



**Lester B. Pearson International Airport  
Air-Rail Link Study**

**TRAFFIC AND FINANCIAL  
PROJECTIONS**

**Final Report**



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**Prepared for Transport Canada**

**by**

**KPMG LLP**

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## Executive Summary

This report presents the results of a study, conducted by KPMG for the Passenger Rail Task Force of Transport Canada, with the objective of examining the feasibility of a rail access service between Toronto's Union Station and Lester B. Pearson International Airport. The parameters of the service, defined as the Air-Rail Link, were developed by the IBI Group and described in a report entitled "Rapid Transit Access to Lester B. Pearson International Airport," issued in May 1999. The present study complemented IBI's work by:

- developing ridership projections for the Link,
- reviewing and refining IBI's capital cost estimates,
- developing operating cost estimates, and
- preparing financial projections for the project.

There have been many options suggested for rapid transit access to Pearson International Airport, which were narrowed down by IBI to a rail service that would connect Union Station with the Airport via CN's existing rail line, known as the Weston Subdivision. That line runs at a distance of less than 2 kms from the Airport. The option analyzed in this study included:

- fully double-tracking the Weston Subdivision,
- building several grade-separated crossings along the rail line,
- building a short rail spur from the existing railway line to a point near the Airport boundary, and a transfer station between the Air-Rail Link and the Airport's planned people-mover system at that point, and
- building seamless transfer connections between Toronto's Subway System and the Air-Rail Link at Union Station and at the Bloor-Dundas Subway Station: the only intermediate stop on the 25-kilometer link between Union Station and the Airport.

It was assumed in the study that the service will be performed by self-propelled Multiple Diesel Units, operating at 15-minute intervals and completing the ride between Union Station and the Airport in less than 20 minutes.



In order to project the expected ridership of the Air-Rail Link, a passenger survey was conducted in the departure areas of Pearson International Airport by Aerocan Aviation Specialists. Over 4,000 responses were obtained from originating passengers, which made it possible to develop estimates of the percentage of passengers who would use the Link. The estimates were based on the following factors:

- the locations in Toronto or its environs from which the surveyed passengers came to the airport,
- whether they were residents of the Toronto area or visitors,
- whether they had luggage to carry,
- whether they stated in the survey that they would or would not have used the Air-Rail Link on their present trip if it had been available, and
- the number of persons in their party.

After appropriate consideration of these factors it was estimated that in the first year of operation 8.6 % of all originating and terminating passengers at Pearson International Airport might use the Air-Rail Link. That number is approximately three times greater than the number of air travellers who currently use the Airport Express bus service, which charges a fare approximately equal to that assumed for the Air-Rail Link, but offers lower frequencies of service, longer travel times and less convenient transfers to or from Toronto's Subway System than foreseen for the Link.

It was assumed that the usage of the Air-Rail Link will increase to 10.4 % in 20 years. With that assumption, and the forecast growth in air traffic it was found that the number of air travellers who might use the Air-Rail Link would increase from approximately 2.0 million in the first year of service to 4.2 million by 2022. In addition, about two percent of the employees working at the airport may also use the service, as estimated on the basis of a brief survey of employees.

Based on these estimates financial projections were prepared to examine the feasibility of the Air-Rail Link. In order to prepare the projections, capital and operating cost estimates had to be developed for the service. It was estimated that the capital costs of the extensions and improvements to the existing rail line and the construction of transfer facilities, including contingencies and financing costs, will amount to \$282 million at 1999 price levels. The costs of the train sets were estimated to amount to \$33 million, for a total initial investment of \$315 million. Annual operating costs were estimated to amount to approximately \$9 million at 1999 price levels.



Several financing options were examined for the project. Assuming financial ratios that were considered acceptable to the financial markets for this type of project it was considered to be financeable if an equity of \$90 million was provided by the investors, i.e., approximately 28 % of the total required capital. With that assumption the after-tax internal rate of return of the project to the shareholders would be 12.4 %. With an 8.6 % ridership percentage the project would generate a positive cash flow in all years, approximating \$5 million in the first year.

In order to assess the risks of the project, a scenario was examined in which the rail service would attract only twice the percentage of air travellers who currently use the Airport Express bus service (instead of three times the current percentage), i.e. 5.8 % of all travellers. In that case the shareholders' after-tax internal rate of return would decline to 5.2 %. However, cash deficiencies of approximately \$19 million would be incurred during the first six years of operation, which would have to be made up by the shareholders, in addition to their initial investment of \$90 million.

Considering that risk, investors may find the 12.4 % return on their investment too low, in consideration of other opportunities that would be available for making investments in transportation infrastructure. Recognizing this possibility, financial projections were prepared for a scenario in which Government were to guarantee a subordinated loan to cover one-half of the shareholders' initial investment. The repayment of that loan would only start in the tenth year of operation and the Government would cover interest payments in all years in which the project's cash flow was negative.

In that scenario, the shareholders' after-tax internal rate of return in the "Base Case" would increase from 12.4 % to 16.9 %, which is likely to attract a reasonable number of potential investors.

As noted in the report, all the estimates above should be considered preliminary and subject to the assumptions made in the analysis. Investors will have to carry out their own due diligence tests before making any decisions. Nonetheless, the results of the study indicated that it is worthwhile for all interested parties to proceed with further actions on this project.



# I Introduction

This report prepared by KPMG LLP (“KPMG”) presents projections of passenger volumes for the proposed Air-Rail Link (the “Link”) between Toronto’s Union Station and Lester B. Pearson International Airport (LBPIA), and of the potential financial returns to an operator of the Link.

The overall objective of this study, commissioned by the Passenger Rail Task Force of Transport Canada, was to examine the potential feasibility of a financially self-supporting dedicated rail service between Union Station and the Airport. An earlier report on this subject, entitled “Rapid Transit Access to Lester B. Pearson International Airport,” was prepared by the IBI Group and was issued in May 1999. That report defined the technical parameters of the proposed service and developed preliminary capital cost estimates for the project.

The IBI report examined several options. The options analyzed in this report assumed a 25-kilometer Link between Union Station and the Airport utilizing CN’s existing Weston subdivision, to a point approximately 2 kilometers northeast of the Airport. From that point a rail spur would be built to a terminal close to the airport boundary, where passengers would transfer from the Air-Rail Link to the Airport’s proposed people-mover system. The people-mover would provide direct connections between the Air-Rail Link and each passenger terminal.

The Air-Rail Link would have one stop enroute at Bloor and Dundas Streets, adjacent to the existing Subway Station. Seamless transfers would be provided between the Subway System and the Air-Rail Link, both at Union Station and at the Bloor-Dundas Subway Station.

An additional stop might be provided near the Woodbine Race Track if the Ontario Jockey Club were to go ahead with its potential development plans in that area. Whereas the costs of fully double-tracking CN’s Weston Sub division, providing several grade separations along the line, building a new railway spur and transfer station at the Airport and providing convenient transfer facilities between the Subway System and the Air-Rail Link have all been included in the analysis, the costs of a station near the potential Woodbine development and its impacts on the ridership of the Link were not included in the study.

It was assumed that frequent service would be provided on the Link by self-propelled Diesel Multiple Units, seating 162 to 240 passengers and completing the ride between the Airport and Union Station in less than 20 minutes.



The scope of the present study included:

- the development of ridership projections for the proposed Air-Rail Link,
- a review and refinement of the capital cost estimates prepared by IBI and the development of estimates for operating costs, and
- based on the results of the tasks above, the preparation of financial projections for exploring the financial viability of the project on a preliminary basis.

The study indicated a reasonable level of probability for the project to be financially viable without imposing a burden on taxpayers. The study provided sufficient grounds for further proceeding with the process, aimed at the implementation of the proposed service in the first half of the next decade.

The report is divided into the following parts:

- Traffic analysis and projections.
- Description of the service and estimates of costs.
- Financial projections.

All projections contained in the report are based on estimates and KPMG does not assume any responsibility for their validity in actual practice. The study results are for the sole use of Transport Canada and shall not be used for the purpose of raising financing.



## II Air Traffic Analysis and Projections

The analysis and projections of passenger volumes were based on an interview survey of air travellers, performed by Aerocan Aviation Specialists Inc. in the departure areas of LBPIA during the month of June 1999. The following methodology was used for developing ridership projections for the proposed service:

- In order to obtain a full understanding of the traffic profile of LBPIA, and to serve as the basis for projections, the characteristics of LBPIA's present traffic were determined. This task was performed prior to the passenger survey.
- The passenger survey was then completed, which provided the following information:
  - The percentage of air travellers in major user groups, such as:
    - (i) residents of the Region vs. visitors to the Region,
    - (ii) passengers travelling on business vs. non-business travellers,
    - (iii) users of the major travel sectors (Domestic Scheduled, Transborder Scheduled, Overseas/Caribbean Scheduled and Charter), and
    - (iv) groups defined by several other characteristics which were considered to influence peoples' decisions regarding the use of the Air-Rail Link.
  - The geographic areas from which the passengers access the Airport.
  - The mode of transport by which they access the Airport.
  - The passengers' views (at the time of the interview) whether they might have used the proposed Air-Rail Link on their current trip if it had been available.
- Next, the survey results were expanded to the expected full traffic of 1999.
- Next, adjustments were applied to the survey results to (i) eliminate inconsistent responses and (ii) eliminate the responses of some respondents who said that they would use the Link but whose responses were considered unreliable.



- Based on a general understanding of peoples' decision-making process regarding airport access, estimates were then made of the proportions of travellers who might decide not to use the Link at the time of their actual travel, even if they said they wanted to do so at the time of the survey. At the time of their travel these travellers may decide not to take the train for a variety of reasons, including the number of travellers in their party, the weight of their luggage, weather conditions or other reasons.
- After having estimated the likely number of air travellers who would use the Air-Rail Link in 1999 if it were available, projections were developed to the year 2022 and assumptions made for the ensuing 20 years.

In parallel with the interview survey of air travellers, a mail-back survey of airport employees was also conducted. Questionnaires were handed out to a sample of airport employees and to the staff of businesses and other organizations operating on airport property, to obtain a broad estimate of the likely number of daily commuters who may use the Air-Rail Link.

The results of the surveys and their expansion to the totality of potential users of the Air-Rail Link are described in the next sections.

## **A. 1999 Passenger Statistics and Expansion of the Survey Results**

To determine the composition of passengers at LBPIA two statistical sources were used:

- Monthly statistics published by LBPIA.
- Statistics Canada's reports on the traffic at Canadian airports and on the origins and destinations of passengers within Canada and between Canada and the United States.<sup>1</sup>

LBPIA's statistics for enplaned + deplaned passengers are the most complete, as they include non-revenue passengers<sup>2</sup> and the passengers of carriers that do not provide full data to Statistics Canada.<sup>3</sup> Furthermore, LBPIA correctly classifies the passengers of international flights stopping over in Montreal or Vancouver as overseas passengers, while Statistics

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<sup>1</sup> "Air Carrier Traffic at Canadian Airports" Catalogue #51-203, "Air Passenger Origin Destination" Catalogue #51-204 and #51-205.

<sup>2</sup> Approximately 3.5% of all scheduled passengers are airline employees or their families, while 4.5% of all scheduled passengers travel on frequent flyer plans, without paying for their tickets. Until mid-1997 these passengers were not included in Statistics Canada's data.

<sup>3</sup> U.S. aircraft with less than 60 seats and none of the aircraft operated by foreign carriers participate in Statistics Canada's origin/destination survey. In the domestic sector, small local/regional carriers and scheduled aircraft operated by charter carriers do not participate either.



Canada puts them into the domestic category. However, LBPIA does not distinguish between originating/ terminating and connecting (transfer) passengers. This is why Statistics Canada's data had to be used to complement LBPIA's data.

Statistics Canada provide data for originating and terminating passengers (as distinct from those enplaning and deplaning passengers who make connections between flights but do not leave the airport and do not use ground transportation). However, Statistics Canada data were only available up to the year 1997. For that year, a detailed analysis was applied to Statistics Canada's data to separate connecting passengers from originating + terminating passengers, and their proportions were then applied to the 1999 LBPIA data.

Using this process, and LBPIA's data for the first five months of 1999, it was estimated that the total number of originating + terminating passengers at LBPIA is expected to be 20.2 million in 1999. The following estimates were developed for the individual traffic sectors:

Domestic Scheduled:	6,500,000
Transborder Scheduled:	6,500,000
Overseas and Caribbean Scheduled:	3,400,000
Charters:	<u>3,800,000</u>
Total:	20,200,000

After having determined the annual control totals for originating + terminating passengers, their distribution throughout a typical day was estimated. This was necessary because people behave differently at different times of the day with respect to their methods of access to the airport. As it was not possible to ensure that a constant percentage of enplaning passengers will be surveyed during every hour of the day, the survey results had to be stratified by time period. The following time periods were identified:

Morning:	6am to 10am
Late morning/noon:	10am to 1pm
Early afternoon:	1pm to 4pm
Mid-afternoon:	4pm to 6pm
Late afternoon:	6pm to 8pm
Evening:	8pm to midnight



The actual number of seats departing from LBPIA during these periods in the month of June were determined from (1) the Official Airline Guide and (2) flight schedules obtained from the Airport (to account for charter flights not contained in the Official Airline Guide). The load factors<sup>4</sup> for each flight sector (Domestic Scheduled, Transborder Scheduled, Overseas/Caribbean Scheduled and Charter) were calculated by reconciling the numbers of seats with the known passenger volumes in each sector. As the actual numbers of passengers carried by each flight are confidential, the assumption had to be made that each flight had the same load factor within a particular traffic sector, regardless of the time of the day or season. This assumption tends to underestimate the ridership of the Link, as it underestimates the proportion of people who travel during peak periods, when the relative usage of the Link is likely to be higher than average. Whereas the extent of this underestimate is not known, it influences the traffic projections for the Link in a conservative direction.

By comparing the numbers of valid survey responses obtained within each time period with the corresponding annual numbers of passengers enplaning during the same time period, multipliers, or “weights”, were developed for each traffic sector and time period which, when applied to the survey responses, produced the desired annual control totals.<sup>5</sup>

Another factor not considered in the expansion of the survey results was the impact of seasonal variations i.e., the recognition that winter airline schedules are somewhat different from the June schedules, which would result in different multipliers or “weights” than those used in this study. More importantly, it is likely that passengers would behave differently in the cold weather of winter with respect to their choice of access to the Airport than in the summer. These seasonal differences were recognized in the adjustment of the survey results, as discussed later in the report.

As far as the composition of the passengers is concerned, it was assumed that June was fairly representative of annual averages, as it falls between the summer holiday season and the season of more prominent business travel.

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<sup>4</sup> For the purpose of this study, load factor was defined as the number of enplaning passengers divided by the number of seats on each aircraft.

<sup>5</sup> The multipliers ranged from 1,656 (10 am to 1 pm in the Domestic scheduled sector) to 15,786 (during the morning hours in the Charter sector, when very few flights were “caught”), with an average of 4,532.

## **B. Survey Results**

As noted, the passenger survey was an intercept (interview) survey, conducted in the departure areas of LBPIA. A copy of the survey questionnaire, used by the interviewers, is presented in Appendix A. The following was the methodology for developing the estimates of current passenger profiles:

- LBPIA's service area was divided into Zones. Appendix B shows the Zones in the GTA and the percentage of travellers originating in each Zone, as well as outside the GTA.
- The Zones were then grouped in accordance with the likelihood that people originating in the Zone may include the Air-Rail Link into their access to the Airport. Four categories of Zones were identified, defined as being parts of "Prime", "Good", "Potential" or "Infeasible" Areas.
- Two groups of responses were eliminated from the interview results:
  - The responses of those people who stated that they would not have used the train on their current trip.
  - The responses of those people who stated that they would have used the train but whose responses appeared to be unrealistic in consideration of the geographic location from which they came to the Airport.
- The remainder was defined as representing the "Addressable Market".
- Further adjustments were then made to the results to account for the estimated number of people who might have thought at the time of the interview that they would have used the train on their current trip if it had been available but who, in fact, may not use it at "decision time", as explained later in this section.
- The remainder of the responses was considered to represent the "Predicted Ridership" of the Link.

In reporting the survey results only the weighted results are shown in the Tables of this section, i.e., the survey counts expanded to the estimated 1999 passenger volumes.



## **C. Survey Statistics**

The survey produced 6,180 fully completed responses, of which 1,723, or 27.9% related to connecting (transfer) passengers and were therefore irrelevant to the study. Accordingly, the survey produced 4,457 valid responses of originating passengers.

The survey covered all three terminals at LBPIA from June 2 to June 27, 1999. Care was taken to cover all hours of the day and all terminals at least three times: twice on weekdays and once on weekends.

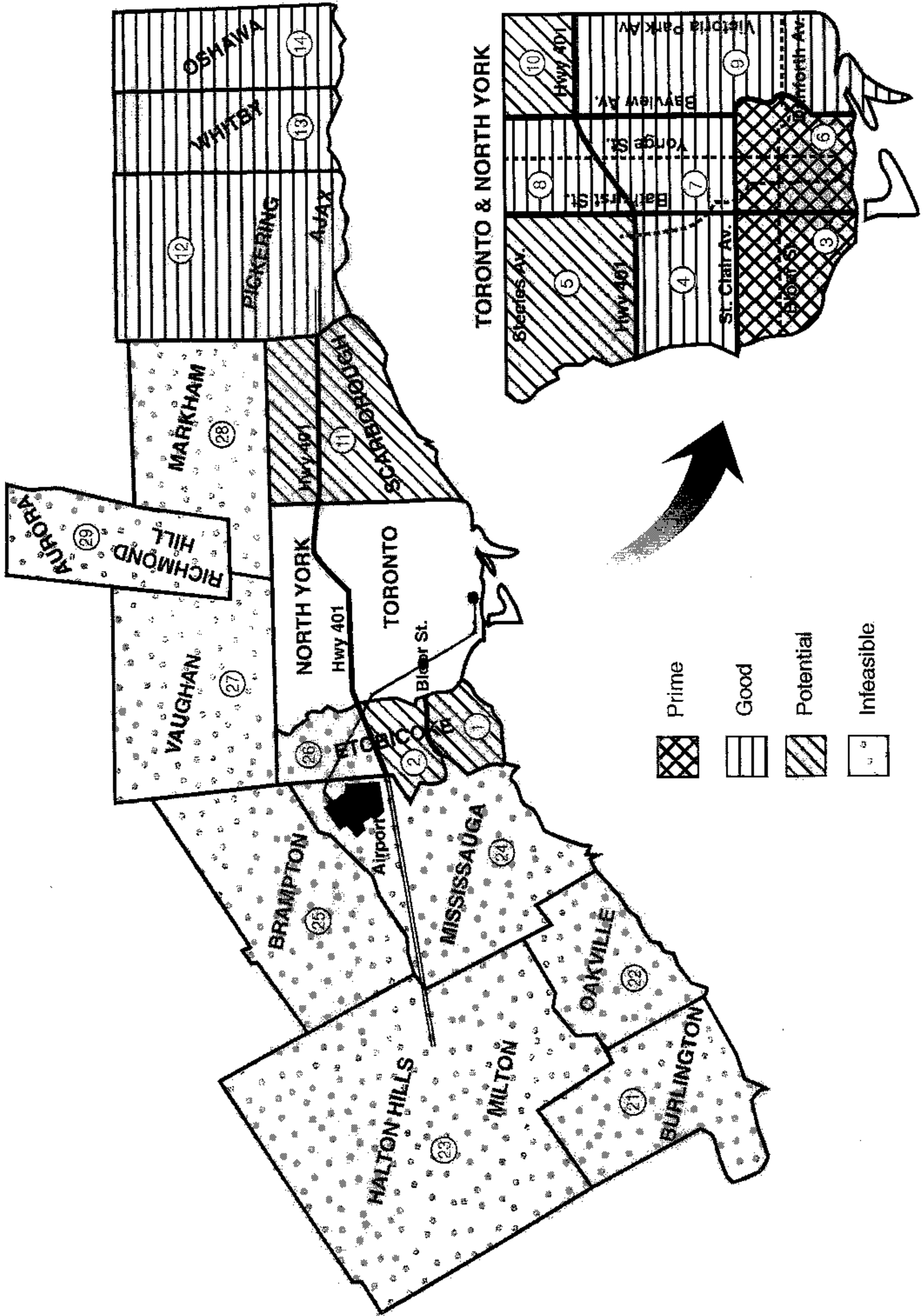
The interviewers actually approached 7,510 persons. About 10 % of the approached individuals either refused to respond or (in most cases) had language problems and could not be interviewed. About 7.5 % of the responses were “spoiled”, mostly because the interviews had to be interrupted when flights were called or were obtained from in-transit (same-plane) passengers “stretching their legs” in the terminals (about 1.0 %). These deductions resulted in the aforementioned 6,180 completed responses of which 4,457 were from originating passengers.

## **D. Passenger Origins by Area**

As noted, the geographic region served by LBPIA was divided into four areas, distinguished by the level of convenience that people accessing the Airport from each Area (or accessing each Area from the Airport) would find when making a decision whether or not to use the Air-Rail Link. Exhibit 1 shows the grouping of Zones into the four Areas. More details on the Zones are provided in Appendix B.

EXHIBIT 1

AREA CATEGORIES





As noted, the four identified Areas were defined as “Prime”, “Good”, “Potential” and “Infeasible”. The Zones were then assigned to these four Areas on the basis of logic, considered to reflect people’s most likely behaviour in a reasonable manner. The designations may not perfectly fit everybody’s decision process, but are, nonetheless, considered to be representative of the likely choices of most travellers.

The **Prime Area** consisted of the two zones surrounding Union Station and the Bloor-Dundas Subway Station (Zones 3 and 6 on the map in Appendix B). The **Good Area** included the zones served by Toronto’s Subway System and the Eastern Lakeshore Go Train Service. They excluded the zones served by the GO system’s Western routes (Mississauga, Oakville, Burlington, Milton, Brampton), as people from these zones would not be likely to travel all the way to Union Station (actually in the opposite direction from their final destination), only to subsequently trace their steps back to the Airport. They also excluded the Northern GO routes (Barrie, Bradford, Newmarket), as people bused by the Go system to the Yonge-York Mills Subway Station would be more likely to transfer at that point to a bus of the Airport Express service, which would be able to offer essentially the same times and costs to the travellers as the Subway/Air-Rail Link combination.

The **Potential Area** included:

- Southern Etobicoke, served by the Bloor Subway and GO Transit.
- Scarborough, served by the Subway System and GO Transit.
- The northern parts of North York with good access to the Steeles and Finch Subway Stations by city bus.
- Cities served by VIA Rail Canada, except for the Kitchener-Waterloo-Guelph-Cambridge area, which is served by VIA Rail with a stop at Malton, quite close to the Airport.

All other zones in the GTA and communities outside the GTA not directly served by VIA Rail were considered to be part of the **Infeasible Area**. Within the GTA they included the North part of Etobicoke (quite close to the airport), the municipalities North of Toronto such as Vaughan, Richmond Hill, Aurora and Markham (which are quite far from Union Station and have good access to the Airport via Highway 407) and municipalities West of the Airport (such as Mississauga, Oakville, Burlington, Milton, Brampton) for the reasons noted above. It is important to note, however, that for those areas north of the airport, there is considerable potential associated with providing a connecting station at Woodbine. Such a station would allow VIA Rail passengers from outside the GTA to connect to the airport link as well as GO Transit passengers located north of the airport. In addition, there is potential to increase ridership by exploring possible Park&Ride services using airport parking lots or else the construction of new lots at Woodbine.



The key Zones, from which most of the patronage of the proposed Link is expected, are Zones 3 and 6, defined as the “Prime Area”. It was found in the survey that approximately 19 % of the air travellers come from or visit those two Zones. The following distribution of airport passengers was found for the four Areas:

### Origin of enplaned air travellers by Area ('000 annual passengers)

	Prime Area	Good Area	Potential Area	Infeasible Area	Total
<b>Business travellers</b>					
Residents	284	412	438	1,127	<b>2,261</b>
Visitors	776	335	335	667	<b>2,113</b>
<b>TOTAL</b>	<b>1,060</b>	<b>747</b>	<b>773</b>	<b>1,794</b>	<b>4,374</b>
<b>Non-business travellers</b>					
Residents	415	597	889	1,586	<b>3,487</b>
Visitors	456	359	358	1,067	<b>2,240</b>
<b>TOTAL</b>	<b>871</b>	<b>956</b>	<b>1,247</b>	<b>2,653</b>	<b>5,727</b>
<b>All travellers</b>					
Residents	699	1,009	1,327	2,713	<b>5,748</b>
Visitors	1,232	694	693	1,734	<b>4,353</b>
<b>TOTAL</b>	<b>1,931</b>	<b>1,703</b>	<b>2,020</b>	<b>4,447</b>	<b>10,101</b>

### Origin of enplaned air travellers by Area (Percent of all travellers)

	Prime Area	Good Area	Potential Area	Infeasible Area	Total
<b>Business travellers</b>					
Residents	2.8%	4.1%	4.3%	11.2%	<b>22.4%</b>
Visitors	7.7%	3.3%	3.3%	6.6%	<b>20.9%</b>
<b>TOTAL</b>	<b>10.5%</b>	<b>7.4%</b>	<b>7.6%</b>	<b>17.8%</b>	<b>43.3%</b>
<b>Non-business travellers</b>					
Residents	4.1%	5.9%	8.8%	15.7%	<b>34.5%</b>
Visitors	4.5%	3.6%	3.5%	10.6%	<b>22.2%</b>
<b>TOTAL</b>	<b>8.6%</b>	<b>9.5%</b>	<b>12.3%</b>	<b>26.3%</b>	<b>56.7%</b>
<b>All travellers</b>					
Residents	6.9%	10.0%	13.1%	26.9%	<b>56.9%</b>
Visitors	12.2%	6.9%	6.8%	17.2%	<b>43.1%</b>
<b>TOTAL</b>	<b>19.1%</b>	<b>16.9%</b>	<b>19.9%</b>	<b>44.1%</b>	<b>100.0%</b>



The next step was to identify those air travellers who answered “Yes” to the question whether they would have used the Air-Rail Link on their current trip if it had been available. Obviously, a significantly larger percentage of travellers responded “Yes” coming from the Prime Area than from the less attractive areas.

Before identifying those percentages, however, an adjustment was made to the “Yes” responses in consideration of a certain portion of people who did not appear to have carefully listened to the question and did not state what they themselves would have done on their current trip if the rail service had been available. They rather answered in a general way, stating what they believed other people should or would generally do. This became clearly apparent from responses obtained from travellers originating in the Infeasible Area, where close to 20 % of the respondents stated that they would have used the rail service. For example, when some of the respondents from the Infeasible Area were asked how they would have accessed Union Station that day, they said “by subway”, even though they might have actually originated their trip in such places as Oakville, far from any subway.

This type of answer to questions is commonly encountered in surveys. A certain percentage of people do not put themselves into a hypothetical situation and do not think of their own behaviour in that situation, but rather answer in a way that is “politically correct” i.e., what appears to be the proper behaviour of a person who has a choice. Some people also want to avoid disappointing the surveyors.

In order to discount the impact of this respondent group, it was assumed that only 80 % of the people responding “Yes” to the question regarding train usage answered truthfully, while the distribution of the rest between the “Yes” and “No” answers was actually the same as the distribution found for the first 80 %. After this correction an estimate was made of the “addressable market”, i.e., of the number of people who could be considered candidates for using the Air-Rail Link.

## E. The Addressable Market

The following table shows the numbers and percentages of the passengers who, after the aforementioned correction, said that they would have used the Air-Rail Link on their current trip:

### The Addressable Market by Area ('000 annual O+T passengers)

	Prime Area	Good Area	Potential Area	Infeasible Area	Total
Business travellers					
Residents	336	280	69	0	685
Visitors	993	341	86	0	1,420
<b>TOTAL</b>	<b>1,329</b>	<b>621</b>	<b>155</b>	<b>0</b>	<b>2,105</b>
Non-business travellers					
Residents	560	396	375	0	1,331
Visitors	521	262	138	0	921
<b>TOTAL</b>	<b>1,081</b>	<b>658</b>	<b>513</b>	<b>0</b>	<b>2,252</b>
All travellers					
Residents	896	676	444	0	2,016
Visitors	1,514	603	224	0	2,341
<b>TOTAL</b>	<b>2,410</b>	<b>1,279</b>	<b>668</b>	<b>0</b>	<b>4,357</b>

### The Addressable Market by Area (Percent of all O+T passengers)

	Prime Area	Good Area	Potential Area	Infeasible Area	Total
Business travellers					
Residents	59.7%	34.1%	7.9%	0.0%	15.9%
Visitors	63.9%	51.0%	12.8%	0.0%	29.5%
<b>TOTAL</b>	<b>62.8%</b>	<b>41.7%</b>	<b>10.0%</b>	<b>0.0%</b>	<b>23.1%</b>
Non-business travellers					
Residents	68.3%	33.5%	21.1%	0.0%	18.5%
Visitors	57.1%	36.5%	19.5%	0.0%	23.7%
<b>TOTAL</b>	<b>62.4%</b>	<b>34.6%</b>	<b>20.7%</b>	<b>0.0%</b>	<b>20.3%</b>
All travellers					
Residents	64.8%	33.7%	16.7%	0.0%	17.5%
Visitors	61.4%	43.5%	16.3%	0.0%	26.9%
<b>TOTAL</b>	<b>62.6%</b>	<b>37.7%</b>	<b>16.6%</b>	<b>0.0%</b>	<b>21.6%</b>



The Table shows that 21.6 % of all originating travellers complied with the following three criteria:

- they came from Areas from which it was logical to make use of the Air-Rail Link,
- they answered “Yes” to the question whether they would have used the Link on their current trip, and
- their response was not inconsistent with the Area they came from.

It should be noted that the question in the interview (see Appendix A) was quite clear on what was asked: “WOULD YOU HAVE **USED** THIS TRAIN TODAY?” Yet many people appeared to have interpreted the question in a broader sense, meaning whether they would have **considered** using the train today. It was assumed in the ensuing analysis that this was most peoples’ interpretation of the question.

In order to estimate the sensitivity of the positive responses to the usage of the Link the respondents to the survey were presented with six scenarios, randomly distributed across the process. Two train frequency scenarios were presented to them: a train every 10 minutes and a train every 15 minutes (Series i and ii). For each frequency scenario, three price scenarios were presented to the respondents: a \$5, a \$10 and a \$15 one-way fare (Series A, B and C). Approximately equal numbers of interviews were performed for each scenario, producing approximately 700 complete responses for each of the six scenarios.<sup>6</sup>

As shown later in this Chapter, the study indicated that when fares are raised beyond the \$15 level, revenues to the Link operator begin to decline strongly on account of declining usage of the Link. Consequently, exploring a scenario beyond that fare level would not have produced useful information.

It was found that the sensitivity of people to **train frequencies** was quite small in the range that was used or, at least, the respondents could not differentiate between the two alternatives in the hypothetical situations presented to them.

Accordingly, in the following discussion, the responses to the 10-minute and 15-minute headway scenarios are combined and the combined results are presented for each of the \$5, \$10, and \$15 scenarios. They are presented in detail in Exhibits 2A to 2C, and are summarized in the Table following the detailed Exhibits, on Page 21.

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<sup>6</sup> An additional set of 157 interviews, which were treated outside the main analysis, explored peoples’ reaction to a 20 minute headway. Furthermore, 100 responses had to be ignored because of incomplete or ambiguous answers.

EXHIBIT 2A

SURVEY RESPONSES ADJUSTED FOR OVERSTATEMENTS: THE "ADDRESSABLE MARKET"  
 '000 annual passengers

**Scenario A(i): 10 minutes headway, \$5 fare**

Party and Bag Code	Business				Non Business				Total				Grand Total								
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Resident		Visitor						
	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes					
1 person with no bags	211	32	15.3	196	70	35.5	136	25	18.3	32	4	11.5	347	57	16.5	229	74	32.1	576	131	22.7
1 person with bags	196	33	16.8	386	64	16.6	487	138	28.3	255	98	38.5	683	171	25.0	641	163	25.3	1,324	334	25.2
2+ persons	149	6	3.9	156	57	36.7	540	53	9.9	250	99	39.6	689	59	8.6	406	156	38.5	1,095	215	19.7
<b>Total</b>	<b>556</b>	<b>71</b>	<b>12.8</b>	<b>739</b>	<b>191</b>	<b>25.9</b>	<b>1,163</b>	<b>216</b>	<b>18.6</b>	<b>537</b>	<b>201</b>	<b>37.4</b>	<b>1,719</b>	<b>287</b>	<b>17</b>	<b>1,276</b>	<b>392</b>	<b>30.7</b>	<b>2,995</b>	<b>680</b>	<b>22.69</b>

**Scenario A(ii): 15 minutes headway, \$5 fare**

Party and Bag Code	Business				Non Business				Total				Grand Total								
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Resident		Visitor						
	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes					
1 person with no bags	159	23	14.6	242	78	32.3	83	33	39.6	75	29	38.6	242	56	23.2	318	107	33.8	560	164	29.2
1 person with bags	380	75	19.7	340	100	29.5	469	91	19.4	239	68	28.2	848	166	19.5	579	168	29.0	1,427	333	23.4
2+ persons	153	9	5.9	201	68	33.8	581	103	17.6	360	77	21.4	734	112	15.2	562	145	25.9	1,296	257	19.8
<b>Total</b>	<b>691</b>	<b>107</b>	<b>15.5</b>	<b>784</b>	<b>247</b>	<b>31.5</b>	<b>1,133</b>	<b>226</b>	<b>20.0</b>	<b>674</b>	<b>174</b>	<b>25.8</b>	<b>1,824</b>	<b>333</b>	<b>18.3</b>	<b>1,458</b>	<b>420</b>	<b>28.8</b>	<b>3,282</b>	<b>754</b>	<b>22.96</b>

**Combined Scenario A: 10 and 15 minutes headway, \$5 fare**

Party and Bag Code	Business				Non Business				Total				Grand Total								
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Resident		Visitor						
	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes					
1 person with no bags	370	56	15.0	439	148	33.7	220	58	26.4	108	33	30.4	589	114	19.3	546	181	33.1	1,136	294	25.9
1 person with bags	576	108	18.7	726	165	22.7	956	229	23.9	494	166	33.6	1531	337	22.0	1220	330	27.1	2,751	667	24.2
2+ persons	302	15	4.9	357	125	35.1	1121	156	13.9	610	176	28.9	1423	171	12.0	968	302	31.2	2,390	472	19.7
<b>Total</b>	<b>1247</b>	<b>178</b>	<b>14.3</b>	<b>1,522</b>	<b>438</b>	<b>28.8</b>	<b>2,296</b>	<b>443</b>	<b>19.3</b>	<b>1,212</b>	<b>375</b>	<b>30.9</b>	<b>3,543</b>	<b>621</b>	<b>17.5</b>	<b>2,734</b>	<b>813</b>	<b>29.7</b>	<b>6,277</b>	<b>1,433</b>	<b>22.83</b>

**EXHIBIT 2B**

**SURVEY RESPONSES ADJUSTED FOR OVERSTATEMENTS: THE "ADDRESSABLE MARKET"**  
 '000 annual passengers

**Scenario B(ii): 15 minutes headway, \$10 fare**

Party and Bag Code	Business				Non Business				Total												
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Grand Total								
	Would Take Train?	%	Total	%	Would Take Train?	%	Total	%	Would Take Train?	%	Total	%	Would Take Train?	%							
1 person with no bags	159	49	30.4	216	102	47.3	126	51	40.1	65	37	56.0	285	99	34.7	281	139	49.3	567	238	42.0
1 person with bags	476	73	15.4	343	156	45.4	378	83	21.9	308	67	21.7	855	156	18.3	651	223	34.2	1,506	379	25.1
2+ persons	141	31	22.0	187	71	38.1	582	114	19.6	369	95	25.8	723	145	20.1	555	166	29.9	1,278	311	24.4
<b>Total</b>	<b>777</b>	<b>153</b>	<b>19.7</b>	<b>746</b>	<b>329</b>	<b>44.1</b>	<b>1,086</b>	<b>247</b>	<b>22.8</b>	<b>742</b>	<b>199</b>	<b>26.8</b>	<b>1,863</b>	<b>400</b>	<b>21</b>	<b>1,488</b>	<b>528</b>	<b>35.5</b>	<b>3,351</b>	<b>928</b>	<b>27.68</b>

**Scenario B(ii): 15 minutes headway, \$10 fare**

Party and Bag Code	Business				Non Business				Total												
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Grand Total								
	Would Take Train?	%	Total	%	Would Take Train?	%	Total	%	Would Take Train?	%	Total	%	Would Take Train?	%							
1 person with no bags	186	29	15.5	122	40	33.0	21	10	48.5	96	2	1.6	206	39	18.8	218	42	19.2	424	81	19.0
1 person with bags	363	50	13.7	418	91	21.8	607	160	26.4	212	59	27.7	970	210	21.7	630	150	23.8	1,600	360	22.5
2+ persons	78	7	8.6	133	50	37.7	543	76	13.9	345	104	30.1	621	82	13.2	478	154	32.2	1,099	236	21.5
<b>Total</b>	<b>627</b>	<b>85</b>	<b>13.6</b>	<b>672</b>	<b>181</b>	<b>27.0</b>	<b>1,170</b>	<b>246</b>	<b>21.0</b>	<b>653</b>	<b>164</b>	<b>25.1</b>	<b>1,797</b>	<b>331</b>	<b>18.4</b>	<b>1,325</b>	<b>345</b>	<b>26.1</b>	<b>3,123</b>	<b>676</b>	<b>21.66</b>

**Combined Scenario B: 10 and 15 minutes headway, \$10 fare**

Party and Bag Code	Business				Non Business				Total												
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Grand Total								
	Would Take Train?	%	Total	%	Would Take Train?	%	Total	%	Would Take Train?	%	Total	%	Would Take Train?	%							
1 person with no bags	345	77	22.4	338	143	42.1	147	61	41.2	161	38	23.6	492	138	28.0	499	181	36.2	991	318	32.1
1 person with bags	840	123	14.6	761	247	32.4	985	243	24.7	520	126	24.1	1824	366	20.1	1281	372	29.1	3,106	738	23.8
2+ persons	219	38	17.2	319	121	37.9	1125	190	16.8	714	199	27.9	1344	227	16.9	1033	320	31.0	2,377	547	23.0
<b>Total</b>	<b>1,404</b>	<b>238</b>	<b>17.0</b>	<b>1,418</b>	<b>510</b>	<b>36.0</b>	<b>2,256</b>	<b>493</b>	<b>21.8</b>	<b>1,395</b>	<b>363</b>	<b>26.0</b>	<b>3,660</b>	<b>731</b>	<b>20.0</b>	<b>2,813</b>	<b>873</b>	<b>31.0</b>	<b>6,473</b>	<b>1,604</b>	<b>24.77</b>

EXHIBIT 2C

SURVEY RESPONSES ADJUSTED FOR OVERSTATEMENTS: THE "ADDRESSABLE MARKET"  
 '000 annual passengers

**Scenario C(i): 10 minutes headway, \$15 fare**

Party and Bag Code	Business				Non Business				Total				Grand Total								
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Resident		Visitor		Total				
	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%			
1 person with no bags	210	49	23.1	217	51	23.7	140	14	10.0	40	2	4.4	350	63	17.8	256	53	20.7	607	116	19.0
1 person with bags	375	28	7.5	347	93	26.7	437	96	22.0	246	70	28.2	812	124	15.3	593	162	27.3	1,405	286	20.4
2+ persons	115	19	16.0	196	57	29.0	664	35	5.2	267	30	11.3	780	53	6.8	463	87	18.8	1,243	140	11.3
<b>Total</b>	<b>700</b>	<b>95</b>	<b>13.6</b>	<b>759</b>	<b>201</b>	<b>26.4</b>	<b>1,242</b>	<b>145</b>	<b>11.7</b>	<b>553</b>	<b>102</b>	<b>18.4</b>	<b>1,942</b>	<b>240</b>	<b>12</b>	<b>1,312</b>	<b>302</b>	<b>23.0</b>	<b>3,254</b>	<b>542</b>	<b>16.65</b>

**Scenario C(ii): 15 minutes headway, \$15 fare**

Party and Bag Code	Business				Non Business				Total				Grand Total								
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Resident		Visitor		Total				
	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%			
1 person with no bags	164	29	17.8	209	49	23.4	121	28	22.7	66	6	8.3	285	57	19.9	275	54	19.8	560	111	19.8
1 person with bags	486	81	16.7	386	62	16.1	527	138	26.2	247	55	22.1	1014	219	21.6	633	117	18.4	1,646	336	20.4
2+ persons	149	25	16.8	217	71	32.8	499	9	1.9	264	13	5.0	648	34	5.3	482	85	17.5	1,130	119	10.5
<b>Total</b>	<b>799</b>	<b>135</b>	<b>16.9</b>	<b>812</b>	<b>182</b>	<b>22.4</b>	<b>1,148</b>	<b>175</b>	<b>15.2</b>	<b>577</b>	<b>73</b>	<b>12.7</b>	<b>1,947</b>	<b>310</b>	<b>15.9</b>	<b>1,389</b>	<b>255</b>	<b>18.4</b>	<b>3,336</b>	<b>565</b>	<b>16.94</b>

**Combined Scenario C: 10 and 15 minutes headway, \$15 fare**

Party and Bag Code	Business				Non Business				Total				Grand Total								
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Resident		Visitor		Total				
	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%	Total	Yes	Would Take Train?	%			
1 person with no bags	374	78	20.8	425	100	23.5	261	42	15.9	106	7	6.8	635	119	18.8	531	107	20.2	1,166	227	19.4
1 person with bags	861	109	12.7	733	155	21.1	965	234	24.3	493	124	25.2	1826	343	18.8	1225	279	22.7	3,051	622	20.4
2+ persons	265	44	16.4	413	128	31.0	1164	44	3.8	531	44	8.2	1428	88	6.1	944	172	18.2	2,372	259	10.9
<b>Total</b>	<b>1,500</b>	<b>230</b>	<b>15.4</b>	<b>1,571</b>	<b>383</b>	<b>24.3</b>	<b>2,389</b>	<b>320</b>	<b>13.4</b>	<b>1,130</b>	<b>175</b>	<b>15.5</b>	<b>3,889</b>	<b>550</b>	<b>14.1</b>	<b>2,701</b>	<b>557</b>	<b>20.6</b>	<b>6,590</b>	<b>1,107</b>	<b>16.80</b>



## The Addressable Market (% of Air Travellers)

	\$5 Fare	\$10 Fare	\$5 + \$10 Fare Combined	\$15 Fare
<b>Business travellers</b>				
Residents	14.3%	17.0%	15.6%	15.4%
Visitors	28.8%	36.0%	32.4%	24.3%
<b>Total</b>	<b>22.2%</b>	<b>26.5%</b>	<b>24.3%</b>	<b>20.0%</b>
<b>Non-business travellers</b>				
Residents	19.3%	21.8%	20.5%	13.4%
Visitors	30.9%	26.0%	28.5%	15.5%
<b>Total</b>	<b>23.3%</b>	<b>23.4%</b>	<b>23.3%</b>	<b>14.0%</b>
<b>All travellers</b>				
Residents	17.5%	20.0%	18.7%	14.1%
Visitors	29.7%	31.0%	30.3%	20.6%
<b>TOTAL</b>	<b>22.8%</b>	<b>24.8%</b>	<b>23.8%</b>	<b>16.8%</b>

The Table indicates that, considering only the combined \$5 and \$10 fare scenarios business travellers in the resident sector have the lowest propensity for being candidates for using the service. In contrast, business travellers in the visitor sector have the highest propensity.

In the resident sector, non-business travellers have a higher propensity for being candidates for using the service than business travellers. In contrast, in the visitor sector, non-business travellers have a lower propensity.

Considering all travellers, visitors have a substantially higher propensity for being candidates for using the service than residents, which is understandable in view of the fact that many visitors have no access to cars.

The Table shows that there is no difference of statistical significance between the \$5 and \$10 fare scenarios. However, there is a significant drop in propensity at the \$15 fare level.

At this point, comments should be made regarding the magnitude of sampling errors. In spite of the large total sample size, individual groups were reduced to sizes that implied sampling errors of sufficient magnitudes to be recognized. These errors explain some of the apparent discrepancies between individual numbers shown in the Table above. Even though there were approximately 2,800 responses received in the combined \$5 and \$10 fare groups, a



particular line in the table above represents only about one-quarter of that, i.e., 700 responses. Assuming confidence limits of 80 % (i.e., if the survey were to be repeated five times, four of the five results would be within those limits), we find that the numbers imply statistical errors of 1.75 to 2.25 percentage points. Thus, it is quite possible that what is shown as a 15.6 % propensity (in the \$5 + \$10 fare column) may in fact be higher than 17 % and what is shown as 15.4 % propensity (in the \$15 fare column) may in fact be lower than 14 %.

When all travellers are considered in a combined fashion, the results are more consistent and clear differences can be observed between the combined \$5 and \$10 fare groups on the one hand and the \$15 fare group on the other. The last three lines of the Table indicate that in the \$15 fare scenario, approximately 20 % fewer residents would use the Air-Rail Link than in the \$5 - \$10 scenario, and approximately 33 % fewer visitors would use it, for an average reduction of approximately 29 %.

## F. The Predicted Ridership

The next step in the analysis was to estimate the **predicted usage** of the Link. This number excludes the people who might consider the rail service in a hypothetical situation but, when confronted with an actual situation, may in fact choose a transportation mode that might appear to be more attractive to them at that moment. The estimation of the predicted usage was based on a set of broad assumptions, reflected by the following adjustments to the “addressable” percentages:

- The first adjustment recognized the inconvenience faced by people having to carry heavy bags, even if the transfer between the subway and the train was as “seamless” as possible. Also, people would have to get to the subway in the first place, carrying their bags. Many people may not have fully realized that inconvenience in their responses. Furthermore, groups travelling together would achieve smaller cost savings vis-à-vis a taxi ride than single persons: again, many respondents might not have realized this difference.
- The second adjustment related to the risk perceived by some travellers of potentially missing their flights if they used a mode of transport that required several transfers.

The first adjustment consisted of applying specific factors to the following groups of travellers:

- single travellers with light luggage (not to be checked at the Airport),
- single travellers who have to carry heavier luggage (to be checked at the Airport), and

- families or groups consisting of more than one traveller.

Each of the groups above would find different levels of relative inconvenience and/or encounter different cost differentials between using transit and a door-to-door taxi or private automobile drive. Accordingly, different reductions were applied to the addressable market percentages for each group. The reductions were represented by multipliers, which incorporated two further factors:

- The recognition that on cold winter days, many travellers would choose door-to-door automobiles in favour to other access modes, regardless of any other factor (causing all of the multipliers to be smaller than one).
- The recognition that visitors to the Region may not have been fully familiar with Toronto’s geography when responding to questions in the survey. This recognition caused a further reduction in the multipliers when applied to visitors. However, for visitors to the Prime Area a mid-point was assumed between the factors used for residents and those used for visitors, as many of the visitors to the Prime Area would be quite familiar with the geography and Downtown Toronto, including the location of Union Station.

These were the multipliers applied to the responses in each category:

**Multipliers to obtain the predicted market**

	<u>Residents</u>	<u>Visitors to Prime Area</u>	<u>Other Visitors</u>
Single person without heavy bags:	0.8	0.7	0.6
Single person with bags:	0.6	0.5	0.4
Groups (more than one person):	0.4	0.3	0.2

The second adjustment was only applied to departing passengers. As noted, it reflected the potential impact of peoples’ perceived risk of missing their flight because of unpredictable delays in access to the airport. When driving or being driven to the airport, people tend to make reasonably reliable estimates of the probable time their trip may take, considering the time of the day and their driving experience. When using several modes of transportation, including (1) the Air-Rail Link, (2) potentially a subway ride to the Link, and (3) getting to the subway itself, with two or three modal transfers enroute, some infrequent flyers would be worried about the uncertainties or complexities of that kind of access, and may choose the automobile mode, regardless of any other factor. Such “worries” may not be realized by the



travellers in a hypothetical situation, until they actually have to make a modal decision at the spur of the moment.

A global reduction of 25 % was therefore applied in the analysis to reduce the usage of the Air-Rail Link on the departure side. No such reduction was used on the arrival side, resulting in an overall reduction of 12.5 %, applied across the board.

With that, the following Table shows the predicted usage of the Air-Rail Link (with details provided in Exhibits 3A to 3C on Pages 26 to 28).

### **Details of the Predicted Ridership (% of Air Travellers)**

	\$5 Fare	\$10 Fare	\$5 + \$10 Fare Combined	\$15 Fare
<b>Business travellers</b>				
Residents	8.1%	9.4%	8.7%	8.5%
Visitors	10.3%	12.9%	11.6%	8.2%
<b>Total</b>	<b>9.3%</b>	<b>11.1%</b>	<b>10.2%</b>	<b>8.3%</b>
<b>Non-business travellers</b>				
Residents	9.4%	10.5%	10.0%	7.0%
Visitors	8.8%	7.1%	8.0%	4.9%
<b>Total</b>	<b>9.2%</b>	<b>9.2%</b>	<b>9.2%</b>	<b>6.3%</b>
<b>All travellers</b>				
Residents	8.9%	10.1%	9.5%	7.6%
Visitors	9.6%	10.0%	9.8%	6.8%
<b>TOTAL</b>	<b>9.2%</b>	<b>10.0%</b>	<b>9.6%</b>	<b>7.25%</b>

It is interesting to note the relatively high percentage of Air-Rail Link users in the business sector. Contrary to the traditional belief that business travellers are not inclined to use public transportation services, these are some of the factors that counter that belief:

- People travelling on business are generally more experienced travellers and can plan their trip to the airport better than infrequent non-business travellers who are afraid of unknown delays in public transportation and do not mind spending more money (once in many years) on a “safe” taxi trip.
- Business travellers have generally fewer opportunities for being driven to the airport by friends or relatives.



- Business travellers’ time is more valuable than the time of non-business travellers and, therefore, avoiding peak hour traffic jams on highways can be a potentially important factor.

Considering the sample size of 2,800 passengers for the combined \$5 and \$10 fare group, the sampling error for that category, within 80 % confidence limits, is approximately 0.7 percentage points. For individual lines in the Table, reflecting sample sizes ranging from 700 to 1400, the range of sampling errors is 0.9 to 1.4 percentage points.

As discussed in more detail further below, visitors were asked questions about the mode of access to the Airport on departure “today” and on arrival some time earlier. It was found that among people visiting the Prime Area some 5 to 10 % more people used the airport bus or public transit on arrival than on departure (when there is no risk of missing a flight). The number of people who used the airport bus or public transit from areas other than the Prime Area was too small to provide statistically meaningful information. Nonetheless, it would appear from these findings that the 25 % estimate of the “risk factor”, applied only to departures, might have been somewhat too high.

Takeup factors:	Visitors	
	Res.	Other
1 person, no bag	0.8	0.7
1 person w. bags	0.6	0.5
2+ persons	0.4	0.3

Scenario A

### ADJUSTED SURVEY RESPONSES: THE PREDICTED MARKET

'000 annual passengers

#### Scenario A(i): 10 minutes headway, \$5 fare

Party and Bag Code	Business						Non Business						Total		Grand Total				
	Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		
	Yes	%	Yes	%	Total	%	Yes	%	Total	%	Yes	%	Total	%	Yes	%	Total	%	
1 person with no bags	23	10.7	37	18.6	136	12.8	18	6.1	32	2	6.1	347	40	11.5	39	16.9	576	79	13.7
1 person with bags	17	8.8	22	5.8	487	14.9	72	13.5	255	34	13.5	683	90	13.1	57	8.9	1,324	147	11.1
2+ persons	2	1.4	10	6.4	540	3.5	19	6.9	250	17	6.9	689	21	3.0	27	6.7	1,095	48	4.4
<b>Total</b>	<b>42</b>	<b>7.5</b>	<b>69</b>	<b>9.4</b>	<b>1,163</b>	<b>9.3</b>	<b>109</b>	<b>10.0</b>	<b>537</b>	<b>54</b>	<b>10.0</b>	<b>1,719</b>	<b>151</b>	<b>8.8</b>	<b>123</b>	<b>9.6</b>	<b>2,995</b>	<b>273</b>	<b>9.13</b>

#### Scenario A(ii): 15 minutes headway, \$5 fare

Party and Bag Code	Business						Non Business						Total		Grand Total				
	Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		
	Yes	%	Yes	%	Total	%	Yes	%	Total	%	Yes	%	Total	%	Yes	%	Total	%	
1 person with no bags	16	10.3	41	16.9	83	21.7	23	20.3	75	15	20.3	242	39	16.3	56	17.7	560	96	17.1
1 person with bags	39	10.3	35	10.3	469	10.2	48	9.9	239	24	9.9	848	87	10.2	59	10.1	1,427	146	10.2
2+ persons	3	2.1	12	5.9	581	6.2	36	3.8	360	14	3.8	734	39	5.3	25	4.5	1,296	64	5.0
<b>Total</b>	<b>59</b>	<b>8.6</b>	<b>88</b>	<b>11.2</b>	<b>1,133</b>	<b>9.4</b>	<b>107</b>	<b>7.8</b>	<b>674</b>	<b>52</b>	<b>7.8</b>	<b>1,824</b>	<b>165</b>	<b>9.1</b>	<b>140</b>	<b>9.6</b>	<b>3,282</b>	<b>306</b>	<b>9.32</b>

#### Combined Scenario A: 10 and 15 minutes headway, \$5 fare

Party and Bag Code	Business						Non Business						Total		Grand Total				
	Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		
	Yes	%	Yes	%	Total	%	Yes	%	Total	%	Yes	%	Total	%	Yes	%	Total	%	
1 person with no bags	39	10.5	78	17.7	220	18.5	41	16.0	108	17	16.0	589	79	13.5	95	17.4	1,136	174	15.4
1 person with bags	57	9.8	58	7.9	956	12.6	120	11.7	494	58	11.7	1531	177	11.5	116	9.5	2,751	292	10.6
2+ persons	5	1.7	22	6.1	1121	4.9	55	5.1	610	31	5.1	1423	60	4.2	53	5.5	2,390	112	4.7
<b>Total</b>	<b>101</b>	<b>8.1</b>	<b>157</b>	<b>10.3</b>	<b>2,296</b>	<b>9.4</b>	<b>215</b>	<b>8.8</b>	<b>1,212</b>	<b>106</b>	<b>8.8</b>	<b>3,543</b>	<b>316</b>	<b>8.9</b>	<b>263</b>	<b>9.6</b>	<b>6,277</b>	<b>579</b>	<b>9.22</b>

Takeup factors:

	Visiteurs	
	Res.	Other
1 pers. sans bag.	0.8	0.7
1 pers. avec bag.	0.6	0.5
2+ personnes	0.4	0.3

EXHIBIT 3B

ADJUSTED SURVEY RESPONSES: THE PREDICTED MARKET

'000 annual passengers

Scenario B(ii): 15 minutes headway, \$10 fare

Party and Bag Code	Business				Non Business				Total				Grand Total			
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Total		Would Take Train? %	Total
	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total		
1 person with no bags	34	21.3	54	24.8	35	28.0	19	29.4	69	24.3	73	25.9	281	142	25.1	567
1 person with bags	38	8.1	55	15.9	43	11.5	23	7.6	82	9.6	78	12.0	651	160	10.6	1,506
2+ persons	11	7.7	12	6.7	40	6.9	17	4.5	51	7.0	29	5.2	555	80	6.2	1,278
Total	83	10.7	121	16.2	119	10.9	59	8.0	202	10.8	180	12.1	1,488	382	11.39	3,351

Scenario B(ii): 15 minutes headway, \$10 fare

Party and Bag Code	Business				Non Business				Total				Grand Total			
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Total		Would Take Train? %	Total
	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total		
1 person with no bags	20	10.8	21	17.3	7	33.9	1	0.8	27	13.1	22	10.1	218	49	11.6	424
1 person with bags	26	7.2	32	7.6	84	13.9	21	9.7	110	11.4	52	8.3	630	163	10.2	1,600
2+ persons	2	3.0	9	6.6	26	4.9	18	5.3	29	4.6	27	5.6	478	56	5.1	1,099
Total	49	7.7	62	9.2	118	10.0	40	6.1	166	9.2	101	7.6	1,325	267	8.56	3,123

Combined Scenario B: 10 and 15 minutes headway, \$10 fare

Party and Bag Code	Business				Non Business				Total				Grand Total			
	Resident		Visitor		Resident		Visitor		Resident		Visitor		Total		Would Take Train? %	Total
	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total	Would Take Train? %	Total		
1 person with no bags	54	15.7	75	22.1	42	28.9	20	12.4	96	19.6	95	19.0	499	191	19.3	991
1 person with bags	65	7.7	86	11.3	128	13.0	44	8.4	192	10.5	130	10.2	1281	322	10.4	3,106
2+ persons	13	6.0	21	6.6	66	5.9	35	4.9	80	5.9	56	5.4	1033	136	5.7	2,377
Total	132	9.4	182	12.9	236	10.5	99	7.1	368	10.1	281	10.0	2,813	649	10.03	6,473

**Takeup factors:**

	Res.	Prime	Other
1 person, no bag	0.8	0.7	0.6
1 person w. bags	0.6	0.5	0.4
2+ persons	0.4	0.3	0.2

**Visitors**

**EXHIBIT 3C**

**ADJUSTED SURVEY RESPONSES: THE PREDICTED MARKET**

'000 annual passengers

**Scenario C(i): 10 minutes headway, \$15 fare**

Party and Bag Code	Business						Non Business						Total						Grand Total					
	Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Total	Yes	%	Total	Yes	%
	Yes	%	Yes	%	Total	%	Yes	%	Yes	%	Total	%	Yes	%	Yes	%	Total	%	Total	Yes	%	Total	Yes	%
1 person with no bags	210	34	16.2	27	12.4	140	10	7.0	40	1	2.3	350	44	12.5	256	28	10.8	607	72	11.8	1,405	122	8.7	
1 person with bags	375	15	3.9	32	9.3	437	50	11.5	246	24	9.9	812	65	8.0	593	57	9.6	1,405	122	8.7	1,243	34	2.7	
2+ persons	115	6	5.6	10	5.1	664	12	1.8	267	5	2.0	780	19	2.4	463	15	3.3	1,243	34	2.7	3,254	227	6.98	
<b>Total</b>	<b>700</b>	<b>55</b>	<b>7.9</b>	<b>69</b>	<b>9.1</b>	<b>1,242</b>	<b>72</b>	<b>5.8</b>	<b>553</b>	<b>31</b>	<b>5.5</b>	<b>1,942</b>	<b>127</b>	<b>6.6</b>	<b>1,312</b>	<b>100</b>	<b>7.6</b>	<b>3,254</b>	<b>227</b>	<b>6.98</b>	<b>3,254</b>	<b>227</b>	<b>6.98</b>	

**Scenario C(ii): 15 minutes headway, \$15 fare**

Party and Bag Code	Business						Non Business						Total						Grand Total					
	Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Total	Yes	%	Total	Yes	%
	Yes	%	Yes	%	Total	%	Yes	%	Yes	%	Total	%	Yes	%	Yes	%	Total	%	Total	Yes	%	Total	Yes	%
1 person with no bags	164	20	12.5	26	12.3	121	19	15.9	66	3	4.4	285	40	13.9	275	28	10.4	560	68	12.2	1,646	156	9.5	
1 person with bags	486	43	8.7	22	5.6	527	72	13.7	247	19	7.7	1014	115	11.3	633	41	6.4	1,646	156	9.5	1,130	27	2.4	
2+ persons	149	9	5.9	12	5.7	499	3	0.6	264	2	0.9	648	12	1.8	482	15	3.1	1,130	27	2.4	3,336	251	7.52	
<b>Total</b>	<b>799</b>	<b>72</b>	<b>9.0</b>	<b>60</b>	<b>7.4</b>	<b>1,148</b>	<b>95</b>	<b>8.3</b>	<b>577</b>	<b>24</b>	<b>4.2</b>	<b>1,947</b>	<b>167</b>	<b>8.6</b>	<b>1,389</b>	<b>84</b>	<b>6.1</b>	<b>3,336</b>	<b>251</b>	<b>7.52</b>	<b>3,336</b>	<b>251</b>	<b>7.52</b>	

**Combined Scenario C: 10 and 15 minutes headway, \$15 fare**

Party and Bag Code	Business						Non Business						Total						Grand Total					
	Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Resident		Visitor		Would Take Train?		Total	Yes	%	Total	Yes	%
	Yes	%	Yes	%	Total	%	Yes	%	Yes	%	Total	%	Yes	%	Yes	%	Total	%	Total	Yes	%	Total	Yes	%
1 person with no bags	374	54	14.5	53	12.3	261	29	11.1	106	4	3.6	635	83	13.1	531	56	10.6	1,166	140	12.0	3,051	278	9.1	
1 person with bags	861	57	6.6	54	7.4	965	123	12.7	493	43	8.8	1826	180	9.9	1225	97	8.0	3,051	278	9.1	2,372	61	2.6	
2+ persons	265	15	5.8	22	5.4	1164	15	1.3	531	8	1.4	1428	31	2.1	944	30	3.2	2,372	61	2.6	6,590	478	7.25	
<b>Total</b>	<b>1,500</b>	<b>127</b>	<b>8.5</b>	<b>129</b>	<b>8.2</b>	<b>2,389</b>	<b>167</b>	<b>7.0</b>	<b>1,130</b>	<b>55</b>	<b>4.9</b>	<b>3,889</b>	<b>294</b>	<b>7.6</b>	<b>2,701</b>	<b>184</b>	<b>6.8</b>	<b>6,590</b>	<b>478</b>	<b>7.25</b>	<b>6,590</b>	<b>478</b>	<b>7.25</b>	

## G. Revenue Optimization

For transportation modes that are in competition with others, the relationship between revenues and fares follows an inverted U curve, as shown in Exhibit 4. In a range in which the fares are low and do not compete effectively with other modes of transportation, revenues will increase in proportion to the fares. As the fares increase to levels at which the cost of transportation, as seen by the user, approaches that of a competing mode (for example, when the cost of using a train approaches the cost of using a taxi), the number of users will begin to decline and, therefore, revenues will tend to level off, in spite of the increase in fares. As fares increase further, the decline in the number of users will outweigh the impacts of the increases in fares and revenues will drop.

The curve shown in Exhibit 4 was drawn on the basis of the following assumptions:

- For fares up to \$10 passenger usage is not materially sensitive to price and, therefore, the revenues will increase in proportion to the fare. As shown in the previous section, it was found in the survey that in a group of one million total annual originating/ terminating air travellers, 9.6 %, or 96,000 passengers are predicted to use the Link at a \$10 fare, producing a total annual revenue of \$960,000. That determines the slope of the first part of the curve.
- It was also found that with a fare of \$15 only 7.25 % are predicted to use the train, producing a total revenue of \$1,090,000.
- By assuming that at a fare of \$40 nobody will use the Link, the full curve shown in Exhibit 4 could be constructed.

By constructing a smooth transition from the upward slope to the downward slope of the curve, it was found that the maximum revenue might be attained at a \$13.00 fare level (in 1999 dollars). That will produce revenues of approximately \$1,120,000, representing a ridership of 86,100, i.e., 8.6 % of the total of one million passengers.

It is realized that drawing a curve to fit just four points in a graph is a fairly arbitrary process. To illustrate this, Exhibit 4A presents an alternative curve that, allowing for some sampling errors in the position of the reference points, shows a pattern that is quite different from that of Exhibit 4. However, the maximum revenue associated with the curve in Exhibit 4A is only slightly higher than the maximum revenue shown in Exhibit 4 and is associated with a fare that may be undesirable from a public perspective (as it would reduce the affordability of the rail service to a significant number of people).



Exhibit 4

### Fare Revenue Curve

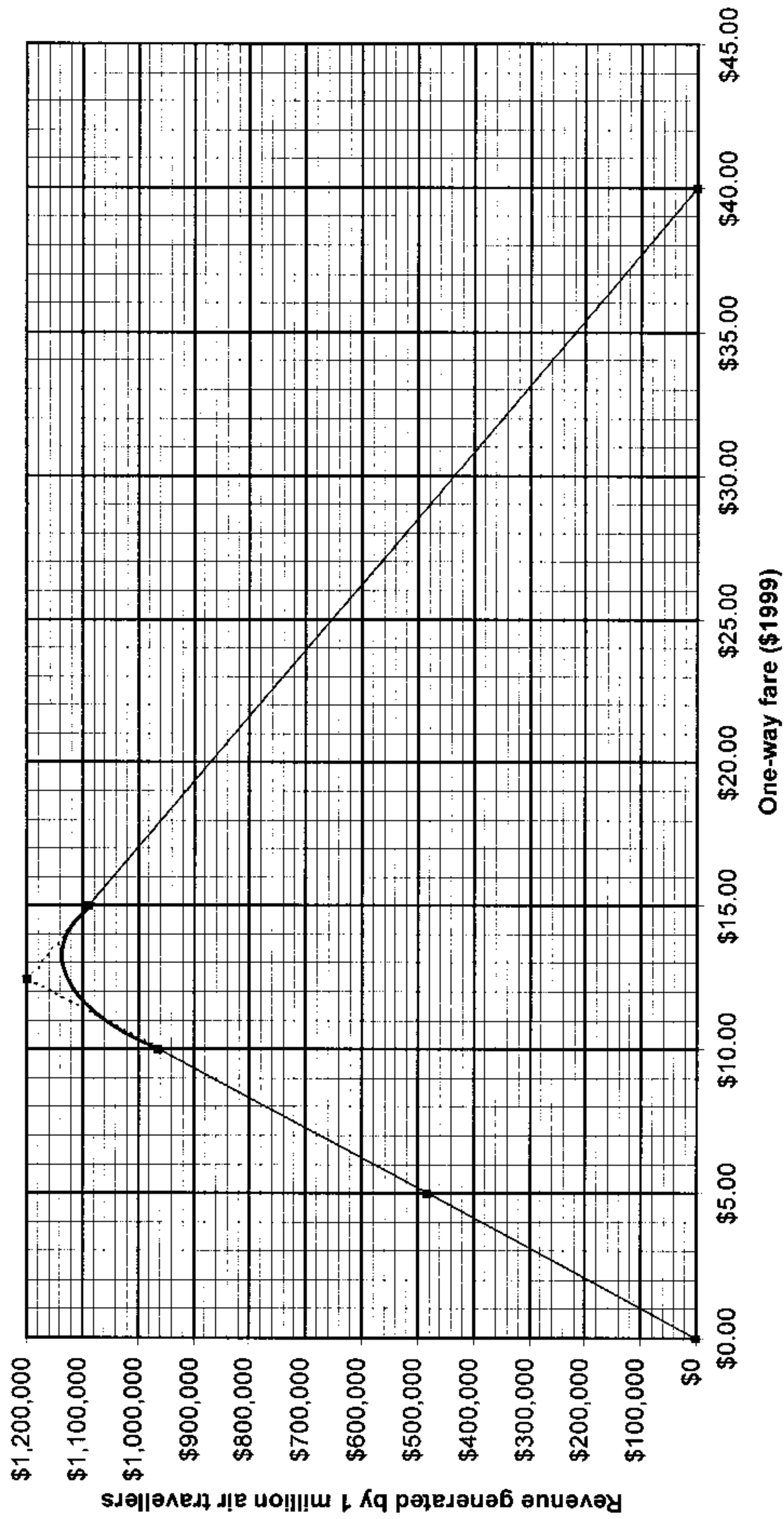
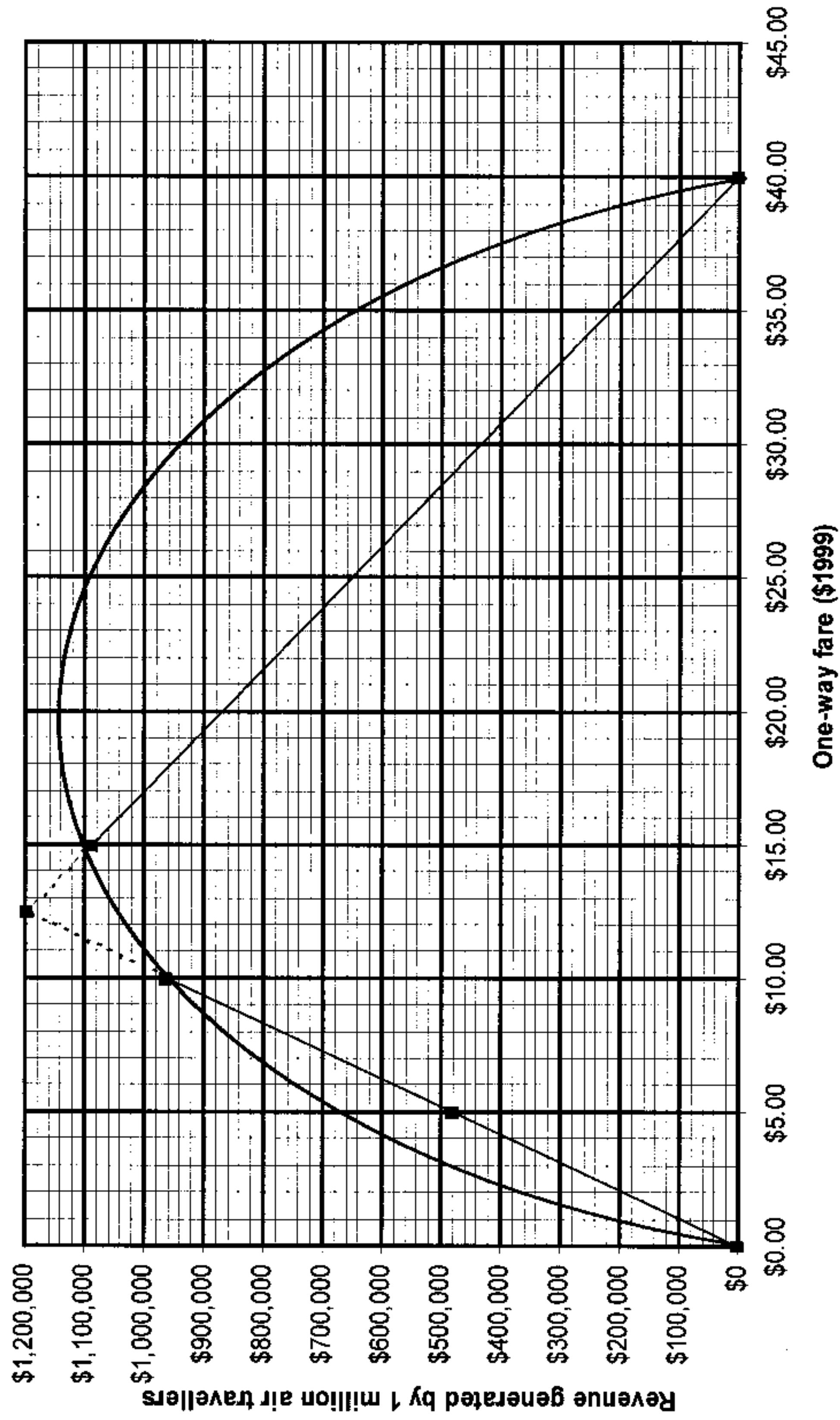


Exhibit 4/A

Alternate Fare Revenue Curve



Accordingly, even if the curve shown in Exhibit 4A were found to be a better reflection of the price sensitivity of riders, the operator of the service would still not want to charge more than \$13 for a one-way trip in 1999 dollars. This would result in slightly lower revenues than the theoretical maximum.

## **H. Current Modal Split of Passengers**

The survey provided information on the current modal split of passengers. It is summarized in Exhibit 5 for departing and arriving passengers. Information on arriving passengers is only shown for visitors to Toronto, as only they were asked a question about the mode of transport they had used when they first arrived to Toronto.

Several interesting conclusions can be drawn from Exhibit 5, some of which are self-evident:

- The percentage of using rented cars is obviously much higher for visitors than for residents of the Region. The opposite is true for owned cars.
- As observed earlier, a relatively smaller percentage of visitors is driven by others to the airport than the corresponding percentage of residents of the Region.
- It is surprising that some residents of the Region indicated that they used hotel courtesy vans. It is believed that they may be people who live in cities relatively far from Toronto and stay overnight in Toronto before boarding their flights.
- Consistent with their statements of potential rail usage, a relatively higher percentage of visitors is in fact using today's public transportation services than the corresponding percentage of residents. It appears from Exhibit 5 that, considering the totality of visitors (as opposed to just Downtown visitors), fewer arriving visitors use public transportation than departing visitors. However, the differences are inconsistent between the business and non-business sectors and are well within the range of sampling errors.

Because of their importance to the present study, further analysis was applied to the travellers who reported to have used public transportation (indicated as "bus/mini-bus" in Exhibit 5). Accordingly, the breakdown of the responses relating to public transit usage are broken down further in Exhibit 6.

## Exhibit 5 Modal Split ('000)

	Business		Non-Business		All Travellers	
	Users of mode	% of total sector	Users of mode	% of total sector	Users of mode	% of total sector
<b>1. Departing residents</b>						
Taxi, limousine	743	32.9	660	18.9	1,403	24.4
Hotel courtesy van	58	2.6	158	4.5	216	3.8
Rented car	66	2.9	32	0.9	98	1.7
Own car	720	31.9	601	17.2	1,321	23.0
Being driven	558	24.7	1,739	49.9	2,297	40.0
Bus/mini-bus	109	4.8	278	8.0	387	6.7
Other	5	0.2	19	0.6	24	0.4
<b>TOTAL SECTOR</b>	<b>2,259</b>	<b>100.0</b>	<b>3,487</b>	<b>100.0</b>	<b>5,746</b>	<b>100.0</b>
<b>2. Departing visitors</b>						
Taxi, limousine	745	35.3	388	17.3	1,133	26.0
Hotel courtesy van	192	9.1	235	10.5	428	9.8
Rented car	652	30.9	423	18.9	1,075	24.7
Own car	22	1.0	9	0.4	31	0.7
Being driven	315	14.9	945	42.2	1,260	29.0
Bus/mini-bus	176	8.3	234	10.4	410	9.4
Other	10	0.5	5	0.2	16	0.4
<b>TOTAL SECTOR</b>	<b>2,112</b>	<b>100.0</b>	<b>2,239</b>	<b>100.0</b>	<b>4,352</b>	<b>100.0</b>
<b>3. Arriving visitors</b>						
Taxi, limousine	744	36.8	392	19.1	1,136	27.9
Hotel courtesy van	170	8.4	160	7.8	330	8.1
Rented car	645	31.9	404	19.7	1,050	25.7
Own car	21	1.0	13	0.6	35	0.9
Being driven	261	12.9	883	43.1	1,144	28.1
Bus/mini-bus	181	8.9	183	9.0	364	8.9
Other	2	0.1	11	0.5	13	0.3
<b>TOTAL SECTOR</b>	<b>2,023</b>	<b>100.0</b>	<b>2,048</b>	<b>100.0</b>	<b>4,071</b>	<b>100.0</b>

**Exhibit 6**  
**Public Transit Usage ('000)**

	Business		Non-Business		All Sectors	
	Users of mode	% of all travellers of Area	Users of mode	% of all travellers of Area	Users of mode	% of all travellers of Area
<b>1. Departing residents</b>						
Outside GTA	80	17.8	172	16.6	252	17.0
Prime Area	16	3.9	50	9.0	66	6.9
Airport vicinity	5	1.7	13	1.9	18	1.8
Other GTA	8	0.7	43	3.5	51	2.2
<b>TOTAL SECTOR</b>	<b>109</b>	<b>4.8</b>	<b>278</b>	<b>8.0</b>	<b>387</b>	<b>6.7</b>
<b>2. Departing visitors</b>						
Outside GTA	43	11.1	75	14.3	118	13.0
Prime Area	115	12.4	111	18.5	226	14.8
Airport vicinity	18	4.8	24	4.9	42	4.8
Other GTA	0	0	23	3.7	23	2.7
<b>TOTAL SECTOR</b>	<b>176</b>	<b>8.3</b>	<b>233</b>	<b>10.4</b>	<b>409</b>	<b>9.4</b>
<b>3. Arriving visitors</b>						
Outside GTA	28	7.7	44	9.5	72	8.7
Prime Area	136	15.4	107	19.2	243	16.8
Airport vicinity	13	3.6	17	3.6	30	3.6
Other GTA	4	0.9	15	2.7	19	1.9
<b>TOTAL SECTOR</b>	<b>181</b>	<b>8.9</b>	<b>183</b>	<b>8.9</b>	<b>364</b>	<b>8.9</b>



In Exhibit 6, information is provided separately for:

- Passengers originating in, or visiting the Prime Area.
- Passengers originating in, or visiting other parts of the Greater Toronto Area (GTA).
- Passengers originating in, or visiting other cities in the Region.

The following are the characteristics of **residents** of the Region:

- Most residents who use public transportation are from outside the GTA: about 17 % of residents coming from outside the GTA use some form of bus service.
- About 7 % of the residents in the Prime Area use one of the Airport Express bus services (Downtown, York Mills or Islington) to access the airport.
- Less than 2 % of the travellers who live close to the Airport (in Peel Region or Northern Etobicoke) use public transportation to access the airport.
- Only about 2 % of the travellers who live elsewhere in the GTA use public transportation. (This is logical, as no convenient public transportation service is available from most of those areas.)

The propensity of **visitors** to use public transportation is higher than that of residents. This is understandable, in the light of earlier comments that most visitors have no cars of their own in Toronto and many of them have no opportunities for being driven to or from the airport by residents. Exhibit 6 shows the following percentages of visitors using public transit:

- 13 % who visit locations outside the GTA.
- 15 % who visit the Prime Area.
- 5 % who visit the vicinity of the Airport.
- 3 % who visit the rest of the GTA.

Exhibit 6 shows that, **considering only the Prime Area**, public transit usage by visitors is somewhat higher on arrival than on departure. Whereas the difference is well within the range of sampling errors, it was nonetheless assumed that 5% to 10% more people might use the Airport Express bus service on arrival than on departure. This assumption also fits the logic of travellers' decision processes (considering that there is no risk of missing flights on



arrival, and the impact of an Airport Bus being often in evidence at the curbside of the terminals).

With the assumptions above it was concluded that the current bus services between Downtown and Islington on the one hand and the Airport on the other can be estimated to carry approximately 580,000 passengers per year in 1999, or 2.87 % of all originating/terminating passengers.

A more detailed analysis of the data indicated that the Downtown Airport Express bus service may carry about 500,000 passengers in 1999, or an average of some 12 to 13 riders per bus.

## **I. Passenger Projections**

After having established a data base for the year 1999, passenger projections were prepared for future years. The projections are consistent with those used by LBPIA.

The projections indicate declining annual growth rates over time for the Airport's total traffic, starting at an average annual growth rate of 4.1 % from 1999 to 2002. This growth rate declines gradually and drops to 2.5 % by 2017, declining by 0.1 percentage points each year.

A continuation of the same pattern was assumed after 2017, implying a steady decrease of the growth rate until it reached 1.5 % per annum in the year 2027. From then on, the growth rate was assumed to remain constant at that level.

It was assumed in this study that when a level of 40 million annual originating + terminating passengers was reached, LBPIA will have reached its ultimate capacity. According to the projection, that level would be reached in the year 2022. It was assumed that after that year a new airport will be available in the Region for certain categories of flights (e.g., charters). Accordingly it was assumed that in 2023 the total traffic available to the Air-Rail Link will drop from 40 million to 30 million passengers. Traffic was then assumed to continue its growth from that level and to reach 40 million passengers again in the year 2042.

Note that any numbers used in the study representing traffic levels that far in the future should be considered as being assumptions rather than projections.

The year 2042 was the ultimate time horizon used in the financial model developed in this study. However, as indicated in the next chapter, the last 20 years in the model were only used for estimating a terminal value for the project in 2022, the twentieth year of operation.



The terminal value is the estimated amount someone would pay for the Air-Rail Link company if it was sold by its shareholders at that time.

It was assumed that the Air-Rail Link will commence its operation on January 1, 2003, with a one-way fare of \$14.00 (\$13.00 inflated to the year 2003). As indicated earlier, at that fare the anticipated usage rate was projected to be 8.6 % of all originating + terminating passengers.

Considering the growth of passengers from the current 20.2 million to 23.7 million in the year 2003, the number of air travellers who would use the Air-Rail Link in that year 2003 was projected to be 2.04 million.

Assuming that approximately two-thirds of these travellers would be diverted from automobiles, the Air-Rail Link would remove approximately one million cars annually from the roads of the GTA.

It was assumed that the percentage of users, starting at 8.6 %, will increase by 0.1 % each year, due to increases in highway congestion and people becoming more familiar with the Link. Thus, usage was predicted to grow from 8.6 % in 2003 to 8.686 % in 2004. It was projected to reach 10.4 % by 2022 and 12.0 % by 2037. It was not assumed to increase beyond 12.0 % after that.

## **J. Employee Survey and Projections**

A survey of airport employees was commenced in July 1999. 1,950 postage-paid mail-back forms were distributed by eight employers on airport premises. It was not expected that the response rate would be very high and/or that the responses could be used for anything other than providing a broad assessment of the potential usage of the Air-Rail Link for commuting purposes by airport employees. In fact, the response rate was less than 10 %.

It was found that only a small fraction of the employees live in areas from which it would be convenient to use the Link. The vast majority of employees live near the airport, predominantly west of the airport. Less than 7 % of the employees live in areas that would be convenient for using the train but only 40 % of those said they would use the train. About 6 % of the respondents live in Scarborough where they could be potential users of the train by using three modes of transport: getting to the subway or GO Transit by one mode, taking the subway or GO train, and then changing to the Air-Rail Link. Even though in that area about 30% of the respondents said that they may use the train, their responses were not accepted in the light of the complexity of their trip.





In the questionnaires the fare was stated as \$30 per week, which is less than one-quarter of the fare that air travellers would pay.

The following current modal split was reported by the employees:

- Public transit (mostly those who live in the vicinity of the airport): 8%
- Driving own car: 67%
- Being driven by others: 25%

Considering the responses received it was estimated that perhaps 2 % of all employees would use the train (7 % of the employees, living in “convenient” areas, times a usage of 40 %, discounted for presumed overstatements.) Considering a reported number of 24,000 employees working on airport premises, this estimate would result in 480 employees using the Air-Rail Link for an average of 45 weeks per year, five days a week, for a fare that is about one-quarter of the fare paid by air travellers. Their contribution would increase project revenues by less than 3 %.

## **K. Initial Trends**

When projecting the users of a new transportation facility or service (such as a new highway, bridge or transit service) it is customary to make adjustments to the first one or two years of service on account of the time that people need to learn about the new service and experience its advantages or disadvantages. Normally there are two opposing factors that influence initial traffic:

- A “ramp-up”, reflecting the time required for the “word to get around” about the new service.
- A “novelty effect” reflecting usage by people who may use the service only once to see how it works.

Whereas it is not known how these two factors will affect the traffic and revenues of the new service in its initial years, the question has to be answered whether the projections presented in this report represent the traffic expected in the first year of the project (with the net impacts of “ramp-up” and “novelty” being incremental to it) or the long term steady state?



One relevant detail obtained from the survey suggests that the former assumption is probably more appropriate. About one-quarter of the people who **actually** used the Airport Express bus service from Downtown to the Airport said that they would **not** use the train. That answer was most surprising, as the train would leave from almost exactly the same point as the bus, would offer a significantly shorter travel time and would cost approximately the same as the bus. Whereas all these details were communicated to the respondents, they nonetheless answered that they would prefer the bus.

An allowance for people who, at this point in time, answered “No” to the question relating to train usage but might later find the train more convenient was not included in the forecasting methodology. For example, in the case above, it would have been clearly more appropriate to apply a positive adjustment factor to the survey results, as it would not be logical to assume that people will not eventually realize the advantages of the train over the bus.

While it might be expected that in the initial year or years the “ramp-up” effect would cause the volume of travellers using the Link to be somewhat below the predictions, there would be an offsetting increase on account of the travellers who responded “No” to the train usage question in the survey (and were therefore excluded from the projections) but would actually use the train, in line with the logic described above.

Accordingly, it was assumed that the projections in this report reflect the usage of the Air-Rail Link in its early years and that any net “ramp-up less novelty” impact would be incremental to it.



### **III Description of the Service and Estimates of Costs**

This chapter provides a description of the Air-Rail Link service assumed in the report and summarizes the capital and operating cost estimates used in the financial projections. The chapter is divided into the following sections:

- A description of the service.
- Capital costs.
- Operating costs.

The specification of the service relies on a previous study conducted by the IBI Group, entitled “Rapid Transit Access to Lester B. Pearson International Airport”. The Final Report of that study was issued in May 1999.

The IBI study contained preliminary capital cost estimates for the rail infrastructure. They were further refined in this study. The IBI study contained only very broad estimates for the capital costs of rolling stock and operating costs. Those costs were analyzed in more detail in this study.

The results of the analysis described in this report were used as inputs to the financial projections described in Chapter IV.

#### **A. Description of the Service**

The IBI report, referenced earlier, describes the proposed Air-Rail Link service. It is a dedicated rail service between Toronto’s Union Station and Lester B. Pearson International Airport, using CN’s existing rail line, defined as the Weston Subdivision. That rail line runs in close proximity to the Airport, at a distance of approximately 2 kilometers northeast of Terminal 3. A new rail spur would connect the existing CN line with the people-mover system planned by the airport as part of its major re-development program currently under way. A detailed description of the connections between that system and the existing rail system is provided in IBI’s report.



The Airport's people-mover system is planned to be an elevated light train, which will interconnect the Airport's passenger terminals. The assumption was made in this study that the Airport's people-mover system will be extended beyond Terminal 3 to cross Airport Road on elevated structures to an area owned by the Airport, identified as "Area 6", northeast of Airport Road. In that Area a transfer station would be built where air travellers would be able to transfer in a seamless way between the people-mover and the trains of the Air-Rail Link. More details of that transfer are provided further below.

It was assumed in this study that the Airport will build the extension of the people-mover system to Area 6, as it will serve not only the Air-Rail Link but also parking lots and a potential hotel development. However, the costs of the transfer station itself were assigned to the Air-Rail Link project.

The Air-Rail Link will consist of Diesel Multiple Units (DMUs), seating 160 to 240 passengers. They will initially consist of two self-propelled coaches coupled back-to-back and seating 80 passengers each. Later, a third un-powered coach would be inserted between the two powered units. Similar units are currently manufactured in Europe by Bombardier, GEC Alstom, Siemens and others.

It was assumed that a train would leave the Airport transfer station every fifteen minutes from 6:00 am to 9:00 p.m., and less frequently from 9:00 p.m. to 11:30 or 12:00 p.m. (depending on airline schedules), seven days a week. This would represent higher frequencies than those provided by the current bus service between the Airport and the Royal York Hotel near Union Station (which now runs every 20 minutes).

The first train would leave Union Station at 5:30 am. The last train would leave at 11:00 p.m. or 11:30 p.m.

It was assumed that the number of seats will allow the passengers of the Air-Rail Link to be seated most of the time, with no need for standing room. As noted later in the report, an analysis of the daily air traveller profile indicated that, with perhaps a few hours of exception, the highest number of passengers passing through the Airport in each direction is approximately equal to the total number of annual passengers (in that direction) divided by 2,700. It was further assumed that the number of airport employees using the Air-Rail Link during the peak passenger hours will equal the hourly average of employee travel (assuming that the peaks of employee travel will not coincide with the peak of the passenger traffic).

The travel time of the train will be substantially lower than that of the bus: it was assumed to be less than 20 minutes, over a distance of approximately 25 kilometers. It was assumed that the train would have one stop enroute, at the intersection of Bloor Street and Dundas Street, adjacent to the existing Subway Station.



It was assumed that the transfer between the subway system and the Air-Rail Link will be as “seamless” as possible, using elevators from the subway level to the train level, to avoid the need for pushing baggage carts onto escalators.

An additional stop at Woodbine would have the potential of picking up further traffic from any future commercial/recreational development that may be put in place by the Ontario Jockey Club. This additional traffic was not included in the projections of the report.

The parameters above described the full cycle of a train run: it will be exactly one hour. The train will be in motion over a period lasting less than 20 minutes in each direction, followed by a stay at the rail terminals of more than 10 minutes. In this manner, there will almost always be a train in the stations, waiting with open doors for boarding passengers. To explain the cycle in more detail: if a train was to leave, for example, at 12 noon from the Airport transfer station toward Union Station, there would be no train at the transfer station for a few minutes but around 12:03: or 12:04 the train that has left Union Station at 11:45 will arrive and stay at the transfer station until 12:15.

The schedule of the Airport’s people-mover will have to be highly co-ordinated with this schedule. The people-mover will have to arrive at the transfer station a few minutes before the departure of the Air-Rail Link (in the case above at about 11:57) and then wait for the next train from Union Station (arriving at about 12:03) to head back to the Airport with the new passenger load at about 12:06.

## **Transfers**

The co-ordination of the people-mover’s and Air-Rail Link’s schedules is extremely important, as the major attraction of the Air-Rail Link will be time saving. It is therefore imperative that the transfer from the people-mover to the Air-Rail Link should not take more than a few minutes.

The transfer itself should be as seamless as possible, consisting of a simple walk across a platform. The traveller should perceive the combination of the people-mover and the Air-Rail Link as a single service and not as a service consisting of two segments with a transfer in between.

IBI identified an alternative which differs from the described system in the location of the transfer station. Instead of a transfer station in Area 6 it may be possible to build the transfer station along the existing CN rail line. This would require the Airport’s people-mover system to be extended over a substantial distance, beyond Airport property. It is possible that this alternative could imply complexities that may cause delays in the implementation of the project and may not be justified by the relative cost savings that it may produce.

Turning to the transfers between the Air-Rail Link and the Toronto Subway System at Union Station and at the Bloor/Dundas Subway Station, the importance of a seamless and comfortable transfer cannot be emphasised often enough. Travellers with luggage are not expected to use the system if they have to carry heavy bags along platforms and on escalators between the subway trains and the trains of the Air-Rail Link. Consequently, no-charge baggage carts will have to be provided at the transfer points and the transfer will have to occur via elevators rather than escalators, which can accommodate the baggage carts without creating much difficulty for the travellers. The costs of such elevators were included in the cost estimates in this report. The elevators can be built with little difficulty at Union Station. However, at the Bloor/Dundas Subway Station the TTC platforms will have to be extended in an easterly direction by some 50 to 75 meters in order to accommodate vertical connections between the subway and the railway platforms.

No details of the necessary construction at Union Station and the Bloor/Dundas site have been developed at this time and the issue has not been discussed with the TTC. It is anticipated that the TTC would welcome the construction of seamless links between its system and the Air-Rail Link, as long as the costs of building the links are included in Air-Rail Link's budget estimates.

### **The Rail Line**

As indicated in the IBI report, approximately 11.5 kilometers of the existing rail line is single tracked. Considering the frequent service on the line and the existence of other rail traffic, it appears to be impractical to operate the system without double tracking the entire length of the line.

Currently, GO Transit has four trains from Georgetown to Downtown in the morning and four trains in the opposite direction in the afternoon. This service may be increased in the future.

VIA Rail has two daily trains from Toronto to London and Sarnia via Kitchener (one continuing to Chicago).

As it is not practically possible to co-ordinate the schedules of these services with those of the Air-Rail Link, a single-track section of the line would cause significant scheduling complexities and would make delays to some of the Air-Rail Link passengers unavoidable. As the primary attraction of the Air-Rail Link service is time saving, such delays would be highly counterproductive. The costs of fully double-tracking the presently single-tracked sections of the Weston Subdivision were therefore included in the cost estimates.



The Subdivision also handles some freight traffic, consisting of one or two daily trains in each direction.

Furthermore, there are currently six level crossings on the Subdivision. The IBI study noted that one of those (near the Woodbine Race Track) might be closed and three of them, just north of Lawrence Avenue, could be replaced by a single grade-separated crossing.

Whereas the cost of a grade-separated crossing north of Lawrence Avenue was included in IBI's capital cost estimates, it is believed that another grade-separated crossing south of Lawrence Avenue and one at, or near, Strachan Avenue (south of King Street) may also be necessary. It is felt that a rapid rail service with at least 8 trains per hour at all times of the day would require grade-separated crossings everywhere along the line. The capital cost estimates of the study include the assumption that such crossings will be built. Further comments on this subject will be made in the next section.

## **B. Capital Costs**

This section is divided into the following subsections:

- The capital costs of improvements to the rail line and its structures.
- The capital costs related to the improvement of the transfer stations.
- The capital costs of the rolling stock.

### **The Rail Line and its Structures**

The preliminary cost estimates contained in the aforementioned IBI study consisted of the following components:

- Double tracking of approximately 11.5 kilometers of track.
- Grade separations in Weston and at the West Toronto Diamond (rail-rail crossing).
- Building an extension from the existing CN rail line to the proposed new transfer station between the Air-Rail Link and the Airport's people-mover in Area 6.

KPMG obtained assistance from the McCormick Rankin Corporation ("MRC") in the assessment of IBI's cost estimates. MRC carried out a study of a proposed extension of the rush hour GO Transit service to a full service in the late 1980s. As part of that study, MRC estimated the capital expenditures that would be required for upgrading the current rail



system for accommodating such service. Data from that study were used in the assessment of IBI's present cost estimates.

All the costs indicated below are in 1999 Canadian dollars.

IBI estimated the costs of double tracking to be in the order of \$62 million. MRC's estimate was \$55 million in 1989 terms. Considering inflation, IBI's estimate was increased to \$68 million in this study.

The costs of a grade separation between rail and rail at the West Toronto Diamond (where the CN line crosses the main East-West CP rail line) was estimated by IBI to be \$40 million.

Based on its GO Transit study, MRC suggested that this amount should be increased to \$50 million.

With respect to the three level crossings that exist today in the area east of Weston Road, north of Lawrence Avenue the assumption was made that these will be replaced by a single grade-separated crossing. IBI estimated a cost of \$5 million for that crossing. However, this amount does not include increases in approval costs resulting from potential public representations. Consequently, the cost estimates for this grade separation were doubled to \$10 million in this study.

The capital cost of building a new railway spur from the existing CN line to Area 6 was estimated by IBI to amount to \$42 million (without a connection to the existing line in the Georgetown direction). MRC, in a Property Protection Study conducted in 1997, estimated that cost to be in the order of \$32 to \$33 million, including compensation payments for property outside the area owned by the Airport.

Because of the importance of a highly convenient transfer between the Airport's people-mover system and the Air-Rail Link, and the costs associated with a transfer facility that will provide such a convenience, IBI's high cost estimate was adopted for this study.

In addition to the items above, two further improvements were identified that were not included in IBI's cost estimates but are believed to be necessary for ensuring high-speed safe service between Union Station and the Airport. They consist of a grade separation at or near Strachan Avenue (south of King Street) and the replacement of a current level crossing west of Weston Road, south of Lawrence Avenue. As noted earlier, the Air-Rail Link will generate at least 8 train crossings per hour at these points throughout seven days of the week. It is believed that this frequency of rail traffic, combined with urban road traffic, would make it impractical to maintain the current level crossings.





The replacement of the current level crossing with a grade separated crossing at Strachan Avenue would encounter serious technical difficulties. The existence of underground services and the proximity of homes to the crossing appears to make the costs of a grade separation at this point prohibitive.

A practical alternative would be to close the crossing at Strachan Avenue and replace it with a crossing at Shaw Street, west of the existing crossing. The south side of the railway tracks between Strachan Avenue and Shaw Street is planned to be re-developed in the near future and, as part of that re-development, Shaw Street could be continued south of the crossing to turn to the East and connect to the existing southern portion of Strachan Avenue.

The costs of each of these grade separated crossings are estimated to be similar to the costs of the crossing north of Lawrence Avenue, i.e., \$10 million each.

### **Improvement of the Transfer Stations**

IBI estimated the costs of improving Union Station to accommodate a simple transfer between the subway and the Air-Rail Link to amount to \$8 million. As noted earlier, in order to accommodate travellers with luggage it may be necessary to build elevators between the subway platforms and the Air-Rail Link level, and cross-overs to the rail platforms which was not contemplated by IBI. Consequently, a capital cost of \$10 million was assigned to this improvement, somewhat in excess of IBI's estimate of \$8 million.

At the Dundas Subway Station of the Bloor Subway, a seamless transfer would require the extension of the existing Subway platforms to the East, as they currently do not extend far enough for allowing a vertical movement between the subway platforms and the Air-Rail Link platforms. An extension in the order of 50 to 75 metres would be required for each of the two subway platforms.

As IBI did not contemplate such an extension, the original capital cost estimate of \$6 million dollars was increased in this study to \$15 million.

The costs of the transfer station in Area 6 of the Airport were included in the costs of the rail extension, noted earlier.

### **Total Construction Costs and Contingencies**

The sum total of the cost elements above amounts to \$215 million. Adding a "developer's contingency" of \$10 million, the total capital cost of structures and improvements is thus estimated to be \$225 million.

The “developer’s contingency” is additional to the construction contingencies already incorporated in the capital costs. It is an amount the private sector would normally consider in its feasibility studies, to allow for a possible range of risks concerning cost overruns not necessarily related to mis-estimates of construction costs.

### **Capital Costs of the Rolling Stock**

It was assumed that the Air-Rail Link service will be provided by vehicles commonly called Diesel Multiple Units (DMUs) in the industry. The units contemplated for this service would consist of two diesel-powered self-propelled cars, coupled back-to-back. In later years a third un-powered car may be added to the unit between the powered cars. The seating capacity of each car would be in the order of 80 seats. The train would have to have the capability of travelling at a maximum speed of at least 120 km/hour.

It was outside the scope of this study to develop any further specifications for the units. The objective, at this point in time, was to develop broad capital and operating cost estimates for the units and identify a few potential suppliers.

Following enquiries it was found that, generally, the types of vehicles described above are manufactured in Europe. Three possible suppliers were identified:

1. Bombardier, with several plants in Europe.
2. GEC Alstom in France.
3. Siemens in Germany.

The Regional Municipality of Ottawa-Carleton is currently negotiating with Bombardier for the supply of DMUs for an eight kilometer rapid transit line in Ottawa. In 1996 Siemens supplied DMUs for a demonstration project in Calgary (the RegioSprinter). Alstom manufactures similar units and markets them under the brand name “Alice”. Examples of vehicles currently manufactured by Bombardier and GEC Alstom are shown in Appendix C.

The capital costs of the DMUs depend greatly on the number of similar units a manufacturer has on order at a given time. For that reason, manufacturers are unwilling to quote any prices in hypothetical situations. However, based on information obtained from the Ottawa-Carleton project, it was estimated that the capital costs of a powered railway car of the specified size would be in the order of \$3 million (Canadian) including duties and taxes. The cost of an un-powered car was estimated to be in the order of \$2 million.

The estimates above were corroborated by a 1996 report prepared by Calgary Transit in which the capital cost of a RegioSprinter was reported to be in the order of \$2.45 million.



The RegioSprinter, used in the Calgary demonstration project, seated 74 passengers with standing room for 100. It was significantly lighter than the vehicle contemplated for this study: its weight was only 30 tonnes, as opposed to 58 tonnes of the Bombardier vehicle assumed for this project (see Appendix C). Bombardier's heavy cars are claimed by the manufacturer to comply with all the specifications required for travel on rail lines shared with railway traffic.

With the assumed 15 minute headway and one hour round trip cycle time of the Air-Rail Link service, four train sets would be in operation at all times. It was assumed that the Air-Rail Link service would order five and a half sets, allowing for one spare set and one car to be under maintenance. According to Bombardier's specifications, a car would seat 80 passengers, with substantial room for luggage. When, in the future, the peak hour passenger volume will reach 640 passengers per hour in one direction (for four trains per hour) a third car would be added to the train sets for a total capacity of 240 passengers per train or 960 passengers per hour.

### **C. Direct Operating Expenses**

Operating expenses were estimated on the basis of data obtained from several sources.

**Drivers' expenses** were estimated on the basis of an assumed annual cost of \$70,000 per driver, including "loadings" for benefits, vacation pay, sick leave and overtime (probably a high estimate). It was assumed that the average driver will drive 50 kms per hour (one round trip) and spend 20 % of his/her time in a standby capacity. Thus, a driver would spend 1440 hours per year on a train, driving 72,000 kms. This would result in an average driver cost of approximately \$1.00 per train-km.

**Rolling stock maintenance expenses** were estimated on the basis of a study conducted by KPMG for the intercity bus industry in 1998. That study indicated that bus maintenance costs, excluding tire replacements, were in the order of 25 cents per bus-kilometer for a typical intercity bus. It was assumed that of that amount 20 cents could be allocated to the maintenance of motors and driving gear and 5 cents to the maintenance of the vehicle bodies. Since a typical bus engine and the engines used in the proposed trains are similar in size (400-HP), and a train has four such engines plus two engines for auxiliary power, a multiplier of 5 was applied to the expenses related to a bus for estimating the average maintenance expenses incurred by the mechanical equipment of the train. Maintenance expenses for vehicle bodies was assumed to be four times those of a bus, based on the number of seats. This resulted in a total maintenance cost estimate of \$1.20 train-km.



The **fuel expenses** of an intercity bus were found to be in the order of 17 cents per km. However, diesel prices for train fuels in Ontario are approximately 20 % lower than prices for road fuels, due to lower provincial taxes for rail usage. Thus, using a 14 cent per kilometer fuel cost per engine, and a multiplier of 5.5, the average fuel cost per train-kilometer was estimated to be 77 cents, rounded to 80 cents.

The multiplier of 5.5, used above, is the mid-point between two multipliers, arrived at by different means. First, it was recognized that the train proposed for this project consists of two cars with two 400-HP engines each. In addition, each car has an Auxiliary Power Unit. This resulted in the assumption of a fuel consumption that is five times that of a typical intercity bus. Another calculation looked at the weight of the vehicles and found that a bus seating 47 passengers would weigh 22 tonnes while a two-car train with 160 passengers would weigh 132 tonnes. If fuel consumption was proportional to vehicle weight, this would result in a multiplier of 6. As noted, a mid-point of 5.5 was chosen.

That choice was corroborated by Calgary Transit's study for the RegioSprinter quoted earlier, in which a fuel consumption estimate of 70 litres per 100 vehicle kms was reported. The cost of 140 litres of diesel fuel would be approximately \$56 (for a two-car unit) in Ontario, or 56 cents per train-kilometer. Considering a gross weight multiplier of 1.75 between the two types of vehicles, and the fact that fuel consumption does not increase entirely in proportion with vehicle weight, it appeared reasonable to use a multiplier of 1.5, which would result in a per-kilometer cost of 84 cents: not much different from the 80 cents noted above.

The three items above account for somewhat more than half of the total operating expenses. The remainder of the expenses consist of the following major items:

- The cost of supervisors, dispatchers and inspectors. They will control the operation of the trains, check passenger tickets and supervise the drivers. The costs of this personnel was estimated to be \$700,000 per year.
- Management and administration costs were estimated to represent another \$one million per year, including salaries, office rents, supplies and other administrative expenses.
- The maintenance and staffing of transfer stations was estimated to cost \$700,000 per year. It was assumed that the stations would have roofs, so that snow removal would not represent a major cost.
- Insurance was estimated to cost \$300,000 per year, based on an estimate made by the Ottawa-Carleton Rapid Transit Study noted earlier.



- Marketing expenses, including automated ticketing, were estimated to amount to another \$300,000 per year.

Thus, in total, \$3.0 million were estimated for overhead-type expenses. With a total of 1.2 million train-kms per year this estimate results in \$2.50 per train-km.

A contingency of 10 % was added to the amounts above, resulting in a total operating cost estimate of \$6.05 per train-kilometer at 1999 price levels.

#### **D. Expenses Related to the Usage of the Tracks**

It was assumed that the operator of the proposed service would have to pay the owner and operator of the rail line for the following:

- Compensate the operator for usage-dependent operating expenses.
- Pay the owner compensation for the use of the tracks, which represent a fixed capital cost. The contributions to these costs are not usage-dependent.

Regarding both items it must be recognized that VIA Rail and GO Transit are already using the track under consideration, and pay for its usage. Consequently, the proposed service would be incremental to that usage.

In order to include the costs related to the usage of the tracks by the Air-Rail Link, certain assumptions had to be made. The amounts currently paid by VIA Rail and GO Transit were not considered to provide good benchmarks, as the Air-Rail Link project is more discretionary than either the VIA Rail or the GO Transit operations. In fact, its viability may actually hinge on the level of user fees charged for the use of the tracks. This recognition may influence the level of user fees the operator may charge. As the GO Transit and VIA Rail services pay for the use of the tracks anyway, all additional revenues from the tracks could be considered incremental and would depend on the viability of the Air-Rail Link. If high user fees were to jeopardize the viability of the Link, the owner/operator of the rail line might forego an opportunity for earning incremental income.

For modelling purposes, CN's total system-wide track operating costs were used as the basis for calculating the potential charges for covering the rail line's operating expenses. Whereas, in an urban area, the actual operating expenses of a rail line may be higher than the system average, that difference would be more than offset by the generous assumption that all of the operating expenses will be recovered from the Air-Rail Link and none of the revenue received from VIA Rail or GO Transit will be used to reduce Air-Rail Link's share of expenses.



CN's Annual Report indicates that CN's average operating and maintenance costs for tracks, structures and signals (excluding stations and yards) are in the order of \$23,000 per track-kilometer per year in 1999 dollars. Using that figure, Air-Rail Link's payments to CN were assumed to consist of the reimbursement of annual operating and maintenance costs of \$1.15 million (for 2x25 kms of track).

Regarding contributions to right-of-way costs, recognition was given to the fact that all **incremental** right-of-way capital costs caused by the addition of the new service will be directly borne by the new service providers in the form of the improvements noted in Chapter III. Consequently, it was assumed, for modelling purposes, that the Air-Rail Link will only pay the owner of the line a nominal rent of \$250,000 per year for the use of the existing plant.

The track under consideration might continue to be owned by CN or, alternatively, it may be possible for Government to buy the Weston Subdivision and ensure that Air-Rail Link's contribution will not exceed the assumed amount.

Similarly, it was assumed that an annual payment of \$250,000 will be made to the Toronto Terminals Railway for the use of one of the existing platforms at Union Station. That amount, again, recognizes the capital costs of the improvements to Union Station put up by the Air-Rail Link as part of its original investment and its contribution to the general quality of service at Union Station.

Considering all of the above, a total cost of \$1.65 million per year was assumed in the projections (at 1999 price levels) for the use of tracks and the platform at Union Station.

All operating costs were escalated by inflation in the model. Also, a general contingency of 10 % was added to the totality of operating costs.

## **E. Municipal Taxes**

It was assumed that **no municipal taxes will be paid** by the project, as transit properties are exempt from such taxes in Ontario. The presumed underlying rationale for the exception is the recognition that municipal taxes are intended to cover the costs of the municipalities caused by most properties when using municipal services. Transit services divert people from automobiles and roads, causing savings rather than costs to the municipality. This is why, in fact, transit services receive heavy subsidies from the municipalities (and previously also from the Province) neither of which were assumed to be available to the Air-Rail Link.



## F. Operating Cost Summary

The following is the summary of the operating costs described above, in terms of dollars per year per train-kilometer, and in total dollars per year (all expressed in 1999 dollars and assumed to be escalated by inflation thereafter):

	Costs Per Train-km (1999 \$)	Costs Per Year (1999 \$)
Drivers' wages	1.00	1,200,000
Rolling stock maintenance	1.20	1,440,000
Fuel	0.80	960,000
Supervision, dispatching, inspection	0.58	700,000
Station operations	0.58	700,000
Management and administration	0.83	1,000,000
Insurance	0.25	300,000
Ticketing and marketing	0.25	300,000
Payments for use of track	1.38	1,650,000
Subtotal	6.87	8,250,000
10% contingency	0.69	825,000
TOTAL	7.56	9,075,000



## IV Financial Projections

Based on the projections of riders presented in the preceding chapter, financial projections were prepared for the proposed service. The financial model and its inputs used for the projections are described under the following headings below:

- General structure of the model.
- Revenue projections.
- Service assumptions.
- Capital costs.
- Operating costs.
- Financing assumptions.
- Cash flows before and after income taxes.
- Rates of Return and sensitivity tests.
- Concluding Comments

Each item is described below.

### **General structure of the model**

The time horizon of the model was 40 years. It was assumed that operations would begin on January 1, 2003, with all capital expenditures booked at the end of 2002. All financing and interest costs during construction were assumed to be capitalized and included in the booked capital costs.

A printout of the model is attached to the report in Appendix E. Only the first 20 years of operation (2003 to 2022) are presented, as the modeling of the subsequent 20 years was only used for estimating the terminal value of the project at the end of 2022, shown as a positive cash inflow at that time.





An inflation rate of 1.5 % per annum was assumed throughout the planning period. All operating and capital renewal costs were inflated at that rate. Increases in actual inflation rates, after the close of financing at the assumed interest rates, would increase the profitability of the project.

## **A. Revenue Projections**

As noted in the preceding chapter, it was assumed that in 2003 the service will offer an initial one-way fare of \$14.00. It was assumed that, reflecting inflation, the fare will be increased by approximately 4.5 % every three years.

The traffic that will generate the project revenues, (including both air travellers and airport employees) was described in the preceding chapter. The survey indicated that the impact of greeters and well-wishers using the system would be negligible. They were therefore excluded from the projections.

It was assumed that the largest cash outflow of the project, i.e., the servicing of debt, will occur at the end of each 6-month period. As the revenues of the business will be derived in cash (with minor delays associated with credit cards), and accumulate until the next debt service payment throughout six months of the year, the project will have an interest income from short term deposits, which was included in the model.

## **B. Service Assumptions**

The details of the assumptions made in the financial projections regarding service were provided in Chapter III.

As noted earlier, the trains will use the existing CN Weston Subdivision with a new spur built between the existing track and the new transfer station in Area 6 of the Airport. Substantial improvements will be made to the rail line and its stations.

The rail line will be used predominantly by the Air-Rail Link service, but would also accommodate the existing GO Transit Service (which currently has four trains in the downtown direction in the morning and four trains in the opposite direction in the evening), two daily VIA Rail trains in each direction and some infrequent freight traffic.

Given the multiple use of the tracks and the frequency of the Air-Rail Link service, it was not considered practical to save money by avoiding the full double tracking of the system. Even though, in theory, 20-minute headways may make it possible to avoid full double tracking,

and even though the survey found that the usage of the system would not be overly sensitive to changes in frequency in the 10 to 20 minute range, it was felt that in a highly competitive environment the train should offer better service levels than the current bus service (which has a 20 minute frequency). Furthermore, the train service will have to be co-ordinated with the schedules of the people-mover which, serving connecting passengers, must have a frequency that is significantly higher than one train every 20 minutes. Consequently, the alternative of a partially single-track system, which would exclude the possibility of 10 or 15 minute headways on the Air-Rail Link, was not costed in this report.

### **C. Capital and Operating Costs**

As described in Chapter III, **capital costs** consist of the following:

- Double tracking of 11.5 kilometers of track.
- Enhancement of interchanges at Union Station and the Bloor/Dundas Subway Station, and the construction of an interchange in Area 6.
- Construction of three grade separations at crossings with urban roads and one with an existing CP rail line.
- Building a railway spur from the existing Weston Subdivision to Area 6.

The hard costs of these improvements, at 1999 price levels, were estimated to amount to \$225 million, including engineering and contingencies.

The soft costs were estimated to amount to 20 % of the hard costs, consisting of the costs of routine approval processes, project management costs, developers' fees, insurance and interest costs during construction and other financing costs. The total of hard and soft infrastructure costs were thus estimated to be \$270 million at 1999 price levels.

It was assumed that the costs of extending the Airport's people-mover system to Area 6 will be borne by the airport.

It was also assumed that the newly built track will be transferred to the owner of the track, at no cost to the owner.

As noted in Chapter III, it was not possible to obtain reliable precise quotes for the prices of Diesel Multiple Units DMUs. Based on some recent data obtained by the Ottawa-Carleton Rapid Transit Project, the capital cost of a powered diesel unit was estimated to be in the order of \$3 million and that of an un-powered unit to be in the order of \$2 million. The total capital costs of the initial rolling stock, including spares, were projected to amount to \$33 million at 1999 price levels.



It was assumed that no replacement of any structure or track will be necessary during the horizon of the projection. It was assumed that vehicles would have to be replaced after 25 years, at their original cost adjusted by inflation.

Details on **operating costs** were provided in Chapter III. The major cost items are:

- Drivers' expenses.
- Maintenance expenses.
- Fuel.
- Station operations.
- Ticketing and marketing expenses.
- Insurance.
- Administration and Overhead expenses.
- User fee paid to the rail operator.
- User fee paid to the operator of Union Station.

As detailed in Chapter III, operating expenses were estimated to be \$7.56 per train kilometer at 1999 price levels.

## **D. Financing Assumptions**

Several financing options were considered for the project. The first assumptions were as follows:

- 72 % of the initial investment will be debt financed. This level ensured acceptable debt service coverage ratios and debt-to-net asset ratios for the project (see below).
- The interest rate on the debt will be 6.61 % on an annual basis (6.5 % considering semi-annual payments in arrears). The debt, in the form of a first mortgage loan, will be repaid in instalments, resulting in equal annual debt service payments over 30 years.
- The parameters of the financing will be set so that the proportion of debt to net assets never exceeds 80 %, and the ratio of the projected pre-tax, pre-interest cash flow to debt service will never be smaller than 1.3, with the possible exception of the first two or three years of operation.
- It was assumed that agreement will be reached with the lenders to bridge the cash flow problems of the first 3 years by deferring re-payments of some of the principal.



- Occasional re-financing within the limitations of the parameters above will be applied as necessary, at the time of capital replacements.

As shown in the attached projections, the total amount of the initial debt will be approximately \$227 million (72 % of the required capital investment in 2002). The owners' equity will be \$90 million. That covers total infrastructure and rolling stock capital costs of \$317 million in 2002.

## **E. Cash flows before and after income taxes**

The pre-tax cash flow resulting from the plan is shown in the attached projections in Appendix E. A capital cost allowance rate of 4 % was used for structures and 20 % for rolling stock. It was recognized in the projections that only the necessary amount of capital cost allowance will be taken in each taxation year, so as to make the net book income zero in the initial years. The project will pay no taxes in those years.

## **F. Rates of Return and Sensitivity Tests**

With the assumptions above, the after-tax internal rate of return of the project to the shareholders, over a 20-year period, will be 12.4 %. That implies an after-tax terminal value of \$110 million, which reflects the Net Present Value of cash flows of the ensuing years. Without that, i.e., considering the returns to the shareholders only up to the year 2022, the average rate of return would only be 11.0 %.

Sensitivity tests were performed to indicate the returns that would be obtained by the shareholders of the project if the ridership of the Air-Rail Link would be only 5.75 % instead of the 8.6 % assumed in the "most likely" projection described above. That percentage reflects a ridership that is about twice the ridership of the existing Airport Express bus service connecting the Airport with the Royal York hotel and the Islington Subway Station. It is not unreasonable to assume that the much more convenient rail service, at a comparable fare, may attract at least this level of patronage.<sup>7</sup> With that assumption the after-tax rate-of-return of the shareholders would be 5.4 %, i.e. less than the return to non-taxable lenders, but higher than the return to lenders who have to pay taxes on their interest income.

However, with a 5.8 % patronage the project would have negative cash flows for the first six years of operation, requiring an infusion of approximately \$20 million from the shareholders,

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<sup>7</sup> It was assumed that with an initial ridership of 5.75 percent the annual increase in the ridership percentage would be 2% instead of 1% applied to the assumption of 8.6 percent initial ridership in the "Base Case", i.e., the ridership percentage would become 5.86% in the second year.



in addition to the \$90 million that they have already invested in the project. With that patronage, the project would not break even on a cash basis until after Year 10 of the service.

This example demonstrates the sensitivity of the study results to the assumptions made at various points in the process described in this report. In particular, the uncertainty surrounding the factors that translated raw survey results into the set of numbers used to estimate the “predicted” ridership of the Link are likely to make private investors cautious. In addition, as summarized in Appendix D, experience in other North American cities indicates that even in the most successful cases (Washington D.C., Boston, Atlanta) public transit ridership varies only from 7 to 18 % of all originating + terminating passengers, even though the fares generally do not exceed \$3.00 (CAN). Whereas it is true that the noted services are integral parts of the general urban or regional transit systems of the particular cities, with many stops and no amenities to accommodate luggage, or to guarantee comfortable seating, the low fare levels of those services in relation to those proposed for the Air-Rail Link and their impacts on ridership cannot be overlooked.

As indicated in Appendix D, a dedicated transit system for airport access, which would be comparable to the proposed Air-Rail Link, is offered in London for both Heathrow and Gatwick Airports. While that service charges 10 pounds (approximately \$25.00 CAN) for a one-way trip, and faces competition from the London Underground System (offering a fraction of that fare), the ridership of the dedicated service is still in the order of 10 % of all originating + terminating passengers at both Heathrow and Gatwick Airports. These statistics should alleviate some of the fears of would-be investors, particularly as the ratio of the train fares to comparable taxi fares would be almost the same in Toronto as in London (roughly 1 to 3) and, while the highway congestion to and from London’s airports is worse during certain hours of the day than the congestion on Toronto’s highways today, the difference between the congestion levels of the two cities is expected to diminish over time.

Considering all of the above, it could nonetheless happen that private investors may find an after-tax return of 12.4 % on their investment too low in relation to the returns of potential investments in other major projects. In order to place the project on a more firm financial footing, an alternative is presented below that might be considered by the Federal Government.

Assuming that the commercial debt of the project was held at the same level as described above, the Government may guarantee a \$45 million subordinated loan (half of the investor's equity) at a commercial interest rate. The investors' investment would then be reduced to only \$45 million and the returns of the project would be greatly enhanced. Financial projections were prepared for this alternative, with the following assumptions:

- The loan will be for 20 years, with no re-payments of principal in the first ten years.
- The loan, guaranteed by Government, will bear an interest rate equal to the interest rate of the senior debt.
- When the project is in a negative cash flow position, interest on the loan will be deferred up to the level of the deficit and will be added to the outstanding debt.

With the government-guaranteed loan the shareholders' return in the assumed "base case" will increase to 16.9 %. That would make the project more attractive to potential investors, as the government-guaranteed loan would significantly reduce the shareholders' capital at risk, and would increase the financial returns of the project to a level more comparable to the returns of other projects with similar risks.

Even though a government-guaranteed loan would substantially reduce the investors' and lenders' risks, there is a possibility that the financing of the project may still run into difficulties. Similar difficulties were encountered in other projects where a radically new form of transportation was introduced without prior relevant experience or precedents. Examples were Highway 407 in Toronto and the PEI Confederation Bridge. Both of these projects were initially financed through 100 % equity (provided by Government in the first case and by the major shareholders in the second), and financing was not put into place until such time as the profitability of the project was clearly demonstrated (which, in fact, materialized in both instances). This project may find itself to be in a similar situation, considering that Canada has no direct experience with such services as the Air-Rail Link.

## **G. Conclusions**

In summary, the project discussed in this report appears to be viable under the assumptions described in the report and the passenger projections developed in the study. Obviously, there are risks that the projections may prove to be overly optimistic or that some of the assumptions made in the financial projections, such as those relating to costs, may not have been sufficiently conservative.



Nonetheless, it is believed that the study provided enough substantiation for the Federal Government and stakeholders to proceed with the process, and to pursue the exploration of interest of potential investors. Interested investors, of course, would have to rely on their own examination of the facts and projections, and make their own due diligence determination.

This study, however, in conjunction with the earlier IBI Group report, indicates that the financial self-sufficiency of the project is attainable under certain conditions and assumptions. Consequently, further action on this matter by interested parties is certainly warranted.



# **Appendix A**

## **Survey Questions**



**Time of Interview:** Day: \_\_\_\_\_, June \_\_\_\_\_, 1999  
 AM  
 \_\_\_\_\_ hr \_\_\_\_\_ min  PM

**Scheduled Flight Time:** \_\_\_\_\_ hr. \_\_\_\_\_ min.

Interviewer initials:

- |                              |                          |            |                          |
|------------------------------|--------------------------|------------|--------------------------|
| Domestic Scheduled           | <input type="checkbox"/> | Long West? | <input type="checkbox"/> |
| US Scheduled                 | <input type="checkbox"/> | Long West? | <input type="checkbox"/> |
| Overseas/Caribbean Scheduled | <input type="checkbox"/> |            |                          |
| Charter                      | <input type="checkbox"/> |            |                          |

HELLO, I AM \_\_\_\_\_. I AM CONDUCTING A SURVEY FOR TRANSPORT CANADA TO FIND OUT HOW PEOPLE COME TO THE AIRPORT. I SHOULD LIKE TO ASK YOU A FEW QUESTIONS IF YOU DON'T MIND. IT WILL ONLY TAKE A FEW MINUTES.

1. Are you transferring today from another flight.....or did you come to the airport from outside? From outside  Transferring  Aircraft stopover  ) → THANK YOU VERY MUCH, THIS WILL BE ALL. [ TERMINATE ]

2. Are you now starting your round trip, or are you returning home? Starting round trip now  MARK THIS SQUARE "A" Returning home  ) Traveling between cities  ) →  Leaving for a long time

3. What kind of transportation did you use to arrive at the Airport today? Taxi or Limousine  MARK THIS SQUARE "B" Hotel courtesy van (mbus)  ) Other bus / minibus\*  ) →   
 Dntwn  YorkMIs  Isling  Other   
 Rented car   
 Own car, parked here  Other: \_\_\_\_\_  
 Someone drove me here

4. [Ask only if "A" is marked in Question 2]: What kind of transportation did you use to leave the Airport when you first arrived in Toronto? Taxi or Limousine  Hotel courtesy van (mbus)  Other bus / minibus\*   
 Dntwn  YorkMIs  Isling  Other   
 Rented car   
 Own car, parked here  Other: \_\_\_\_\_  
 Someone picked me up

5. From which part of the Toronto Area did you come to the Airport today? Zone # \_\_\_\_\_ or (words): ↓  
 [ If # is greater than 20 ]: \_\_\_\_\_  
 THANK YOU VERY MUCH, THIS WILL BE ALL.  
 [ TERMINATE ] Other city: \_\_\_\_\_

6/A How many people in your party are boarding this aircraft, including yourself? \_\_\_\_\_

6/B Have you checked any baggage?  
 Yes  No

If this is the response, ask : "Wherefrom?". If he/she says "Parking lot" or "Hotel", mark the proper line. This line is only for people who came from the city or region by a bus they paid for.

7. This is a picture of a train that may run in the future directly between a Downtown terminal at Union Station and the Airport. The train would also stop at Bloor and Dundas at the Subway. The ride on this train would:

- take 20 minutes,
- cost 5 dollars one way, and
- trains would run every 10 minutes

**Transfer  
"B"**



If you took the subway or GoTrain to go to the Train Terminal (Downtown or at Bloor and Dundas), the transfer would be short and direct, with pushcarts for your luggage. If you stayed in a hotel, there would be a shuttle bus to the Train Terminal . **WOULD YOU HAVE USED THIS TRAIN TODAY?**

Yes

No  →

Can you tell me why not?

---



---

**GO TO QUESTION 10**

8. On your way to the Train Terminal (Downtown or at Bloor and Dundas) which method of city or regional transportation would you have used?

A. Subway

B. GoTrain

C. Hotel courtesy bus (van)

D. Someone would have driven me

E. Would have taken a taxi

F. Would have walked to the terminal

G. Other \_\_\_\_\_ )

**GO TO QU. 10**

9. How would you have gotten to the {...Subway, ...GoTrain}?

Someone would have driven me to the Subway/GoTrain

By city bus or streetcar to the Subway/GoTrain

By taxi to the Subway/GoTrain

By walking to the Subway/GoTrain

**GO TO QUESTION 10**

10. NOW TWO MORE BRIEF QUESTIONS:

Is this a business trip or a non-business trip?

Business

Non-business

Both

11. [ Ask only if "B" is marked above ]:

Did people come to see you off at the Airport today?

No

[ If answer is "No": GO TO 12 ]

Yes

How many people?

How will they go home?

By taxi  By bus  Other: \_\_\_\_\_

12. [ Ask only if in doubt ] Are you over 30?

Under 30

30-60

14. Scenario:

Are you under 60?

30-60

Over 60

**1**

13. [ Mark but do not ask ] Male

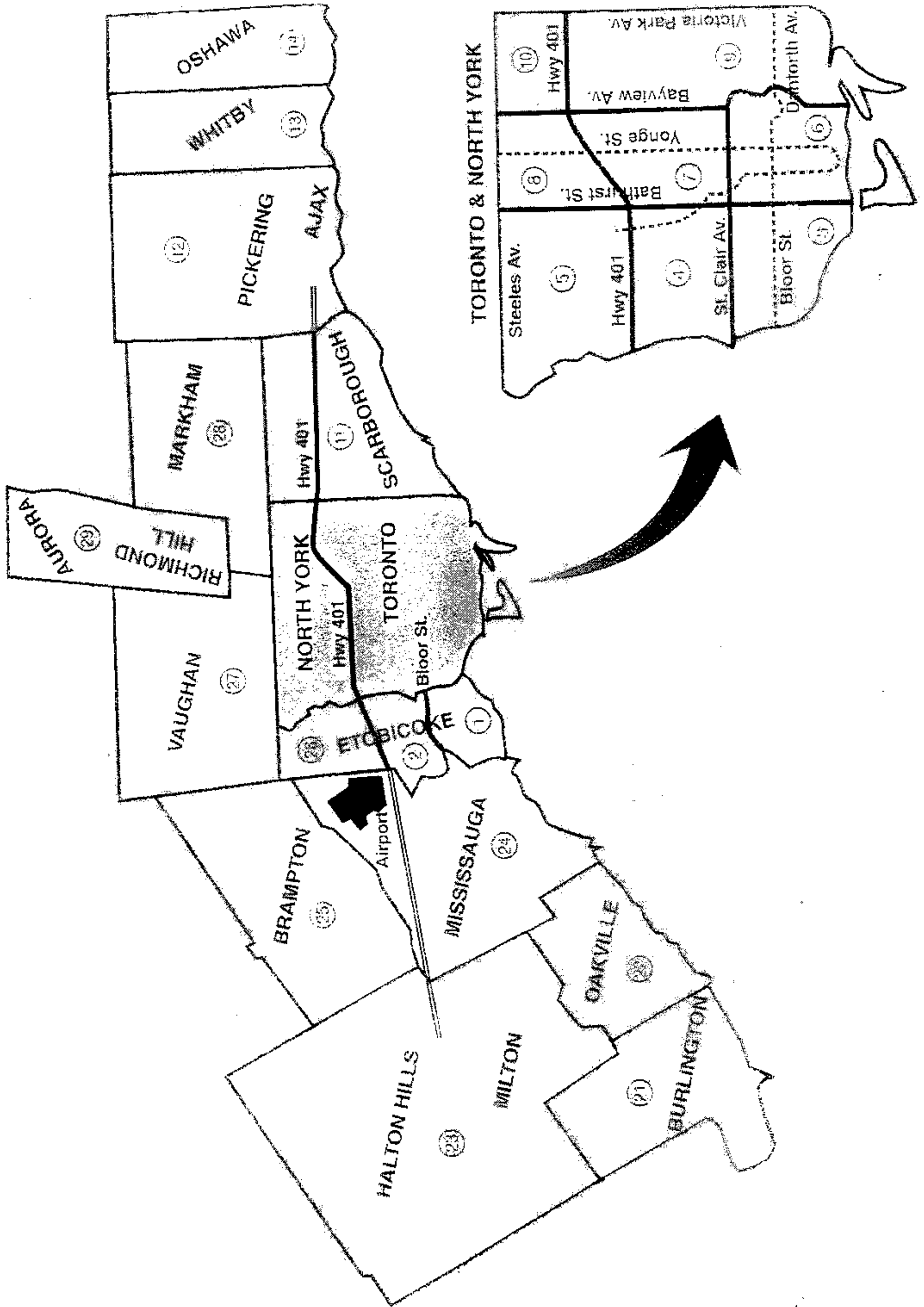
Female

**THANK YOU VERY MUCH FOR YOUR TIME**



# Appendix B

## Zones





### Zonal distribution of LBPIA passengers

<u>Zone #</u>	<u>% of Total</u>	
Outside GTA	24.8%	
1	1.1%	
2	2.1%	
3	2.6%	
4	1.7%	
5	1.8%	
6	16.5%	Downtown
7	5.4%	Both sides of Yonge
8	2.6%	
9	3.1%	
10	1.1%	
11	5.2%	Scarborough
12	1.5%	
13	0.7%	
14	1.0%	
<hr/>		
21	2.3%	
22	2.7%	
23	1.3%	
24	12.7%	Mississauga
25	4.2%	Brampton
26	1.5%	
27	1.3%	
28	2.8%	
	<hr/>	
	100.0%	

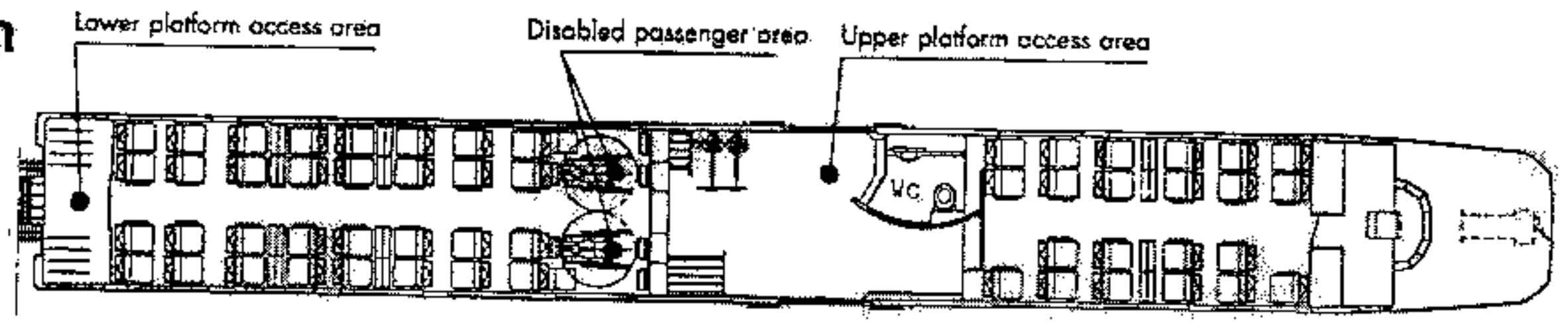


# **Appendix C**

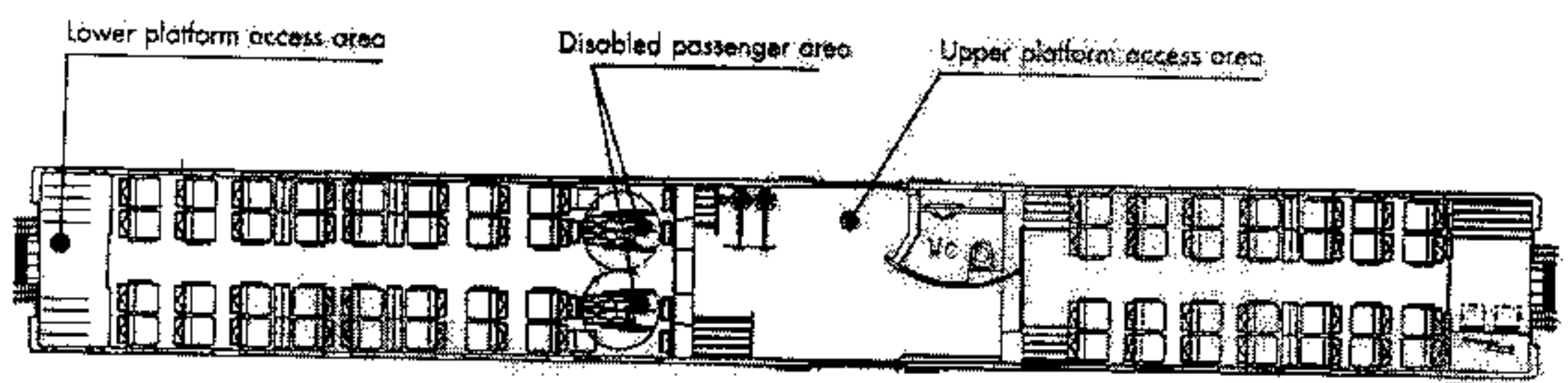
## **Examples of Rail Cars**



### GEC Alstom

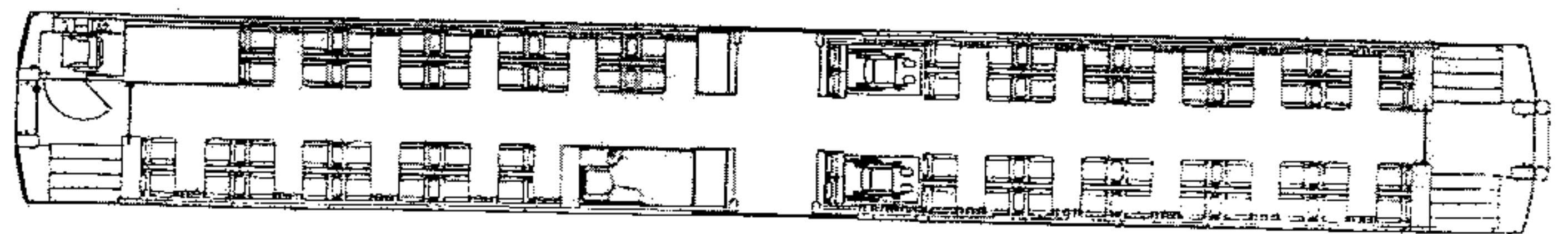
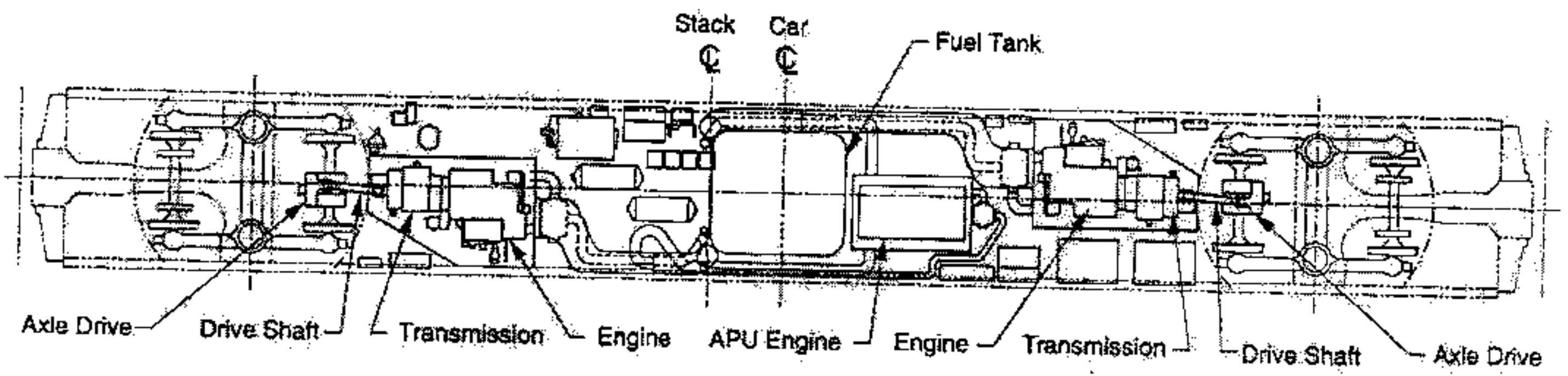
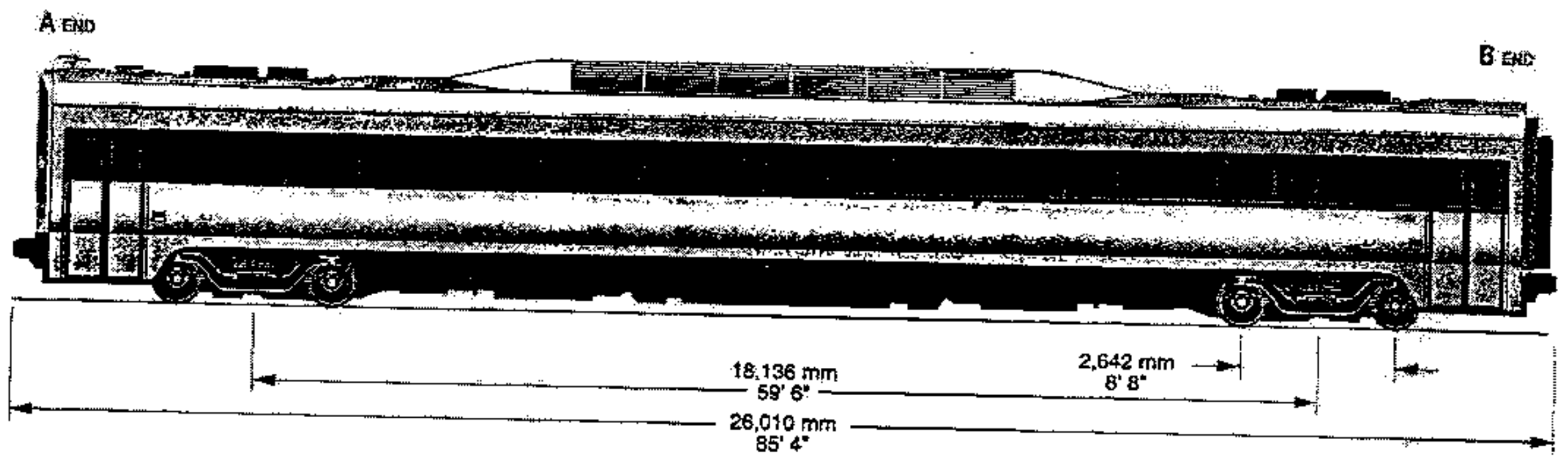


Power car - 62 seated passengers\*



Trailer car - 68 seated passengers\*

### Bombardier



Low/High Level Diagrams 78 C and D

# ALICE Diesel Multiple Unit



## ALICE 203

### GENERAL DATA

Type of trainset: Diesel Multiple Unit (DMU)

Train composition: power car + power car

### SYSTEM DESCRIPTION

Propulsion system: one or two diesel engines per power car  
400 hp (300 kW) per engine

Transmission: hydraulic - two stage driving inboard axles

Cooling system: roof-mounted coolant radiators with hydraulic fan motor

Fuel tank capacity:  
670 US gal. / 2500 approx. litres per car

Truck type: outboard bearing, fabricated frame

Primary suspension: helicoil springs

Secondary suspension: air springs

Brakes: friction tread brakes on all wheels, two disc brakes on each unpowered axle and dynamic retarder within transmission.

Heating: floor

Air conditioning: two 6,5 ton roof-mounted self-contained units

Carbody: stainless Steel (ferritic and austenitic)

### ELECTRICAL SYSTEM

Auxiliary power: one diesel engine powered APU

Auxiliary voltage:  
480 Vac / 3 ph / 60 Hz  
120 Vac / 1 ph / 60 Hz

Low voltage: 24 Vdc or 72 Vdc

Lighting (passenger area): fluorescent

### PERFORMANCE

	Metric	Imperial
Maximum operating speed on level tangent track	120 kph	75 mph
Minimum horizontal curve radius	80 m	3149'
Minimum vertical curve radius	500 m	19685'

### DIMENSIONS

	Metric	Imperial
Length (over coupler)	53528 mm	2107'
Width (over side sheets)	3119 mm	122' 1/32"
Width (over threshold)	3024 mm	119'
Height (rail to roof)	4001 mm	157' 1/2"
Doorway width (center side door)	1350 mm	53' 1/64"
(end side door)	750 mm	29' 1/64"
Coupler height above rail	876 mm	34' 1/64"
Wheel diameter (new)	920 mm	36' 1/64"
Number of Axle motors	3	
Truck wheel base	2600 mm	8' 6' 1/2"
Truck centers	18135 mm	713' 1/32"
Track gauge	1435 mm	56' 1/64"
Floor height above rail	1300 mm	51' 1/64"
Minimum height - floor to ceiling	2200 mm	86' 1/32"

### WEIGHT AND CAPACITY

	Metric	Imperial
Car weight (power car)	59000 kg	130 000 lb
Seat Capacity		124 to 164 seats

## ALICE 204

### PERFORMANCE

	Metric	Imperial
Maximum operating speed on level tangent track	160 kph	100 mph
Minimum horizontal curve radius	80 m	3149'
Minimum vertical curve radius	500 m	19685'

### DIMENSIONS

	Metric	Imperial
Length (over coupler)	53528 mm	2107'
Width (over side sheets)	3119 mm	122' 1/32"
Width (over threshold)	3024 mm	119'
Height (rail to roof)	4001 mm	157' 1/2"
Doorway width (center side door)	1350 mm	53' 1/64"
(end side door)	750 mm	29' 1/64"
Coupler height above rail	876 mm	34' 1/64"
Wheel diameter (new)	920 mm	36' 1/64"
Number of Axle motors	4	
Truck wheel base	2600 mm	8' 6' 1/2"
Truck centers	18135 mm	713' 1/32"
Track gauge	1435 mm	56' 1/64"
Floor height above rail	1300 mm	51' 1/64"
Minimum height - floor to ceiling	2200 mm	86' 1/32"

### WEIGHT AND CAPACITY

	Metric	Imperial
Car weight (power car)	59000 kg	130 000 lb
Seat Capacity		124 to 264 seats

\* The technical data are given for information purposes only and may be modified without previous notice.









# Appendix D

## Sample of Successful Services



**Rail Services to Airports  
(Sample of successful services)**

Airport	Type of Operator <sup>8</sup>	Frequency (minutes)	Number of Stops to Downtown	Fare (rounded) (CAN \$)	Users: % of Orig. & Term. Passengers
London Heathrow	I	15	0	\$25.00	10%
London Gatwick	I	15	0	\$25.00	10%
Frankfurt	R	15-20	1-2	\$4.85	?
Washington National	U	6-12	8	\$3.00	18%
Boston	U	4-9	4	\$1.25	12%
Atlanta	U	8-15	7	\$2.25	7%

<sup>8</sup> U Urban transit  
R Regional transit  
I Independent



# **Appendix E**

## **Financial Projections**