

POLICY SERIES



A Canadian Autobahn

Creating a World-Class Highway System
for the Nation

By Wendell Cox

About the Author



Wendell Cox is principal of Wendell Cox Consultancy, an international public policy, demographics and transport consulting firm. He has developed a leadership role in urban transport and land use and the firm maintains three internet websites: www.demographia.com, www.publicpurpose.com and www.rentalcartours.net. Mr. Cox has completed projects in Canada, the United States, Asia, Australia, New Zealand, Europe and Africa. He is author of *War on the Dream: How Anti-Sprawl Policy Threatens the Quality of Life*, and a co-author with Richard Vedder of *The Wal-Mart Revolution: How Big-Box Stores Benefit Consumers, Workers, and the Economy*.

He was appointed to three terms on the Los Angeles County Transportation Commission which oversaw highways and public transit in the largest county in the United States. He was also appointed to the Amtrak Reform Council. Mr. Cox is visiting professor at the Conservatoire National des Arts et Metiers (a national university) in Paris.

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MB: 203-2727 Portage Avenue,
Winnipeg, Manitoba Canada R3J 0R2
Tel: 204 957-1567

SK: 2353 McIntyre Street,
Regina, Saskatchewan Canada S4P 2S3
Tel: 306 352-2915

AB: Ste. 1280-300, 5th Avenue SW
Calgary, Alberta Canada T2P 3C4
Tel: 403 230-2435

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Table of Contents

Executive Summary	4
Introduction	5
Infrastructure Proposals	6
Highways in Canada	8
The Canadian Autobahn	10
Transcontinental Route	13
Additional Routes	16
The North: Development and Sovereignty	19
Appendix	20
Endnotes	24

Executive Summary

As the worldwide “Great Recession,” (as characterized by the International Monetary Fund), has developed, there have been many proposals to expand transportation infrastructure. One is to build high-speed passenger rail lines in Canada. Another alternative is to establish a world-class highway system of freeways, also known as motorways, autobahns or autoroutes in other parts of the world.

Motorways and autoroutes are fully grade separated roadways that permit traffic to flow generally uninterrupted between urban areas. They do not have at-grade cross traffic. The United States, Europe and Japan have motorway systems that reach virtually all of their major urban areas. China is developing a system that will eventually equal the length of the world’s most extensive system, which is in the United States. Mexico and Brazil have developed substantial systems. Canada, however, does not have a comprehensive system and is the largest developed nation in the world without a comprehensive intercity motorway system. In addition, some nations have built highways to pre-motorway standards, which provide superior capacity, speed and safety compared to conventional roadways.

Motorways have a significant positive impact on national and local economies, principally because saving time improves productivity. Moreover, motorways are far safer than conventional roads, because there are no grade crossings.

Canada is largely unconnected by motorways or autoroutes. On average, the metropolitan areas are connected to less than one-quarter of the other metropolitan areas. Two of the nation’s six metropolitan areas with more than 1,000,000 people

(Calgary and Edmonton) are not connected to any other metropolitan area by motorway, and Vancouver is connected only to Abbotsford. Calgary and Edmonton are also the only major metropolitan areas not connected to the motorway systems of the United States and Mexico. As a result, much of Canada, one of the three North American Free Trade Agreement (NAFTA) partners, is not connected to the motorway systems of the United States and Mexico.

For many trips between metropolitan areas within Canada, it takes less time to travel through the United States on its motorways. The principal problem is the long, crowded, slow, two-lane stretch of roadway between the Manitoba-Ontario border, between Sudbury and Parry Sound, and much of the route between the Alberta border and Kamloops, B.C. Canada pays an economic price for this lack of a world-class highway system, both in terms of manufacturing and tourism.

It is proposed that a national motorway and pre-motorway be established, the Canadian Autobahn. This system would include the following improvements:

- All non-motorway segments of the transcontinental route from Halifax through Toronto to Vancouver would be upgraded to motorway standard. These improvements should be completed within 10 years and would cost approximately \$28 billion (2009\$).
- The inclusion of all existing intercity motorways and autoroutes
- Other principal routes would be upgraded to at least pre-motorway standard. The longest of these is the Yellowhead route; Edmonton and Calgary to the Canada-

U.S. border; Ottawa to Sudbury; and across the island of Newfoundland. These improvements should be completed within 15 years and would cost approximately \$33.5 billion).

Moreover, new roads to the North need to be considered. Less than 300 kilometers remain to complete a link to the port city of Churchill, Manitoba. Given the concerns about national sovereignty in the North, the potential for a road to Nunavut (Rankin Inlet or eventually Iqaluit) deserves a serious review.

Because of the importance of tying the nation together, it would be appropriate to spend federal and provincial funding on the Canadian Autobahn. User fees, such as a dedicated gasoline tax (as in the United States) or tolls (as in France, China and Mexico) could finance it.

Introduction

Canada is one of the world's most affluent countries and is served by a generally superior transportation infrastructure system. Its user-financed airport system provides convenient passenger and freight connections throughout the nation and to the rest of the world. Canada has first-rate ports, both ocean and inland. Canada's freight rail system may have the highest market share of surface shipments in the developed world. As a result, Canada has thus far been spared the extreme truck traffic congestion that is routine in Europe and Japan, where freight rail has been relegated to, at best, a marginal share. However, with continuing increases in commerce and the importance of "just-in-time" delivery, truck traffic seems likely to increase substantially. This will put a strain on Canada's highway system, which, unlike its air and rail systems, does not measure up to international standards.

The principal problems are the long, crowded, slow, two-lane stretch of roadway between the Manitoba-Ontario border, between Sudbury and Parry Sound, and much of the route between the Alberta border and Kamloops, B.C. Canada pays an economic price for this lack of a world-class highway system...

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INFRASTRUCTURE PROPOSALS

As the present worldwide “Great Recession” (as characterized by the International Monetary Fund) has developed, there has been considerable discussion about improving infrastructure to spur economic growth. One suggestion is high-speed rail. However, it could be a higher priority to tie the entire nation together with a world-class highway system.

WORLD-CLASS HIGHWAYS

Nearly all of the world’s developed nations have comprehensive intercity motorway systems. Motorways facilitate higher levels of commerce and tourism. Canada has an extensive roadway system, with the most important segments designated as the Trans-Canada Highway. However, much of the Trans-Canada is only two lanes.

Despite its international leadership in many sectors, Canada’s highway system is of generally lower quality. Canada is the largest high-income nation without a comprehensive intercity motorway system.

Canada has many high-quality motorways, but they fall far short of connecting the nation’s metropolitan areas and major ports. Canada’s highway disadvantage is likely to become more of a problem as truck, general travel and tourism volumes increase.

Motorways and the Economy

Motorways are associated with improved economic performance. The principal reason is that motorways reduce the time it takes for commercial and personal travel (such as commuting to work), which inherently improves productivity.

The old adage “time is money” holds true.¹ For example, a synthesis of research by the American Association of State Highway and Transportation Officials (AASHTO) noted the positive impact of the U.S. motorway system.²

The Interstate Highway System represented an investment in a new, higher speed, safer, lower cost per mile technology which fundamentally altered relationships between time, cost, and space in a manner which allowed new economic opportunities to emerge that would never have emerged under previous technologies.

In particular, the AASHTO synthesis indicated that motorway “... investments have lowered production and distribution costs in virtually every industry sector.”

Further, it has been estimated that in its first 40 years (1956 to 1996), the U.S. interstate highway system reduced traffic fatalities by 187,000.³

World Motorways

The United States has the longest motorway system in the world, at approximately 88,000 kilometres. This system was designed in the 1950s to connect all major cities (municipalities) with more than 50,000 people, and today it connects virtually all large urban areas. The European Union (EU-15) and Japan also have extensive motorway systems, which connect virtually all major urban areas. Moreover, some developing nations have extensive motorway systems.

China's motorway system is already the second longest in the world, at more than 60,000 kilometres as of the end of 2008.⁴ By 2020, the China motorway system is likely to be as extensive as that of the United States and will extend virtually from border to border. The longest route will be from the Kazakhstan border in the Pamir Mountains to Manchuria, more than 5,000 kilometers. India began its system later but is in the process of developing a national network, major parts of which are already in operation. Mexico and Brazil also have extensive motorway systems.

Motorway Standards

Fully grade separated roadways are of the highest quality, because they substantially reduce travel times for passengers and freight, while materially improving safety by virtually eliminating head-on or side collisions. Motorway standards require all crossings to be above or below the roadway, with no crossings at grade. They also require a minimum of two traffic lanes in each direction, separation between the directions and no traffic signals.

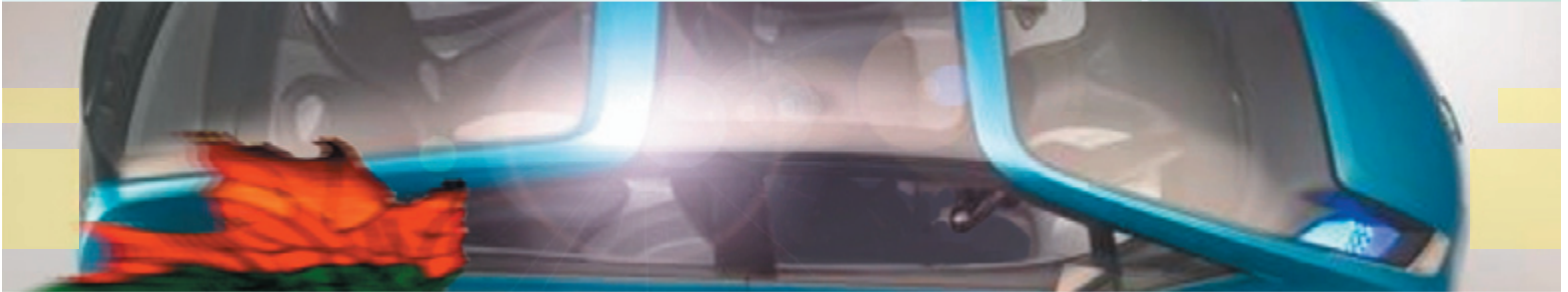
Motorways have strict control over entry and exit, so, for example, commercial businesses and homes cannot be accessed



directly (they may be accessed by means of parallel frontage roads). These roads go by a variety of names, such as motorways in the United Kingdom, autoroutes in France and Quebec, autobahns in Germany, expressways in China and interstates or freeways in the United States and parts of Canada.

Pre-Motorway Standards

Substantial improvements in travel times and safety can also be accomplished by less expensive improvements. China built Class One highways in addition to the motorways. These highways have at least two lanes in each direction, complete physical separation of directional traffic and a few grade crossings with signals. In between these widely spaced crossings, all entries to the roadway require a right turn, so that there is no crossing of the highway except at the infrequent intersections with traffic lights.⁵ These crossings can be made even safer by constructing ramps that require all turns to be to the right on to the intersecting roadway, which is then used to cross the main roadway lanes (Figure 1, above).⁶ This paper refers to such improvements as "pre-motorway" standard, because they can be efficiently converted to motorway standard later.



HIGHWAYS IN CANADA

The average metropolitan area (out of the nation's 33⁷) is connected by motorway to only 23 per cent of the other metropolitan areas. These connected metropolitan areas account for, on average, 30 per cent of the nation's metropolitan population.

Two of the six metropolitan areas with more than 1,000,000 people are not connected to any other Canadian metropolitan area by motorway (Calgary and Edmonton), and they are not connected to the motorways of the United States and Mexico. The third-largest metropolitan area, Vancouver, is connected only to Abbotsford. Vancouver, however, has good connections to the motorways of the United States and Mexico.

On the other hand, motorways connect almost all of the metropolitan areas of Ontario and Quebec to one another.⁸ As well, three metropolitan areas in New Brunswick and Nova Scotia are connected to one another (Figure 2, Pg. 11).

Motorway standard alignments, however, are far shorter or even non-existent in the northern Great Lakes area (north of lakes Superior and Huron), the Prairie Provinces and British Columbia. Moreover, major urban areas such as Calgary, Edmonton, Winnipeg, Halifax, Regina and Saskatoon have no motorway connection to the United States interstate system and the expanding motorway/autoroute system in Mexico. As a result, much of Canada, one of the three NAFTA partners, is not connected to the

motorway systems of the United States and Mexico.

The U.S. Motorway Advantage for Canadians

Because of the slow travel times along the Trans-Canada Highway, drivers can actually save time by travelling through the United States. For example, travelers headed from Winnipeg or west to Toronto (or destinations further east) can generally reach their destinations more quickly by using the United States interstate highway system. The same is true, at least theoretically, for trucks. However, U.S. border-crossing formalities have made this more difficult since the terrorist attacks of September 11, 2001. The U.S. advantage could return for Canadian truckers should border-crossing procedures improve.

The most significant problem is the crowded, two-lane roadway across the northern Great Lakes region, from the Manitoba-Ontario border to Sudbury and Parry Sound. This difficult stretch of roadway represents a virtual division in the nation's economy.



Metropolitan areas such as Thunder Bay, Sudbury and North Bay are disadvantaged by their relative isolation from distant markets.

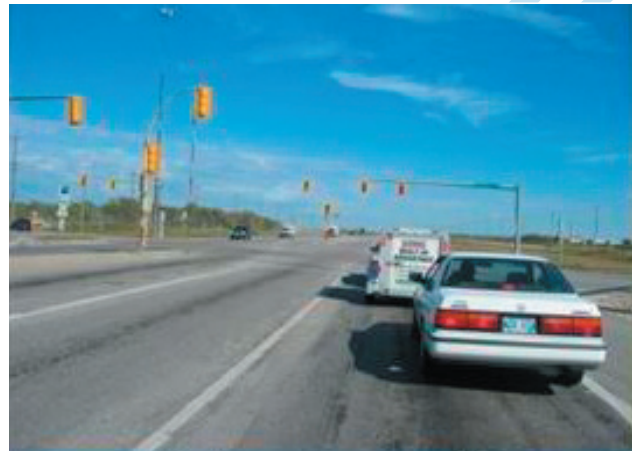
The Economic Price

Canada pays a price for not completing a high-quality highway system that connects its metropolitan areas. Central and eastern markets are served more effectively from U.S. locations than from locations in the Prairie Provinces or the West, because of the superior access provided by the U.S. interstate system.

Similarly, eastern and central vendors are at a geographical disadvantage relative to U.S. manufacturers who ship by truck. More particularly, metropolitan areas such as Thunder Bay, Sudbury and North Bay are disadvantaged by their relative isolation from distant markets. This isolation is the result of their substandard highway connections to the rest of the nation.

The heavy summer traffic in the northern Great Lakes and eastern British Columbia limit substantial tourist growth from the U.S. market.

Moreover, with the increasingly global market and NAFTA, Canada's competitive potential is limited by the extent of its less than adequate highways. As noted above, the United States has a comprehensive motorway system. The third partner in NAFTA, Mexico, is proceeding with the development of motorways from the centre of the nation to the U.S. border.



THE CANADIAN AUTOBAHN

Canada should follow the economic development examples already set by the European Union, Japan, the United States and China and develop a world-class national highway system (principally motorway). Such a system would likely produce substantial economic growth, as has occurred in other nations. Moreover, portions of the nation that have been bypassed in their economic development because of standard road access are liable to be particular beneficiaries, leading to more decentralized and balanced growth.

A Canadian Autobahn, could eventually be developed to serve all metropolitan areas. Moreover, Canadian Autobahn would serve the largest metropolitan areas in each province, the national capital and all the provincial capitals. The Canadian Autobahn would provide the type of roadway connections that have improved commerce in other countries, simplified and sped up travel and improved highway safety.

The Canadian Autobahn should have a national logo for use in connection with the present provincial highway signs and on highway maps. This would provide travelers with simple and reliable information on the availability of high-quality highways, similar to the role of the interstate shield and European motorway entrance signs.

The Canadian Autobahn would include the following components (Figure 2, at right):

1. Transcontinental route: The first priority would be the upgrading to motorway standards of all segments of the transcontinental route from Halifax, through Toronto to Vancouver. This would substantially improve connectivity in the nation. The average metropolitan area would be connected to 52 per cent of the other metropolitan areas, which is more than double the present 23 per cent. Further, the average metropolitan area would be connected by motorway to 61 per cent of the nation's metropolitan population, again more than double the present 28 per cent (Figure 2). The transcontinental route should be completed within 10 years.
2. All existing and future intercity motorways. (Table 1, Pg. 12)
3. Additional routes: Additional routes would be upgraded to motorway or pre-motorway standard (above). Completion of these roadways would connect all of the nation's present metropolitan areas to all others as well as to the U.S. interstate highway system. The additional routes should be completed within 15 years.

The entire Canadian Autobahn could be upgraded over a period of 15 years. Further details follow.

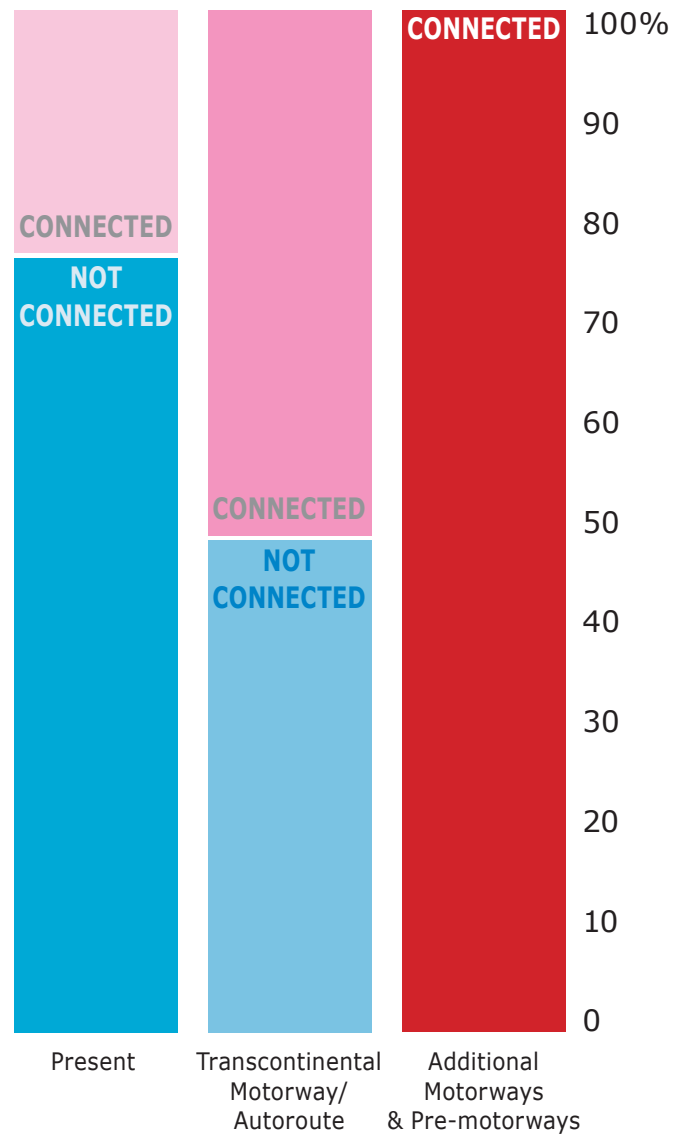


FIGURE 2.

Table 1: Existing Intercity Routes Included in the Canadian Autobahn

Province	Route (General Description)
NB	Trans-Canada Highway–West of Saint John
NS	Halifax-Bridgewater
NS	Halifax-Digby
ON	Hamilton-Woodstock
ON	London-Sarnia
ON	Ottawa–MacDonald-Cartier Freeway
ON	Peterborough–MacDonald-Cartier Freeway
ON	Toronto-Niagara (Queen Elizabeth Way)
ON	Toronto-Windsor
ON-QC	Montreal-Ottawa
QC	Autoroute 20-Shawnigan
QC	Autoroute 40-Joliette
QC	Drummondville-Sherbrooke-U. S. border
QC	Montreal toward Mont-Tremblant
QC	Montreal-Drummondville
QC	Montreal-New York border
QC	Montreal-Trois Rivieres-Quebec
QC	Montreal-Vermont border
QC	Quebec to Sainte-Joseph-de-Beauce

Table 2: Connections: All 3 Metropolitan Areas



Canadian Motorway/Autoroute System



TRANSCONTINENTAL ROUTE

The entire transcontinental route from Halifax to Vancouver should be motorway standard. Currently, approximately 40 per cent is motorway standard.⁹

The transcontinental route is largely world-class in its eastern and central segments and of high quality; however, it is not of motorway or pre-motorway standard in much of its alignment from Winnipeg west. Nearly all of the northern Great Lakes alignment is two-lanes, as are important sections in eastern British Columbia.

Eastern and Central Route

Much of the eastern and central transcontinental route is already at motorway standards. However, a 90-kilometre section from just east of the New Brunswick border to Rivière-du-Loup would need upgrading from its current two lanes.

The transcontinental route passes through Montreal along the Autoroute Métropolitain (Route 40), which is a road long since made obsolete by its limited capacity. The Quebec government is in the process of completing a new metropolitan bypass (Route 30), which will substantially increase capacity through the Montreal metropolitan area by providing an alternate route through the southern suburbs. The transcontinental route continues to the MacDonald-Cartier Freeway in Ontario and turns north on Route 400 in the Toronto suburbs toward Parry Sound, where the motorway ends.

Northern Great Lakes

The transcontinental route is largely two lanes from Parry Sound to west of the Ontario-Manitoba border. Its substantial volumes make it virtually impossible to maintain the speeds that are typical of motorways, because of all the curves and the limited passing opportunities. There is a short motorway segment west of Sudbury. However, the balance of the Great Lakes segment would need upgrading to motorway standard from Parry Sound to the Manitoba border. It would appear that the southerly route, near the shorelines of the lakes, would be the priority for development (Route 17).

The Prairies

Much of the Prairie section is already four lanes, but it is not to motorway or pre-motorway standards. Except for short segments between the Ontario border and Calgary, the transcontinental route would require upgrades, especially grade separation of all crossings, access control and some bypasses of urban areas (most urban areas are already bypassed by the current roadway). The southern bypass would appear to be the most appropriate route through the Winnipeg area. A Calgary bypass, which will connect with the motorway in operation from the western suburbs to Banff National Park, is under construction.



The West

The transcontinental route is of motorway standard west of Calgary to the junction with southbound Route 93 (Vermillion Pass). A project is underway to expand the motorway alignment further north to the British Columbia border. Another upgrade will soon be completed between the western boundary of Yoho National Park and Golden, B.C. Finally, there is a motorway from east of Kamloops to Vancouver, (the Coquihalla Highway to Hope and the Trans-Canada Highway continuing to the Vancouver area). All other sections would need upgrading to motorway standard. This includes particularly challenging alignments west from the Kicking Horse Pass summit, at the Alberta-British Columbia border, and Rogers Pass in eastern British Columbia.

Vermillion Pass Alternative

The Kicking Horse Pass grade in British Columbia may be the most complex section on the transcontinental route that needs upgrading. This steep roadway is in the same area as the renowned spiral tunnels of the Canadian Pacific Railroad.

Parks Canada administers the Kicking Horse Pass grade, because of its alignment through Yoho National Park. The Yoho National Park Management Plan indicates no immediate plans for expanding this section of roadway.¹⁰ It is important, however, that this segment is upgraded.

Another possibility is to review alternative routings that may be less environmentally sensitive but provide the same or nearly the same level of mobility. The transcontinental route could turn west to follow the southbound and westbound Route 93 (Kootenay Highway), crossing Vermillion Pass. Two alternatives would be useful for further study:

Vermillion Tunnel

This route would be aligned westbound from the point where Route 93 turns south (approximately 20 kilometres east of the Trans-Canada Highway junction) and crosses the Vermillion Range through a single-bore tunnel approximately 15 kilometres in length (perhaps in the area of Wolverine Pass). A new motorway alignment would be built from the western tunnel portal northerly through the Kootenay Valley, rejoining the upgraded Trans-Canada alignment at the western entrance to Yoho National Park (east of Golden). Single-bore tunnels, with only two lanes, have been effective in handling high volumes of traffic for relatively short distances (long distances for tunnels) in such tunnels as the St. Gotthard in Switzerland, and the Mont Blanc and Frejus, both between France and Italy. It is likely such a tunnel could pay for itself with tolls.

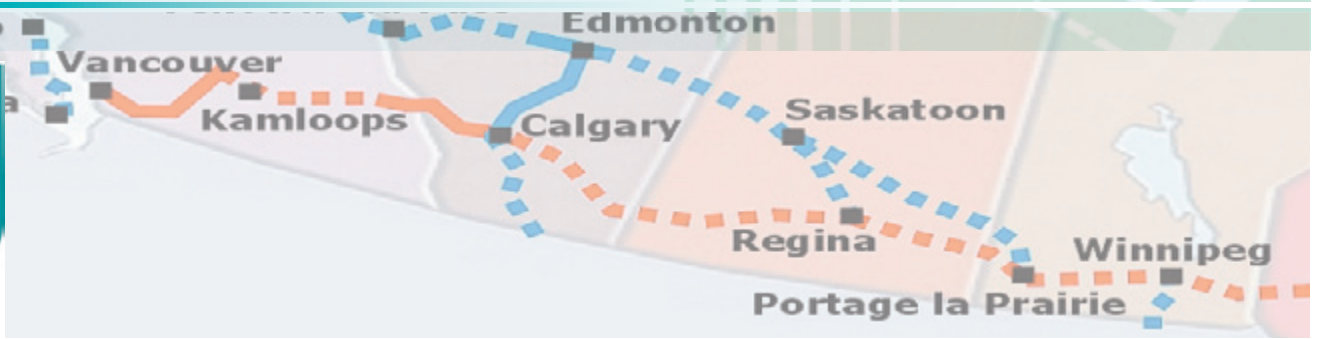
Surface Alignment

Another alternative would be for the motorway to continue southbound along the Route 93 alignment, then turn north once it reaches the Kootenay Valley at Kootenay Crossing (before Route 93 enters Sinclair Pass). From that point, the motorway would rejoin the upgraded Trans-Canada Highway alignment at the western entrance to Yoho National Park east of Golden.

The Cost

The cost of upgrading the transcontinental route to motorway standards is estimated at \$28.0 billion (this assumes the present Kicking Horse Pass grade alignment in British Columbia).¹¹





ADDITIONAL ROUTES

The Canadian Autobahn should be expanded to include other important routes to link the balance of the nation's metropolitan areas. These could be built to pre-motorway standards, with subsequent improvement to motorway standards.

Yellowhead Route

The second-largest ocean port on Canada's Pacific Coast is Prince Rupert, B.C., which is also the closest major Pacific Coast port to the Orient. Prince Rupert is connected to the rest of Canada and the United States by the Yellowhead Highway, which continues to Edmonton and Saskatoon and joins the transcontinental route near Portage la Prairie, Manitoba. An upgraded Yellowhead route could have substantial benefits for Prince Rupert, especially since the largest U.S. Pacific ports are becoming less competitive, due to labour difficulties and rising fees. From 1999 to 2005, U.S. West Coast ports experienced a drop in their market share of Asian commerce from 86 per cent to 58 per cent, with much of the business traversing the Panama Canal instead.¹² With the expanded higher capacity Panama Canal set to open in the middle of the next decade, the U.S. West Coast ports could become even less competitive. This situation could provide a significant strategic opportunity for the Port of Prince Rupert.

Moreover, the Port of Prince Rupert expansion that would be facilitated by an upgraded Yellowhead route would have substantial

advantages for Vancouver, where there is significant port congestion.¹³ By handling more cargo, a more accessible, expanded Port of Prince Rupert could relieve the congestion at the Port of Vancouver, which will inevitably face logistical difficulties due to the resistance to expanding road and rail capacities in an overcrowded urban area.

An upgraded Yellowhead route would provide the Port of Prince Rupert with superb access not only to Canadian markets, but also to U.S. Mountain West markets, connecting via the proposed Edmonton-Calgary-U.S. border route (below) and the Winnipeg-U.S. border route (below), which would provide access to U.S. mid-western, eastern and southern markets.

A long section of the Yellowhead route between Saskatoon and near the foot of the Rocky Mountains in Alberta (Hinton area) is four lanes. These conventional four-lane alignments would be upgraded to pre-motorway standard. A motorway bypass of Edmonton already exists.

The Yellowhead route would need to be upgraded from two lanes to pre-motorway standards between Prince Rupert and Hinton and between Saskatoon and Portage la Prairie, Manitoba, where the Yellowhead route meets the transcontinental route. New bypasses of Prince George, B.C., and Lloydminster, Alberta-Saskatchewan, would need to be constructed.

Edmonton-Calgary– U.S. Border Route

The Edmonton to Calgary highway is motorway standard, which is indicative of the large demand in this corridor. Much of the route from south of Calgary to the border and through Lethbridge is a conventional four-lane roadway, which should be upgraded to pre-motorway standard. This route would meet US Interstate 15 at the Montana border. As noted above, this alignment could improve the competitiveness of the Port of Prince Rupert, which would be better positioned for handling East Asian commerce to Canadian and U.S. destinations (in the Mountain West).

Winnipeg-U.S. Border Route

The Winnipeg to U.S. border highway is currently a conventional four-lane alignment, which should be upgraded to at least pre-motorway standard. This route would require some bypass construction around urban areas. The route would meet US Interstate 29 at the border. As noted above, this alignment could improve the competitiveness of the Port of Prince Rupert, which would be better positioned for handling East Asian commerce to Canadian and U.S. destinations (in the Mid-West, South and East).

St. John's-Truro Route

The Truro, N.S., to St. John's, Newfoundland, route is in two parts, connected by the ferry from Sydney, N.S., to Port aux Basques, NL. Parts of the Nova Scotia roadway are already at motorway standard but other portions are two lanes and would require upgrading to pre-motorway standard. Nearly all of the route in Newfoundland is two lanes and would need to be upgraded to pre-motorway standard.

Ottawa-North Bay-Sudbury

The Ottawa to North Bay and Sudbury is the principal route of the Trans-Canada Highway across eastern Ontario. It receives heavy truck traffic, especially from Montreal and further east. This road is two lanes and would need to be upgraded to pre-motorway standards virtually along its entire alignment.

Charlottetown-Sackville Route

The Charlottetown, PEI, to Sackville, N.B., highway is two lanes and would need to be upgraded to pre-motorway standards. The Northumberland Strait crossing (Confederation Bridge) is also two lanes. However, it is likely upgrading could be deferred, just as major motorway routes through the Alps narrow to two lanes for short distances through tunnels (such as the St. Gotthard in Switzerland and the Mont Blanc and Frejus tunnels, both between France and Italy).

Quebec-Saguenay Route

The Quebec to Saguenay route is two lanes from the northern suburbs of Quebec and would need to be upgraded to pre-motorway standards.

Barrie-North Bay Route

The Barrie to North Bay route is motorway standard except for a 35-kilometre section, which would be upgraded to pre-motorway standards.

Victoria-Nanaimo Route

The Victoria to Nanaimo highway is four lanes and would be upgraded to pre-motorway standards.

Guelph Connection

A short segment of four-lane roadway would need to be upgraded between the McDonald Cartier Freeway and Guelph.

Kelowna-Salmon Arm

A connection would be built between the transcontinental route near Salmon Arm and the northern fringe of Kelowna. This would provide good access from one of the nation's fastest growing areas, the Okanagan Valley, toward the east.

Thunder Bay-Border

This short segment should be upgraded from its current two-lane alignment to pre-motorway standards. It would be a priority to seek U.S. and Minnesota agreement to upgrade Route 61 from the border to the north terminus of Interstate 35 in Duluth, Minnesota.

Other Expansions

There may be a need to expand some existing motorways due to high demand, such as the Toronto to Montreal or Edmonton to Calgary corridors. This can be accomplished cost effectively. For example, adding a lane in each direction between Edmonton and Calgary would cost less than \$600-million and would provide significant additional capacity.¹⁴

Cost:

The additional roadways are estimated to cost \$33.5 billion.





THE NORTH: DEVELOPMENT AND SOVEREIGNTY

Churchill, Manitoba, is one of the nation's major ocean ports; yet it has no highway access to the rest of the nation. The closest road (Manitoba 280) ends 300 kilometres away from Churchill. The potential benefits of building a basic two-lane highway to connect Churchill with the Canadian Autobahn should be considered.

Moreover, as shipping increases in the Northwest Passage, there is legitimate concern about sovereignty in the North. All provincial and territorial capitals are connected by the basic road system, with the exception of Iqaluit, the capital of Nunavut. It will be difficult to reach Iqaluit by road, but such access may be necessary to maintain sovereignty. A Churchill road might be extended to Rankin Inlet and eventually to Baffin Island to Iqaluit. The route would be very challenging and might require ferry crossings (or ice-road crossings).¹⁵ As a model, the highway extension to Yellowknife in the Northwest Territories has driven economic development. Moreover, the Arctic coast is served by one highway, the Dempster, from near Dawson, Yukon Territory, to Inuvik. A Nunavut highway should be considered for both economic development and national security reasons.

Finance

Because of the importance of tying together the entire nation, direct expenditures by the federal and provincial governments would be appropriate. The system should also be wholly or partly user financed. For example, gas taxes could be dedicated to use for highways, as in the United States. User financing would be particularly attractive because of the large number of U.S. drivers who vacation in Canada and the additional vacationers that the better roads would attract. Foreign visitors would thus pay for part of the cost of the improved highways.

Another user fee approach would be tolls under the auspices of an arm's-length agency similar to the National Highway Traffic Safety Administration or public-private partnerships such as in France and China.¹⁶ Tolls could be removed when the upgrades are paid for (as recently occurred on British Columbia's Coquihalla Highway).

Appendix

PRELIMINARY COST ESTIMATE: CMAS

- USES 2006 US FHWA COSTS PER LANE MILE OF RURAL CONSTRUCTION, INCLUDING INTERCHANGES
- CONVERTS TO C\$ AT EXCHANGE RATE, CONSTRUCTION COST INDEX & FOR KMS"
- 4 LANE MILES ASSUMED PER EACH KM OF ROUTE UPGRADED
- PRE-MOTORWAY ASSUMED AT 75% OF MOTORWAY COSTS

COST BASIS (BASED UPON US FHWA FACTORS)

TYPE OF IMPROVEMENT	COST CATEGORY	IN 000\$ OF US\$ 2006: PER LANE MILE	IN 000\$ OF US\$ 2006: PER LANE KM	IN 000\$ PER LANE KM Cdn\$: 2009
NEW MOTORWAY FLAT	1	\$ 3,191	\$ 1,981	\$ 2,288
NEW MOTORWAY ROLLING	2	\$ 4,037	\$ 2,507	\$ 2,895
NEW MOTORWAY MOUNTAIN	3	\$ 9,095	\$ 5,648	\$ 6,521
NEW MOTORWAY HALF MOUNTAIN/ROLLING	4		\$ 4,077	\$ 4,708
NEW MOTORWAY HALF ROLLING/FLAT	5		\$ 2,244	\$ 2,592
UPGRADE 4-L TO MOTORWAY FLAT	10	\$ 551	\$ 342	\$ 395
UPGRADE 4-L TO MOTORWAY ROLLING	11	\$ 851	\$ 529	\$ 611
UPGRADE 4-L TO MOTORWAY MOUNTAIN	12	\$ 1,070	\$ 664	\$ 767

CONVERSION FACTORS FOR Cdn\$ 2009 ABOVE

EXCHANGE RATE TO Cdn\$ (2009.10.27)	1.056		
INFLATION: 2006-2009 (RS MEANS CONSTRUCTION INDEX)	1.094	164.7	180.1
GROSS CONVERSION FROM FHWA FACTORS	1.155		

ROUTES		ROUTE COST (\$000,000)				TOTAL COST @ MOTORWAY \$	PER LANE KM (\$000)	KM	COST BASIS	COST/ LANE KM	NUMBER LANES
FROM	TO	MOTORWAY	PRE MOTORWAY	MOTORWAY							
TRANSCONTINENTAL											
EDMUNTON	RIVIERE DU LOUP			\$ 823,636	\$ 2,288	90	1	\$ 1,981	4		
PARRY SOUND	SUDBURY			\$ 1,555,757	\$ 2,288	170	1	\$ 1,981	4		
WEST OF SUDBURY	WEST OF MB BORDER			\$ 15,549,092	\$ 2,592	1,500	5	\$ 2,244	4		
WEST OF MB BORDER	WEST OF FLEMING			\$ 790,871	\$ 395	500	10	\$ 342	4		
EAST OF WHITEWOOD	EAST OF CALGARY			\$ 1,471,020	\$ 395	930	10	\$ 342	4		
LESS REGINA, SWIFT CURRENT & MEDICINE HAT MOTORWAYS	(20)			\$ (31,635)		\$ 395	10	\$ 342	4		
BC BORDER	YOHO NATL PARK WEST ENTRANCE			\$ 1,304,286	\$ 6,521	50	3	\$ 5,648	4		
GOLDEN	EAST OF KAMLOOPS			\$ 6,403,275	\$ 4,708	340	4	\$ 4,077	4		
				\$ 27,866,302				\$ 27,870			
YELLOWHEAD											
PORTAGE LA PRAIRIE	SASKATOON			\$ 5,994,239	\$ 2,288	655	1	\$ 1,981	4		
SASKATOON LLOYDMINSTER BYPASS	LLOYDMINSTER BYPASS			\$ 411,253	\$ 395	260	10	\$ 342	4		
LLOYDMINSTER BYPASS				\$ 137,273	\$ 2,288	15	1	\$ 1,981	4		
LLOYDMINSTER BYPASS	EAST EDMONTON			\$ 347,983	\$ 395	220	10	\$ 342	4		
EDMONTON BYPASS SHORT UPGRADE SEGMENT (WEST SIDE)	-			\$-		\$ 395	10	\$ 342	4		
WEST EDMONTON	HINTON			\$ 411,253	\$ 395	260	10	\$ 342	4		
HINTON	JASPER PARK			\$ 289,515	\$ 2,895	25	2	\$ 2,507	4		
JASPER PARK	JASPER			\$ 1,304,286	\$ 6,521	50	3	\$ 5,648	4		
JASPER	HWY 5			\$ 1,215,964	\$ 2,895	105	2	\$ 2,507	4		
HWY 5	PRINCE GEORGE EAST			\$ 2,953,056	\$ 2,895	255	2	\$ 2,507	4		
PRINCE GEORGE BYPASS				\$ 231,612	\$ 2,895	20	2	\$ 2,507	4		

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ROUTES		ROUTE COST (\$'000,000)					TOTAL COST @ MOTORWAY \$			PER LANE KM (\$'000)	
FROM	TO	KM	PER LANE KM (\$'000)	MOTORWAY	PRE MOTORWAY	MOTORWAY \$	PER LANE KM (\$'000)	KM	COST BASIS	COST/LANE KM	NUMBER LANES
PRINCE GEORGE WEST	PRINCE RUPERT	700	\$ 2,895		\$ 16,050	\$ 8,106,430 \$ 21,402,864			2	\$ 2,507	4
EDMONTON - CALGARY - BORDER											
DIDESBURY AREA		-	\$ 395	\$-		\$-			10	\$ 342	4
SOUTH OF CALGARY	US BORDER I-15	285	\$ 395		\$ 340	\$ 450,797 \$ 450,797			10	\$ 342	4
WINNIPEG - BORDER											
WINNIPEG	US BORDER	75	\$ 395			\$ 118,631			10	\$ 342	4
BYASSES		10	\$ 2,288		\$ 160	\$ 91,515 \$ 210,146			1	\$ 1,981	4
SASKATOON - REGINA											
SASKATOON	REGINA	230	\$ 395		\$ 270	\$ 363,801			10	\$ 342	4
NANAIMO - VICTORIA											
NANAIMO	VICTORIA	110	\$ 395		\$ 130	\$ 173,992			10	\$ 342	4
OTTAWA - NORTH BAY - SYDNEY											
OTTAWA (WEST OF)	SUDBURY	420	\$ 2,895		\$ 3,650	\$ 4,863,858			2	\$ 2,507	4
ST. JOHN'S - TRURO											
ST JOHN'S	PORT-AUX-BASQUES	770	\$ 2,895			\$ 8,917,072			2	\$ 2,507	4
NEW GLASGOW	SYDNEY	260	\$ 2,895			\$ 3,010,960			2	\$ 2,507	4
	\$ 11,928,032	\$ 8,950									
CHARLOTTETOWN - SACKVILLE											
SACKVILLE	CHARLOTTETOWN	120	\$ 2,895			\$ 1,389,674			2	\$ 2,507	4
CONFEDERATION BRIDGE REMAINS 2 LANE	\$ 1,389,674	\$ 1,040									

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ROUTES		ROUTE COST (\$000,000)								
FROM	TO	KM	PER LANE KM (\$000)	TOTAL COST @ MOTORWAY \$	MOTORWAY	PRE MOTORWAY	COST BASIS	COST/LANE KM	NUMBER LANES	
QUEBEC-SAGUENAY										
QUEBEC	SAGUENAY	180	\$ 2,895	\$ 2,084,510		\$ 1,560	2	\$ 2,507	4	
GUELPH CONNECTION										
MACDONALD CARTIER FREEWAY	GUELPH	13	\$ 395	\$ 20,563		\$ 20	10	\$ 342	4	
BARRIE-NORTH BAY										
BARRIE	NORTH BAY	35	\$ 2,288	\$ 320,303		\$ 240	1	\$ 1,981	4	
KELOWNA-SALMON ARM										
KELOWNA	SALMON ARM	95	\$ 2,895	\$ 1,100,158		\$ 830	2	\$ 2,507	4	
VERNON BYPASS		10	\$ 2,288	\$ 91,515		\$ 70	1	\$ 1,981	4	
THUNDER BAY TO BORDER										
THUNDER BAY	BORDER	60	\$ 2,288	\$ 549,091		\$ 410	1	\$ 1,981	4	
TOTAL (000,000)					\$ 27,870	\$ 33,720				

Endnotes

1. For example, see <http://usj.sagepub.com/cgi/content/abstract/36/11/1849> and <http://reason.org/news/show/gridlock-and-growth-the-effect> which document this effect within urban areas.
2. <http://www.interstate50th.org/>. (AASHTO is the association of state departments of transportation.)
3. <http://www.publicpurpose.com/freewaypdf.pdf>
4. This does not include urban motorways administered by municipalities such as Shanghai and Beijing (which is building its fifth motorway ring road (one of its six ring roads is not a motorway)).
6. This practice has been employed in New Jersey on non-motorway routes such as US-1, US-9, US-22 and US-46 since the 1960s.
7. Census metropolitan areas are designated by Statistics Canada and have a population of more than 100,000. Approximately two-thirds of the population is in these metropolitan areas.
8. The exceptions are Guelph, Sudbury, North Bay and Saguenay.
9. Most of this route is designated as the Trans-Canada Highway; however, some sections are not part of the Trans-Canada, such as from Montreal to Toronto and Sudbury (Ontario) and from Kamloops to Hope (British Columbia).
10. <http://www.pc.gc.ca/docs/v-g/yoho/plan1/index.aspx>
11. Based upon 2006 U.S. Federal Highway Administration costs per rural lane kilometre (four-lane kilometres per route kilometre) by topography. The figure is adjusted for current exchange rates (C\$0.97 per US\$1) and adjusted for construction cost increases to 2009.
12. Wendell Cox, Alan Pisarski, David Ellis (Texas Transportation Institute) and Tim Lomax, *The Importance of Freight Mobility and Reliability to Economic Growth* (2009), pp. 30-31 (draft).
13. <http://www.tc.gc.ca/CanadasGateways/APGCI/document/strategicadvisorreport.pdf>
14. In contrast, a high-speed rail line in this corridor was estimated to cost up to \$3.4 billion in 2004. [http://www.vanhorne.info/files/vanhorne/HSRFullReport\(1062004\).pdf](http://www.vanhorne.info/files/vanhorne/HSRFullReport(1062004).pdf)
15. The mainland and Baffin Island nearly meet because of nearby islands, with the longest Northwest Passage crossing being approximately three miles.
16. Electronic tolling technology has improved to the point that there is no need for tollbooths on upgraded segments. For example, automated Route 407 in the northern Toronto suburbs was one of the world's first electronic toll routes without tollbooths. Tolls could be structured to minimize costs for short distance or for local urban travelers. For example, tolls are not imposed in the urban portions of many autoroutes in France (such as Lyon, Marseille, Montpellier and Rheims.)

Further Reading

July 2009

Getting a Better Bang for the Pothole Buck

Rural municipalities should charge the heaviest road users directly for the damage they cause.

By Larry N. Mitchell and David Seymour

http://www.fcpp.org/main/publication_detail.php?PubID=2860

June 2009

How Free is Your Parking?

Somehow, the urban land use with the biggest footprint and a profound effect on the transportation system has been invisible to scholars in every discipline.

By Stuart Donovan

http://www.fcpp.org/main/publication_detail.php?PubID=2839

October 2008

Environmental Policy That Creates A Freeway of Benefits for Manitobans

Upgrading the Perimeter Highway to free-flowing conditions.

By Mark Hearson & James Blatz

http://www.fcpp.org/main/publication_detail.php?PubID=2396

September 2006

Winnipeg's Perimeter Highway: Disaster by Design

Winnipeg needs to invest at least \$440 million to bring its Perimeter Highway up to first world freeway standards.

By Ben Eisen

<http://www.fcpp.org/publication.php/1497>

For more see
www.fcpp.org