JOURNAL OF PUBLIC TRANSIT IN OTTAWA

JPTO

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This issue:

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From the Editor

There probably hasn't been an issue in the recent past that has been as divisive as public transit. No matter what the specific issue—service, labour relations, infrastructure planning, scheduling, fares, or all the rest—just about every citizen has an opinion, and they run the gamut. We've seen the two most recent municipal elections feature public transit as one of the main issues -- if not the primary issue -- and we can expect more of the same during the next campaign this fall.

This all brings up a good question: At what point do we say that enough is enough, and get down to brass tacks about improving our public transit system? There is little doubt that citizens – even the most engaged – are becoming fatigued with the constant barrage of "options" for upgrading our transit system. The city needs a mayor (and a mayoral campaign) that renews interest and sparks optimism for the future of our transit system. Citizens will be looking to mayoral candidates to provide intelligence, rationality, and sensibility on the transit file, and aren't interested in hearing what the city can't or won't do. There was enough of that last election; this time, people want to move forward.

The merits and demerits of Ottawa's current transit plan have been debated at length: it's expensive, but the capacity upgrade is significant; it doesn't (necessarily) serve new riders, but it does allow those who use it to do so more predictably. The arguments have been made, and the councillors made a decision – what they were elected to do. The new city council, no matter how similar or distinct it is from the current group, needs to respect the decision that's been made and move forward with it. The city can't afford to take another step back, because time is one thing we can't get back.

Public transit can be an amazing thing. A proper public transit system isn't just a way of getting people from point A to point B. It's a real, physical asset a city can rely on and, in some cases, brag about—Ottawa spent many years legitimately bragging about its bus rapid transit, one of the continent's best. More than that, though, a good public transit system unites a city—something that would benefit a city as diverse as Ottawa. Our city is large and growing, and it runs the spectrum of rural, urban, suburban, and exurban. There is a very real divide right now between urban and suburban citizens, and it's a result of more than the physical boundary set out by the Greenbelt. There is a psychological barrier in our city, and that stems from the lack of reliable, consistent mobility between all of its neighbourhoods.

The articles in this journal present many different ideas that could arguably improve public transit in the City of Ottawa. We look at options within Ottawa and the surrounding area: how alternative revenue sources can grow transit budgets; how we can take advantage of our unique standing as the National Capital Region and include the City of Gatineau in future plans; how the city can integrate cycling into its public transit system; and how we can expand the system's sphere of inclusion to neighbouring communities, such as Cornwall or Smiths Falls. Going even further, we take a look at how the city can use the public transit system to complement a high-speed rail corridor in our economic mega-region. It's also important to take lessons learned in the past, too; contributors also take a look at the outcomes of decisions Ottawa has made and how we can learn from them, as well as lessons we can learn from sister cities, including Edmonton and Waterloo, as we move forward with an expanded transit plan.

In the end, there is no shortage of options when it comes to building and growing a public transit system. The key is in identifying your city's priorities and building a transit system that helps meet them. That the citizens of Ottawa can be so passionate about public transit is not a bad thing – it's quite the opposite. More important than the final decisions are the discussions that produce them, because the more people that have been involved in the process, and the more educated they are on the underlying issues, the more reflective that final choice will be of what residents want from their tax dollars. And Ottawa's public transit system will, in the long run, be better for it.

Peter Raaymakers
Managing Editor, Journal of Public Transit in Ottawa

The road ahead:

Light-rail technology lessons learned in Edmonton and Waterloo

By Scott Hindle

As Ottawa looks to make the switch to light-rail transit, observers continue to raise questions about the potential for such a system in the city and how it will affect life in the city. Both the existing LRT system in Edmonton, Alberta and the planned LRT in Waterloo, Ontario provide parallels that can inform Ottawa's attempt to build a network to serve its own needs.

Edmonton

Similar in population to Ottawa, Edmonton is the capital of Alberta and currently has approximately 783,000 residents. The area's wider metropolitan population is more than one million (Edmonton Economic Development Corporation, 2009).

The City of Edmonton was the first city in North America to develop an LRT system and continues to be the smallest metropolitan area in North America to operate electric LRT. The city's high-floor LRT route, opened in 1978 for the Commonwealth Games, was created only five years before Ottawa's Transitway and has been extended numerous times (City of Edmonton, 2009). It features a single route that terminates in the northeast at the suburban Clareview station. It runs along a former railway corridor towards the downtown core, where it runs approximately two stories below grade underneath Jasper Avenue. Once through the city centre, the line turns south and crosses the North Saskatchewan River towards the University of Alberta, which also has an underground station. In the summer of 2009, the line began extended service south by two stations. Two additional suburban stations, are slated to open in April 2010 (City of Edmonton, 2009).

Trains operate at a maximum speed of 70 kilometres per hour and run every six minutes during peak hours (City of Edmonton, 2009). The LRT has become an integral part of Edmonton's transit network. Major sports and entertainment venues that are heavily used and located along the line include Commonwealth Stadium, the home of the Edmonton Eskimos football club; Rexall Place, home of the Edmonton Oilers; and Northlands, a large convention facility that houses the annual Edmonton Exhibition. Currently, an average 53,540 passengers ride the LRT every day out of a total of 228,300 average daily transit users (City of Edmonton, 2009). The expanded system is projected to double average weekday LRT ridership alone to 100,000 (City of Edmonton, 2009). Most suburban stations integrate bus transfer stations as well as park and ride lots to expand their service area and better integrate within the city's overall transportation network.

Planning for four additional LRT lines is currently in various stages of completion, with the North line already under construction and slated for completion in 2014 (City of Edmonton, 2009).

Waterloo

Waterloo Region is one of the fastest growing communities in Canada, with a population of 500,000 people that is forecast to grow as high as 729,000 within the next 25 years (City of Waterloo, 2009)

Construction of an LRT line along the central corridor of the cities of Waterloo and Kitchener is slated to begin in 2012 and be completed by 2014. The route runs along city streets as well as existing rail lines that run throughout the city. In many cases roadways will be reduced to two lanes from four to accommodate dedicated rail alignments that only interact with vehicular traffic at intersections. Various existing rights of way are used based on their proximity to important employment

centres and destinations, their ability to support redevelopment and intensification as well as through cost considerations. The proposed line stretches through the region's central corridor and is projected to carry 31,000 passengers daily by 2041 (Region of Waterloo, 2009).

A modified bus rapid transit route is currently in place along the proposed LRT route and is by far the city's busiest bus route carrying a significant percentage of average daily ridership. It was implemented for two reasons:

- To test the feasibility and ridership along the core route, and
- To get residents used to greater station spacing, in preparation for a more permanent system.

By choosing LRT over an expanded bus rapid transit system, the Region of Waterloo found that "the benefits associated with LRT are more than double those of Bus Rapid Transit, although the costs of LRT are higher" (Region of Waterloo, 2007). Interestingly enough, it also states "LRT has much greater potential to attract transit ridership and to shape urban form than BRT" (Region of Waterloo, 2007). Once its electric LRT is complete, the Region of Waterloo would be North America's smallest metropolitan area to implement such a system.

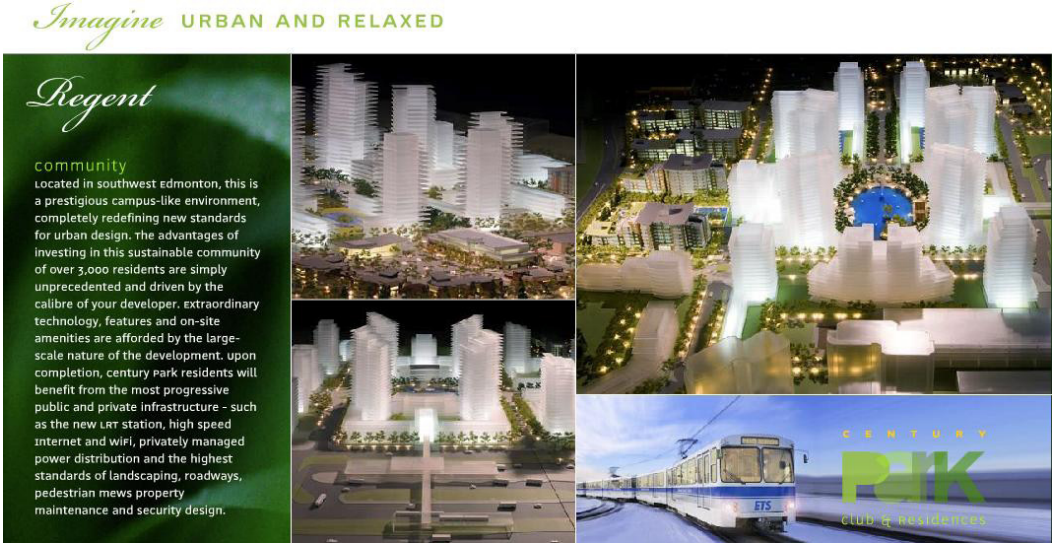
Route Choice

Both Edmonton and Waterloo's LRT route choices are indicative of their city-building goals for the LRT: to link major destinations and provide opportunities for intensification and development along the route. Cities around the world have identified increased density tied to transit accessibility as a means of improving the sustainability and livability of cities, and LRT has become a central feature of achieving that goal. When choosing between a bus rapid transit system and LRT, the Region of Waterloo stated that "rail transit has a demonstrable influence on land values and locational decisions, and is recognized as a planning tool that can support and encourage the development of more sustainable land use patterns." (Region of Waterloo, 2009)

Bus-based systems offer a high level of route flexibility; however, that often hampers investment along bus routes. Bus routes can be changed overnight; rail lines cannot. Developers along rail lines have greater certainty that their investments will be served into the foreseeable future and therefore have a higher propensity to invest in high quality and publicly amenable buildings.

Similar to Ottawa, the areas around many of the existing LRT stations in Edmonton are relatively desolate, undeveloped suburban spaces surrounded by parking and bus transfer areas. Retroactively, the city is now undergoing significant work to develop stations and urbanize the nearby areas. In doing so, the city can provide housing, office space and other amenities that are within direct walking distance of stations, while maintaining the station's role as a local centre for travel. Not only does this anchor the station's role within the neighbourhood, but it also aims to increase off-peak use of the LRT for activities that previously would have required a vehicle.

Through the use of a variety of development incentives as well as the creation of specific station plans that reflect the needs for the neighbourhood, the neighbourhood nodes created by a properly routed LRT system have the ability to completely reshape neighbourhoods into lively, pedestrian friendly environments that are good for business, as well as the local tax base. As municipal budgets are increasingly strained, the increased density of redeveloped properties reduces the cost to service residents and represents the future of sustainable environmentally conscious living with decreased



Promotional material for Century Park, a new transit-oriented development planned for the south side of the city. The development is slated to house thousands of residents and hundreds of thousands of square feet of office and retail space.

Source: Century Parks Developments Ltd.

need for car-based transportation. The new community of Century Park (see image above) along the southern extension of the Edmonton LRT is an example of a comprehensive transit-oriented development (TOD) that is reshaping the city as well as the idea of city life.

Specific redevelopment of sites near stations (such as Century Park, above) as well as linear redevelopment of entire streets can spawn from LRT development. When the 'it' places in town are mentioned, they are indicative of the types of development encouraged through TOD. Caroline Street in Waterloo (see before and after images on p. 7) is an example of medium-density redevelopment that Waterloo's LRT is supposed to trigger.

The possibilities for redevelopment and revitalization are endless, and Ottawa is full of areas ready for this type of reinvestment. Sites such as Tunney's Pasture, CFB Rockcliffe, Lebreton Flats, and Kanata Centrum can become places where people live, work, and play without a car like the distillery district in Toronto – or closer to home, the Byward Market. Entire streetscapes could be redefined. Imagine Merivale Road, Carling Avenue, or St. Joseph Boulevard as streets with a similar feel to Westboro's Richmond Road or the Glebe's Bank Street.

LRT has the ability to comfortably and conveniently connect the city like no other form of transportation. From streetcar-like local routes to high-speed, cross-city travel, the route an LRT system travels profoundly shapes people's lives and the development of entire neighbourhoods. **Proper route choice coupled with targeted plans for redevelopment and change is imperative to the success of both LRT and the end goal of increased sustainability and liveability for residents.**

Grade and Roadway Separation

There are three ways in which to operate an LRT line – integrated at grade, dedicated at grade, and grade separated. Integrated at grade consists of what is essentially

Before (left) and after (right) images of the Region of Waterloo's plans to redevelop Caroline Street in central Waterloo using light-rail transit. Note the at-grade light rail line to the left of the after image.

Source: Region of Waterloo.

a streetcar – that is, tracks embedded in the roadway where regular traffic can also use the lane. Dedicated at grade consists of tracks built at street level however the route is for use by the LRT alone, only interacting with vehicles at intersections. In most cases, LRT is given full priority at intersections through signaling an the control of traffic lights to ensure speed and reliability while at some major intersections there is at times grade separation. Grade separation consists of full of the railway from roadways and any other potential obstacles. This is usually achieved through the use of underground tunnels, especially in downtown or already developed areas.

Grade and roadway separation is a subject of debate in many cities; however, more and more cities are opting for at-grade services, especially due to their significantly lower costs and better neighbourhood integration. Edmonton's system was initially built almost exclusively as grade-separated, including the downtown tunnel; however, new extensions are almost exclusively at grade. When the line was being built underground, extensions were so prohibitively expensive that it took many years to be able to extend the route to a usable size. With new extensions being at grade, there are plans to more than double the size of the system in the near future. This massive expansion is only considered possible thanks to the cost-effectiveness of at-grade construction.

Much of the City of Edmonton's LRT is completely grade separated. In the downtown core, there is a tunnel. Throughout suburban areas, however, the train operates in a dedicated at grade fashion with limited signalized roadway and pedestrian crossings at track level. At certain major intersections in suburban areas, there is grade separation to avoid interference with traffic flow. All tracks are currently dedicated and do not run along city streets. This could change, since a proposed western line is envisioned to travel along city streets in the downtown area; however, it would still travel largely along its own dedicated route outside the core. This is

consistent with the City of Edmonton's desire to create an urban LRT system and have better interaction with street activity.

A suburban system typically builds stations at two-kilometre intervals and relies heavily on bus transfers and park-and-ride lots. Urban LRT systems have more stations closer together and are designed to provide more direct service. Operating speeds are typically lower; however, the possibility for development along the line is significantly increased as there are more stations and better integration with the community.

The Region of Waterloo's proposed system is largely urban in nature and is proposed to be almost completely at grade along a number of downtown city streets. It is designed to strongly influence behaviour, encouraging transit use, and it complements regional growth management goals to intensify the region along the LRT's central transit corridor.

Ottawa's proposed system is certainly a suburban style that is fully grade separated and makes use of much of the existing Transitway infrastructure for rapid travel from environs into the city. Without a concerted effort, there will likely be little redevelopment as a result of poor connectivity and routes that are heavily isolated from major centres.

Vehicle Technology

Although Edmonton's LRT uses high-floor technology, when it was first built, low-floor trains did not yet exist. Due to the high cost of converting the existing high-floor system, extensions along the current LRT line—and any new routes that make use of the downtown tunnel—will be built for high-floor trains. Other new routes are slated to use low-floor technology however, as the smaller stations and infrastructure required makes integrating stations with neighbourhoods much easier (City of Edmonton, 2009). Low-floor platforms can look like large bus stops, similar to what already exists in Ottawa. In fact, Ottawa's Transitway was initially designed to be converted to low-floor LRT (Gray, 2008). The LRT system in Waterloo will also implement low-floor technology in its proposed system.

The vast majority of new LRT systems being built make use of low-floor technologies due to its flexibility for urban as well as suburban style uses as well as the significantly lower costs for station construction.

The potential for automation of Ottawa's system has also been broached. Automation is only possible where there is full grade separation for the entire route for safety reasons. Both Edmonton and Waterloo will have drivers on all trains

Conclusion

In the City of Edmonton, surveys show that:

- 85 percent of respondents agreed that new LRT development is critical toward sustainable and continued growth in Edmonton
- 66 percent feel that LRT expansion should be an urgent priority for the City
- Edmontonians support a public investment of $7–10 billion ($300 million per year) over the next 30 years to develop a city-wide LRT system (City of Edmonton, 2009).

In short, for a city that has lived with LRT since 1978, support is stronger than ever for an expanded system that serves the whole city.

As Ottawa continues to debate that details of a massive project to expand its transit system using light rail, other cities in Canada and abroad have implemented next-generation LRT networks. LRT is a major commit-

ment and a major shift for the City of Ottawa. It is the best way for the city to adapt to its own growth into a major centre. But no longer is it adequate to build a major transportation spine and ignore stations or its integration into communities.

The Cities of Waterloo and Edmonton are realizing that LRT is an instrument for much more than simple commuting. Investment in LRT should also be seen as an investment in the communities that it serves and shaping its development. While the conversion of the Transitway to LRT is a good start for the city, the expansion beyond that simple route needs to be considered so that transit can truly serve Ottawans and become an integral part of their lives connecting destinations to homes and truly building an integrated community.

A tunnel through the downtown core is likely the best choice to maintain the speed and reliability of the system, but its implementation should avoid mistakes made in other cities. Edmonton's underground stations are 2–3 stories below ground, and some riders complain that it takes too long to reach the platform. Ottawa's tunnel could be built eight stories below ground. That could nullify any advantages that a tunnel provides riders in terms of speed, given the time it would take to travel from ground level to platform.

Scott Hindle is an Ottawa native who is currently a third year student of urban planning at the University of Waterloo in Waterloo, Ontario where he is also President of the Faculty of Environment's student society. He formerly worked in Edmonton, Alberta, for leading planning firm Armin A. Preiksaitis & Associates on a number of high-profile projects in the city, including the planning for additional LRT lines, TOD, intensification and the potential impact of stations along various proposed LRT routes.

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Looking back:
The cancelled North-South light-rail plan

By Peter Raaymakers
Executive Director, Public Transit in Ottawa

Introduction

In July 2006, the City of Ottawa decided to move forward with the most ambitious public transit project since the construction of the Transitway—arguably the city's largest undertaking to that point in its history. On the 12th of that month, the city awarded a contract to construction consortium Siemens-PCL/Dufferin in the amount of roughly $880M to build a 29-kilometre light-rail transit line. When completed, it would extend from the southern suburb of Barrhaven and, after running along the existing O-Train line and crossing downtown, eventually terminate at the University of Ottawa.

Over the course of the next five months, however, the plan became embroiled in a heated municipal election. Incumbent mayor Bob Chiarelli wanted to move forward with the plan; challenger Alex Munter resolved to "fix it, not nix it"; and the eventual election winner, Larry O'Brien, wanted to "hit the re-set button" and cancel the north-south light-rail project. Although the federal government had pledged $200 million toward the project, it became unclear how firm that commitment was when, during the municipal campaign, Ottawa West-Nepean Member of Parliament John Baird requested that the new council review the program. On Dec. 1, the new council began its work. Within two weeks, by a vote of 13-11, it cancelled the project. Looming over the decision was an impending lawsuit, rumoured to be filed by contract partner Siemens-PCL/Dufferin. Councillors believed a settlement could amount to $50–$200 million[i]

The decision was as divisive as the election, and the city and its councillors remain divided as 2009 draws to a close. Reflecting on the 2006 plan, O'Brien recently called it a "tragically flawed" system that failed to address downtown congestion.[ii] Gloucester-Southgate councillor Diane Deans referred to it as "probably the biggest mistake any city council in Ottawa's history has ever made".[iii] If those two opinions bookend the debate, most citizens and councillors probably fall somewhere between—both disappointed for the lost time and money, and partially satisfied that the city decided to rethink its transit strategy.

During the discussion of the north-south transit plan and throughout the election and post-election debates, critics raised a number of issues with the plan, not the least of which was the uncertainty of a secure funding commitment from the federal government. Although some councillors were convinced that the federal government would have followed through on its memorandum of understanding to fully fund its portion of the project, others were concerned that there was no absolute guarantee made by the city's contract deadline—a deadline built into the contract with Siemens-PCL/Dufferin, whose exact date was questioned throughout the process and further muddied the funding process.

Another significant sticking point of the north-south rail extension was the uncertainty of its total cost; not simply the rising cost of the project, but questions about exactly what qualified as a cost associated with the transit plan. The prices for bridges, water, sewer, and roadway projects were all, at different times, associated and then disassociated with the project, and it all served to blur the bottom line.

Probably the biggest issue triggering a review of the north-south rail line, however, was its direction. Rather than building to serve a larger and more transit-

hungry population to the east and west of the city, the north-south line was designed to serve anticipated ridership through growing areas first, and move to the east and west afterwards. Critics pointed out that this anticipated ridership was far from a sure thing; they wondered why the plan ignored existing riders as a means to serve riders who were, at the time, only projected and never guaranteed to exist. Most pressing and pertinent to the current transit discussion was the common idea that any light-rail plan Ottawa decided to pursue would have to resolve congestion issues within the city's downtown core before compounding that with more riders running through it. It was, in essence, a chicken-or-egg dilemma that left plenty of individuals on either side of the fence.

Building a partnership: Securing funding from federal and provincial governments

One of the chief issues heading into the December 2006 municipal vote was whether or not the federal and provincial governments—long-time project partners—were going to be able to follow through on their pledges. Although there seemed to be no question about provincial participation in the project, the federal government, and particularly then-Treasury Board President John Baird, were skeptical of public support for the project. Funding from the federal government was withheld pending a vote of full council, which meant that the funding wasn't guaranteed by the deadline of Dec. 15. Some councillors saw this as a serious question mark while moving forward with the project. It became one of the biggest issues behind the cancellation of the light-rail line.

Baird's role in the cancellation was controversial. He said he was serving the public interest when he interfered in the process of what he termed a "billion-dollar boondoggle." Some municipal staff, councillors, and provincial and federal politicians wondered why Baird decided to step back from the $200-million commitment despite years invested into public consultation and discussion, environmental assessments, and other expenditures for the product already undertaken, as well as approval for the project from seven distinct federal government departments—including Baird's own Treasury Board. He was accused of "thwarting local democracy" by Deans,[iv] and Mark Holland, the Liberal Member of Parliament for Ajax-Pickering, accused him of "wanting to influence the municipal election."[v] Even amidst the political turmoil, Baird's decision was supported by the majority of Ottawans: According to a poll conducted by Holinshed Research Group shortly after Baird's announcement, 41 percent of respondents agreed that his move interfered with municipal politics, but 49.9 percent still said it was the right move.[vi]

The issue with the federal government, however, was never really whether or not they would fulfill their commitment. Although Baird's review forced the project to be delayed by two months, he pledged that the federal government would be available no matter what—whether the city voted to move forward with the same project, altered the project, or completely cancelled it and started a new one.[vii]

River councillor Maria McRae said that council "could have proceeded with the north-south line rail plan. There is no doubt in my mind that the $200-million contribution from the federal government would have been implemented through the memorandum of understanding."[viii] That was not the case, however, for the provincial funding. Ontario premier (and Ottawa

South MPP) Dalton McGuinty suggested that his pledge was "for a specific project", and if the plan were altered the province would have to review its commitment.[ix]

Understanding the price tag: Increasing costs and increasing confusion

Although Baird declined an interview for this article, the major reason he gave to justify his role in the cancellation of the North-South light-rail extension at the time was the rapidly climbing cost of the project. Cost estimates began around $660 million, but those quickly grew when other aspects of the project were incorporated, including the construction of the Strandherd-Armstrong Bridge, the relocation of sewer and water infrastructure, and construction of a maintenance yard. The winning bid for Siemens-PCL/Dufferin was $721 million, which included the costs of designing and building the rail line and the bridge, which was better than the bids of either competitor in the process. The final bid for all components of the project for Siemens-PCL/Dufferin, though, was $953.2 million, including 15 years of maintenance and the construction of the maintenance yard.[x] With so many numbers circulating, and so much debate about what should be considered part of the north-south transit extension, there remained plenty of uncertainty about what the final cost would be.

Looking back at the project, O'Brien called the cost estimates received from tender "very soft," due not only to the uncertainty of what would contribute to the cost, but also associated costs with the project, such as land procurement and utility re-alignment costs.[xi] College councillor Rick Chiarelli suggested that, as the cost of the project climbed to almost $1 billion, the percentage funded by the City of Ottawa would have approached 60 percent of the tab—which he said would have the city "scrambling to fund basic annual project programs."[xii] Those cost increases were also identified before the project had even begun; there is no telling how many, if any, further costs would have been unearthed during the construction process.

Other councillors questioned whether or not these concerns were really justified. During the original vote on the north-south extension, the decision to have Siemens-PCL/Dufferin work on infrastructure projects including roads, sewers, water lines, and the Strandherd-Armstrong Bridge was, according to Council minutes, an effort "to minimize public inconvenience and construction times, reduce costs and take advantage of the ability to integrate the project under one contract".[xiii] As McRae explained it, "the City determined [that there was] an opportunity to do other transit-linked or transportation-linked improvements at the same time we were building north-south light-rail."[xiv] The potential savings these efficiencies could have provided, in money or in time, was never publicly announced, and that oversight likely hurt the plan in the long run. As for utility relocations and land procurement, McRae suggested that these costs were unavoidable, no matter how construction projects were priced.

Where to begin: Revisiting the starting point

Perhaps the biggest issue, at least politically speaking, was the direction of the north-south light-rail extension. By starting with a rail line connecting southern suburbs, the plan left Ottawa's eastern and western suburbs—centres with greater general populations, as well as higher ridership bases—without light rail until some undetermined time in the future. It also included surface rail through the downtown core. Some councillors believed that it was necessary to establish a grade-separated system in the downtown before bringing more riders into the core.

Within six months of cancelling the north-south rail line, Mayor O'Brien received the report *Moving Ottawa*. It was the product of a task force that he had commissioned upon winning election. One of the chief recommendations of that report was that the City of Ottawa bore a tunnel downtown to cut down on bus congestion, which the report concluded "is at odds with building a vibrant streetscape that attracts a sustainable commercial and residential mix".[xv] That notion of reducing downtown congestion was top of mind not only for O'Brien, but also some councillors. Bay councillor and current transit committee chair Alex Cullen voted against the north-south line from the beginning because, in his words, it would have "compounded the current downtown congestion problems and neglected to address east-west transit needs."[xvi]

Kanata North councillor Marianne Wilkinson, a critic of the north-south plan who preferred an east-west alignment for the first phase of light rail development, said that the 2006 plan would have served the smaller communities of Riverside South and Barrhaven. As a result, she said, that alignment would "completely ignore service to areas with the largest population and greatest potential transit usage",[xvii] a concern that was shared by Stittsville-Kanata West councillor Shad Qadri. [xviii] Knoxdale-Merivale councillor Gord Hunter opposed the plan from the beginning (and opposes light rail outright, arguing that bus rapid transit outperforms light-rail). He suggested that "the projected ridership did not justify the costs."[xix] There was plenty of controversy about the selection of a starting point for the project.

There were plenty of other councillors, however, who offered another perspective regarding the project's starting point. By building into the small—but rapidly growing—suburb of Barrhaven, the north-south rail line would have made public transit more attractive to people who aren't yet using public transit. As Deans argued, "that's where we were going to get the biggest bang for our buck, in terms of new riders. Because the ridership, in some areas, is marginal, we were going to get a big boost in ridership. We had done a ridership study to prove that."[xx] Many developments in Barrhaven and Riverside South were designed to include the integration of light rail; notably, the newest parts of the Minto Developments community at Chapman Mills include a large swath of land along the main street that was meant for LRT, but which is now undeveloped land surrounded by growth. The idea behind this conscious planning decision, according to Deans, was the smart-growth principle: "You take light-rail to your less densely populated areas, where you have a master plan for major intensification. You put in the rail first and you build the density around the line—not the other way around. Because if the homes are there first and you try and put a rail line through, you get all kinds of human cry from the public."

Deciding where to build first was a Catch-22. Either start where the riders already are, and pay more to integrate the line into an existing development; or pay less to build into a new development and anticipate riders will use the service once both are there. The north-south plan was a conscious decision to begin with the less costly and, in terms of land procurement, simpler process to build towards future riders. On the other hand, critics suggested that there was already a stable user base in the established communities of Kanata and Orleans that offered less risk for the reward.

Conclusion: Costs, means, and ends

Cancelling the north-south light-rail extension certainly cost the City of Ottawa a lot of money, and those costs extend beyond what turned out to be a $36.7 million settlement paid to Siemens-PCL/Dufferin for the

cancellation of the contract, which was legally binding. Although that price tag is obviously undesirable, the City also ended up wasting years of consultation and a valuable fixed-price contract with a globally renowned construction consortium. The City also sacrificed some measure of respect from both Ottawa residents and private companies. Alta Vista councillor Peter Hume described perhaps the most important cost: wasted time. "We had an opportunity to evolve our transit system and to start an evolution. Unfortunately, we've delayed that, and the city is the lesser for it."[xxi] Orleans councillor Bob Monette voted against cancelling the north-south rail line in order to avoid the inevitable lawsuit. He said, quite simply: "We can't go back."[xxii]

But by looking back at the various factors that led to the review and ultimate cancellation of a light-rail project the City of Ottawa spent years and millions of dollars developing, municipal decision-makers should be able to learn from their mistakes and build a light-rail network that best serves every corner of Ottawa. The chief lesson learned is that Ottawa City Council must ensure they are absolutely convinced any future transit plan meets their criteria for acceptability before they vote to go forward with it. If that requirement had been met, the City would undoubtedly be farther ahead in improving its public transit infrastructure than it is in reality today.

Endnotes

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Transit on two wheels:
Making cycling work with buses and trains

By Émilie Sartoretto and Travis Boisvenue

Thanks to the National Capital Commission's (NCC) network of bike paths, Ottawa was considered one of the leading bicycle-friendly cities in Canada during the 1980s. Since then, the city has been hesitant to further integrate cycling infrastructure into its urban landscape. Ottawa's current Transportation Master Plan claims the City will grow by 50 per cent within 20 years, which will create "1.2 million new trips every day on City roads, the transit system and on cycling routes and pathways". In particular, the City of Ottawa, as stated in the Ottawa Cycling Plan (2003) aims to "triple the number of trips made by bicycle from 4,500 (2001) to 12,000 by 2021".

In June 2009, the NCC and the City of Ottawa worked with Bixi, a private company based in Montreal, to create a bicycle-sharing system with four stations throughout the downtown regions of Ottawa and Gatineau. The pilot lasted several months. The benefits of the BIXI pilot ran congruent with several goals laid out in the City's Transportation Master Plan, including: a decrease in pollution, an emphasis on safer and healthier ways to travel, an effort to make the transit system more efficient, and promoting short-distance bicycling to make the core of the city more appealing.

According to former deputy leader of the Green Party David Chernushenko, Ottawa is "at the point of moving from an immature cycling city to a more mature one."[1] In this paper, we will outline the benefits and challenges of integrating bicycles into public transit and determine why the City of Ottawa should take immediate steps to do so.

Public-use bicycles (PUB) are, like the BIXI system, bicycle-sharing systems that provide numerous pick-up and drop-off points enabling one-way use of bicycles. These systems are public, in that they are usable by the general public, but they are not necessarily publicly owned or operated (Transport Canada, 2009). In this article, we will examine the history of such programs, highlight advantages and challenges to their implementations and finally, discuss their applicability in Ottawa. The various forms of PUBs, being open to the public and incorporated into the transit system, represent ideal ways to incorporate bicycles into public transit.

Public-use Bicycles programs: a short history

Public-use bicycle programs were founded on the premise that a bicycle can become an influential addition to public transit (NICHES, 2007). PUBs have existed since the 1960s and have mostly focused on the provision of bicycles for use by a population at a nominal cost per ride (Bonnette, 2007).

PUBs first emerged in the Netherlands to provide an alternative to public transit options. These initial initiatives utilized donated bicycles painted in a solid colour to deter theft, and were placed unlocked throughout a city (Beroud, 2007). However, because they hinged on the idea of civic responsibility and a general sense of community, they lacked theft deterrents. The bicycles were easily stolen and relocated, compromising the system.

Second-generation PUBs addressed these issues and proved far more successful. In addition to theft deterrents, the bicycles were available in fixed locations. Among the first of these projects was the Fonden Bycyklen I Kobenhavn in Copenhagen, Denmark, which was founded in 1995. The donated bicycles were attached by a lock system that would open with a coin deposit amounting to the rough equivalent of four dollars. Given the low rental cost, theft and vandalism persisted, depleting the supply of bicycles.

The third-generation PUBs first appeared in the late

1990s. They incorporated improved theft deterrents, including electronically controlled locks and mandatory user identification to ensure accountability. User fees vary: many programs allowed bicycles to be free for the first use and followed that with incremental pricing based on further usage. Those programs are intended for point-to-point public commutes and aim to incorporate individual mobility to public transportation. The pioneering system was launched in Rennes, France in 1998 and was operated by Adshel in exchange for advertising space in public areas.

Using PUBs effectively: Multimodal Public Transit Access Systems

Used in conjunction with public transit, PUBs aren't meant for long-distance travel by themselves. Instead, PUBs are integrated into other modes of public transit, covering shorter distances; for example, between home and transit stations, and between transit stations and the workplace. Used in this way, PUBs can contribute to multi-modal public transit systems and expand the reach of other modes of transit, including trains and buses (DeMaio & Gifford, 2004:2).

Chernushenko succinctly describes the ideal use of PUBs:

> "People need to understand what [PUBs] are designed to accomplish: to blend in with other modes of transit. You don't borrow one out in the suburbs and then ride it downtown and drop it off there. You use it at the end of a longer trip [...] It's always meant to be part of an integrated transit plan."

In fact, intermodal co-ordination of cycling with public transport is better in Ottawa compared to most Canadian cities (Pucher & Buelher, 2005): the City of Ottawa has already created initiatives to capitalize on multi-modal transit use: The Park and Ride, which makes it easier for commuters to incorporate cars into their bus commute; and Rack-and-Roll allowing cyclists to rack their bikes on the front of buses at no extra charge. Twelve per cent of cyclists take advantage of the Rack-and-Roll program (Pucher & Buehler, 2005). In addition, Ottawa permits bikes on the O-Train at all times.

However, it can be time-consuming and inconvenient for cyclists to use bike racks mounted on the front of buses. PUBs alleviate inconveniences associated with multi-modal transit by offering an alternative that is already integrated into the transit system—the public bikes can be used to get from an underserved location to a bus station, for instance, and left at the station so the user can complete the rest of their trip without hassle.

Barry Wellar, professor emeritus of geography at the University of Ottawa and head of Wellar Consulting, explained the usefulness of a PUB program.

> "What you need is the bikes located where you have substantial numbers of origins and destinations ... A substantial amount of people [living in Ottawa] are from the suburbs. If it turns out that they take transit downtown and they have an awkward transfer, you could use a bike. Rather than waiting for a bus, you could fire people downtown. If it came right down and you had a very thoughtful, very progressive bike program, you could actually add a considerable dimension to any transit program." [2]

Pucher and Buehler (2005) state that, "coordinating public transport with bicycling is crucial to encouraging increased use of both of these modes. Especially in lower-density residential areas, cycling is ideal as a feeder and distribution system to access public transport stops" (Pucher & Buehler, 2005: 58). In both cases, PUBs can be used to increase ease the traveling distances using multi-modal transit.

Benefits of PUB programs

Various academics have highlighted that walking and cycling are "the most economically, socially, and environmentally sustainable forms of human locomotion" (Donaghy and Poppelreuter, 2005:197). Cyclists produce virtually no emissions (Dekoster and Schollaert, 2000). For example, the Vélo'V project in Lyon, France has a tangible impact on the environment: from May

"Here, for once, was a product of man's brain that was entirely beneficial to those who used it, and of no harm or irritation to others. Progress should have stopped when man invented the bicycle."
~Elizabeth West, Hovel in the Hills

2005 to September 2007, the bicycles traveled approximately 26 million kilometres. Automobiles covering the same distance would have produced 5,200 tons of carbon dioxide (Bonnette, 2007). Although bicycle use decreases significantly during Ottawa winters, Zlatko Krstulich, President of Citizens for Safe Cycling, insists that the carbon emissions saved would be worth the cost: "We're investing heavily from a societal standpoint into global warming, and any time you save CO_2 emissions, no matter what season you're in, it counts."[3]

Bicycles also inflict fewer maintenance costs on roads compared to automobiles (Bonnette, 2007). Less maintenance not only saves money, but it also reduces the carbon emissions involved with construction, as well as noise pollution.

Cycling also has positive impacts for individual users. In terms of cost, cycling is a far less expensive alternative to driving and provides an enormous health benefit to users. As Krstulich points out:

> "One of our other big challenges is to get people active ... The thinking now is that we have to incorporate more activity into your every day comings and goings—take the stairs not the elevator, bike to work, or bike somewhere once in a while instead of driving. If we incorporate that sort of active living, then I think that's the way we get collectively [healthier], which has huge impact also on the cost structure of our health-care system."

Krstulich is correct: about two-thirds of Canadians are physically inactive, resulting in about $2.1 billion of direct health care costs in Canada (Bonnette, 2007). Increased physical activity can reduce the risk of serious diseases and "the cost of medical care, decrease workplace absenteeism, and maintain the independence of older adults". International studies confirm that regular moderate activity can help reduce the risk of a multitude of ailments such as obesity, adult diabetes, hypertension, coronary heart disease, osteoporosis, depression, stress, and anxiety (City of Ottawa, 2008a).

Bicycles enable cyclists to reach underserved urban destinations (DeMaio & Gifford, 2004). Having PUB stations in suburban Ottawa, for instance, could be an enormous benefit to users that normally wait 30 up to minutes for buses during the week (or an hour on weekends). Additionally, they generally don't add to traffic congestion (DeMaio & Gifford, 2004), and as both Bonnette (2007) and Pucher & Buehler (2005) point out, they take up less roadway and parking space than automobiles.

Making PUBs available in the city would increase the amount of cyclists, and increase the benefits outlined, as Wellar summarizes.

> "[It] would make a significant dent in the number of vehicles on the roads in downtown Ottawa ... It's good for everybody's health, it's good for the health of the environment. And to my mind, there is absolutely no question that this is, in effect, what sustainability is all about."

Challenges for PUBs programs

One challenge for Pubs and their users is weather. Canadian weather isn't as hospitable to bikers as the weather in many European cities where PUB programs flourish. Despite this, Pucher (2008) points out that many cyclists aren't completely deterred by weather: northern Europe has higher cycling levels than southern Europe, which has typically ideal biking weather (Pucher & Buehler, 2008).

Although weather does play a role in terms of cycling decisions, it tends to be over-exaggerated. To address

this issue, the City of Ottawa and Citizens for Safe Cycling make a special effort to promote winter cycling by offering cold weather cycling seminars at workplaces and community centres.

The notion of cycling as being unsafe can serve as a deterrent to commuter cycling (DeMaio & Gifford, 2004). There is, however, a discrepancy between perceived and actual dangers attributed to cycling as a mode of transportation. Pucher & Buehler highlight that longitudinal data suggests that cycling has, over time, become much safer in Ontario, with fatalities decreasing by 61 per cent from 1984 to 2002 (Pucher & Buehler, 2005). The growth in cycling levels over the same period of time suggests an even sharper decline in accidents per kilometre cycled. Ottawa has observed a similar trend: cycling injuries declined by 33 percent in the last decade (Pucher & Buehler, 2005). Ottawa has done much to promote safer cycling by improving cycling and motorist behaviour (Pucher & Buehler, 2005) in addition to creating bicycle infrastructure like bike paths that take cyclists away from more dangerous routes. In terms of helmet wear in Ottawa, 68 percent of all cyclists—and 54 percent of adult cyclists—wear helmets (City of Ottawa, 2008a). In addition, Citizens for Safe Cycling provides a variety of education and training courses for all age groups and skill levels (Pucher & Buehler, 2005).

In order for an Ottawa-based PUB program to be feasible, several safety measures would need to be implemented. DeMaio and Gifford (2004) propose that this issue can be addressed by creating and enforcing liability agreements, encouraging helmet wear, offering cycling classes, and providing sufficiently visible bikes during the day and at night (DeMaio & Gifford, 2004). Additionally, maintaining bicycles regularly helps ensure rider safety. The city can also hire bike paramedics, bike parking officers, and a volunteer bike pathway patrol to increase security and aid riders (Pucher & Buehler, 2005).

No Canadian city has yet implemented a comprehensive, integrated, regional network of cycling facilities. The City of Ottawa's 10-year plan to improve cycling infrastructure describes such a plan, calling for an additional 2,508.1 kilometres of Bikeway Network in the form of improved bike lanes, paved shoulders, wider curb lanes, and additional bike paths at a cost of $26.6 million (City of Ottawa, 2008a). The plan will also improve trip-end facilities like bicycle parking, and lockers and shower facilities at cycling destinations (ibid). Addressing this issue is imperative to the end goal of getting more Ottawans to embrace cycling.

Pucher and Buehler suggest that, without comprehensive cycling networks, current urban infrastructure forces cyclists to share the road with motor vehicles for most of their trip. That makes them more vulnerable to unsafe conditions, and it also deters potential cyclists (Pucher and Buehler, 2005). Various studies conducted in both Canada and the United States demonstrate that segregated cycling infrastructure—bike paths and lanes, for example—make cycling more attractive (Dill and Carr, 2003 in Buehler & Pucher, 2005). The Ottawa Cycling Plan (2008) states that if cyclists concerns are addressed—the top three concerns are related to improved and safer infrastructure—that "people will cycle more often, given the right on- and off-road facilities" (ibid: 2-4).

Additional infrastructure challenges include snowfall and other related winter conditions. The BIXI system is ideal for winters in Ottawa, as stations are portable and can be moved or removed according to demand. This allows the equipment to be removed during winter to avoid obstructing snow removal and to decrease exposure to harsh elements (Transport Canada, 2009).

Noland and Kunreuther (1995) conclude that, in order to increase the usage of bicycles as a mode of transportation, measures need to be implemented that make it easier to ride bicycles and, consequently, more difficult to drive in automobiles. Unlike the wide range of car-restrictive measures found in most European cities, Canadian cities have been hesitant to impose restrictions on car use or to increase its cost to users (Pucher, 2004; Pucher & Lefevre, 1996; Pucher & Dijkstra, 2003; Transportation Research Boards, 2001 in Pucher & Buehler, 2005). For example, measures such as traffic calming of residential neighborhoods, car-free zones, parking restrictions and supply limitations are not as extensive in Canada as they are in Europe (Pucher & Buehler, 2005). Gasoline prices, motor vehicles registration fees, sale taxes on cars, roadway tolls, and parking costs tend to be only a fraction of many European levels

(Pucher & Buehler, 2008).

One of the biggest challenges to increasing cycling levels in Canada, according to Pucher ad Buehler, is the proliferation of sprawling, low-density suburbs (Nivola, 1999 in Pucher & Buehler, 2005). These are usually characterized as car-oriented, with an almost complete absence of cycling infrastructure (Pucher & Buehler, 2005). Suburban sprawl leads to increased trip distances, making cycling less feasible as a mode of transportation outside the urban core (Pucher & Buehler, 2005). Wellar points out that:

> "Canadians should... put to rest the notion that you can continue to spread. Well, you can't—that day is over. What you're now looking at is increased transit and increased cycling. And it becomes very difficult to look at a coherence walk and cycling transit plan when you've already committed one god-awful legacy of roads that are means to move cars."

That statement largely agrees with Pucher and Buehler's position:

> "Unless Canadian metropolitan areas can implement more mixed-use, more compact, less car-dependence and use policies on a truly regional level that includes the suburbs, an increasing proportion of Canada's population will live in areas where cycling is impractical as a mode of daily transport, and will only be occasionally used for recreation" (Pucher & Buehler, 2005:57).

Transport and Urban Planning in Ottawa: Considerations for cycling and PUBs

In terms measures taken towards improving cycling, Ottawa stands to learn much from European countries such as the Netherlands, Germany, and Denmark who have greatly improved their cycling rates since the mid-1970s (Pucher & Buehler, 2008). They are among the most successful countries at promoting cycling for daily travel. In all three countries, cycling levels fell significantly from 1950 to 1975 (Dutch Bicycling Council, 2006 in Pucher & Buehler, 2008) and it was through considerable reversals in transport and urban planning policies that emerged in the 1970s that cycling was reinvigorated to its current thriving state (Pucher & Buehler, 2008). All three being quite affluent, "their high level of cycling are not due to an inability to afford more expensive transport modes" (Pucher & Buehler, 2008:8).

Although considerations such as climate and topography are important, they aren't necessarily the decisive factors in determining the future of cycling. As Pucher and Buehler point out, government measures such as "transport policies, land use policies, urban development policies, housing policies, environmental policies, taxation policies, and parking policies" are at least as important (Pucher & Buheler, 2008: 4). According to them, the key lesson from these case studies is the necessity of establishing a coordinated, multi-faced approach. They explain that the success of measures widely adopted in Dutch, Danish, and German cities are "attributable to the coordinated implementation of all these measure, so that they reinforce the impact of each other in promoting cycling" (Pucher & Buehler, 2008:18).

In the last decades, they have created, expanded, and maintained separate facilities such as bike paths and lanes (Pucher & Buehler, 2008). The result of these wide range facilities is a complete, integrated cycling system that enables cyclists to complete most trips either on completely separate paths and lanes or on lightly traveled, traffic-calmed residential streets (Pucher & Buehler, 2008). In addition, they have in place an extensive bicycle parking infrastructure and have ensure cycling integration with public transport. Though indirect, taxation, parking and land-use policies have also contributed to making cycling safer and more appealing.

They also provide training and education starting at an early age. Dutch, Danish, and German children receive extensive training in safe and effective cycling techniques as part of their regular curriculum in school typically completed by the time students reach the end of fourth grade (Pucher & Buehler, 2008). These programs include both classroom and road training. Such initiatives have proven successful in getting children "off to a lifetime of safe cycling skills" (Pucher & Buehler, 2008). Another key factor in ensuring safety on the road is training motorist to be aware of cyclists on the road. In these countries, the onus rests on motorists: they are legally responsible for collisions with vulnera-

ble populations such as children and the elderly regardless of who is at fault (Netherlands Ministry of Transport, 2006; German Federal Ministry of Transport, 2002 in Pucher & Buehler, 2008). This priority legal status of non-motorist puts motorists on the defensive forcing them to drive with care thus avoiding endangering cyclists and pedestrians (Pucher & Buehler, 2008).

Critics may contend that such pro-cycling policies may not be applicable in North American cities that differ from Europeans ones in that they are far more car oriented. However, some of the same policies are already successfully in place, though to a much lesser extent, in various American cities (Pucher et al, 1999 in Pucher & Buehler, 2008). For example, the city of Portland has more than tripled the total annual number of bicycle trips since 1991 (City of Portland, 2007a in Pucher & Buehler, 2008). Pucher and Buehler highlight that this success is partly due to a variety of pro-bicycle measures that include expanding the bikeway network, increasing bicycle parking, and integrating cycling with the existing transit system (Pucher & Buehler, 2008). Portland's land use reforms to limit sprawl and encourage mixed-use development are also conductive to shorter commutes making cycling more appealing.

Ottawa has, in the past, made progress to make cycling more attractive, including some measures to improve cycling safety. As of 2003, Ottawa had laid down 511 kilometres of bike routes on arterial and secondary roads; 83 kilometres were bikes lanes; 81 kilometres had paved shoulders specifically for cycling; and 35 kilometres had extra-wide shared lanes (Pucher & Buehler, 2005). In addition, Ottawa also has 311 kilometres of off-road bike routes. In total, Ottawa has laid down 822 kilometres of cycling paths, which include the extensive system of bike paths known as the National Capital Pathway.

The Ottawa metropolitan area has a considerable level of cycling equaling 1.9 per cent of work trips (Statistics Canada, 2003 in Pucher & Buehler, 2005). The data was confirmed by a 2002 survey of 1,099 Ottawa area residents that indicated that two per cent used bicycles as their primary mode of transportation for work commutes, and an additional 12 per cent used bikes as their secondary mode of transportation (City of Ottawa, 2003; in Pucher and Buehler, 2005: 50).

This data demonstrates that Ottawa has a substantial culture of cycling. Over the next decade, the City will extend the Bikeway Network by 2,508 kilometres. In addition to this, on January 7, 2010, City council approved a motion to "identify locations of potential pedestrian/cyclist/vehicle conflict" and "determine whether segregated bike lanes would be appropriate in these locations to improve safety and promote cycling as a mode of transportation" (City of Ottawa, 2010). Though these are steps in the right direction, further improvements such as intersection modifications to protect cyclists from exposure to traffic dangers, and cycling specific signage and street markings to help make cycling safer and more convenient in Ottawa are desired.

The City should embrace PUBs as a part of their already multi-modal transit system. The BIXI pilot in Ottawa had relatively successful numbers. The National Capital Commission reported that between June 8 and September 22, 2009, more than 3,000 riders used the bikes during a total of 5,361 trips (2009). Wellar described these numbers as a "core" of users, and he added that they are "good numbers in the sense that they point to a productive outcome" if the City continues the program.

The BIXI pilot program this summer was aimed at tourists. Organizers placed a total of 50 bicycles located at stations near the Museum of Civilization, the National Arts Centre, and the ByWard Market. Now, the City must focus on expanding the program to service commuters, and expand the stations into its multi-modal transit system. The BIXI system is consistent with the priorities set out by City Council's Strategic Directions Report (2007-2010): "to reduce greenhouse gas emissions; to require walking, transit, and cycling oriented communities and employment centres; and to ensure

public health programs are maintained with the growing population of the city".

With 1.2 million new trips expected to coincide with a 50 percent increase in population over the next 20 years, BIXI would be a valuable transit program in that it would not contribute to traffic congestion (Pucher & Buehler, 2005). Expanding PUBs during a period of population growth could help with the shift in mentality associated with embracing increased cycling.

In terms of cost and profitability, the BIXI program shows great promise as observed by the success it has had in Montreal. After a successful launch in May 2009, the BIXI Montreal has served more than one million users. Given Ottawa's healthy base of cyclists demonstrated above, it doesn't seem far-fetched that Ottawa can replicate the Montreal's success.

In November 2008, Clive Doucet told Centretown News that the City will go ahead next year with an expansion of 50 stations to the BIXI program (Ruskin, 2009). In an original interview, Pierre Johnson, a representative for Doucet, confirmed the statement and clarified that the stations are a step towards integrating BIXI into Ottawa's multi-modal transit. As confirmed by Senior Manager of Media Relations at the NCC Jean Wolff, the Bixi Program will be expanded in Ottawa by 50 stations this year.

As we've shown, there is little reason Ottawa should not move ahead with an increased BIXI presence in its inter-modal transit system. "It's a long process and I think you have to operate at many different levels," said Krstulich. "You have to convince people first of all, you have to show some political courage and leadership, [and] you need to promote and make sure everyone is aware of new changes and new facilities." These are the values that can turn Ottawa's Cycling Plan and Ottawa's Transportation Master Plan into reality that includes PUBs as a major, valuable component.

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Making high-speed rail work for Ottawa:
Benefits and success factors

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Construction of a high-speed rail (HSR) line connecting the Quebec City to Windsor corridor is without a doubt one of the most frequently re-proposed megaprojects in post-war Canada. It has now been thirty-five years since the first feasibility study of a rapid rail link between Ontario and Quebec was completed, and such a line is no closer to completion. In 1991, the Ontario / Québec Rapid Train Task Force recommended concluded that:

A high speed passenger rail service could make a significant contribution to business and personal travel in the Quebec City-Windsor corridor in the 21st century. This transportation concept has the potential to provide a new travel experience to millions of Canadians and foreign tourists. (Carman et al. 1991)

Since then, fifteen studies have been carried out to examine HSR's feasibility, to calculate its benefits and costs, and, of course, to study other studies (Archambault 1990, Carman et al. 1991). Fans of the movie *Groundhog Day* were no doubt relieved to learn that another feasibility study, commissioned by both provinces in partnership, was announced in February 2009. Even our team at the Martin Prosperity Institute has contributed to the discussion, albeit from an economic perspective (MPI 2009a).

Our assessment of HSR departs from other studies that have been performed to date. We assert that the global economy is undergoing an economic transformation that strengthens the case for high-speed rail. Determining whether the project makes sense from a balanced budget perspective (Carman et al. 1991) or a neoclassical, cost-benefit one (Martin 1997) is not our aim here. Instead, we focus on the justification for high-speed rail in light of two emerging (and related) trends in economic geography, both popularized by Richard Florida and his collaborators (which, in the spirit of full disclosure, includes ourselves). The first is the emergence of the mega-region as the key geographic unit for economic activity (Florida et al. 2008). The second is the greater concentration of economic activity into fewer places (Florida 2005). These trends, which are only crystallizing now, legitimize the need for a more coordinated infrastructure to connect the Quebec City-Windsor corridor—the sort of infrastructure that high-speed rail represents.

Our paper then shifts gears to explore the potential benefits of high-speed rail to the Ottawa-Gatineau region. We begin by illustrating the potential economic benefits made possible by high-speed rail, and then outline some of the accompanying health and quality-of-life advantages. A case is made for the the importance of a connected, robust, well-designed local transit system, and we close with a commentary on the importance of station location to harnessing the full benefits of a high-speed connection.

The Rise of the Mega-Region

The mega-region is emerging as the most valid and consistent unit of urban analysis. Bigger than a single city and smaller than a nation, the mega-region has been defined as "an integrated set of cities and their surrounding suburban hinterlands across which labour and capital can be reallocated at a very low cost" (Florida et al. 2008), and has been defined using several different methods (see Lang and Dhavale 2005, Florida et al. 2008). The Florida team delineates the boundaries of a mega-region by using nighttime satellite images of the earth, defining mega-regions as contiguous areas of

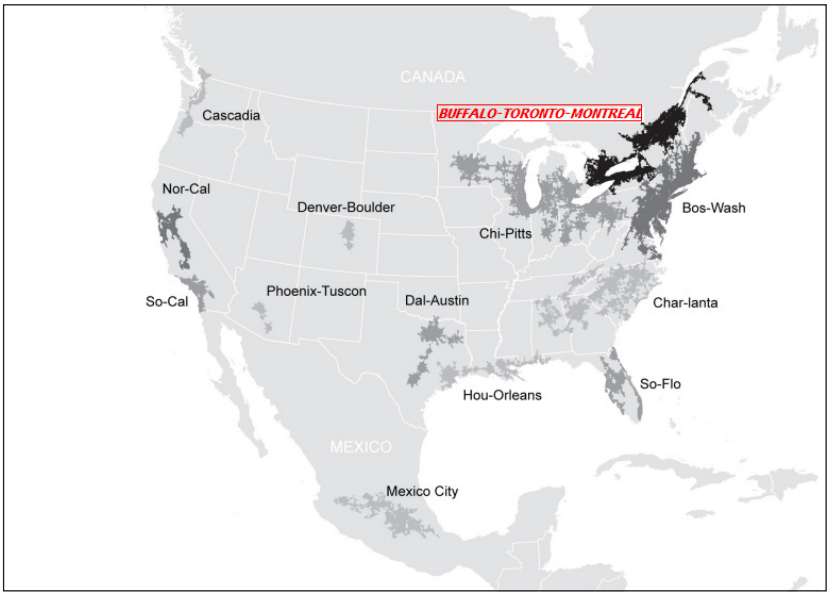
light emissions that contain at least one metro area and account for at least $100 billion of economic activity. We adopt this definition because it is the only one we have found to be empirically objective, reliable, and globally applicable.

The mega-region, defined in this way, is a more appropriate economic unit for three reasons. First, it is based on a criterion of current economic integration, while the nation-state has been forged politically and is not necessarily a coherent economic unit. Second, it is sensitive to urban activity that transcends national boundaries. Examples abound of transnational economic regions, including El Paso-Ciudad Juarez and Copenhagen-Malmö. A nation-state approach would study Malmo as a Swedish city and Copenhagen as a Danish one, ignoring the numerous synergies (commuting, infrastructure, trade) that have developed between the nearby cities (Schmidt 2005) and the unique international character of the region. Third, in a world where trade barriers are being removed and financial governance is increasingly supranational, national governments have less of a role to play in the management of trade. Globilization helps to create a common institutional framework within mega-regions, replacing tariffs with free trade treaties. While the influence of national trade systems remain (via instruments like border security and enduring tariffs), governance and flow of trade is contained within the nation-state less today than ever before in modern history.

The mega-region is also more effective than its smaller cousin—the "principal city"—as a unit of economic analysis. In epochs characterized by slower transportation infrastructure, similar economic activity could be contained by a single principal city. Indeed, the first cities only gained political boundaries after they had become trading centres. But with the advent of the railways and then the automobile, workers began to work and live at much greater distances from one another, and modern urbanites cross urban boundaries frequently in the course of their daily lives. The "metropolitan" level of analysis gets at part of this problem, since it is defined based on commuting patterns and not political boundaries (see Statistics Canada's work on Metropolitan Influenced Zones for a look at this method in action [Statistics Canada 2003]). Still, a great deal of commuting and trade occurs between proximate Census Metropolitan Areas (CMAs). It's easy to imagine a Torontonian who lives in Etobicoke (in the city's west end), has an office in Brampton (a nearby suburb and part of the Toronto CMA), and attends weekly meetings in Guelph (an adjacent CMA). A metropolitan measure like CMA fails to capture this third scale of economic interaction because Toronto and Guelph are in different CMAs. The mega-region is the unit that more accurately captures this broader scope of uninterrupted economic activity, both between cities and between metro areas.

Commuting patterns themselves are also changing. As a result, the scope of regions defined by commuting must also be reconsidered. An expanding creative workforce has sparked a change in employment situations and labour markets (Florida 2002). While manufacturing employment is long-term in nature and associated with a fixed location, creative and service employment has a greater tendency to be short-term. Those who change jobs or projects more frequently benefit from access to a greater quantity and variety of jobs within a reasonable travelling distance. Shorter-term employment, more specialized skills and, in some cases, the need for multiple, simultaneous projects combine to make individuals less willing to relocate for a job, since they know that it's unlikely to last long enough to justify a permanent move. A well-connected mega-region provides greater employment opportunities for the increas-

Figure 1: The Mega-Regions of North America



Source: Adapted from *Who's Your City* (2008) by Richard Florida.
Original map by Tim Gulden and Ryan Morris.

ing share of the labour force working in creative and service occupations.

Ottawa finds itself at the northern end of what Florida calls the "Tor-Buff-Chester" mega-region (see Figure 1 on p. 11), which stretches from Buffalo, New York in the southwest to Quebec City in the northeast and takes in the regions of Syracuse, Rochester, Hamilton, Toronto, Ottawa, and Montreal along the way. This paper focuses on the Quebec City to Windsor corridor—the primary axis of the mega-region.

Regions Reborn: Concentration through Globalization

Globalization has reshaped the world, but not necessarily in the way described by some. The combination of communication and transportation technologies that prompted Thomas L. Friedman to declare that "the world is flat" are actually acting to make economic activity even more concentrated.

In a proudly anti-geographic piece, Friedman argues that the competitive environment for high technology has flattened. The world, he says, "is flat and anyone with smarts, access to Google and a cheap wireless laptop can join the innovation fray." (Friedman 2005, p. 3). While economic geography has not directly refuted the claim that it has become easier to innovate from anywhere, the consensus in the field is that innovation occurs much more frequently in large cities. According to a recent analysis (Florida et al. 2008), a small number of city regions command an astounding share of global innovation. The top ten extended urban regions (mega-regions) account for only 6.5 percent of the world's population, but they are awarded 57 percent of its patents. And even those with the highest levels of talent, who could technically innovate from anywhere, choose to locate in large centres with high concentrations of creative class occupations and infrastructure, as evidenced by the fact that the top 40 mega regions are home to a majority (53 percent) of star scientists (defined as the most highly-cited scientific authors).

But high-tech activity is just one dimension of what economic geographers call the "post-Fordist economy", a set of industries and occupations that has propelled economic growth in developed countries in recent years. Scott (2001) identifies the others as neo-artisanal manufacturing, cultural products industries, media, and related business services. Studies of these activities find they tend to cluster in a limited set of locations. In their research on the distribution of media and cultural products industries across the United States, Florida et al. (2009) find that Los Angeles and New York have disproportionate shares of entertainment activity, even when controlling for their very large populations. For instance, Los Angeles, New York, and Washington D.C., accounted for almost 15 percent of all broadcasting employment in 2000, and just three cities (New York, Los Angeles, and Nashville) played host to 35 percent of all American recording industry activity. Cooke (2009) finds that biotechnology activity is heavily "spiky"—that is, it is concentrated in a relatively small number of ecosystems where both funding and human capital converge.

Why does leading economic activity tend to cluster in this highly uneven way? This continues to be a subject of inquiry, but several high-level explanations are both compelling and empirically tested.

The continuous information and learning that these activities require is one such explanation. The post-Fordist sectors are expressions of what has been called the cognitive or creative shift in economic growth (See Bell 1973; Poulantazas, 1973; Scott, 2001; Florida, 2002), whereby value is added via the generation of new methods, applications, ideas, and technologies. In this framework, knowledge acquired through learning is a key input in the production process. Cities with high agglomerations of learning institutions and communities of practice act as more supportive environments for knowledge industries. The world's top 10 mega-regions host more than half of the world's top 50 universities (see Figure 2).

Another explanation is the necessity to tap into a diverse labour pool. The biggest cities offer the largest labour pools within reasonable commuting distance. This is important for firms that rely on cognitive workers. Their work tends to be more project-based, less predictable, and more locationally varied than traditional manufacturing, farming, or service work—all of which tend to be more routine-oriented and fixed in place. Density also benefits creative workers themselves. Cognitive and creative workers rely on deep pools of employees, partners, and subcontractors in order to negotiate the unpredictability of their work.

Finally, the largest and most advantageous physical infrastructure tends to be located in the largest cities. Some types of efficient infrastructure—subways, for example—can only be justified at certain size and density thresholds. Others, like highway networks, are of a higher quality in heavily populated areas. Broadband Internet illustrates this latter rule, as the Canadian Urban Institute's report on the matter argues: "Telecommunications infrastructure is better between, say, Toronto and Singapore than it is between Toronto and Seagrave, Ontario" (Miller, 2007). It would seem there is evidence to support the notion that Friedman's prized computer programmers are "plugging and playing" at much faster speeds in the largest cities rather than anywhere in the massive gaps in between.

Benchmarking Ontario's Mega-Region

To this point, we have established our arguments that mega-regions are an increasingly important unit of economic analysis, and that economic activity is increasing-

Figure 2: The Ontario-Quebec Mega-Region in Perspective

Rank	Region	Regional Product ($Billions)	Population (millions)
1	Greater Tokyo	2500	55.1
2	Boston-Washington	2200	54.3
3	Chicago-Pittsburgh	1600	46.0
4	Amsterdam-Brussels-Antwerp	1500	59.3
5	Osaka-Nagoya	1400	36.0
6	London-Leeds-Manchester	1200	50.1
7	Rome-Milan-Turin	1000	48.3
8	Charlotte-Atlanta	730	22.4
9	Southern California	710	21.4
10	Frankfurt-Stuttgart	630	23.1
11	Barcelona-Lyon	610	25.0
12	**Buffalo-Toronto-Montreal**	**530**	**22.1**

Source: Adapted from *The Rise of the Mega-Region* (2007) by Richard Florida, Tim Gulden, and Charlotta Mellander.

ly concentrated in a small number of or mega-regions. This begs the question: Is the Buffalo-Toronto-Montreal mega-region one of the "spiky" areas that command much of the world's economic and technological activity? The short answer is yes. It ranks 12th worldwide in terms of economic activity (as measured by Gross Regional Product), and is home to a significant number of top research universities (according to the Times Higher Education Supplement - see Figure 2). However, as we have seen, the degree of concentration in some types of activity (such as the recording industry in the United States) is so great that 12th place does not mean a lot, in absolute terms, when compared to the top regions. If our region is to generate more economic growth by connecting its isolated parts to the main metro areas of Toronto, Montreal, and Ottawa, then it must increase its connectivity to the level achieved in a mega-region like "Bos-Wash", where there are high rates of inter-metro commuting from one end to the other (Lang and Nelson 2007). High-speed rail is clearly a useful means to that end.

A reliable high-speed rail service across the mega-region would:

1. Improve access to the region's learning institutions and communities of practice.
2. Expand the size of the job pool for creative and cognitive workers across the mega-region.
3. Expand the labour pool for creative industries across the mega-region.
4. Expand the benefits of large-scale productivity-enhancing infrastructure and efficiency in the biggest cities to smaller CMAs and non-CMAs.

Applying the effects of high-speed rail to a specific locational context can both illustrate how they manifest themselves and identify some of the conditions HSR needs to be successful. The next section examines the

benefits and considerations surrounding high-speed rail in a specific location: Ottawa.

Closer Economic Connections

An effective transportation system improves productivity because it helps allocate labour more effectively (Stutzer and Frey 2004). Vickerman (1997) places this finding in a local context when he observes that where high-speed rail is in place, "regional authorities see there being further benefits in terms of the enhanced image and accessibility of cities, which will have a direct effect on investment and business development."

The Japanese experience suggests that information exchange industries particularly benefit from localized growth near high-speed rail stations (Nakamura and Ueda 1989). As the region with the heaviest concentration of creative class occupations in Canada, at 40.9 percent (Florida and Martin 2009), Ottawa-Gatineau is uniquely suited to capitalize on this relationship. The government and science and technology clusters that drive Ottawa's high creative share are both prototypical information exchange industries. Nakamura and Umeda (1989) suggest that higher education is another success factor, something that Ottawa-Gatineau has in spades, with over 79,000 students and five major centres of post-secondary education (OCRI 2007).

The federal government is by far the largest employer in the region, with more than 120,000 federal employees (OCRI 2007). The stream of research on how decentralization improves the quality of governance (Shah 1999, Faguet 2004) suggests that bringing governments closer to citizens and stakeholders helps to benefit jurisdictions. We believe this suggests high-speed rail presents an opportunity for the federal government to become more responsive to the needs of its stakeholders in central Canada—to citizens, to industry, and to other levels of government. A high-speed rail link in the Windsor-Quebec City corridor would link the federal government more closely to Canada's two greatest metropolises and to the provincial capitals of its two largest provinces. The stronger connections would contribute to more pressure and discipline for fast, high-quality responses to the challenges facing the country, something increasingly important in an era when jurisdictions see themselves as competitors for top talent and businesses (Feldman and Martin 2005).

Ottawa's science and technology industries have grown beyond the National Research Council since its founding in 1916 and now count among them globally competitive companies in telecommunications, software, and semiconductors. In total, Ottawa claims more than 1,800 companies and 80,000 workers in knowledge-based industries (OCRI 2007). A Martin Prosperity Institute analysis suggests that in technology industries, Ottawa performs well relative to its 11 North American peers, ranking fourth on the North American Tech-Pole Index, fourth in patents per 10,000, and third in short-term patent growth (MPI 2009b).

High-speed rail would strengthen the connections of Ottawa's technology businesses to complementary high-tech industries in Montreal such as aerospace, biosciences, telecommunications, and advanced manufacturing (Stolarick and Florida 2006), and it would better connect the Ontario and Quebec economies to increase the velocity of people and ideas in key sectors like financial services, business services, and education and knowledge creation (MPI 2009a). It would also mean better connections for technology companies operating in Ottawa but headquartered in parts of the Greater Golden Horseshoe not served by direct flights to Ottawa. And by expanding the size of Ottawa's commuter shed, it could provide new opportunities for nearby towns like Smiths Falls and Casselman to become vi-

able suburbs for those working in downtown Ottawa-Gatineau, or to become more popular tourist destinations for Ottawa residents. Both phenomena have been observed following the development of high-speed rail in other jurisdictions (Bonnafous 1987, Masson and Petiot 2009).

High-speed rail would enable scenarios such as the following: an Ottawa engineer or public servant could catch a 7:30 a.m. train to Toronto and arrive in time for a morning meeting. In Toronto, there would be none of the complications of travelling from airport to downtown core or one of the other business or industrial districts—Toronto's Union Station is not only located in the city's central business district, it is also the central hub of the region's transportation network. The train traveller could work or relax the entire trip, avoiding the queuing and interruptions airports require for check-in, security, boarding, disembarking, and luggage retrieval. The morning in Toronto could be followed by an afternoon meeting at Queen's University in Kingston, and our engineer or public servant would be back in Ottawa in time for dinner with her family and a night out at a Senators game. High-speed rail would also, of course, create parallel opportunities for travellers from elsewhere in the mega-region to visit Ottawa more easily.

Many of the advantages described in this scenario are not reflected in traditional cost-benefit analyses because they are difficult to measure accurately (Stutzer and Frey 2004). Vickerman (1997, p. 33) describes the challenge:

Although there is a tendency to think in terms of time, and time thresholds, there is clearly subjective evidence relating to the comfort/convenience factor. City centre to city centre travel by a single mode with higher comfort characteristics than either car or rail has difficult to quantify advantages.

But there is a growing body of research that attempts to capture these so-called "difficult-to-quantify" advantages of high-speed rail. Lyons and Urry (2005) find that the changes in technology and the nature of work associated with the information age magnify these benefits and enable much more productive use of travel time. The European and Asian experience with high-speed rail suggests that in aggregate, the economic and other changes it initiates can have a transformative effect on certain regions and industries (Burnett 2009, Wright 2009).

Benefits beyond the Economic: Health and Lifestyle

High-speed rail can have other benefits that contribute to improved quality of life, a factor that Florida (2002) argues is increasingly influencing the location choices of talented, well-educated individuals who could choose to live anywhere.

High-speed rail decreases the time and increases the comfort of inter-city trips and long-distance commutes, and there is considerable evidence that these aspects of commuting and travel are ripe for improvement. Krueger et al. (2009), for example, find that in the United States, the daily commute is the second-most unpleasant activity of the day. Stutzer and Frey (2004) find that people with longer commuting times report systematically lower subjective well-being—the academic term for "happiness". Wener, Evans, and Lutin (2006) find that auto commuters show significantly higher levels of reported stress, a more negative mood, and feel their trip is significantly less predictable compared to train commuters. Several psychological studies find that commuting can have negative effects on health and family life (Novaco et al. 1990, Koslowsky et al. 1995, Koslowsky 1998). The strain of commuting is associated with increased absenteeism and turnover at work, adverse effects on cognitive performance, and

several serious health problems (Koslowsky et al. 1995). Lyons et al. (2007) find that most U.K. rail passengers use their travel time for productive activities like working, studying, reading, resting, or chatting with other passengers, and so they place a positive utility on that part of their day.

High-speed rail also has the potential to reduce congestion and accident costs for those who do continue to drive and fly (Vickerman, 1997). Travellers who switch to high-speed rail free up valuable road space for those who continue to drive, speeding up travel times for everyone—a benefit that can certainly be appreciated by anyone who has taken the 416 back to Ottawa on the final evening of a holiday weekend. And rail reduces congestion at over-taxed airports and provides healthy competition against short hop shuttle flights.

We will avoid exploring environmental benefits in much depth, because they have been covered elsewhere, both in the large body of work supporting the emissions benefits of high-speed rail (Levinson et al. 1996, CCAP and CNT 2006) and in the smaller body of work questioning the technology's potential for lowering pollution (Van Wee et al. 2003, O'Toole 2008).

Linking High-speed rail to Local Transit

Thus far we have made a strong case that the potential exists for substantial benefits from high-speed rail. But rail systems do not exist in a vacuum. The context of local stations and their connections to other modes of transportation are crucial to realizing the potential benefits of high-speed rail. Haynes (1997) observes that economic "spill-out" from new stations appear to be highly dependent on high-quality intermodal exchange services. Kennedy et al. (2009) outline the sorts of connections that would provide local connectivity to trip destinations throughout the region: commuter rail, light rail, bus rapid transit, and regular bus service. The automobile plays a role as well, but it is unlikely that significant amounts of parking would be cost-effective to build at any centrally located station. Vickerman (1997) notes that, because high-speed rail is suited to intermediate-length journeys, it should be linked to airports for longer trips and park-and-ride facilities for exurban stations with poor transit accessibility. Henry and Marsh (2008) provide detailed case studies of stations that link intercity rail to local transit, pointing out the strengths and weaknesses of major intermodal stations across the United States.

To compete effectively with the private automobile, transit service must be frequent, clean, and fast (Litman 2007). A minimum service frequency of about six times per hour is the point at which most customers are willing to wait to transfer without consulting a timetable, a crucial factor for extending transit's reach beyond a few corridors to the entire city. The central section of Ottawa's Transitway currently offers service at this level for most of the day, but outlying stations like Fallowfield and Airport have less frequent service outside the rush hour. Low frequency of evening and weekend service on key street routes like the 1 (Bank Street), the 12 (Montreal Road), and the 118 (Baseline Road) is also a drawback. Although the service frequency of routes that do not connect to the high-speed rail station may seem irrelevant, it is important to realize that collector routes like these and others are crucial to the viability of high-speed rail, as they extend its connections beyond the narrow skeleton of the Transitway. A transit system is best evaluated as a network, not as a series of individual routes.

Perceived travel time costs increase with variability and arrival time uncertainty (Cohen and Southworth 1999) and tend to be particularly high for unexpected delays (Small et al. 1999), so on-time performance is im-

portant. Murray (2001) points out that stop placement must be strategic as well: there are tradeoffs to be made between accessibility (keeping stops and stations within reasonable walking distance) and speed (stopping too frequently increases travel time and decreases service quality).

Land-use issues are also important. Transportation and land-use are irrevocably linked, as public transit is only viable and cost-effective with urban land-use forms that maintain a minimum density (Pushkarev and Zupan 1977, 1980). Thus supportive land-use policies must be in place in order to provide high-order public transportation in a cost-effective way. In Ottawa, many Transitway stations with frequent service are surrounded by low-density suburban housing stock or parkland, such as Hurdman, Walkley, and Iris. More intense development, built in the right places, can generate a positive feedback loop. Greater numbers of transit users expand demand and creates a stronger business case for more frequent service and, in time, capital investment in faster, more desirable transit modes such as an upgrade from bus rapid transit (BRT), like the Transitway, to higher-capacity light-rail transit (LRT) like Calgary's C-Train (Cervero 1998) and Ottawa's shifting plan.

Station placement

Station placement is a crucial factor in maximizing the positive effects of high-speed rail on the Ottawa-Gatineau region. Given that an extensive list of technical, political, economic, and geographic considerations affect station placement, we will not recommend a specific location here. But we will comment on several factors to take into account.

A station situated in the central business district is ideal. The disinclination of travelers to add additional transfers to their journeys is well-documented (Railway Gazette, 2009). While it is obviously impossible to place a station within walking distance of all the centrally located destinations in a large city, high-speed rail lines in Europe, Japan, and the United States almost always situate urban stations at major local transportation hubs that are destinations unto themselves. Tokyo's main Shinkansen station, for example, is located in the city's Marunouchi financial district, and New York City's Penn Station is situated in its midtown business district. Even London's Eurostar terminus at St. Pancras, placed several kilometres from either of the city's financial districts, is part of the King's Cross complex, the most widely-connected transportation hub in London with rapid connections to every corner of the city. High-speed rail station location choices must maximize transit and pedestrian connections to the network covering the entire city.

A station located outside the central city is also possible, as demonstrated by one arm of Taiwan's new High-speed rail system. At the Kaohsiung City terminal, trains stop outside the city core at Zuoying Station, where travellers must transfer to the subway to reach more central districts. This kind of arrangement is, however, best envisioned as a temporary measure. It is in Taiwan, where plans are in place to extend the high speed line to an underground station in downtown Kaohsiung City when the funds become available for the expensive tunneling required.

Conclusion

The nature of work and employment are changing. Place is becoming a much more important factor in the success and prosperity of a region. Place, however, does not always refer to a single city or metropolitan region—it can also refer to an interconnected mega-region that encompasses multiple metropolitan areas. Access-

ing the patchwork of jobs and employment opportunities that constitute a career in today's creative economy requires a larger, better-connected geography. Improving that underlying connectedness throughout a mega-region enhances its capacity for knowledge transfer and innovation. Individuals are drawn to regions based on numerous factors, and the mega-region can provide opportunities, amenities, and experiences not available at the level of a single region. High-speed rail helps to provide the necessary "backbone" linkages between the cities of a mega-region. But high-speed rail on its own is not enough. The rail connection must link transportation hubs (local, national, and international) to one another at a service level that provides seamless end-to-end connectivity to both residents and visitors.

The Ottawa-Gatineau region is at the centre of the fourth largest mega-region in North America. High-speed rail along the lines of the well-studied Quebec City to Windsor corridor would greatly enhance connectivity among the component regions of mega-region. But simply adding high-speed rail would not be sufficient to transform the prosperity-generating potential of the mega-region. High-speed rail *must* be part of a complete transportation system tailored to the industries, occupations, and lifestyles of the people who use it.

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Bold steps
for Ottawa-Gatineau public transit

By Jevone Nicholas

Ottawa and Gatineau are preparing for major expansions of their respective transit systems. The onset of rapid-transit rail and bus lines, respectively, could lead to potentially dramatic improvements in each city. There are, however, other actions that could yield more transformative changes in the National Capital Region. These bold steps would complement the rapid-transit initiatives and, in the process, completely reconfigure and revitalize the use of public transit in Ottawa-Gatineau. If implemented, these steps could have an immediate effect on traffic congestion and ridership–decreasing and increasing, respectively–while laying a solid foundation for an eventual rail-based system across the metropolitan area.

Three actions are proposed in this paper, two of which could be implemented before the planned rapid-transit lines come into operation. The first two actions are also within the respective control of the local transit companies, OC Transpo and the Société de transport de l'Outaouais (STO). The third action is decidedly more ambitious and would require the involvement of higher levels of government.

Action 1: Non-Stop Express Routes

Express routes exist on both OC Transpo and the STO. Most of these routes funnel passengers to downtown Ottawa and, while stops may be limited, there are still several embarkment/disembarkment points.

There are two problems with the system as it operates currently. The first is that the arrangement of express routes does not reflect the reality that some commuters (both in cars and in transit) do not work downtown, but rather need to get from suburb to suburb. The routing of such commuters through downtown, rather than directly to their destination, unnecessarily adds to current congestion.

The second problem is that, even for passengers heading to and from downtown, there can be stops *en route* which slow their trips and feed congestion. That many express routes often run half-full complicates matters.

Express bus routes that carry passengers need to travel without stopping between major destinations–at least during rush hour. These routes could run on existing Transitway lines, highways and the eventual STO Rapibus line, along with other arterial roads. Examples of routes could include the following:

1. Terry Fox Transitway Station to Carleton University O-Train Station
2. Promenades de l'Outaouais Mall to Campus Transitway Station
3. Barrhaven Town Centre to Rideau Centre
4. Place de Portage to Cité Collegiale
5. Place d'Orléans Transitway Station to Baseline Transitway Station (Algonquin College.

Local feeder lines could funnel into the terminuses of each non-stop express route. Understandably, traffic projections would have to be completed for each proposed route. The main criteria would be expected volumes at route endpoints. Post-secondary institutions are good candidates. Because students already have a price incentive to use transit, a service incentive could convince many more currently driving to make the switch.

An extension of this idea would be to introduce a dedicated, climate-controlled bus terminus in downtown Ottawa, similar to Toronto's Union Station or the Terminus Centre-Ville in Montreal. The

main challenge would be acquiring an appropriate parcel of land. Perhaps a future office tower, the redevelopment of 90 Elgin St., or even the expansion of the Rideau Centre could feature an underground bus terminal that could serve non-stop express buses from the suburbs. The most feasible option could actually be the Transitway's Bayview station. There is available city-owned land there, and it is currently the intersection of the Transitway and the O-Train (and would be an ideal hub for possible rail extension into Gatineau along the Prince of Wales Bridge).

2. Re-alignment of Bus Routes

A visitor to Ottawa might be struck by the peculiar look of the OC Transpo route map. It can be a challenge to trace a number of routes from terminus to terminus. Major routes stretch across the entire city, jumping from one road to another and often zigzagging through subdivisions. This is particularly the case for Routes 1 through 18 and the 80 Series.

OC Transpo must prove that the configuration for these routes is more efficient than one based on arterial roads emanating from a backbone–i.e. the Transitway. Major routes could be limited to either the western or eastern sides of the city. They would terminate at Transitway stops and only drive on principal thoroughfares. This approach would test whether or not the frequency of these major routes could be increased and their punctuality improved. The offset may have to be an increase in feeder routes that enter enclosed neighbourhoods.

3. One Interprovincial Operator

Although it would be daring, Ottawa and Gatineau should merge their respective services into one interprovincial operator. The efficiencies that could be gleaned from such a merger, coupled with the user benefits of harmonization, would outweigh any concerns about jurisdiction or division of public funds allocation.

There are several metropolitan areas in North America that straddle provincial or state boundaries, or even international boundaries. Just like Ottawa and Gatineau, these urban areas tend to have a large city on one side of the boundary and a smaller city on the other: Detroit-Windsor, Buffalo-Fort Erie, and Philadelphia-Camden are a few examples. In most of these cases, public transit systems are maintained separately; that is, each jurisdiction offers a separate service. As in the case of Ottawa and Gatineau, both cities send their vehicles across borders, but the two systems remain independent.

These divisions are largely borne out of historical political demarcations, but also from differing demographic growth patterns. As urban areas spill over jurisdictional boundaries, such political distinctions tend to become irrelevant, particularly in domains such as public transit. Ottawa and Gatineau are already considered a unified urban area by Statistics Canada. Unfortunately, the problem of congestion is not currently being addressed by a unified single approach.

Ottawa-Gatineau should consider the example of the St. Louis, Missouri metropolitan area. The St. Louis area has one transit system that spans two states. The Bi-State Development Agency runs the Metro System on both the Missouri and Illinois sides of the Missouri River, even though approximately three-quarters of the population served lives in Missouri (a proportion not far from that of Ottawa-Gatineau). Rail and bus lines in both states share the same equipment, charge the same fares, and share the same operating personnel.

The Bi-State Development Agency is sixty years old and is governed by a federal mandate. Its authority to establish bus and light-rail systems covers 200 municipalities. Governance is split between the two states, despite the Missouri side's population advantage:

"Metro's 10-member Board provides overall leadership and policy direction for the Agency, and

is comprised of five members from Illinois and five from Missouri. In Missouri, members are selected by the governor. In Illinois, the Chairman of the Board for both St. Clair and Madison counties appoint their representatives."[1]

The main sources of revenue for the Metro, after passenger fares, are local sales taxes and federal grants. The states of Illinois and Missouri both provide capital and operating grants, but these are generally earmarked for their respective territories.

"The Illinois Department of Transportation ("IDOT") is authorized to provide capital assistance to Metro for capital grants, covering up to 100% of the local share requirement. Historically, IDOT has almost always directly provided the full local match for capital projects located in Illinois, buses used to provide service in Illinois, and a share of the capital projects that benefit Illinois but are located in Missouri."[2]

Those quotations illustrate that it is possible to generally maintain taxpayer contributions to respective jurisdictions, but still have an integrated system. What is more important than the revenue splitting (which does not have to be 50-50, given the population imbalance) is the joint planning and common pooling of assets, in order to prevent overlap and take advantage of possible efficiencies in the system. In order to assure the public that transportation needs are met across one metropolitan area, this area should have one single authority–even if there are 200 municipalities and a clear population advantage at play. Employment nodes, commuting patterns, and general thru-traffic do not pay much attention to local jurisdictional demarcations within a larger metropolitan area. Unfortunately, in the National Capital Region, the Ottawa River is a much deeper deterrent to such integration than is the Missouri River.

Operationally, both OC Transpo and the STO could achieve integration. There would be differences in fleet composition, driver scheduling and, most critically, driver wages but these would not be insurmountable. Any potential increase in personnel costs from collective agreement reconciliation could be offset by administrative efficiencies in back-office operations and procurement.

Real logistical gains could be achieved through harmonization of routes, schedules, and vehicle deployment. The current flow of buses through downtown Ottawa and Hull could be smoother, particularly if non-stop buses and a central terminus are established.

Accessing the entire urban area of the National Capital Region with a single fare could be an attractive incentive for riders. There could be opportunities for seamless transfers, joint marketing, and joint special services (including but not limited to disabled access, event shuttles, and so on) which could all hopefully help stimulate ridership.

Most importantly, a single transit operator for the National Capital Region would enable more strategic planning for the expansion of systems, particularly light-rail. If streetcars or trains could cross the Ottawa River, the real potential of shifting thousands of cars to public vehicles could be tapped. A single authority, with fair composition from both sides, would be better able to plan, build, and operate such a system.

Of course, even if there was complete public will for this proposal at the local level, its fate would be in the hands of the two provincial governments and the federal government. These political and constitutional challenges are the main blockages to a fundamentally local issue.

[1] 2008 Annual Report of the Bi-State Development Agency
[2] 2008 Annual Report of the Bi-State Development Agency

"Air rights" in Ottawa

Maximizing the value of public transit infrastructure

By James Tompkins

By all counts, Ottawa's ambitious new transit plan will be very expensive, and there is little doubt that its cost will place a large burden on taxpayers. Although many Ottawans want world-class transit for the nation's capital, many are justifiably hesitant to see their property taxes rise once again. Ottawa is, after all, the city that elected Larry O'Brien on his "zero means zero" property tax increase platform.

But is it even fair to assume that payment for a $4B transit system has to be subsidized by taxpayers? Must this be a zero-sum game for the residents of Ottawa? Or is there a way the city can expand the pie and get more from this plan than it put in?

One way the City of Ottawa might be able to achieve a synergistic solution that will bring costs down and increase the quality of the overall system, while simultaneously increasing accessibility and ridership, would be to establish a market for air rights. "Air rights" is a fairly common urban development concept involving the purchase of the right to build above a structure while not actually owning the land or existing structure underneath.

Essentially, the city can sell the right to build above transit stations and lines, while preserving the right-of-way underneath for trains or buses. This type of development isn't new to the Ottawa-Gatineau region. We see an example of this in Hull, where Boulevard Maisonneuve passes underneath the Place du Portage complex at the north end of the Portage Bridge. The financial implications of turning Ottawa's vast land holdings around transit into a revenue source should not be underestimated. Hong Kong covers all of its transit costs by leasing space directly linked to its system.[1] And while Ottawa is not Hong Kong, the idea that our transit system can be a revenue generator needs to be recognized.

Ottawa is an ideal candidate for this kind of development. The existing Transitway snakes through some of the most accessible and urbanized parts of the city, but currently it often lacks the amenities and density that other rapid-transit systems encourage within very close proximity to stations. A coffee shop inside Hurdman Station would be guaranteed success while leasable office space above Blair would eliminate extra transfers for thousands of commuters destined for office parks just down the road. When the federal government next decides it needs more office space, why can the City of Ottawa not lease them a building directly above Tunney's Pasture station?

Ottawa has the opportunity to design centres of commerce, learning, culture, and community on property they already own as part of nearly every rapid transit station. And more people could have the opportunity to live near these services. Development of condominiums appears to be a trend likely to continue into the future. Our aging population, along with the resurgence of urban living has powered strong growth in Ottawa's condominium market. The Canada Mortgage and Housing Corporation sees condominiums as an "affordable and popular type of dwelling" in Ottawa, and the organization noted growth in the mar-

A topographical map of a Park-and-Ride lot (green) surrounded by residential (blue), future residential (yellow), and commercial development (red).

Source: Adapted from Google Maps (2009).

ket rebounding along with economic conditions in the third quarter of this year.[2]

Although building above transit may not be conventional, at various times in Ottawa's ongoing transit saga the opportunities have been discussed. The possibility was raised of the new Ottawa Public Library main branch being constructed overtop of Bayview Station. Officials at Carleton University wanted to construct their new graduate studies building above the O-Train station on campus. Algonquin College is moving forward with a development above Baseline Station. Having these destinations linked to transit in such a way that library books, classes, jobs, and residences are not just a short walk from trains–but a heated elevator ride–could encourage Ottawans to brave cold winter weather and choose public transit.

The ancillary benefits of development above transit are potentially great: snow removal would cost less, enclosed stations are more comfortable, and there would be greater ability to provide visible signage indicating locations of rapid-transit stations. Air rights could greatly reduce the need to expand our city into the precious nature that surrounds us. We cannot continue to allow the urban boundary to be expanded for low-density development as prime locations near rapid transit go under-developed. When council voted to expand the urban boundary by 230 hectares in June,[3] it ignored that underdeveloped property already included in the city's urban areas. In addition, many of Ottawa's existing suburban neighbourhoods would benefit from in-fill development centred on rapid transit stations.

Concerns remain regarding this kind of development, including the relative value of a square foot of air rights as compared to land. Because the value of land is mostly based on the ability to build *up*, it could be surmised that the value of air rights in a given area should be comparable or superior to adjacent land. The proximity of the development to transit could offset any negative aspects such as not being able to build a subterranean level. The city is also in the unique position of being able to manage the value of its property holdings by controlling development in other areas. It has been proven that these types of transit-oriented development command higher lease prices and operate with lower vacancy rates than average in many cities, including Washington, D.C. and Atlanta, Georgia.[4]

Furthermore, land adjacent to many of Ottawa's transit stations such as Bayshore, Place d'Orleans, and Blair that is currently used for surface parking could be converted to parking garages, with spaces reserved for businesses, residents, visitors, park-and-ride programs, and car-sharing. Although this initial investment would be greater than creating more low-density development on the city's urban fringes, its long-term benefits would be worth the cost. It would also create more attractive, community-like environments in some of Ottawa's most visible and well-travelled areas.

The City should make a proposal to the development community regarding opportunities for above-station development with asking prices as well as purchase-and-lease options to gauge demand. After appropriate public consultation and identification of that demand, the City should select the most desirable sites for development. The air rights to those sites should be sold with conditions, including construction completion dates, design, community consultation, and building use. Remaining sites should be released strategically according to demand, in order to avoid flooding the market.

To be able to move forward with the development of air rights, Ottawa needs a strong, united signal from our city council backing a single comprehensive plan. Councillor Christine Leadman, who sits on both the transit and transportation committees, has stated that she believes that "development of transit stations–possibly in partnership with the private sector–is an important component to a successful transit plan." She also believes that it could help achieve overall cost reductions and improve the system as a whole, but that it is too early to move forward with this aspect of the plan because "we need to have the route and station locations firmly established and approved."[5]

As soon as there is a consensus on our rapid transit strategy, city council should explore all options–including developing stations and lines–to reduce the cost of the overall transit plan to taxpayers, create a more livable city, and make the pie larger for all–instead of simply cutting up what we have.

Endnotes

[1] Chapter 9: Real Estate Impacts of T.O.D. http://www.rtd-fastracks.com/media/uploads/nm/RealEstateImpacts.pdf. pg. 14. Accessed 29 November 2009.

[2] CMHC. Housing Now: Ottawa. October 2009. http://www.cmhc-schl.gc.ca/odpub/esub/64187/64187 _2009_M10.pdf. Page 3. Accessed 30 October 2009.

[3] CBC News. City council extends Ottawa's urban boundaries. 10 June 2009. http://www.cbc.ca/canada/ ottawa/story/2009/06/10/ottawa-boundary-expansion-council.html. Accessed 30 October 2009.

[4] Chapter 9: Real Estate Impacts of T.O.D. http://www.rtd-fastracks.com/media/uploads/nm/RealEstateImpacts.pdf. Pg. 16. Accessed 29 November 2009.

[5] James Tompkins. Personal Interview with Christine Leadman. Via E-mail. 15 October 2009.

Exploring the case for a direct rail link between Ottawa and Cornwall

By Harry Valentine

Beginning during the mid 1880's, the New York Central Railroad extended its rail services between New York City and Tupper Lake into Canada by crossing the border at Cornwall, Ont. It included a direct rail link between Ottawa and Cornwall. The service thrived for several decades until patronage began to decline in the years that followed WW2. Continually declining revenues during the early 1950s led the NYCR to discontinue service between New York City and Ottawa in 1953 and removed the rail line between Ottawa and Cornwall. However, there is potential in this time period to re-examine the potential to re-establish a direct rail link between Ottawa and Cornwall for the purpose of carrying future freight trains and providing daily return commuter train service.

During the first decade of the 21st century, road vehicular traffic reached an estimated 16,000 vehicles per day along Highway 138, the two-lane link that connects Cornwall (population: 42,000) to Highway 417 and eventually to Ottawa, a distance of 100 kilometres. Major road construction to widen this highway might occur between 2015 and 2020. By mid-2006, the Ontario Ministry of Transportation had estimated that over 16,000 vehicles per day were travelling on Highway 7 between Carleton Place and Ottawa. Plans were subsequently implemented to widen Highway 7 from Carleton Place to the interchange with Highway 417.

Beginning in 2007, Ottawa mayor Larry O'Brien initiated discussions with leaders of outlying communities about possible future regional commuter rail service that would link outlying municipalities to Ottawa. O'Brien initiated a demonstration run where he invited elected officials aboard a chartered O-Train that traveled along a rural rail line to an outlying community to the northwest of Ottawa. There are at present three possible commuter rail routes under discussion. O'Brien's vision includes an electric light railway system for Ottawa along with a regional commuter rail system with Ottawa as its centre.

Proposed Commuter Rail Routes

The proposed route to the southwest of Ottawa involves existing rail lines that connect to the towns of Richmond (population: 4,000), Smiths Falls (9,000), and Perth (5,600) for a combined population of 18,000. A possible stop at Barrhaven (almost 50,000) would raise this to almost 70,000. An alternative route that would include Smiths Falls and Brockville (27,000) using an existing rail line would increase the population base to almost 90,000. The proposed route to the northwest of Ottawa is intended to connect to Arnprior (8,000) and Renfrew (8,000), with a possible extension to Pembroke (16,000). The proposed route to the southeast would connect to the towns of Limoges (1,200), Casselman (4,000), Maxville (1,000) and Alexandria (3,500) for a population base of almost 10,000 along an existing rail line.

Only the communities of Barrhaven, Vars and Richmond lie within the boundaries of the City of Ottawa. A branch of the GO Transit rail system may need to oversee the operation of commuter trains in the Greater Ottawa area, between Ottawa and the outlying municipalities. Ottawa municipal officials have discussed the possibility of OC Transpo evolving into a regional tran-

sit authority that will oversee the overall operation of city buses, regional commuter buses, light rail within Ottawa, and regional commuter rail services.

Faster Ottawa-Montréal Passenger Rail and Regional Commuter Trains

The introduction of faster express passenger train services along a revised rail route between Ottawa and Montréal could enhance the attractiveness of intercity train travel between those cities. It could also enhance future prospects of introducing a commuter passenger train service between Cornwall and Ottawa. The improvement to the intercity service would involve construction of a five-mile rail line west of Highway 138 that connects the double-tracked east-west CP Rail line at Monkland, Ont., to the CN Rail line to and from Ottawa at Moose Creek. That link would allow passenger trains to travel a shorter overall distance at higher speed along the double-tracked CP line between Montréal and Monkland. It would bypass the slow and twisting track between Moose Creek and the east-west CN Rail line at Coteau-du-Lac, Que.

The existing track between Ottawa and Moose Creek is relatively straight, and it can allow higher rail speeds after suitable modifications are made to signals and the timing of gates at grade crossings. A high-speed set of points and a gently curving track at Moose Creek could allow for sustained high speed along the proposed five-mile link between Moose Creek and Monkland, where a gently curving track and high-speed set of points would connect to the CP Rail line to and from Montréal. An interchange in Montréal could transfer the express passenger trains between the CN and CP tracks. There is the option for certain Montréal-Ottawa departures to arrive at and depart from the CP Rail Windsor station.

Possible Cornwall-Ottawa Rail Route

A future Ottawa-Cornwall commuter train would travel along the same proposed railway line between Ottawa and Monkland as would the optional route of a faster Montréal-Ottawa express train service. The installation of the five-mile link between Moose Creek and Monkland would justify the construction of a 12-mile north-south rail line from the east-west CP Rail line at a point east of Monkland to the CN Rail line at a point east of Cornwall – the village of Glendale. The main east-west CN Rail rail line between Montréal and Toronto runs parallel to Highway 401 and is located on the north side of Highway 401 from Montréal to within one kilometre east of Cornwall's eastern boundary. At this point, the rail line crosses under Highway 401 to the south side and enters the City of Cornwall. The proposed rail link between Monkland and Cornwall would need to carry freight trains to justify its construction cost and long-term operating costs.

A Possible case for a Cornwall-Ottawa Commuter Train

The City of Cornwall (population: 42,000) and surrounding area has endured the closures of several factories that have resulted in significant job losses in that region over the past five years. One option for workers who are Cornwall residents is to commute to workplaces in Ottawa and Montréal. That trend is likely to continue into the future. One future option for Cornwall would be to become a bedroom community of Ottawa, courtesy of employment opportunities in Ottawa for Cornwall resi-

dents along with access to economical, fast, and reliable commuter train and bus service to and from Ottawa.

The commuter bus and train service could compliment each other by transporting passengers to different locations inside Ottawa. Commuter buses that arrive at the east end of Ottawa could travel along the Transitway all the way into the downtown core. The commuter train could be interlined and interscheduled to serve the stations of the O-Train system on inbound and outbound journeys.

The City of Cornwall is located some 100 kilometres southeast of Ottawa. When traffic density is low during good weather conditions, a journey by road between Cornwall and Ottawa on Highwayy 417 and Highway 138 will take about one hour. Travel time increases during times of snowfall and also during peak travel periods. Currently, two bus companies provide peak-hour service between Cornwall and Ottawa on schedules geared to commuters. Both buses have access to the Transitway.

An increase in ridership aboard one of the bus services has warranted the introduction of a larger capacity vehicle (24–56 seats). Future increases in patronage are expected to warrant the introduction of additional vehicles or larger (double-decker) buses that will transport commuters into downtown Ottawa. A future commuter train may transport passengers to a variety of other destinations around Ottawa.

Freight train service

The long-term viability of a north-south rail line to Cornwall will ultimately depend on such a link becoming attractive for future freight operations. There are slowly evolving trends in the rail-freight transportation sector that may offer future opportunity for Cornwall. These trends are occurring in the regions that include and surround the Greater Montréal and Toronto areas, where there is public opposition to expanding intermodal freight terminals that need to be expanded over the long-term future.

Prior to the stock market mortgage meltdown of 2008, the intermodal train-truck freight terminals at Toronto and Montréal were operating near capacity. There is little remaining space in the Greater Toronto Area to expand such terminals or build new ones. Traffic gridlock has become especially problematic along main roads and highways on the island of Montréal. Increasing vehicular traffic on Montréal's existing road network is no longer an option.

There are plans to build a new intermodal rail-marine freight terminal at the Port of Montréal capable of processing the new-generation PANAMAX 2 size of container ship. There is limited land available on the Island of Montréal to build a new intermodal train-truck freight terminal and chronic traffic congestion on Montréal roads disqualifies such an option. Any new rail-truck intermodal terminal will have to be built off the island of Montréal. Such a terminal would need to be built to the west of Montréal, within close proximity to Highway 401 and the CN Rail and CP Rail lines in eastern Ontario.

Economic recovery and new economic development will likely occur over the long-term future, perhaps a decade ahead or beyond. At that time, the railway companies may have to organize operations that allow more east-west trains to bypass the intermodal terminals in the Greater Toronto Area. More container freight train traffic that travels between western Canada and Montréal may be diverted on to the remaining rail lines that pass through the Ottawa Valley. Some of these trains may even be routed through Cornwall if a future train-

truck intermodal terminal is built in eastern Ontario near Cornwall.

The rail line through the Ottawa Valley could transport forest products for wood-based industries that are likely to commence operation in eastern Ontario. Lumber trains could carry forest products destined for the proposed wood pellet processing plant at Ingleside, Ont., which lies some 20 kilometres west of Cornwall. Ontario Power Generation is testing wood pellets as an alternative fuel to coal for use in thermal power stations. The plant at Ingleside could become a major supplier of wood pellets for power generation. The distance from the Upper Ottawa valley to Cornwall would be 70 kilometres shorter using the proposed rail link between Moose Creek and Cornwall than the present rail route via Coteau-du-Lac, Quebec.

Expected Commuter Train Patronage

Although there is certainly great political enthusiasm to promote and develop peak-hour commuter train services in the Greater Ottawa area, a recent precedent from the town of Rigaud, Que., suggests that the viability of several of the proposed routes in eastern Ontario may be uncertain. Rigaud is a town of 7,000 that is served by a peak-hour commuter train of 11 single-level coaches that that carry 30–40 riders between Rigaud and Montreal. The journey between Windsor station and Rigaud station can take up to 90 minutes.

At a future time, a semi-express commuter train between Ottawa and Cornwall could cover the journey from station to station in less than an hour with a projected 180–240 riders aboard a two-coach, bi-level train. The projected number of riders is based on Cornwall's population, which is six times larger than Rigaud, and its access to multiple stops along the O-Train system. The possibility of reduced travel duration will enhance the attractiveness of the train and potentially push the number of riders closer to 300 people per train.

Cost Factors

The Canadian Transportation Agency (CTA) will allow a two-coach, bi-level train that is "self-propelled" with driver located in a cab in a passenger coach to operate with a three-person crew. If both coaches were hauled by a locomotive, CTA rules mandate a six-person crew, with two people in the locomotive cab. The operating cost of a short, self-propelled, bi-level train would be relatively low and require minimal subsidy.

The CTA may allow a short passenger train to be hauled by a low-level locomotive, and allow the driver to be located in the cab of the bi-level passenger coach coupled immediately behind such a locomotive. The alternative would be a two-axle trailer coach carrying a diesel-powered generator, which would supply electric power.

Commuter Trains in O-Train Stations

It may be possible many years into the future *to use dynamic, real-time computer scheduling to allow* commuter trains that terminate in Ottawa to stop not only at Ottawa's main station on Tremblay Road, but also Billings Bridge plaza and at the O-Train stations at Confederation Heights, Carleton University, Carling Avenue, and Bayview Station. There may initially appear to be a problem due to the short length of the O-Train platforms. However, the railways long ago developed solutions where a very long train can provide service at a very short station.

The operation of commuter train services would involve the use of short commuter trains with high passenger carrying capacity per coach as a means to reduce operating costs. Gallery-style, bi-level railcars are built to a length of 85 feet between couplers and are designed with passenger doors at the centre of each coach. A two-car gallery, bi-level train would place the centre of the passenger doors at a distance of 26 metres apart in a platform of less than 40 metres in length. Pairs of under-floor, horizontal six-cylinder diesel engines that drive the axles via hydraulic transmissions may be installed into each railcar to provide propulsive power.

An alternative propulsion system would place a low-level, cab-less locomotive ahead of the train and the driver in the high-level cab in the passenger coach. The driver would have a clear view over the hood of the locomotive and of the track and signals that lie ahead. Another propulsive concept would involve a lightweight, two-axle diesel-electric power unit coupled at the rear of the train that would provide electric power to electric traction motors on the axles on one or both passenger coaches.

An alternative two-car train would be the GO Transit bi-level design that features two sets of passenger doors per coach set 12.5 metres apart. A low-level locomotive or power unit would provide propulsive power with traction motors either on the power unit or on the outer axles of the passenger coaches. The driver would drive from a cab in the passenger coach and see over the track ahead over the low-level hood of the locomotive or power unit. A lightweight trailing power unit may alternately provide power to traction motors that drive the outer axles of a modified GO Transit coach.

When the train arrives at an O-Train station, only the inner doors close to the centre of the two-coach train would operate. Green lights inside and outside the coaches could indicate to passengers which doors are operating in the O-train stations. The centres of the inner doors are 14 metres apart on a two-coach train, and they can be easily accommodated in short O-Train stations. Special markers may be installed at the side of the track at each O-Train station to pinpoint the location of the driving cab when the commuter train is stopped. A three-coach, bi-level train may use this door operation system on the O-Train network.

Conclusions

A direct rail link between Cornwall and the CN line at Moose Creek will depend on whether sufficient future freight service could materialize to ensure the viability of a link. The possible opening of Ontario's largest wood pellet processing plant at Ingleside could result in forest products being transported to that location by rail, from points in Quebec and northern Ontario. That facility could supply wood pellets to thermal power stations that were formerly coal-fired.

There is potential to divert future rail-container freight trains via the Ottawa region as a way to bypass congested terminals in Toronto. As well, there is future potential to locate a future train-truck inter-modal terminal to the west of the island of Montréal, even as far west as Eastern Ontario. There is future potential for a north-south rail line between the CN Rail line at Cornwall and the CP Rail line at Monkland to carry inter-modal container trains between Western Canadian ports and major distribution centers at Cornwall and at Coteau, Quebec.

Further research would need to be undertaken within the next several years to determine the potential of a viable rail line for freight operations.

Public Transit in Ottawa

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Photo by Charles Akben-Marchand, winner of the *Public Transit in Ottawa* photo contest. Pictured is a model made by Tim Lane of a potential configuration of the South Keys transit station with platforms for O-Train, LRT, and passing tracks for freight trains.