyclists and other forms of alternative transportation. However, while this may be the preferred option, it may not be the most feasible one. We will now investigate whether this is the case or not.

Feasibility

We will now look at the practical considerations involved in the creation of a limited-access route for bicycles traveling between the North End and the Downtown. First we will look at how such a route could be constructed. While it may not be possible to close-off a street like Isleville to motorized traffic completely, in order to make allowances for access to homes and businesses located along the route, it may be possible to limit the access of motor-vehicles and control the manner of their operation. In the following discussion, we will therefore be focusing on the creation of a limited-access bicycle route as opposed to a bicycle-only route along Isleville Street.

Limiting the Access of Motor-Vehicles

As we have discussed, motor-vehicles can pose a significant danger to bicyclists. Every car parked on the side of the road has to be viewed as if it might start moving or that someone might get out of it. The same is true at every intersection. A car that is parked at a stop sign may not be waiting for you to pass. The driver may have checked for other cars and is preparing to pull-out into the street-right in front of you. In order to provide a safer route for bicyclists, as well as a more relaxing environment in which to cycle, as many of the streets connecting to Isleville should be blocked off to motorized traffic as possible. As it will likely prove necessary to maintain some access to Isleville for motorists, I suggest that blocking off 3 out of 4 of the intersections with other roads along Isleville would provide a reasonable balance between these two considerations. In order to reduce the impact of these closures and facilitate the most efficient flow of motorized-traffic as possible, perhaps a one-way system could be employed along the streets that will continue to have access to Isleville. One street could provide travel in one direction, another in the opposite. Two roads which are Atypical@ of this sort include Columbus and Stairs Street.

Controlling the Use of Motor-Vehicles

In addition to limiting the access of motor-vehicles to Isleville, traffic calming measures such as “bottle-necks,” swerves, and speed-bumps should be employed. Limiting the speed of vehicles on Isleville will create a disincentive for motorists to use the street for purposes other than local

access. It will also tend to decrease the length of the journey made by the average motorist along the route. As well, traffic calming measures will serve to keep motorists alert to the presence of bicycles and other kinds of non-motorized traffic as they are made to focus more closely on the road in the expectation of encountering such measures. Ideally, such measures should be designed to slow the speed motor-vehicles but not bicycles and other forms of alternate transport.3

Intersections

There are only a limited number of four-way stops and controlled intersections along Isleville. Wherever possible, I think priority-access should be provided to bicyclists for these intersections. Over or under-passes could be employed, but the cost would likely be prohibitive. Between Duffus Street and the Citadel, the only major intersections along Isleville occur with Almon, Young, and North Streets. At each of these intersections there are pedestrian-controlled crosswalk signals which provide priority-access to pedestrians, and many bicyclists likely already dismount to use these crossings. Therefore, providing the same for bicyclists should not have a significant additional negative impact on the flow of traffic in the area. Conversely, as there are only a limited number of such intersections, having to wait to cross one or two would not pose a significant delay for bicyclists traveling between the North End and the Downtown, either.

Street Parking

In some parts Isleville is used very lightly for street parking, whereas in others it used more heavily. Therefore, in some cases it will be relatively easy to deal with a reduction in the amount of available street parking whereas in other areas it will be more difficult.4 The difficulty of providing alternatives in these areas will depend on a number of factors. Private residences could provide their own additional parking spaces, or the surface of the road could be extended with the use of Arecessed parking spaces.5 There may also be other options available, such as limiting parking to one side of the street or issuing compensation.

Ultimately, it would be preferable to have no vehicles parking along the side of such a route for reasons that we have discussed. However, in areas where it is used more heavily for street-parking and where there may not be a lot of land available to provide alternatives, this may not be possible.

Conclusions

Limiting the access of motor-vehicles to Isleville Street, as well as their speed, would not pose any significant problems. Isleville has a low volume of traffic flow, and I would imagine that it is primarily used by residents and the customers of businesses located nearby. As residents, many of the drivers presently using the route will become accustomed to the changes and will be able to adapt their journeys accordingly without any significant inconvenience. As a residential street, provincial legislation governing the use of motor-vehicles states that vehicles should not be

3 See Appendix C.
4 See Appendix D.
5 See Appendix B.

traveling at full-speeds along Isleville, anyway. Under circumstances in which children might be expected to be playing in the area, a motorist is advised not to travel any faster than 30km/hr even though provincial laws state that the un-posted speed limit on any street is 50km/hr.

Therefore, traffic-calming measures will not have a significant impact on the flow of traffic; but will help ensure that vehicles are operated in a manner that would ensure the maximum level of safety and comfort possible for bicyclists traveling along the route, as well as providing a deterrent for the use of the street other than local-access where most journeys would be short.

There is a high volume of traffic along North Street; however, vehicles traveling along it encounter stops at Agricola and Gottingen Street. Providing a signal light with priority access for bicyclists crossing North Street from one side of Isleville to the other, for example, may or may not have a significant impact on the flow of traffic. As Isleville has a limited number of such intersections, the impact a bicycle-only route on the flow of traffic in the areas should be minimal.

In both cases, a bicycle route would be compatible with the existing patterns of traffic flow in the area. The biggest draw-back from limiting access to Isleville Street for motor-vehicles will be in the provision of street-parking. Ideally, it would be best for there to be no parked cars on Isleville Street if it were to be used as a bicycle route. As we've discussed, parked cars pose several dangers to bicyclists. Unfortunately, this may not be possible. Along some parts of Isleville where the street is not used heavily for street parking, this will not pose a challenge. In other areas where it is used more heavily for street parking, and where there may not be alternatives readily available, this could pose a bigger problem. However, in winter residents all over the HRM have to adapt to the loss of their street-parking for several months. As we have seen, there are several ways in which this problem could be mitigated. It may be possible to limit the inconveniences posed to residents and business in the area that make use of street-parking while providing bicyclists with a safe route where they will encounter only a limited amount of parked cars.

Costs

The creation of any bicycle route will involve costs. It is in consideration, then, of the alternatives that we must measure the costs of providing a limited-access bicycle route along Isleville.

<u>Limiting Access and Traffic-Calming</u>

Blocking off 3 out of 4 roads with access to Isleville Street will be relatively inexpensive and can be achieved using ready-made concrete barriers available for such purposes. Traffic calming measures such as speed bumps and bottle-necks, on the other-hand, will require modifications to the road-surface. In addition to modifications to the road-surface, street signs will need to be posted along the route informing motorists that it is intended primarily for use by bicyclists. Signs will also need to be posted along routes which intersect Isleville Street and where motorists might possibly be affected by the route or would benefit from advanced warning of its presence.

<u>The Loss of Parking Spaces</u>

The biggest cost will be in dealing with the loss of street-side parking. In areas where the road is not heavily used for street-parking this isn't a big consideration. In other areas this may provide more of a challenge. Do residential properties in these areas have enough space to provide alternatives? If not, I think that the city should either invest in alleviating these inconveniences or providing compensation to residents along the route so they can provide their own alternatives.

Conclusions

Blocking off access to Isleville for 3/4 of roads that intersect with it should not be that difficult. Cement barricades can be bought pre-made and simply have to be lowered into place. Basic modifications to the road surface such as speed bumps should not be too costly, and bottle-necks, if employed, would involve re-surfacing and modifying only short portions of the road. All of these modifications would be quite cheap compared to the costs involved in modifying and resurfacing the entire length of a street like Agricola. Widening such a road would be a massive undertaking, and the construction would provide a significant inconvenience to motorists. Parking spaces are already limited along Agricola, and eliminating half of them by closing one side of the street to parking would likely place a big burden on businesses operating in the area. Widening Agricola would mean that the entire length of it would have to be resurfaced. In contrast, any work done to Isleville could be done in a piece-meal fashion with minimal disruption to traffic.

The largest single cost involved in converting Isleville into a limited-access bicycle route would be in dealing with the provision of street-side parking spaces. The loss of street-parking could be a significant inconvenience to many of the people living along Isleville Street. It therefore seems fair for the city to compensate these residents for this inconvenience or to find ways of mitigating it. Recessed parking spaces, for example, will incur construction and road resurfacing costs. The compensation of residents may take the form of payments towards providing alternative parking spaces, such as extending driveways, or providing parking spaces through a rear entrance to their properties. All of these options will incur costs. However, the cost of providing these alternatives on Isleville will likely be less than providing them on Agricola St. For instance, some properties along Isleville Street, particularly in areas where it is used most frequently for street parking, have service roads at their rear for garbage collection and other such purposes. Many of the residents who park on Isleville would tend to do so for longer periods than those parking along Agricola St. Five minuets spent searching for a spot represents a much bigger waste of time for someone who is going to park their car for only 10 minuets opposed to someone who is parking their car for several hours or over-night. The loss of street parking on Agricola would likely prove, therefore, to be a bigger burden than it would on Isleville Street. Depending on how heavily it is used, and what alternatives exist, creating a few recessed parking spaces and providing compensation may be much cheaper than expanding and resurfacing the entire length of Agricola St.[6,7]

Conclusion

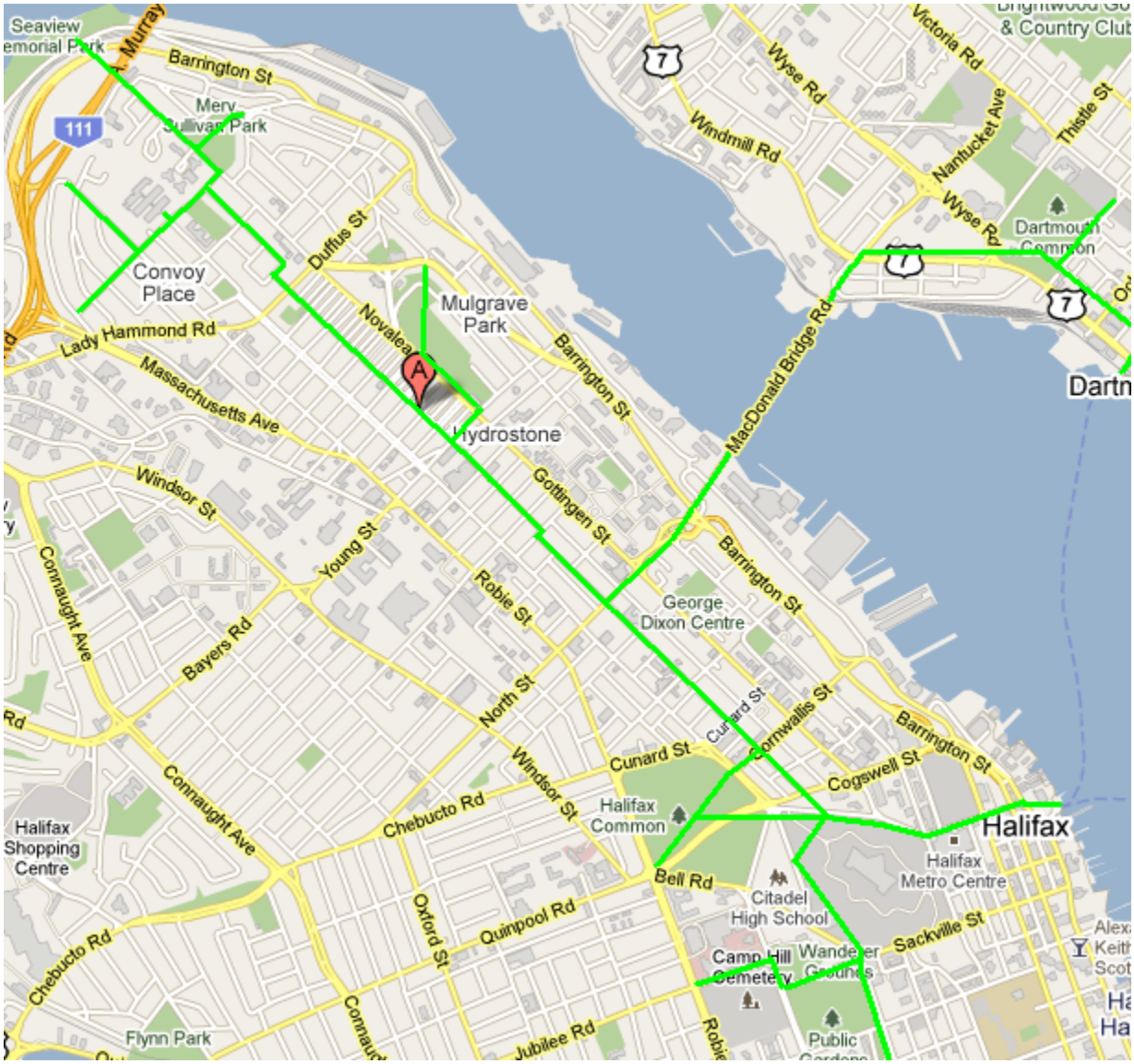
6 See Appendix D
7 See Appendix E

Based on our analysis, a separate bicycle route between the North End and Downtown would be better for the health and safety of bicyclists. It would also provide better options for leisure and exercise. In comparison to a route along a shared road, a bicycle-only route may provide more opportunities for use by non-enthusiasts or casual bicycle riders, as well. A separate bicycle route may also potentially be used by other alternative modes of transportation such as scooters or cross-country skiers in the winter. Increasingly, bicycles are also being used to haul wagons or trailers. I would not be comfortable putting my child in a bicycle-trailer along a route that is shared with cars. However, I would be happy to do so along a route that is separated from the flow of motorized traffic. I have also seen bicycle trailers being used to haul lumber and other construction materials and for taking bottles to the recycling center. Given the importance of reducing greenhouse gas emissions to address the issue of global warming, I think such things represent positive developments which should be encouraged.

Based on our analysis, the creation of a limited-access bicycle route between the North End and the Downtown would not be difficult. Most of the modifications could be performed using ready-made materials, such as concrete barricades. Other modifications, such as speed bumps, bottle-necks, or recessed parking spaces would require minimal amounts of construction and could be done in a piece-meal fashion as opposed to expanding and resurfacing the entire length of Agricola Street. Agricola is already a narrow street with little room for street-side parking *and* the flow of two-way traffic. Agricola is also home to more businesses for which street parking is crucial. Finding alternatives to these parking spaces or restricting the flow of traffic along a busy route like Agricola would have much greater negative consequences than it would on a relatively low-traffic street like Isleville, as would any construction involved. Therefore, I think the best option would be the creation of a limited-access bicycle route along Isleville Street. It would be better for cyclists and would have less of an impact on motorists. There are some challenges involved in the creation of such a route, but these would not be greater than those encountered on a busy route like Agricola, the greatest of these being the provision of parking spaces.

Appendix A

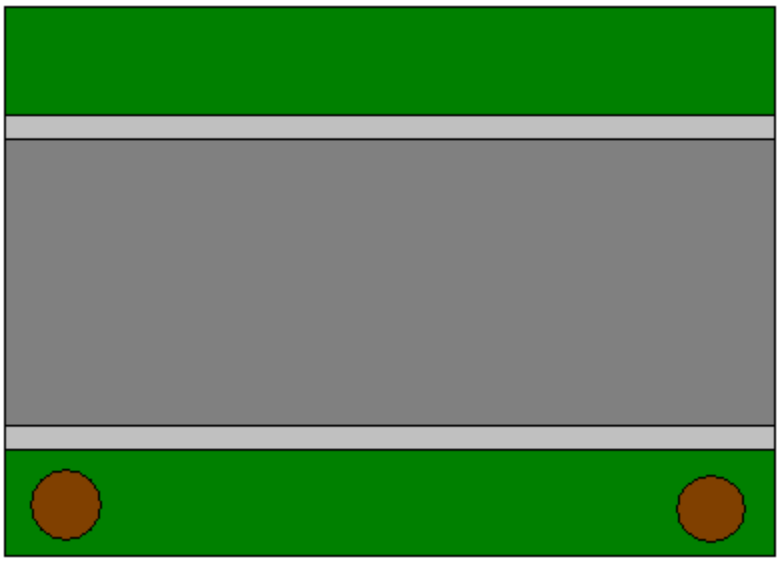
The Proposed Limited-Access Route Along Isleville



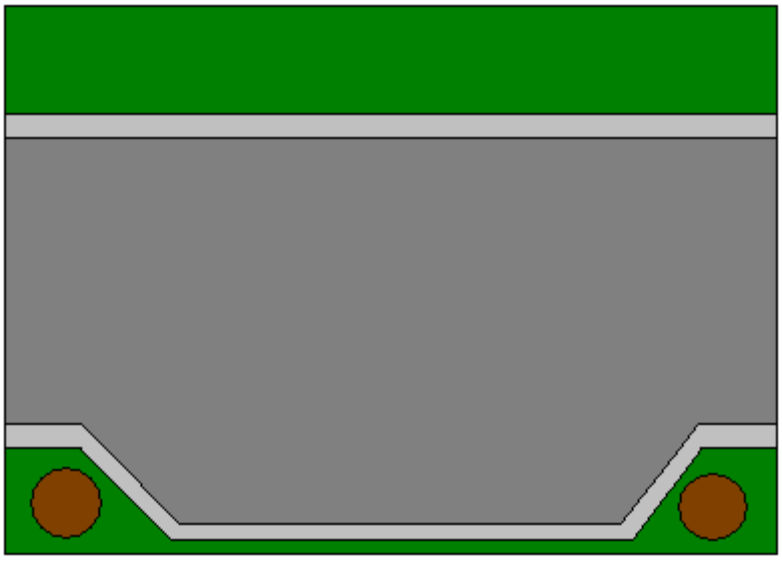
A limited-access bicycle route along Isleville, in conjunction with Fuller Terrace and Maynard Street, will place cyclists within reach of the NSCC's Institute of Technology Campus. Also shown are routes either through public properties, such as the Citadel and the Common, or quiet streets and existing bicycle routes that cyclists could use to connect to the rest of the city.

Appendix B

A Road Surface Without “Recessed Parking Spaces”

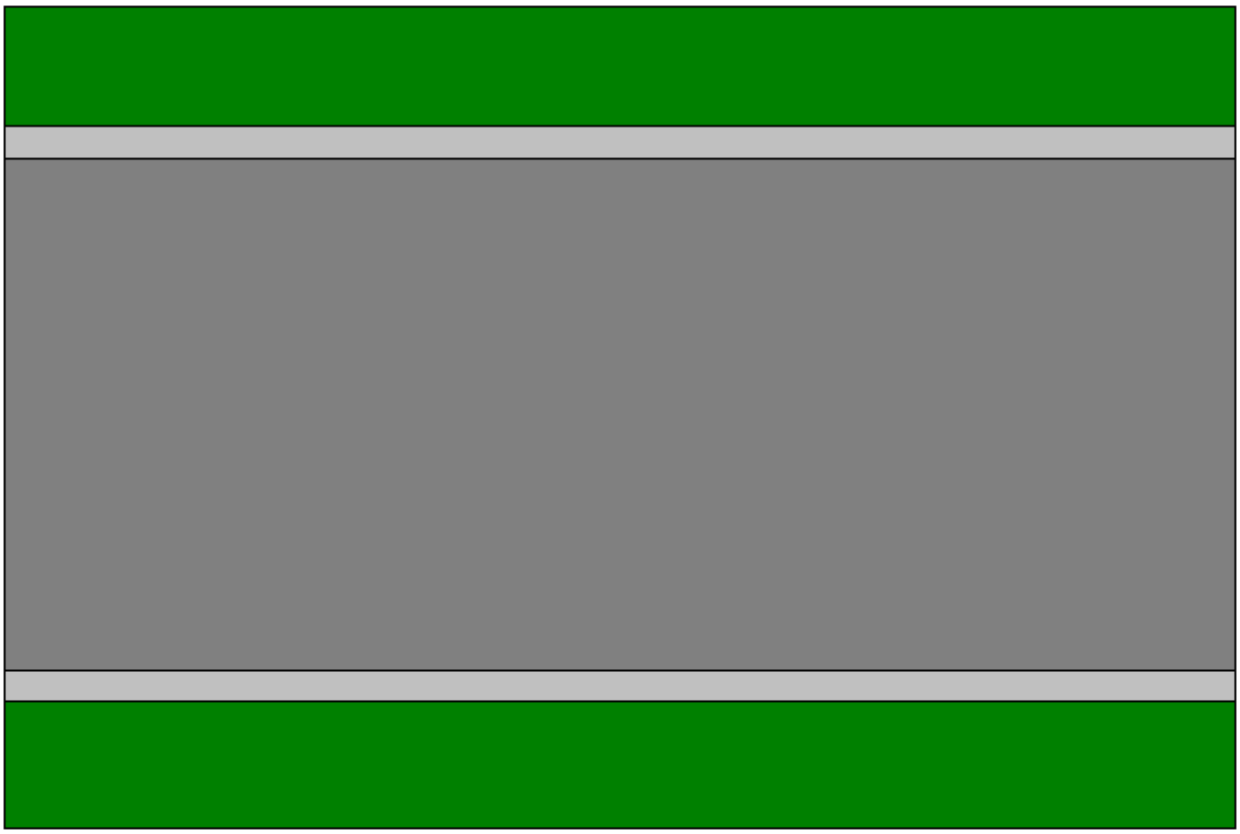


A Road Surface With “Recessed Parking Spaces

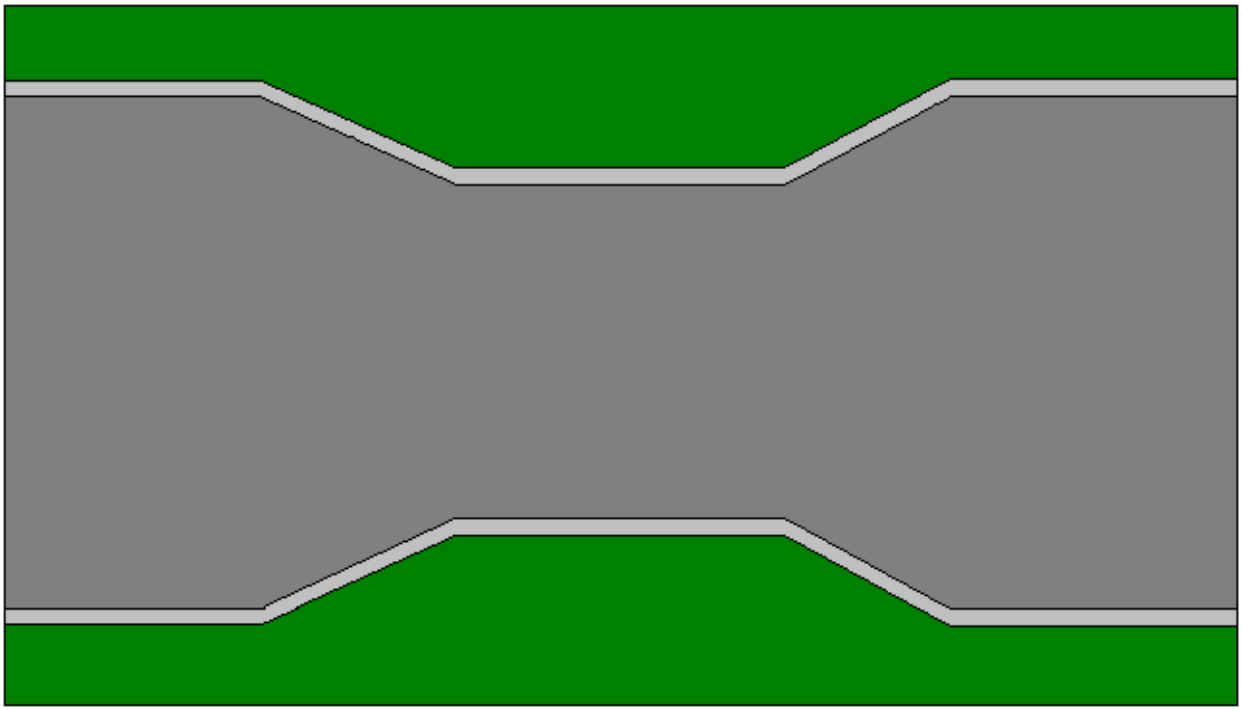


Appendix C

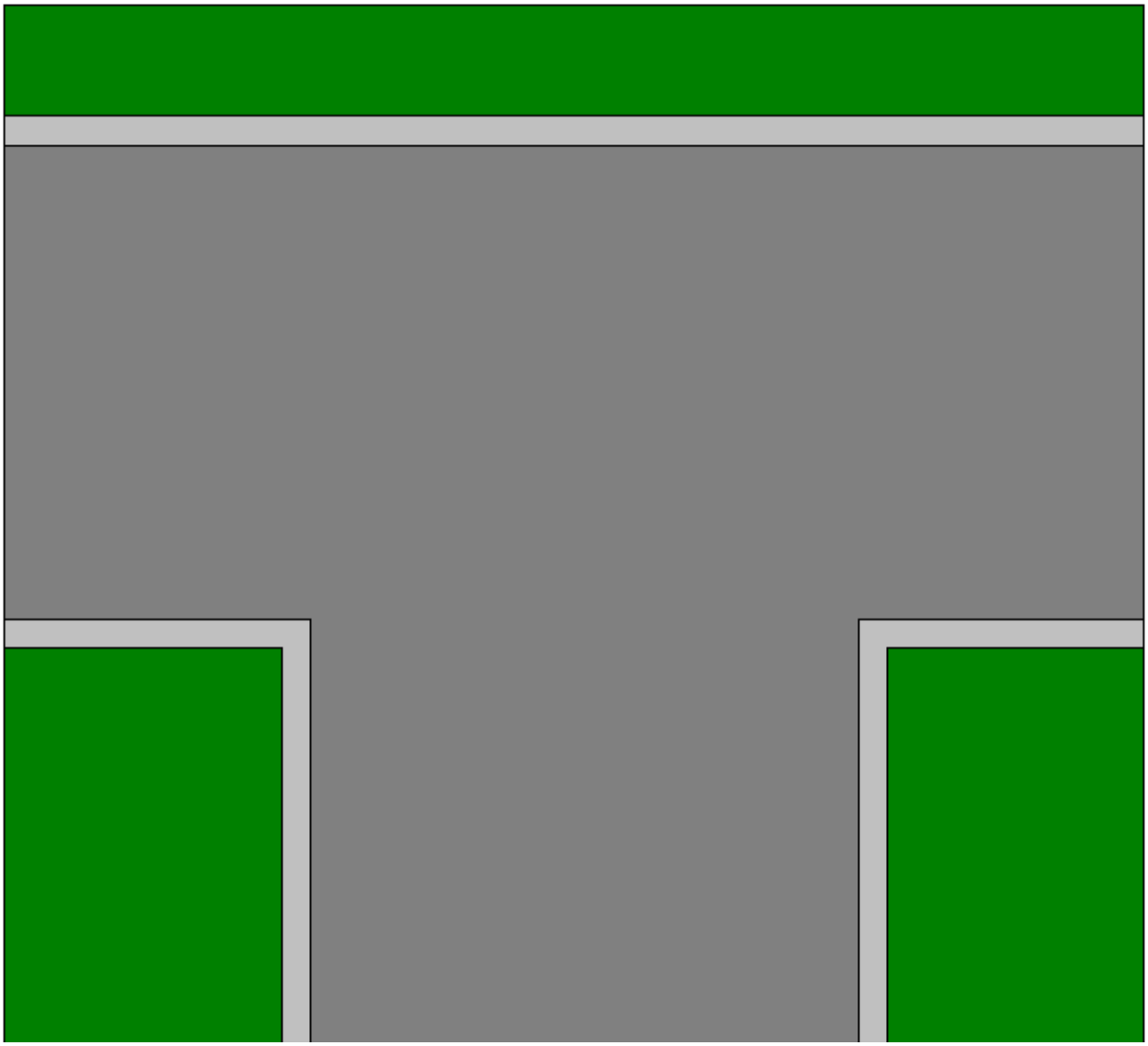
A Road Surface Without a “Bottle-Neck”



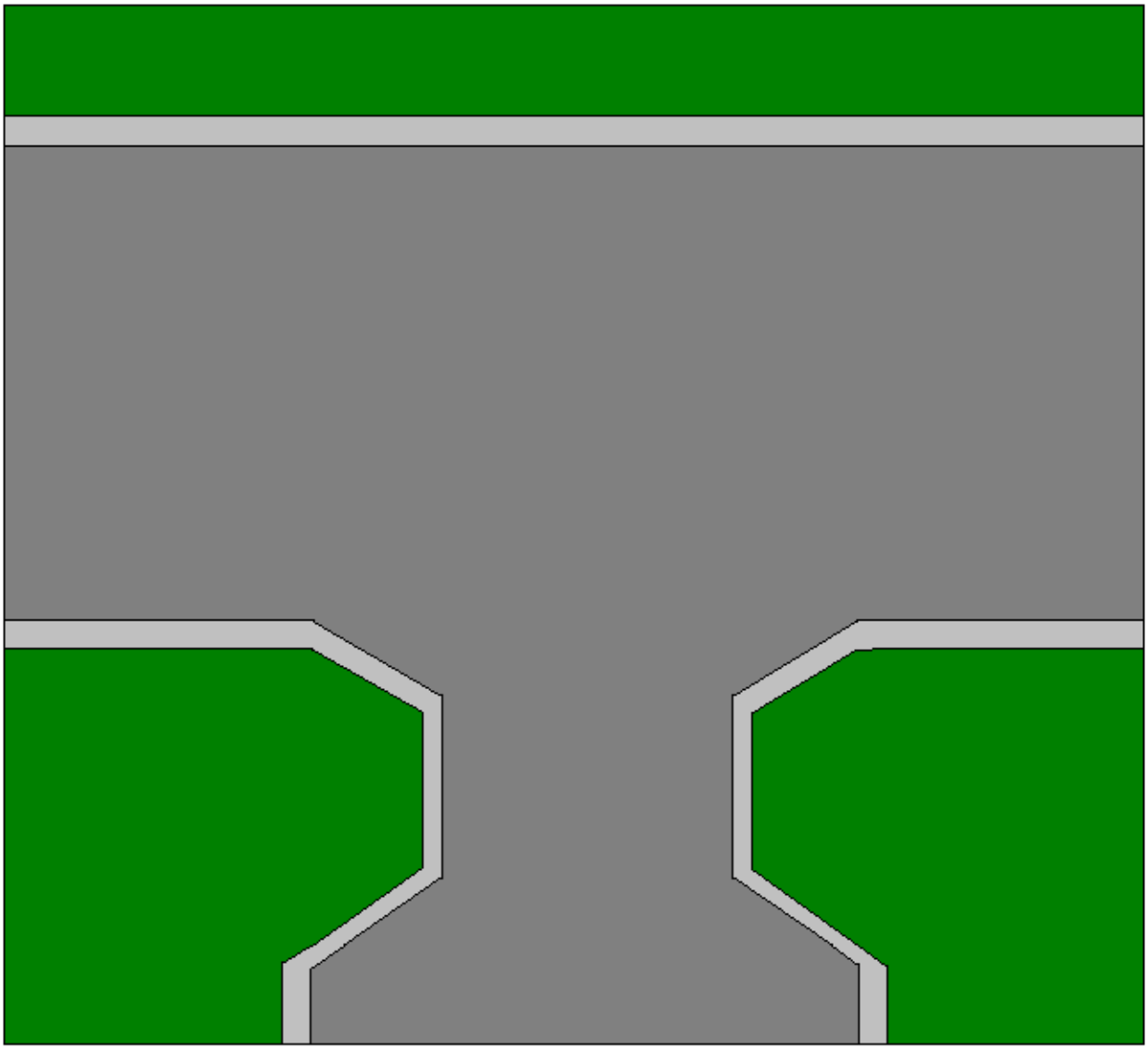
A Road Surface With a Bottle-Neck



An Intersection Without a Bottle-Neck



An Intersection With a Bottle-Neck



Appendix D

Street-parking Along Isleville

Isleville above Merkel Street
December 14, 2010 at 3:15pm

Isleville below Livingstone Street
December 14, 2010 at 3:20pm

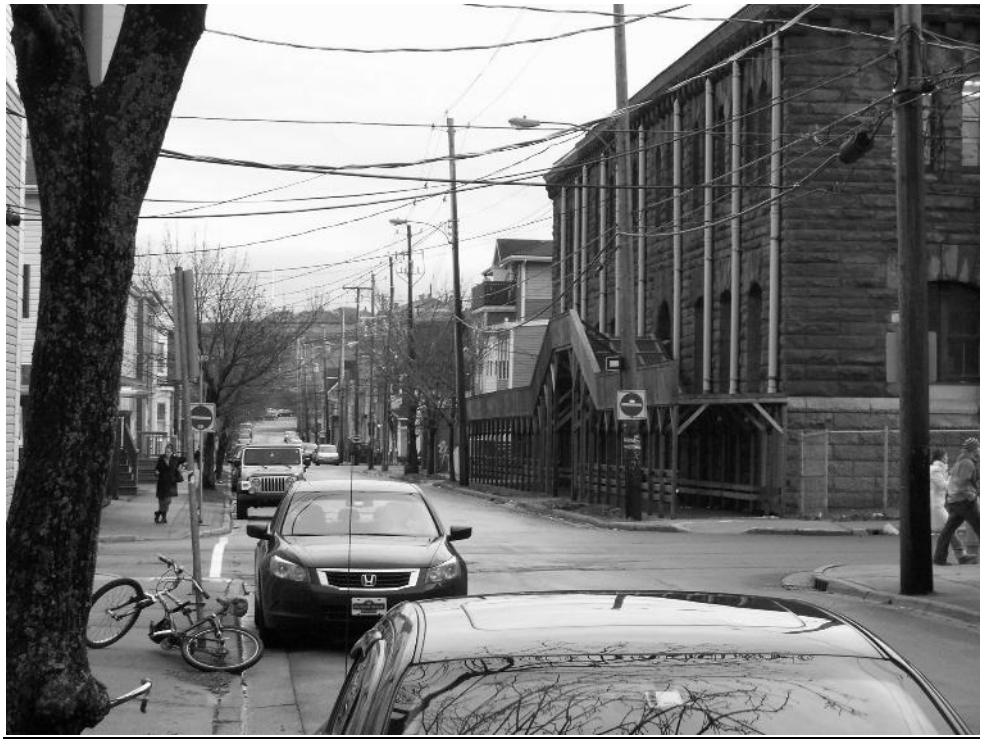
Isleville across from Oland's
December 14, 2010 at 3:25pm

Isleville above Macara Street
December 14, 2010 at 3:30pm

Fuller Terrace below Ontario Street
December 14, 2010 at 3:35pm

Isleville above Charles Street
December 14, 2010 at 3:40pm

Maynard above Harris Street
December 14, 2010 at 3:45pm



Maynard above Cunard Street
December 14, 2010 at 3:50pm

Rear access to Fuller from Belle Aire Terrace

Rear-access to properties along Maynard could
be provided from Buddy Dave Street

Employee parking at Oland's Brewery on Russell Street
December 17th, 2010 at 1:15pm

Analyzing these photographs produces some interesting results. For example, we can see that there are three areas in which Isleville is used heavily for parking. These include the sections behind Oland's Brewery, Fuller Terrace, and Maynard below Harris Street. The other sections include the parts of the route between Duffus and Young, Young and Bloomfield, and North and Harris Streets, along which is only light to moderate use of the street for parking.

There are only five buildings on the right-hand side of the road between Cabot and Merkel Street. Each of these has a private driveway with lots of room for parking. The houses on the left-hand side of the road are part of the Hydrostone development and have private driveways and additional parking spaces available to them on the streets that connect to Isleville, in addition to a service entrance and their rear. Therefore, in this area, we can eliminate one side of the street from our considerations, or 50% of the available street parking. Even though there are a number of alternatives available to residents on both sides of Isleville Street in this area, it will likely be necessary to provide some street-side parking spaces. As we can see from the photographs, there are only a couple of cars parked on the street in this section, anyway. Therefore, two recessed spaces on Isleville Street between Merkel and Cabot should provide enough parking.

An alternative to constructing recessed parking spaces might be to simply provide the owners of the buildings in a section such as this with some kind of compensation. Such compensation could include one-time cash pay-outs related to construction expenses incurred in increasing private parking spaces, or it could involve an annual break on their property taxes. In these cases, it might prove cheaper to provide compensation to the building owners than engaging in road-work. Compensation could also be used to reduce the amount of needed road work.

In the other areas, the negative impacts of a ban on parking could be moderated by more extensive use of recessed parking spaces and other alternatives. An extreme example of these alternatives would be the purchase and demolition of a building to provide additional parking spaces. This would be an expensive option, but it would serve to maintain current levels of parking and hence limit the negative impact of a ban on street-parking. We will therefore take this as an example of the maximum costs of mitigating the negative impacts of a loss of street parking to the residents and businesses along Isleville. A home can be purchased in the North End for under $330,000. There are three areas in which Isleville is heavily used for parking. Therefore, the total cost of mitigating completely the loss of street-parking would be $1,000,000. Compared to these purchases, the construction of individual recessed parking spaces is not significant and we will, therefore, use this figure to provide an approximation of the maximum cost in mitigating the loss of street parking along the entire length of Isleville Street. Depending on the extent to which alternatives will need to be found, the actual costs may be substantially lower than this.

As we have seen, the section behind Oland's is used quite heavily for parking. Presumably, most of these vehicles belong to the workers at the brewery. It is possible that with a limited-access bicycle route in existence along Isleville more workers at this factory will chose to ride their bikes to work, reducing the need for street parking. However, it is also important to note that Oland's does provide its own parking spaces to its workers. There is a parking lot on Russell Street that is seldom more than half-full during the day. The buildings on the other side of the street in this

section also have their own parking spaces. One has parking at its rear, another has underground parking. Therefore, there is no need to provide compensation or even a significant amount of recessed parking spaces in this area. As such, we can eliminate 1/3 from our total costs.

To assist in this analysis, I will break the section along Fuller Terrace into two parts. Nine out of 11 buildings on the left-hand side of the section of Fuller Terrace that is furthest from Downtown have their own driveways. On the other side of the road there is a church and a park. Along this section, there are only a few cars parked on the road. Further down Fuller Terrace, however, there are many more parked vehicles. On the right-hand side, heading towards Downtown, I counted a total of 32 parked cars. On this same side of the road there are 21 buildings. Out of these, four have space for a driveway. However, these properties also have a service entrance at their rear with spaces available for parking. On the left-hand side of the road there were 9 parked cars, and five of the buildings had room for parking at their rear. Along both sides of this section, a visual inspection reveals that there is room for the creation of roughly 34 recessed parking spaces-a loss of only 7 spaces from the number of cars presently parked on the road. Therefore, there is no need to do extensive work to provide alternative parking spaces in this section, either. Some recessed parking spaces could be created and perhaps compensation issued to the owners of these buildings for the inconvenience of having to use the rear of their buildings for parking. However, providing alternatives as the result of a ban on street parking should not prove too difficult.

In the section below Harris Street, facing towards Downtown, there were 20 parked cars on the left-hand side of the road. However, there is only room for the creation of approximately 13 recessed parking spaces, leaving a deficit of 7. One thing that is interesting to note in the picture is that all the vehicles are parked on the left-hand side of the road. While this is a one-way street, this is not the case along Fuller Terrace which is also one-way. Of the houses along the left-hand side of the road, only two have room for a driveway, although all of the buildings have a backyard. It may be possible to create a rear entrance to some of the properties. In this case, a number of additional parking spaces could be created. There is also an empty lot on the right-hand side of the road in this section. Another option would be for the city to purchase this lot and subdivide it. Taking 1/5 of this lot would create many parking spaces. Assuming a purchase price of $500,000, the cost of providing these spaces would be 1/5 x $500,000=$100,000. It should also be noted that one driveway can serve two buildings. If the land is already in use, this would come at no additional cost. Offering compensation may create the situation where one neighbor can simply take the amount offered to them and exchange it with another for their parking. A number of parking spaces may be created in this manner. While this section of Isleville will pose the greatest challenge when dealing with the issue of street parking, the creation of recessed parking spaces and 7 additional spaces through the purchase of the empty lot could completely deal with the issue.

Therefore, based on our analysis, we can eliminate up to 2/3 of the major cost considerations involved in mitigating the loss of street parking along the sections of Isleville where it is most heavily used for these purposes. From a maximum of $1,000,000, we have been able to provide alternatives for the majority of parking spaces along Isleville for less than $330,000.

Considering our discussion of compensation and the creation of recessed parking spaces, it may be

interesting to attempt to arrive at a more precise figure for the total costs of mitigating the loss of street parking along Isleville. It would also be interesting to compare the total costs involved when considering the different alternatives. Is it cheaper to provide compensation, which could be used to either create or purchase additional spaces, or to provide them by purchasing a piece of land?

Taking the section below Harris Street as an example, simply providing $200 of annual compensation to the owners of the 32 buildings along the street would cost $6400/year. Along this section, there are two buildings with driveways. If the driveways are shared, this will create parking spaces for up to 4 buildings. If this number were increased through the sale of parking spaces, the number could be increased to a maximum of parking spaces for 8 buildings. I will estimate the cost of the construction of a single "recessed parking space" at $2000. This will involve creating a new curb and resurfacing a section of the road. Creating 13 recessed parking spaces, therefore, would cost $2000 x 13=$26,000. Creating 13 recessed parking spaces, at a cost of $26,000, and issuing $6400 of annual compensation would provide alternatives for all of the parking spaces presently located in this section. As we have discussed, purchasing a piece of property for $100,000 could also provide many additional spaces, perhaps as many as 15. Based on a 25-year fixed rate mortgage at 8.5%, the annual payments would be $8400. In this case, only 5 recessed parking spaces would need to be created along Maynard.

As we have discussed, 50% of Isleville can be eliminated from consideration in relation to street-parking between Duffus and Young Street because of the buildings which belong to the Hydrostone development. The houses on the other side of the road all have their own driveways and a considerable amount of yard-space. In addition, this part of Isleville is presently used only lightly for parking. We estimated earlier in this analysis that two recessed parking spaces will be necessary between a section like Cabot and Merkel. There are 10 such sections between Duffus and Young Street, therefore this part of Isleville will require a total of 20 recessed parking spaces. The provision of recessed parking spaces along Isleville between Young and Bloomfield Street is not critical. Perhaps 10 recessed spaces will need to be created in this section. Along Fuller Terrace, where the buildings on one side of the road have a rear-access, and a number of buildings have room for a driveway off of Fuller, it will not be necessary to create large amount of recessed parking spaces here, either. There is room for 35 recessed parking spaces in this section, but perhaps the HRM will only need to construct 15, or so. The only section of Maynard that is used heavily for parking is between Harris and Cunard Streets. There is room for 13 recessed parking spaces, and additional parking may be created through alternative mechanisms.

As such, between Duffus and Cunard Streets, a limited-access bicycle route will require the construction of 20 + 10 + 15 + 13=58 recessed parking spaces. In addition, providing parking between Harris and Duffus Streets will require an annual payment of at least $6400. As we have seen, it was marginally cheaper to provide compensation than mortgage a property for this section. However, in order to arrive at a figure for the total costs involved, I will use the purchase price of $100,000 for the property. 63 recessed parking spaces at $2000 each will cost $116,000. In addition, purchasing a property or using some other mechanism of providing an adequate number of parking spaces along the section between Harris and Cunard Street will be necessary. Therefore, the total costs of mitigating the negative impacts resulting from a loss of street-parking along the

entire length of Isleville should be somewhere in the range of $116,000 + $100,000=$216,000. As such, the loss of street-parking along Isleville might actually be quite cheap to address.

Any compensation that is issued should be looked at as a cost saving measure. Is it possible to lower the total costs of providing alternative parking spaces by issuing compensation instead of engaging in more costly road-work? Compensation would also create opportunities for profit in the cases where one neighbor may have surplus yard-space which can be used to create additional parking spaces. As we have seen, the costs of providing compensation in one section were lower than that of mortgaging a property over a certain period of time. The problem with compensation is that it can result in "free-rider" problems. Some people may not find the loss of their street-parking an inconvenience at all. Therefore, they would consider any compensation they receive as a "wind-fall," and it would have no effect towards the provision of additional parking spaces. Such problems are difficult to avoid entirely, and may be small compared to the total savings. But, if they are wide-spread, they can result in substantial costs that can otherwise be avoided.

It is also important to note that, while we have been dealing with the negative aspects of a limited-access bicycle route along Isleville, there are benefits for building owners. A limited-access route will create less noise and less pollution than one used primarily by motor-vehicles. It may also provide ascetic or recreational benefits.

While taking pictures, I did not notice a lot of vehicles traveling along Isleville, except in some areas. I did notice, however, a large number of courier, Canada Post, and delivery trucks traveling along Isleville. These appeared to either be making local stops or using the road as a means of completing a larger journey. The two areas where I did encounter some traffic were at Isleville and Macara and at the intersection of Maynard and Buddy Dave Streets near Harris Street. The traffic from Macara was coming mostly off of Gottingen, and the traffic along Isleville was coming off of Almon Street. I would venture the guess that this represented connecting, not local, traffic.

One way, therefore, to reduce the flow of this kind of traffic along Isleville would be to improve the traffic connections along the routes which feed into Isleville. With improved connections, this traffic may simply divert to alternate routes. Limiting the flow of motorized-vehicles along Isleville will have some negative impact, but this can be moderated. Delivery trucks will still be able to use Isleville, but they will have to travel at lower speeds. While this may represent a slight inconvenience for motorists, it represents a big benefit to cyclists. Therefore, on the balance, I would argue that the interruptions to traffic flow are out-weighed by the benefits. As we have also discussed, there are benefits for motorists to consider. Obstructing the flow of motorized traffic along Isleville is probably much less of an inconvenience than it would be along Agricola Street.

As we have noted, the cars parked along the section of Isleville below Harris Street were all parked on the same side of the road, although this was not the case along Fuller Terrace which is also a one-way street. One-way traffic might offer additional safety to bicyclists. For bicyclists traveling in one direction along the route, all the motor-vehicle traffic would be coming towards them. All the cars pulling out into the road would also be facing them. This would make it more likely that a bicyclist could be seen by a motorist. Along a section like the one between Harris and Cunard,

where it is more difficult to provide alternatives to street parking, perhaps a one-way system for motorized traffic that involved parking on only one side of the street could provide a reasonable trade-off between the safety of bicyclists and the costs of providing alternative parking spaces.8

Appendix E

Compensation can be used for different purposes. It can offset negative consequences, and it can be used to achieve equality. Notions of 'equality' or 'fairness' are important to human beings, and under certain circumstances humans will value 'fairness' as much as the receipt of additional income. A project that requires unanimous community support can fail because of disproportionate negative consequences or an unequal distribution of the benefits.

In the following analysis, I will use two models to demonstrate the use of compensation to offset negative consequences and to achieve equality. I will assume that there are 1000 residents within a particular municipality. There is a project under consideration that will have benefits worth $10 to each resident. However, 100 residents will also suffer negative consequences worth $10, each.

Therefore, the project will generate:

1000x$10=$10,000 worth of benefit.

100x$10=$1000 worth of negative consequences.

The net-benefit of the project will be $10,000-$1000=$9000.

1.) The use of compensation to off-set, or distribute, negative consequences:

900 residents will each receive $10 of benefit from the project with no negative consequences. As such, the net benefit of the project to each of them will be $10-$0=$10.

100 residents, however, will each suffer $10 in negative consequences in addition to receiving $10 in benefits from the project. As such, the net benefit of the project to them will be $10-$10=$0.

In this case, we would expect the 900 residents who do not suffer negative consequences to support the project while the 100 residents who suffer negative consequences to be indifferent between supporting the project or not. Some may chose to support it, but they have no incentive to.

2.) I will now examine the effects of compensation. Each of the 900 residents who gained $10 in benefits from the project will now pay $1 in compensation to those who suffered the negative consequences caused by it, amongst whom this money will be distributed equally.

The total amount of compensation collected will be: 900 x $1=$900.

8 Much of what we have talked about in this section can be seen at www.maps.google.ca/streeview

The amount of compensation paid to each of the 100 residents will be: $900/100=$9.

The net benefit for each of the 900 residents who will not suffer any negative consequences from the project will be: $10-$1=$9.

The net benefit for each of the 100 residents who suffered negative consequences from the project will now be $10 + $9 -$10=$9.

In this case, the benefits of the project will be the same for both categories of residents. Each will benefit by $9 and we would expect there to be unanimous support for the project.

2.) Returning to the first example, I will assume that the 100 residents who suffered negative consequences because of the project will now receive an extra $1 in benefits from it. This could be because the residents live closer to the project and therefore receive additional benefits from it.

Each of the 900 residents will still receive a net benefit of $10-$0=$10.

Each of the 100 residents will now receive a net benefit $11-$10=$1.

While the 100 residents will receive a net benefit of $1 from the project, they still may chose to oppose it because they feel that this outcome is "unfair." While they have benefitted from the project, others have benefitted from it more.

In this case, compensation can be used to achieve equality between these two outcomes:

If 900 residents each pay $1, their net benefit from the project will be: $10 -$1=$9

If this amount is then divided equally between the 100 residents, each will receive: $11+$9-$10=$10.

Both groups now benefit from the project almost equally, and we would now expect there to be no opposition to it based an 'unfair' distribution of its benefits.

Compensation can be used to mitigate the negative consequences of a particular project, especially when that project has positive benefits for a large number of people but has negative consequences for a small number of people. In this case, compensation distributes the negative consequences of the project amongst the entire community. Compensation can also be used to achieve equality of outcomes. In the second example, both groups benefitted from the project, but with one group benefitting considerably more. In this case, compensation distributes the benefits of the project.

In both cases, 'fairness' is important. We should, therefore, not only consider the costs or benefits of a limited-access bicycle route for particular members of the community, but also the relative costs or benefits of it to them. The issue of compensation may directly relate to the success or failure of the project; even in the case where all groups benefit but one group may benefit more.