Final Report

Independent Passenger and Revenue Forecasts
Ontario-Québec High Speed Rail Project

Prepared For

La Société Québécoise des Transports

Prepared By

TEMS, Inc.
Les Consultants Trafix Inc.

June 30, 1995

EXECUTIVE SUMMARY

This report presents the results of the Independent Passenger and Revenue Forecasts prepared by Transportation Economics & Management Systems, Inc. and Les Consultants Trafix Inc. for the Québec-Ontario High Speed Rail Project. The project is being undertaken by Transport Canada, the Ministère des Transports du Québec, and the Ontario Ministry of Transportation to determine the potential for high speed rail in the Québec City-Montréal-Ottawa-Toronto-Windsor Corridor.

The objectives set for the study have all been met:

- The study produced strong and effective forecasts that can be used in assessing the financial feasibility of the project.

- The forecasts are based on sound methodologies and can be replicated by others using the same assumptions. All calibrations and assumptions are explicit and fully quantified. The calibrated model for the Québec-Ontario Corridor and the COMPASS(c) software package have been given to Transport Canada for its ongoing use.

- The models are capable of analyzing:
  - Alternative high speed rail strategies involving different routes, station locations, travel times, frequencies, and fares.
  - The characteristics and potential competitive strategies of other modes in the corridor.
  - The impact of different socioeconomic and settlement patterns in the corridor.

The development of the travel demand models and forecasts for the Québec-Ontario Corridor involved a major data assembly and analysis exercise in order to provide information at the level of geographic specificity needed for the development of sound and realistic forecasts for the corridor. The data included:

- Origin-destination data derived from travel surveys specifically carried out for the study.

- Transportation network data derived from current timetables for the public modes and from engineering estimates for the auto mode. The data reflected travel within the corridor by each of the four modes (auto, air, rail, and bus).

- Socioeconomic data derived from StatsCan census data for the corridor.

- Socioeconomic growth rates developed by Transport Canada for specific geographic areas within the corridor.

- Stated preference value of time data derived from quota surveys specifically carried out for the study.

To provide an effective disaggregation of the data for the forecasts and also allow for comparison with previous studies, TEMS used the fine zone system developed by VIA Rail in 1987. The zone system has 136 internal zones to represent the corridor and a further 7 external zones to represent travel areas outside the corridor. The zone system has the advantage of being correlated with existing county and municipal boundaries. In addition, an aggregate 19 super zone system (14 internal and 5 external zones) was defined by the study steering committee so that it would be able to compare TEMS' results with those of other demand consultants whose work was carried out at the super zone level.

With reference to the origin-destination data collected for the study, three waves of surveys were used to ensure that seasonal variations were captured. Ten "mid-point" survey locations (i.e., midway between major city pairs) were used for the auto origin-destination survey to ensure that "true" intercity travel would be properly represented. While the distribution of trips by mode and purpose for the surveys collected is very comparable to that achieved in the 1987 VIA Survey, the trip volumes collected for the public modes (air, rail, and bus) were significantly lower than in 1987, while the trip volumes for auto were only 1 percent higher. This was due to the fact that the data were collected during the 1991-93 recession.

Transport Canada, in conjunction with Infometrics, prepared forecasts of the growth in population, income and employment for the years 2005 and 2025. The projections were based on a GDP annual growth rate of three percent, which is lower than the long-term trend of four percent annual growth that Canada has achieved over the past thirty years. The three percent growth rate is based on the assumption that economic growth in the future will probably be slower.

As part of the overall market research for the Québec-Ontario High Speed Rail Study, a Stated Preference Survey was conducted by Market Facts of Canada Limited between mid-November 1992 and the end of February 1993. Data were collected by on-board surveys for rail and bus, terminal lounge surveys for air, and by a mixture of mail-out surveys and roadside surveys for auto. The Stated Preference Survey used a quota design which ensured that a range of responses was obtained for different travel purposes, income groups, trip distances, sizes of travel parties, and geographic areas. The TEMS study team established quota requirements by category (mode/distance/purpose) for the survey and laid out the questionnaire design. The questionnaire was designed to provide information by mode and trip purpose on the value of time, value of frequency, value of access time, value of interchange time, and value of modal bias.

The passenger and revenue forecasts were developed using TEMS' COMPASS-R(c) Regional Model System which is a flexible demand forecasting tool that enables alternative socioeconomic and network scenarios to be evaluated for comparative purposes. It also allows input variables to be modified to test the sensitivity of demand to such parameters as elasticities, values of time, and values of frequency. The COMPASS-R(c) model is structured on two principal models: a Total Demand Model and a Hierarchical Modal Split Model. These two models were calibrated separately for three trip purposes, i.e., business, commuter, and "other" (personal, social, and tourism). To fully evaluate the level of traffic that might use a new high speed ground transportation system for airport access/egress, a separate demand model, the COMPASS-A(c) model, was developed.

The first step in the calibration process was to use the basic data collected in the 1992-93 Stated Preference Survey and to compare the results of the model calibration with the results of the 1987 VIA Model calibration which was based on data collected before the 1991-93 recession. It was found that the results of the two surveys are distinctly different. The air/business value of time has risen by more than 30 percent, while the values of time for the commuter and other trip purposes have fallen substantially for all modes. The bus values of time were consistently lower for all trip purposes. Only the business values of time for auto and rail are consistent with the 1987 results.

The model calibration process was successful in deriving significant coefficients for both the Total Demand Model and Modal Split Model. However, two limitations in the calibration should be noted. The first is that, despite the fact that the Modal Split Model used the fine zone system which included over 11,000 zone pairs, some limitations existed in the data. In particular, the business data were limited to travellers with either a high or low probability of selecting rail. This essentially created two separate blocks of data, with few observations in common between the two blocks. The model therefore assumes that the behaviour of middle-income travellers is consistent with that of high- and low-income travellers.

The second concern with the model calibration is that the Total Demand Model has stronger utility coefficients and weaker socioeconomic coefficients than might have been expected. This appears to be the result of the impact of the recession on individuals' travel behaviour. In a recessionary period, there is typically less trip-making because the economic downturn reduces the need for business travel and commuting as there are fewer people working Similarly, there is less social travel because people feel less confident about spending money on long weekends, holidays, and the like. This short-term downturn in the economy was not reflected in the long-term socioeconomic values used in the calibration process.

It is therefore considered that the model calibrated on the results of the 1992-93 Stated Preference Survey, although it is statistically sound, reflects recessionary behaviour and is not appropriate for forecasting long-term demand in the Québec-Ontario Corridor. TEMS believes that models developed on the 1992-93 data will mis-specify demand and produce erroneous forecasts which overstate induced demand and reduce the effect of socioeconomic variables on total demand.

To eliminate or at least minimize the impact of the recession on the model, the values of time were revised to values that are more typical of normal, non-recessionary travel behaviour. This was done by comparing the results of the values of time analysis with the results of the 1987 VIA Survey as well as the results of a wide range of surveys completed by TEMS throughout North America. As a result, the business values of time for air were reduced and the business and non-business values of time for auto, rail and bus were increased. The revised values of time were then used to recalibrate the Total Demand and Modal Split Models.

The Non-Recessionary Model demand forecasts produced a more balanced and realistic demand profile than the Recessionary Model, with less business traffic (which fell as a proportion of total demand from 56 percent to 38 percent) and more non-business traffic (which rose as a proportion of total demand from 42 percent to 60 percent). Also, in the Non-Recessionary Model, the contribution of socioeconomic growth and diverted demand to the total demand was greater (5 percent and 49 percent as opposed to 4 percent and 35 percent) while the contribution of induced demand fell (from 61 percent to 46 percent). The size of the induced demand in the Recessionary Model was a clear result of using recessionary values of time which, as previously noted, overstated the value of time of air travel and understated it for auto, rail and bus. The 46 percent induced demand for the Non-Recessionary Model is well in line with the results in Europe and Japan for high speed rail investments, whereas the 61 percent estimate is a clear overstatement of induced demand.

Two principal inputs required for the development of forecasts are economic scenarios which describe the likely rates of economic growth over the forecast period, and transportation strategies that describe the service attributes of the proposed high speed rail options and changes in the level of service offered by the competing intercity bus, air and auto modes.

Economic scenarios were developed by Transport Canada for the life of the high speed rail project, from the base year 1993 to the year 2025. This time frame allows for the construction of the project and a twenty-year period for the repayment of capital costs. Because the economic scenarios are intended to show the potential range of economic growth, three economic scenarios were defined--an upper (optimistic) case, a central case, and a lower (pessimistic) case.

To evaluate the potential of high speed rail in the corridor, a series of rail strategies was defined which included a range of service options for the 200 kph and 300 kph technologies. The 200 kph alternatives largely use an existing right-of-way between Windsor and Québec City and the South Shore route between Ottawa and Montréal. To provide service to Pearson International Airport, trains are rerouted from Toronto to London on a new line running through Pearson Airport rather than use the existing right-of-way which goes through Hamilton. While this has the benefit of avoiding one of the most heavily used rail lines in Southern Ontario, it also reduces accessibility for a heavily populated portion of the province.

The 300 kph alternatives use a new, dedicated right-of-way which minimizes curves and topographical constraints and maximizes tangent track to enable the 300 kph technology to maintain maximum commercial speed for as long as possible. The 300 kph alternatives use the North Shore route between Ottawa and Montréal which connects with Mirabel Airport but misses the heavily populated West Island area of Montréal. The 300 kph alternatives also use the new route via Pearson Airport between Toronto and London.

The ridership and revenue forecasts for the Québec-Ontario Corridor were developed using the calibrated COMPASS[c] Model; the central case economic scenario; and six basic High Speed Rail Alternatives. In order to evaluate the impact of the High Speed Rail Alternatives on demand, forecasts were first prepared for No Action Alternatives. The No Action Alternatives were intended to reflect what will happen in the corridor if high speed rail is not developed. Three No Action Alternatives were defined to reflect the range of possibilities.

The No Action Alternative #1 assumed the continuation of the status quo in terms of the level of transportation services within the corridor. This results in total travel demand in the corridor growing from 89.5 million trips in 1993, to 123.2 million trips in the year 2005, and to 192.8 million trips in 2025, a doubling of demand over the thirty-year period. As might be expected, auto continues to dominate the market and maintains its 90 percent market share. The assumed increase in air fares, improved rail times, and lower bus fares result in a slight shift in demand from air to rail and bus; between 1993 and 2025, air falls from 4.42 percent to 3.30 percent of the market, while rail increases from 2.75 to 3.70 percent and bus increases from 2.52 to 2.64 percent. However, the No Action Alternative #1 is highly optimistic about future travel markets since it fails to recognize the very real reductions that will occur in the supply of transportation services.

With the No Action Alternative #2, which assumes that at least modest highway congestion will occur over the next thirty years, growth in total travel demand is much lower. The 0.5 percent annual reduction in urban traffic speeds and the 1.0 percent annual reduction in access mode speeds that result from increased congestion results in a reduction in travel demand in the corridor of 20 percent from 192.8 to 153.6 million trips in 2025. Furthermore, the market share for auto falls while the market shares for all the public modes, particularly rail and bus, increase.

In No Action Alternative #3, which assumes an even higher though still very conservative level of highway congestion, urban traffic speeds and mode access speeds respectively are reduced by 1.0 and 2.0 percent annually. With this alternative, mobility in the corridor is reduced by 30 percent from 192.8 to 135.9 million trips in 2025. In terms of market share, auto falls to 77 percent while rail, bus, and air increase to 9.5, 7.2, and 6.1 percent respectively.

To assess the impact of using the 200 kph or 300 kph high speed rail technology, a series of High Speed Rail Alternatives were defined. It should be noted that the demand forecasts for the High Speed Rail Alternatives were based on the No Action Alternative #1, which excludes the impact of congestion on intercity travel. Major findings of the study included:

- Rail demand for the whole corridor with the 300 kph technology is 10 to 15 percent higher than with the 200 kph technology.

- Implementation of the 200 kph technology between Toronto and Montréal achieves nearly 70 percent of the total rail demand in the corridor; this figures rises to 76 percent if the 200 kph is implemented between Toronto and Québec City. The corresponding figures for the 300 kph technology are 66 percent and 71 percent.

- The South Shore route performs consistently better than the North Shore route.

- Increasing train speed from 300 kph to 350 kph on the South Shore route and from 200 kph to 250 kph on the North Shore route raises demand by some 9 percent in both cases.

- The weakest link in the corridor is between Windsor and London, where demand between 2005 and 2025 only increases from 0.7 to 1.2 million for the 200 kph technology and from less than 1 million to 1.6 million for the 300 kph technology.

- Toronto-Ottawa and Ottawa-Montréal are the strongest corridor segments, with demand in the Toronto-Ottawa segment increasing from 5.5 million to nearly 10 million for the 200 kph technology and from 8 million to over 13 million for the 300 kph technology between 2005 and 2025.

- The revenue forecasts, which were based on the passenger origin-destination forecasts and appropriate fare estimates, range from $1.04 to $1.77 billion for the 200 kph and from $1.35 to $1.99 billion for the 300 kph in 2025 for implementation of high speed rail on the whole corridor.

- For both the 200 kph and 300 kph options, the Toronto-Montréal segment accounts for 65 percent of the revenues, while the longer Toronto-Québec City segment accounts for approximately 73 percent of the revenues.

Summary of Passenger Forecasts
Québec-Ontario High Speed Rail Project

	Passenger Forecasts (Millions of Trips)				Revenue Forecasts (Billions of 1992$)			
	200 kph		300 kph		200 kph		300 kph	
	2005	2025	2005	2025	2005	2025	2005	2025
High Speed Rail on the Full Corridor, using the South Shore Route between Ottawa and Montréal	10.32	17.32	13.19	22.06	0.68	1.14	0.91	1.52
High Speed Rail on the Full Corridor, using the North Shore Route between Ottawa and Montréal	9.47	15.87	12.02	20.09	0.62	1.04	0.81	1.35
High Speed Rail between Toronto and Montréal and VIA Service Elsewhere	7.27	11.94	8.09	13.20	0.45	0.74	0.52	0.85
High Speed Rail between Toronto and Québec City and VIA Service Elsewhere	7.88	12.94	8.82	14.41	0.50	0.82	0.58	0.94
High Speed Rail on the Full Corridor with Lower Level of Increased Highway Congestion	11.68	23.11	13.45	26.14	0.76	1.44	0.89	1.69
High Speed Rail on the Full Corridor with Higher Level of Increased Highway Congestion	12.80	28.95	14.62	32.16	0.82	1.77	0.96	1.99

- The North Shore route, as currently defined, is clearly less attractive for both the 200 kph and the 300 kph options in terms of revenue generation.

- In terms of the impact of increasing train speed, both the 250 kph and 350 kph options generate significant additional revenues.

- An important role for high speed rail in the future will be providing access to existing and potential hub airports such as Pearson, Dorval and Mirabel International Airports from communities within the corridor. This will become increasingly important as highway congestion in and around urban areas increases.

- For both the 200 kph and 300 kph technologies, the South Shore route which serves Dorval Airport is more effective as an airport access mode. It should be noted that overall demand for airport access is relatively small. The 200 kph on the North Shore attracts some 1.9 million trips in 2025, while the 300 kph on the North Shore route attracts only 0.9 million trips. Moving the 300 kph to the South Shore effectively triples the demand, to 2.7 million trips in 2025.

- In testing the sensitivity of the airport access forecasts to high speed rail service conditions, both fare and frequency were found to have a quite marginal effect as the demand is relatively inelastic to both of these service factors.

Conclusions

The passenger and revenue forecasts for the Québec-Ontario High Speed Rail Study are based on the most extensive and sophisticated travel demand survey that has been collected to date for travel demand modelling in the Québec-Ontario Corridor. As a result, TEMS has been able to develop very powerful and realistic projections for the planning of both the 200 kph and 300 kph technologies.

For both the 200 kph and 300 kph technologies, the consultants' preferred alternatives are based on the South Shore route between Ottawa and Montréal. The North Shore route generates far fewer riders and revenues and, unless it is far less expensive to construct, it is clearly the less desirable of the two routes.

Because demand forecasting is a very complex and difficult process that cannot be resolved in any one study, the consultants would advise the study steering committee that they should treat the current study as a building block and that an ongoing program of data development and model calibration and forecasting should be carried out to monitor:

- Impact of the recession on the current database and forecasts.
- Effects of different model structures.
- Robustness of modal parameters and elasticities.
- Differences in the results of the forecasting consultants.
- Impact of different socioeconomic growth projections.
- Impact of different strategies for rail but also for the competing modes, air, bus and auto.

FINAL REPORT

INDEPENDENT PASSENGER AND REVENUE FORECASTS

ONTARIO-QUÉBEC HIGH SPEED RAIL PROJECT

PREPARED FOR

LA SOCIÉTÉ QUÉBÉCOISE DES TRANSPORTS

PREPARED BY

TEMS, INC.
LES CONSULTANTS TRAFIX INC.

JUNE 30, 1995

TABLE OF CONTENTS

1. STUDY CONTEXT

This report presents the results of the Passenger and Revenue Forecasts prepared by Transportation Economics & Management Systems, Inc. and Les Consultants Trafix Inc. for the Québec-Ontario High Speed Rail Project. The project is being undertaken by Transport Canada, the Ministère des Transports du Québec, and the Ontario Ministry of Transportation to determine the potential for high speed rail in the Québec City-Montréal-Ottawa-Toronto-Windsor Corridor.

1.1 STUDY OBJECTIVES

The objectives of the Passenger and Revenue Forecasting Study were as follows:

- The intercity demand forecasting models developed must be capable of providing passenger and revenue projections that can be used to make decisions on the financial and economic feasibility of the project.
- The forecasts must be based on sound methodologies that can be replicated by others using the same assumptions.
- The models should be capable of testing:
  - Alternative high speed rail strategies involving different routes, station locations, travel times, frequencies, and fares.
  - The characteristics and potential competitive strategies of other modes in the corridor.
  - The impact of different socioeconomic and settlement patterns in the corridor.

1.2 DATABASE ASSEMBLY AND DEVELOPMENT

The development of the travel demand models and forecasts for the Québec-Ontario Corridor involved a major data assembly and analysis exercise in order to provide information at the level of geographic specificity needed for the development of sound and realistic forecasts for the corridor. The data included:

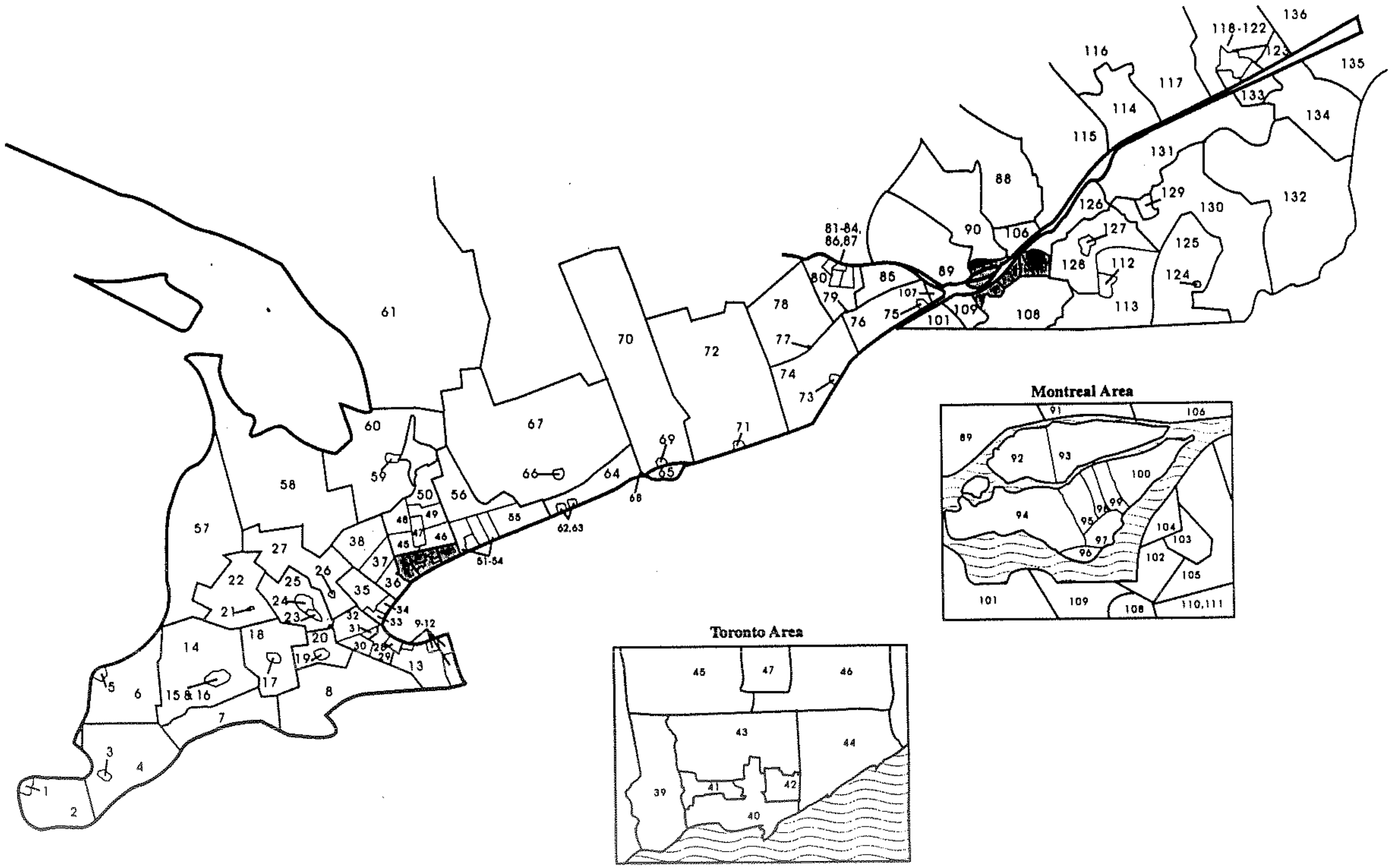
- Origin-destination data derived from origin-destination travel surveys that were specifically carried out for the study.

- Transportation network data that were derived from current timetables for the public modes and from engineering estimates for the auto mode and subsequently coded to reflect travel within the corridor by each of the four modes (auto, air, rail, and bus).
- Socioeconomic data that were derived from StatsCan census data for the corridor.
- Socioeconomic growth rates that were developed by Transport Canada for specific geographic areas within the corridor.
- Stated preference value of time data derived from quota surveys that were specifically carried out for the study.

The data were to be compiled for a zone system, or set of specific geographic areas, that would best correlate with the formats of these different data sets. Following a review of potential zone systems, it was determined that the most detailed zone system that could be adopted that would provide an effective disaggregation of the data for the forecasts and also allow for comparison with previous studies was the fine zone system developed by VIA Rail in 1987 (see Exhibit 1.1). The zone system has 136 internal zones to represent the corridor and a further 7 external zones to represent travel areas outside the corridor, e.g., Detroit. The zone system has the advantage of being correlated with existing county and municipal boundaries, with additional detail provided in the major urban areas of Toronto, Montréal and Ottawa; this ensured that census data could be easily utilized. The zone system also reflects the principal travel patterns in the corridor and separates major travel routes, in particular east-west routes, from each other.

In addition to the fine zone system, an aggregate 19 super zone system (14 internal and 5 external zones) was defined by the study steering committee so that it would have the ability to compare TEMS' results with those of other demand consultants. The definition of the aggregate super zones is given in Appendix 1. It should be noted that all modelling work carried out by TEMS was completed using the fine zone system and that the super zone system was used only as a means for displaying the results of the modelling work. The reason TEMS, unlike the other two demand consultants, did not use super zones for modelling is that the super zones represent geographical areas that are much larger than the principal city for which they are named and are not necessarily very homogeneous. For example, the Trois Rivières super zone includes large areas south of the St. Lawrence River and even areas east of Québec City itself.

Exhibit 1.1
Zone System for the Québec-Ontario Passenger and Revenue Forecasting Study



1.2.1 Origin-Destination Data

The origin-destination data for the study were collected in the 1992-93 Travel Survey conducted by Consumer Contact. The survey was an "in course of travel" survey of auto, rail, bus and air travellers and there were three "waves" of surveys during the summer and autumn of 1992 and winter of 1992-93. The survey results are described in detail in a report by Consumer Contact to the study steering committee.

Few difficulties were experienced with the survey, which was largely a repeat of the survey conducted by VIA Rail in 1987. Major differences with the 1987 VIA Survey included:

- The use of three waves of surveys to ensure that seasonal variations were captured in the data.
- The use of ten "mid-point" survey locations (i.e., midway between major city pairs) for the auto origin-destination survey versus the twenty "entering city" auto survey locations of the 1987 VIA Survey. This approach ensured that a larger proportion of the surveys conducted were for "true" intercity travel. It did, however, result in fewer surveys for "commuter" travel which predominates at the suburban fringe of the larger cities in the corridor.

An important part of the TEMS/Trafix work for the Passenger and Revenue Forecasting Study was a detailed evaluation of the origin-destination surveys. The evaluation found only some minor discrepancies for the air and auto modes and specific origin-destination pairs such as Ottawa-Toronto, Ottawa-London, Toronto-Kingston, and Brantford-Hamilton. The evaluation concluded that the overall response rates and expansions undertaken were satisfactory (see Appendix 2).

To provide a further check on the data, a series of comparisons were made with the 1987 VIA data. The first assessment considered the overall volume of travel between the super zones. This assessment revealed major differences in the travel data collected in the 1992-93 Survey period. As shown in Exhibit 1.2, while the distribution of trips by mode and purpose is very comparable to that achieved in the 1987 VIA Survey, the trip volumes collected for the public modes (air, rail, and bus) were significantly lower than in 1987, while the trip volumes for auto were actually 1 percent higher.

Exhibit 1.2
Distribution of Internal Trip Volumes by Mode and Purpose for All Modes
1987 VIA Survey and 1992-93 Survey (Millions of Trips)

	Rail			Bus			Air			Auto			All Modes		
Purpose	1987	1992-3	Change	1987	1992-3	Change	1987	1992-3	Change	1987	1992-3	Change	1987	1992-3	Change
Business	0.61	0.76	23.9%	0.17	0.42	138.9%	2.20	2.24	2.0%	21.00	17.33	-17.4%	23.97	20.75	-13.4%
Commuter	0.19	0.28	47.4%	0.99	0.41	312.1%	0.34	0.52	52.9%	7.65	7.63	-0.2%	7.97	8.37	5.0%
Other	2.27	1.51	-33.3%	3.41	1.58	-53.8%	0.55	0.37	-33.9%	60.12	64.57	7.4%	66.35	68.02	2.5%
Total	3.07	2.55	-16.9%	3.68	2.40	-34.8%	2.79	2.66	-4.5%	88.75	89.53	0.9%	98.29	97.14	-1.2%

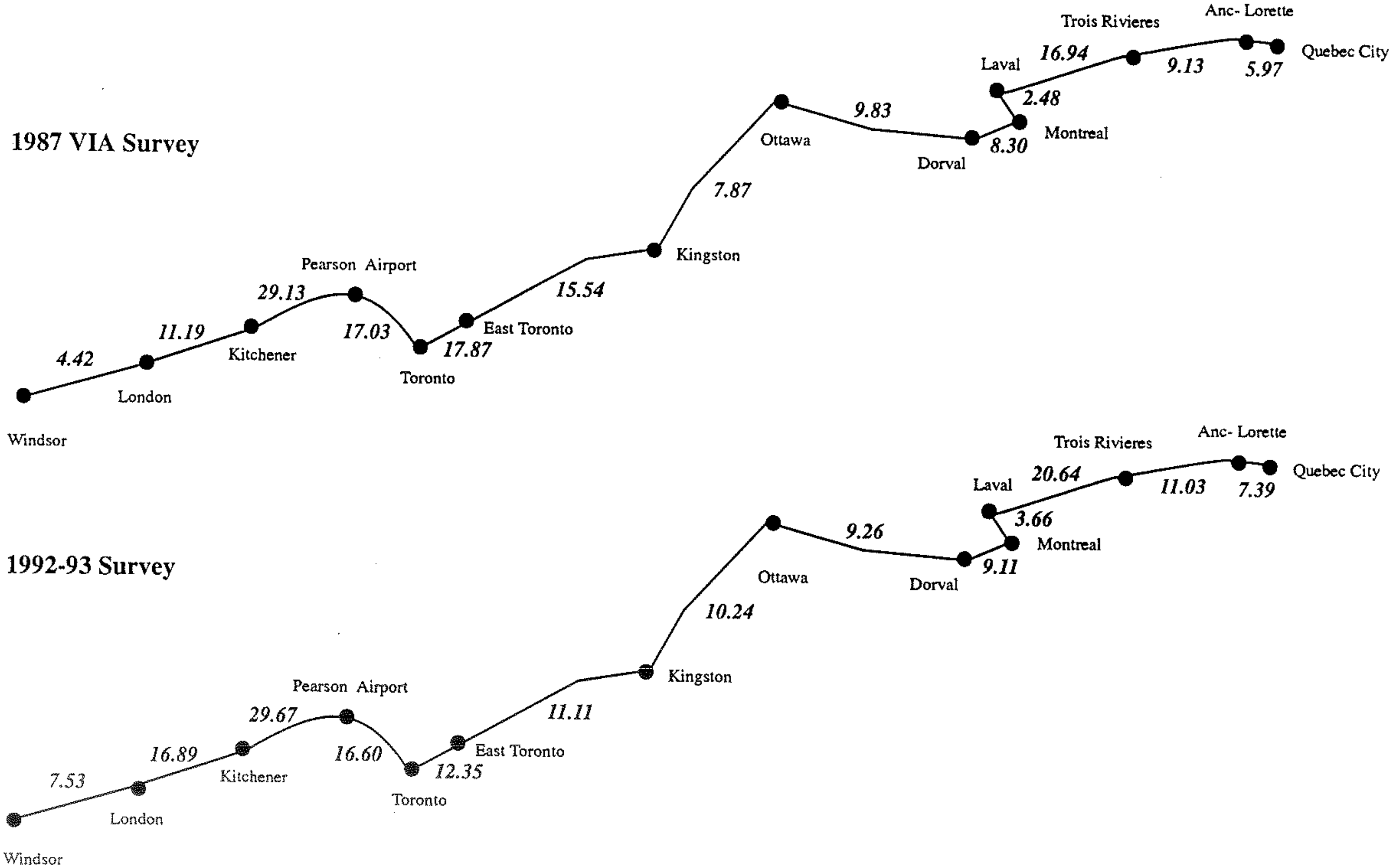
Given that demand for intercity travel would normally grow by two to three percent per year between 1987 and 1990, this phenomenon can only be a reflection of the impact of the economic recession which occurred in 1991-92. Because business and personal travel is highly correlated with the performance of the economy, it is generally considered that the recession reduced urban travel demand by 15 to 20 percent throughout the corridor and may well have had a similar effect on intercity travel. Given the potential impact of the recession on the super zone data, assessments were also made of base year flows and trip length.

Exhibits 1.3 and 1.4 show the volume of travel on the networks (link loadings) in the corridor for auto and the public modes as derived from the 1987 and 1992-93 Surveys. It can be seen that there is a distinct difference in the distribution of trips for intercity travel whether it is auto or the public modes. In the case of auto, the "ends" of the corridor (i.e., west of Kitchener and east of Dorval) had much higher trip volumes in 1992 than in 1987. In the two surveys, the trip volumes for the central portion of the corridor were more similar, although there were areas such as Kingston to Ottawa where they were substantially higher.

As previously noted, the 1992-93 trip volumes for the public modes were much lower in 1992-93 than in 1987, particularly at the end of the corridor between Toronto and Windsor. In this sector, the demand for the public modes was 30 to 40 percent less in 1992-93 than in 1987. This is clearly a result of recessionary pressures on the lower-income segments of the corridor.

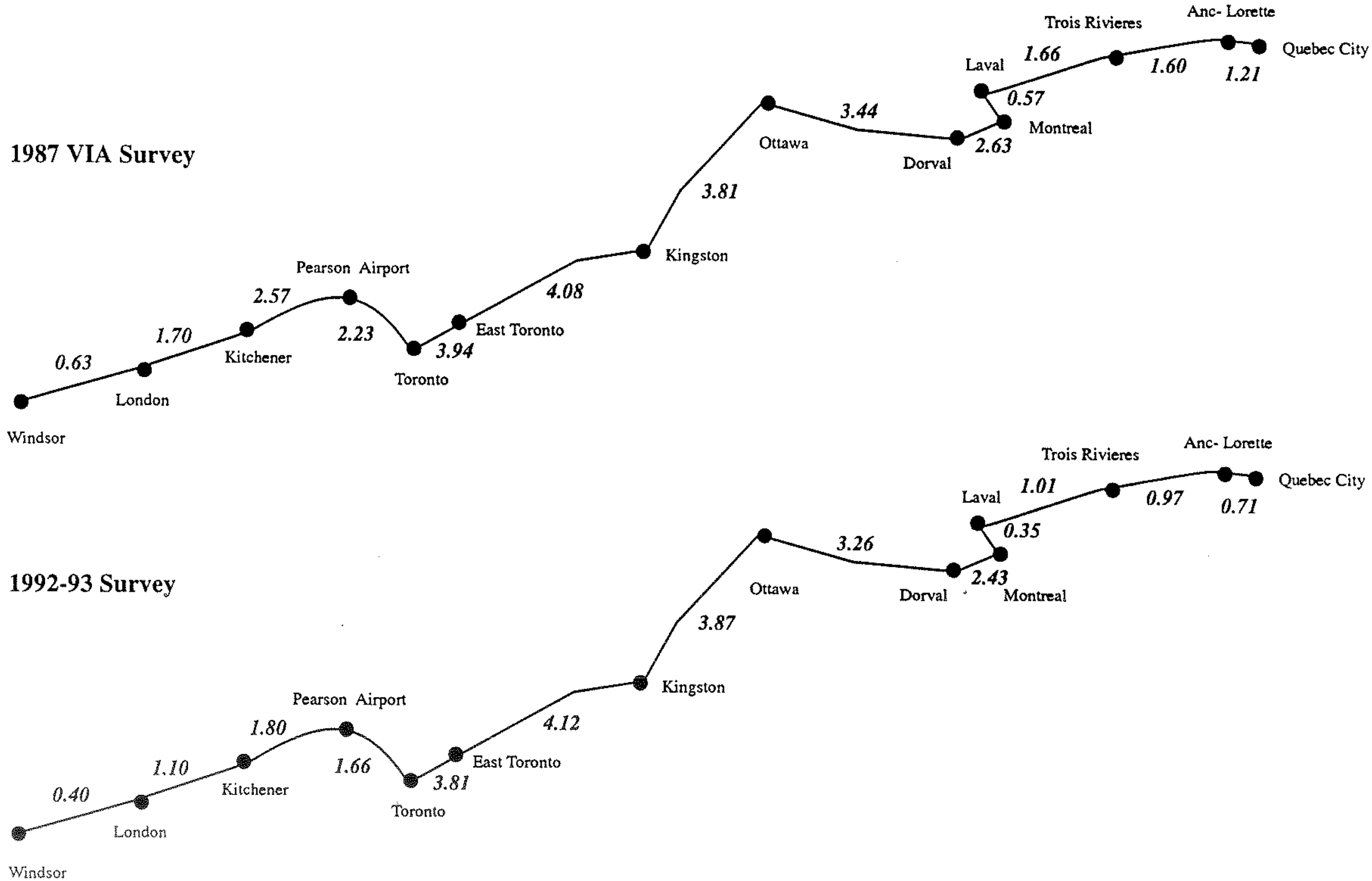
As shown in Exhibit 1.5, the 1992-93 Survey showed longer trip lengths for auto, air, and rail and shorter trip lengths for bus. While there are not substantial differences between the 1987 and 1992-93 trip lengths, the increase in the air and rail trip lengths may well reflect the diversion of shorter distance movements on these modes to auto travel. The decrease in the bus trip lengths may simply reflect the substantial decline in bus use in the recessionary period.

Exhibit 1.3
Link Loadings for the Auto Mode for the 1987 VIA Survey and 1992-93 Survey (Millions of Trips)[1]



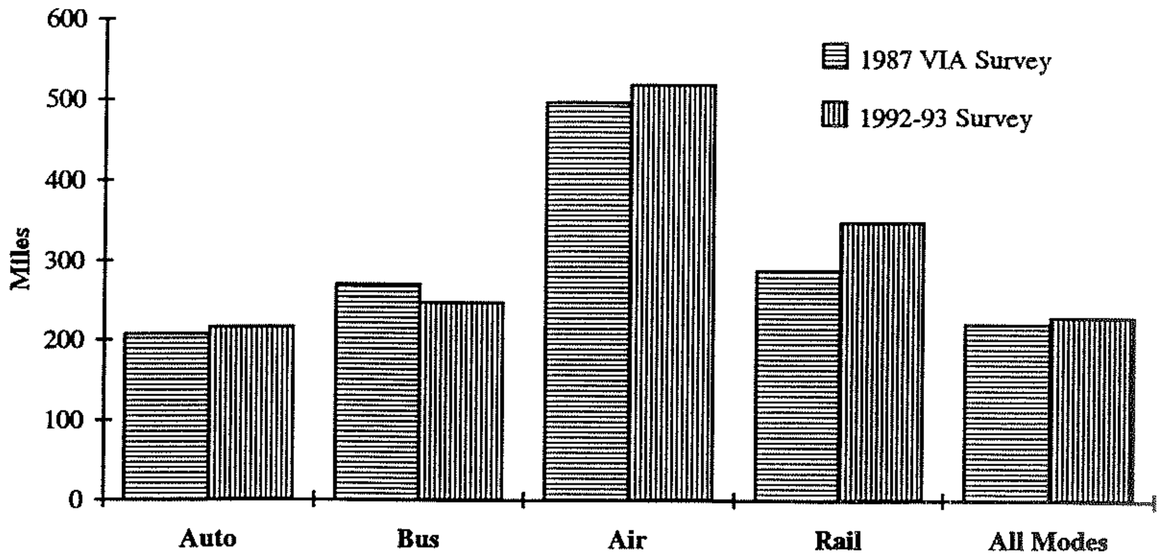
[1] *The numbers given along the route are the internal trip volumes on the links between terminals.*

Exhibit 1.4
Link Loadings for the Public Modes for the 1987 VIA Survey and 1992-93 Survey (Millions of Trips)[1]



[1] *The numbers given along the route are the internal trip volumes on the links between terminals.*

Exhibit 1.5
Average Trip Lengths by Mode
1987 VIA Survey and 1992-93 Survey



As a result of this analysis, it was concluded that, one, the overall level of travel demand in the corridor had been significantly reduced by the recession and, two, there had also been a change in the geographical distribution of trips with increased emphasis on intercity rather commuter trips. It is therefore considered that:

- The overall volume of intercity trips collected in the 1992-93 Survey has been deflated by at least 10 to 20 percent over the volume of trips that would have existed with non-recessionary economic conditions.
- The data from the 1992-93 Survey may well reflect attitudes to travel that would be different with non-recessionary economic conditions.
- The origin-destination data provides a very conservative database from which to develop forecasts for the proposed Québec-Ontario High Speed Rail Project.

1.2.2 Network Data

Network data were developed which identified the costs of travel in terms of time, cost, access, egress, and level of service for each travel mode. These data were developed for the base year

1993 as well as for the forecast years 2005 and 2025. The base year network was used to develop and validate the travel demand models, while the future year networks were used to forecast the changes in travel demand in that given year.

Key assumptions used in developing the base year and forecast year networks are as follows:

- Intercity networks for auto, bus, and air will remain largely unchanged over the next thirty-five years.
- Existing VIA Rail service will be replaced by a high speed rail service which will not stop at all the stations currently served by VIA Rail.
- Energy prices will remain constant up to the year 2025, at which time they will increase by 15 percent.

1.2.3 Socioeconomic Data

Socioeconomic data were collected on the basis of the fine zone system to provide an understanding of how the demand for intercity travel is related to socioeconomic factors and how, as these factors change over time, the demand for intercity travel will change. The most important socioeconomic factors for forecasting the future size of the travel market are:

- Population.
- Employment.
- Household income.

Transport Canada, in conjunction with Infometrics, prepared forecasts, firstly, to the year 2005 and, secondly, to the year 2025 of the growth in these three socioeconomic factors. The base year data for the 14 internal super zones are shown in Exhibit 1.6. and the projected central case economic scenario annual growth rates for the three socioeconomic factors are shown in Exhibit 1.7. The projections are based on a GDP annual growth rate of three percent, which is lower than the long-term trend of four percent annual growth that Canada has achieved over the past thirty years. It should be noted that, in past thirty years of the OECD countries, Canada's growth rate has been second only to Japan's. However, the three percent growth rate is based on the assumption that economic growth in the future will probably be slower. As shown in

Exhibit 1.7, the rate of growth is projected to be higher in Ontario than in Québec and the rate of growth in both provinces falls after the year 2005. The latter assumption is presumably due Transport Canada's desire to take a more conservative view of long-term growth.

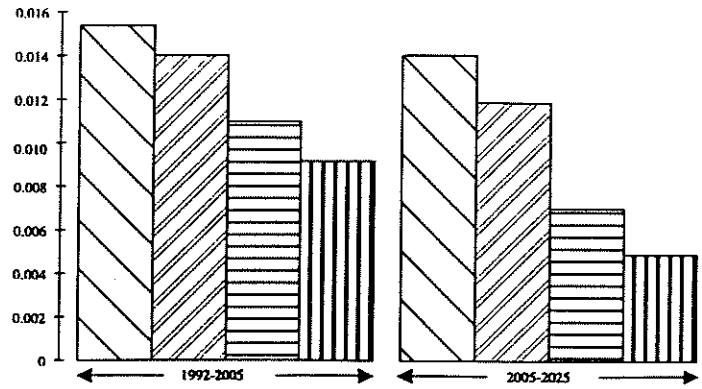
Exhibit 1.6
Socioeconomic Forecasts Prepared by Transport Canada

Super Zone	Population	Employment	Household Income
#1	329,327	150,116	$49,707
#2	353,292	155,252	$48,547
#3	342,482	162,695	$52,921
#4	386,811	197,458	$58,105
#5	1,064,294	530,668	$49,095
#6	456,749	216,389	$51,776
#7	4,334,674	2,208,361	$66,286
#8	797,046	337,074	$47,282
#9	169,353	75,323	$48,947
#10	913,458	349,288	$44,204
#11	852,313	430,235	$61,743
#12	3,413,116	1,547,395	$45,585
#13	1,582,714	601,637	$38,967
#14	614,018	268,311	$44,907
Total Corridor	15,609,647	7,230,202	$52,606

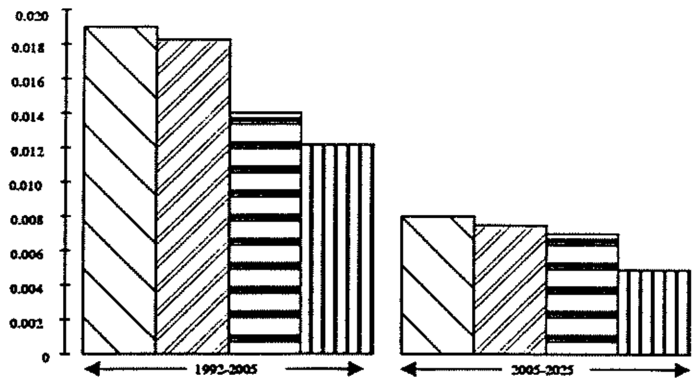
Transport Canada related each overall socioeconomic projection to the 136 internal fine zones using an allocation procedure they developed in 1987, which applies lower growth rates to slower performing economies (e.g., Windsor) and higher growth rates to the faster performing economies (e.g., suburban Montréal and Toronto). The detailed socioeconomic forecasts by zone for the corridor for the base year, 2005, and 2020 are given in Appendix 3.

Exhibit 1.7
Projected Annual Growth Rates for the Central Case Economic Scenario

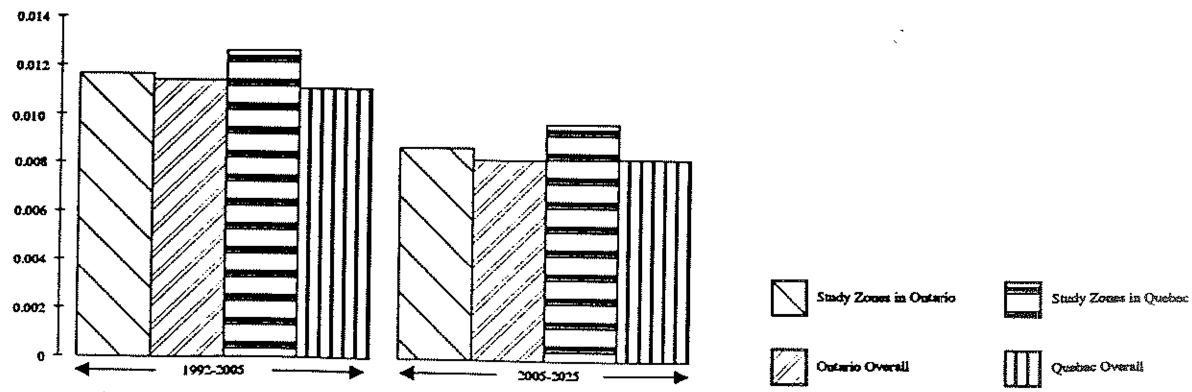
Population



Employment



Household Income



1.2.4 Stated Preference Data

As part of the overall market research for the Québec-Ontario High Speed Rail Study, a Stated Preference Survey was carried out by Market Facts of Canada Limited. The survey was conducted between mid-November 1992 and the end of February 1993. Data were collected by on-board surveys for rail and bus, terminal lounge surveys for air, and by a mixture of mail-out surveys and roadside surveys for auto. The Stated Preference Survey used a quota design which ensured that a range of responses was obtained for different travel purposes, income groups, trip travel distances, sizes of travel parties, and geographic areas. TEMS/Trafix established quota requirements by category (mode/distance/purpose) for the survey and laid out the questionnaire design.

The questionnaire was designed to provide information on the following variables:

- Value of Time by mode and purpose
- Value of Frequency by mode and purpose
- Value of Access Time by mode and purpose
- Value of Interchange Time by mode and purpose
- Value of Modal Bias

A typical questionnaire is given in Appendix 4. The survey methods and procedures used to collect the stated preference data have been documented by Market Facts in their report to the study steering committee. The number of valid surveys collected for each mode/purpose group and each mode/purpose/distance group are shown in Exhibits 1.8 and 1.9 respectively. The minimum statistical requirement to ensure valid results, i.e., estimated errors that are significantly smaller than the coefficient estimates, is 40 surveys. It can be seen that quota numbers that exceeded the minimum requirement were obtained for all the mode/purpose groups except rail and bus commuter.

For auto commuters, although the quota is small (i.e., 53 observations), the results are likely to be valid. With respect to the mode/purpose/distance breakdown, the number of insignificant quota groups was larger but in only six cases were the surveys invalid. These included the bus business medium- and short-distance quotas, the bus commuter short-distance quota, and the rail business and commuter short-distance quotas. The results for the bus business quota group are not too surprising as it is notoriously difficult to obtain valid surveys for this particular quota group. However, the short-distance bus commuter result is quite surprising since large numbers of commuters use the bus for journeys to work. In the case of rail, again the business short-distance results are not too surprising but the commuter short-distance results are disappointing.

For all other quota groups, the results were very good with a substantial number of valid surveys in each case.

EXHIBIT 1.8
STATED PREFERENCE SURVEY RETURNS BY MODE AND PURPOSE

Mode/Purpose		Specified Sample	Minimum Return Required	Sample Collected	Sample Collected as Percent of Minimum Required
Air	Business	611	392	400	101
	Non-Business[1]	457	298	303	102
Rail	Business	426	288	221	77
	Commuter	72	48	15	31
	Other	670	427	585	137
Bus	Business	208	130	20	15
	Commuter	18	12	8	67
	Other	712	450	952	212
Auto	Business	1,032	346	338	98
	Commuter	214	72	53	74
	Other	1,209	404	517	128

(1) *Includes commuter and other travel purposes.*

EXHIBIT 1.9
STATED PREFERENCE SURVEY RETURNS BY MODE, PURPOSE, AND DISTANCE[1]

Mode/Purpose		Short-Distance	Medium-Distance	Long-Distance
Air	Business	n/a[2]	143	257
	Commuter	n/a	n/a	n/a
	Other	n/a	99	204
Rail	Business	23	151	47
	Commuter	15	n/a	n/a
	Other	125	222	238
Bus	Business	3	17	n/a
	Commuter	8	n/a	n/a
	Other	89	642	221
Auto	Business	78	165	95
	Commuter	53	n/a	n/a
	Other	89	261	167

(1) *Short-distance trips are defined as less than 100 km, medium-distance as 100 to 300 km, and long-distance as more than 300 km.*
(2) *N/A denotes quotas not requested.*

2. BASIC MODEL STRUCTURE

The TEMS/Trafix passenger and revenue forecasts for the Québec-Ontario High Speed Rail Study were developed using the COMPASS-R(c) Regional Model System. The COMPASS-R(c) Regional Model System is a flexible demand forecasting tool, which enables alternative socioeconomic and network scenarios to be evaluated for comparative purposes. It also allows input variables to be modified to test the sensitivity of demand to such parameters as elasticities, values of time, and values of frequency.

The COMPASS-R(c) Regional Model System is structured on two principal models: a Total Demand Model and a Hierarchical Modal Split Model. These two models are calibrated separately for three trip purposes, i.e., business, commuter, and "other" (personal, social, and tourism). In each case, the models are calibrated for internal origin-destination data. External trips or trips with an origin or destination outside the designated study area are excluded from the model calibration as they do not have the trip-making characteristics typical of travellers from the corridor. To include external trips in the forecasting process, the base year external trips are factored up in relation to overall socioeconomic growth and improvements to the transportation system.

In particular, close attention was paid to external air trips since ground transportation systems are used for airport access and egress and these trips may include connecting traffic between hub airports such as Pearson and Mirabel and regional airports such as Windsor and Québec City. To fully evaluate the level of traffic that might use a new high speed ground transportation system for airport access/egress, a separate demand model, the SKYLINK-COMPASS(c) model, was developed (see Chapter 7).

2.1 COMPASS-R(c) TOTAL DEMAND MODEL

The Total Demand Model, as shown in Equation 1, provides a mechanism for assessing overall growth in the travel market.

$$T_{ijp} = e^{\beta_{0p}}(SE_{ijp})^{\beta_{1p}}(U_{ijp})^{\beta_{2p}} \tag{1}$$

where

T_{ijp} = Volume of trips between zones i and j for trip purpose p

SE_{ijp} = Socioeconomic variables for zones i and j for trip purpose p

U_{ijp}	=	Total utility of the transportation system for zone i to j
β_{0p}, β_{1p}, β_{2p}	=	Coefficients for trip purpose p

As shown in Equation 1, the total number of trips between any two zones for all modes of travel, segmented by trip purpose, is a function of the socioeconomic characteristics of the two zones and the total utility of the transportation system that exists between the two zones. Trip purposes include business, commuter, and other; typical socioeconomic variables include household income, employment, and population. The utility function provides a logical and intuitively sound method of assigning a value to the travel opportunities provided by the overall transportation system. In the Total Demand Model, utility provides a measure of the total travel time, travel cost, and worth of travel by all modes disaggregated by trip purpose.

The Total Demand Model equation may be interpreted as meaning that travel between zones will increase as socioeconomic factors rise or the utility of the transportation system is improved and travel times and costs fall. As a result, the effect of changes in both socioeconomic and travel characteristics on total demand can be evaluated with the Total Demand Model.

2.1.1 Socioeconomic Variables

The socioeconomic variables in the Total Demand Model show the impact of economic growth on travel demand. The COMPASS-R(c) Regional Model System, in line with most intercity modelling systems, uses three variables (population, employment, and household income) to represent the socioeconomic characteristics of a zone. Depending on the trip purpose, the socioeconomic variables are used independently or in product form. Different combinations were tested in the calibration process but, as found in other studies by TEMS, the most reasonable and stable relationship used the following formulation:

Trip Purpose	**Socioeconomic Variable**
Business	Employment (x) Annual Household Income
Commuting	Population (x) Annual Household Income
Other	Population (x) Annual Household Income

Both the population and employment estimates are taken as the arithmetic average for a zone pair, while income is the average, weighted by population, of a zone pair.

2.1.2 Travel Utility

Estimates of travel utility for a transportation network are generated as a function of generalized cost, as shown in Equation 2:

$$U_{ijp} = f(GC_{ijp}) \tag{2}$$

where

GC_{ijp} = Generalized cost of travel between zones i and j for trip purpose p

Because the generalized cost variable is used to estimate the impact of improvements in the transportation system on the overall level of trip-making, it needs to incorporate all the key modal attributes which affect an individual's decision to make trips. For the public modes, the generalized cost of travel includes all aspects of travel time (access, egress, and in-vehicle times), travel cost (fares, tolls, parking charges), and service frequency.

The generalized cost of travel is typically defined in travel time rather than dollars. Costs are converted to time by applying appropriate conversion factors as shown in Equation 3. The generalized cost of travel between zones i and j for mode m and purpose p is calculated as follows:

$$GC_{ijmp} = TT_{ijm} + \frac{TC_{ijmp}}{VOT_{mp}} + \frac{VOF_{mp} \ x \ OH}{VOT_{mp} \ x \ F_{ijm}} \tag{3}$$

where

TT_{ijm} = Travel time between zones i and j for mode m (in-vehicle time + waiting time + delay time + connect time + access/egress time + interchange penalty), with waiting, delay, connect and access/egress time multiplied by two to account for the additional disutility felt by travellers for these activities

TC_{ijmp} = Travel cost between zones i and j for mode m and trip purpose p (fare + access/egress cost for public modes, operating costs for auto)

VOT_{mp} = Value of Time for mode m and trip purpose p

VOF_{mp} = Value of Frequency for mode m and trip purpose p

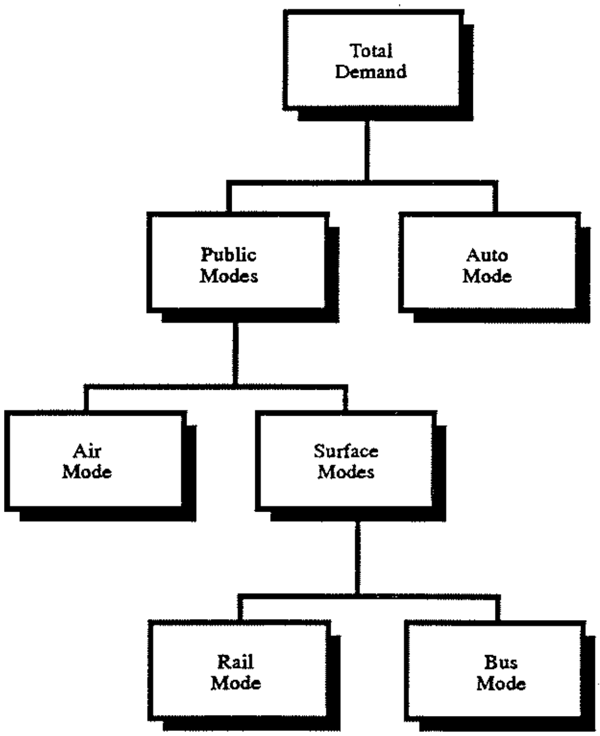
F_{ijm} = Frequency in departures per week between zones i and j for mode m

OH = Operating hours per week

2.2 COMPASS-R(c) MODAL SPLIT MODEL

The role of the Modal Split Model is to estimate relative modal shares given the estimation of the total market share by the Total Demand Model. The relative modal shares are derived by comparing the relative levels of service offered by each of the transportation modes. The COMPASS-R$^{(c)}$ Regional Modal Split Model uses a nested logit structure (but not multinomial hierarchical structure), which was adapted to model the modal choices available in the Québec-Ontario Corridor. Three levels of binary choice, as shown in Exhibit 2.1, were calibrated.

Exhibit 2.1
Hierarchical Structure of the Modal Split Model



The main feature of the Modal Split Model's hierarchical structure is the increasing commonality of travel characteristics as the structure is descended. The first level of the hierarchy separates private auto travel, with its spontaneous frequency, low access and egress times and costs, and highly personalized characteristics, from the public modes. The second level of the structure separates air, the fastest, most expensive, and perhaps most frequent and comfortable public mode, from the rail and bus surface modes. The lowest level of the hierarchy separates rail, a potentially faster, more reliable, and more comfortable mode, from intercity bus.

2.2.1 Form of the Modal Split Model

To assess modal split behaviour, the logsum utility function which is derived from travel utility theory has been adopted. As the modal split hierarchy is ascended, the logsum utility values are derived by combining the generalized costs of travel. Advantages of the logsum utility approach are that, one, the introduction of a new mode increases the overall utility of travel and, two, the new mode can be readily incorporated into the Modal Split Model even though it was not included in the base year calibration.

As only two choices exist at each level of the Modal Split Model hierarchy, a Binary Logit Model, as shown in Equation 4, is used:

$$P_{ijmp} = \frac{e^{U_{ijmp}}}{e^{U_{ijmp}} + e^{U_{ijnp}}} \tag{4}$$

where

P_{ijmp} = Percentage of trips between zones i and j by mode m for trip purpose p

U_{ijmp}, U_{ijnp} = Utility functions of modes m and n between zones i and j for trip purpose p

Equation 4 can be rewritten as follows:

$$P_{ijmp} = \frac{1}{1 + e^{(U_{ijnp} - U_{ijmp})}} \tag{5}$$

As the modal split hierarchy is ascended, the utility of travel between zones i and j by mode m for trip purpose p (U_{ijmp}) is always expressed as the generalized cost of travel. However, for the alternative mode n, the utility of travel (U_{ijnp}) is only expressed as generalized cost when it is an independent mode. Where mode n is a composite mode, e.g., more than one surface mode as in the upper levels of the modal split hierarchy, the utility of travel is derived as described below from the utility of the two or more modes it represents.

2.2.2 Utility of Combined Modes

If modes are combined, as in the upper levels of the Modal Split Model hierarchy, it is essential to be able to measure the "inclusive value" of the composite mode, e.g., how the combined utility for bus and rail compares with the utility for bus or rail alone. The combined utility is more than the utility of either of the modes alone but is not simply the utilities of the two modes added together. A realistic approach to solving this problem, which is consistent with utility theory and the logit model, is to use the logsum function. As the name logsum suggests, the utility of a composite mode is defined as the natural logarithm of the sum of the utilities of the component modes. In combining the utility of separate modes, the logsum function provides a proportional increase in utility which is less than the combined utilities of the two modes. For example:

suppose

$$\textit{Utility of Rail or } U_{rail} = \alpha + \beta GC_{rail}$$

$$\textit{Utility of Bus or } U_{bus} = \gamma GC_{bus}$$

then

Inclusive Utility of Surface Modes

$$U_{surface} = log(e^{Urail} + e^{Ubus})$$

It should be noted that improvements in either rail or bus will result in improvements to the inclusive utility of the surface modes.

In a nested logit model, the calibrated coefficients associated with the inclusive values of the composite modes take on special meaning. If one of these coefficients is equal to one, then that level of the hierarchical model is essentially a multinomial logit model between all the modes making up the composite mode and the other modes in that level of the hierarchy. If one of the coefficients is greater than one, then the hierarchy has been incorrectly specified and counter-intuitive forecasts will result. Because of the assumptions behind the Modal Split Model, the coefficients must decrease as one proceeds up the modal split hierarchy or counter-intuitive results will occur. Thus, the coefficients provide a check on the specification of the hierarchy.

3. CALIBRATION OF THE RECESSIONARY MODEL

The first step in the calibration process was to use the basic data collected in the 1992-93 Stated Preference Survey and to compare the results of the model calibration with the results of the 1987 VIA Model calibration which was based on non-recessionary data.

3.1 GENERALIZED COST DATA

The generalized cost of travel that was used to describe travellers' journeys by road, rail and air throughout the corridor were developed using the following data for movements between all fine zone pairs:

- For the private mode (auto):
  - Travel Time: Estimated on the basis of highway speed.
  - Auto Operating Costs: Estimated on the basis of Canadian Automobile Association (CAA) average costs for business travel and CAA marginal costs for commuting.
  - Toll and Parking Charges: As appropriate for specific highways and city locations.
- For the public modes (air, intercity rail, bus):
  - Access and Egress Times and Costs: Estimated on the basis of most likely time and cost for the mode.
  - Terminal Waiting and Delay Times: Estimated on the basis of mode and location of specific facilities (e.g., Dorval Airport, Union Station).
  - In-Vehicle Travel Times: Estimated from published schedules.
  - Number of Interchanges and Connect Times: Estimated from published schedules and network data for the study.
  - Fares: Estimated from published fares with appropriate assumptions for business, commuter, and social travel with respect to the type of fare used and the level of discount.
  - Frequency: Estimated from published schedules.

3.2 VALUES OF TIME

Exhibit 3.1 shows the values of time derived from the 1992-93 Stated Preference Survey. These results show business purpose values of time that are nearly twice the values of time for the commuter and other trip purposes; higher values of time for air than for auto and rail; and, finally, the lowest values of time for bus users.

Exhibit 3.1
Value of Time Results Derived from the 1992-93 Survey (1992$)

Trip Purpose	Air	Auto	Rail	Bus
Business	72.8	27.0	29.2	16.0
Commuter	30.0	14.6	16.0	10.7
Other	26.9	18.1	14.1	9.7

The results of the 1992-93 Survey are distinctly different from the results of the 1987 VIA Study. As shown in Exhibit 3.2, the air/business value of time has risen by more than 30 percent, while the values of time for the commuter and other trip purposes have fallen substantially for all modes. The bus values of time were consistently lower for all trip purposes. Only the business values of time for auto and rail are consistent with the 1987 results.

Exhibit 3.2
Comparison of 1992-93 and 1987 Values of Time

Trip Purpose	Air	Auto	Rail	Bus
Business	+32%	+4%	0%	-12%
Commuter	-8%	-22%	-30%	-20%
Other	-15%	-3%	-39%	-28%

The impact of the recession is clearly evidenced in these results. Overall values of time fell as individuals reassessed the value of money both to themselves and their businesses. However, in the case of air, the value of time rose because many middle managers who use air in "normal" times either did not make the journey or diverted to auto and rail. The travellers using air were making journeys that were essential for their business and could not be made by another, less expensive mode. In the case of auto and rail, while non-essential business trips were lost, the values of time were maintained by the transfer of middle manager trips from air. In the case of bus, there was little diversion from auto and rail which are highly cost-competitive with bus and so bus values of time fell as individuals showed a greater willingness to spend time rather than money. In the case of the commuter and other trip purposes, the fall in the values of time for all modes reflects the reluctance of individuals at all income levels to spend their own money on travel and a willingness to accept less comfortable, lower priced journeys when they are paying.

3.3 CALIBRATION OF THE TOTAL DEMAND MODEL

For the purpose of calibrating the Total Demand Model coefficients by linear regression techniques, the equation for the Total Demand Model was transformed by taking the natural logarithm of both sides as shown below:

$$\log(T_{ijp}) = \beta_{0p} + \beta_{1p}\log(SE_{ijp}) + \beta_{2p}\log(U_{ijp}) \qquad (1)$$

This provides the linear specification of the model necessary for regression analysis. The data available for the Total Demand analysis were more than adequate for each of the three trip purposes (business, commuter, and other). In each case, the full range of socioeconomic and network conditions were present in the data.

The results of the calibration of the Total Demand Model are shown in Exhibit 3.3. It can be seen that all the models are significant with good t-statistics and R^2 values. The socioeconomic elasticity values are in the range of 0.7 to 0.9, such that each one percent in growth in the socioeconomic factors generates just under a one percent increase in the number of trips. The travel utility elasticity is the same or slightly higher in each case, with each one percent improvement in travel utility (i.e., travel times, costs, etc.) generating a 0.94 percent increase in the number of business trips, a 0.92 percent increase in commuter trips, and a 1.06 percent increase in other trips.

Exhibit 3.3
Total Demand Model Coefficients[1]

Trip Purpose	Constant β_0	Socioeconomic β_1	Utility β_2	R^2
Business	-7.529	0.952 (13.5)	0.936 (23.5)	0.90
Commuter	-5.712	0.694 (8.4)	0.921 (24.1)	0.91
Other	-7.372	0.789 (37.6)	1.058 (61.1)	0.86

[1] *t-statistics are given in parentheses.*

While the 1993 Model is very strong statistically, the socioeconomic coefficients are relatively small when compared to the VIA Model which was calibrated in 1987 prior to the recession. In the VIA Model, the socioeconomic coefficients were all greater than one. Equally, the utility coefficients seem high when compared to the previous VIA Model calibration. Specifically, the utility coefficients of the 1993 Model are 31, 21, and 15 percent higher respectively for the business, commuter and other trip purposes. These differences are undoubtedly due to the recession changing individuals' behaviour and the fact that the socioeconomic data have not been adjusted to account for the effects of the recession.

3.4 CALIBRATION OF THE MODAL SPLIT MODEL

Beginning at the bottom or third level of the Modal Split Model hierarchy and working up to the top, the first analysis was between intercity rail and intercity bus. As shown in Exhibit 3.4, the model was effectively calibrated for the three trip purposes with reasonable t-statistics and R^2 values in all cases given the degrees of freedom in the model and despite the data limitations for the business and commuter trip purposes.

Exhibit 3.4
Rail versus Bus Modal Split Model Coefficients[1]

Business	$\log(P_{Bus}/P_{Rail})$	=	-0.6300 +	$0.0095\ GC_{Rail}$ -	$0.0101\ GC_{Bus}$	
				(11)	(-13)	$R^2 = 0.56$
Commuter	$\log(P_{Bus}/P_{Rail})$	=	0.4738 +	$0.0090\ GC_{Rail}$ -	$0.0093\ GC_{Bus}$	
				(5)	(-5)	$R^2 = 0.57$
Other	$\log(P_{Bus}/P_{Rail})$	=	-0.6400 +	$0.0034\ GC_{Rail}$ -	$0.0034\ GC_{Bus}$	
				(21)	(-21)	$R^2 = 0.55$

where

Business $U_{Surf} = \log[\exp(+0.6300 - 0.0095\ GC_{Rail}) + \exp(-0.0101\ GC_{Bus})]$
Commuter $U_{Surf} = \log[\exp(-0.4738 - 0.0090\ GC_{Rail}) + \exp(-0.0093\ GC_{Bus})]$
Other $U_{Surf} = \log[\exp(+0.6400 - 0.0034\ GC_{Rail}) + \exp(-0.0034\ GC_{Bus})]$

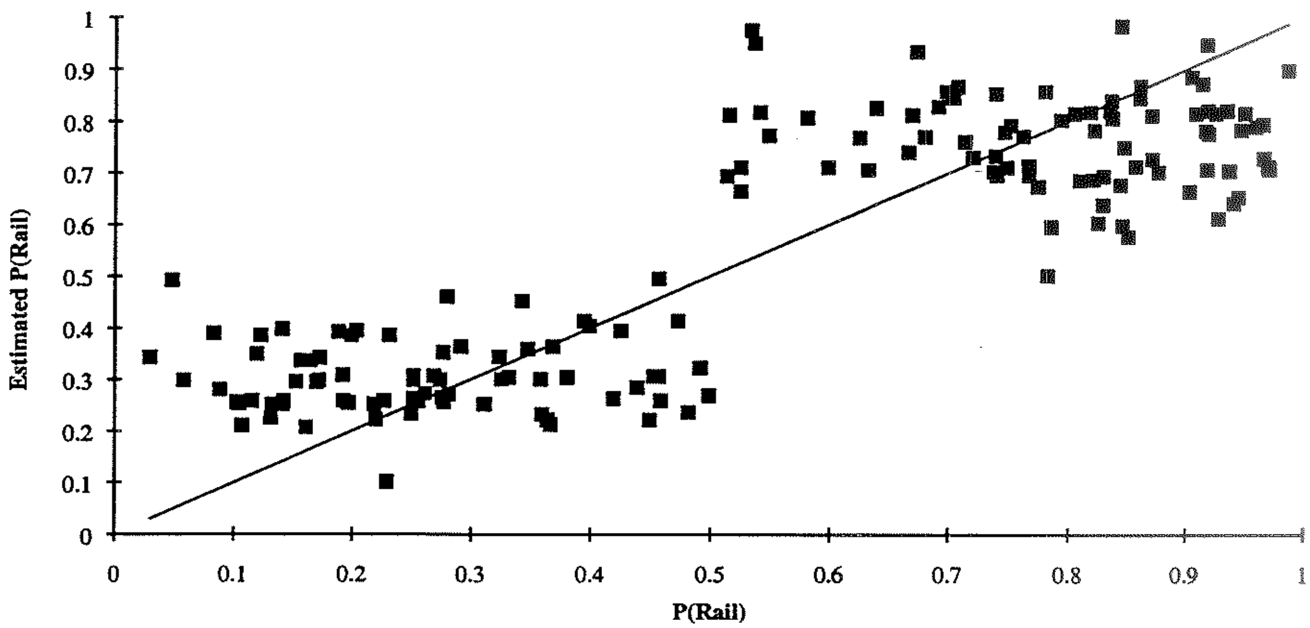
[1] *t-statistics are given in parentheses.*

It is worth noting that, despite the fact that the Modal Split Model used the fine zone system which included over 11,000 zone pairs, some data limitations occurred (see Exhibit 3.5). In particular, the business data were limited to travellers with either a high or low probability of selecting rail. This essentially created two separate blocks of data, with few observations in common between the two blocks. The commuter data, while even more limited in volume, provided a more comprehensive range of rail/bus selection probabilities. Certainly, if a zone system with fewer zones, e.g., the super zone system, had been used, very real calibration problems would have been encountered.

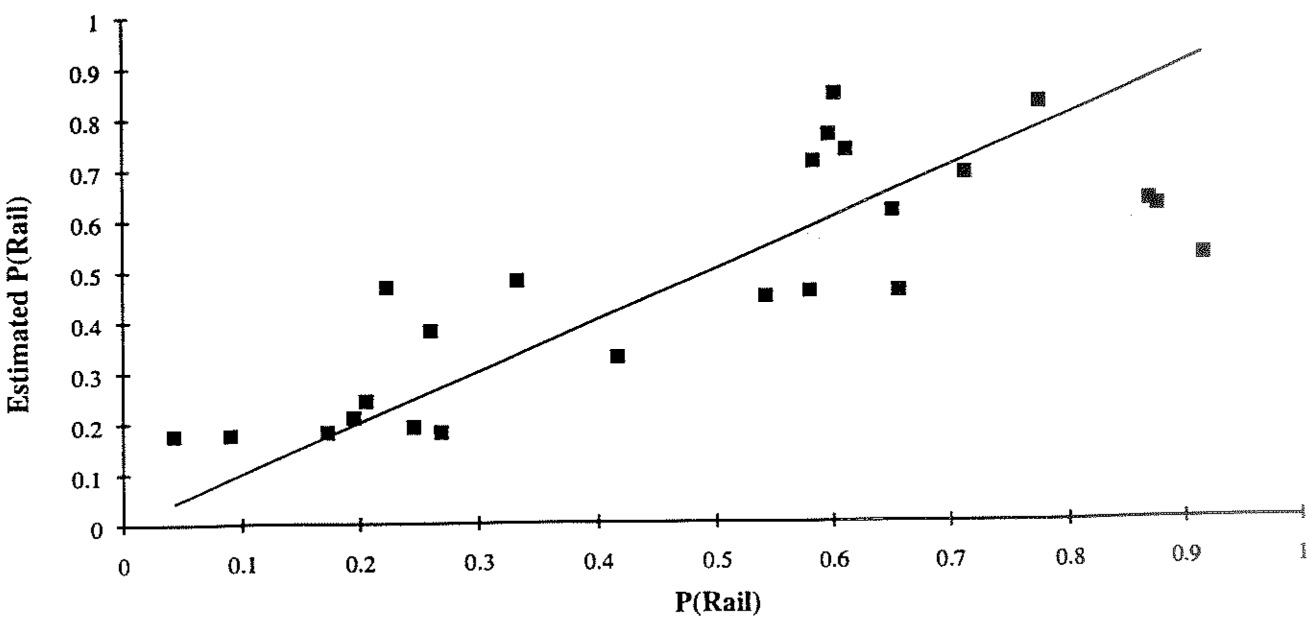
As it was, all the coefficients have the correct signs and would appear to be reasonable. The utility of travel (generalized cost in this case) becomes increasingly less sensitive for the business, commuter, and other trip purposes respectively. The selection of bus over rail is more sensitive to the travel utility of bus than the travel utility of rail. This is probably due to the attractiveness of lower costs to bus users.

Exhibit 3.5
Data Limitations of the 1992-93 Survey

Rail versus Bus: Business



Rail versus Bus: Commuter



For the second level of the hierarchy, an analysis was made of air versus intercity rail and bus, the two public surface modes. The data available were more than sufficient for the other trip purpose, somewhat limited for the business trip purpose and, as is often the case, very limited for the commuter trip purpose. However, as shown in Exhibit 3.6, the model was effectively calibrated for the three trip purposes with highly significant t-statistics and R^2 values.

The utility coefficients for the surface modes seem reasonable; they have the correct signs and reflect the same order as in the lower level of the model hierarchy from which they were derived. With respect to the air mode, the generalized cost coefficient is highest for the commuter trip purpose, and lowest for the other trip purpose; this means, for the air mode, the commuter trip purpose is the most sensitive to travel costs and the other trip purpose is the least sensitive.

Exhibit 3.6
Rail and Bus versus Air Modal Split Model Coefficients[1]

Business	$\log(P_{Surf}/P_{Air})$	= -0.3329 -	$0.8758\ U_{Surf}$	-	$0.0073\ GC_{Air}$	
			(-25.7)		(-12.6)	$R^2 = 0.93$
Commuter	$\log(P_{Surf}/P_{Air})$	= 0.6025 -	$0.7580\ U_{Surf}$	-	$0.0118\ GC_{Air}$	
			(-4.1)		(-2.6)	$R^2 = 0.68$
Other	$\log(P_{Surf}/P_{Air})$	= -1.1768 -	$0.4329\ U_{Surf}$	-	$0.0015\ GC_{Air}$	
			(-21.4)		(-21.3)	$R^2 = 0.69$

where

$$\text{Business } U_{Public} = \log[\exp(-0.3329 - 0.0073\ GC_{Air}) + \exp(0.8758\ U_{Surf})]$$
$$\text{Commuter } U_{Public} = \log[\exp(0.6025 - 0.0118\ GC_{Air}) + \exp(0.7580\ U_{Surf})]$$
$$\text{Other } U_{Public} = \log[\exp(-1.1768 - 0.0015\ GC_{Air}) + \exp(0.4329\ U_{Surf})]$$

(1) t-statistics are given in parentheses.

For the top level of the hierarchy, an analysis was made of auto versus the public modes. The data available for calibration were good for the other trip purpose, reasonable for the business trip purpose, and very limited for the commuter trip purpose. As shown in Exhibit 3.7, the model was effectively calibrated for the three trip purposes with strong t-statistics and R^2 values. The utility coefficients again seem reasonable, have the correct sign, and reflect the order observed in the air generalized costs at the second level of the hierarchy. The coefficients for the auto generalized costs show the commuter trip purpose to be the most sensitive to travel costs and the other trip purpose the least sensitive.

Exhibit 3.7
Public Modes versus Auto Modal Split Model Coefficients(1)

Business	$\log(P_{Public}/P_{Auto})$	= 0.2369 -	$0.9693\ U_{Public}$ -	$0.0064\ GC_{Auto}$	
			(-3.5)	(-5.5)	$R^2 = 0.51$
Commuter	$\log(P_{Public}/P_{Auto})$	= 2.1305 -	$0.7173\ U_{Public}$ -	$0.0072\ GC_{Auto}$	
			(-2.3)	(-3.0)	$R^2 = 0.80$
Other	$\log(P_{Public}/P_{Auto})$	= 1.4539 -	$0.8642\ U_{Public}$ -	$0.0053\ GC_{Auto}$	
			(-9.1)	(-29.2)	$R^2 = 0.93$

where

$$\text{Business } U_{Total} = \log[\exp(0.2369 - 0.0064\ GC_{Auto}) + \exp(0.9693\ U_{Public})]$$
$$\text{Commuter } U_{Total} = \log[\exp(2.1305 - 0.0072\ GC_{Auto}) + \exp(0.7173\ U_{Public})]$$
$$\text{Other } U_{Total} = \log[\exp(1.4539 - 0.0053\ GC_{Auto}) + \exp(0.8642\ U_{Public})]$$

(1) *t-statistics are given in parentheses.*

The peculiarity of this model is that the business trip purpose appears to be very sensitive to the generalized cost of travel, resulting in substantial diversion to any low "cost" options. This is again undoubtedly a reflection of recessionary conditions when business travel expenditures are significantly reduced.

3.5 CONCLUSIONS REGARDING THE RECESSIONARY MODEL

In general, the calibration process was successful in deriving significant coefficients for both the Total Demand Model and Modal Split Model. However, as noted, the Total Demand Model has very strong utility coefficients and somewhat weaker socioeconomic coefficients than might have been expected. This appears to be the result of the impact of the recession on individuals' travel behaviour.

There is typically a lower level of trip-making in a recessionary period because the economic downturn reduces the need for business travel and commuting as there are fewer people working; similarly, there is less social travel because people feel less confident about spending money on long weekends, holidays, etc. Unfortunately, this short-term downturn in the economy and its effects on population, employment, and income were not reflected in the long-term socioeconomic values used in the calibration process. In other words, the relationships developed suggested fewer trips per unit of population, employment, and income than is typically the case.

A recession also causes those individuals who travel to behave differently and to be, in particular, more conscientious about how they spend money and increasingly willing to spend more time in order to spend less money. In particular, individuals tend to "trade down" during a recessionary period and take more notice of travel times and costs. The impact of this phenomenon is that travel utility or generalized cost has a much greater significance in travel decisions.

As a result, it is considered that the model calibrated on the results of the 1992-93 Stated Preference Survey, although it is statistically sound, reflects recessionary behaviour and is not appropriate for forecasting long-term demand in the Québec-Ontario Corridor. Because the utility coefficients seem to be overstated in the model and the socioeconomic factors understated, it was necessary to develop a suitable approach for eliminating the impact of the recession on the model.

4. DEVELOPMENT OF A NON-RECESSIONARY MODEL

As previously noted, the results of the 1992-93 Stated Preference Survey showed a marked deviation from the results of the 1987 VIA Survey. To eliminate the impact of the recession on the 1992-93 data, the first step was to revise the values of time to values that are more typical of normal, non-recessionary travel behaviour. This was done by comparing the results of the values of time analysis with the results of the 1987 VIA Survey as well as the results of a wide range of surveys completed by TEMS throughout North America. Consequently, the business values of time for air were reduced and the business and non-business values of time for auto, rail and bus were increased. The revised values of time (see Exhibit 4.1) were then used to recalibrate the total demand and modal split models.

Exhibit 4.1
Values of Time used in the Passenger and Revenue Forecasting Study (1992$/Hour)

Trip Purpose	Air	Auto	Rail	Bus
Business	50	30	35	18.0
Commuter	30	20	25	12.5
Other	27	20	20	12.5

4.1 TOTAL DEMAND MODEL

Exhibit 4.2 gives a comparison of the 1992-93 Recessionary Total Demand Model, the recalibrated Non-Recessionary Model, and the 1987 VIA Model. It can be seen that the structure of the Non-Recessionary Model is more like the 1987 VIA Model than the Recessionary Model; this applies to the constant term, the socioeconomic coefficient, and the travel utility coefficient. The Non-Recessionary Model is clearly more sensitive to socioeconomic growth than the Recessionary Model, but less sensitive to utility changes than the Recessionary Model, thereby overcoming both of the concerns with the Recessionary Model.

Exhibit 4.2
Comparison of Total Demand Models[1]

Trip Purpose	Constant β_0	Socioeconomic β_1	Utility β_2	R^2
1992-93 Recessionary Model				
Business	-7.53	0.952 (14)	0.936 (24)	0.90
Commuter	-5.71	0.694 (8)	0.921 (24)	0.91
Other	-7.37	0.789 (38)	1.058 (61)	0.86
1992-93 Non-Recessionary Model				
Business	-17.20	1.011 (45)	0.811 (49)	0.94
Commuter	-14.00	1.003 (21)	0.864 (22)	0.85
Other	-16.78	0.989 (47)	0.798 (36)	0.70
VIA 1987 Model				
Business	-15.76	1.036 (11)	0.647 (21)	0.77
Commuter	-15.76	1.077 (8)	0.732 (19)	0.75
Other	-14.76	1.043 (12)	0.907 (27)	0.85

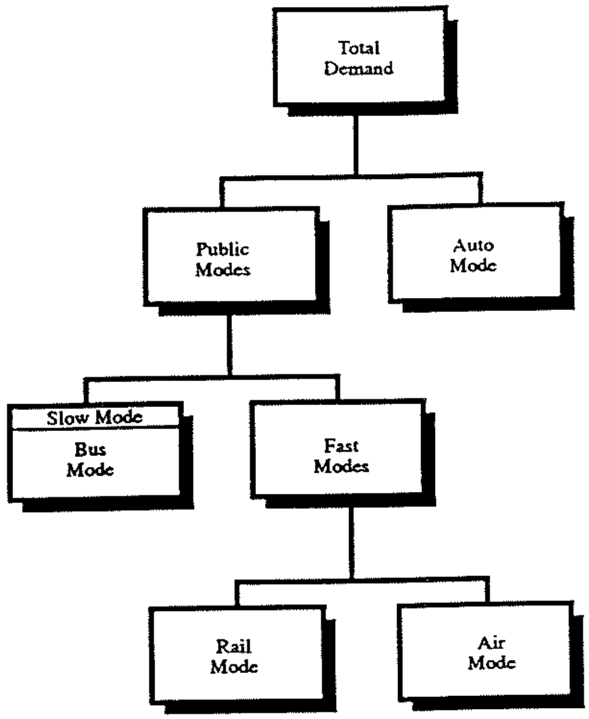
(1) *t-statistics are given in parentheses.*

4.2 MODAL SPLIT MODEL

In considering the development of a Non-Recessionary Modal Split Model for high speed rail, a review was made of the modal split hierarchy. The most appropriate approach when analyzing conventional rail is to classify rail with bus as one of the two public surface modes to be compared with air. However, it was decided to revise the Modal Split Model's hierarchical structure to provide for a more effective representation of the new mode, high speed rail.

As shown in Exhibit 4.3, the new hierarchy classifies both high speed rail and air as fast modes to be compared against the slow mode bus. The basis for adopting the revised structure is that the travel characteristics of high speed rail (in particular, the door-to-door travel characteristics of high speed rail) will be more like the travel characteristics of air than bus. As such, individuals' travel behaviour with respect to the new mode, high speed rail, is likely to be closer to that of air travellers rather than bus travellers. The hierarchical modal split structure was therefore adjusted to reflect the new behaviour and travel attitudes that this new mode of travel will engender.

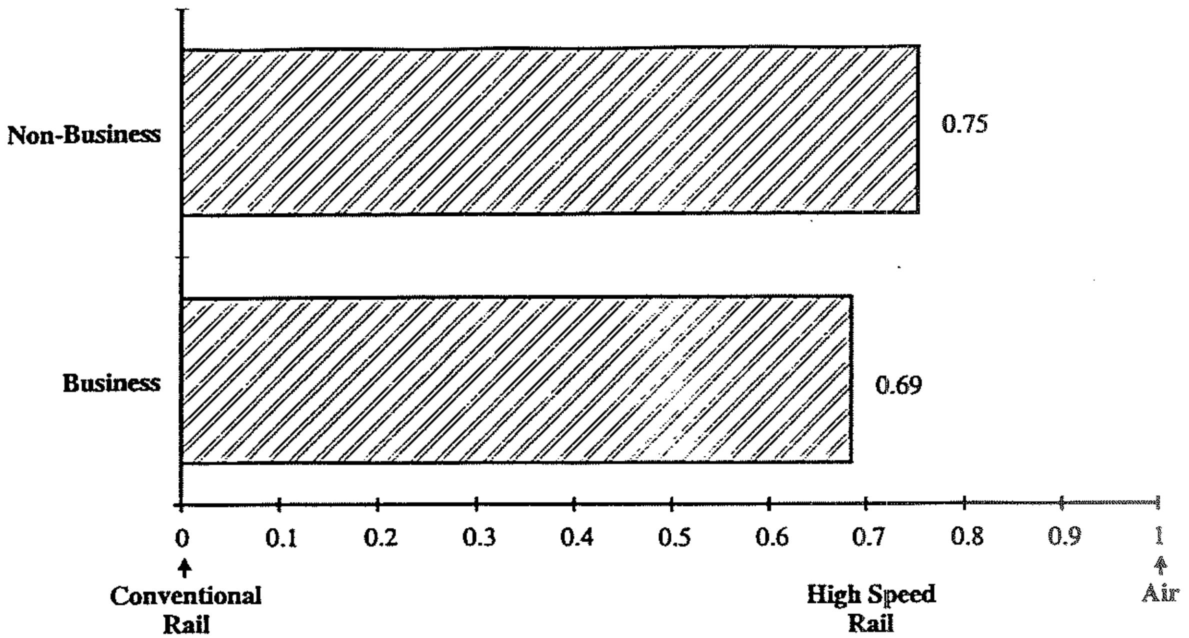
Exhibit 4.3
Revised Structure for the Modal Split Model



4.2.1 New Mode Bias

In considering the attitudes of travellers to the new mode, high speed rail, it was clear that the bias associated with conventional rail was entirely inappropriate for measuring the relative attractiveness of high speed rail (leaving aside time and cost) when compared to auto, air, and bus or for evaluating the overall impact of high speed rail on demand. TEMS used the results of a specially designed stated preference survey (collected as part of the overall 1992-93 Stated Preference Survey) that specifically measured the way individuals would judge the new mode, high speed rail, when it was in competition with air travel. It was found, as shown in Exhibit 4.4, that the bias against rail in favour of air would be substantially reduced. As a result, the modal split equations were adjusted to include a more favourable bias for high speed rail than for conventional rail.

Exhibit 4.4
Estimated Adjustment in Modal Bias for High Speed Rail Compared with Conventional Rail and Air



4.2.2 Modal Split Calibration Results

The results of the calibration of the Non-Recessionary Modal Split Models are shown in Exhibit 4.5. It can be seen that the models are all statistically significant with appropriate t-statistics and R^2 values. It should be noted that the R^2 values and t-statistics for the rail versus air modal split for the other and commuter trip purposes are slightly marginal due to weaknesses in the data for these market segments. In this model, rail versus air is the lowest level of the hierarchy and lower R^2 values and t-statistics can be expected for some market segments such as commuter travel for which demand data is naturally very limited. As a result, a second check was made on the reasonableness of the coefficients. It can be seen that the commuter coefficients are very consistent with the highly significant business market segment. Commuters were more sensitive to price and almost as sensitive to time as business travellers, while social travellers were far less sensitive to time but very sensitive to price.

Exhibit 4.5
Modal Split Model Coefficients for the Non-Recessionary Model[1]

Rail versus Air

	β_0	GC_{Air}	GC_{Rail}	R^2
Business	-3.6989	-0.0084 (-3.05)	+0.0163 (+10.25)	0.54
Commuter	+0.0742	-0.0119 (-1.23)	+0.0149 (+1.79)	0.42
Other	+5.4333	-0.0070 (+0.96)	+0.0163 (+7.42)	0.49

Fast versus Bus[2]

	β_0	GC_{Bus}	U_{Fast}	R^2
Business	+2.1103	-0.0058 (-13.96)	-0.8830 (-4.85)	0.75
Commuter	-0.6740	-0.0054 (-2.18)	-0.9063 (-1.62)	0.65
Other	+2.2002	-0.0055 (-10.31)	-0.8668 (-5.55)	0.69

Public versus Auto

	β_0	GC_{Auto}	U_{Public}	R^2
Business	+2.6088	-0.0143 (-7.84)	-0.8106 (-4.93)	0.95
Commuter	+1.9102	-0.0163 (-2.67)	-0.8497 (-1.74)	0.66
Other	+5.5181	-0.0135 (-6.79)	-0.8003 (-4.26)	0.87

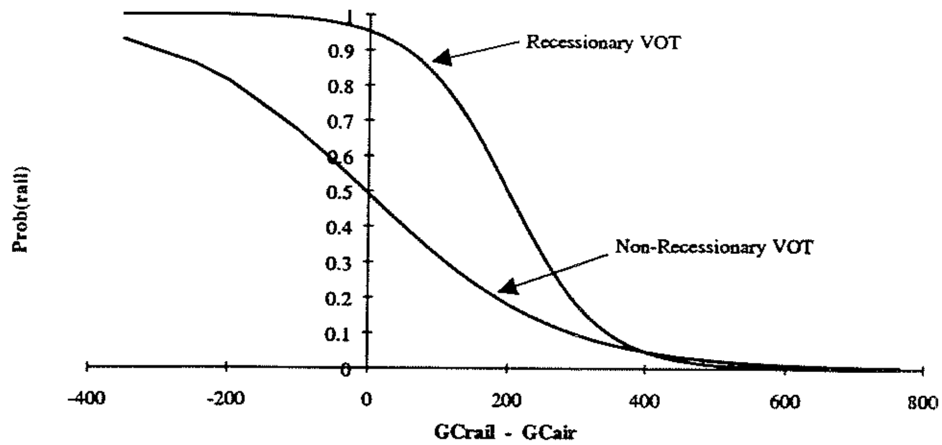
[1] *t-statistics are given in parentheses.*
[2] *Fast denotes the higher speed public modes, i.e., air and high speed rail.*

Exhibit 4.6 shows the impact of the use of the recessionary and non-recessionary values of time on the Modal Split Model curves for air versus rail. It can be seen that for the business, commuter and other trip purposes, the bias against rail is substantially reduced with the use of the "new mode" bias and the non-recessionary values of time and, as denoted by the slope of the curves, the rate of substitution is substantially reduced.

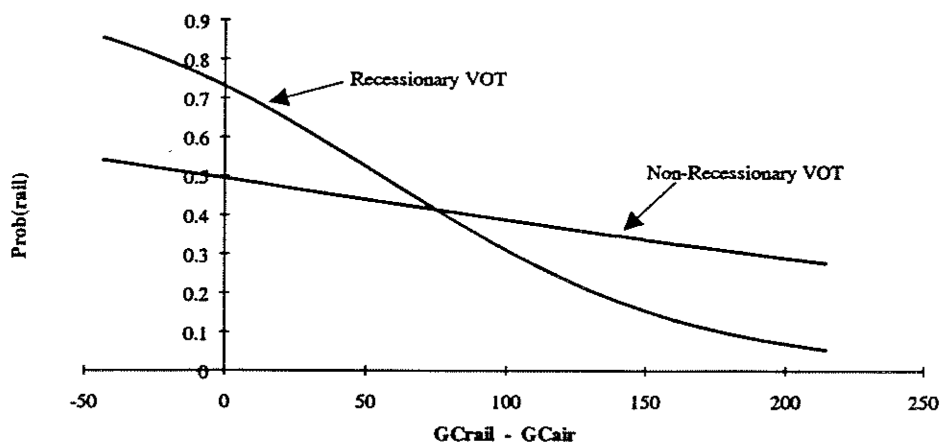
Using the non-recessionary values of time gives a more realistic assessment of the competition between rail and air and produces forecasts with a more realistic balance between the rail and air modes. Similar changes occurred at the other levels of the Modal Split Model hierarchy as the Non-Recessionary Model is less sensitive in general than the Recessionary Model to improvements in the competitiveness of rail.

Exhibit 4.6
Impact of the Recessionary and Non-Recessionary Values of Time on Modal Split

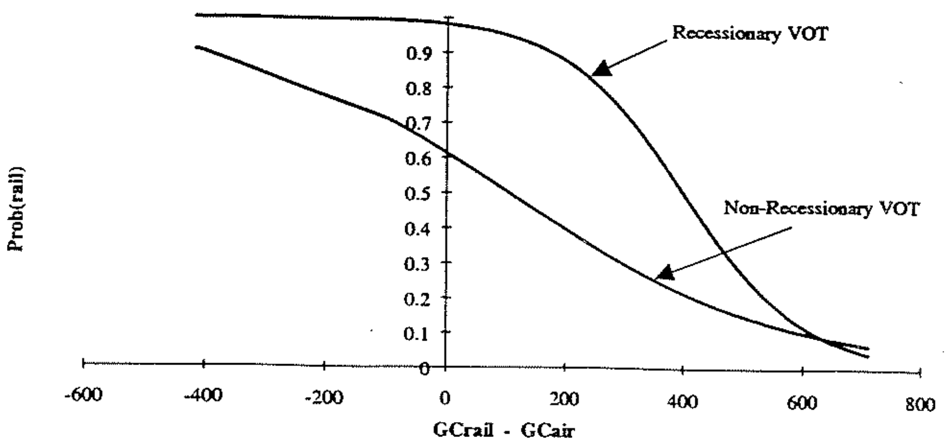
Air versus Rail for the Business Trip Purpose



Air versus Rail for the Commuter Trip Purpose



Air versus Rail for the Other Trip Purpose



4.3 CONCLUSIONS REGARDING THE NON-RECESSIONARY MODEL

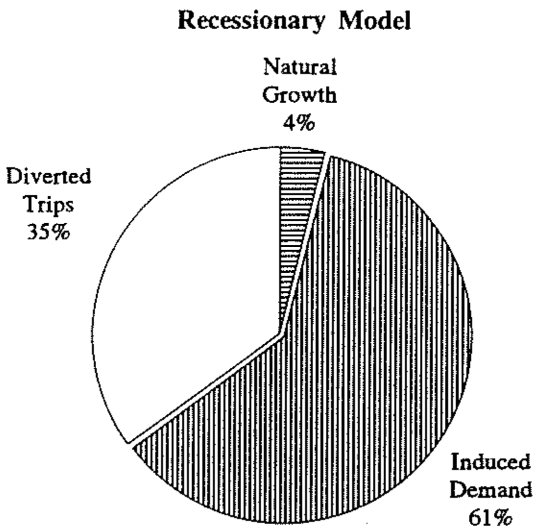
The Non-Recessionary Model was found to be:

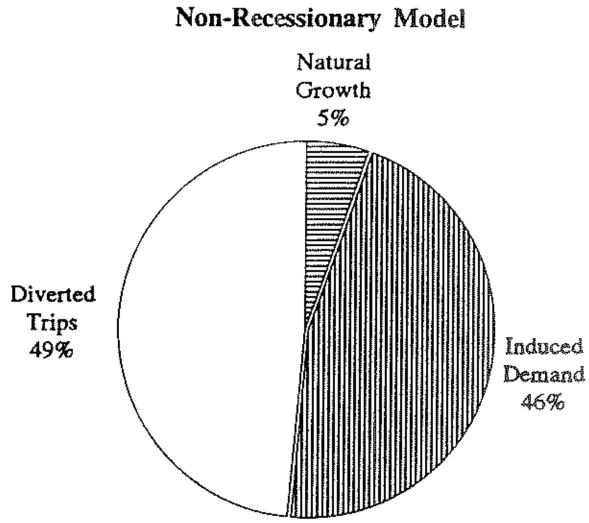
- More sensitive to socioeconomic growth.
- Less sensitive to network improvements in generating induced demand.
- Less sensitive to rail network improvements in diverting trips from other modes, particularly from air business trips.

As shown in Exhibit 4.7, the Non-Recessionary Model demand forecasts produced a more balanced and realistic demand profile than the Recessionary Model, with less business traffic (which fell as a proportion of total demand from 56 percent to 38 percent) and more non-business traffic (which rose as a proportion of total demand from 42 percent to 60 percent). Also, in the Non-Recessionary Model, the contribution of socioeconomic growth and diverted demand to the total demand was greater (5 percent and 49 percent as opposed to 4 percent and 35 percent) while the contribution of induced demand fell (from 61 percent to 46 percent). The size of the induced demand in the Recessionary Model was a clear result of using recessionary values of time which, as previously noted, overstated the value of time of air travel and understated it for auto, rail and bus. The 46 percent induced demand for the Non-Recessionary Model is well in line with the results in Europe and Japan for high speed rail investments.

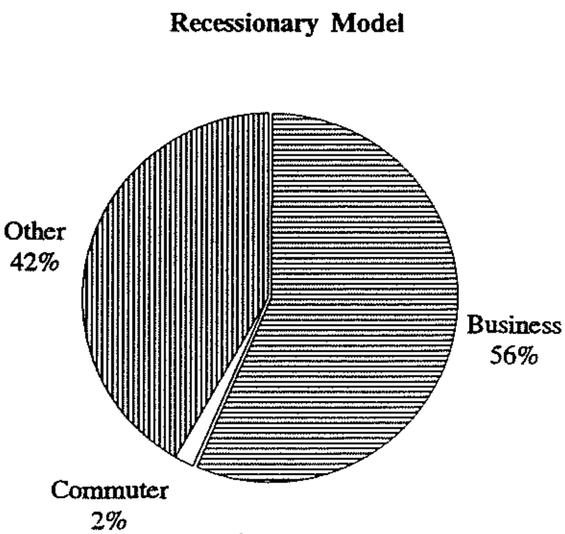
Exhibit 4.7
Impacts of the Recession

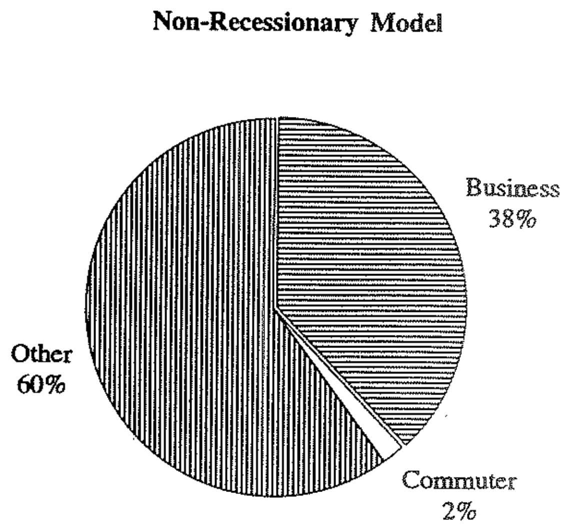
Induced Demand and Natural Growth





Trip Purpose Forecasts





5. FORECASTING PROCESS

In developing forecasts for the alternative high speed rail options, two principal inputs are required: economic scenarios which describe the likely rates of economic growth over the forecast period and transportation strategies that describe the service attributes of the proposed high speed rail options and changes in the level of service offered by the competing intercity bus, air and auto modes.

5.1 ECONOMIC SCENARIOS

Economic scenarios were developed for the life of the high speed rail project, from the base year 1993 to the year 2025. This time frame allows for the construction of the project and a twenty-year period for repayment of capital costs. Because the economic scenarios are intended to show the potential range of economic growth, three economic scenarios were defined; an upper (optimistic) case, a central case, and a lower (pessimistic) case. The economic scenarios for the Québec-Ontario Corridor were developed by Transport Canada.

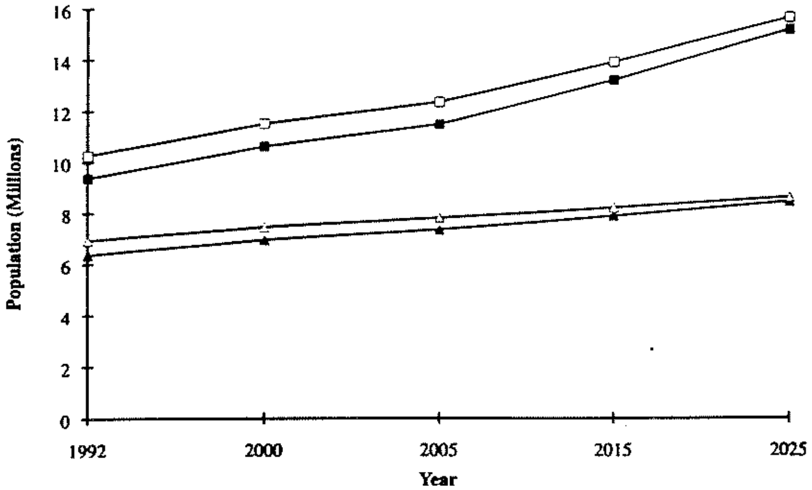
The methodology used to develop the economic scenarios included:

- A review of historical trends and variations in economic performance on a provincial and national basis.
- The use of official national and provincial forecasts to establish the central case scenario.
- An analysis of the range of forecasts made by provincial agencies, research institutes, and regional economic studies to establish the upper and lower case scenarios.

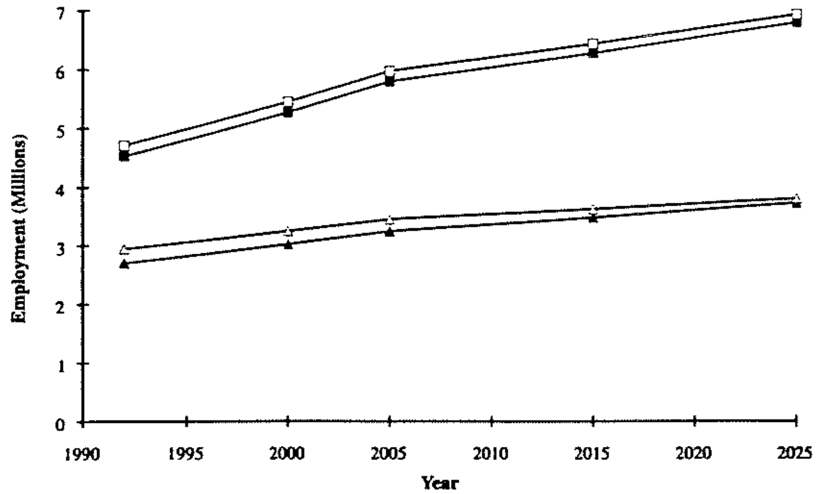
Overall, a conservative approach was taken to identifying economic growth rates. It was initially decided that the central case scenario should reflect a slower rate of economic growth, i.e., a three percent annual growth in GDP rather than the four percent annual growth which Canada (and thus Ontario and Québec) have achieved over the last thirty years (see Exhibit 5.1). Because of the difficulties in determining the most appropriate central case economic scenario for the study, the study steering committee decided to adopt a different approach and decided that the central case economic scenario should be equivalent to a 2.6 percent annual growth in travel demand in the overall corridor. To meet this objective, TEMS revised Transport Canada's central case economic scenario upward such that the annual growth rate is 1.4 percent rather than 0.73 percent for household income GDP and 3.5 percent rather than 2.8 percent for GDP.

Exhibit 5.1
Transport Canada Economic Scenarios for the Québec-Ontario Corridor

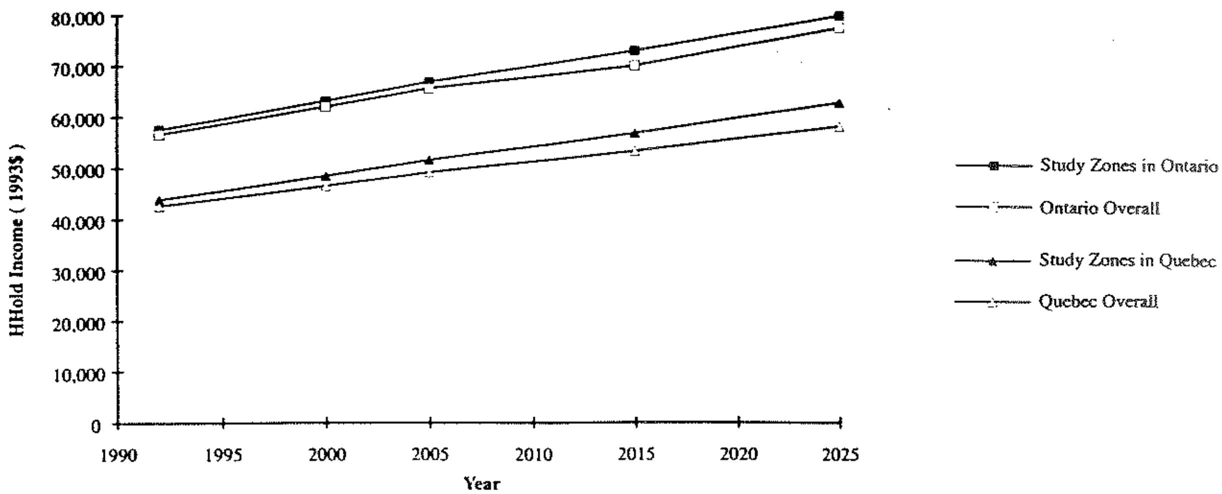
Population



Employment



Household Income



5.2 TRANSPORTATION STRATEGIES

Transportation strategies were developed to reflect, one, the competitive position of the existing air, auto, and bus modes at the time the high speed rail service is introduced and for the period of time it operates in the corridor and, two, the effect on corridor travel demand of introducing different types of high speed trains and providing different levels of service with each type of train. The competitive mode strategies are typically called the "No Action" or "Do Nothing" alternatives and define what would happen in the corridor if the high speed rail service is not introduced. The high speed rail strategies are called the "Action" or "Do Something" alternatives and define what would happen if different high speed rail options were implemented.

5.2.1 No Action Alternatives

The No Action Alternative #1 for the competitive modes (auto, air, and intercity bus) was defined by Peat, Marwick. In their report, it was recommended that, since no significant changes were planned to the intercity network, a neutral strategy should be adopted with respect to the competitive modes. As a result, the changes to the base and forecast year networks for the competitive modes are minor (see Exhibit 5.2). This strategy, although accepted by the study's steering committee is, in fact, unreasonably conservative. Increased highway congestion will undoubtedly have a highly detrimental effect on the access times for all modes as well as the travel times for auto and intercity bus in urban areas.

TEMS/Trafix recommended that a more realistic approach would be to increase highway travel times in urban areas in line with the projected annual growth rate for auto traffic, i.e., approximately two to three percent. The rationale for this increase in travel times is based on recent studies that have shown that, one, in peak hours, most highways in the corridor's urban areas are already at capacity; two, peak travel time now encompasses 6 to 8 hours per day and is expected to expand to 10 to 12 hours per day by the year 2005; and, three, in peak hours, the elasticity of traffic speed to traffic volume is about 1.0. The latter suggests that congestion delays will expand at about the same rate as the growth in traffic. This is a conservative assumption since, in traffic capacity models, when traffic exceeds highway capacity, this elasticity will dramatically increase and will be greater than 1.0; furthermore, as the volume of traffic continues to increase over and beyond highway capacity, the elasticity's rate of increase will accelerate and traffic speeds will fall dramatically.

To evaluate urban congestion trends, TEMS/Trafix tested a range of congestion effects. In the most conservative case, No Action Alternative #2, it was assumed that general traffic speeds in urban areas will decline by 0.5 percent annually which in turn will result in a decrease of one percent annually in access mode speeds. Access mode time was given a higher value than general travel time to reflect the fact that intercity mode access typically occurs in peak hours and use slower arterial roads for at least part of the trip. Less conservative but still well below what will probably occur, a second congestion option, No Action Alternative #3, was defined. This alternative assumes a one percent annual decrease in general traffic speeds in urban areas and a two percent annual decrease in access speeds for all modes. Both of these alternatives reflect very modest decreases in accessibility and general highway traffic speeds and it may well be that the true impact of congestion will be substantially higher than the impacts evaluated for the study.

Exhibit 5.2
Transportation Strategies for the No Action Alternatives[1]

No Action Alternative #1

Auto	Implementation of planned highway investments Current energy prices increased by 15 percent in 2025
Air	Implementation of planned improvements Current fares and frequencies increased by 10 percent in 2025 Processing time at terminals increased from 15 to 20 minutes in 2025
Intercity Rail	Implementation of planned improvements In-vehicle time equal to 90 percent of 1992 levels Current fares and frequencies
Bus	Fares at 95 percent of 1992 levels in 2005 Fares back to 1992 levels in 2025 Current frequencies Slight increases in in-vehicle times

No Action Alternative #2

Assumes the following reductions in access speeds for all modes of travel and general auto and bus speeds within the urban areas of Montréal and Toronto. Other conditions are the same as for Alternative #1.

	2005	2025
Decrease in Access Speed for All Modes	11.63%	32.22%
Decrease in GTA/GMA Traffic Speed[2]	5.67%	15.02%

No Action Alternative #3

Assumes the following reductions in access speeds for all modes of travel and general auto and bus speeds within the urban areas of Montréal and Toronto. Other conditions are the same as for Alternative #1.

	2005	2025
Decrease in Access Speed for All Modes	21.40%	63.45%
Decrease in GTA/GMA Traffic Speed	10.20%	28.00%

(1) *The transportation strategies for all of the No Action Alternatives are based on the central case economic scenario.*
(2) *GTA denotes the Greater Toronto Area and GMA the Greater Montréal Area.*

5.2.2 High Speed Rail Alternatives

To evaluate the potential of high speed rail in the corridor, a range of service options was defined for the 200 kph and 300 kph technologies (see Exhibit 5.3). The 200 kph alternatives use a largely existing right-of-way between Windsor and Québec City and the South Shore route between Ottawa and Montréal (see Exhibit 5.4). However, to provide service to Pearson Airport, trains are rerouted from Toronto to London on a new line running through Pearson Airport rather than use the existing right-of-way which goes through Hamilton. While this has the benefit of avoiding one of the most heavily used rail lines in Southern Ontario, it also reduces accessibility for a heavily populated portion of the province.

The 300 kph alternatives use a new, dedicated right-of-way which minimizes curves and topographical constraints and maximizes tangent track to enable the 300 kph option to maintain maximum commercial speed for as long as possible. As shown in Exhibit 5.4, the 300 kph alternatives use the North Shore route between Ottawa and Montréal which connects with Mirabel Airport but misses the heavily populated West Island area of Montréal. The 300 kph alternatives also use the new route via Pearson Airport between Toronto and London.

Timetables for the 200 kph and 300 kph high speed rail alternatives are given in Exhibit 5.5.

Exhibit 5.3
Transportation Strategies for the High Speed Rail Alternatives(1)

High Speed Rail Alternative #1	200 kph throughout the entire corridor South Shore route between Ottawa and Montréal New route via Pearson Airport between London and Toronto Existing right-of-way in remainder of the corridor
High Speed Rail Alternative #2	200 kph between Toronto and Québec City Existing intercity rail service in the remainder of the corridor South Shore route between Ottawa and Montréal Existing right-of-way in the remainder of the corridor
High Speed Rail Alternative #3	200 kph between Toronto and Montréal Existing intercity rail service in the remainder of the corridor South Shore route between Ottawa and Montréal Existing right-of-way throughout the corridor
High Speed Rail Alternative #4	300 kph throughout the entire corridor New, dedicated right-of-way throughout the corridor North Shore route between Ottawa and Montréal New route via Pearson between London and Toronto
High Speed Rail Alternative #5	300 kph between Toronto and Québec City Existing intercity rail service in the remainder of the corridor New, dedicated right-of-way between Toronto and Québec City North Shore route between Ottawa and Montréal Existing right-of-way in the remainder of the corridor
High Speed Rail Alternative #6	300 kph between Toronto and Montréal Existing intercity rail in the remainder of the corridor New, dedicated right-of-way between Toronto and Montréal North Shore route between Ottawa and Montréal Existing right-of-way in the remainder of the corridor
Fares	Optimized for each origin-destination pair at 60 percent of air fares

Frequency(2)	HSR #1	HSR #2	HSR #3	HSR #4	HSR #5	HSR #6
Windsor-Toronto	9	5	5	9	5	5
London-Toronto	14	5	5	15	5	5
Kitchener-Toronto	17	2	2	17	2	2
Toronto-Kingston	28	28	28	28	28	28
Toronto-Ottawa	28	28	28	30	30	30
Ottawa-Montréal	20	20	20	30	30	30
Montréal-Québec City	10	10	4	10	10	4

(1) *Unless otherwise noted, conditions are the same as for the No Action Alternative #1.*
(2) *Number of trains per day in each direction.*

Exhibit 5.4
Designated Routes for the 200 kph and 300 kph High Speed Rail Alternatives

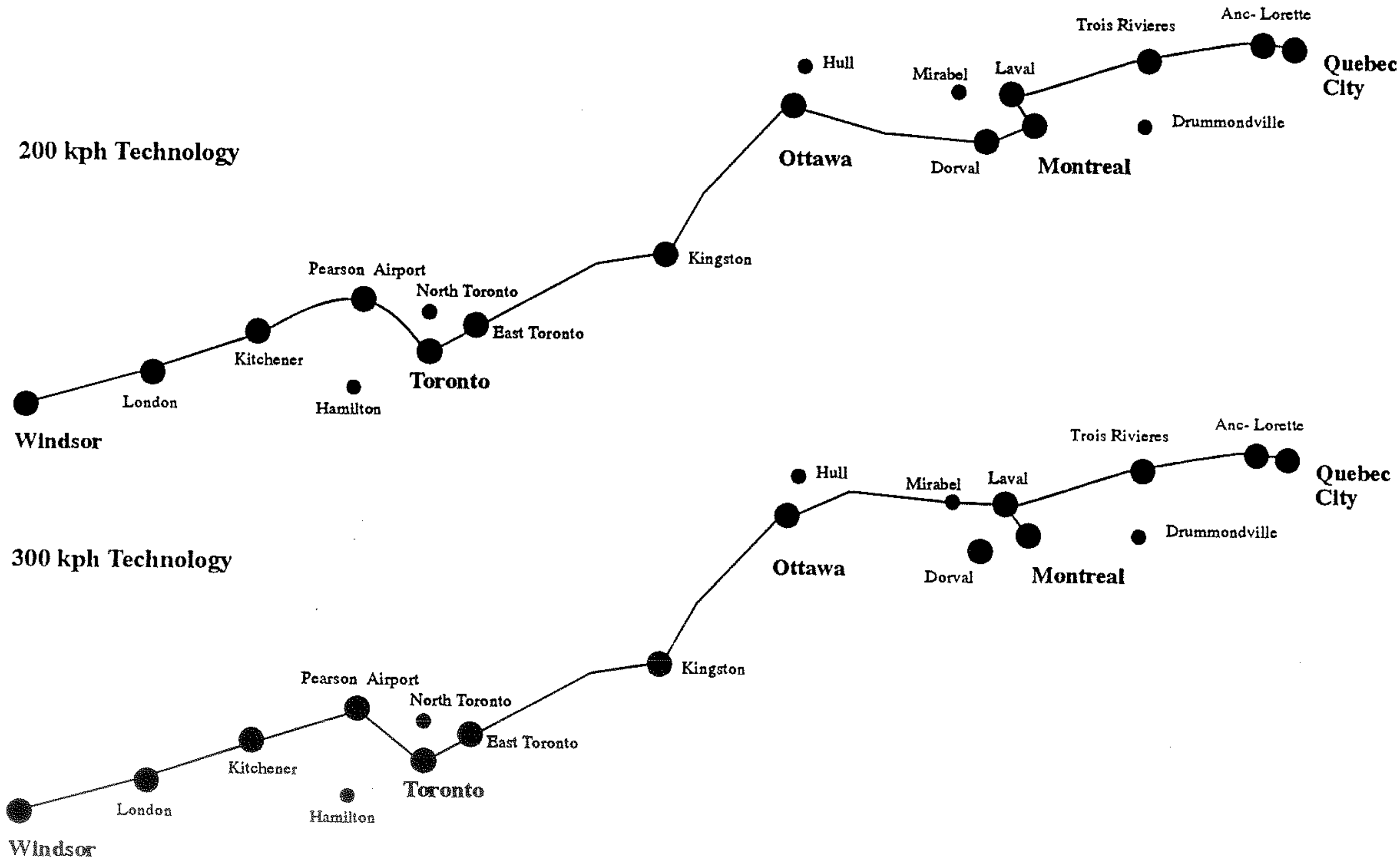


Exhibit 5.5
Timetables for the 200 kph and 300 kph High Speed Rail Alternatives[(1)(2)]

	200 kph Standard Service	200 kph Express Service	300 kph Standard Service	300 kph Express Service
Windsor-Toronto				
Windsor	0:00	0:00	0:00	0:00
London	0:58		0:41	
Kitchener	1:31		1:05	
Pearson	1:55		1:25	
Toronto	2:09	1:56	1:39	1:24
Toronto-Montréal				
Toronto	0:00	0:00	0:00	0:00
East Toronto	0:13		0:14	
Kingston	1:26		1:07	1:05
Ottawa	2:18	2:10	1:46	1:36
Dorval	3:10		2:23	
Montréal	3:20	3:05	2:51	2:32
Montréal-Québec				
Montréal	0:00	0:00	0:00	0:00
Laval	0:11		0:12	
Trois Rivières	0:55		0:44	
Ancienne-Lorette	1:36		1:14	
Québec City	1:45	1:34	1:24	1:12

(1) *Source: Canadian Institute of Guided Ground Transportation (CIGGT).*
(2) *Timetable time to be read hh:mm, e.g., 1:45 is one hour and forty-five minutes.*

5.3 SENSITIVITY ANALYSIS

A range of sensitivity tests were defined to assess the impact of:

- Operating the 200 kph option on the North Shore and the 300 kph option on the South Shore route between Ottawa and Montréal.
- Increasing/decreasing frequencies by three trains per day.
- Increasing/decreasing fares by 10 percent and 20 percent
- Increasing train speeds for the 200 kph technology to 250 kph and the 300 kph technology to 350 kph.
- Upper case and lower case economic scenarios.
- Increasing highway congestion by 1 and 2 percent.
- Eliminating additional stations, i.e., Ancienne Lorette and Trois Rivières.
- Developing different segments of the corridor at different times, to include:
  - Using different technologies on different corridor segments versus a single technology for the entire corridor.
  - Implementing the Toronto-Montréal segment on its own and retaining the existing VIA service in the remainder of the corridor.
  - Implementing the Toronto-Montréal and Montréal-Québec City segments simultaneously and retaining the existing VIA service in the remainder of the corridor.

The sensitivity tests for the development of different segments at different times assumed the continuance of existing VIA service in corridor segments where the new high speed rail service was not introduced raised some interesting issues. The decision of the study steering committee was that, for study purposes, it should be assumed there would be no conventional rail service in those corridor segments served by high speed rail. This approach has the unfortunate effect of eliminating service for a number of cities in the corridor. For example, the assumption suggests that Hamilton and Chatham in Ontario and St. Hyacinthe and Drummondville in Québec will lose service when high speed rail is introduced.

However, in practice, it is unlikely that rail service to such communities will be discontinued. It is more likely that they will either continue to be served by conventional rail or become intermittent station stops on the high speed rail. If this is the case, the demand forecasts for the high speed rail alternatives would be substantially increased.

6. HIGH SPEED RAIL RIDERSHIP AND REVENUE FORECASTS

The ridership and revenue forecasts for the Québec-Ontario Corridor were developed using the calibrated COMPASS(c) Model; the central case economic scenario; and the six High Speed Rail Alternatives. To evaluate the impact of the High Speed Rail Alternatives on demand, forecasts were also prepared for the three No Action Alternatives. Descriptions of the No Action Alternatives, the High Speed Rail Alternatives, and the economic scenarios used in the forecasts are given in Chapter 5.

6.1 DEMAND FORECASTS FOR THE NO ACTION ALTERNATIVES

The demand forecasts for the No Action Alternatives are shown in Exhibit 6.1. It can be seen that the continuation of the status quo in terms of the level of transportation services within the corridor, i.e., No Action Alternative #1, results in the demand in the corridor growing from 89.5 million trips in 1993, to 123.2 million trips in the year 2005, and to 192.8 million trips in 2025, a doubling of demand over the thirty-year period. As might be expected, auto continues to dominate the market and maintains its 90 percent market share. The assumed increase in air fares, improved rail times, and lower bus fares result in a slight shift in demand from air to rail and bus; between 1993 and 2025, air falls from 4.42 percent to 3.30 percent of the market, while rail and bus increase from 2.75 to 3.70 percent and from 2.52 to 2.64 percent respectively.

However, the No Action Alternative #1 is somewhat optimistic about future travel markets since it fails to recognize the very real change that will occur in the supply of transportation services because of highway congestion in urban areas (see Appendix 5). The unacceptable cost and environmental impacts of highway development have resulted in lower levels of urban expressway construction and will inevitably result in significantly increased congestion. The minimum effect of highway congestion over the next thirty years is likely to be an 0.5 percent annual reduction in urban traffic speeds and a 1.0 percent annual reduction in access mode speeds.

The impact of this level of congestion can be seen by comparing the No Action Alternatives #1 and #2. Mobility in the corridor is severely restricted; corridor demand is reduced by more than 20 percent from 192.8 to 153.6 million trips in 2025. Furthermore, the market share for auto falls from 90 percent to 84 percent and the market shares for all the public modes, particularly rail and bus, increase. By 2025, the market shares for rail and bus increase from 2.75 to 6.47 percent and from 2.52 to 4.68 percent respectively. The growth in air demand is nominal because of the higher air fares proposed for the forecast years.

In No Action Alternative #3, which assumes a slightly higher though still very conservative level of highway congestion, urban traffic speeds and mode access speeds respectively are reduced by 1.0 and 2.0 percent annually. With this alternative, mobility in the corridor is reduced by 30 percent from 192.8 to 135.9 million trips in 2025. In terms of market share, auto falls to 77 percent while rail, bus, and air increase to 9.5, 7.2, and 6.1 percent respectively.

Overall, there seems to be little doubt that regional mobility is severely threatened by congestion and, as highway travel times increase, new ways of meeting travel demand in the corridor will be required.

Exhibit 6.1
Demand Forecasts for the No Action Alternatives (Millions of Trips)

		Study Area Demand	Corridor Demand	Market Shares(%) Air	Bus	Auto	Rail	Rail Demand
No Action Alternative #1								
1993	Business	21.26	18.29	16.02	2.15	77.76	4.06	0.743
	Commuter	4.41	3.35	1.39	2.42	94.40	1.76	0.060
	Other	77.22	67.88	1.45	2.62	93.48	2.45	1.661
	Total	102.89	89.52	4.42	2.52	90.31	2.75	2.464
2005	Business	80.57	26.23	15.07	2.16	77.70	5.08	1.331
	Commuter	6.81	5.26	1.17	2.26	94.90	1.68	0.088
	Other	105.05	91.75	1.22	2.80	92.87	3.11	2.855
	Total	142.43	123.24	4.16	2.64	89.73	3.47	4.274
2025	Business	44.01	37.86	13.80	2.40	78.04	5.76	2.181
	Commuter	10.84	8.56	0.74	1.98	95.89	1.40	0.120
	Other	168.75	146.42	0.74	2.74	93.23	3.30	4.826
	Total	223.61	192.84	3.30	2.64	90.37	3.70	7.127
No Action Alternative #2								
1992	Business	21.26	18.29	16.02	2.15	77.76	4.06	0.743
	Commuter	4.41	3.35	1.39	2.42	94.40	1.79	0.060
	Other	77.22	67.88	1.45	2.62	93.48	2.45	1.661
	Total	102.89	89.52	4.42	2.52	90.31	2.75	2.464
2005	Business	28.32	24.43	17.10	2.61	74.21	6.08	1.486
	Commuter	6.23	4.82	1.32	2.44	94.27	1.97	0.95
	Other	93.61	81.58	1.54	3.61	90.76	4.09	3.335
	Total	128.16	110.83	4.96	3.34	87.27	4.44	4.916
2025	Business	37.40	32.59	17.95	3.82	69.55	8.68	2.830
	Commuter	8.84	7.02	0.97	2.44	94.56	2.03	0.142
	Other	131.80	114.02	1.29	5.06	87.53	6.12	6.974
	Total	178.05	153.64	4.81	4.68	84.04	6.47	9.947
No Action Alternative #3								
1992	Business	21.26	18.29	16.02	2.15	77.76	4.06	0.743
	Commuter	4.41	3.35	1.39	2.42	94.40	1.79	0.060
	Other	77.22	67.88	1.45	2.62	93.48	2.45	1.661
	Total	102.88	89.52	4.42	2.52	90.31	2.75	2.464
2005	Business	26.99	23.35	18.54	3.01	71.52	6.92	1.616
	Commuter	5.86	4.54	1.44	2.61	93.76	2.20	0.100
	Other	86.99	75.73	1.81	4.36	88.88	4.94	3.742
	Total	119.84	103.63	5.56	3.98	85.19	5.27	5.458
2025	Business	34.14	30.04	20.91	5.23	62.16	11.71	3.517
	Commuter	7.60	6.04	1.21	2.98	93.03	2.78	0.168
	Other	115.06	99.80	1.88	8.06	80.78	9.28	9.259
	Total	156.80	135.89	6.06	7.21	77.21	9.53	12.944

6.2 DEMAND FORECASTS FOR THE HIGH SPEED RAIL ALTERNATIVES

To assess the impact of using the 200 kph or 300 kph technology, a series of six High Speed Rail Alternatives were defined. It should be noted that the demand forecasts for the High Speed Rail Alternatives were based on the No Action Alternative #1, which excludes the impact of congestion on intercity travel.

As shown in Exhibit 6.2, rail demand with the 300 kph technology is 16 percent higher than with the 200 kph technology if the high speed rail service is implemented throughout the corridor and about 10 percent higher if implemented for either the Toronto-Montréal or Toronto-Québec City corridor segments.

Implementation of the 200 kph technology between Toronto and Montréal achieves nearly 70 percent of the total rail demand in the corridor; this figures rises to 76 percent if the 200 kph is implemented between Toronto and Québec City. The corresponding figures for the 300 kph technology are 66 percent and 71 percent. It should not be assumed that Windsor-Toronto or Montréal-Québec City traffic accounts for the remaining rail demand in the corridor as there is considerable interaction between corridor segments. For example, while it is unlikely that residents of Trois Rivières who now drive to Ottawa will use the high speed rail service for the Montréal to Ottawa portion of their trip, they may well use high speed rail for trips to Toronto because the savings in travel times and costs justify driving to Montréal to access the high speed rail service.

Exhibit 6.2
Demand Forecasts for the High Speed Rail Alternatives (Millions of Trips)

	Study Area Demand	Corridor Demand	Market Shares(%) Air	Bus	Auto	Rail	Rail Demand
High Speed Rail Alternative #1[(1)] 200 kph throughout the Corridor South Shore Route for Ottawa-Montréal							
1992	102.81	93.24	3.94	2.69	90.61	2.75	2.563
2005	143.94	131.14	2.61	2.39	87.13	7.87	10.321
2025	226.58	207.16	1.94	2.32	87.38	8.36	17.322
High Speed Rail Alternative #2 200 kph between Toronto and Québec City South Shore Route for Ottawa-Montréal							
1992	102.83	96.46	3.82	2.65	90.85	2.69	2.592
2005	143.19	134.92	2.80	2.44	88.92	5.84	7.880
2025	225.03	212.72	2.18	2.39	89.35	6.06	13.211
High Speed Rail Alternative #3 200 kph between Toronto and Montréal South Shore Route for Ottawa-Montréal							
1992	102.84	96.88	3.80	2.64	90.88	2.69	2.602
2005	143.07	135.45	2.84	2.52	89.27	5.37	7.270
2025	224.81	213.63	2.21	2.48	89.72	5.59	11.961
High Speed Rail Alternative #4[(1)] 300 kph throughout the Corridor North Shore Route for Ottawa-Montréal							
1992	102.80	93.29	3.94	2.69	90.62	2.74	2.560
2005	144.87	132.17	2.46	2.32	86.12	9.69	12.018
2025	228.17	208.98	1.82	2.26	86.31	9.61	20.088
High Speed Rail Alternative #5 300 kph between Toronto and Québec City North Shore Route for Ottawa-Montréal							
1992	102.83	96.50	3.81	2.65	90.86	2.68	2.589
2005	143.68	135.50	2.67	2.40	88.43	6.51	8.816
2025	225.85	213.76	2.06	2.35	88.85	6.74	14.410
High Speed Rail Alternative #6 300 kph between Toronto and Montréal North Shore Route for Ottawa-Montréal							
1992	102.88	98.53	3.73	2.60	91.00	2.67	2.635
2005	143.49	138.21	2.65	2.45	89.04	5.86	8.093
2025	225.50	217.92	2.06	2.41	89.47	6.06	13.211

(1) *Base case for the 200 kph and 300 kph technologies respectively.*

6.3 SENSITIVITY ANALYSIS

The results of the sensitivity tests conducted for fare, frequency, route, speed, and rate of economic growth are given in Exhibit 6.3, and the sensitivity elasticities for fare, frequency and time are given in Exhibit 6.4.

As shown, demand is very sensitive to changes in the rail fares, with an elasticity of -1.39 and -1.59 respectively for the 10 percent and 20 percent fare reductions for the 200 kph technology and -1.48 and -1.75 respectively for the 300 kph technology. When fares are increased by 10 and 20 percent for the 200 kph technology, the fare elasticity is somewhat lower, i.e., -1.19 and -1.05 respectively. The corresponding elasticities for the 300 kph technology are -1.25 and -1.09 percent respectively. Overall, the analysis suggests that rail revenues would be optimized by increasing fares by 20 percent over those originally proposed for the high speed rail alternatives (see Chapter 5).

On the other hand, the frequency elasticity, whether associated with increasing or decreasing the frequency by three trains per day, is quite small, about -0.3 for both the 200 kph and 300 kph technologies. This is due to the high level of service between Toronto and Montréal, i.e., 28 and 30 trains per day respectively for the 200 kph and 300 kph technologies. North American rail and air studies have shown that demand for additional service falls rapidly once a frequency of 8 to 12 trains per day is reached.

The South Shore route is the most effective route for both the 200 kph and 300 kph technologies. For the 200 kph technology, rail captures about 8 percent of the market, with a demand of 10.3 million trips in 2005 and 17.3 million trips in 2025. For the 300 kph technology, the market share is about 10 percent and total rail demand is 13.2 million trips in 2005 and 22.1 million trips in 2025.

The North Shore route produces significantly smaller rail market shares for both the 200 kph and 300 kph technologies, reducing the total rail demand in 2005 by about 1 million trips. For the 200 kph technology, although the timetable takes 12 minutes less with the North Shore route (i.e., a 2.6 percent reduction in the overall corridor timetable), demand falls by 8.2 percent. This is equivalent to a cross route elasticity of -3.15. Conversely, although the timetable for the 300 kph technology increases by 11 minutes with the South Shore route, demand increases by 9.7 percent. While this phenomenon is a reflection of the demographics of the South Shore, the West Island of Montréal may be the critical area and other North Shore routes that include the West Island area could and perhaps should be defined.

The elasticity for time shows that, while there is considerable variation within the corridor, the elasticity is generally elastic, i.e., greater than 1. Increasing train speed from 200 kph to 250 kph while using the North Shore route reduces travel time by 8.6 percent and generates a 16.5 percent increase in demand. This equals an elasticity of -1.92, which suggests that further substantial increases in demand can be obtained with even higher speeds. Increasing train speed to 300 kph reduces corridor travel time by 18 percent and increases demand by 9.0 percent, or 1 million trips in 2005 and 1.5 million trips in 2025. This equals an elasticity of -0.5, which suggests that the most effective speed for the North Shore route lies between 250 kph and 300 kph.

With respect to the South Shore route, increasing train speed from 200 kph to 300 kph results in a 21 percent decrease in the corridor timetable and a 28 percent increase in demand, or an elasticity of -1.33. Further increasing the train speed to 350 kph results in a 6.6 percent decrease in the timetable and a 6.6 percent increase in demand, or an elasticity of 1.0. This suggests that 300 kph to 350 kph is the most effective speed for the South Shore route.

The impact of changes in economic growth was measured using the central case, upper case, and lower case economic scenarios developed by Transport Canada for the study. The results show, firstly, the contrast between the base case forecasts which were derived from the straight line extrapolation of 2.6 percent annual growth in traffic, and Transport Canada's central case economic scenario which assumes a slight decline in growth rates over the forecast period. This conservative assumption has typified Transport Canada's macro-economic forecasts for the present study as well as previous studies in 1983, 1987, and 1990. For example, in the case of the 200 kph technology, it reduces the 2025 demand by more than 2 million trips.

The sensitivity analysis also included an assessment of the impact of the faster and slower growth rates associated with the upper case and lower case economic scenarios. The upper case economic scenario is based on the historical trend of 4 percent long-term growth that Canada has experienced over the past 40 years. Today, the consensus view is that this level of growth is not expected to continue over the next thirty years because of Canada's deficit problems and the restructuring of its economy as a result of NAFTA, GATT, and other trade agreements. However, it should be noted that economic growth in the 1980's was not far below this level. If the growth rates of the 1980's were achieved in the next thirty years, rail ridership would be 30 percent higher than that predicted under the central case economic scenario.

The lower case economic scenario is based on a very pessimistic view of Central Canada's economy, one that might not be sustainable given that it suggests economic growth well below that of the U.S. The Canadian economy has typically grown 1 percent faster than the U.S. economy, and it is this increased rate of growth that has enabled Canada to maintain its population base and its independent culture. With the lower case economic scenario, rail demand in the corridor falls substantially, i.e., by 35 percent in 2025.

Exhibit 6.3
Results of the Sensitivity Analysis (Millions of Trips)

	2005	2025
200 kph Technology		
Base Case[1]	10.32	17.32
Fares increased by 10 percent	9.09	15.31
Fares increased by 20 percent	8.03	15.56
Fares decreased by 10 percent	11.75	19.68
Fares decreased by 20 percent	13.46	22.46
Frequency increased by 3 trains per day	10.57	17.73
Frequency decreased by 3 trains per day	10.00	16.80
South Shore route without Ancienne-Lorette Station	10.92	18.00
South Shore route without Trois Rivières Station	11.10	18.32
North Shore route between Ottawa and Montréal	9.47	15.87
Train speed increased to 250 kph between Ottawa and Montréal using the North Shore route	11.01	18.43
Train speed increased to 250 kph between Ottawa and Montréal using the South Shore route	11.03	18.25
Central case economic scenario	10.10	15.19
Upper case economic scenario	11.21	19.75
Lower case economic scenario	8.43	10.02
300 kph Technology		
Base Case[1]	12.02	20.09
Fares increased by 10 percent	10.52	23.03
Fares increased by 20 percent	9.24	15.53
Fares decreased by 10 percent	13.81	17.62
Fares decreased by 20 percent	16.01	26.61
Frequency increased by 3 trains per day	12.31	20.56
Frequency decreased by 3 trains per day	9.99	16.69
North Shore route without Ancienne-Lorette Station	12.27	20.24
North Shore route without Trois Rivières Station	12.60	20.71
South Shore route between Ottawa and Montréal	13.19	22.06
Train speed increased to 350 kph between Ottawa and Montréal using the South Shore route	14.07	23.57
Train speed increased to 350 kph between Ottawa and Montréal using the North Shore route	12.83	21.21
Central case economic scenario	11.77	17.61
Upper case economic scenario	13.53	22.92
Lower case economic scenario	9.82	11.63

[1] *For the 200 kph technology, High Speed Rail Alternative #1 and, for the 300 kph technology, High Speed Rail Alternative #4.*

Exhibit 6.4
Rail Sensitivity Elasticities

Fare Elasticities for 200 kph Technology

Fares increased by 10 percent	-1.19
Fares increased by 20 percent	-1.05
Fares decreased by 10 percent	-1.39
Fares decreased by 20 percent	-1.59

Frequency Elasticities for 200 kph Technology

Frequency increased by +3 trains per day	-0.30
Frequency decreased by 3 trains per day	-0.30

Fare Elasticities for 300 kph Technology

Fares increased by 10 percent	-1.25
Fares increased by 20 percent	-1.09
Fares decreased by 10 percent	-1.48
Fares decreased by 20 percent	-1.75

Frequency Elasticities for 300 kph Technology

Frequency increased by +3 trains per day	-0.30
Frequency decreased by 3 trains per day	-0.30

Time Elasticities

Speed increased from 200 kph to 250 kph between Montréal and Ottawa using the North Shore route	-1.92
Speed increased from 200 kph to 250 kph between Montréal and Ottawa using the South Shore route	-1.33
Speed increased from 250 kph to 300 kph between Montréal and Ottawa using the North Shore route	-0.50
Speed increased from 300 kph to 350 kph between Montréal and Ottawa using the South Shore route	-1.00

6.4 PROJECT PHASING

In order to identify the impact of proceeding with building different segments of the corridor, a set of forecasts were prepared comparing the implementation of the high speed rail system on the full corridor versus its implementation on selected corridor segments. The Steering Committee defined the phasing options as:

- For 200 kph and 300 kph:
  - High speed rail service on the full corridor.

- For 200 kph and 300 kph:
  - High speed rail service between Toronto and Montréal.
  - VIA service between Windsor and Toronto.
  - VIA service between Montréal and Québec City.
- For 200 kph and 300 kph:
  - High speed rail service on the Toronto-Montréal-Québec City corridor segments.
  - VIA service between Windsor and Toronto.

The results of this analysis are shown in Exhibit 6.5. It can be seen that the Toronto-Montréal segment captures 65 to 70 percent of the total demand generated by implementation of high speed rail on the full corridor. The addition of the Montréal-Québec City segment only increases the number of trips by another 6 percent. This is because the rail market shares for VIA service are 2.6 percent and 8.5 percent for Montréal-Québec City and Trois Rivières-Québec City respectively. With implementation of the 300 kph technology on these segments, the rail market shares only rise to 7.3 percent and 13.9 percent respectively. Since the traffic flows between Toronto and Windsor are very comparable, i.e., about 2 million trips, a similar increase in demand of some 5 to 10 percent would result from implementing high speed rail on the Toronto-Windsor segment in conjunction with the Toronto-Montréal segment.

It can therefore be concluded that the loss of either or both of the two weaker segments, i.e., Windsor-Toronto and/or Montréal-Québec City, is equivalent to a 25 to 30 percent loss in demand to the system as a whole. From a demand perspective, this would suggest that one approach would be to implement the Toronto-Montréal segment first to capture 70 percent of the total potential demand in the corridor and subsequently implement the two outer corridor segments to capture the outstanding 30 percent of the demand. The reason why building both segments together adds more than building them individually is that the interaction between the Windsor-Toronto and Montréal-Québec City segments accounts for 15 to 18 percent of the total demand for the corridor.

Exhibit 6.5
Impact of Project Phasing on Demand (Millions of Trips)

	200 kph		300 kph	
	2005	2025	2005	2025
High Speed Rail in Full Corridor	10.32	17.32	12.02	20.09
High Speed Rail between Toronto and Montréal VIA Service between Windsor and Toronto VIA Service between Montréal and Québec City	7.27	11.94	8.09	13.20
High Speed Rail between Toronto, Montréal and Québec City VIA Service between Windsor and Toronto	7.88	12.94	8.82	14.41

6.5 IMPACT OF HIGHWAY CONGESTION

A critical element in the development of high speed rail forecasts is the impact of urban highway congestion on both the access time to terminals and stations for the public modes and in-vehicle travel times for auto and intercity bus in urban areas. Exhibit 6.6 shows the effects of the low and high levels of congestion associated with the No Action Alternatives #2 and #3. It can be seen that rail's market share increases significantly as the level of congestion increases. With the more realistic No Action Alternative #3, rail demand in 2025 for the 200 kph/South Shore option rises from 17.3 million trips for the base case to 28.9 million, an increase of nearly 70 percent (compare Exhibits 6.2 and 6.6). This increase represents an increase in rail's market share from 8.4 percent to 19.5 percent. It is worth noting that increased highway congestion also improves the market shares for bus and air as auto travel times worsen.

For the 300 kph/North Shore option, the higher level of congestion raises rail demand in 2025 from 20.0 million trips for the base case to 32.2 million trips, an increase of more than 60 percent. This represents an increase in the rail market share from 9.6 percent to 21.4 percent. The market shares for air and bus are also increased.

The high speed rail alternatives contribute significantly to maintaining the regional mobility that is lost because of congestion. For example, by 2025, it increased rail demand in the corridor to 168 million trips versus the 136 million trips that would occur without high speed rail (compare Exhibits 6.2 and 6.6). Overall, high speed rail serves to offset losses in regional mobility due to congestion and, by 2025, will provide a more effective means of travel for 20 percent of the travellers in the corridor.

Exhibit 6.6
Impact of Urban Highway Congestion (Millions of Trips)

		Study Area Demand	Corridor Demand	Market Shares(%) Air	Bus	Auto	Rail	Rail Demand
Lower Level of Congestion No Action Alternative #2								
200 kph	1992	102.81	93.24	3.94	2.69	90.61	2.75	2.564
	2005	130.18	117.83	3.07	2.97	84.05	9.91	11.680
	2025	183.16	165.88	2.74	3.90	79.44	13.44	23.107
300 kph	1992	102.80	93.29	3.94	2.69	90.62	2.74	2.560
	2005	131.22	118.96	2.88	2.88	82.94	11.31	13.453
	2025	185.09	168.03	2.55	3.76	78.14	15.56	26.137
Higher Level of Congestion No Action Alternative #3								
200 kph	1992	102.81	93.24	3.94	2.69	90.61	2.75	2.563
	2005	122.26	127.95	3.40	3.47	81.54	11.59	12.795
	2025	163.59	148.14	3.41	5.67	71.38	19.54	28.949
300 kph	1992	102.80	93.29	3.94	2.69	90.62	2.74	2.560
	2005	123.36	111.61	3.18	3.36	80.36	13.10	14.622
	2025	165.73	150.47	3.17	5.46	70.00	21.37	32.156

6.6 PASSENGER LOADINGS

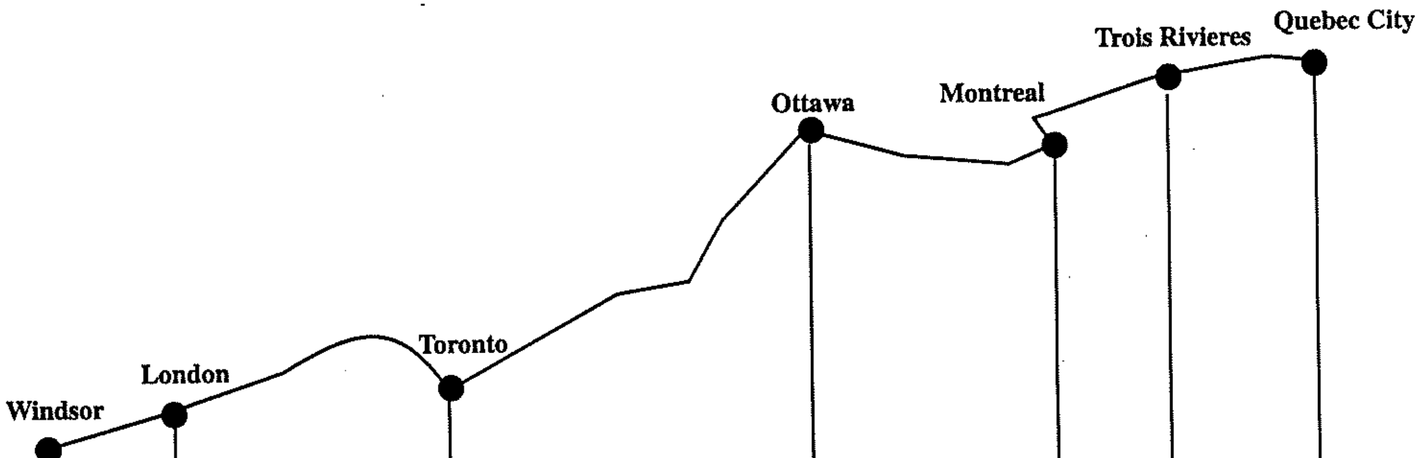
Exhibits 6.7 and 6.8 show the passenger loadings for a range of technology options for the South Shore and North Shore routes between Ottawa and Montréal. As previously noted, the South Shore route performs consistently better than the North Shore route. Increasing train speed from 300 kph to 350 kph on the South Shore route and from 200 kph to 250 kph on the North Shore route raises demand by some 9 percent in both cases.

The weakest link in the corridor is between Windsor and London, where demand between 2005 and 2025 only increases from 0.7 to 1.2 million for the 200 kph technology and from less than 1 million to 1.6 million for the 300 kph technology. Montréal to Trois Rivières and Trois Rivières to Québec City each generate an average of 1.25 and 2 million passengers in 2005 and 2025 respectively for the 200 kph technology; for the 300 kph technology, the corresponding figures are

1.6 million and more than 2.5 million. Toronto-Ottawa and Ottawa-Montréal are the strongest corridor segments, with demand in the Toronto-Ottawa segment increasing from 5.5 million to nearly 10 million for the 200 kph technology and from 8 million to over 13 million for the 300 kph technology between 2005 and 2025.

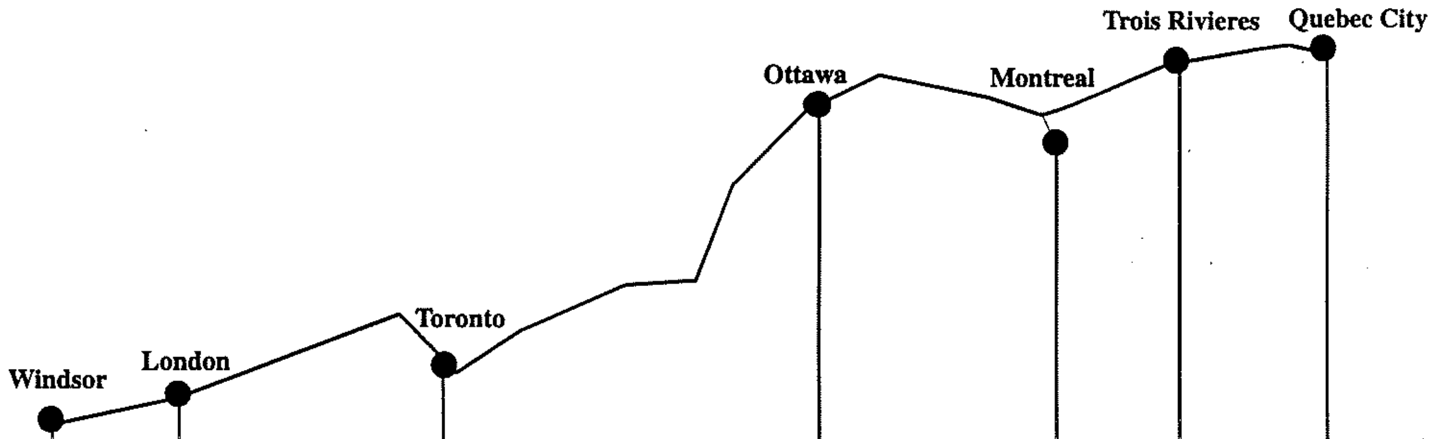
The most striking effect is the impact of congestion. For the low level of congestion (No Action Alternative #2), demand for the 200 kph South Shore and the 300 kph North Shore route options are increased by 8 to 10 percent by 2005 and by 18 to 20 percent by 2025. With higher levels of congestion (No Action Alternative #3), the demand is increased by 15 to 20 percent by 2005 and by 40 to 45 percent by 2025.

Exhibit 6.7
Passenger Loadings for the South Shore Route between Ottawa and Montréal (Millions of Passengers)



Option	Year	Windsor–London	London–Toronto	Toronto–Ottawa	Ottawa–Montreal	Montreal–Trois Rivieres	Trois Rivieres–Quebec City
200 kph	2005	742	2,571	5,801	4,295	1,360	1,144
	2025	1,229	4,147	9,973	7,489	2,234	1,852
300 kph	2005	984	3,224	8,004	5,977	1,783	1,502
	2025	1,628	5,202	13,634	10,350	2,918	2,424
350 kph	2005	1,092	3,494	8,719	6,472	1,855	1,560
	2025	1,806	5,639	14,808	11,187	3,035	2,516
200 kph with Low Congestion	2005	844	2,902	6,313	4,743	1,658	1,416
	2025	1,679	5,529	11,841	9,297	3,710	3,205
200 kph with High Congestion	2005	931	3,171	6,687	5,071	1,937	1,676
	2025	2,129	6,788	13,059	10,943	5,603	4,932

Exhibit 6.8
Passenger Loadings for the North Shore Route between Ottawa and Montréal (Millions of Passengers)



Option	Year						
200 kph	2005	737	2,533	5,257	3,462	1,326	1,155
	2025	1,222	4,089	9,014	6,066	2,179	1,873
250 kph	2005	869	2,904	6,468	4,415	1,427	1,231
	2025	1,443	4,692	11,033	7,693	2,342	1,994
300 kph	2005	966	3,123	7,166	4,854	1,809	1,506
	2025	1,601	5,046	12,172	8,429	2,972	2,436
300 kph with Low Congestion	2005	1,082	3,481	7,728	5,275	2,143	1,810
	2025	2,103	6,517	14,178	10,119	4,618	3,941
300 kph with High Congestion	2005	1,178	3,766	8,132	5,580	2,454	2,100
	2025	2,592	7,821	15,448	11,647	6,677	5,814

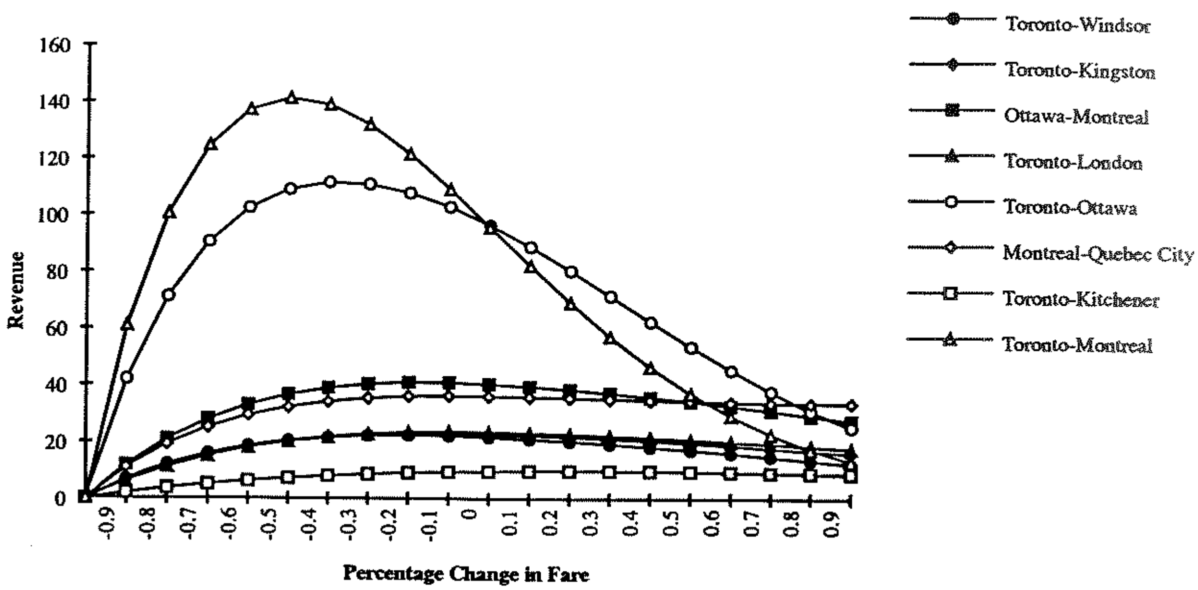
6.7 REVENUE FORECASTS FOR THE HIGH SPEED RAIL ALTERNATIVES

The high speed revenue forecasts were developed using passenger origin-destination forecasts and appropriate fare estimates. Once the basic revenue estimates were obtained, they were optimized using a two-step process. Firstly, the revenues for the whole corridor were optimized on an average basis and it was found that average rail fares should be set at 60 percent of current air fares. Secondly, the revenues for the top eight rail flows, which account for over 65 percent of demand, were individually optimized. As shown in Exhibit 6.9, with the exception of the Toronto-Montréal and Toronto-Ottawa corridor segments, the revenue optimization curves are very flat between -40 percent to +60 percent of the average rail fares determined in the first step of the optimization process.

The reason the Toronto-Montréal and Toronto-Ottawa segments are so sensitive and have very specific optimization points is that rail and air are highly competitive and fare plays a decisive role in the choice of mode. As a result of this competition, the average rail fare for the Toronto-Montréal segment peaks at -40 to -50 percent of the current air fare or at just less than $100, while the average rail fare for Toronto-Ottawa segment peaks at -40 to -30 percent of the air fare or at about $120. It can be seen in Exhibit 6.9 that it would be theoretically possible to charge more for the shorter distance trips than for the longer trips. Certainly in the airline industry, the consequence of air deregulation is to charge higher fares for shorter distance intercity travel because of the lack of competition and higher airline operating costs for routes less than 300 miles.

Therefore, it is not surprising to find that, if high speed rail fares are optimized, a higher rail fare per mile can be charged for shorter segments such as Windsor-Toronto, Toronto-Ottawa, Ottawa-Montréal, and Montréal-Québec City than for Montréal-Toronto. This would generate substantial additional revenues for high speed rail on what are relatively low volume segments. However, it should be noted that, in practice, where intermediate terminals exist in a corridor, rail fares must increase with distance or a traveller will simply buy the cheaper ticket but get off at the intermediate terminal. For example, in the Toronto-Montréal corridor, if the Toronto-Ottawa fare is higher than the Toronto-Montréal fare, travellers to Ottawa will naturally purchase the cheaper Toronto-Montréal ticket but get off in Ottawa. As a result, in developing the optimum rail fare structure for the corridor, the Toronto-Montréal fare was set at $95 while that for Toronto-Ottawa was set at $92.

Exhibit 6.9
Revenue Optimization for Top Eight Rail Flows



The resultant revenues for the high speed rail alternatives are given in Exhibit 6.10. High Speed Rail Alternative #1, the 200 kph technology on the full corridor using the South Shore route between Ottawa and Montréal, has revenues rising from $680 million in 2005 to $1.14 billion in 2025. High Speed Rail Alternative #4, the 300 kph technology on the full corridor using the North Shore route, has revenues rising from $814 million in 2005 to $1.35 billion in 2025.

Exhibit 6.10
Revenues for the High Speed Rail Alternatives (Billions of 1992$)

	2005	2025
High Speed Rail Alternative #1 200 kph throughout the Corridor South Shore Route for Ottawa-Montréal	0.680	1.139
High Speed Rail Alternative #2 200 kph between Toronto and Québec City South Shore Route for Ottawa-Montréal	0.496	0.815
High Speed Rail Alternative #3 200 kph between Toronto and Montréal South Shore Route for Ottawa-Montréal	0.450	0.738
High Speed Rail Alternative #4 300 kph throughout the Corridor North Shore Route for Ottawa-Montréal	0.814	1.352
High Speed Rail Alternative #5 300 kph between Toronto and Québec City North Shore Route for Ottawa-Montréal	0.576	0.941
High Speed Rail Alternative #6 300 kph between Toronto and Montréal North Shore Route for Ottawa-Montréal	0.520	0.847

The effect of speed and route sensitivities on revenue is shown in Exhibit 6.11 In terms on increasing train speed, both the 250 kph and 350 kph generate significant additional revenues. The revenues generated by the North Shore route, as currently defined, are less for all of the speed sensitivities.

The 200 kph option on the South Shore route has revenues rising from $680 million in 2005 to $1.14 billion in 2025. By increasing the train speed to 250 kph, revenues are increased to $739 million and $1.21 billion in 2005 and 2025 respectively. Similarly, increasing the train speed from 300 kph to 350 kph, generates total revenues of $988 million in 2005 and $1.64 billion in 2025, versus $914 million and $1.64 billion respectively for 300 kph.

The 200 kph option on the North Shore route has revenues rising from $620 million in 2005 to $1.04 billion in 2025. By increasing the train speed to 250 kph, revenues are increased to $750 million and $1.25 billion in 2005 and 2025 respectively. Similarly, increasing the train speed from 300 kph to 350 kph, generates total revenues of $884 million in 2005 and $1.45 billion in 2025, versus $814 million and $1.35 billion respectively for 300 kph.

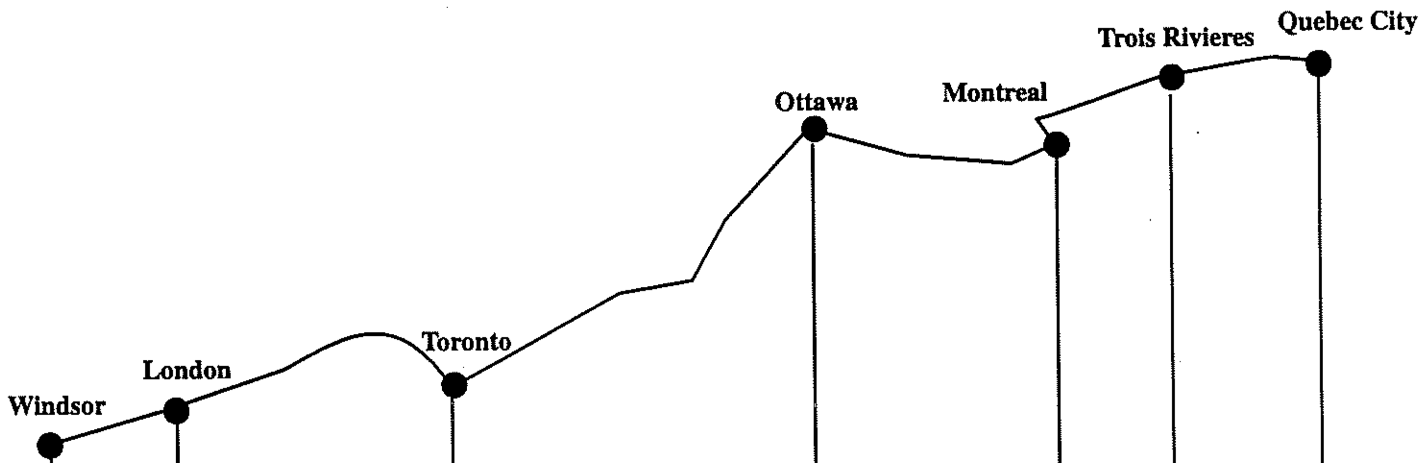
Exhibit 6.11
Corridor Revenues for the Speed and Route Sensitivities (Billions of 1992$)

	2005	2025
South Shore Route		
200 kph Technology Windsor to Québec City/South Shore Route	0.680	1.139
250 kph Technology Windsor to Québec City/South Shore Route	0.739	1.215
300 kph Technology Windsor to Québec City/South Shore Route	0.914	1.523
350 kph Technology Windsor to Québec City/South Shore Route	0.988	1.642
North Shore Route		
200 kph Technology Windsor to Québec City/North Shore Route	0.620	1.037
250 kph Technology Windsor to Québec City/North Shore Route	0.750	1.250
300 kph Technology Windsor to Québec City/North Shore Route	0.814	1.352
350 kph Technology Windsor to Québec City/North Shore Route	0.884	1.447

The revenues for the 200 kph and 300 kph options given in Exhibits 6.12 and 6.13 reflect the ridership volumes shown in Exhibits 6.7 and 6.8. The highest revenues, as previously noted, are achieved by the South Shore route. The Toronto-Ottawa-Montréal corridor segments not only provide the highest absolute revenues at about 65 percent of the total corridor revenue, but also produce the highest revenue per kilometre, i.e., in 2005, $0.78 million per kilometre and $1.22 million per kilometre for the 200 kph and 300 kph options respectively compared with $0.20 million and $0.46 million per kilometre for the 200 kph and 300 kph options for Montréal-Québec City and $0.25 million and $0.31 million per kilometre for the 200 kph and 300 kph options for Windsor-Toronto.

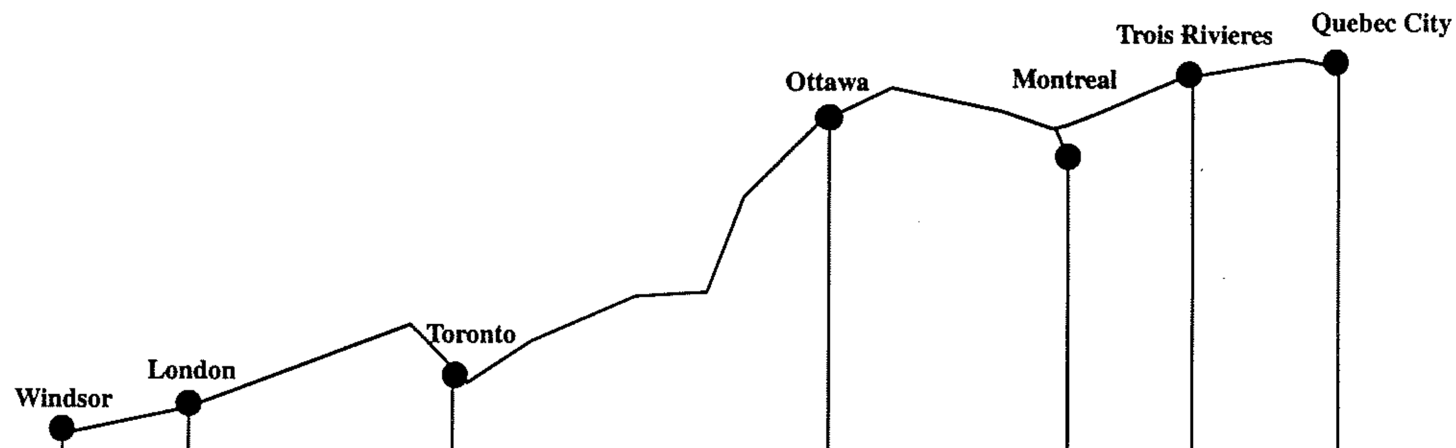
The impact of the low congestion assumption on the 200 kph and 300 kph options is to raise revenues by 10 to 15 percent in 2005 and by 18 to 20 percent in 2025. The high congestion assumption raises revenues for the 200 kph and 300 kph options respectively by 15 to 20 percent in 2005 and by 40 to 50 percent in 2025.

Exhibit 6.12
High Speed Rail Revenues for the South Shore Route between Ottawa and Montréal (Millions of 1992$)



Option	Year						
200 kph	2005	21.92	68.33	402.71	130.37	31.61	24.66
	2025	35.61	108.70	679.20	224.27	51.33	39.50
300 kph	2005	30.07	81.11	546.55	183.16	41.90	31.17
	2025	48.87	129.14	913.66	313.33	67.80	49.80
350 kph	2005	33.30	87.39	593.80	197.68	43.30	32.17
	2025	54.11	139.14	989.83	337.60	70.16	51.37
200 kph with Low Congestion	2005	25.09	77.92	441.15	144.98	38.86	30.92
	2025	49.65	149.77	823.00	258.32	87.37	70.69
200 kph with High Congestion	2005	27.82	86.12	470.00	156.17	45.73	36.98
	2025	64.55	189.37	926.04	344.02	134.51	111.13

Exhibit 6.13
High Speed Rail Revenues for the North Shore Route between Ottawa and Montréal (Millions of 1992$)



Option	Year	Windsor–London	London–Toronto	Toronto–Ottawa	Ottawa–Montreal	Montreal–Trois Rivieres	Trois Rivieres–Quebec City
200 kph	2005	21.66	67.87	361.86	114.37	30.41	24.70
	2025	35.18	107.89	607.29	197.63	49.34	39.60
250 kph	2005	25.45	76.61	444.17	145.33	32.28	26.03
	2025	41.41	121.99	742.37	250.07	52.34	41.71
300 kph	2005	29.50	79.27	487.09	148.76	38.27	31.21
	2025	47.94	126.21	810.39	255.06	62.10	49.92
300 kph with Low Congestion	2005	33.18	89.18	528.10	162.64	45.77	37.97
	2025	64.06	168.01	960.52	312.68	99.38	83.40
300 kph with High Congestion	2005	36.31	97.52	558.52	173.20	52.91	44.48
	2025	80.73	207.21	1,065.62	367.40	146.99	125.74

7. THE ROLE OF HIGH SPEED RAIL IN AIRPORT ACCESS

An important role for high speed rail in the future will be providing access to existing and potential hub airports such as Pearson, Dorval and Mirabel International Airports from communities within the Québec-Ontario Corridor. To provide forecasts of the likely role of high speed rail in meeting this need, TEMS calibrated its COMPASS-A$^{(c)}$ model. The COMPASS-A$^{(c)}$ model provides estimates for the use of high speed rail as an access mode by air travellers from, one, a comparison of the quality of service and the market areas of airports and, two, an assessment of the relative quality of high speed rail as an access mode relative to other access modes such as auto, air, or bus.

7.1 DATABASE FOR THE AIRPORT ACCESS ASSESSMENT

To evaluate the potential of high speed rail for providing airport access, as a result of connecting the high speed rail system to major hub airports, it was necessary to develop a database identifying the current and future origin-destination of air trips. This data could not be derived from the Consumer Contact origin-destination survey data as the survey was largely concerned with air travel in the Québec-Ontario Corridor and contained only limited information on air travellers outside the corridor. To overcome this problem, a comprehensive air travel origin-destination database was developed using Transport Canada airport passenger data.

Transport Canada provided base and forecast year estimates of airport passengers for each airport in the corridor. The data gave the direct enplanements at each airport for all destinations as well as the level of connecting air traffic. As a result, the total "true" air origins and destinations in the corridor could be derived. For each airport, the direct enplanement trip forecasts were distributed across the fine zone system established for the study using airport trip length data derived from the Consumer Contact origin-destination survey. Although these trip length data largely reflect air travel in the Québec-Ontario Corridor, the distribution pattern for air travel both inside and outside the corridor is likely to be similar.

The introduction of high speed rail will affect the pattern of air travel in two ways. First, the distribution of air travel between different hub airports will be affected. Second, the mode choice for access to each of these airports will be affected.

To capture the airport choice effect, the COMPASS-A(c) model was calibrated. This requires data on the base and future total study area air demand, and the total utility of travel by all modes to each of the airports. The total utility of travel to an airport, including high speed rail, is estimated using the networks derived from the modal choice model for the base and forecast years.

To assess the likely modal share that high speed rail might obtain in the future, a modal split model was developed and calibrated using base year access mode data and network data describing the travel utility for each mode. To allow the high speed rail mode to be introduced into the modal split structure, it is necessary to estimate the utility of travel for high speed rail from each zone. The same socioeconomic data that were used to develop the high speed rail forecasts were utilized to develop the COMPASS-A(c) model. As a result, the COMPASS-A(c) database included:

- Total "true" origin-destination air trips to, from, and within the Québec-Ontario Corridor.
- Travel utility estimates for all access modes for travel to corridor airports from each of the fine zones.
- Socioeconomic data on a fine zone basis.

7.2 COMPASS-A(c) MODEL STRUCTURE

The COMPASS-A(c) Model is used to assess air travel demand levels and access modal shares for both regional and external air travel. Each travel market is treated separately, as demand levels reflect the travel characteristics people are faced with when deciding to make a trip. The travel characteristics for regional travel, which are "complete" trips because both the origin and destination are located in the study area, are fundamentally different from external air travel, where only one end of the journey is in the corridor.

A different set of models is calibrated for each of the two travel markets. For each market, a Total Demand Model is typically calibrated for business, commuter and other purpose travel to provide long-term forecasts. In this study, Transport Canada provided forecasts for airports in the study area. Airport choice and modal split models were then calibrated to identify the impact of a high speed rail connections to the airports. These models provide a predictive structure for airport selection and access modal choice, based on differences in airport service levels, existing modal splits, and comparative travel impedances.

7.2.1 Access Modal Split Model

The access modal split model is developed in a similar way to the regional modal split model and is based on a nested logit model. If mode *a* competes with mode *b* at a given level of the modal split hierarchy, then the probability that mode a will be chosen by a given traveller (P_a) is a function of the Generalized Costs of the two competing modes. When passengers are aggregated to the zonal level, P_a represents the proportion of travellers that will choose mode *a* over mode *b*.

$$P_a = f\,(GC_a,\ GC_b) \qquad (1)$$

This probability can be calculated for each alternative path by mode a, with reference to the best mode b path. For path i, the following relationship is derived:

$$P_{ai} = f\,(GC_{ai},\ GC_b) \qquad (2)$$

Since total probability, as specified in Equation 1, must equal 1, P_{ai} is normalized using the following transformation:

$$PM_{ai} = \frac{P_{ai}}{\sum_{j=1}^{n} P_{aj}} \qquad (3)$$

This results in the appropriate "percent market" from Equation 7. Therefore, the number of *OD* trips by mode *a* on path *i* is a proportion of the total number of trips on all paths.

$$OD_{ai} = OD_a \times PM_{ai} \qquad (4)$$

In the resulting probabilistic trip assignment process, the COMPASS-A[(c)] model provides a precise assessment of airport choice at the zonal level. Finally, external air trips to and from each study zone are disaggregated by airport choice, access mode, and trip purpose.

7.3 APPLICATION OF THE COMPASS-A$^{(c)}$ MODEL TO THE QUÉBEC-ONTARIO CORRIDOR

In this study, the development of the COMPASS-A$^{(c)}$ model was limited to forecasting the diversion of true origin-destination air access trips to high speed rail. There was no attempt made to model the total market for air travel in the corridor or the overspill of the major airports as they reach capacity, or to evaluate the potential for using high speed rail as a component of a regional airport system. Equally, no consideration was given to the planning policies of medium-size airports to attract new air services. The basic assumption was the continuation of current travel patterns and travel behaviour on the part of the travellers, airport authorities, and the airlines. The object of the analysis was simply to assess the impact of connecting the high speed rail system to specific airports and assessing how this might change both airport use and the access modal distributions.

7.3.1 Calibration of the Airport Access Modal Split Model

Currently, only a limited set of modes are used to access the airports. As a result, the base data do not reflect the full set of information needed to calibrate a model split structure that includes high speed rail. To offset the deficiencies in the modal data, the airport modal split analyses were supplemented with utility and parameter information derived from the regional model. The nested structure used is the same as that employed in the non-recessionary regional model (see Chapter 2). At the top level of the hierarchy, the traveller has the choice between the auto mode and the public modes. If the public modes are selected, the traveller then has a choice between a fast mode (air or high speed rail) and the slow mode (bus). The air mode is used by connecting air traffic from smaller airports (e.g., Windsor, London and Québec City) to the major hub airports (i.e., Pearson, Dorval, and Mirabel). An integrated high speed rail service offers a competitive service but from a much larger number of communities since there are more high speed rail stations in corridor than airports.

Exhibit 7.1 shows the coefficients obtained for the hierarchical nested logit model. It can be seen that, while the Generalized Cost coefficients of the COMPASS-A$^{(c)}$ model are higher than those of the regional model, the coefficients of utility are lower. This suggests a higher sensitivity of the travellers towards the access impedance. However, since these access journeys are only part of a much longer air journey, access time and cost in fact represent only a small part of the total journey Generalized Cost.

Exhibit 7.1
Modal Split Model Coefficients for the Québec-Ontario Corridor Study[1]

	β_0	GC_{auto}	GC_{public}	R^2
Public Modes versus Auto				
Business	3.1019	-0.0071 (-12)	-0.7786 (- 9)	0.73
Commuter	3.0069	-0.0058 (- 7)	-0.9793 (- 4)	0.84
Other	3.8522	-0.0039 (-31)	-0.5309 (-30)	0.83
Bus versus Fast Modes				
Business	8.2101	-0.0067 (- 4)	-0.8320 (- 5)	0.70
Commuter	8.4431	-0.0049 (-13)	-0.9870 (- 9)	0.82
Other	8.9832	-0.0051 (-32)	-0.7932 (-22)	0.83
High Speed Rail versus Air[2]				
Business	3.6989	-0.0084	0.0163	---
Commuter	-0.0742	-0.0119	0.0149	---
Other	5.4333	-0.0072	0.0163	---

[1] *t-statistics given in parentheses.*
[2] *High speed rail bias adjustment derived from Stated Preference Survey.*

7.3.2 Calibration of the Airport Choice Model

Because the availability of high speed rail as an airport access mode may affect which airports travellers select for regional and external travel, the airport choice model was calibrated. A multinominal logit model was used, incorporating the composite mode access utilities of the hub airports in the study area. The composite mode access utilities were derived from the modal choice models developed for each of the hub airports.

7.4 AIRPORT ACCESS FORECASTS

The forecasts of the potential of high speed rail as an airport access mode are given in Exhibit 7.2. It can be seen that the 200 kph high speed rail option attracts some 1.2 million trips in 2005 and 1.9 million in 2025. This is about a seven percent market share. Interestingly, while the 300 kph high speed rail option attracts only 0.6 million trips in 2005 and 0.9 million in 2025, it also has a seven percent market share. This reflects the much lower level of service to air travellers provided by the North Shore route between Ottawa and Montréal, as evidenced by the fact that the North Shore route only serves 8.5 million travellers while the South Shore route serves 17.4 million travellers. Clearly, the South Shore route serves air travellers in the corridor far more effectively than the North Shore route. Moving the 300 kph option to the South Shore raises its demand nearly threefold to 1.7 million trips in 2005 and 2.7 million by 2025, while running the 200 kph option on the North Shore route reduces its demand by 50 percent to 0.6 million in 2005 and 0.8 million in 2025 (see Exhibit 7.2).

Exhibit 7.2
Airport Access Forecasts for the North Shore and South Shore Routes (Millions of Trips and Millions of 1992$)

	Study Area	Corridor	Market Share (%)				Rail		Pearson	Dorval/ Mirabel
	Demand	Demand	Air	Bus	Auto	Rail	Demand	Revenues	Demand	Demand
200 kph/South Shore Route										
2005	31.835	17.443	5.31	3.72	83.92	7.02	1.224	27.114	0.236	0.987
2025	50.026	27.288	2.55	3.97	86.58	6.90	1.882	32.536	0.398	1.484
300 kph/North Shore Route										
2005	31.574	8.454	10.23	7.20	75.27	7.30	0.617	28.896	0.486	0.131
2025	49.718	12.891	4.93	7.86	80.25	6.96	0.897	34.453	0.713	0.184
200 kph/North Shore Route										
2005	32.207	8.546	10.45	7.29	75.39	6.86	0.586	25.233	0.497	0.089
2025	50.580	13.036	5.11	7.97	80.48	6.44	0.840	29.107	0.714	0.125
300 kph/South Shore Route										
2005	31.207	17.147	5.31	3.69	83.56	7.44	1.276	29.289	0.269	1.006
2025	49.174	26.832	2.54	3.94	86.22	7.30	1.958	35.637	0.441	1.517

Finally, it is clear that the selection of route has a significant impact on the use of high speed rail as an access mode for the major hub airports. The South Shore route is heavily used by Dorval passengers, as opposed to the North Shore route which only serves the smaller number of Mirabel passengers. The lack of air service at Mirabel results in traffic diverting to Pearson Airport from Kingston, Ottawa the eastern portion of Southern Ontario, and even Montréal for long-distance domestic flights. A key factor in these results is the low quality of air service proposed for Mirabel. A significant improvement in the level of air service from Mirabel would change the degree of diversion to Pearson, and raise overall use of the high speed rail service as an access mode to Mirabel. This is a sensitivity that should be further explored in the future.

To test the effect of high speed rail service conditions on the airport access forecasts for high speed rail, a range of sensitivity tests were made. As shown in Exhibit 7.3, the effect of fare and frequency is quite marginal as the demand is relatively inelastic to both of these service factors.

Exhibit 7.3
Results of the Fare and Frequency Sensitivity Tests (Millions of Trips and Millions of 1992$)

	Fares Reduced by 20%		Fares Reduced by 10%		Fares Increased by 10%		Fares Increased by 20%		Frequency Increased by 3 Trains per Day		Frequency Increased by 3 Trains per Day	
	Trips	Revenue	Trips	Revenue	Trips	Revenue	Trips	Revenue	Trips	Revenue	Trips	Revenue
200 kph												
2005	1.290	23.92	1.258	25.74	1.180	27.94	1.144	28.37	1.256	27.69	1.170	26.19
2025	1.982	29.24	1.933	31.09	1.825	33.75	1.775	34.64	1.938	33.53	1.808	31.37
300 kph												
2005	0.374	25.49	0.647	27.36	0.584	30.02	0.550	30.78	0.680	33.96	0.593	27.77
2025	0.994	31.45	0.944	33.20	0.838	34.98	0.792	35.26	0.922	35.43	0.863	33.01

7.5 IMPACT OF CONGESTION

A major factor in the planning of transportation systems over the next thirty years will be the increasing levels of highway traffic congestion since it is anticipated that highway construction programs will not keep pace with the increasing demand for road space. For example, in the Southern Ontario Passenger Strategy Study, the long-term evaluation was that auto traffic would grow by 270 percent by 2020 while highways are only likely to be expanded by 60 percent even if an aggressive highway expansion policy is adopted. As congestion increases, the role of rail in improving mobility is likely to be very important. To assess the likely impact that congestion would have on the use of rail as an airport access mode in a congested highway environment, the same congestion factors used in the analysis of the impact of congestion on intercity rail, i.e., congestion will reduce urban travel times by all modes by 1.5 percent per year, were applied.

As shown in Exhibit 7.4, the demand for the 200 kph high speed rail is increased from the 7 percent market share it achieves with uncongested highways to 14 percent in 2005 and 18 percent in 2025 on what would be moderately congested highways. The high speed rail ridership rises from 1.2 million and 1.9 million in 2005 and 2025 to 2.5 million and 4.9 million in 2005 and 2025. For the 300 kph North Shore option, rail ridership increases from 0.6 million and 0.9 million in 2005 and 2025 to 1.6 million and 3.1 million in 2005 and 2025. The associated revenues for the 200 kph option are $53 million and $92 million in 2005 and 2025. For the 300 kph option, the corresponding figures are $50 million in 2005 and $81 million in 2025.

Exhibit 7.4
Airport Access Forecasts with Congestion (Millions of Trips and Millions of 1992$)

	Study Area Demand	Corridor Demand	Market Share (%) Air	Bus	Auto	Rail	Rail Demand	Rail Revenues	Pearson Demand	Dorval/ Mirabel Demand
200 kph/South Shore Route										
2005	31.564	17.173	4.98	1.78	79.10	14.13	2.426	53.278	0.713	1.713
2025	49.701	26.964	2.46	2.09	77.22	18.24	4.918	92.229	1.442	3.476
300 kph/North Shore Route										
2005	31.165	10.372	7.26	2.82	74.11	15.80	1.639	50.525	1.379	0.260
2025	49.214	15.777	3.64	3.34	73.48	19.54	3.082	80.720	2.582	0.500

8. STUDY CONCLUSIONS AND PREFERRED ALTERNATIVES

8.1 CONCERNS OF THE CONSULTANTS

The passenger and revenue forecasts for the Québec-Ontario High Speed Rail Study are based on the most extensive and sophisticated travel demand survey that has been collected to date for travel demand modelling in the Québec-Ontario Corridor. As a result, TEMS/Trafix has been able to develop very powerful and realistic projections for the planning of both the 200 kph and 300 kph technologies (see Exhibit 8.1).

However, TEMS/Trafix has been concerned that both the modelling systems and the input assumptions used in the development of these forecasts should reflect the "real" conditions that will be associated with implementing the high speed rail service. Particular concerns of TEMS/Trafix include:

- Demand models using a 1992-93 origin-destination and stated preference database should be **explicitly** modified to reflect more normal, **non-recessionary** conditions. Failure to explicitly evaluate the impact of the recession in the base data will lead to overly high levels of induced demand (impact too large), reduced natural growth (impact too small), and overly high level of diversion to rail (impact too large). This would significantly distort the model forecasts and seriously bias the resulting forecasts.

- The reason the forecasts produced in this study are significantly higher than in previous studies is the result of the decision of the study steering committee to use more realistic GDP growth rates of 3.0 to 3.5 percent as opposed to the 2.25 percent growth rate adopted by all previous studies. In the context of Canada's historical GDP growth rate of 4.0 percent, it is clear that previous studies greatly understated the level of GDP growth in Canada and in the Québec-Ontario Corridor. A GDP growth rate of 3 percent would appear a very realistic achievement once the effects of the current recession can be viewed in a historical context.

- The study steering committee has been unwilling to take account of the growing urban traffic congestion in the corridor that is even today beginning to affect intercity travel behaviour. The consultants' view is that congestion will prove to be a serious problem in the next ten years and, from the year 2000 on, will be the major factor influencing urban transportation conditions. As a result, the consultants' preferred alternatives take congestion into account and assume at least a modest increase in congestion and highway travel times over the next thirty years. The impact of even modest urban congestion on high speed rail patronage is substantial, raising rail's market share by 80 to 100 percent by 2025. High speed rail offers one of the few options for offsetting the loss of regional mobility associated with congestion. Without high speed rail, regional mobility in the corridor falls 25 to 30 percent because of **urban** congestion. Conversely, a high speed rail investment expands regional mobility by 20 percent. While this does not completely offset the impact of urban congestion, it does much to alleviate the worse consequences of urban congestion on intercity travel and, as noted in the Southern Ontario Passenger Strategy Study, provides a basis for a more integrated multi-modal approach that can offer a real alternative to highway travel.

8.2 PREFERRED HIGH SPEED RAIL ALTERNATIVES

For both the 200 kph and 300 kph technologies, the consultants' preferred alternatives are based on the South Shore route between Ottawa and Montréal (see Exhibit 8.1). The North Shore route generates far fewer riders and revenues and, unless it is far less expensive to construct, it is clearly the less desirable of the two routes. While it is not anticipated that the intercity portion of the highways in the corridor will become congested in the next thirty years, the preferred alternatives are based on the assumption that the provincial governments will continue to expand highways as needed to accommodate the ever growing volumes of intercity highway traffic.

Exhibit 8.1
TEMS/Trafix Preferred Alternatives (Millions of Trips and Millions of 1992$)

	200 kph		300 kph	
	Trips	Revenue	Trips	Revenue
For Intercity Travel				
2005	12.8	823	15.8	1,059
2025	28.9	1,770	34.3	2,108
For Airport Access				
2005	2.9	55	3.2	57
2025	5.2	95	5.6	97
Total for Intercity Travel and Airport Access				
2005	15.7	878	19.0	1,116
2025	34.1	1,865	39.9	2,205

8.3 RECOMMENDATIONS

TEMS/Trafix believe that demand forecasting is a very complex and difficult process that cannot be resolved in any one study. As a result, the consultants would advise the study steering committee that they should treat the current study as a building block and that an ongoing program of data development and model calibration and forecasting should be carried out to monitor:

- Impact of the recession on the current database and forecasts.
- Effects of different model structures.
- Robustness of modal parameters and elasticities.
- Differences in the results of the forecasting consultants.
- Impact of different socioeconomic growth projections.
- Impact of different strategies for rail but also for the competing modes, air, bus and auto.

APPENDIX 1

DEFINITION OF SUPER ZONES
QUÉBEC-ONTARIO HIGH SPEED RAIL CORRIDOR

APPENDIX 1

DEFINITION OF SUPER ZONES

ZONE NUMBER	ZONE NAME	CORRESPONDING VIA RAIL ZONE NUMBER
Internal Zones		
1	Greater Windsor	1,2
2	Western Ontario	3-7, 14
3	Greater London	15, 16
4	Greater Kitchener-Waterloo	23, 24, 25
5	West Central Ontario	8-13, 17-22, 26, 27, 57, 58
6	Hamilton-Wentworth	28-32
7	Greater Toronto	33-56
8	Central Ontario	59-70
9	Greater Kingston	71, 72
10	Eastern Ontario/ Western Québec	73-78, 85, 87-89, 91, 108, 178
11	Greater Ottawa-Hull	79-84, 86
12	Greater Montréal	90, 92-107, 109-111, 126-128
13	Eastern Québec	112-117, 123-125, 129-132, 134-136
14	Greater Québec City	118-122, 133
External Zones		
15	Eastern Canada	201-204
16	Northern Ontario/Québec	205-207
17	Western Canada	208
18	United States	209-218
19	Rest of the World	219-221

APPENDIX 2

SUMMARY OF FINDINGS ORIGIN-DESTINATION SURVEY AUDIT

APPENDIX 2

SUMMARY OF FINDINGS
ORIGIN-DESTINATION SURVEY AUDIT

This appendix documents the areas where the origin-destination survey conducted for the Québec-Ontario High Speed Rail Project may be weak and special attention should be given in the development of the forecasts. Most of the potential bias in the survey results occurs because of the under-representation of travel in the high speed rail corridor. Significant areas that may require special or extra consideration in the use of the data for forecasting purposes are summarized in Exhibit 1.

LESS RELIABILITY FOR CERTAIN CITY PAIRS

For the public modes, due to lower than expected passenger volumes and schedule considerations, the sampling methodology was modified for the autumn and winter survey waves. That is, the goal of obtaining samples based on minimum returns for specific markets (i.e., city pairs) was changed to obtaining samples based on the frequency of departures. Consequently, responses for some city pairs do not meet the survey quota, i.e., the minimum number required to achieve reliability (see Exhibits 2, 3, 4 and 5). Notable city pairs with low response rates include:

- Air Survey (see Exhibit 2)
  - Toronto-Kingston: 33 percent of the desired number of responses during the summer survey wave.
  - Ottawa-London: 34 percent of the desired number of responses during the summer survey and 61 percent during the winter survey.
  - Ottawa-Toronto: 42 percent of the desired number of responses during the summer survey and 78 percent of the target during the winter wave.
  - Toronto-Québec: 46 percent of the target number of responses during the summer survey.

- Toronto-Montréal: 55 percent of the target number of responses during the summer survey, 71 percent during the autumn survey, and 77 percent during the winter survey.

The summer survey in particular did not achieve the desired response target for most city pairs. Overall, it achieved only 55 percent of the total responses desired. Response rates for the various corridor segments were:

- Auto Survey (Exhibit 3)

  Key city pairs in Québec are under-represented in the summer survey wave and several city pairs in Ontario are under-represented in the autumn wave. Specific city pairs which will require extra attention at interpretation time due to smaller than desired sample sizes during the autumn wave include:

  - Toronto-Ottawa: 930 responses out of a desired target of 2000 (47 percent).
  - Brantford-Hamilton: 418 responses out of a desired target of 800 (52 percent).

- Bus Survey (see Exhibit 4)

  The Sarnia to Toronto city pair is under-represented especially during the summer survey which achieved only 18 percent of the target number of responses. Toronto-Ottawa is under-represented in the autumn and winter survey waves. The Ottawa-Montréal and Montréal-Québec city pairs are under-represented during all survey waves.

- Rail Survey (see Exhibit 5)

  The Windsor-Toronto and Toronto-Montréal city pairs are significantly under-represented during the summer survey at 40 to 44 percent of the desired number of responses. The Toronto-Montréal city pair is also significantly under-represented in the autumn and winter surveys at 23 percent and 32 percent respectively of the desired number of responses.

ADJUSTMENTS TO SURVEY COUNTS

The expansion formulas rely on the use of survey counts. Due to logistic problems, special adjustments are required in cases where significant problems occurred. These cases are:

- Auto volumes for the summer wave.
- Auto volumes for non-survey hours for the autumn wave.
- Bus volumes for the autumn wave.

USAGE GUIDELINES

Sampling of weekend and weekday travel was adequately covered for all survey waves. The database was used to portray typical weekend and weekday daily travel patterns. Analysis by day of week is not possible.

Only the autumn wave can be used to portray typical weekend and weekday travel on an hourly basis. The weekend can be used in two-hour segments, while the weekday data can be used in one-hour segments.

CONCLUSIONS

On the basis of the survey audit, the following conclusions have been developed:

- The survey was undertaken under very difficult time and logistical constraints. As a result, a number of unusual events which occurred during the survey had an affect on the quality and representativeness of the data. Many of these could have been avoided with adequate time for logistics and survey planning. Given the constraints on the survey, the survey results are considered to be very good.
- The data were collected using self-administered surveys. This approach is expected to result in a response bias as certain socioeconomic groups are less likely to respond to these types of surveys. The survey data should be evaluated to determine the need to adjust for this type of bias in expanding the data. Ideally, the self-administered surveys should have been supplemented with direct interview surveys in order to identify corrections for bias in the survey process.

- Coding and data entry activities were very accurate based on the results of the audit.
- Difficulties in obtaining accurate control volumes made the survey expansion process less reliable and accurate.
- The sample size for some city pairs was under-represented. These city pairs have been identified by mode and season so they can be considered in evaluating the results of the forecasts developing using the data.

Overall, the base year data is expected to be suitable for forecasting with the qualifications described above. However, it should be noted that the survey was undertaken during a recessionary period when travel with the Québec-Ontario Corridor could be affected substantially, especially with the non-auto modes. Therefore, it is recommended that this factor be considered in the development of forecasts for the Québec-Ontario High Speed Rail Project.

EXHIBIT 1
SUMMARY OF SIGNIFICANT FINDINGS

Mode	Wave	Temporal	Spatial	Traveller
Auto	Summer	(See Note 1)	(See Note 2)	
	Autumn	(See Note 3)	(See Note 4)	
	Winter			
Air	Summer		(See Note 5)	
	Autumn			(See Note 6)
	Winter			
Bus	Summer			(See Note 7)
	Autumn		(See Note 8)	(See Note 7)
	Winter			(See Note 7)
Rail	Summer			(See Note 9)
	Autumn			(See Note 9)
	Winter			(See Note 9)

NOTES:

1. *Substantial portions of the hourly and daily vehicle counts at each of the three Québec count locations were not obtained due to equipment malfunction. Missing data were estimated.*

2. *Québec locations (city pairs) are under-represented (see Exhibit 3.*

3. *Whenever pre-set quotas or sub-quotas were not met, the responses of travelers from the nearest similar category were duplicated and were assigned to that category. The net impact of the use of duplicates is that, while the "origin and destination" is correct, all other traveler characteristics are biased since the complete responses were duplicated and the results based on a smaller sample size. Therefore, great care should be used at interpretation time.*

   Most of the duplication was required to fill missing hourly observations for the autumn wave. However, duplicates were also observed in both the summer and winter waves where stratification by hour was not required. A breakdown by mode and wave of the percentage of samples using duplicate responses is summarized below:

   For auto: 3 percent in summer and 15 percent in autumn. Data for the winter wave was not available.
   For air: 3 percent in summer, 16 percent in autumn, and 1 percent in winter.
   For bus: 0 percent in summer, 38 percent in autumn, and 0 percent in winter.
   For rail, 3 percent in summer, 19 percent in autumn, and 3 percent in winter.

4. *Ontario city pairs are under-represented (see Exhibit 3).*

5. *Responses for several city pairs are significantly below the minimum required (see Exhibit 2).*

6. *The proportion of business travellers sampled was: summer, 37 percent; autumn, 23 percent; and winter, 25 percent. The autumn wave seems to be under-represented, resulting in a possible survey bias.*

7. *In all survey waves, Sarnia-Toronto was under-represented, while Windsor-Toronto was significantly over the minimum required quota (see Exhibit 4). The probable cause for this is the lack of distinction between these two city pairs. The two city pair markets may have to be combined for interpretation purposes. The other city pairs where the minimum was not met and where extra attention is required include Ottawa-Montréal (summer wave) and Montréal-Québec (autumn wave).*

8. *Consumer Contact experienced difficulty obtaining control volumes for routes that ran multiple buses at one time. Only the first bus was surveyed, i.e., passengers who arrived early. Control volumes for stints with intermediate stops are questionable as problems occurred in tracking these volumes.*

9. *Although the overall quotas were not achieved in the autumn and winter waves, the deficits were small, 13 percent and 2 percent respectively. In the summer wave, where the overall quota was met, two city pairs, Windsor-Toronto and Toronto-Montréal, were under the minimum required number.*

   For the Toronto-Montréal city pair, the quotas were not met in either the autumn or winter wave. A possible explanation is that Toronto-Kingston traffic could not be distinguished from Toronto-Montréal traffic. Toronto-Kingston traffic is significantly above the minimum in all waves (see Exhibit 5).

EXHIBIT 2
AIR MODE SAMPLE COVERAGE

	Summer			Autumn			Winter		
City Pair	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required
Sarnia-Toronto	70	93	133%	140	184	131%	70	76	109%
Windsor-Toronto	130	70	54%	270	274	101%	130	204	157%
London-Toronto	70	184	263%	140	468	334%	70	270	386%
London-Ottawa	100	34	34%	200	232	116%	100	61	61%
London-Montréal	60	0	0%	150	0	0%	80	0	0%
Toronto-Kingston	70	23	33%	140	259	185%	70	181	259%
Toronto-Ottawa	1,050	443	42%	2,100	2,101	100%	1,050	820	78%
Toronto-Montréal	1,470	813	55%	2,940	2,102	71%	1,470	1,126	77%
Toronto-Québec City	150	69	46%	290	355	122%	150	187	125%
Ottawa-Montréal	110	59	54%	210	283	135%	110	248	225%
Ottawa-Québec City	70	58	83%	140	147	105%	70	94	134%
Montréal-Québec City	110	84	76%	210	445	212%	110	237	215%
TOTALS	3,480	1,930	55%	6,930	6,850	99%	3,480	3,504	101%

EXHIBIT 3
AUTO MODE SAMPLE COVERAGE

	Summer			Autumn		
Survey Location and City Pair	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required
401/Chatham Windsor-Toronto	970	1,297	134%	2,200	1,896	86%
401/Woodstock London-Toronto	840	1,143	136%	1,900	1,774	93%
401/Guelph Kitchener-Toronto	880	1,084	123%	2,000	1,647	82%
53/2 Brantford-Hamilton	350	390	111%	800	418	52%
401/Napanee Toronto-Kingston	700	974	139%	1,600	1,509	94%
401/Prescott Kingston-Ottawa	1,010	1,144	113%	2,300	1,622	71%
7/Perth Toronto-Ottawa	880	890	101%	2,000	930	47%
40/Rigaud Ottawa-Montréal	570	425	75%	1,300	1,064	82%
40/Louisville Montréal-Québec City	350	227	65%	800	1,234	154%
20/Saint Eugene Montréal-Québec City	350	226	65%	800	1,198	150%
TOTALS	6,900	7,800	113%	15,700	13,292	85%

NOTE: Auto surveys were not conducted during the winter wave.

EXHIBIT 4
BUS MODE SAMPLE COVERAGE

City Pair	Summer: Minimum Sample Required	Summer: Actual Sample Collected	Summer: Sample Collected as Percent of Minimum Required	Autumn: Minimum Sample Required	Autumn: Actual Sample Collected	Autumn: Sample Collected as Percent of Minimum Required	Winter: Minimum Sample Required	Winter: Actual Sample Collected	Winter: Sample Collected as Percent of Minimum Required
Sarnia-Toronto	40	7	18%	70	42	60%	40	31	78%
Windsor-Toronto	110	225	205%	220	463	210%	110	248	225%
London-Toronto	330	466	141%	670	602	90%	330	444	135%
Toronto-Kingston	130	135	104%	260	342	132%	130	284	218%
Toronto-Ottawa	200	215	108%	410	256	62%	200	148	74%
Toronto-Montréal	160	178	111%	310	483	156%	160	310	194%
Kingston-Ottawa	50	100	200%	90	250	278%	50	134	268%
Ottawa-Montréal	520	325	63%	1,040	992	95%	520	427	82%
Montréal-Québec City	670	562	84%	1,340	839	63%	670	537	80%
TOTALS	2,210	2,213	100%	4,410	4,269	97%	2,210	2,563	116%

EXHIBIT 5
RAIL MODE SAMPLE COVERAGE

	Summer			Autumn			Winter		
City Pair	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required	Minimum Sample Required	Actual Sample Collected	Sample Collected as Percent of Minimum Required
Sarnia-Toronto	110	131	119%	200	136	68%	110	89	81%
Windsor-Toronto	200	80	40%	410	299	73%	200	223	112%
London-Toronto	670	933	139%	1,340	1,704	127%	670	822	123%
Toronto-Kingston	470	1,175	250%	940	1,491	159%	470	851	181%
Toronto-Ottawa	310	275	89%	610	503	82%	310	257	83%
Toronto-Montréal	650	289	44%	1,300	295	23%	650	205	32%
Ottawa-Montréal	370	401	108%	740	570	77%	370	331	89%
Montréal-Trois Rivière	70	0	0%	140	0	0%	70	0	0%
Montréal-Québec City	350	352	101%	690	539	78%	350	361	103%
TOTALS	3,200	3,636	114%	6,370	5,537	87%	3,200	3,139	98%

APPENDIX 3

SOCIOECONOMIC FORECASTS BY ZONE
QUÉBEC-ONTARIO HIGH SPEED RAIL CORRIDOR

CENTRAL CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current Dollars------------				
1. Windsor City	191	226	293	1.31%	1.31%	90	112	129	1.66%	0.72%	46,801	75,647	149,409	0.64%	0.54%
2. Essex County (less 1)	139	164	213	1.31%	1.31%	60	74	86	1.66%	0.72%	53,710	86,813	171,465	0.64%	0.54%
3. Chatham CA	44	50	64	1.06%	1.25%	19	23	26	1.42%	0.66%	45,579	71,387	139,304	0.40%	0.48%
4. Kent County (less 3)	67	76	98	1.06%	1.25%	30	36	41	1.42%	0.66%	46,256	72,447	141,373	0.40%	0.48%
5. Sarnia City	51	54	63	0.48%	0.76%	22	24	25	0.83%	0.17%	49,147	71,399	126,415	-0.18%	0.00%
6. Lambton County (less 5)	79	84	97	0.48%	0.76%	34	38	39	0.83%	0.17%	52,949	76,923	136,196	-0.18%	0.00%
7. Elgin	76	87	110	1.01%	1.20%	34	40	45	1.37%	0.61%	46,688	72,691	140,433	0.35%	0.43%
8. Haldimand-Norfolk	100	115	148	1.05%	1.29%	44	53	61	1.40%	0.70%	47,929	74,915	147,341	0.39%	0.52%
9. Grimsby	19	21	25	0.82%	0.92%	9	10	11	1.18%	0.33%	61,776	93,823	171,651	0.16%	0.16%
10. St. Catherines City	130	145	174	0.82%	0.92%	60	69	74	1.18%	0.33%	51,842	78,736	144,048	0.16%	0.16%
11. Niagara-0n-The-Lake City	13	14	17	0.82%	0.92%	7	8	8	1.18%	0.33%	63,375	96,252	176,094	0.16%	0.16%
12. Niagara Falls	76	84	102	0.82%	0.92%	36	41	44	1.18%	0.33%	49,055	74,504	136,305	0.16%	0.16%
13. Niagara R. M. (less 9-12)	160	178	214	0.82%	0.92%	69	80	86	1.18%	0.33%	50,395	76,539	140,030	0.16%	0.16%
14. Middlesex County (less 15-16)	37	44	58	1.35%	1.34%	17	21	25	1.70%	0.75%	49,837	80,992	161,028	0.69%	0.58%
15. London City	310	368	481	1.35%	1.34%	147	183	212	1.70%	0.75%	51,832	84,234	167,474	0.69%	0.58%
16.London CMA (less Yarm.,	33	39	51	1.35%	1.34%	16	20	23	1.70%	0.75%	63,155	102,635	204,059	0.69%	0.58%
Southw., London,Coradac, St. Thomas)															
17. Woodstock CA	31	33	40	0.57%	0.98%	13	15	16	0.92%	0.38%	47,147	69,318	128,155	-0.09%	0.21%
18. Oxford County (less 17)	63	68	83	0.57%	0.98%	29	32	35	0.92%	0.38%	47,970	70,528	130,391	-0.09%	0.21%
19. Brantford City	83	96	124	1.09%	1.28%	35	42	48	1.45%	0.69%	46,464	73,052	143,565	0.43%	0.52%
20. Brant County (less 19)	28	33	42	1.09%	1.28%	12	15	17	1.45%	0.69%	49,372	77,623	152,549	0.43%	0.52%
21. Stratford CA	28	31	39	0.79%	1.18%	13	15	17	1.14%	0.58%	46,894	70,899	136,367	0.13%	0.41%
22. Perth County (less 21)	43	47	60	0.79%	1.18%	20	23	25	1.14%	0.58%	46,848	70,829	136,233	0.13%	0.41%
23. Kitchener City	171	218	304	1.88%	1.68%	92	122	151	2.24%	1.08%	55,377	96,315	204,477	1.21%	0.91%
24. Waterloo City	74	94	131	1.88%	1.68%	36	49	60	2.24%	1.08%	66,632	115,889	246,034	1.21%	0.91%
25. Waterloo RM (less 23-24)	142	180	230	1.88%	1.21%	69	93	105	2.24%	0.62%	56,969	99,083	191,927	1.21%	0.45%
26. Guelph City	90	111	140	1.62%	1.20%	43	55	63	1.98%	0.61%	52,961	89,117	172,301	0.96%	0.44%
27. Wellington County (less 26)	74	91	115	1.62%	1.20%	34	43	49	1.98%	0.61%	55,398	93,218	180,230	0.96%	0.44%
28. Stoney Creek City	51	59	75	1.10%	1.21%	23	28	31	1.45%	0.62%	60,059	94,488	183,052	0.44%	0.45%
29. Hamilton City	320	369	470	1.10%	1.21%	153	185	209	1.45%	0.62%	46,161	72,623	140,694	0.44%	0.45%
30. Ancaster City and Glenbrook	33	38	48	1.10%	1.21%	15	18	20	1.45%	0.62%	74,953	117,920	228,447	0.44%	0.45%
31. Dundas City	22	26	33	1.10%	1.21%	10	13	14	1.45%	0.62%	62,091	97,685	189,246	0.44%	0.45%
32. Flamborough City	30	35	44	1.10%	1.21%	15	18	20	1.45%	0.62%	64,523	101,511	196,659	0.44%	0.45%
33. Burlington City	132	169	241	1.93%	1.80%	66	89	113	2.29%	1.21%	69,614	121,844	265,174	1.26%	1.03%
34. Oakville	121	155	221	1.93%	1.80%	60	81	103	2.29%	1.21%	82,542	144,471	314,419	1.26%	1.03%
35. Halton R. M. (less 33-34)	69	88	126	1.93%	1.80%	34	46	58	2.29%	1.21%	67,903	118,849	258,656	1.26%	1.03%
36. Mississauga City	481	666	963	2.53%	1.87%	249	361	465	2.89%	1.27%	69,447	131,248	289,274	1.86%	1.10%
37. Brampton City	243	337	488	2.53%	1.87%	124	180	231	2.89%	1.27%	67,274	127,142	280,224	1.86%	1.10%
38. Peel R. M. (less 36-37)	36	50	72	2.53%	1.87%	18	26	34	2.89%	1.27%	78,146	147,688	325,509	1.86%	1.10%
39. Etobicoke	311	348	411	0.88%	0.83%	168	197	207	1.23%	0.24%	64,549	98,710	177,397	0.22%	0.07%
40. Toronto City	639	716	845	0.88%	0.83%	343	402	422	1.23%	0.24%	57,311	87,642	157,506	0.22%	0.07%
41. York	141	158	187	0.88%	0.83%	71	83	87	1.23%	0.24%	47,495	72,631	130,529	0.22%	0.07%

CENTRAL CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current Dollars------------				
42. East York	103	115	136	0.88%	0.83%	55	64	68	1.23%	0.24%	51,024	78,028	140,229	0.22%	0.07%
43. North York	563	631	745	0.88%	0.83%	300	352	369	1.23%	0.24%	63,377	96,917	174,176	0.22%	0.07%
44. Scarborough	532	596	704	0.88%	0.83%	261	306	321	1.23%	0.24%	60,083	91,881	165,124	0.22%	0.07%
45. Vaughan	123	196	315	3.67%	2.40%	60	101	144	4.04%	1.80%	91,718	200,167	489,518	3.00%	1.62%
46. Markham City	161	258	414	3.67%	2.40%	80	134	192	4.04%	1.80%	96,441	210,476	514,728	3.00%	1.62%
47. Richmond Hill	88	141	226	3.67%	2.40%	46	77	110	4.04%	1.80%	83,269	181,730	444,428	3.00%	1.62%
48. Aurora	31	50	80	3.67%	2.40%	16	27	38	4.04%	1.80%	77,414	168,950	413,176	3.00%	1.62%
49. Newmarket and Stouffville	66	106	170	3.67%	2.40%	31	52	75	4.04%	1.80%	71,353	155,722	380,825	3.00%	1.62%
50. York R. M. (less 45-49)	69	110	176	3.67%	2.40%	32	53	76	4.04%	1.80%	68,132	148,692	363,634	3.00%	1.62%
51. Pickering	73	105	159	2.84%	2.12%	31	47	63	3.20%	1.52%	79,792	156,721	362,795	2.16%	1.35%
52. Ajax	62	90	136	2.84%	2.12%	23	34	46	3.20%	1.52%	70,149	137,782	318,952	2.16%	1.35%
53. Whitby	64	93	141	2.84%	2.12%	27	41	56	3.20%	1.52%	72,017	141,451	327,446	2.16%	1.35%
54. Oshawa	129	186	283	2.84%	2.12%	72	108	147	3.20%	1.52%	60,484	118,799	275,009	2.16%	1.35%
55. New Castle	53	76	116	2.84%	2.12%	19	29	39	3.20%	1.52%	64,720	127,119	294,268	2.16%	1.35%
56. Durham R. M. (less 51-55)	44	63	96	2.84%	2.12%	21	31	42	3.20%	1.52%	59,700	117,258	271,440	2.16%	1.35%
57. Huron and Bruce	126	136	170	0.60%	1.10%	53	60	66	0.96%	0.51%	42,511	62,765	118,939	-0.05%	0.34%
58. Grey and Dufferin	127	152	175	1.39%	0.69%	56	70	71	1.74%	0.10%	46,335	75,671	132,269	0.72%	-0.07%
59. Barrie City	66	81	111	1.61%	1.59%	31	40	49	1.96%	0.99%	55,362	92,989	194,072	0.94%	0.82%
60. Simcoe County (less 59)	233	286	392	1.61%	1.59%	100	129	158	1.96%	0.99%	50,089	84,132	175,588	0.94%	0.82%
61. Muskoka and Parry Sound	89	97	138	0.69%	1.79%	35	40	51	1.05%	1.19%	41,877	62,545	135,664	0.03%	1.02%
62. Hope and Port Hope	15	19	26	1.55%	1.65%	7	8	10	1.90%	1.06%	46,883	78,164	165,226	0.88%	0.89%
63. Hamilton and Cobourg	25	31	43	1.55%	1.65%	11	15	18	1.90%	1.06%	48,973	81,649	172,593	0.88%	0.89%
64. Northumberland County (less 62-63)	39	48	67	1.55%	1.65%	16	20	25	1.90%	1.06%	41,961	69,958	147,880	0.88%	0.89%
65. Prince Edward County	24	27	34	0.87%	1.22%	10	12	13	1.23%	0.63%	43,327	66,244	128,561	0.21%	0.46%
66. Peterborough City	70	85	117	1.54%	1.60%	30	38	46	1.90%	1.01%	45,967	76,548	160,126	0.88%	0.83%
67. Peterborough and Victoria (less 66)	118	144	198	1.54%	1.60%	48	62	75	1.90%	1.01%	45,806	76,280	159,566	0.88%	0.83%
68. Trenton	17	20	26	1.22%	1.33%	7	9	11	1.58%	0.73%	43,854	70,126	139,001	0.56%	0.56%
69. Belleville	37	44	57	1.22%	1.33%	16	20	23	1.58%	0.73%	35,600	56,928	112,840	0.56%	0.56%
70. Hasting County (less 68-69)	63	74	96	1.22%	1.33%	25	30	35	1.58%	0.73%	52,440	83,857	166,218	0.56%	0.56%
71. Kingston	57	67	87	1.31%	1.32%	25	31	36	1.67%	0.72%	41,457	67,045	132,577	0.65%	0.55%
72. Front. Cty, Len. & Addinct. (less 71)	113	133	173	1.31%	1.32%	50	62	72	1.67%	0.72%	52,719	85,257	168,589	0.65%	0.55%
73. Brockville	22	26	36	1.53%	1.56%	10	12	15	1.89%	0.97%	44,481	74,029	153,661	0.87%	0.79%
74. Leeds (less 73)	69	85	115	1.53%	1.56%	31	39	47	1.89%	0.97%	46,752	77,809	161,507	0.87%	0.79%
75. Cornwall	47	54	68	0.98%	1.20%	19	23	26	1.34%	0.61%	52,468	81,360	157,357	0.32%	0.44%
76. Stormont-Dundas (less 75)	62	70	89	0.98%	1.20%	26	31	35	1.34%	0.61%	58,053	90,020	174,107	0.32%	0.44%
77. Smith Falls	9	12	17	1.82%	1.78%	4	5	6	2.17%	1.18%	38,939	67,192	145,578	1.15%	1.01%
78. Lanark County (less 77)	46	59	83	1.82%	1.78%	21	27	34	2.17%	1.18%	46,494	80,230	173,826	1.15%	1.01%
79. Rideau, Osgoode	27	31	39	1.29%	1.07%	12	15	16	1.65%	0.48%	71,863	115,943	218,405	0.63%	0.31%
80. Ottawa-Carleton (less 79, 81-84)	74	87	107	1.29%	1.07%	31	38	42	1.65%	0.48%	82,890	133,732	251,916	0.63%	0.31%
81. Nepean	110	130	160	1.29%	1.07%	59	72	80	1.65%	0.48%	73,655	118,834	223,851	0.63%	0.31%
82. Ottawa	315	373	461	1.29%	1.07%	174	215	236	1.65%	0.48%	55,581	89,673	168,921	0.63%	0.31%
83. Vanier, Gloucester	122	144	178	1.29%	1.07%	64	79	87	1.65%	0.48%	66,324	107,005	201,569	0.63%	0.31%

CENTRAL CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	------------Thousands-----------					---------------Thousands ---------------					------------Current Dollars------------				
84. Cumberland	44	52	64	1.29%	1.07%	15	19	21	1.65%	0.48%	73,272	118,216	222,687	0.63%	0.31%
85. Prescott and Russel County	69	92	136	2.24%	1.97%	29	40	53	2.60%	1.38%	46,835	85,349	192,122	1.58%	1.20%
Total for Study Zones in Ontario	9,377	11,438	15,105	1.54%	1.40%	4,527	5,781	6,780	1.90%	0.80%	57,531	99,448	209,674	1.17%	0.87%
Total for All of Ontario	10,262	12,299	15,572	1.40%	1.19%	4,712	5,960	6,919	1.82%	0.75%	56,583	97,498	203,567	1.14%	0.82%

CENTRAL CASE ECONOMIC SCENARIO FOR QUEBEC															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	------------Thousands------------					---------------Thousands ---------------					-------------Current Dollars-------------				
86. Hull	161	201	248	1.70%	1.07%	76	98	121	2.00%	1.07%	47,752	89,838	206,371	1.93%	1.31%
87. Gatineau-Papineau-Labelle	145	180	223	1.70%	1.07%	57	74	92	2.00%	1.07%	42,043	79,097	181,697	1.93%	1.31%
88. Joliette-Montcalm	105	133	164	1.81%	1.07%	42	55	68	2.12%	1.06%	37,012	70,651	162,198	2.04%	1.30%
89. Deux Montagnes-Argenteuil	131	165	205	1.78%	1.08%	46	61	75	2.09%	1.07%	40,563	77,115	177,422	2.01%	1.32%
90. Six cités de Terrebonne	90	101	116	0.88%	0.66%	40	46	53	1.18%	0.66%	44,684	75,682	160,227	1.11%	0.90%
91. Terrebonne (less 90)	179	200	229	0.88%	0.66%	53	62	70	1.18%	0.66%	44,574	75,496	159,834	1.11%	0.90%
92. Laval Ouest	159	194	231	1.55%	0.87%	70	89	106	1.85%	0.86%	49,391	91,161	201,130	1.78%	1.10%
93. Laval Est	162	198	235	1.55%	0.87%	72	91	108	1.85%	0.86%	49,348	91,081	200,955	1.78%	1.10%
94. Montréal - Zone A	401	449	512	0.88%	0.66%	179	209	238	1.18%	0.66%	42,961	72,765	154,051	1.11%	0.90%
95. Montréal - Zone B	379	424	484	0.88%	0.66%	181	211	241	1.18%	0.66%	42,962	72,765	154,052	1.11%	0.90%
96. Montréal - Zone C	160	179	205	0.88%	0.66%	77	89	102	1.18%	0.66%	42,980	72,796	154,118	1.11%	0.90%
97. Montréal - Zone D	53	59	68	0.88%	0.66%	25	30	34	1.18%	0.66%	42,954	72,752	154,024	1.11%	0.90%
98. Montréal - Zone E	290	325	370	0.88%	0.66%	139	162	184	1.18%	0.66%	42,956	72,756	154,034	1.11%	0.90%
99. Montréal - Zone F1	222	249	284	0.88%	0.66%	108	126	143	1.18%	0.66%	42,988	72,810	154,147	1.11%	0.90%
100. Montréal - Zone F2	271	304	347	0.88%	0.66%	131	153	174	1.18%	0.66%	42,704	72,329	153,128	1.11%	0.90%
101. Beauharnois-Soulanges	75	84	96	0.88%	0.66%	31	36	42	1.18%	0.66%	41,535	70,349	148,937	1.11%	0.90%
102. Laprairie	139	156	178	0.88%	0.66%	54	63	72	1.18%	0.66%	54,866	92,927	196,738	1.11%	0.90%
103. St. Hubert City	76	85	97	0.88%	0.66%	31	36	41	1.18%	0.66%	46,223	78,289	165,746	1.11%	0.90%
104. Longueuil City	131	147	167	0.88%	0.66%	60	69	79	1.18%	0.66%	39,878	67,543	142,995	1.11%	0.90%
105. Chambly (less 103-104)	135	151	172	0.88%	0.66%	62	72	82	1.18%	0.66%	58,420	98,948	209,485	1.11%	0.90%
106. L'Assomption	164	207	255	1.81%	1.07%	72	95	117	2.12%	1.06%	50,548	96,489	221,518	2.04%	1.30%
107. Vaudreuil	68	86	107	1.81%	1.07%	25	33	41	2.12%	1.06%	50,549	96,491	221,521	2.04%	1.30%
108. Huntingdon-Napierville- St. Jean (less 110)	29	35	42	1.55%	0.89%	12	16	19	1.85%	0.89%	37,774	69,681	154,597	1.77%	1.13%
109. Chateauguay	66	80	96	1.55%	0.89%	29	37	44	1.85%	0.89%	49,495	91,303	202,570	1.77%	1.13%
110. St. Jean CA	70	86	102	1.55%	0.89%	31	39	47	1.85%	0.89%	41,410	76,387	169,477	1.77%	1.13%
111. Iberville	26	32	39	1.55%	0.89%	11	14	17	1.85%	0.89%	40,022	73,828	163,799	1.77%	1.13%
112. Granby CA	61	75	89	1.55%	0.89%	26	33	39	1.85%	0.89%	44,354	81,818	181,527	1.77%	1.13%
113. Missisquoi-Brome- Shefford (less 112)	78	96	114	1.55%	0.89%	31	39	47	1.85%	0.89%	35,462	65,415	145,134	1.77%	1.13%
114. Trois-Rivières City	49	60	72	1.55%	0.89%	19	24	29	1.85%	0.89%	36,642	67,593	149,965	1.77%	1.13%
115. Berthier-Maskinonge- St. Maurice (less 114)	122	136	151	0.86%	0.51%	45	52	58	1.16%	0.51%	37,094	62,678	128,795	1.09%	0.75%
116. Champlain	124	151	180	1.55%	0.89%	47	59	71	1.85%	0.89%	38,638	71,274	158,133	1.77%	1.13%
117. Portneuf	68	75	81	0.74%	0.35%	27	30	33	1.04%	0.35%	42,312	70,341	140,194	0.96%	0.59%
118. Ste-Foy City	71	79	84	0.74%	0.35%	37	43	46	1.04%	0.35%	46,371	77,087	153,640	0.96%	0.59%
119. Québec City	168	185	198	0.74%	0.35%	72	82	88	1.04%	0.35%	35,753	59,437	118,462	0.96%	0.59%
120. Charlesbourg City	71	79	84	0.74%	0.35%	33	38	41	1.04%	0.35%	49,111	81,643	162,721	0.96%	0.59%
121. Beauport City	71	78	83	0.74%	0.35%	28	32	34	1.04%	0.35%	43,345	72,058	143,616	0.96%	0.59%
122. Québec (less 118-121)	113	124	134	0.74%	0.35%	46	52	56	1.04%	0.35%	54,055	89,862	179,101	0.96%	0.59%
123. Montmorency No. 1, 2 & Charlevoix-Ouest	45	49	53	0.74%	0.35%	17	19	21	1.04%	0.35%	42,542	70,723	140,955	0.96%	0.59%

CENTRAL CASE ECONOMIC SCENARIO FOR QUEBEC															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					-------------Current Dollars------------				
124. Sherbrooke City	77	87	98	0.96%	0.62%	34	40	45	1.26%	0.62%	38,211	65,379	137,350	1.18%	0.86%
125. Richmond-Sherbrooke and Stanstead (less 124)	134	152	171	0.96%	0.62%	55	65	73	1.26%	0.62%	40,298	68,951	144,854	1.18%	0.86%
126. Verchères-Richelieu	134	164	196	1.55%	0.89%	56	71	85	1.85%	0.89%	51,647	95,271	211,375	1.77%	1.13%
127. St-Hyacinthe CA	51	62	74	1.55%	0.89%	23	29	34	1.85%	0.89%	47,263	87,185	193,434	1.77%	1.13%
128. St-Hyacinthe-Rouville-Bagot (less 127)	91	111	132	1.55%	0.89%	40	51	61	1.85%	0.89%	42,307	78,043	173,151	1.77%	1.13%
129. Drummondville CA	61	68	75	0.86%	0.51%	25	29	32	1.16%	0.51%	39,418	66,605	136,864	1.09%	0.75%
130. Drummond-Arthabaska-Wolfe-Compton (less 129)	115	128	142	0.86%	0.51%	37	43	47	1.16%	0.51%	35,920	60,694	124,719	1.09%	0.75%
131. Yamaska-Nicolet-Lotbinière	78	88	97	0.86%	0.51%	31	36	40	1.16%	0.51%	38,609	65,238	134,056	1.09%	0.75%
132. Megantic-Frontenac-Beauce	158	181	205	1.08%	0.62%	63	75	84	1.38%	0.61%	36,686	63,752	133,882	1.31%	0.85%
133. Lévis	119	137	155	1.08%	0.62%	52	62	70	1.38%	0.61%	46,656	81,078	170,269	1.31%	0.85%
134. Bellechasse-Dorchester	57	66	74	1.08%	0.62%	22	26	29	1.38%	0.61%	37,277	64,780	136,041	1.31%	0.85%
135. Montmagny-L'Islet-Kamouraska	70	80	91	1.08%	0.62%	25	30	34	1.38%	0.61%	35,036	60,885	127,862	1.31%	0.85%
136. Chicoutimi-Lac St. Jean	286	311	324	0.63%	0.22%	100	113	118	0.93%	0.21%	42,109	69,026	133,847	0.85%	0.45%
Total for Study Zones in Québec	6360	7332	8429	1.10%	0.70%	2704	3239	3724	1.40%	0.70%	43,816	75,741	162,794	1.26%	0.97%
Total for All of Québec	6925	7800	8601	0.92%	0.49%	2945	3446	3800	1.22%	0.49%	42,573	72,134	150,736	1.11%	0.83%

UPPER CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current dollars------------				
1. Windsor City	191	229	309	1.42%	1.51%	90	114	143	1.86%	1.12%	46,801	79,506	166,363	1.52%	1.33%
2. Essex County (less 1)	139	166	225	1.42%	1.51%	60	76	95	1.86%	1.12%	53,710	91,243	190,921	1.52%	1.33%
3. Chatham CA	44	51	68	1.17%	1.45%	19	23	29	1.61%	1.06%	45,579	75,029	155,111	1.28%	1.27%
4. Kent County (less 3)	67	78	103	1.17%	1.45%	30	37	45	1.61%	1.06%	46,256	76,144	157,415	1.28%	1.27%
5. Sarnia City	51	55	67	0.59%	0.96%	22	25	28	1.03%	0.57%	49,147	75,042	140,759	0.69%	0.78%
6. Lambton County (less 5)	79	85	103	0.59%	0.96%	34	39	43	1.03%	0.57%	52,949	80,848	151,650	0.69%	0.78%
7. Elgin	76	88	116	1.13%	1.40%	34	41	50	1.57%	1.00%	46,688	76,399	156,368	1.23%	1.22%
8. Haldimand-Norfolk	100	116	156	1.16%	1.49%	44	54	68	1.60%	1.09%	47,929	78,738	164,060	1.26%	1.31%
9. Grimsby	19	21	27	0.94%	1.12%	9	10	12	1.37%	0.73%	61,776	98,610	191,128	1.04%	0.94%
10. St. Catherines City	130	147	184	0.94%	1.12%	60	71	82	1.37%	0.73%	51,842	82,753	160,393	1.04%	0.94%
11. Niagara-0n-The-Lake City	13	15	18	0.94%	1.12%	7	8	9	1.37%	0.73%	63,375	101,163	196,075	1.04%	0.94%
12. Niagara Falls	76	86	107	0.94%	1.12%	36	42	49	1.37%	0.73%	49,055	78,305	151,772	1.04%	0.94%
13. Niagara R. M. (less 9-12)	160	181	226	0.94%	1.12%	69	82	95	1.37%	0.73%	50,395	80,444	155,919	1.04%	0.94%
14. Middlesex County (less 15-16)	37	45	61	1.46%	1.54%	17	22	28	1.90%	1.15%	49,837	85,124	179,300	1.56%	1.36%
15. London City	310	374	508	1.46%	1.54%	147	187	236	1.90%	1.15%	51,832	88,531	186,478	1.56%	1.36%
16.London CMA (less Yarm.,	33	40	54	1.46%	1.54%	16	20	26	1.90%	1.15%	63,155	107,871	227,214	1.56%	1.36%
Southw., London,Coradac, St. Thomas)															
17. Woodstock CA	31	34	43	0.68%	1.18%	13	15	18	1.12%	0.78%	47,147	72,855	142,696	0.78%	1.00%
18. Oxford County (less 17)	63	69	88	0.68%	1.18%	29	33	39	1.12%	0.78%	47,970	74,126	145,187	0.78%	1.00%
19. Brantford City	83	97	130	1.20%	1.48%	35	43	54	1.64%	1.09%	46,464	76,779	159,855	1.31%	1.30%
20. Brant County (less 19)	28	33	45	1.20%	1.48%	12	15	19	1.64%	1.09%	49,372	81,583	169,858	1.31%	1.30%
21. Stratford CA	28	31	41	0.90%	1.38%	13	16	19	1.34%	0.98%	46,894	74,516	151,841	1.00%	1.20%
22. Perth County (less 21)	43	48	63	0.90%	1.38%	20	23	28	1.34%	0.98%	46,848	74,443	151,692	1.00%	1.20%
23. Kitchener City	171	222	321	1.99%	1.88%	92	125	168	2.44%	1.48%	55,377	101,228	227,679	2.09%	1.70%
24. Waterloo City	74	95	138	1.99%	1.88%	36	50	67	2.44%	1.48%	66,632	121,802	273,951	2.09%	1.70%
25. Waterloo RM (less 23-24)	142	183	242	1.99%	1.41%	69	95	116	2.44%	1.02%	56,969	104,138	213,705	2.09%	1.23%
26. Guelph City	90	112	148	1.73%	1.40%	43	57	69	2.18%	1.01%	52,961	93,664	191,851	1.84%	1.22%
27. Wellington County (less 26)	74	92	122	1.73%	1.40%	34	44	54	2.18%	1.01%	55,398	97,974	200,680	1.84%	1.22%
28. Stoney Creek City	51	60	79	1.21%	1.41%	23	28	35	1.65%	1.02%	60,059	99,308	203,823	1.31%	1.23%
29. Hamilton City	320	374	496	1.21%	1.41%	153	190	232	1.65%	1.02%	46,161	76,329	156,659	1.31%	1.23%
30. Ancaster City and Glenbrook	33	38	51	1.21%	1.41%	15	18	23	1.65%	1.02%	74,953	123,936	254,369	1.31%	1.23%
31. Dundas City	22	26	34	1.21%	1.41%	10	13	16	1.65%	1.02%	62,091	102,669	210,720	1.31%	1.23%
32. Flamborough City	30	35	47	1.21%	1.41%	15	18	23	1.65%	1.02%	64,523	106,690	218,973	1.31%	1.23%
33. Burlington City	132	171	255	2.04%	2.00%	66	91	125	2.49%	1.61%	69,614	128,061	295,263	2.14%	1.82%
34. Oakville	121	157	233	2.04%	2.00%	60	83	114	2.49%	1.61%	82,542	151,842	350,096	2.14%	1.82%
35. Halton R. M. (less 33-34)	69	89	133	2.04%	2.00%	34	47	65	2.49%	1.61%	67,903	124,913	288,006	2.14%	1.82%
36. Mississauga City	481	675	1,017	2.65%	2.07%	249	370	516	3.09%	1.67%	69,447	137,944	322,097	2.75%	1.89%
37. Brampton City	243	342	515	2.65%	2.07%	124	184	257	3.09%	1.67%	67,274	133,628	312,021	2.75%	1.89%
38. Peel R. M. (less 36-37)	36	51	76	2.65%	2.07%	18	27	38	3.09%	1.67%	78,146	155,224	362,445	2.75%	1.89%
39. Etobicoke	311	354	434	0.99%	1.03%	168	202	230	1.43%	0.64%	64,549	103,746	197,526	1.09%	0.85%
40. Toronto City	639	727	892	0.99%	1.03%	343	412	468	1.43%	0.64%	57,311	92,113	175,378	1.09%	0.85%
41. York	141	161	197	0.99%	1.03%	71	85	96	1.43%	0.64%	47,495	76,336	145,340	1.09%	0.85%

UPPER CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current dollars------------				
42. East York	103	117	144	0.99%	1.03%	55	66	75	1.43%	0.64%	51,024	82,009	156,141	1.09%	0.85%
43. North York	563	640	786	0.99%	1.03%	300	361	410	1.43%	0.64%	63,377	101,862	193,939	1.09%	0.85%
44. Scarborough	532	605	743	0.99%	1.03%	261	314	357	1.43%	0.64%	60,083	96,568	183,861	1.09%	0.85%
45. Vaughan	123	199	332	3.79%	2.60%	60	103	160	4.24%	2.20%	91,718	210,380	545,063	3.89%	2.42%
46. Markham City	161	261	437	3.79%	2.60%	80	138	213	4.24%	2.20%	96,441	221,214	573,134	3.89%	2.42%
47. Richmond Hill	88	143	239	3.79%	2.60%	46	79	122	4.24%	2.20%	83,269	191,001	494,857	3.89%	2.42%
48. Aurora	31	51	85	3.79%	2.60%	16	27	42	4.24%	2.20%	77,414	177,570	460,059	3.89%	2.42%
49. Newmarket and Stouffville	66	107	179	3.79%	2.60%	31	54	83	4.24%	2.20%	71,353	163,667	424,037	3.89%	2.42%
50. York R. M. (less 45-49)	69	111	186	3.79%	2.60%	32	54	84	4.24%	2.20%	68,132	156,278	404,895	3.89%	2.42%
51. Pickering	73	106	168	2.95%	2.32%	31	48	70	3.40%	1.92%	79,792	164,717	403,961	3.05%	2.14%
52. Ajax	62	91	144	2.95%	2.32%	23	35	52	3.40%	1.92%	70,149	144,811	355,143	3.05%	2.14%
53. Whitby	64	94	149	2.95%	2.32%	27	42	62	3.40%	1.92%	72,017	148,668	364,602	3.05%	2.14%
54. Oshawa	129	189	298	2.95%	2.32%	72	111	163	3.40%	1.92%	60,484	124,860	306,214	3.05%	2.14%
55. New Castle	53	77	122	2.95%	2.32%	19	30	43	3.40%	1.92%	64,720	133,604	327,658	3.05%	2.14%
56. Durham R. M. (less 51-55)	44	64	101	2.95%	2.32%	21	32	47	3.40%	1.92%	59,700	123,240	302,240	3.05%	2.14%
57. Huron and Bruce	126	138	179	0.72%	1.30%	53	62	74	1.15%	0.91%	42,511	65,967	132,435	0.82%	1.12%
58. Grey and Dufferin	127	154	184	1.50%	0.89%	56	72	79	1.94%	0.50%	46,335	79,532	147,278	1.60%	0.71%
59. Barrie City	66	82	117	1.72%	1.79%	31	41	55	2.16%	1.40%	55,362	97,733	216,093	1.82%	1.61%
60. Simcoe County (less 59)	233	290	414	1.72%	1.79%	100	133	175	2.16%	1.40%	50,089	88,425	195,512	1.82%	1.61%
61. Muskoka and Parry Sound	89	98	146	0.81%	1.99%	35	41	56	1.24%	1.59%	41,877	65,736	151,057	0.91%	1.81%
62. Hope and Port Hope	15	19	28	1.66%	1.86%	7	9	11	2.10%	1.46%	46,883	82,152	183,974	1.76%	1.67%
63. Hamilton and Cobourg	25	32	46	1.66%	1.86%	11	15	20	2.10%	1.46%	48,973	85,815	192,177	1.76%	1.67%
64. Northumberland County (less 62-63)	39	49	70	1.66%	1.86%	16	21	28	2.10%	1.46%	41,961	73,527	164,660	1.76%	1.67%
65. Prince Edward County	24	27	36	0.99%	1.42%	10	12	15	1.43%	1.03%	43,327	69,624	143,148	1.09%	1.24%
66. Peterborough City	70	86	123	1.65%	1.80%	30	39	51	2.10%	1.41%	45,967	80,453	178,295	1.75%	1.62%
67. Peterborough and Victoria (less 66)	118	147	209	1.65%	1.80%	48	63	84	2.10%	1.41%	45,806	80,172	177,672	1.75%	1.62%
68. Trenton	17	20	28	1.34%	1.53%	7	9	12	1.78%	1.13%	43,854	73,704	154,774	1.44%	1.35%
69. Belleville	37	44	60	1.34%	1.53%	16	20	26	1.78%	1.13%	35,600	59,832	125,644	1.44%	1.35%
70. Hasting County (less 68-69)	63	75	101	1.34%	1.53%	25	31	39	1.78%	1.13%	52,440	88,136	185,079	1.44%	1.35%
71. Kingston	57	68	92	1.42%	1.52%	25	32	40	1.87%	1.12%	41,457	70,466	147,620	1.53%	1.34%
72. Front. Cty, Len. & Addinct. (less 71)	113	135	183	1.42%	1.52%	50	64	80	1.87%	1.12%	52,719	89,607	187,719	1.53%	1.34%
73. Brockville	22	27	38	1.65%	1.76%	10	13	17	2.09%	1.37%	44,481	77,806	171,097	1.75%	1.58%
74. Leeds (less 73)	69	86	122	1.65%	1.76%	31	40	53	2.09%	1.37%	46,752	81,779	179,833	1.75%	1.58%
75. Cornwall	47	54	72	1.10%	1.40%	19	23	28	1.54%	1.01%	52,468	85,511	175,213	1.20%	1.22%
76. Stormont-Dundas (less 75)	62	71	94	1.10%	1.40%	26	32	39	1.54%	1.01%	58,053	94,613	193,863	1.20%	1.22%
77. Smith Falls	9	12	18	1.93%	1.98%	4	5	7	2.38%	1.59%	38,939	70,620	162,097	2.03%	1.80%
78. Lanark County (less 77)	46	59	88	1.93%	1.98%	21	28	38	2.38%	1.59%	46,494	84,323	193,550	2.03%	1.80%
79. Rideau, Osgoode	27	32	41	1.41%	1.27%	12	15	18	1.85%	0.88%	71,863	121,858	243,187	1.51%	1.09%
80. Ottawa-Carleton (less 79, 81-84)	74	88	113	1.41%	1.27%	31	39	46	1.85%	0.88%	82,890	140,555	280,501	1.51%	1.09%
81. Nepean	110	132	169	1.41%	1.27%	59	74	89	1.85%	0.88%	73,655	124,897	249,251	1.51%	1.09%
82. Ottawa	315	378	487	1.41%	1.27%	174	220	262	1.85%	0.88%	55,581	94,249	188,088	1.51%	1.09%
83. Vanier, Gloucester	122	146	188	1.41%	1.27%	64	81	97	1.85%	0.88%	66,324	112,464	224,441	1.51%	1.09%

UPPER CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					---------------Thousands ---------------					-------------Current dollars-------------				
84. Cumberland	44	53	68	1.41%	1.27%	15	20	23	1.85%	0.88%	73,272	124,247	247,955	1.51%	1.09%
85. Prescott and Russel County	69	93	144	2.36%	2.18%	29	41	59	2.81%	1.78%	46,835	89,703	213,922	2.46%	1.99%
Total for Study Zones in Ontario	9,377	11,606	15,943	1.65%	1.60%	4,527	5,931	7,529	2.10%	1.20%	57,531	104,522	233,466	2.05%	1.66%
Total for All of Ontario	10,262	12,480	16,436	1.52%	1.39%	4,712	6,114	7,682	2.02%	1.15%	56,583	102,473	226,666	2.02%	1.61%

UPPER CASE ECONOMIC SCENARIO FOR QUEBEC															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1,992	2,005	2,025	1992-2005	2005-2025
FINE ZONES	------------Thousands------------					---------------Thousands ---------------					-------------Current Dollars-------------				
86. Hull	161	206	269	1.90%	1.34%	76	102	128	2.31%	1.14%	47,752	90,965	211,801	2.62%	1.97%
87. Gatineau-Papineau-Labelle	145	185	242	1.90%	1.34%	57	77	96	2.31%	1.14%	42,043	80,088	186,477	2.62%	1.97%
88. Joliette-Montcalm	105	136	181	2.01%	1.43%	42	57	73	2.42%	1.23%	37,012	71,536	169,426	2.73%	2.06%
89. Deux Montagnes-Argenteuil	131	169	225	1.98%	1.44%	46	63	80	2.39%	1.23%	40,563	78,081	185,267	2.70%	2.07%
90. Six cités de Terrebonne	90	104	125	1.08%	0.92%	40	48	56	1.48%	0.72%	44,684	76,631	164,163	1.79%	1.55%
91. Terrebonne (less 90)	179	206	247	1.08%	0.92%	53	64	74	1.48%	0.72%	44,574	76,442	163,759	1.79%	1.55%
92. Laval Ouest	159	199	252	1.75%	1.19%	70	93	113	2.15%	0.99%	49,391	92,304	208,472	2.47%	1.82%
93. Laval Est	162	203	257	1.75%	1.19%	72	95	115	2.15%	0.99%	49,348	92,223	208,291	2.47%	1.82%
94. Montréal - Zone A	401	461	553	1.08%	0.92%	179	217	250	1.48%	0.72%	42,961	73,677	157,835	1.79%	1.55%
95. Montréal - Zone B	379	435	523	1.08%	0.92%	181	220	253	1.48%	0.72%	42,962	73,677	157,836	1.79%	1.55%
96. Montréal - Zone C	160	184	221	1.08%	0.92%	77	93	107	1.48%	0.72%	42,980	73,709	157,903	1.79%	1.55%
97. Montréal - Zone D	53	61	73	1.08%	0.92%	25	31	35	1.48%	0.72%	42,954	73,664	157,807	1.79%	1.55%
98. Montréal - Zone E	290	333	400	1.08%	0.92%	139	168	194	1.48%	0.72%	42,956	73,668	157,817	1.79%	1.55%
99. Montréal - Zone F1	222	256	307	1.08%	0.92%	108	130	151	1.48%	0.72%	42,988	73,723	157,933	1.79%	1.55%
100. Montréal - Zone F2	271	312	374	1.08%	0.92%	131	159	183	1.48%	0.72%	42,704	73,235	156,889	1.79%	1.55%
101. Beauharnois-Soulanges	75	86	103	1.08%	0.92%	31	38	44	1.48%	0.72%	41,535	71,231	152,595	1.79%	1.55%
102. Laprairie	139	160	192	1.08%	0.92%	54	66	76	1.48%	0.72%	54,866	94,092	201,570	1.79%	1.55%
103. St. Hubert City	76	87	104	1.08%	0.92%	31	37	43	1.48%	0.72%	46,223	79,270	169,817	1.79%	1.55%
104. Longueuil City	131	151	181	1.08%	0.92%	60	72	83	1.48%	0.72%	39,878	68,389	146,508	1.79%	1.55%
105. Chambly (less 103-104)	135	155	186	1.08%	0.92%	62	75	86	1.48%	0.72%	58,420	100,189	214,630	1.79%	1.55%
106. L'Assomption	164	212	281	2.01%	1.43%	72	99	126	2.42%	1.23%	50,548	97,699	231,390	2.73%	2.06%
107. Vaudreuil	68	89	113	2.01%	1.24%	25	35	43	2.42%	1.04%	50,549	97,700	222,919	2.73%	1.87%
108. Huntingdon-Napierville-															
St. Jean (less 110)	29	36	46	1.75%	1.24%	12	16	20	2.15%	1.04%	37,774	70,554	160,980	2.46%	1.87%
109. Chateauguay	66	82	105	1.75%	1.24%	29	38	47	2.15%	1.04%	49,495	92,448	210,934	2.46%	1.87%
110. St. Jean CA	70	88	112	1.75%	1.24%	31	41	50	2.15%	1.04%	41,410	77,345	176,475	2.46%	1.87%
111. Iberville	26	33	42	1.75%	1.24%	11	15	18	2.15%	1.04%	40,022	74,753	170,562	2.46%	1.87%
112. Granby CA	61	77	98	1.75%	1.24%	26	34	42	2.15%	1.04%	44,354	82,844	189,021	2.46%	1.87%
113. Missisquoi-Brome-															
Shefford (less 112)	78	98	125	1.75%	1.24%	31	41	50	2.15%	1.04%	35,462	66,235	151,126	2.46%	1.87%
114. Trois-Rivières City	49	62	79	1.75%	1.24%	19	25	31	2.15%	1.04%	36,642	68,440	156,156	2.46%	1.87%
115. Berthier-Maskinonge-															
St. Maurice (less 114)	122	140	165	1.06%	0.83%	45	54	61	1.46%	0.63%	37,094	63,464	133,528	1.77%	1.46%
116. Champlain	124	155	198	1.75%	1.24%	47	62	76	2.15%	1.04%	38,638	72,168	164,662	2.46%	1.87%
117. Portneuf	68	77	88	0.93%	0.65%	27	32	35	1.34%	0.45%	42,312	71,223	144,733	1.65%	1.28%
118. Ste-Foy City	71	81	92	0.93%	0.65%	37	44	49	1.34%	0.45%	46,371	78,054	158,615	1.65%	1.28%
119. Québec City	168	190	216	0.93%	0.65%	72	86	94	1.34%	0.45%	35,753	60,182	122,298	1.65%	1.28%
120. Charlesbourg City	71	81	92	0.93%	0.65%	33	40	43	1.34%	0.45%	49,111	82,667	167,990	1.65%	1.28%
121. Beauport City	71	80	91	0.93%	0.65%	28	33	36	1.34%	0.45%	43,345	72,961	148,266	1.65%	1.28%
122. Québec (less 118-121)	113	128	145	0.93%	0.65%	46	54	60	1.34%	0.45%	54,055	90,989	184,901	1.65%	1.28%
123. Montmorency No. 1, 2 &															
Charlevoix-Ouest	45	51	58	0.93%	0.65%	17	20	22	1.34%	0.45%	42,542	71,609	145,519	1.65%	1.28%

UPPER CASE ECONOMIC SCENARIO FOR QUEBEC															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1,992	2,005	2,025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current Dollars------------				
124. Sherbrooke City	77	89	108	1.16%	0.95%	34	41	48	1.56%	0.75%	38,211	66,199	142,825	1.87%	1.58%
125. Richmond-Sherbrooke and															
Stanstead (less 124)	134	156	188	1.16%	0.95%	55	67	78	1.56%	0.75%	40,298	69,815	150,627	1.87%	1.58%
126. Verchères-Richelieu	134	168	215	1.75%	1.24%	56	74	91	2.15%	1.04%	51,647	96,466	220,102	2.46%	1.87%
127. St-Hyacinthe CA	51	63	81	1.75%	1.24%	23	30	37	2.15%	1.04%	47,263	88,278	201,420	2.46%	1.87%
128. St-Hyacinthe-Rouville-Bagot															
(less 127)	91	114	145	1.75%	1.24%	40	53	65	2.15%	1.04%	42,307	79,021	180,299	2.46%	1.87%
129. Drummondville CA	61	70	82	1.06%	0.83%	25	30	35	1.46%	0.63%	39,418	67,440	141,894	1.77%	1.46%
130. Drummond-Arthabaska-															
Wolfe-Compton (less 129)	115	132	155	1.06%	0.83%	37	45	50	1.46%	0.63%	35,920	61,455	129,302	1.77%	1.46%
131. Yamaska-Nicolet-Lotbinière	78	90	106	1.06%	0.83%	31	37	42	1.46%	0.63%	38,609	66,056	138,982	1.77%	1.46%
132. Megantic-Frontenac-Beauce	158	186	226	1.28%	0.97%	63	78	91	1.68%	0.77%	36,686	64,551	139,748	1.99%	1.60%
133. Lévis	119	141	171	1.28%	0.97%	52	65	75	1.68%	0.77%	46,656	82,095	177,729	1.99%	1.60%
134. Bellechasse-Dorchester	57	67	82	1.28%	0.97%	22	27	32	1.68%	0.77%	37,277	65,592	142,001	1.99%	1.60%
135. Montmagny-L'Islet-Kamouraska	70	82	100	1.28%	0.97%	25	31	36	1.68%	0.77%	35,036	61,648	133,464	1.99%	1.60%
136. Chicoutimi-Lac St. Jean	286	319	357	0.83%	0.57%	100	117	126	1.23%	0.37%	42,109	69,891	139,619	1.54%	1.19%
Total for Study Zones in Québec	6360	7522	9179	1.30%	1.00%	2704	3366	3948	1.70%	0.80%	43,816	76,690	168,037	1.95%	1.66%
Total for All of Québec	6925	8003	9366	1.12%	0.79%	2945	3581	4028	1.52%	0.59%	42,573	73,038	155,590	1.80%	1.52%

LOWER CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	------------Thousands-----------					--------------Thousands --------------					------------Current dollars-------------				
1. Windsor City	191	220	275	1.11%	1.11%	90	109	121	1.46%	0.52%	46,801	70,181	133,369	-0.32%	-0.23%
2. Essex County (less 1)	139	160	199	1.11%	1.11%	60	73	80	1.46%	0.52%	53,710	80,541	153,056	-0.32%	-0.23%
3. Chatham CA	44	49	60	0.87%	1.05%	19	22	24	1.22%	0.46%	45,579	66,229	124,348	-0.57%	-0.29%
4. Kent County (less 3)	67	75	92	0.87%	1.05%	30	35	38	1.22%	0.46%	46,256	67,213	126,195	-0.57%	-0.29%
5. Sarnia City	51	53	59	0.28%	0.56%	22	24	24	0.63%	-0.03%	49,147	66,240	112,843	-1.14%	-0.77%
6. Lambton County (less 5)	79	81	91	0.28%	0.56%	34	37	37	0.63%	-0.03%	52,949	71,365	121,574	-1.14%	-0.77%
7. Elgin	76	85	103	0.82%	1.00%	34	39	43	1.17%	0.41%	46,688	67,438	125,356	-0.61%	-0.34%
8. Haldimand-Norfolk	100	112	139	0.85%	1.09%	44	52	57	1.20%	0.50%	47,929	69,502	131,523	-0.58%	-0.25%
9. Grimsby	19	20	24	0.63%	0.72%	9	10	10	0.98%	0.13%	61,776	87,044	153,222	-0.80%	-0.61%
10. St. Catherines City	130	141	163	0.63%	0.72%	60	68	70	0.98%	0.13%	51,842	73,047	128,583	-0.80%	-0.61%
11. Niagara-0n-The-Lake City	13	14	16	0.63%	0.72%	7	8	8	0.98%	0.13%	63,375	89,297	157,188	-0.80%	-0.61%
12. Niagara Falls	76	82	95	0.63%	0.72%	36	40	41	0.98%	0.13%	49,055	69,120	121,672	-0.80%	-0.61%
13. Niagara R. M. (less 9-12)	160	174	201	0.63%	0.72%	69	78	80	0.98%	0.13%	50,395	71,009	124,996	-0.80%	-0.61%
14. Middlesex County (less 15-16)	37	43	54	1.15%	1.14%	17	21	23	1.50%	0.55%	49,837	75,139	143,740	-0.28%	-0.20%
15. London City	310	359	451	1.15%	1.14%	147	178	199	1.50%	0.55%	51,832	78,147	149,494	-0.28%	-0.20%
16.London CMA (less Yarm., Southw., London,Coradac, St. Thomas)	33	38	48	1.15%	1.14%	16	19	22	1.50%	0.55%	63,155	95,219	182,151	-0.28%	-0.20%
17. Woodstock CA	31	32	38	0.38%	0.78%	13	15	15	0.73%	0.19%	47,147	64,309	114,396	-1.05%	-0.56%
18. Oxford County (less 17)	63	67	78	0.38%	0.78%	29	31	32	0.73%	0.19%	47,970	65,432	116,392	-1.05%	-0.56%
19. Brantford City	83	93	116	0.90%	1.09%	35	41	45	1.25%	0.49%	46,464	67,773	128,151	-0.54%	-0.25%
20. Brant County (less 19)	28	32	40	0.90%	1.09%	12	14	16	1.25%	0.49%	49,372	72,014	136,171	-0.54%	-0.25%
21. Stratford CA	28	30	37	0.59%	0.98%	13	15	16	0.94%	0.38%	46,894	65,776	121,727	-0.83%	-0.36%
22. Perth County (less 21)	43	46	56	0.59%	0.98%	20	22	24	0.94%	0.38%	46,848	65,711	121,607	-0.83%	-0.36%
23. Kitchener City	171	213	285	1.68%	1.48%	92	119	142	2.04%	0.88%	55,377	89,355	182,524	0.24%	0.13%
24. Waterloo City	74	92	123	1.68%	1.48%	36	47	56	2.04%	0.88%	66,632	107,515	219,619	0.24%	0.13%
25. Waterloo RM (less 23-24)	142	176	215	1.68%	1.01%	69	90	98	2.04%	0.42%	56,969	91,924	171,321	0.24%	-0.33%
26. Guelph City	90	108	132	1.42%	1.00%	43	54	59	1.78%	0.41%	52,961	82,678	153,802	-0.01%	-0.34%
27. Wellington County (less 26)	74	88	108	1.42%	1.00%	34	42	46	1.78%	0.41%	55,398	86,482	160,880	-0.01%	-0.34%
28. Stoney Creek City	51	58	70	0.90%	1.01%	23	27	29	1.25%	0.42%	60,059	87,660	163,400	-0.53%	-0.33%
29. Hamilton City	320	360	440	0.90%	1.01%	153	180	196	1.25%	0.42%	46,161	67,376	125,589	-0.53%	-0.33%
30. Ancaster City and Glenbrook	33	37	45	0.90%	1.01%	15	17	19	1.25%	0.42%	74,953	109,399	203,921	-0.53%	-0.33%
31. Dundas City	22	25	31	0.90%	1.01%	10	12	13	1.25%	0.42%	62,091	90,627	168,929	-0.53%	-0.33%
32. Flamborough City	30	34	42	0.90%	1.01%	15	17	19	1.25%	0.42%	64,523	94,176	175,545	-0.53%	-0.33%
33. Burlington City	132	165	226	1.73%	1.60%	66	86	106	2.09%	1.01%	69,614	113,040	236,705	0.29%	0.26%
34. Oakville	121	151	207	1.73%	1.60%	60	79	96	2.09%	1.01%	82,542	134,032	280,662	0.29%	0.26%
35. Halton R. M. (less 33-34)	69	86	118	1.73%	1.60%	34	45	55	2.09%	1.01%	67,903	110,262	230,887	0.29%	0.26%
36. Mississauga City	481	649	903	2.33%	1.67%	249	352	435	2.69%	1.07%	69,447	121,764	258,217	0.88%	0.32%
37. Brampton City	243	329	457	2.33%	1.67%	124	175	216	2.69%	1.07%	67,274	117,955	250,139	0.88%	0.32%
38. Peel R. M. (less 36-37)	36	49	68	2.33%	1.67%	18	26	32	2.69%	1.07%	78,146	137,017	290,562	0.88%	0.32%
39. Etobicoke	311	340	386	0.68%	0.63%	168	192	194	1.03%	0.04%	64,549	91,577	158,351	-0.75%	-0.70%
40. Toronto City	639	698	793	0.68%	0.63%	343	392	395	1.03%	0.04%	57,311	81,309	140,596	-0.75%	-0.70%
41. York	141	154	175	0.68%	0.63%	71	81	81	1.03%	0.04%	47,495	67,383	116,515	-0.75%	-0.70%

LOWER CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					---------------Thousands ---------------					------------Current dollars------------				
42. East York	103	112	128	0.68%	0.63%	55	63	63	1.03%	0.04%	51,024	72,390	125,174	-0.75%	-0.70%
43. North York	563	615	698	0.68%	0.63%	300	343	346	1.03%	0.04%	63,377	89,914	155,476	-0.75%	-0.70%
44. Scarborough	532	582	660	0.68%	0.63%	261	299	301	1.03%	0.04%	60,083	85,242	147,396	-0.75%	-0.70%
45. Vaughan	123	191	295	3.47%	2.20%	60	98	135	3.83%	1.60%	91,718	185,704	436,963	2.01%	0.84%
46. Markham City	161	251	388	3.47%	2.20%	80	131	180	3.83%	1.60%	96,441	195,268	459,466	2.01%	0.84%
47. Richmond Hill	88	137	212	3.47%	2.20%	46	75	103	3.83%	1.60%	83,269	168,598	396,714	2.01%	0.84%
48. Aurora	31	49	75	3.47%	2.20%	16	26	36	3.83%	1.60%	77,414	156,743	368,817	2.01%	0.84%
49. Newmarket and Stouffville	66	103	159	3.47%	2.20%	31	51	70	3.83%	1.60%	71,353	144,470	339,939	2.01%	0.84%
50. York R. M. (less 45-49)	69	107	165	3.47%	2.20%	32	52	71	3.83%	1.60%	68,132	137,948	324,593	2.01%	0.84%
51. Pickering	73	102	149	2.64%	1.92%	31	46	59	2.99%	1.32%	79,792	145,397	323,845	1.18%	0.57%
52. Ajax	62	87	128	2.64%	1.92%	23	34	44	2.99%	1.32%	70,149	127,826	284,709	1.18%	0.57%
53. Whitby	64	90	132	2.64%	1.92%	27	40	52	2.99%	1.32%	72,017	131,231	292,291	1.18%	0.57%
54. Oshawa	129	181	265	2.64%	1.92%	72	106	137	2.99%	1.32%	60,484	110,215	245,484	1.18%	0.57%
55. New Castle	53	74	108	2.64%	1.92%	19	28	37	2.99%	1.32%	64,720	117,934	262,675	1.18%	0.57%
56. Durham R. M. (less 51-55)	44	62	90	2.64%	1.92%	21	31	40	2.99%	1.32%	59,700	108,785	242,298	1.18%	0.57%
57. Huron and Bruce	126	133	159	0.41%	0.90%	53	59	62	0.76%	0.31%	42,511	58,230	106,169	-1.02%	-0.44%
58. Grey and Dufferin	127	148	164	1.19%	0.49%	56	68	67	1.54%	-0.10%	46,335	70,203	118,069	-0.24%	-0.84%
59. Barrie City	66	79	104	1.41%	1.39%	31	39	46	1.76%	0.79%	55,362	86,270	173,236	-0.03%	0.05%
60. Simcoe County (less 59)	233	279	368	1.41%	1.39%	100	126	148	1.76%	0.79%	50,089	78,053	156,736	-0.03%	0.05%
61. Muskoka and Parry Sound	89	95	130	0.50%	1.59%	35	39	48	0.85%	0.99%	41,877	58,026	121,099	-0.93%	0.24%
62. Hope and Port Hope	15	18	24	1.35%	1.45%	7	8	10	1.70%	0.86%	46,883	72,516	147,487	-0.09%	0.11%
63. Hamilton and Cobourg	25	30	40	1.35%	1.45%	11	14	17	1.70%	0.86%	48,973	75,749	154,063	-0.09%	0.11%
64. Northumberland County (less 62-63)	39	47	62	1.35%	1.45%	16	20	23	1.70%	0.86%	41,961	64,903	132,004	-0.09%	0.11%
65. Prince Edward County	24	26	32	0.68%	1.02%	10	12	13	1.03%	0.43%	43,327	61,458	114,758	-0.75%	-0.32%
66. Peterborough City	70	83	109	1.34%	1.40%	30	37	43	1.70%	0.81%	45,967	71,017	142,934	-0.09%	0.06%
67. Peterborough and Victoria (less 66)	118	141	186	1.34%	1.40%	48	60	71	1.70%	0.81%	45,806	70,768	142,435	-0.09%	0.06%
68. Trenton	17	20	25	1.03%	1.13%	7	9	10	1.38%	0.53%	43,854	65,059	124,078	-0.41%	-0.21%
69. Belleville	37	43	53	1.03%	1.13%	16	19	22	1.38%	0.53%	35,600	52,814	100,725	-0.41%	-0.21%
70. Hasting County (less 68-69)	63	72	90	1.03%	1.13%	25	30	33	1.38%	0.53%	52,440	77,798	148,373	-0.41%	-0.21%
71. Kingston	57	66	82	1.12%	1.12%	25	30	34	1.47%	0.52%	41,457	62,201	118,343	-0.32%	-0.22%
72. Front. Cty, Len. & Addinct. (less 71)	113	130	162	1.12%	1.12%	50	61	67	1.47%	0.52%	52,719	79,097	150,489	-0.32%	-0.22%
73. Brockville	22	26	34	1.34%	1.36%	10	12	14	1.69%	0.77%	44,481	68,680	137,164	-0.10%	0.02%
74. Leeds (less 73)	69	83	108	1.34%	1.36%	31	38	44	1.69%	0.77%	46,752	72,187	144,168	-0.10%	0.02%
75. Cornwall	47	52	64	0.79%	1.00%	19	22	24	1.14%	0.41%	52,468	75,481	140,463	-0.64%	-0.33%
76. Stormont-Dundas (less 75)	62	68	83	0.79%	1.00%	26	30	33	1.14%	0.41%	58,053	83,516	155,415	-0.64%	-0.33%
77. Smith Falls	9	12	16	1.62%	1.58%	4	5	6	1.97%	0.98%	38,939	62,337	129,948	0.18%	0.23%
78. Lanark County (less 77)	46	57	78	1.62%	1.58%	21	27	32	1.97%	0.98%	46,494	74,433	155,164	0.18%	0.23%
79. Rideau, Osgoode	27	31	37	1.10%	0.87%	12	15	15	1.45%	0.28%	71,863	107,565	194,957	-0.34%	-0.47%
80. Ottawa-Carleton (less 79, 81-84)	74	85	101	1.10%	0.87%	31	37	39	1.45%	0.28%	82,890	124,069	224,870	-0.34%	-0.47%
81. Nepean	110	126	150	1.10%	0.87%	59	71	75	1.45%	0.28%	73,655	110,247	199,818	-0.34%	-0.47%
82. Ottawa	315	363	432	1.10%	0.87%	174	209	221	1.45%	0.28%	55,581	83,194	150,785	-0.34%	-0.47%
83. Vanier, Gloucester	122	141	167	1.10%	0.87%	64	77	82	1.45%	0.28%	66,324	99,273	179,928	-0.34%	-0.47%

LOWER CASE ECONOMIC SCENARIO FOR ONTARIO															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current dollars------------				
84. Cumberland	44	51	60	1.10%	0.87%	15	19	20	1.45%	0.28%	73,272	109,674	198,779	-0.34%	-0.47%
85. Prescott and Russel County	69	90	128	2.05%	1.77%	29	39	50	2.40%	1.18%	46,835	79,182	171,496	0.60%	0.42%
Total for Study Zones in Ontario	9,377	11,156	14,161	1.35%	1.20%	4,527	5,636	6,352	1.70%	0.60%	57,531	92,263	187,163	0.19%	0.10%
Total for All of Ontario	10,262	11,995	14,599	1.21%	0.99%	4,712	5,810	6,482	1.62%	0.55%	56,583	90,454	181,712	0.17%	0.05%

LOWER CASE ECONOMIC SCENARIO FOR QUEBEC															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1,992	2,005	2,025	1992-2005	2005-2025
FINE ZONES	------------Thousands------------					---------------Thousands ---------------					-------------Current Dollars-------------				
86. Hull	161	193	230	1.40%	0.87%	76	94	106	1.70%	0.57%	47,752	85,461	182,074	0.85%	0.44%
87. Gatineau-Papineau-Labelle	145	174	206	1.40%	0.87%	57	71	80	1.70%	0.57%	42,043	75,243	160,305	0.85%	0.44%
88. Joliette-Montcalm	105	128	156	1.51%	1.01%	42	53	61	1.82%	0.71%	37,012	67,208	147,080	0.96%	0.57%
89. Deux Montagnes-Argenteuil	131	159	195	1.48%	1.02%	46	58	67	1.78%	0.72%	40,563	73,357	160,863	0.93%	0.58%
90. Six cités de Terrebonne	90	97	108	0.58%	0.49%	40	45	46	0.88%	0.19%	44,684	71,994	142,206	0.04%	0.06%
91. Terrebonne (less 90)	179	193	213	0.58%	0.49%	53	59	62	0.88%	0.19%	44,574	71,817	141,856	0.04%	0.06%
92. Laval Ouest	159	187	219	1.25%	0.78%	70	86	94	1.55%	0.48%	49,391	86,719	181,461	0.70%	0.35%
93. Laval Est	162	191	223	1.25%	0.78%	72	88	96	1.55%	0.48%	49,348	86,643	181,303	0.70%	0.35%
94. Montréal - Zone A	401	432	477	0.58%	0.49%	179	201	209	0.88%	0.19%	42,961	69,219	136,724	0.04%	0.06%
95. Montréal - Zone B	379	408	450	0.58%	0.49%	181	203	211	0.88%	0.19%	42,962	69,220	136,725	0.04%	0.06%
96. Montréal - Zone C	160	173	190	0.58%	0.49%	77	86	89	0.88%	0.19%	42,980	69,249	136,783	0.04%	0.06%
97. Montréal - Zone D	53	57	63	0.58%	0.49%	25	28	30	0.88%	0.19%	42,954	69,207	136,700	0.04%	0.06%
98. Montréal - Zone E	290	313	345	0.58%	0.49%	139	156	162	0.88%	0.19%	42,956	69,211	136,709	0.04%	0.06%
99. Montréal - Zone F1	222	240	264	0.58%	0.49%	108	121	126	0.88%	0.19%	42,988	69,262	136,809	0.04%	0.06%
100. Montréal - Zone F2	271	292	323	0.58%	0.49%	131	147	153	0.88%	0.19%	42,704	68,804	135,905	0.04%	0.06%
101. Beauharnois-Soulanges	75	81	89	0.58%	0.49%	31	35	36	0.88%	0.19%	41,535	66,921	132,186	0.04%	0.06%
102. Laprairie	139	150	165	0.58%	0.49%	54	61	63	0.88%	0.19%	54,866	88,400	174,610	0.04%	0.06%
103. St. Hubert City	76	82	90	0.58%	0.49%	31	34	36	0.88%	0.19%	46,223	74,474	147,104	0.04%	0.06%
104. Longueuil City	131	141	156	0.58%	0.49%	60	67	69	0.88%	0.19%	39,878	64,252	126,912	0.04%	0.06%
105. Chambly (less 103-104)	135	145	160	0.58%	0.49%	62	69	72	0.88%	0.19%	58,420	94,127	185,923	0.04%	0.06%
106. L'Assomption	164	199	243	1.51%	1.01%	72	91	105	1.82%	0.71%	50,548	91,788	200,871	0.96%	0.57%
107. Vaudreuil	68	83	98	1.51%	0.82%	25	32	36	1.82%	0.52%	50,549	91,789	193,558	0.96%	0.38%
108. Huntingdon-Napierville-															
St. Jean (less 110)	29	34	40	1.24%	0.82%	12	15	17	1.55%	0.52%	37,774	66,285	139,777	0.69%	0.38%
109. Chateauguay	66	77	91	1.24%	0.82%	29	36	39	1.55%	0.52%	49,495	86,854	183,151	0.69%	0.38%
110. St. Jean CA	70	82	97	1.24%	0.82%	31	38	42	1.55%	0.52%	41,410	72,665	153,231	0.69%	0.38%
111. Iberville	26	31	37	1.24%	0.82%	11	14	15	1.55%	0.52%	40,022	70,231	148,097	0.69%	0.38%
112. Granby CA	61	72	85	1.24%	0.82%	26	32	35	1.55%	0.52%	44,354	77,832	164,125	0.69%	0.38%
113. Missisquoi-Brome-															
Shefford (less 112)	78	92	108	1.24%	0.82%	31	38	42	1.55%	0.52%	35,462	62,228	131,221	0.69%	0.38%
114. Trois-Rivières City	49	58	68	1.24%	0.82%	19	23	26	1.55%	0.52%	36,642	64,299	135,589	0.69%	0.38%
115. Berthier-Maskinonge-															
St. Maurice (less 114)	122	131	145	0.56%	0.52%	45	50	52	0.86%	0.22%	37,094	59,624	118,522	0.02%	0.09%
116. Champlain	124	145	171	1.24%	0.82%	47	57	63	1.55%	0.52%	38,638	67,801	142,974	0.69%	0.38%
117. Portneuf	68	72	77	0.44%	0.33%	27	29	29	0.74%	0.03%	42,312	66,913	127,981	-0.11%	-0.10%
118. Ste-Foy City	71	76	81	0.44%	0.33%	37	41	41	0.74%	0.03%	46,371	73,331	140,256	-0.11%	-0.10%
119. Québec City	168	178	190	0.44%	0.33%	72	79	80	0.74%	0.03%	35,753	56,541	108,142	-0.11%	-0.10%
120. Charlesbourg City	71	76	81	0.44%	0.33%	33	37	37	0.74%	0.03%	49,111	77,665	148,546	-0.11%	-0.10%
121. Beauport City	71	75	80	0.44%	0.33%	28	31	31	0.74%	0.03%	43,345	68,547	131,105	-0.11%	-0.10%
122. Québec (less 118-121)	113	120	128	0.44%	0.33%	46	50	51	0.74%	0.03%	54,055	85,484	163,499	-0.11%	-0.10%
123. Montmorency No. 1, 2 &															
Charlevoix-Ouest	45	47	51	0.44%	0.33%	17	18	19	0.74%	0.03%	42,542	67,277	128,676	-0.11%	-0.10%

LOWER CASE ECONOMIC SCENARIO FOR QUEBEC															
	POPULATION			GROWTH RATE		EMPLOYMENT			GROWTH RATE		HOUSEHOLD INCOME			GROWTH RATE	
	1992	2005	2025	1992-2005	2005-2025	1992	2005	2025	1992-2005	2005-2025	1,992	2,005	2,025	1992-2005	2005-2025
FINE ZONES	-----------Thousands-----------					--------------Thousands --------------					------------Current Dollars------------				
124. Sherbrooke City	77	84	94	0.66%	0.58%	34	38	40	0.96%	0.29%	38,211	62,194	125,141	0.11%	0.15%
125. Richmond-Sherbrooke and															
Stanstead (less 124)	134	146	164	0.66%	0.58%	55	62	66	0.96%	0.29%	40,298	65,591	131,977	0.11%	0.15%
126. Verchères-Richelieu	134	158	186	1.24%	0.82%	56	69	76	1.55%	0.52%	51,647	90,629	191,111	0.69%	0.38%
127. St-Hyacinthe CA	51	59	70	1.24%	0.82%	23	28	31	1.55%	0.52%	47,263	82,937	174,891	0.69%	0.38%
128. St-Hyacinthe-Rouville-Bagot															
(less 127)	91	107	125	1.24%	0.82%	40	49	54	1.55%	0.52%	42,307	74,240	156,552	0.69%	0.38%
129. Drummondville CA	61	65	73	0.56%	0.52%	25	28	29	0.86%	0.22%	39,418	63,359	125,948	0.02%	0.09%
130. Drummond-Arthabaska-															
Wolfe-Compton (less 129)	115	123	137	0.56%	0.52%	37	41	43	0.86%	0.22%	35,920	57,737	114,771	0.02%	0.09%
131. Yamaska-Nicolet-Lotbinière	78	84	94	0.56%	0.52%	31	35	36	0.86%	0.22%	38,609	62,059	123,363	0.02%	0.09%
132. Megantic-Frontenac-Beauce	158	175	198	0.78%	0.63%	63	72	77	1.08%	0.33%	36,686	60,646	123,190	0.23%	0.20%
133. Lévis	119	132	150	0.78%	0.63%	52	60	64	1.08%	0.33%	46,656	77,128	156,671	0.23%	0.20%
134. Bellechasse-Dorchester	57	63	72	0.78%	0.63%	22	25	27	1.08%	0.33%	37,277	61,623	125,176	0.23%	0.20%
135. Montmagny-L'Islet-Kamouraska	70	77	87	0.78%	0.63%	25	29	31	1.08%	0.33%	35,036	57,919	117,651	0.23%	0.20%
136. Chicoutimi-Lac St. Jean	286	299	312	0.33%	0.21%	100	109	107	0.63%	-0.09%	42,109	65,662	122,660	-0.22%	-0.22%
Total for Study Zones in Québec	6360	7054	7950	0.80%	0.60%	2704	3117	3309	1.10%	0.30%	43,816	72,050	146,160	0.19%	0.19%
Total for All of Québec	6925	7504	8113	0.62%	0.39%	2945	3316	3377	0.92%	0.09%	42,573	68,619	135,334	0.04%	0.05%

APPENDIX 4

SAMPLE QUESTIONNAIRE
STATED PREFERENCE SURVEY

INTERCITY AIR TRAVEL SURVEY
TEMS-MB

LE BUREAU DE RECHERCHE SOLUMAR,
a division of Market Facts of Canada Limited
1200 McGill College Ave., Montreal, Québec

Dear Traveller,

In order to better understand the needs of travellers in Ontario and Québec, this survey is being conducted by Le Bureau de recherche Solumar, a division of Market Facts of Canada with the co-operation of the Travel Industry. The results of this survey will help ensure better transportation facilities for people across Ontario and Québec.

We would like you to fill out this questionnaire for the one-way air trip you are about to take. When you have completed the questionnaire, please return it to our representative in the departure lounge (or mail it back to us in the postage paid return envelope provided). Thank you for your cooperation.

YOUR ANSWERS ARE IMPORTANT!

Cash prizes of $200.00 will be awarded to respondents each week from November 30th to December 21st. *Details on page 7.*

The information you provide will be kept strictly confidential and will be used only for research analysis purposes. Your assistance in completing this survey is greatly appreciated.

Le français disponible au verso du questionnaire.

ABOUT YOUR ONE-WAY JOURNEY 6-1 7-1

A. What is your flight number? ______________ (airline) ______________ (flight number) 8- 9-

B. Please write in today's date: ______________ 13-

C. Where did you begin your one-way trip to this airport? Please state nearest street, intersection, prominent landmark, place of interest, institution, etc.

TRIP BEGAN AT:

Intersection/Place ______________ 15-
City/Town ______________ 17-
Prov./State ______________ 20-
Postal Code ______________ 21-

D. How much time did it take you to get from this place to the airport terminal?

ENTER THE TRAVEL TIME TO AIRPORT: ______ hours and ______ minutes 24-

E. And where will you end this one-way part of your journey? This place must be different from where you began your one-way journey in "C".

TRIP WILL END AT:

Intersection/Place ______________ 28-
City/Town ______________ 30-
Prov./State ______________ 33-
Postal Code ______________ 34-

F. How long will it take you to get from the airport terminal at your destination to this ending place?

ENTER THE TRAVEL TIME FROM AIRPORT: ______ hours and ______ minutes 37

1. Approximately how far is the one-way trip you are now making counting all of your connections? ("X" ONE BOX ONLY)

- ☐ 1 Less than 50 km or 35 miles -41
- ☐ 2 50 to 149 km or 35 to 99 miles
- ☐ 3 150 to 360 km or 100 to 225 miles
- ☐ 4 More than 360 km or 225 miles

2. Have you or will you be making a connection either to or from another flight? ("X" ONE BOX ONLY)

- ☐ 1 No air connections made -42
- ☐ 2 Yes, connected to this flight from a previous flight
- ☐ 3 Yes, will connect to a subsequent flight

3. What is the main purpose of your trip? ("X" ONE BOX ONLY)

- ☐ 1 Business - trip paid by employer -43
- ☐ 2 Business - trip not paid by employer
- ☐ 3 Commuting to/from work
- ☐ 4 Going to/from University or College
- ☐ 5 Vacation or recreation
- ☐ 6 Shopping or personal business
- ☐ 7 Visiting friends or relatives
- ☐ 8 Other (PLEASE WRITE IN) ______________________________

4. Right now, are you going to or returning from your main destination? ("X" ONE BOX ONLY)

- ☐ 1 Going to -44
- ☐ 2 Returning from

5. Including yourself, in total, how many people are travelling with you in your immediate party on this trip?

WRITE IN NUMBER: _____ -45

6. Do you own a car? ("X" ONE BOX ONLY)

- ☐ 1 Yes -47
- ☐ 2 No

7. Please check your gender. ("X" ONE BOX ONLY)

- ☐ 1 Male -48
- ☐ 2 Female

8. Please check your age group. ("X" ONE BOX ONLY)

- ☐ 1 Under 20 years -49
- ☐ 2 20 - 34 years
- ☐ 3 35 - 49 years
- ☐ 4 50 - 64 years
- ☐ 5 65 years or over

9. How many people live in your household? WRITE IN NUMBER: _________ -50

10. Which one category represents your household 's total gross income for the year before taxes? ("X" ONE BOX ONLY)

- ☐ 1 Less than $20,000 -52
- ☐ 2 $20,000 to $39,999
- ☐ 3 $40,000 to $59,999
- ☐ 4 $60,000 to $79,999
- ☐ 5 $80,000 or over

11. Imagine that you are planning to make a trip to the SAME PLACE, for the SAME REASON as the trip you are making today.

We need your help to find out what is important when you are considering such a trip. Please answer all of the following questions, each of which presents a choice between two alternatives. There are no right or wrong answers.

Just indicate how you feel with an "X" like this:

Example

	Prefer A Lot	Prefer A Little	No Preference	Prefer A Little	Prefer A Lot	
One-Way Fare $350 Flight Time 1 hr 15 min	◁	◁	☐	▷	X	One-Way Fare $250 Flight Time 1 hr 30 min

Imagine that you are making the same trip and you are presented with the following choices concerning time and cost. Fare is the cost of your air ticket and flight time is the time spent on the airplane.

All times and costs are ONE-WAY.

	Prefer A Lot	Prefer A Little	No Preference	Prefer A Little	Prefer A Lot	
One-Way Fare $205 Flight Time 30 min	◁	◁	☐	▷	▷	One-Way Fare $175 Flight Time 45 min
One-Way Fare $175 Flight Time 45 min	◁	◁	☐	▷	▷	One-Way Fare $125 Flight Time 1 hr 15 min
One-Way Fare $195 Flight Time 30 min	◁	◁	☐	▷	▷	One-Way Fare $175 Flight Time 45 min
One-Way Fare $175 Flight Time 45 min	◁	◁	☐	▷	▷	One-Way Fare $145 Flight Time 1 hr 15 min
One-Way Fare $185 Flight Time 30 min	◁	◁	☐	▷	▷	One-Way Fare $175 Flight Time 45 min
One-Way Fare $175 Flight Time 45 min	◁	◁	☐	▷	▷	One-Way Fare $165 Flight Time 1 hr 15 min

PLEASE MAKE SURE EACH LINE HAS AN "X"

12. Imagine that you are making the same trip and you are presented with the following choices concerning delay times and interchanges. Delay times must be spent at the terminal waiting for the flight.

Assume costs are equal and all times are ONE-WAY.

You arrive at the airport and your choice is to wait for a direct flight or go immediately on a service that involves changing planes.

	Prefer A Lot	Prefer A Little	No Preference	Prefer A Little	Prefer A Lot		
Delay 1 hr Flight Time 1 hr 30 min	◁	◁	□	▷	▷	Immediate Departure But Involves One Interchange Total Travel Time 2 hrs 15 min	-61
Delay 1 hr 30 min Flight Time 1 hr 30 min	◁	◁	□	▷	▷	Immediate Departure But Involves One Interchange Total Travel Time 2 hrs 15 min	-62
Delay 2 hrs Flight Time 1 hr 30 min	◁	◁	□	▷	▷	Immediate Departure But Involves One Interchange Total Travel Time 2 hrs 15 min	-63
Delay 2 hrs 30 min Flight Time 1 hr 30 min	◁	◁	□	▷	▷	Immediate Departure But Involves One Interchange Total Travel Time 2 hrs 15 min	-64

PLEASE MAKE SURE EACH LINE HAS AN "X"

65/66-8L

Air-VOI

PROPOSED HIGH SPEED RAIL SERVICE

13. A High Speed Rail Service is being proposed for the Québec, Montreal, Toronto, London and Windsor corridor. We need your responses to the following questions to understand how people may respond to this service.

The High Speed Rail Service would be comparable to the services offered by the European High Speed trains. These trains offer a standard of comfort and speed (300km/h) far above existing VIA Rail services.

NOTE: Access and wait time consists of the time spent travelling to/from the airports or stations and the time spent waiting in the lounge before departures.

AIR	Prefer A Lot	Prefer A Little	No Preference	Prefer A Little	Prefer A Lot	HIGH SPEED RAIL	
Access & Wait Time 1 hr 15 min; One-Way Fare $175; Flight Time 45 min						Access & Wait Time 45 min; One-Way Fare $230; Train Time 1 hr 15 min	-67
Access & Wait Time 1 hr 15 min; One-Way Fare $175; Flight Time 45 min						Access & Wait Time 45 min; One-Way Fare $215; Train Time 1 hr	-68
Access & Wait Time 1 hr 15 min; One-Way Fare $175; Flight Time 45 min						Access & Wait Time 45 min; One-Way Fare $175; TrainTime 1 hr 15 min	-69
Access & Wait Time 1 hr 15 min; One-Way Fare $175; Flight Time 45 min						Access & Wait Time 45 min; One-Way Fare $165; Train Time 1 hr	-70
Access & Wait Time 1 hr 15 min; One-Way Fare $175; Flight Time 45 min						Access & Wait Time 45 min; One-Way Fare $125; Train Time 1 hr 15 min	-71
Access & Wait Time 1 hr 15 min; One-Way Fare $175; Flight Time 45 min						Access & Wait Time 45 min; One-Way Fare $115; Train Time 1 hr	-72

PLEASE MAKE SURE EACH LINE HAS AN "X"

76-2 79-0
77-2 80-1
78-3

Air-MBM

APPENDIX 5

DOCUMENTATION OF THE GROWTH OF URBAN CONGESTION

APPENDIX 5

DOCUMENTATION OF THE GROWTH OF URBAN CONGESTION

1. INTRODUCTION

The purpose of this paper is to evaluate the likely growth of congestion and its impact on intercity travel in the next thirty years. In assessing congestion, a number of factors need to be evaluated. These include:

- Urban expansion or the growth of the city.
- Downtown employment.
- The relationship of traffic demand to highway capacity.
- The impact of congestion on intercity auto and transit times.

2. THE GROWTH OF THE CITY

A principle cause of congestion is the growth of urban areas and the increasing importance of downtown locations to service industry. In terms of the growth of the city, TEMS calibrated its CITY LIMITS(c) Model which shows how the trends in urban growth have developed over the course of the last fifty years. It can be seen in Exhibit 1 that, as both Montréal and Toronto expanded, the population density of Montréal fell from over 22 inhabitants per acre in 1951 to under 15 per acre by 1990 and, in the case of Toronto, from over 15 inhabitants per acre in 1951 to less then 8 per acre by 1990. The effect of this fall in population density has been an ever-increasing city size which resulted in both Montréal and Toronto expanding their urban boundaries by 80 and 90 percent respectively between 1941 and 1961 and by another 35 and 60 percent respectively between 1961 and 1991. Exhibits 2 and 3 show how the rates of decline in population density have remained consistent over the last 50 years despite the unrelenting expansion of both cities. While urban planners in Toronto and Montréal may wish to limit this expansion in the future, only the most severe land control (Greenbelt) policy would be successful and government has shown little appetite for the very real problems that would result from such a policy. For example, in the case of Toronto, much of the land that will be developed between 1991 and 2020 is already zoned for development and would have to be bought back from developers. This is considered a major problem in establishing any land control policy.

As a result, unless there is major intervention with the market trends, the urban areas of Montréal and Toronto will extend out over 50 km and 95 km respectively from their downtown areas by the year 2025 (see Exhibits 4 and 5). If recent forecasts for Toronto's population to expand from 6 to 7 million by 2020 are realized, this radius would increase to 120 km for Toronto.

3. DOWNTOWN EMPLOYMENT

An important ingredient in the growth of urban areas has been the success of the downtown in attracting service employment. While little data exists on the historical trends in downtown employment, the Metropolitan Toronto Goods Movement Study noted the very real success downtown Toronto has had in attracting service employment. Office employment doubled in the Toronto Central Business District between 1970 and 1985 from 138,996 to 270,797 service jobs. This occurred at a time when both retail and manufacturing industry employment fell (see Exhibit 6). This growth in service employment in downtown Toronto was the driving force behind the 4-5 percent annual growth in commuter traffic that occurred at the same time. While the future rate of growth of downtown employment may not be as fast as it has been in the past, urban redevelopment policies and the desire to limit city expansion should result in an increased level of downtown employment in the future.

4. CONGESTION GROWTH

It is widely recognized that, for the past twenty years, the urban road construction programs have fallen behind the growth of urban traffic (in particular commuter traffic) and congestion has been rapidly increasing on both the urban arterial and expressway systems in the Québec-Ontario Corridor.

The increase in urban congestion was highlighted in the 1987 Metropolitan Toronto Goods Movement Study which showed that, for six urban arterial roads and the expressway "box" (i.e., the Gardiner Expressway, 427, 401, and Don Valley Parkway), the elasticity of speed with respect to volume was 0.9. This means that for each ten percent increase (or decrease) in volume, speed falls (or rises) by 9 percent. As a result, the effect of the recent recession which has temporarily decreased traffic by 20-25 percent has resulted in a 18-22 percent increase in speeds on the key roads into Toronto. Furthermore, as shown in the Metropolitan Toronto Goods Movement Study, since the growth in peak commuter traffic has consistently been 4-5 percent annually over the last twenty years, it is hardly surprising that a road system that was only at 50 percent capacity in the peak hour in 1965 is at capacity in 1990 (see Exhibit 7). However, it is not only in the peak hour that the highway system faces capacity problems. The spread of demand to off-peak hours has resulted in the twelve-hour 7 a.m. to 7 p.m. traffic levels threatening to reach capacity in the mid-1990's once the effects of the current recession recede. Given the lack of any major road building program and the continued growth of Toronto, significant highway capacity shortages and road congestion will undoubtedly develop in the late 1990's and the early part of the 21st Century.

5. INTERCITY TRAVEL TIMES

Clearly, the growth of urban congestion will only affect intercity travel in the areas where auto and road transit are used to access major urban areas such as Montréal and Toronto. Evidence of the impact of urban congestion on intercity bus timetables has been obtained from discussions with Voyageur (see Exhibit 8). For the peak hour, it can be seen that, even in 1993 when urban congestion was muted by the recession, Voyageur maintains that highway congestion increased bus travel times by 10-20 percent. In the Toronto-Montréal Corridor, peak hour journeys vary between 6 hours and 55 minutes and 7 hours and 20 minutes because of traffic, a variance of 25 minutes. In the Montréal-Quebec City Corridor, the journey time may vary between 2 hours and 20 minutes and 3 hours, a variance of 30 minutes. Since the affects of congestion increase with traffic volume and both urban and rural traffic levels are likely to grow at least 3-5 percent per year over the next twenty years, it seems inevitable that, over this period, Voyageur travel times will increase to a similar extent, i.e., 1 hour for travel between Toronto and Montréal and 40 minutes for travel between a large city like Toronto (or Montréal) and a smaller city such as Windsor (or Québec City).

Exhibit 1
Population Density and Its Rate of Decline for Montreal and Toronto

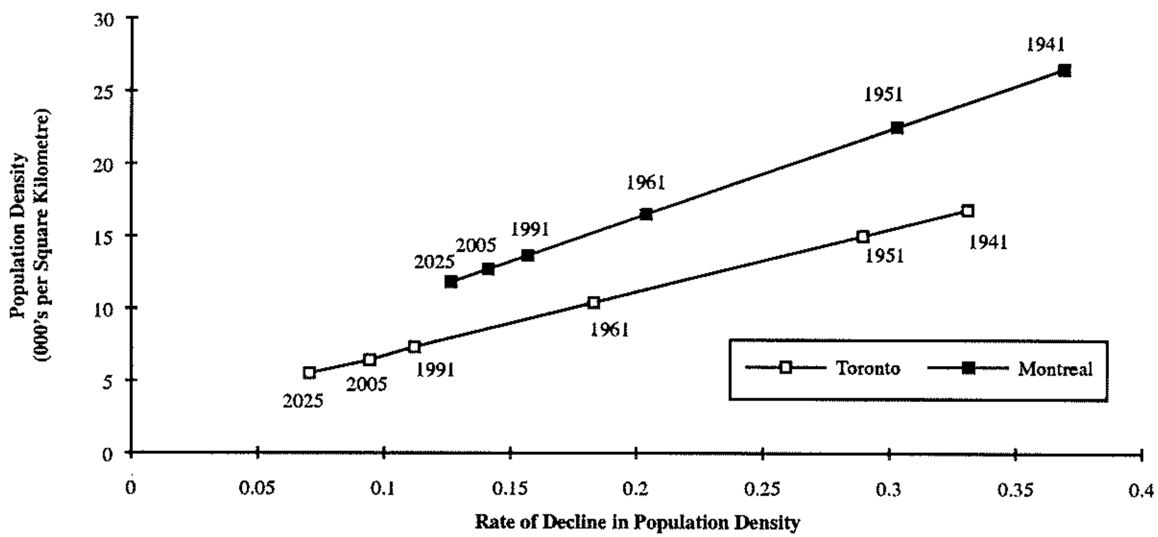


Exhibit 2
Montreal Population Density versus Radius of Urban Development

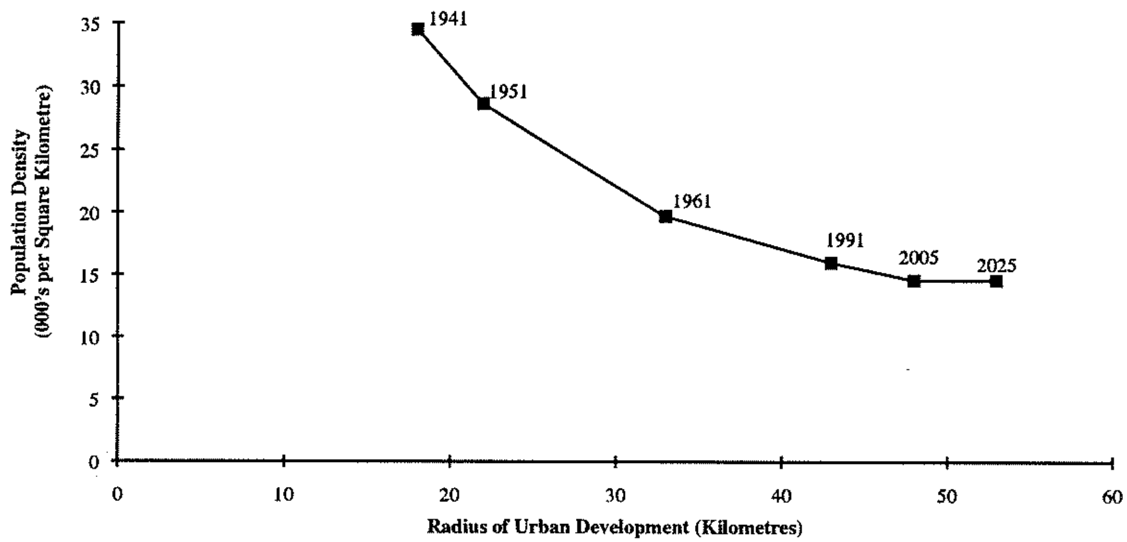


Exhibit 3
Toronto Population Density versus Radius of Urban Development

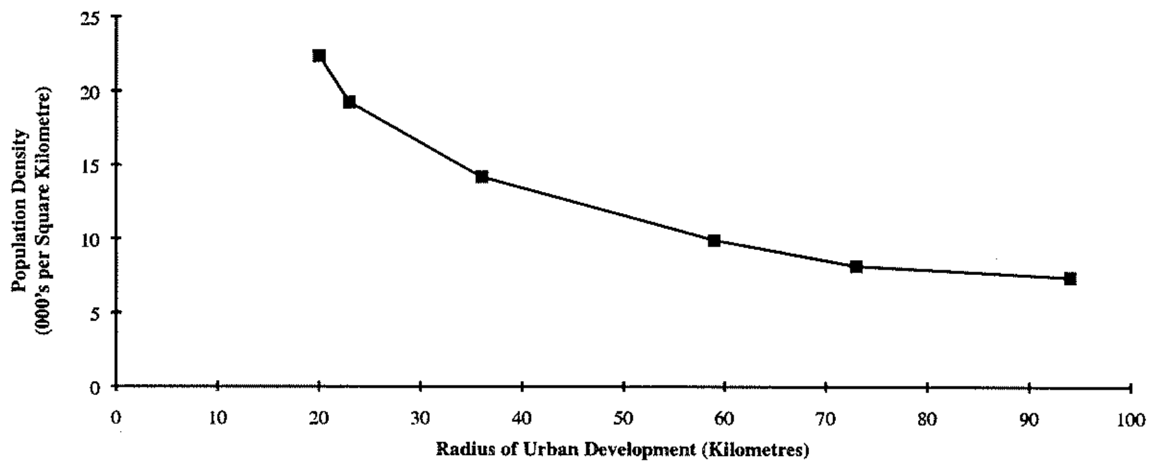


Exhibit 4
Sphere of Influence of Urban Development in Montreal in 2025

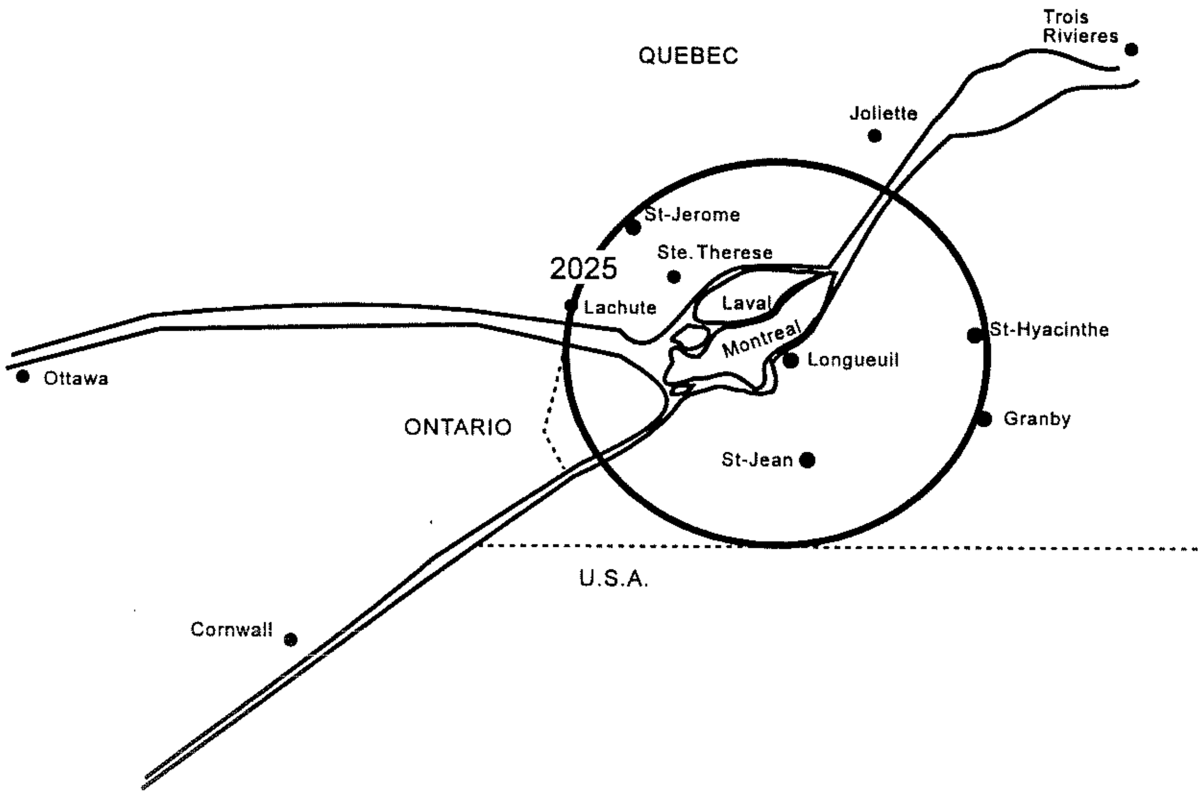


Exhibit 5
Sphere of Influence of Urban Development in Toronto in 2025

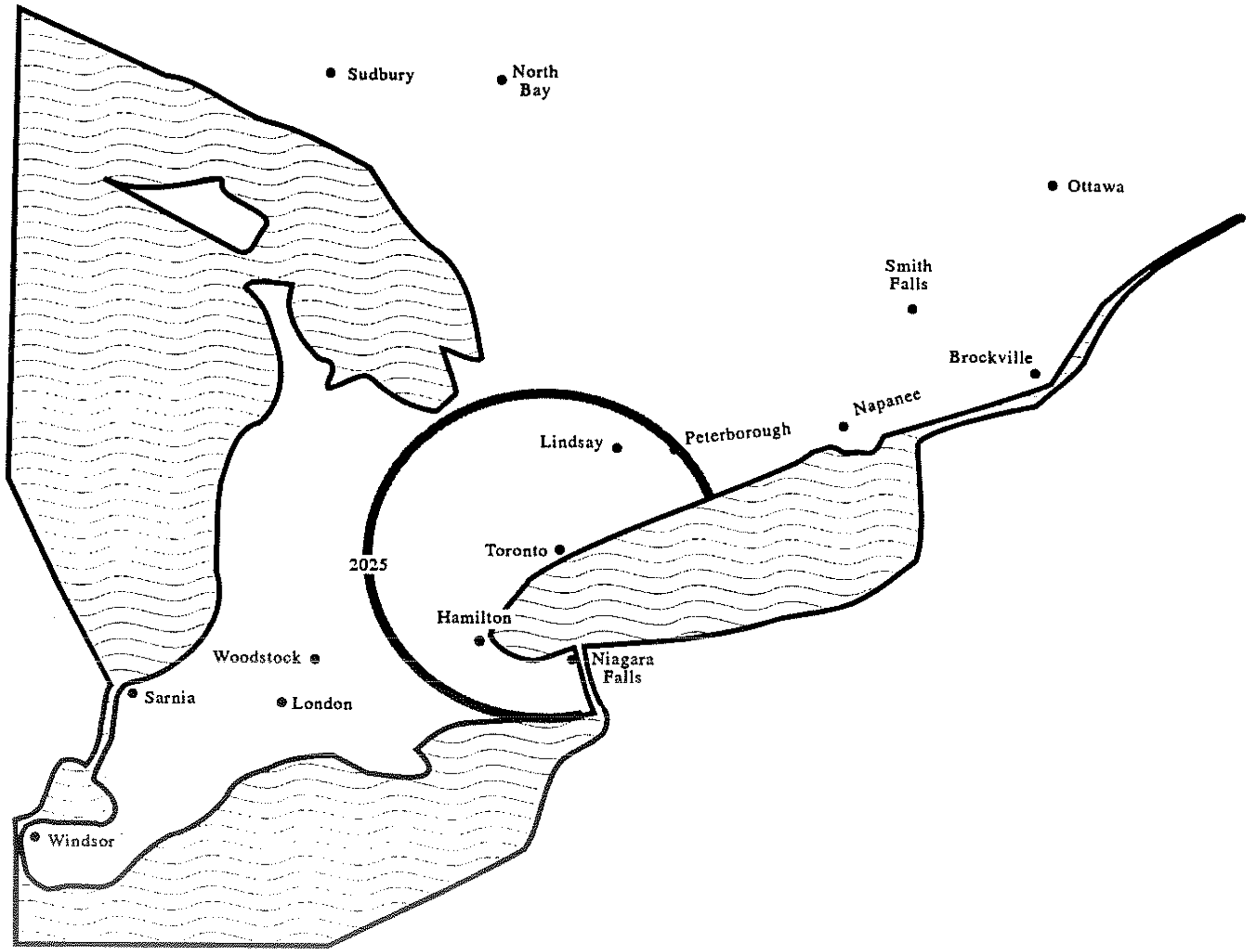


Exhibit 6
Change in Employment for Urban, Suburban and Outer Planning Districts of the Greater Toronto Area, 1975-1985

	Manufacturing & Warehousing		**Office**		**Retail**		**Total Change in Employment**
	1970	**1985**	**1970**	**1985**	**1970**	**1985**	
CBD PD1 (Zones 1,3)	69,736	31,283	138,996	270,797	35,417	31,183	39,114
Inner Suburbs PD3 (Zones 7, 8 pt)	61,099	32,988	7,285	20,155	11,173	12,751	-13,683
Outer Suburbs PD10 (Zone 12)	33,283	41,152	5,565	26,134	5,200	10,483	33,721

Source: Northwest Metro Transportation Study, Working Paper 14

Exhibit 7
Average Metropolitan Network Road Capacity Utilization

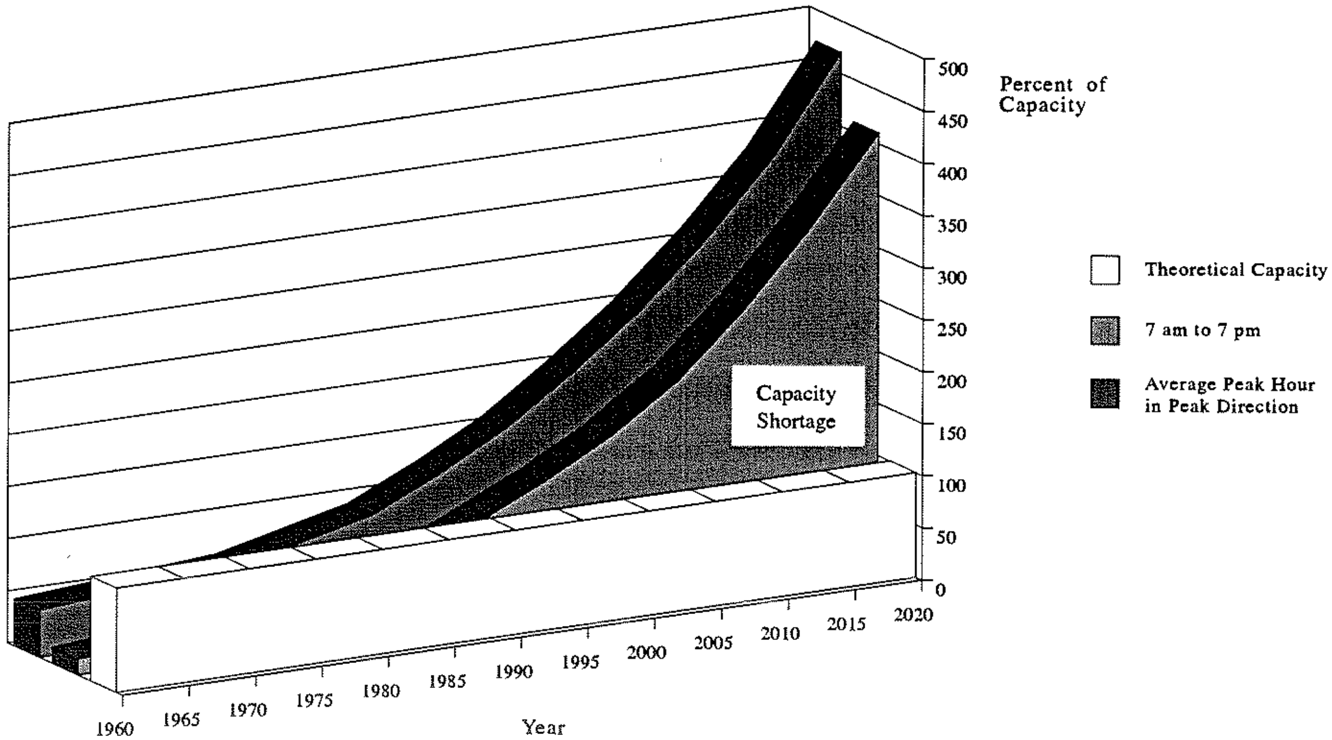


Exhibit 8
Effect of Congestion on Travel Time
for Voyageur Buses within the Quebec City-Toronto Corridor (1993)

Corridor	**Departure Time**	**Arrival Time**	**Trip Duration***	**Variation from Fastest Time**
Montreal-Toronto	8:30 am	3:30 pm	7:00	5 min
	5:30 pm	12:50 am	7:20	25 min
	12:00 pm	7:15 am	7:15	20 min
Toronto-Montreal	12:15 am	7:15 am	7:00	5 min
	9:00 am	3:55 pm	6:55	0 min
	2:15 pm	9:20 pm	7:05	10 min
	6:00 pm	12:55 am	6:55	0 min
Montreal-Quebec City	7:00 am	9:45 am	2:45	5 min
	8:00 am	10:45 am	2:45	15 min
	11:00 pm	1:30 am	2:30	0 min
Quebec City-Montreal	6:00 am	9:00 am	3:00	30 min
	8:00 am	10:45 am	2:45	15 min
	4:00 pm	6:45 pm	2:45	15 min

* *Trip duration to be read as hh:mm, e.g., 6:35 is 6 hours and 35 minutes.*