steer davies gleave

Transport Collectif Train de l'Ouest de Montreal

Report
March 2016

CDPQ Infra

Our ref: 22906001
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Executive Summary

Steer Davies Gleave was appointed by CDPQ infrastructure to develop preliminary demand forecasts for the Train de l'Ouest. The main objective of this study is to inform the initial dimensioning of the transit system in order to proceed with the technical engineering work.

The Train de l'Ouest will consist on three differentiated lines/services.

- ***Deux Montagnes Line*** (DM): This line will have similar alignment and stations as the current DM rail service (from Deux Montagnes to Gare Centrale). A new station will be constructed in the intersection with Autoroute 13.
- ***Airport Line***: This line will have the same alignment as DM from Gare Central to the new Autoroute 13 station. From there, the airport branch will head south to the airport over newly built LRT infrastructure.
- ***Pointe-Claire Line***: This line will have the same layout as the Airport branch, but in the proximity to Sources, new LRT infrastructure will be constructed heading West to access 2 new stations (Sources and Pointe Claire).

The Mascouche line, which currently access directly to Gare Centrale, will terminate at new station near Autoroute 40 and will feed demand to the three LRT lines described above.

Steer Davies Gleave reviewed a number of data sources including 2008 and 2013 Enquêtes, rail passenger profiles for Deux Montagnes, Vaudreuil-Hudson and Mascouche lines, weekday demand for 53 West Island bus routes (including express services and 747 airport service) and data from previous Aerotrain study and market research. For the purpose of this study, we have focused in the AM peak period (6am-9am), since it is expected to determine the maximum load in the line and therefore the dimensioning requirements.

Four models have been developed to estimate AM peak demand for each of the corridors:

- Deux Montagnes/Point-Claire transit access demand: capture model derived from transit demand data from AMT and travel time information collected from Google at Sector Municipaux (SM) level.
- Deux Montagnes/Point-Claire P&R demand: given the P&R demand in the AM peak and the unsatisfied demand, it has been assumed that P&R facilities are at 90% capacity. Demand has been allocated to stations based on P&R capacity and OD distribution observed in DM rail demand and 2008 Enquete demand patterns.
- Airport demand: used the Aerotrain model as basis and updated accordingly. Splits airport demand into various marked segments (transit, taxi, kiss and fly, parking, rental car and staff) and the capture model assigns demand to each mode based on mode characteristics.
- Mascouche: developed a simple capture comparing travel times by Mascouche+new LRT versus Mascouche+ Metro Orange Line to determine demand reduction

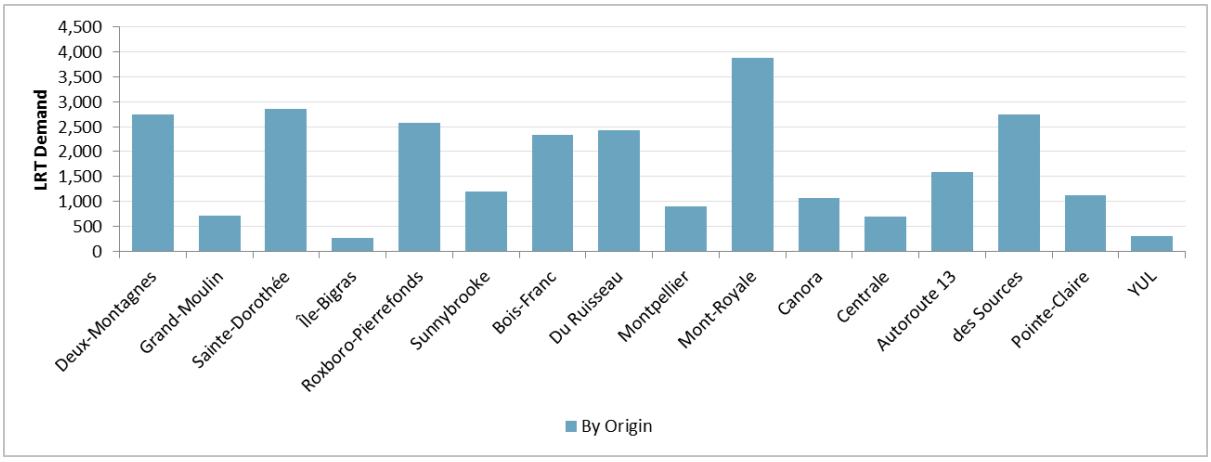
A review of historical transit growth and socioeconomic indicators was undertaken, but it has been challenging to develop an econometric growth model, since historic transit demand growth in the corridor has been affected by a number of external factors. Therefore we applied growth factors estimated by MTQ based on population projections for each zone and reflecting trends on car ownership, transit and active mode market share, etc.

A Base Case was developed with the following assumptions:

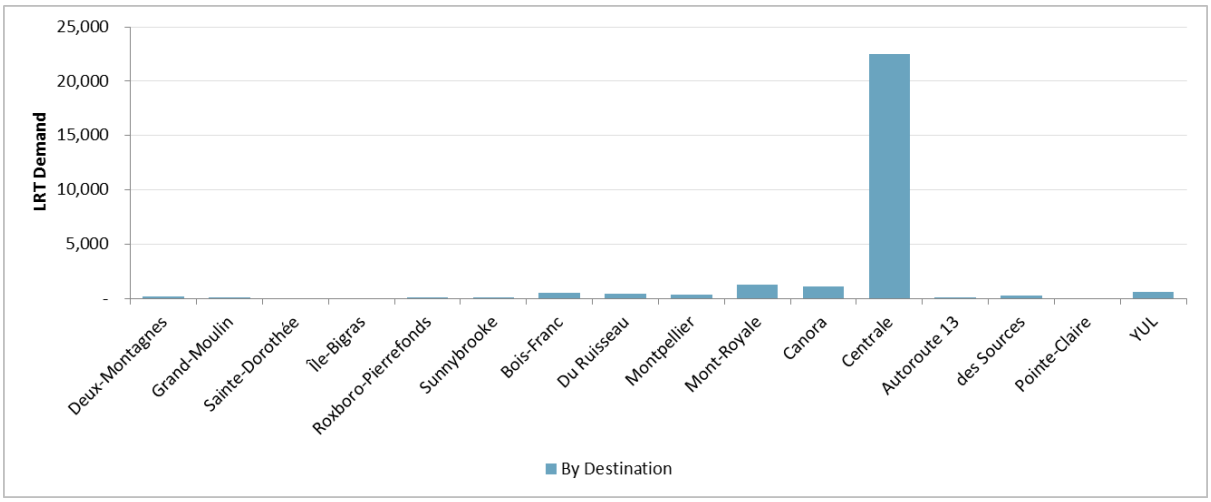
- Base demand: based on 2008 Enquête data and adjusted to reflect AMT counts and P&R capacity
- Growth: MTQ growth assumptions in the corridor
- LRT alignment, stations, P&R and service levels as agreed with CDPQ (Chapter 2)
- Transit assumptions:
  - Express routes, V-H and Orange line service remain as current
  - Fairview bus station relocated to Pointe-Claire
  - 747 airport bus route remains but with a 30 min frequency

AM Peak period (6am-9am) ridership forecasts were developed by applying the various models developed. Figures below present the boarding and alightings. This results in "base dimensioning forecasts" of 24,000 AM peak boardings across the line in 2022 increasing to 27,500 by 2041.

2041 Station boardings (AM Peak Base Case, no ramp up)

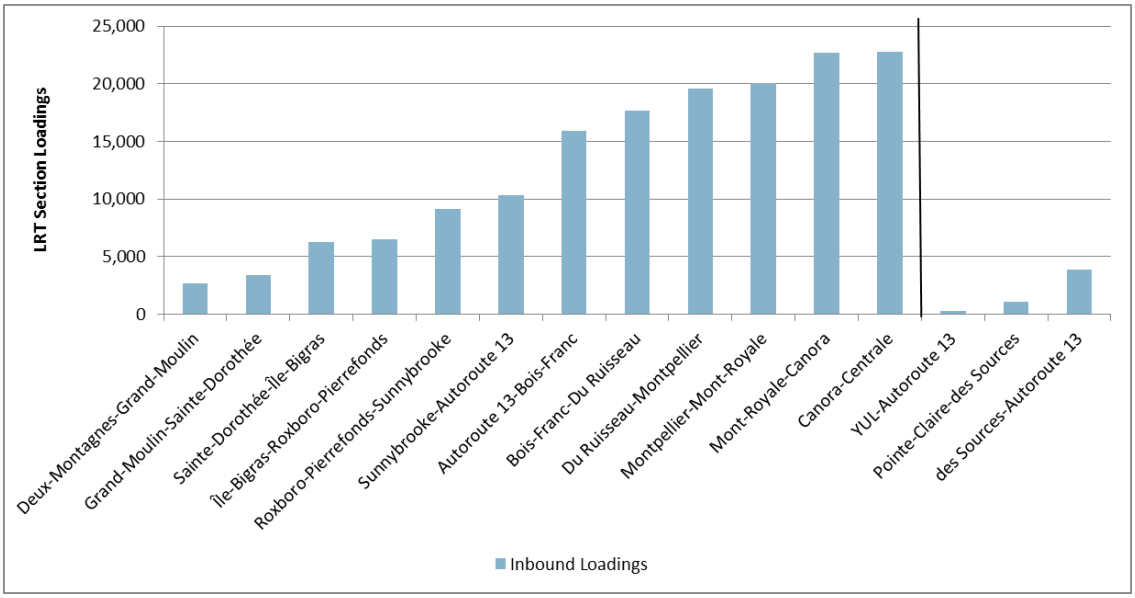


2041 Station alightings (AM Peak Base Case, no ramp up)



Similar to the current DM ridership profile, the majority of the demand in the AM peak period will board at stations with well-integrated feeder bus networks and with P&R facilities, while most of the demand will alight in downtown Montreal. Line loadings were also developed and shown in figure below.

2041 Line Loadings: Inbound to Montreal (AM Peak Base Case, no ramp up)



The section between Mont-Royale and Gare Centrale is the most loaded on the LRT network, with more than 22,800 passengers in the AM peak period in 2041 (note that the modelled AM peak period (6am to 9am) does not represent the real peak period for the airport).

Daily and annual forecast were developed based on expansion factors estimated for different demand segments and corridors. These factors assume improvement in the feeder bus network during the off peak period, which is currently poor due to the limited service levels.

The majority of the LRT demand is driven by passengers currently using the Deux-Montagnes line, with increase as a result of improved service frequency, P&R facilities and the extension to Pointe-Claire.

Preliminary annual demand forecasts are summarized below.

Annual Demand (Base Case with Ramp Up)

	2022	%	2031	%	2041	%
DEMAND						
DM- transit	8,623,700	56%	11,927,800	60%	12,839,300	61%
Park & Ride	4,487,100	29%	4,858,700	25%	4,860,500	23%
Airport	1,335,700	9%	2,059,000	10%	2,485,100	12%
Mascouche	1,005,300	7%	916,200	5%	963,100	5%
TOTAL	**15,451,800**	**100%**	**19,761,700**	**100%**	**21,148,000**	**100%**

The development of these preliminary forecasts has been carried out based on information that has been produced by third parties and that Steer Davies Gleave has not been able to validate extensively at this first stage. These items would need to be assessed in detail in the development of investment-grade forecasts.

The analysis speaks only as of the date thereof and the Company does not undertake any responsibility for updating the analysis for any reason, including as a result of new information, future events or otherwise.

1 Introduction

Background

1.1 Steer Davies Gleave was appointed by CDPQ infrastructure to develop preliminary demand forecasts for the Train de l'Ouest. The main objective of this study is to inform the initial dimensioning of the transit system in order to proceed with the technical engineering work.

1.2 The development of preliminary forecasts has been carried out based on information that has been produced by third parties and that Steer Davies Gleave has not been able to validate extensively at this first stage (e.g. transit and auto travel times, access times, average tariffs, etc.). These items would need to be assessed in detail in the development of investment-grade forecasts.

Report Structure

1.3 Following this introductory section the report includes:

- Chapter 2 describes the Train de l'Ouest alignment and operational characteristics
- Chapter 3 includes the description of the existing demand and the key market segments
- Chapter 4 describes the methodology adopted to estimate the capture of the LRT from transit and car, and the key assumptions that have been adopted
- Chapter 5 summarizes the growth assumptions
- Chapter 6 defines the Base Case and presents preliminary forecasts (including AM peak station boardings and maximum loading sections, daily demand, annual demand and sensitivity analysis

Disclaimer

1.4 The analysis has been based on third party information and assumptions. Moreover, it contains projected information and data (financial and otherwise), and other forward-looking information, that may or may not occur or prove to be accurate. Such projected and forward-looking information is based on current expectations and projections about future events, many of which are beyond the control of the Company, the Client or any other participant in the Project, and such projections and forward-looking information can be affected by and forward-looking information, or the assumptions underlying such projections and forward-looking information.

1.5 The analysis speaks only as of the date thereof and the Company does not undertake any responsibility for updating the analysis for any reason, including as a result of new information, future events or otherwise.

2 Project Definition

2.1 In order to assess LRT ridership, it is critical to define accurately the “base” characteristics of the project, since this will determine the competitiveness of the LRT compared to other modes.

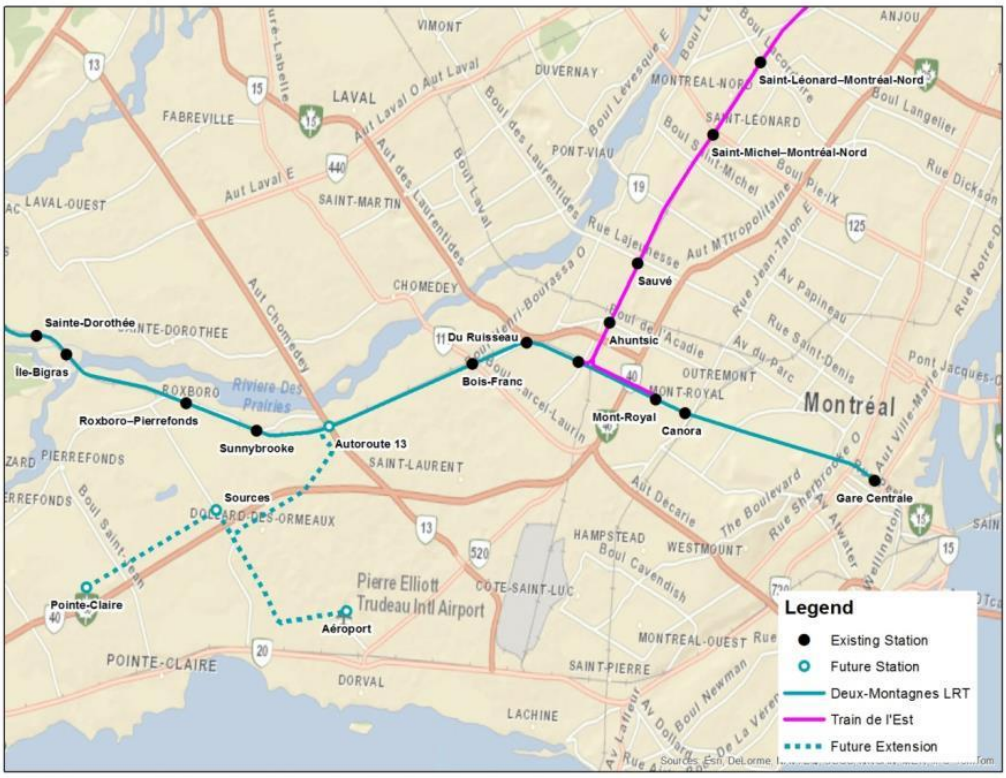
2.2 The definition of the project includes not only the LRT characteristics, but also those of competing and feeder modes; other transit and road.

Train de l’Ouest

Alignment and Stations

2.3 The following figure shows the assumed alignment and station location as agreed with CDPQ infra (January 2016).

Figure 2.1: Train de l’Ouest



2.4 The LRT will consist on three differentiated lines/services.

- ***Deux Montagnes Line*** (DM): This line will have similar alignment and stations as the current DM rail service (from Deux Montagnes to Gare Centrale). A new station will be constructed in the intersection with Autoroute 13.
- ***Airport Line***: This line will have the same alignment as DM from Gare Central to the new Autoroute 13 station . From there, the airport branch will head south with new built LRT infrastructure. The alignment will run parallel to Highway 40 until the Sources area and will head southeast to access a new station at the Airport.
- ***Pointe-Claire Line***: This line will have the same layout as the Airport branch, but in the proximity to Sources, new LRT infrastructure will be constructed heading West to access 2 new stations (Sources and Pointe Claire) in high density population areas.

2.5 The Mascouche line, which currently access directly to Gare Centrale, will now terminate in Mount Royale, and will feed demand to the three LRT lines described above.

Operational Characteristics

2.6 The proposed travel times and headways for these 3 lines are summarised in tables below.

Table 2.1: Deux Montagnes Services – Current and Proposed

	Current	Proposed		
	Deux Montagnes	Deux Montagnes	Airport	Pointe-Claire
Stations	Gare Centrale Canora Mont-Royal Montpellier Du Ruisseau Bois-Franc Sunnybrooke Roxboro-Pierrefonds Ile-Bigras Sainte-Dorothee Grand-Moulin Deux-Montagnes	Gare Centrale Canora Mont-Royal Montpellier Du Ruisseau Bois-Franc ***Autoroute 13 (NEW)*** Sunnybrooke Roxboro-Pierrefonds Ile-Bigras Sainte-Dorothee Grand-Moulin Deux-Montagnes	Gare Centrale Canora Mont-Royal Montpellier Du Ruisseau Bois-Franc ***Autoroute 13 (NEW)*** ***Sources (NEW)*** ***YUL (NEW)***	Gare Centrale Canora Mont-Royal Montpellier Du Ruisseau Bois-Franc ***Autoroute 13 (NEW)*** ***Sources (NEW)*** ***Pointe-Claire (NEW)***
Travel time (mins)	40.0	40.5	33.7	33.8
Distance (km)	29.9	29.9	24.8	24.9
Speed (kph)	45	45	45	45
Peak headway (min)*	20	6	12	12
Off peak headway (min)	60	10	15	15
Operating hours	5:50 to 23:20	5:00 to 24:00	5:00 to 24:00	5:00 to 24:00

*NOTE: * This results in a 3 minute headway between Gare Centrale and Autoroute 13 stations in the Peak and 4 minutes in the Off peak for the Proposed scenario*

Table 2.2: Mascouche Line – Current and Proposed

	Current	Proposed
Stations	Mascouche Terrebonne Pointe-aux-Trembles Rivière-des-Prairies Anjou Saint-Léonard–Montréal-Nord Saint-Michel–Montréal-Nord Sauvé Ahuntsic Mont Royal Canora Gare Centrale	Mascouche Terrebonne Pointe-aux-Trembles Rivière-des-Prairies Anjou Saint-Léonard–Montréal-Nord Saint-Michel–Montréal-Nord Sauvé Ahuntsic *A40 station (NEW)*
Travel time (mins)	66.0	54.5
Distance (km)	50.1	43.5
Speed (kph)	46	46
Headway	45	45
Off peak headway	4 services	4 services
Operating hours	5:40-20:32	5:40-20:32

Transit Network Definition

2.7 The attractiveness of the LRT option depends not only on the LRT characteristics, but also the accessibility to the LRT stations- both by **feeder transit services** and **Park and Ride** facilities.

2.8 Current feeder buses have poor frequencies and coverage and it is expected that in the future there will be a bus restructuring to provide improved services and coordinated with the LRT. A bus restructuring should be carefully designed to optimize the attractiveness of the LRT, and will be analysed in next phases of the project.

2.9 For this study, we have assumed the following limited bus restructuring:

- Current access times to the existing DM stations have been estimated using Google Map tools. For the future scenario, it has been assumed that these times will remain unchanged. However, it is worth noting that the “perception” of improvement on LRT frequencies would be limited unless coordinated with improvements in the feeder buses, and therefore, our models intrinsically assume some improvement in the “*perceived*” access times.

- For the new stations in the Point Claire branch, it has been assumed that bus services currently available at the Fairview bus station will provide direct access to the LRT station from a number of Sector Municipaux (SM)[1] 131, 130, 132, 138. The details of the feeder bus network will need to be confirmed in the next phase of work

2.10 For the Airport link it has been assumed that LRT accessibility from the airport terminal will be similar to the current 747 and no additional access time assumed. This is a critical factor to LRT attractiveness - and has been one of the sources of underperformance of some airport links (i.e. UP Express).

2.11 Another important component to determine the competitiveness of the LRT is the service provided by the **competing transit alternatives (Vaudreuil-Hudson rail line and bus express services)**. Chapter 3 describes in detail the existing competing services, as well as their current market shares. For the purpose of this study, it has been assumed that these services remain the same. However, eliminating or truncating existing services would result in higher competitiveness of the LRT and therefore higher capture rates.

2.12 For the purpose of this study, the following assumptions have been agreed to be adopted with CDPQ Infra:

- Existing express routes remain as current
- Vaudreuil-Hudson service remains as current in the AM peak (additional services planned for the inter peak and PM periods but not included in this analysis which focussed on the AM peak)
- Airport 747 bus route different assumptions (every 30 min or cancelled)
- Orange Metro Line interchange with Mascouche line and service remains as current

Park and Ride

2.13 The Deux Montagnes and Mascouche lines are served by Park and Ride sites at a number of stations. As shown in Chapter 3, an important amount of the existing demand use P&R facilities. However ,this demand growth is constrained by the capacity of these facilities, which are currently almost at full capacity in the AM peak.

2.14 Additional P&R capacity is expected for some of the new stations and this is anticipated it will increase ridership due to the existing unsatisfied demand. Table 2.3 summarizes the current Park & Ride provision and the assumptions regarding new stations.

[1] See Appendix A for a map showing the region's Sector Municipaux (SM)

Table 2.3: Stations and P&R Assumptions

	Deux Montagnes	Size (and occupancy)	Mascouche	Size (and occupancy)
CURRENT				
	Gare Centrale	-	Gare Centrale	-
	Canora	-	Canora	-
	Mont-Royal	-	Mont-Royal	-
	Montpellier	-	Ahuntsic	-
	Du Ruisseau	1063 (82%)	Sauvé	-
	Bois-Franc	742 (91%)	Saint-Michel–Montréal-Nord	140 (-)
	Sunnybrooke	515 (98%)	Saint-Léonard–Montréal-Nord	179 (37%)
	Roxboro–Pierrefonds	918 (92%)	Anjou	308 (28%)
	Île-Bigras	65 (99%)	Rivière-des-Prairies	202 (66%)
	Sainte-Dorothée	1101 (92%)	Pointe-aux-Trembles	359 (-)
	Grand-Moulin	304 (96%)	Repentigny	596 (70%)
	Deux-Montagnes	1256 (92%)	Terrebonne	726 (35%)
			Mascouche	505 (81%)
PROPOSED				
	Autoroute 13	760		
	YUL	-		
	Sources	-		
	Pointe-Claire	1500		

Source: 2014 AMT Annual Report

2.15 An occupancy rate of 90% in the peak was assumed for the proposed new Park & Ride facilities at Autoroute 13 and Sources. Of these additional parking spaces, an average occupation rate per car of 1.1 has been assumed (based on AMT Park &Ride occupancy data) which would result in potential increase of 2,034 cars (or 2,237 users).

3 Existing Demand

Introduction

3.1 Estimating accurately existing demand is critical, since this information provides the basis for the LRT forecasts. Steer Davies Gleave has reviewed the following sources:

- 2008 and 2013 OD surveys classified by:
  - Periods: AM peak and daily
  - Modes: transit (with transit and P&R access) and car demand
- Commuter rail passenger profiles (boardings and alightings) for September 2012, September 2013 and September 2014 for Deux Montagnes, Vaudreuil-Hudson and Mascouche lines for the AM peak, inter peak and PM periods.
- Weekday demand for 53 West Island bus routes, including express services and 747 airport service (average hourly demand between March 30th and June 21st 2015).
- Information available from the Aerotrain study and market research

3.2 For the purpose of this study, we have focused in the AM peak period (6-9am), since it is expected to determine the maximum load in the line and therefore the dimensioning requirements.

Deux Montagnes and Point Claire Demand

In-scope area

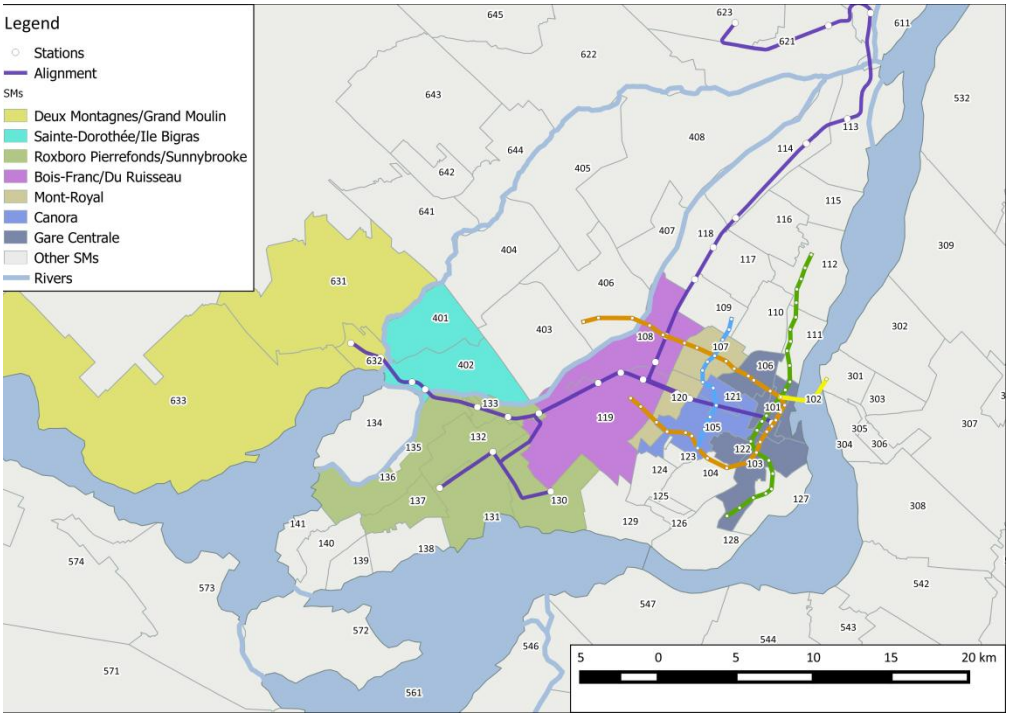
3.3 In order to analyse the demand in the corridor, Steer Davies Gleave has analysed in detail the existing demand patterns in the Deux Montagnes rail line, as well as the whole corridor. Detailed demand patterns have been analysed based on the Enquete data, and this has been complemented with demand data provided by AMT and STM for rail and bus services.

3.4 The Enquete data is provided at the SM level and that is the basis of the analysis. The following table and map shows the identified “in-scope” area, which represents the demand most likely to be attracted by the DM stations by SM. Note that analysis presented below focusses on these SMs to understand the DM demand patterns. Forecasting analysis includes all relevant SMs.

Table 3.1: DM Station and SM correlation

Station	SM	Name
Deux-Montagnes	632	Deux-Montagnes
Grand-Moulin	631	Saint-Eustache
	633	Pointe-Calumet, Saint-Joseph-du-Lac, Oka, Sainte-Marthe-sur-le-Lac, Saint-Placide
Sainte-Dorothée	402	Laval : Sainte-Dorothée, Laval-sur-le-Lac
Île Bigras	401	Laval : Ouest
Roxboro-Pierrefonds	133	Montréal : Roxboro
Sunnybrooke	136	Montréal : Pierrefonds
	132	Dollard-Des Ormeaux
	131	Pointe-Claire
	137	Kirkland
	130	Dorval, L'Île-Dorval
Bois-Franc	119	Montréal : Saint-Laurent
Du Ruisseau	108	Montréal : Ahuntsic
Mont-Royal	120	Mont-Royal
Canora	105	Montréal : Côte-des-Neiges
	121	Montréal : Outremont
Gare Centrale	101	Montréal : Centre-ville
	102	Montréal : Centre-ville périphérique
	103	Montréal : Sud-Ouest

Figure 3.1: DM Station and SM location



3.5 In-scope Origins and Destinations (ODs) were identified as those with existing demand from the DM line, existing demand from the STM west island express buses and 747 service, airport (SM130) and other SMs identified for future capture based on their geographic locations. This resulted in 262 ODs for the AM peak period.

Deux Montagnes rail demand

Daily demand

3.6 The existing demand on the line is the basis for estimating future LRT demand on Deux Montagnes line. The total daily demand according to the data sources available is shown in Table 3.2.

Table 3.2: DM Daily Demand Estimates

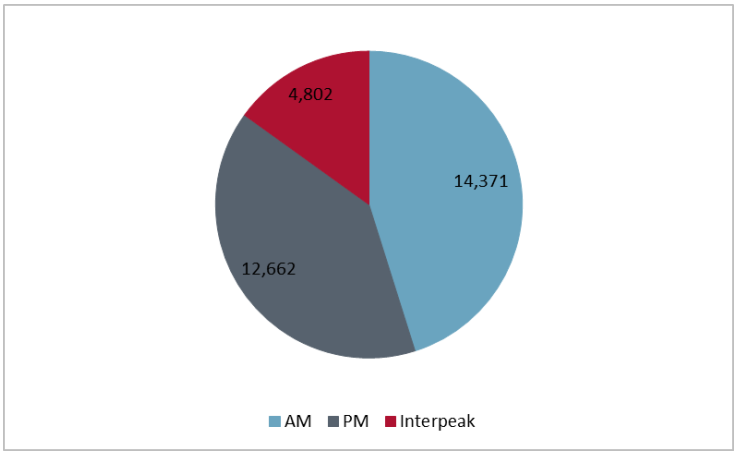
	2008	2012	2013	2014
2008 Enquête	43,200			
AMT boardings		31,700	31,200	31,800

3.7 There are considerable differences between the 2 data sources. However given the limited sample size and the nature of the Enquete, we believe the AMT reported data provides a more reliable source to use for the development of base year demand.

Peak demand

3.8 The existing level of service and resulting demand is commuter-oriented, with high peaks and AM and PM peak accounting for 85% of daily demand.

Figure 3.2: DM time of day demand profile (2014)



Source: AMT

3.9 The AM peak demand according to the data sources available is shown in Table 3.3.

Table 3.3: AM Peak Demand Estimates

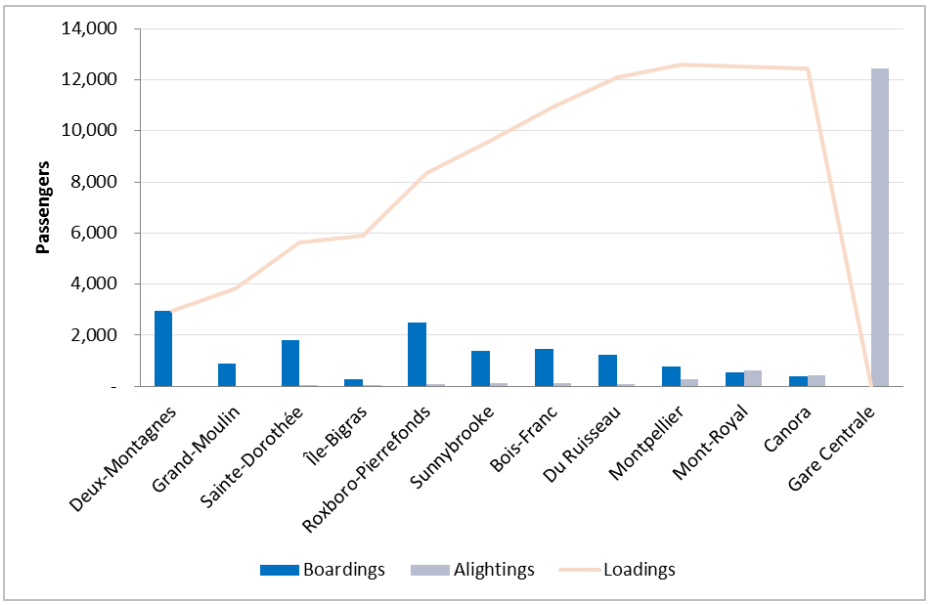
	2008	2012	2013	2014
2008 Enquête	17,850			
AMT		14,780	13,980	14,370

3.10 There are considerable differences between the 2 data sources. However given the limited sample size and the nature of the Enquete, we believe the AMT reported data provides a more reliable source to use for the development of base year demand.

Peak demand by station

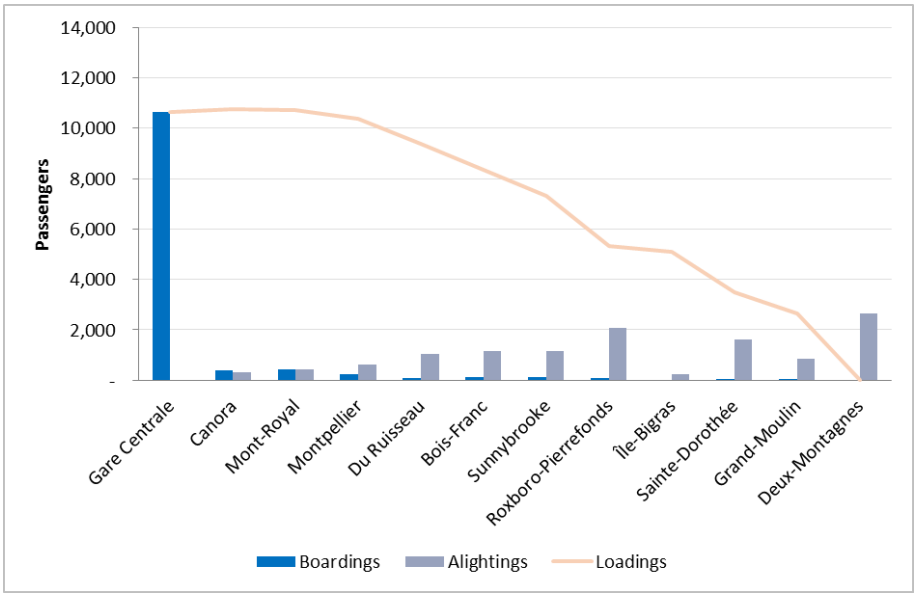
3.11 Figure 3.3 and Figure 3.4show the boardings and alightings per station for the AM and PM peak. Both figures show similar profiles, with majority of demand alighting/boarding at Gare Centrale and limited activity at intermediate stations. The peak loading is around 12,000 passengers in the AM peak.

Figure 3.3: DM AM Peak Inbound Demand Profile (2014)



Source: AMT

Figure 3.4: DM PM Peak Outbound Demand Profile (2014)



Source: AMT

Access Mode Demand - Transit access vs Park and Ride

3.12 AMT provided Origin Destination matrices from the 2008 Enquete for the specific demand that use the DM Line. This information allowed to analyse the demand patterns for two different type of users:

- Users that access to the DM rail stations by car- using P&R facilities (“P&R users”)
- Users that access to the DM rail stations by other modes- transit, walking, kiss and ride, etc. (referred to as “transit users” in the remainder of this report)

3.13 The accessibility to the stations by non-car users can be challenging due to station location. Most of the stations have P&R facilities, mostly free, and therefore the percentage of P&R users is very high. However, the potential growth for this demand is constrained by the capacity of the P&R facilities, which have very high occupation rates (see Table 2.3) from early in the morning.

3.14 Table 3.4 shows the estimated demand by access mode (Enquete 2008) and the capacity of the P&R facilities.

Table 3.4: AM Peak Demand (2008 Enquete)

	Enquete	Capacity
Transit Access	8,311	
P&R access	9,540	5,964

3.15 Based on the P&R capacity available and the differences identified between the Enquete and the AMT reported demand (see Table 3.2 and Table 3.3), we believe that the P&R demand estimated

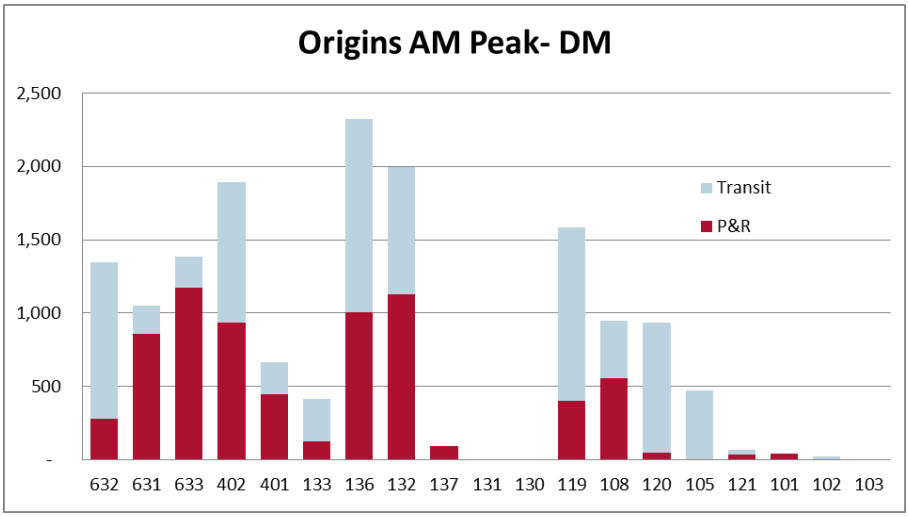
in the Enquete is not correct. Therefore, for the purpose of this study, we have based the P&R demand based the current capacity available at each station.

Demand by OD

3.16 The zones that generate most trips are in the Deux Montagnes area (SM 632, 631, 633), SM 136 (Pierrefonds) and SM 132 (Dollard-Des Ormeaux), followed by SM 404 (Sainte-Dorothée, Laval-sur-le-Lac) and SM 119 (Saint-Laurent).

3.17 The percentage of trips that access by P&R varies depending on the Origin of the trip (SM). The following figure shows how demand in the most inaccessible zones have a very high percentage of P&R demand (e.g. SM 633), while higher density and accessible zones have a high percentage of access by other modes (e.g. SM 632).

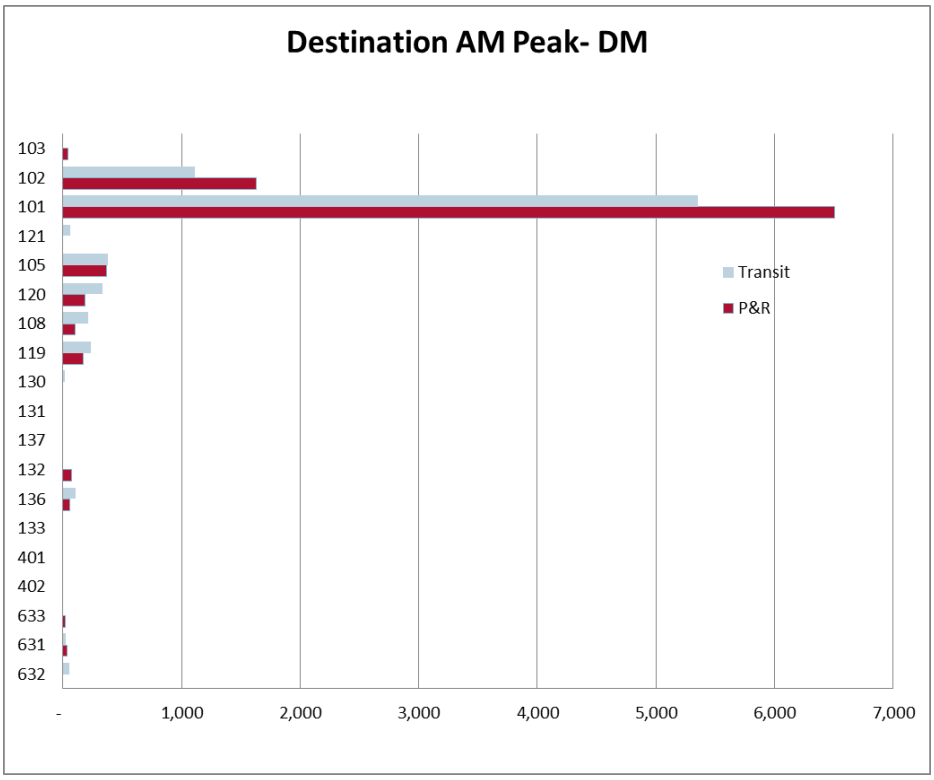
Figure 3.5: DM AM Peak Trips – Origin SM



Note: This figure shows the most representative SMs, which include 74% of total DM P&R demand and 98% of transit demand

3.18 Although the demand by Origin is very different, the destination distribution is very similar, with most of the trips terminating in Downtown (SM 101 and 102) as shown in Figure 3.6.

Figure 3.6: DM AM Peak Trips – Destination SM



3.19 As mentioned above, most of the P&R facilities are close to capacity (see Table 2.3) and therefore there is very little scope to grow ridership for those type of users, except for the additional capacity to be provided at new stations.

3.20 Our analysis moving forward has focused on the potential capture of demand that access by "transit", since this will be the major source of demand growth.

Deux Montagnes Corridor demand

3.21 This section analyses demand by mode in the corridor during the AM peak period, analysing transit market share compared to car, as well as the market share of the different transit modes (DM, Vaudrail and other transit). The analysis has been carried out based on the Enquete 2008 and has been classified by geographic areas, since they present different characteristics and competitiveness with transit alternatives.

Deux Montagnes, Grand Moulin, Sainte Dorothee and Ile Brigras Demand

3.22 The area of Deux Montagnes has 2 stations: Deux Montagnes and Grand Moulin, with 2,950 and 900 boardings in the peak period. Both stations have a total P&R capacity of 1,560 spaces, with an average occupancy of 93%, most of which seem to be used by residents North and West of Deux Montagnes (SM 631, 633)

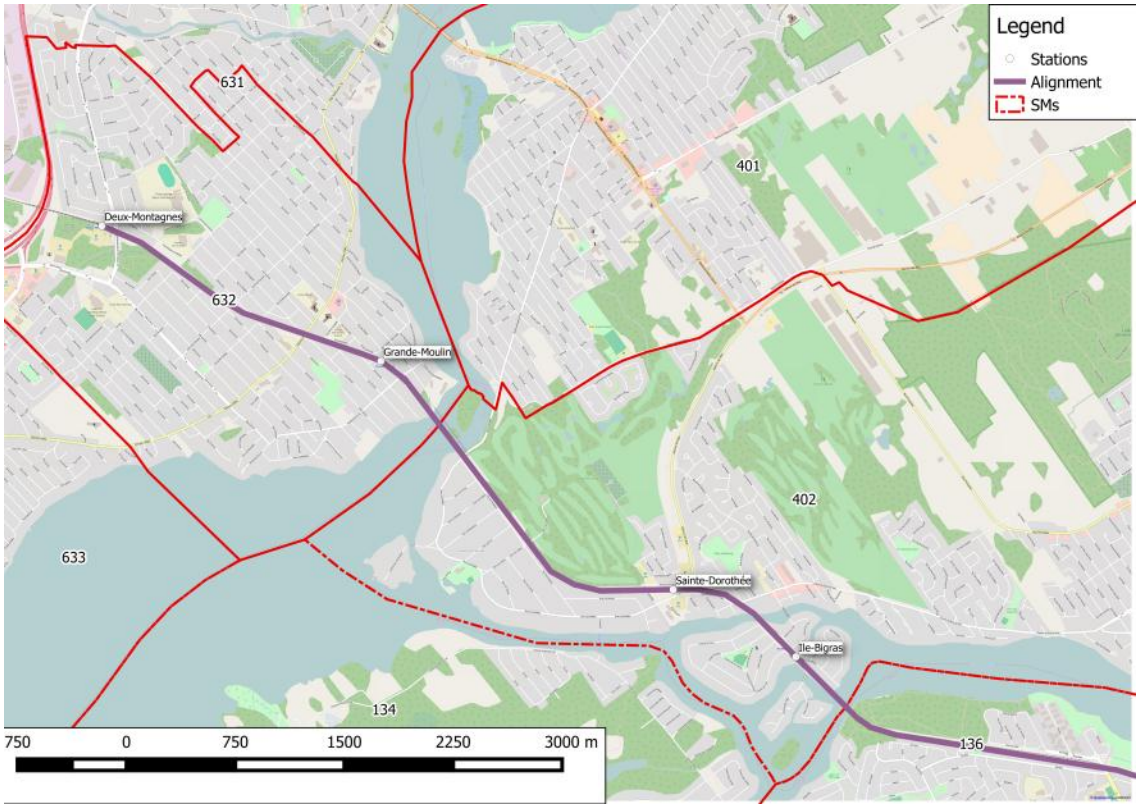
3.23 Saint Dorothee and Ile Brigras have 1,101 and 65 spaces respectively, with a 92% average occupation rate.

3.24 The following table and graph show the main origins for DM trips in the corridor and their market share compared to transit and car.

Table 3.5: Deux Montagnes, Gran Moulin, Sinte-Dorothee and Ile Bigras station demand

Stations	Deux-Montagnes and Gran Moulin			Sainte-Dorothée, Île-Bigras	
SM	632	631	633	402	401
CAR	**2,370**	**2,186**	**4,010**	**4,969**	**1,666**
P&R access	258	840	1,197	1,179	542
Transit access	1,145	286	224	1,475	338
Total transit	**1,403**	**1,126**	**1,421**	**2,654**	**880**
Transit Market share	*37%*	*34%*	*26%*	*35%*	*35%*
P&R access	282	861	1,174	936	449
Transit access	1,067	193	210	961	218
Total DM	**1,349**	**1,053**	**1,385**	**1,896**	**668**
DM Market share	*96%*	*94%*	*97%*	*71%*	*76%*

Figure 3.7: Deux Montagnes, Gran Moulin, Sinte-Dorothee and Ile Bigras stations and SM location



3.25 Transit market shares are high (around 35%), and DM is definitely the preferred transit option, with 95% and 73% market share respectively.

3.26 The improvement in DM travel times and frequencies could lead to an increase in capture from car, however, this could be highly limited by the P&R Capacity constraints, which at the moment is the preferred access mode- 61% use P&R in Deux Montagnes and 54% in Saint Dorothee and Ile Bigras. However, additional increase in LRT capture could be incentivised by improved feeder buses either in terms of coverage and/or frequency.

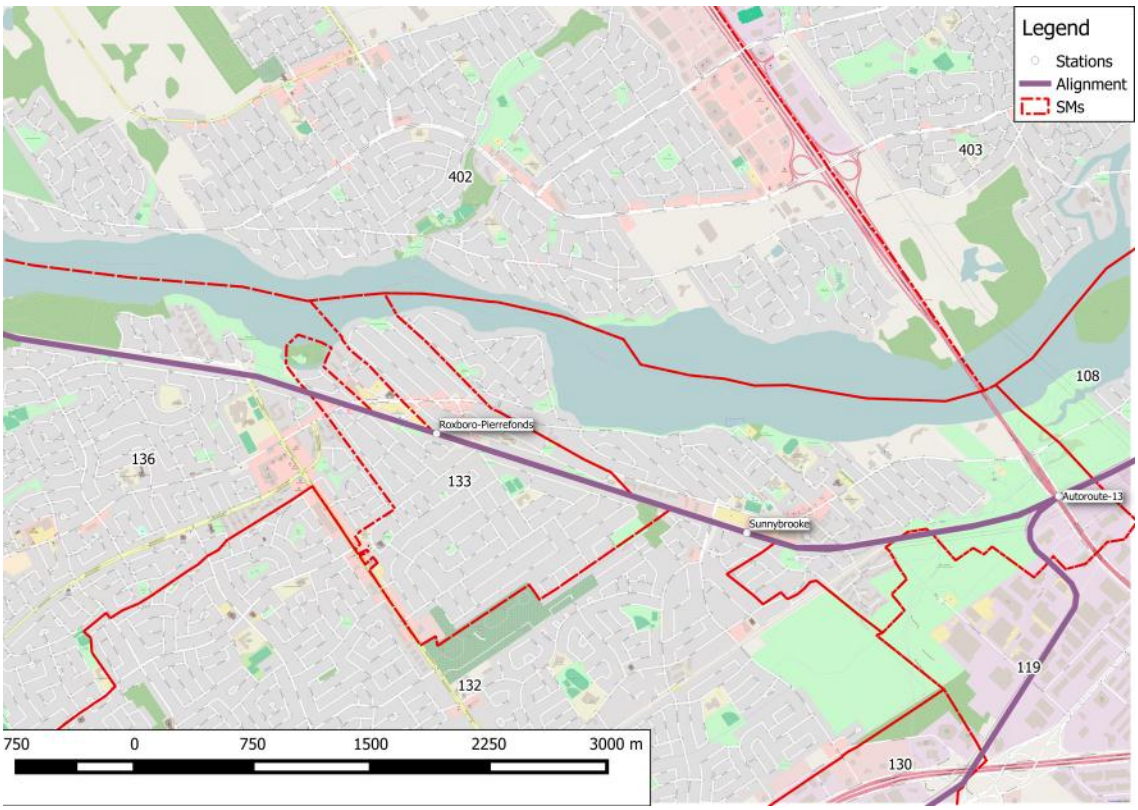
Roxboro-Pierrefonds, Sunnybrooke and Pointe Claire Demand

3.27 Transit market shares are high (between 26-35%) in those zones where there is a rail station with P&R or good transit access. However, market share goes down to 18% on zones with poorer access.

Table 3.6: Roxboro-Pierrefonds and Sunnybrooke Station Demand & Market Share

SM	133	136	132	131	137	130
CAR	**1,557**	**7,793**	**16,905**	**10,088**	**2,597**	**6,296**
P&R access	124	1,662	1,568	644	920	302
Transit access	425	2,673	2,166	2,250	468	1,666
Total transit	**549**	**4,335**	**3,735**	**2,894**	**1,387**	**1,967**
Transit Market share	*26%*	*36%*	*18%*	*22%*	*35%*	*24%*

Figure 3.8: Roxboro-Pierrefonds and Sunnybrooke stations and SM locations



3.28 Rail market share is generally high in zones close to a rail station and P&R facilities i.e. DM station (SM133) or Vaudrail station (S131). Roxboro-Pierrefonds and Sunnybrooke have 918 and 515 P&R spaces respectively with a 94% average occupation rate.

3.29 However, lower market shares are observed on zones with poor rail access and more competition from Express buses.

Table 3.7: Roxboro-Pierrefonds and Sunnybrooke Station Demand & Rail Market Share

SM	133	136	132	131	137	130
P&R access	124	1,662	1,568	644	920	302
Transit access	425	2,673	2,166	2,250	468	1,666
Total transit	**549**	**4,335**	**3,735**	**2,894**	**1,387**	**1,967**
Transit Market share	*26%*	*36%*	*18%*	*22%*	*35%*	*24%*
P&R access	124	1,004	1,128	-	94	-
Transit access	292	1,323	867	-	-	-
Total DM	**416**	**2,327**	**1,995**	**-**	**94**	**-**
DM Market share	***76%***	***54%***	***53%***	*0%*	*7%*	*0%*
P&R access	-	340	146	627	464	147
Transit access	-	19	42	1,158	171	421
Total V-H	**-**	**358**	**189**	**1,784**	**634**	**568**
V-H Market share	*0%*	*8%*	*5%*	***62%***	***46%***	***29%***
P&R access	-	318	294	17	362	155
Transit access	133	1,331	1,257	1,093	297	1,244
Total **OTHER** transit	**133**	**1,650**	**1,551**	**1,110**	**659**	**1,400**
Other Market share	24%	**38%**	**42%**	**38%**	**48%**	**71%**

3.30 In general, demand split between DM and VD is very clear, with the exception of some P&R users. This might change with the extension of DM to Point Claire and the Airport but especially with the additional P&R facilities. However, most of the new "transit" demand is expected to be captured from express buses.

Competition with express bus

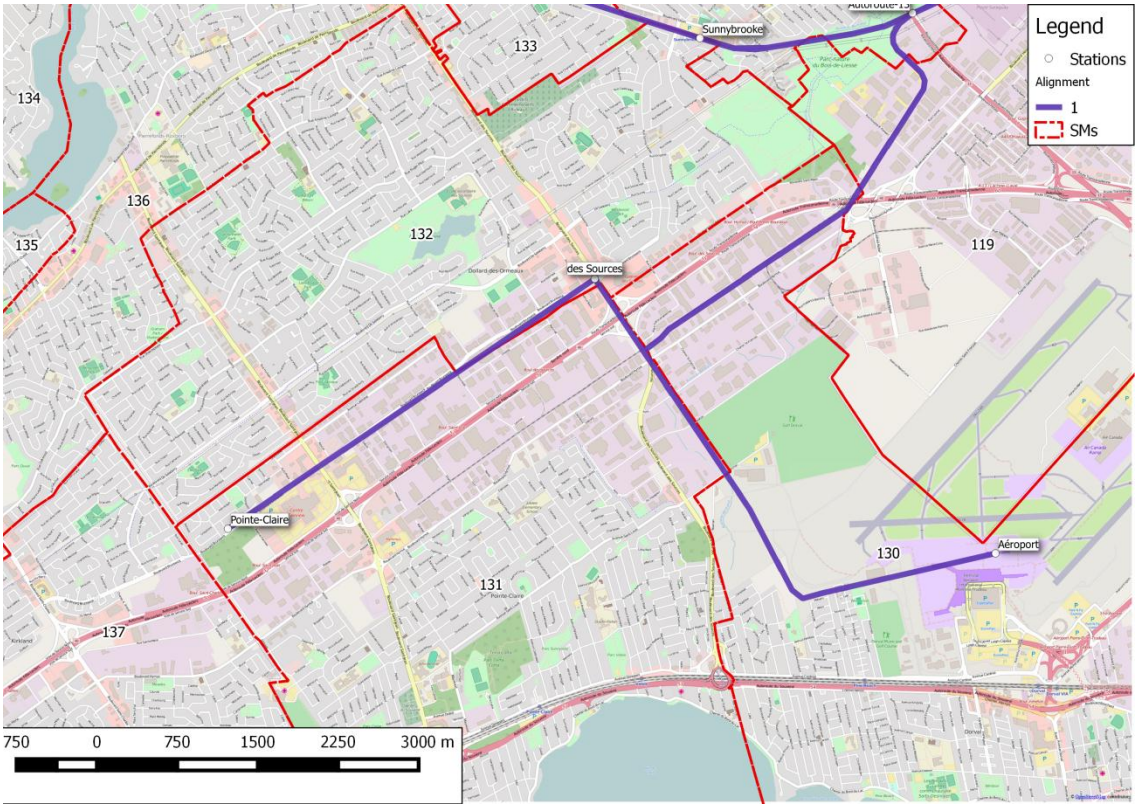
3.31 The areas covered by Roxboro-Pierrefonds and Sunnybrooke are very extensive, with good coverage of express STM services. As a result, there is a high penetration rate of other transit modes (mostly Express routes) especially in the Point Claire areas.

Table 3.8: Roxboro-Pierrefonds and Sunnybrooke Station Demand Profile

SM	133	136	132	131	137	130
Total transit	**425**	**2,673**	**2,166**	**2,250**	**468**	**1,666**
DM transit	292	1,323	867	-	-	-
V-H transit	-	19	42	1,158	171	421
Other transit	133	1,331	1,257	1,093	297	1,244
Market share (rest transit)	*31%*	*50%*	*58%*	*49%*	*64%*	*75%*

3.32 This is likely to change with the introduction of the Point Clare and Airport extensions, especially if optimum feeder connections are implemented to connect stations with SM131, 132, 137 and 130.

Figure 3.9: Pointe-Claire, Sources and Airport stations and SM locations



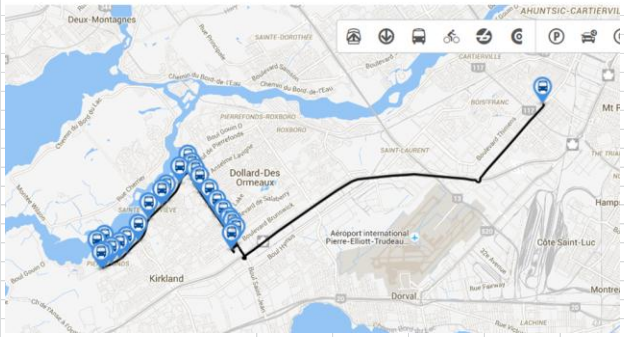
3.33 Table 3.9 and Figure 3.10 overleaf show the main competing express route services in the AM peak between the area of study and heading to Montreal. It is worth noting that most of these express services terminate in an interchange station with the Orange line (SM103 and SM 119), and therefore trips require at least one transfer in most cases.

Table 3.9: Roxboro-Pierrefonds and Sunnybrooke Stations express bus routes

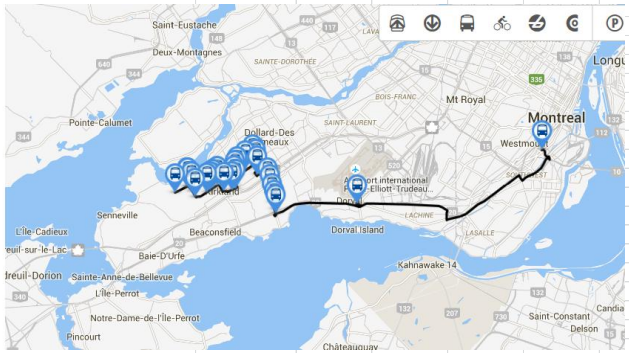
SM	133	136	132	131	137	130
Express lines to SM103				485, 425, 405		425, 496
Express Lines to SM119		468, 470	470, 475, 409	470		470, 475, 409

Figure 3.10: Express Services in the DM Corridor

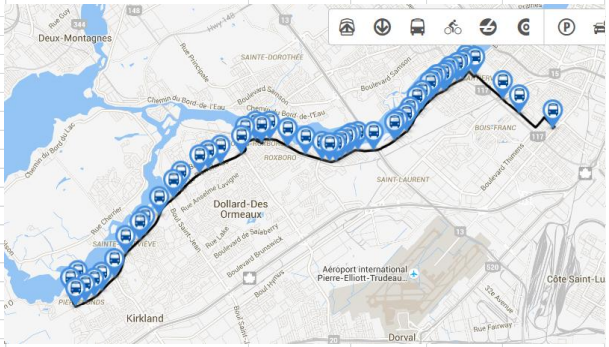
	Line	AM	DAY	FACTOR
Express Pierrefonds	**470**	**2,241**	**10,701**	**4.77**
Connects wit orange line (Cote vertu)				
Peak	10	service/h	at 6am	
Off peak	6		except 2pm and 4pm	



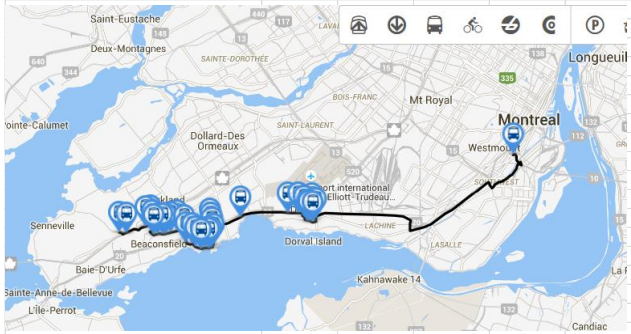
	Line	AM	DAY	FACTOR
Express Antoine-Faucon	**485**	**548**	**2,090**	**3.81**
Connects wit orange and green line (lionel)				
Peak	2 or 3	service/h	only from 5 to 8,30	
Off peak				



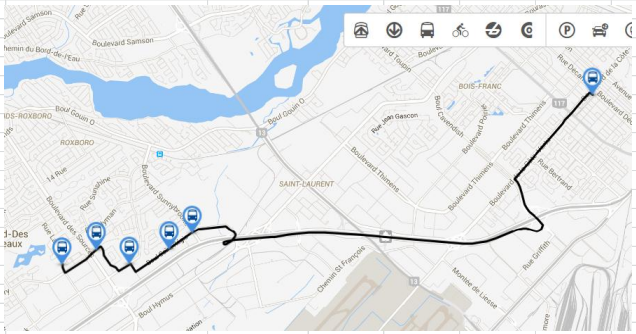
	Line	AM	DAY	FACTOR
Express Pierrefonds / Gouin	**468**	**811**	**2,715**	**3.3**
Connects wit orange line (Cote vertu)				
Peak	5	service/h	only at 6am	
Off peak	2			



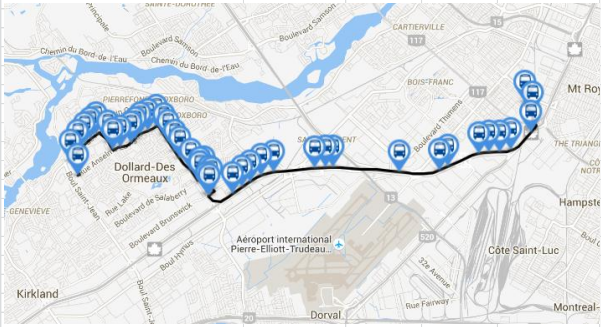
	Line	AM	DAY	FACTOR
Express Anse-à-l'Orme	**425**	**258**	**1,053**	**4.1**
Connects wit orange line (Cote vertu)				
Peak	3	service/h		
Off peak	2	only until 12am		



	Line	AM	DAY	FACTOR
Express Dollard-des-Ormeaux	**475**	**235**	**374**	**1.6**
Connects wit orange line (Cote vertu)				
Peak	4	service/h	only peak service	
Off peak				



	Line	AM	DAY	FACTOR
Express Des Sources	**409**	**650**	**1,442**	**2.2**
Connects wit orange line (du college)				
Peak	3 or 4	service/h		
Off peak	2			



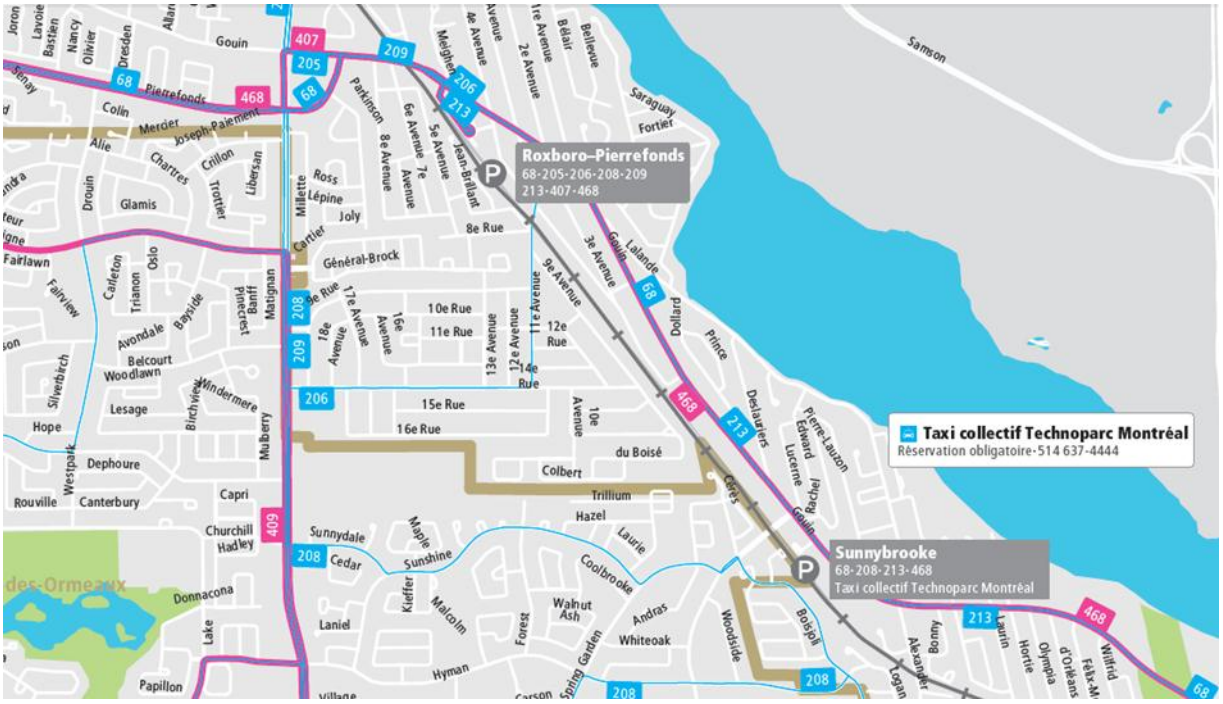
Feeder bus

3.34 In order for the Rail option to be attractive compared to the express services/Vaudrail or car, the feeder buses should be reorganized to improve access to the LRT stations.

3.35 It is expected that most of the growing demand will need to access by transit, and therefore, a very frequent LRT service does not add much value if the feeder services are infrequent. A detailed analysis should be carried out in next phases of the work to optimize access to rail stations with services with optimum coverage, frequencies and integrated timetables.

3.36 The following figure shows the existing bus routes that currently provide access to the two stations and their associated frequencies (between 16 and 30 minutes):

Figure 3.11: Roxboro-Pierrefonds and Sunnybrooke stations bus routes



3.37 The following table shows the current feeder buses and their AM peak period frequencies for both stations.

Table 3.10: Roxboro-Pierrefonds and Sunnybrooke station Feeder Services

Station	Route	Frequency (mins)
Roxboro-Pierrefonds	68	22.5-30.0
	205	22.5-26.0
	206	22.5-26.0
	213	15.0-26.0
	468	16.0-30.0
Sunnybrooke	68	22.0-30.0
	208	22.0-26.0
	213	15.0-26.0
	468	16.0-30.0

Bois Franc, Du-Ruisseau and Montpellier Demand

3.38 Transit market shares for these stations are high (between 38 and 42%). However, the DM share is relatively low (5 to 13%) as most of the transit demand is associated with the Orange line.

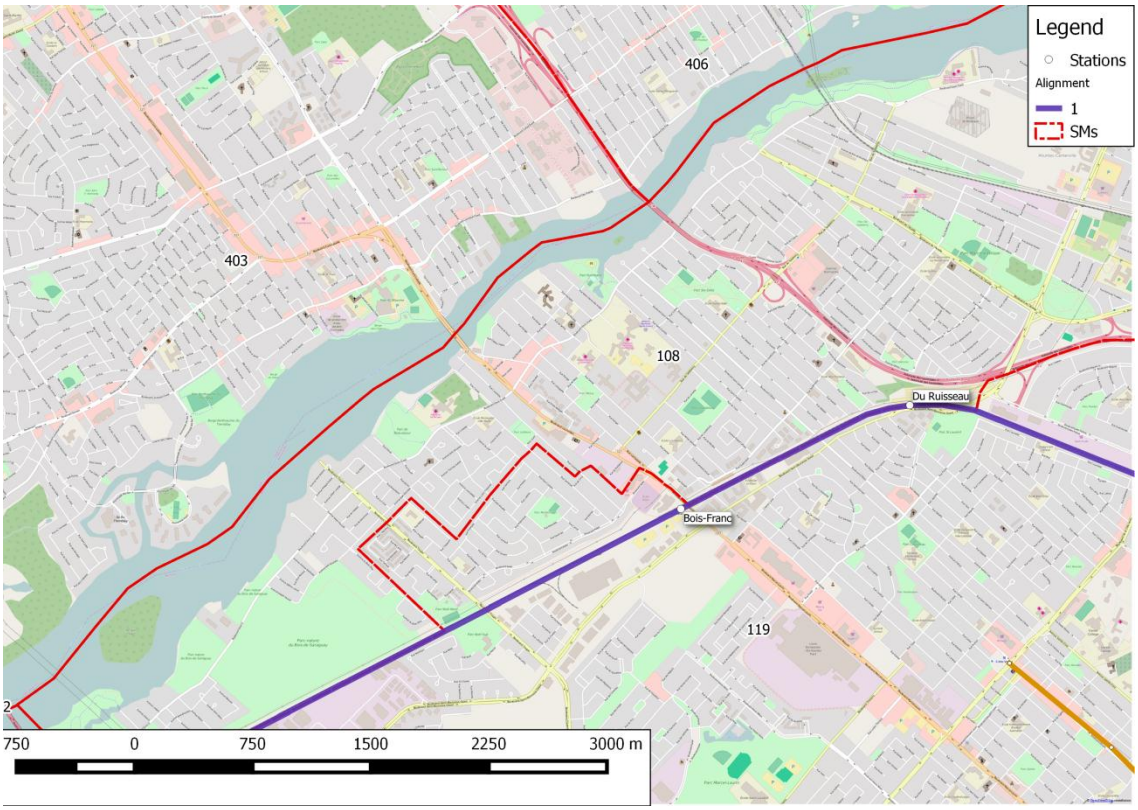
Table 3.11: Bois Franc, Du Ruisseau and Montpellier Station Demand

	SM 119	SM 108
Car demand	20,621	24,700
P&R access	854	1,282
Transit access	11,521	16,498
Total transit demand	12,375	17,781
Transit market share	**38%**	**42%**
P&R access	403	555
Transit access	1,182	394
Total DM	1,585	950
DM market share	**13%**	**5%**

Source: 2008 Enquete

3.39 Great part of the DM demand accesses the rail stations by car (P&R demand). Franc and Du-Ruisseau have 1063 and 742 P&R spaces respectively with 80-90% average occupation rate.

Figure 3.12: Bois Franc and Du Ruisseau stations and SM locations



3.40 Although the DM line will improve substantially frequencies in these stations (3 minutes), in order to capture demand from the Orange line it would be necessary to improve substantially the access to the stations.

3.41 As shown in Figure 3.13 the Orange line is currently much better connected to the bus network, charges lower tariffs (TRAM fares versus TRAIN fares) and provides a high frequency service.

Figure 3.13: Orange Line bus routes

3.42 The bus feeders to the DM stations and Cote Vertu (on the Orange Line) for the AM peak period are summarized below.

Table 3.12: Bois Franc, Du Ruisseau and Cote Vertu Bus Feeder Bus Services

Station	Route	Service Frequency (mins)
Bois-Franc	64	6.0-30.0
	164	11.0-23.0
	170	10.0-30.0
	215	16.0-30.0
Du-Ruisseau	117	26.0-36.0
	135	30.0
Cote-Vertu	17	30.0-36.0
	64	6.0-30.0
	70	20.0-22.0
	72	11.0-60.0
	117	26.0-36.0
	121	6.0-9.0
	128	30.0
	170	10.0-30.0
	171	5.0-15.0
	174	18.0-36.0
	177	23.0-30.0
	196	18.0-36.0
	213	15.0-26.0
	215	16.0-30.0
	468	16.0-30.0
	470	8.0-30.0
	475	15.0

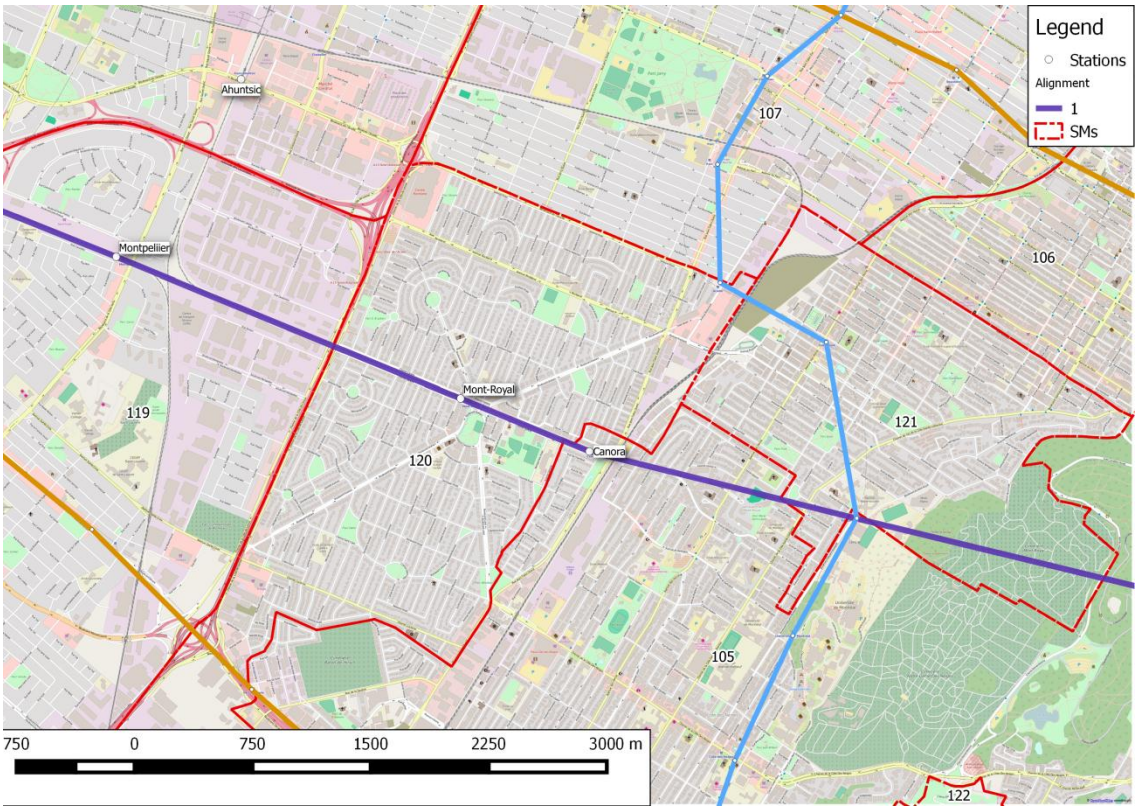
Mont-Royal, and Canora Demand

3.43 Transit market shares are high in this area (between 39-50%). However, although DM share is high (35%) in Mont Royal, it is very low (4%) in Canora.

Table 3.13: Mont-Royale and Canora Station Demand

Stations SM	Mont-Royal 120	Canora 105	 121
CAR	**4,173**	**11,372**	**2,393**
P&R access	146	188	67
Transit access	2,555	11,408	2,027
Total transit	**2,701**	**11,596**	**2,094**
Transit Market share	*39%*	*50%*	*47%*
P&R access	51	-	32
Transit access	887	472	37
Total DM	**938**	**472**	**69**
DM Market share	*35%*	*4%*	*3%*

Figure 3.14: Mont Royal and Canora stations and SM locations



3.44 Both stations are surrounded by multiple public transport modes including bus, Metro and other commuter rail lines as shown in the following figure. Metro stations generally have better feeder buses.

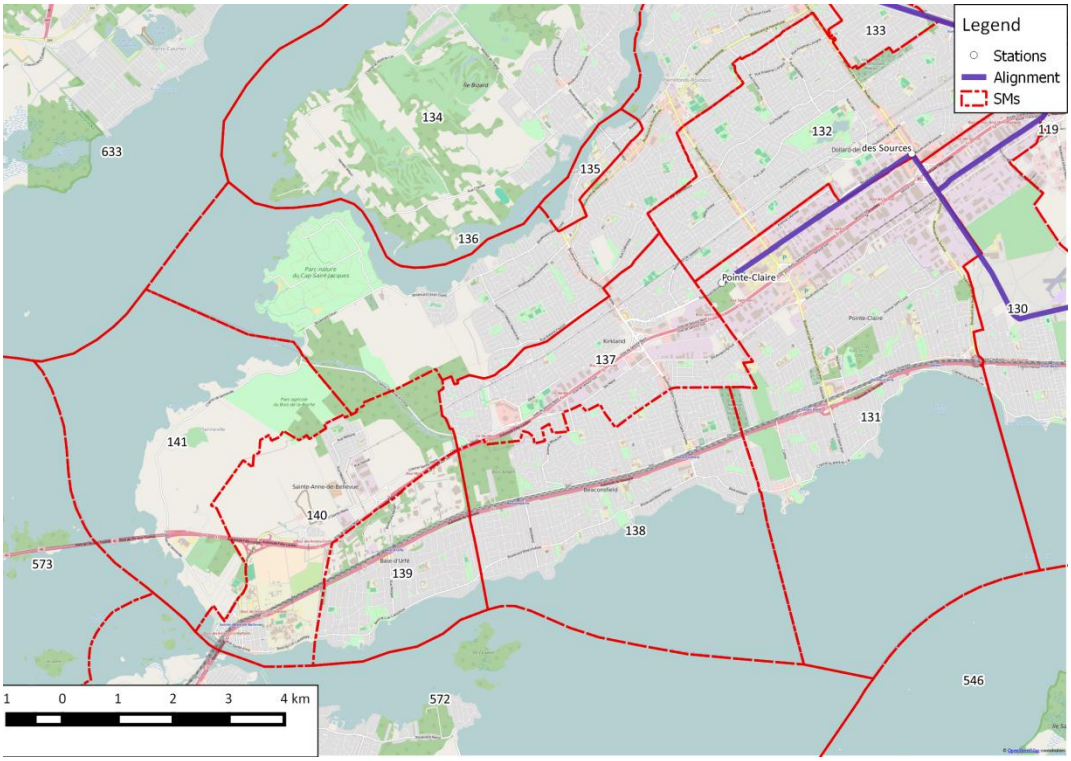
Figure 3.15: Mont-Royal and Canora Stations bus routes

3.45 The Orange line provides access to the downtown core with a travel time of 22 or 18 minutes from Cote-Vertu and Namur stations respectively, a frequency of 3-4 minutes in the peak and a lower tariff due to it being on the STM network.

West extension demand

3.46 Further analysis has been undertaken to assess the potential capture from the SMs west of Pointe-Claire station if the line was extended. Figure 3.16 illustrates the area we have considered which is currently served by the Vaudreuil-Hudson rail line and express/local bus services.

Figure 3.16: West extension - SM Locations



3.47 Table 3.14 presents the existing mode market share for each market segment in the West Island during the AM peak period for the SMs identified.

Table 3.14: West Extension Demand Market Share (2008 AM Peak Period)

West Extension SM	136	137	138	139	140	141
CAR	**12,391**	**5,461**	**4,157**	**669**	**739**	**82**
P&R access	1,692	1,095	696	58	75	0
Transit access	3,165	620	760	148	110	113
Total transit	**4,857**	**1,716**	**1,456**	**206**	**185**	**113**
Transit Market share	***28%***	***24%***	***26%***	***24%***	***20%***	***58%***
P&R access	1,004	94	0	0	0	0
Transit access	1,323	0	0	0	0	0
Total DM	**2,327**	**94**	**0**	**0**	**0**	**0**
DM Market share	***48%***	***5%***	***0%***	***0%***	***0%***	***0%***
P&R access	340	603	590	58	61	0
Transit access	19	228	610	125	95	113
Total V-H	**358**	**831**	**1,200**	**183**	**157**	**113**
V-H Market share	***7%***	***48%***	***82%***	***89%***	***85%***	***100%***
P&R access	348	399	106	0	14	0
Transit access	1,823	393	149	23	14	0
Total Other Transit	**2,171**	**792**	**256**	**23**	**28**	**0**
Other Transit Market share	***45%***	***46%***	***18%***	***11%***	***15%***	***0%***

3.48 In general, transit market share in this area is relatively modest (approximately 27% of total demand) . V-H market share is very high for SM 138 to 141 compared to other transit and DM, as result of good access to V-H rail stations and P&R facilities (for SM 138).

3.49 Other transit capture is relatively high for SM 136 and 137, because of the extensive express bus network in these zones. These could become potential markets for new demand capture if LRT is extended west from Pointe-Claire.

3.50 At a very high level, if we assumed that the West LRT Extension captures 50% of the transit market, the demand in the line would increase by 1,800 boardings in the AM peak period as shown below.

Table 3.15: West LRT Extension Demand Impact Estimate

West Extension SM	136	137	138	139	140	141	Total
Total transit	4,857	1,716	1,456	206	185	113	**8,532**
Current DM Market share	48%	5%	0%	0%	0%	0%	-
Assumed capture	50%	50%	50%	50%	50%	50%	-
Additional demand	101	764	728	103	93	56	**1,846**

Airport demand

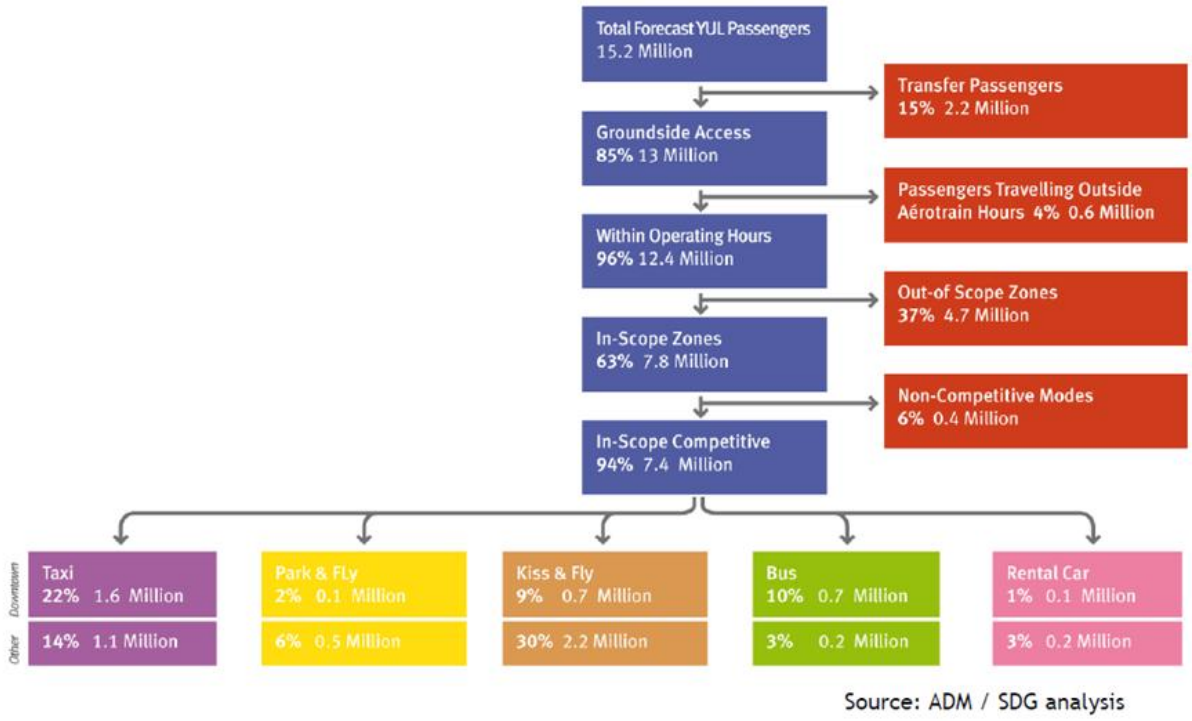
3.51 In-scope demand for the line serving the airport has been estimated using information collected as part of our earlier Aerotrain forecasting for ADM.

3.52 Overall airport passenger numbers (from ADM figures) for the base year were segmented by type of flight: domestic, transborder and international. This overall demand was factored down to account for:

- Non-terminating passengers: passengers who are only transferring flight at Montreal and would therefore not be in scope to use ground access modes
- Out of hours: passengers travelling to or from the airport outside of the assumed operating hours of the LRT service (between midnight and 05:00)
- Out of scope areas: areas of Montreal from and to which passengers could not reasonably use the LRT system to access the airport
- Out of scope modes: captive modes such as hotel shuttles, Orléans Express and Greyhound bus services, buses chartered by airlines or tour operators.

3.53 The remaining demand was spread across the zoning system based on the final origin/destination. The zone system has been updated for the purpose of this study, and then split by current mode of travel. In both cases, we have used the responses from the 2010 behavioural survey, collected as part of the original Aerotrain work.

Figure 3.17: Airport Demand Segmentation



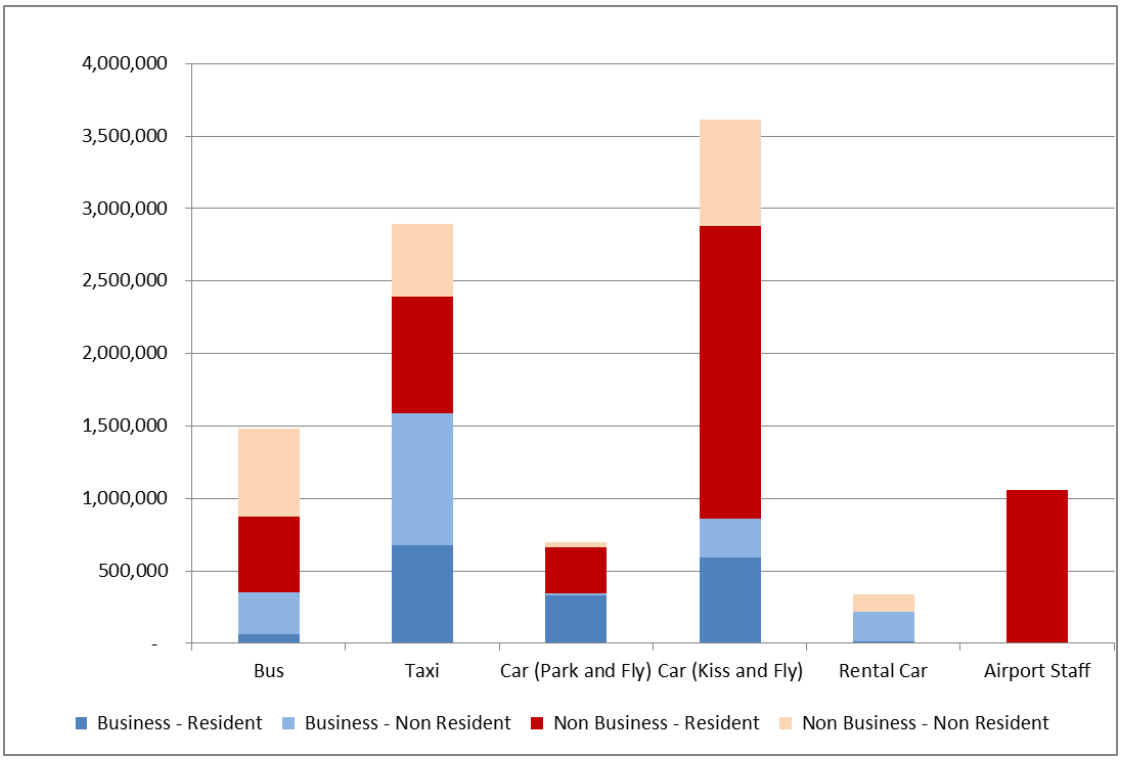
3.54 For the purposes of this study, a number of adjustments have been applied to the model:

- The estimated demand for 2016 has been adjusted based on the past year performance, which has led to an increase of base year demand (2016) of 4%

- A further adjustment has been made to the 747 market share to reflect the rapid growth in patronage since our work in 2010 (when the service started). The original 2010 work assumed a market share of 12% of the in-scope demand and our current calculations adjust this to 15% from 2016 onwards.
- First hour of operation has been adjusted from 04:00 to 05:00
- Inclusion of zones which were previously out of scope
- Inclusion of demand from some modes which had previously been considered out of scope, namely other STM buses (non-747) and rail services.

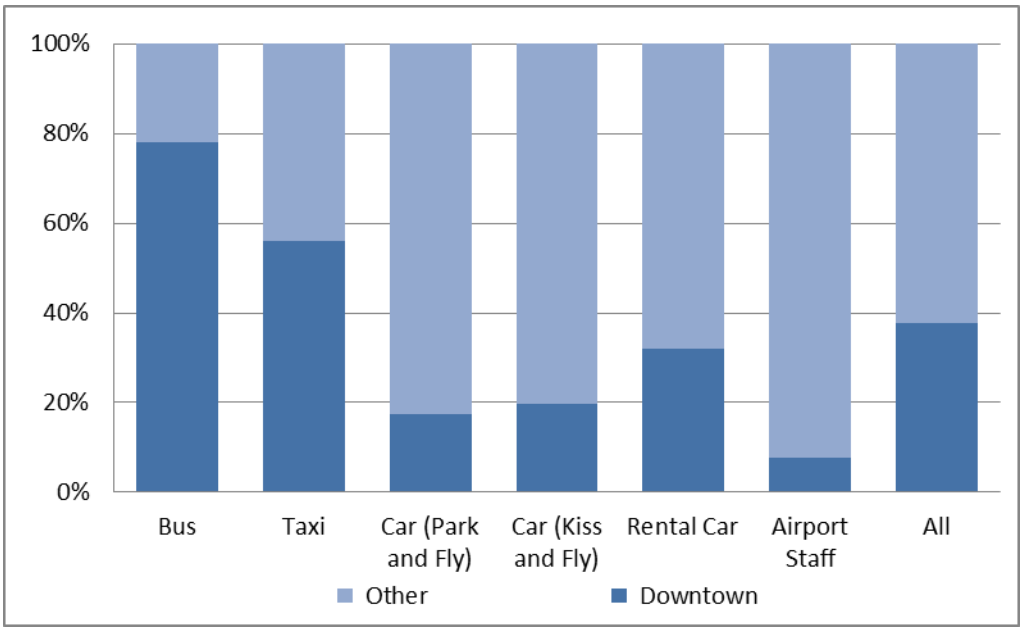
3.55 After applying this adjustment, the in-scope demand estimated for 2016 is shown in Figure 3.18.

Figure 3.18: 2016 Annual Airport In Scope Demand



3.56 In terms of trip patterns, most of the existing bus and taxi demand originates in the downtown. However, trips with other origins use the car as the main access mode (either as driver or mainly as passenger) as shown in Figure 3.19.

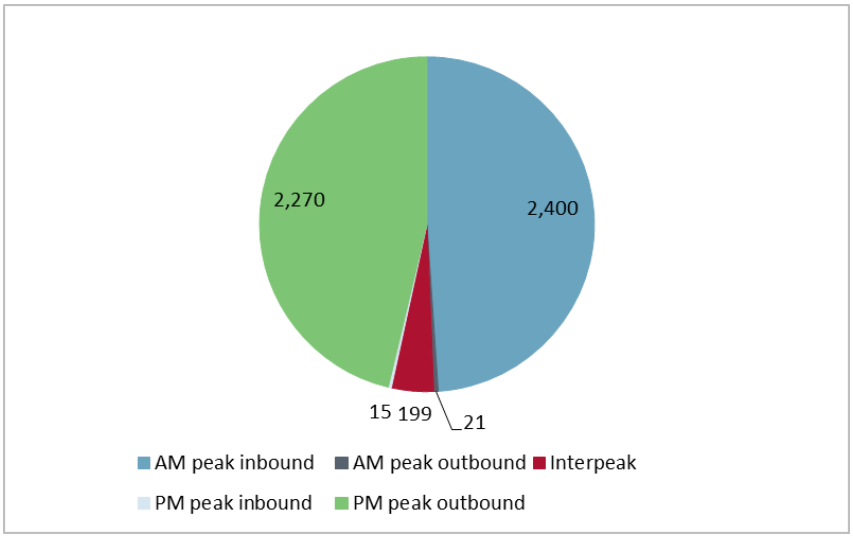
Figure 3.19: Airport Trip Access Mode Breakdown



Mascouche demand

3.57 The Mascouche line opened in December 2014 and limited data is available. AMT has estimated daily demand of 5,000 passengers in 2014 and 6,400 passenger since 2015. The line also shows a similar profile as Deux Montagnes with peak direction flows (AM peak inbound and PM peak outbound) forming the majority (95%) of the daily demand as shown in Figure 3.20.

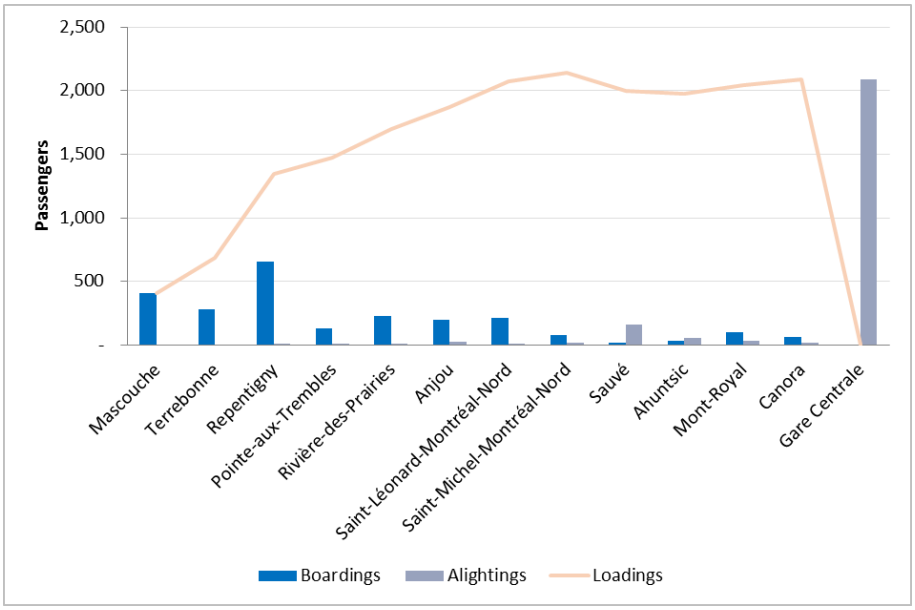
Figure 3.20: Mascouche Daily Demand Profile



Source: AMT

3.58 Figure 3.21 shows the AM peak boardings, alightings and loadings along the line. The total volumes are much lower than DM and the majority of the demand alights at Gare Centrale with Sauve also showing some alighting activity (interchange with Orange Line). The PM peak shows a very similar patterns but in the opposite direction.

Figure 3.21: Mascouche AM Peak Inbound Demand Profile (August 2015)



Source: AMT

4 Methodology

Overview

4.1 4 models have been developed to estimate AM peak demand for each of the corridors:

- Deux Montagnes/Point-Claire transit access demand: capture model derived from transit demand data from AMT and travel time information collected from Google at Sector Municipaux (SM) level.
- Deux Montagnes/Point-Claire P&R demand: no specific model developed. Assumed at 90% capacity and demand allocated to stations based on current P&R capacity and OD distribution based on observed DM rail demand and 2008 Enquete demand patterns.
- Airport demand: used the Aerotrain model as basis and updated accordingly. Splits airport demand into various marked segments (transit, taxi, kiss and fly, parking, rental car and staff) and the capture model assigns demand to each mode based on mode characteristics.
- Mascouche: developed a simple capture comparing travel times by Mascouche+new LRT versus Mascouche+ Metro Orange Line to determine demand reduction

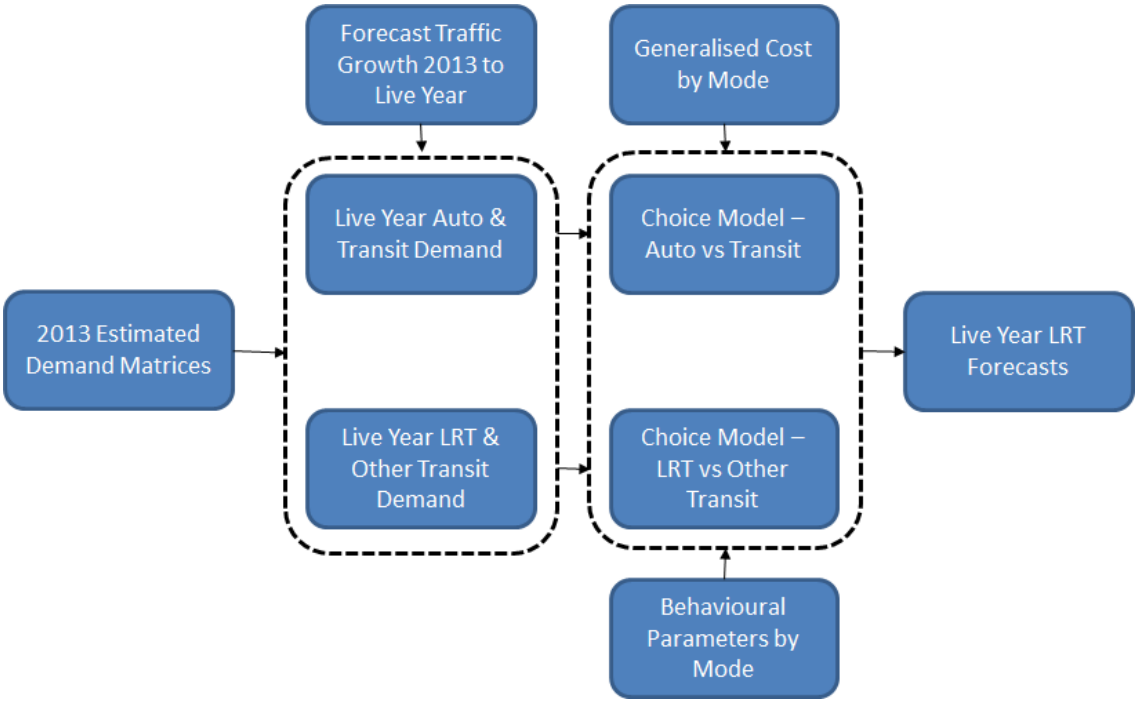
4.2 Daily and annual demand has been estimated using the following assumptions:

- Expansion factors
- Ramp up assumptions
- Demand allocation by station

Deux Montagnes/Point Claire transit model

4.3 The figure below summarizes the modeling methodology used to estimate LRT demand for the Deux Montagnes and Pointe Claire demand.

Figure 4.1: Overview of DM model methodology



4.4 Estimated 2013 demand matrices have been scaled to the year of analysis (live year) according to the demand growth forecasts. The distribution of demand by origin-destination (OD) pair has been kept constant.

4.5 Calibrated choice models are then applied taking as inputs the new generalised costs of each mode for the base case scenario and key behavioural parameters affecting mode choice (for example value of time) to produce forecasts of LRT demand for the live year.

Choice Model

4.6 Discrete choice models are statistical formulations which attempt to assign a probabilistic value to the event of an individual choosing one alternative over another; in the case of transport, this relates the probability of an individual choosing one mode of transport over another.

4.7 The most common type of discrete choice model used to evaluate such cases, and that utilised within our Forecasting Model, is a discrete logit model. A discrete logit model works on the basis of the utility of the two options, or the overall 'Generalised Cost' of choosing each individual mode.

4.8 Cost here does not relate to strictly monetary cost. Instead it incorporates a wide array of journey attributes all of which combine to provide the overall Generalised Cost of the journey. Examples of such attributes include the relative journey time, wait time, number of interchanges required as well as the actual monetary cost.

4.9 Once a Generalised Cost has been constructed for each of the two alternative modes, the following formulation is used to calculate the relative probability of an individual choosing one mode over the other:

$$P_i = \frac{exp(\beta G_i)}{exp(\beta G_i) + exp(\beta G_j)}$$

Where:

P_i = The probability of an individual choosing to travel by mode *i*

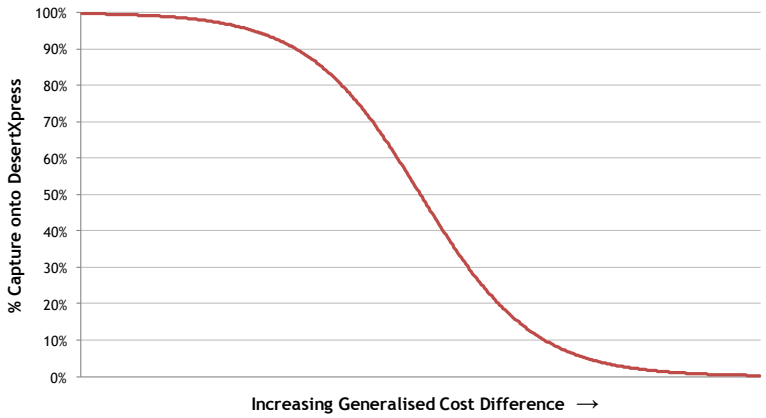
G_i = The Generalised Cost for an individual travelling by mode i

B = A scaling parameter

exp = The exponential function

4.10 What this function yields is an S-shaped curve as demonstrated in the figure below, whereby at an equal Generalised Cost between modes, 50% of demand will choose to travel on each. As the Generalised Cost for the first mode increases (i.e. this mode becomes a less attractive option to travel by), the proportion of demand travelling on each switches in favour of the second mode. The curve tails off however meaning further incremental increases in cost do not result in the same number of people switching away from the mode. In this way, the formulation accounts for the fact that even at a very high difference in Generalised Cost between modes, a small minority of demand is still likely to travel via the higher cost option.

Figure 4.2: Logit curve example



Source: Steer Davies Gleave

4.11 We have developed the following discrete logit models:

- Non airport demand model (split into Auto vs Transit and LRT vs Other Transit)
- Airport demand model

4.12 These are discussed below.

Model Assumptions

Generalised cost calculation

4.13 The logit model works on the basis of the utility of the different options, based on the overall 'Generalised Cost' of choosing each individual mode.

4.14 The generalised costs are calculated based on the estimated travel time and the cost of travel, which is translated into time using behavioural parameters (Value of Time). This chapter describes the assumptions adopted to estimate generalised time for each option.

4.15 Limitations in the OD level generalised costs data have been identified meaning that in a number of cases the observed (from counts) mode shares are inconsistent with the cost differentials between modes. These limitations are of concern and ideally warrant further investigation/data collection beyond the scope which was possible as part of this project.

4.16 Within the calibration of the logit models we have incorporated a balancing item to ensure the forecast OD level mode shares match the observed mode shares. This is a pragmatic solution which was determined to be necessary in order to overcome these limitations in the input data.

4.17 Given this approach, it was also necessary to make an assumption about the overall generalised cost elasticity for the market as a whole and incorporate this as part of the logit model calibration. We have assumed an elasticity of -1.1.

4.18 While we consider this to have been necessary in order to produce credible forecasts based on the input data we have, this does highlight an increased level of risk within the forecasts and highlights an area which will require further analysis in the next phase of work.

Transit Generalised Costs

4.19 Transit trips generalised costs are estimated based on the total travel time (split into in-vehicle time, access and egress times, wait times and transfer) and the tariff to estimate generalized time.

Travel Times

4.20 OD travel times have been determined by using either an internal SDG tool that uses the Google Directions API and Google Distance API, or the Google Maps website. By using the SDG tool, the average travel time by OD over the 3-hour period can be calculated.

- Deux-Montagnes travel times have been determined by setting a “train” preference as part of the tool preferences.
- Other travel times have been calculated by setting a “best” preference as part of the tool preferences

Tariff

4.21 Note that there are several tariff structures considered for this project:

- Average tariff for STM service users (i.e. trips that do **not** use rail)
- Average tariff for AMT service users using the AMT zone structure (i.e. trips that use rail)
- Average tariff for the Mascouche line
- Average tariff for the new LRT line to Pointe-Claire
- Average tariff for the new LRT line to the airport

4.22 The average STM tariff was determined to be **$1.40** (2013 dollars) based on annual revenues and boardings reported in the STM annual report.

4.23 The average AMT fare was calculated taking into account:

- 2014 annual ticket sales breakdown (for TRAM and TRAIN monthly pass, weekly pass, single ticket, etc.)
- 2014 annual ticket sales of full and concession tickets
- Number of trips assumed for each ticket type

4.24 The average fare paid for travel between zones was calculated using this data and the 2014 ticket prices, shown in Table 4.1. 2014 tariffs were converted to 2013 values based on tariff changes and relative changes to the Montreal Consumer Price Index (CPI) from 2013 to 2014.

Table 4.1: AMT Averages Fares

No. of Zones Travelled Within	Average Fare (2014)	Average Fare (2013)
1	$2.10	$2.05
2	$2.45	$2.39
3	$2.80	$2.73
4	$2.85	$2.78
5	$3.58	$3.49
6	$4.02	$3.92
7	$5.05	$4.93

Source: AMT. Note that zone 8 was not included (no train access).

4.25 The tariffs were then calculated on an OD basis, by assigning each Sector Municipaux (SM) to an AMT zone on the existing zone structure. The number of zones travelled between each OD pair was then calculated and the corresponding tariff matched.

4.26 The average tariff for the Mascouche line was determined to be **$2.56** (2013 dollars) based on Mascouche Line annual revenues and boardings reported in the AMT annual report.

4.27 The average tariff for the Pointe-Claire portion of the LRT was assumed to follow the same structure as the current AMT zones. Both Pointe-Claire stations (Ponte Claire and Sources) are located in Zone 2 therefore the tariff was estimated as **$2.39** for travel to downtown.

Auto Generalised Costs

4.28 Auto trip generalised costs are estimated based on the travel times and the operating costs.

- Travel Times
  - OD travel times have been provided by MTQ based on the Motrem model results at the Sector Municipaux (SM) level - see Appendix A.
- Vehicle Operating Costs (VOC)
  - Average monthly fuel prices were obtained from Statistics Canada for the Montreal Census Metropolitan Area (CMA). The monthly data was converted to annual for the 2013 base year and estimated at $1.37/litre. This value has been kept constant (in real terms) due to fuel price uncertainty and improved car efficiency. Only the fuel cost element is used within our forecasting model. This is general practice within most transportation models since research has shown that people tend not to consider indirect costs such as maintenance and tires when making their choice of travel mode.

Behavioural Parameters

4.29 The value of time provides an indication of how much an individual is prepared to pay in order to save a given amount of journey time. Table 4.2 summarizes the values used within each of the choice models.

Table 4.2: Value of Time ($/hour)

VoT Group[2]	Auto vs Transit	LRT vs Other Transit
Quartile 1	$3.20	$2.60
Quartile 2	$6.40	$5.20
Quartile 3	$10.20	$8.30
Quartile 4	$12.70	$10.40
Overall Average	$8.10	$6.60

Source: SDG assumptions from confidential work in Montreal region

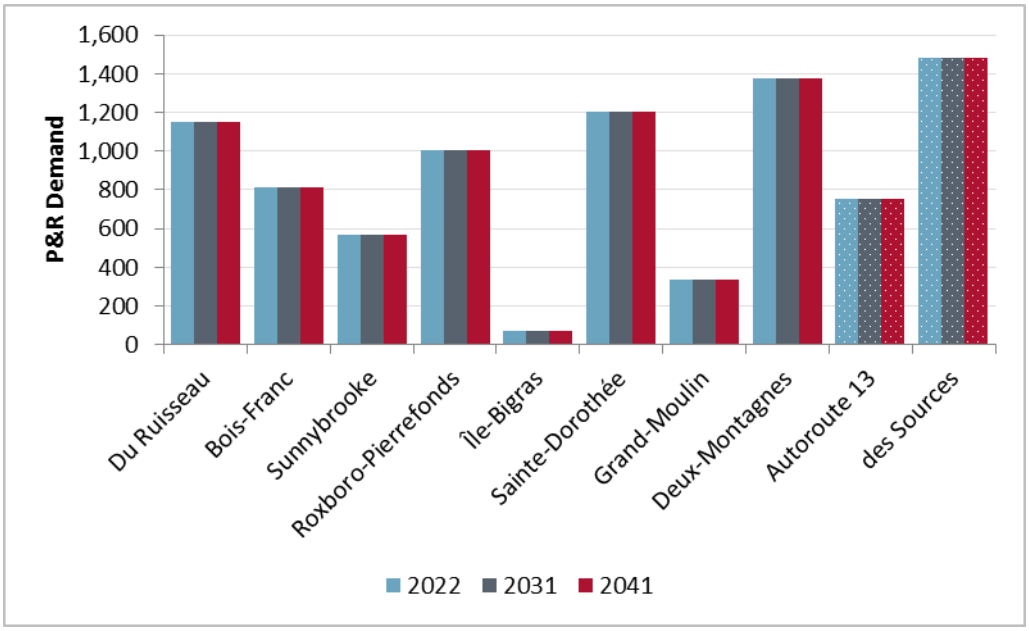
[2] Each quartile represents 25% of the population in-scope for each choice model

Deux Montagnes/Pointe Claire P&R model

4.30 Existing and future P&R demand have been estimated based on current and proposed P&R capacities at each station. Once the LRT is operational, an additional 2,260 P&R spaces are assumed to be available at Autoroute13 and des Sources stations. Similar to existing P&R spaces, we have assumed that 90% of the additional spaces will be occupied by the opening year (2022). An average occupation rate of 1.1 has been applied, which would result in approximately 2,240 additional users during the AM peak period.

Figure 4.3 illustrates forecasted P&R demand for each station.

Figure 4.3: Forecasted P&R Demand



4.31 The origins of P&R demand are determined based on where the existing and proposed P&R spaces are located along the LRT alignment and these demands will get further allocated to each destination stations using 2008 Enquête OD trip pattern. All P&R demands during the AM peak period have been assumed to travel inbound (Montreal direction) only.

4.32 The total P&R demand is capped at maximum capacity since forecasted demand will not outgrow total capacity available. This capacity constraint will dampen the demand impact of tariff increase and other relevant LRT service changes on P&R demand, and hence result in relatively lower elasticity for P&R users compared to other transit users.

Airport model

Choice Model

4.33 To determine the levels of patronage that the Airport line will attract from each of the existing modes, we have used the model developed for the Aérotrain with some upgrades and modifications.

4.34 The capture model was developed based on a set of binary choices between the LRT and existing modes of transport. For each segment (combinations of existing mode, destination, journey purpose, etc.), the total journey time (expressed as generalised time) is calculated taking into account different sensitivities to time and cost as well as propensity to use different feeder modes. The total times for each mode for each passenger segment and geographical area are then compared and the likely capture of LRT established.

4.35 To determine the overall generalised time of a trip to the airport all the individual elements of the journey (such as access time, wait time, in-vehicle time, fare, etc.) are combined. Each journey element is expressed in terms of minutes and is then weighted according to its relative importance. For example, time spent walking, waiting or interchanging between modes tends to be perceived as longer than in-vehicle travel time. These weights were estimated through the behavioural passenger research and validated based on judgment and experience of other transportation projects around the world.

4.36 The generalised times are converted into utilities and LRT capture forecast using logit curves. The assignment of traffic to one mode or other is based on the differences in their generalized times and on the probability given by the logit shaped distribution. Thus the greater the generalized time advantage of the LRT compared with a competing mode, the more capture is likely to be abstracted from that competing mode.

4.37 Within the forecasting model a relatively fine level of segmentation is used to reflect that there are distinct groups of passengers who place different values on journey time components and who might therefore value the proposed LRT service differently. The approach also allows us to reflect the competitive position of the LRT which varies by location and time of day, and due to other considerations such as number of people travelling in a group.

4.38 The final segmentation takes into account the following variables:

- Journey Purpose: Business, Non-business
- Residency: Montréal Residents, Non-residents (outbound vs inbound)
- Flight sector: Domestic, Transborder and International
- Peak (AM and PM Peak) and Off-Peak.
- Zone / Origin within the Montréal area
- Existing mode: Taxi, Car as driver, Drop off, Express Bus, Rental Car
- Group size: 1, 2+

Model Assumptions

Generalised cost calculation

4.39 The various journey time components considered within the forecasting model are summarised below. Trips are modelled as going towards the airport.

- Taxi:
  - Average wait time / time to hail a cab;
  - Time by taxi to the airport terminal; and
  - Taxi fare per person travelling.
- Kiss & Fly:
  - Drive time to the airport; and
  - Average cost per person travelling.
- Park & Fly:
  - Drive time to the airport;
  - Average cost of parking per person travelling;
  - Time from parking lot to terminal building.
- 747 Express Bus
  - For zones within close proximity: walk time to nearest 747 Express Bus stop;
  - For zones located further away: walk time to nearest transit stop, plus time by transit to Lionel-Groulx, plus transit waiting time plus interchange penalty;
  - Average waiting time for bus;
  - Time by 747 Express Bus service from Lionel-Groulx to the airport; and
  - 747 Fare.
- LRT
  - For zones within close proximity of LRT stations: walk time to station;
  - For zones located further away: walk time to nearest transit stop, plus time by transit to nearest station, plus transit waiting time plus interchange penalty, plus transit cost to the closest LRT station;
  - Average waiting time for next LRT service.
  - Time by LRT service to the airport; and
  - LRT Fare.

4.40 A mode specific constant is also included which captures all other aspects of each mode beyond time and cost such as the relative comfort, reliability of specific modes.

4.41 Highway journey time estimates for inclusion within the taxi, Park & Fly and Kiss & Fly models were based on skims extracted from the city of Montréal MOTREM03 highway model, provided by MTQ.

LRT Tariff calculation

4.42 The average tariff for the airport portion of the LRT was based on the 747 average fare and then applied a $5 airport surcharge to represent the improvement in the service provided. The estimation of the average 747 tariff is shown in table below.

Table 4.3: 747 Bus Service Average Fare Calculation

Parameter	Value	Source
747 Annual Ridership (2013)	1,447,525	STM
747 Full Fare (2013)	$9	STM
Number of full fare users	868,515	60% non-resident use of bus (Aerotrain survey)
Concession users	579,010	40% resident use of bus (Aerotrain survey)
CAM Hebdo cost per trip	$2.37	Assuming 10 trips per week
747 Average fare (2013 $)	$6.35[3]	Weighted average of Full and Hebdo cost per trip

Assumptions

4.43 The following table summarises the assumptions adopted in the model.

Table 4.4: Airport Model Assumptions

Item	Description
General Assumptions	
Model Base Year	2010
Forecasting Years	2016, 2022, 2028, 2031, 2041
Potential Demand	
Potential LRT Demand	Passengers, Staff Forecast Passengers / Staff at Montreal Trudeau Airport, allowing for: • Air-air transfers (passengers) • LRT operating hours • Out-of-scope zones • Non-competitive modes
Potential Demand – Data Sources	2004 Ridership Study (Guilbault Associates) 2008 Ridership Study (Abscisse) 2009 Ridership Study Update (Abscisse) ADM Customer Satisfaction Survey Transport Canada air Traffic forecasts 2008-2022 Toronto Pearson 2014 – 2023 Air Traffic Forecast[4] 2008 Staff OD Survey 2010 Steer Davies Gleave OD and SP Survey ADM Profile Information

[3] Calculated based on a 60%/40% non-resident/resident assumption

[4] Used as comparison against current growth forecasts

Item	Description

Potential Demand – Segmentation	Base year demand segmentation based on 2010 SDG OD&SP surveys with back-check against Customer Satisfaction Survey and previous ridership studies
	Base year airport surface access trip distributions will be segmented according to the following categories:
	• Existing mode: Taxi, Car as driver, Drop off, SMT 747 Bus
	  ○ Adjustment made to 747 market share to reflect high take up since 2010.
	• Zone / Origin within the Montreal area
	  ○ Adjustments made to original zoning system (2010) to reflect changes in alignment. Zones split using population density information.
	• Journey Purpose: Business, Non business
	• Residency: Residents, Non-residents
	• Flight sector: Domestic, Transborder and International
	• Peak (AM and PM Peak) and Off-Peak.
	  ○ AM Peak: 06:30 – 09:30 AM
	  ○ PM Peak: 16:00 – 18:30 PM
	  ○ Off-Peak: rest of day, public holidays and weekends)
	• Group Size: 1, 1+
	• Winter vs Summer
	Hourly profiles derived from 747 profile data and compared with flight departure profiles and average security clearance times

Potential Demand - Growth	Future Potential Demand derived from Transport Canada Air Traffic Forecasts for YUL Additional uplift since 2010 applied (4%) to reflect historical performance of airport above forecast
Time and Cost Assumptions	
Taxi / Park&Fly / Kiss&Fly	Journey Times to/from YUL: derived from combination of Montreal area EMME/2 model (MTQ) and google maps. Segmented by peak and off-peak time periods to reflect peak hour congestion and differential competitive position LRT. Complemented with: • Measured traffic times from website **http://www.beatthetraffic.com** • Limited journey time surveys undertaken by Steer Davies Gleave in Montreal in May 2010. • Observations from SDG SP&OD survey Cost of Parking: Based on published tariffs and distributions of stay length derived from SDG SP&OD surveys, checked against stated cost of parking in SDG SP&OD survey, and rechecked for growth since 2010. Cost of taxi: based on published taxi tariffs, checked against stated cost of taxi use in SDG SP&OD surveys, and rechecked for growth since 2010. Park&Fly: Egress time based on distribution of parking location used
STM 747	Access: On foot, subway, drop-off Access Time: see LRT Access Time Wait time / Headway: based on published schedule Journey Time: based on published schedule, complemented with SDG journey time observations (May 2010) and observations from SDG SP&OD survey, and 2016 published travel times from website Fare: based on published fares and analysis of revenues carried out by SDG.

Item	Description
LRT Assumptions	Operating times (both ways): 5am to midnight, 365 days per year Fares (one-way, per person): • Tested fares $5 above STM 747 • Staff fares discounted at $2.73. ○ Where headline LRT fare is greater, the operator takes full revenue (undiscounted) • Integrated fare with STM (ie subway included in LRT fare) Periods: Peak (6.30 to 9.30 am and from 4 to 6.30 pm), Off peak (rest of the day, weekends and public holidays), Late night (after 10pm). Frequency to the airport: every 12 minutes peak, 15 minutes off peak Reliability: very high, negligible service cancellations and delays
LRT Journey Times	Pointe-Claire, Airport and Deux Montagnes as specified in Project Definition
LRT Access	On foot, taxi, subway, drop-off, (feeder) buses Check 'ToAzimut' tool for transit time Distribution of access mode based on zone, proximity to Gare Centrale and nearest subway station or bus stop plus results from SDG SP&OD survey Car/Taxi Time: based on estimates provided in SDG SP&OD survey, complemented with measured traffic times from website **http://www.beatthetraffic.com** and google Subway times: Based on subway journey time surveys (SDG May 2010) and google transit extractions Walk: distance based from zone centroid, assuming average walk speed of 5 kph STM Transit travel times: Based on published times on website **http://www.stm.info** Taxi fare: based on published tariff and rechecked for growth since 2010. Subway fare: based on published tariff
Behavioural Assumptions	
Utility function	Utility functions are defined for different types of passengers and modes. The functions include the following parameters: LRT: access time, access cost, wait time, journey time, fare, egress time, interchange Park&Fly: journey time, parking cost, mode constant, egress time Kiss&Fly: journey time, parking cost, mode constant Taxi: wait time, journey time, fare, mode constant SMT 747: access time, access cost, wait time, journey time, fare, mode constant
Value of Time (VOT) and other generalised time model parameters	Passengers: Based on the responses to the 2010 SP Staff: Based on commuting VoT assumptions embedded within EMME/2 traffic model
Other Assumptions	

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>LRT Stopping pattern</td><td>Stopping Patterns:
<table>
<tr><th>Airport</th><th>Time</th></tr>
<tr><td>Gare Centrale</td><td>0</td></tr>
<tr><td>Canora</td><td>7.5</td></tr>
<tr><td>Mont-Royal</td><td>1.2</td></tr>
<tr><td>Montpellier</td><td>3.2</td></tr>
<tr><td>Du Ruisseau</td><td>2</td></tr>
<tr><td>Bois-Franc</td><td>2.1</td></tr>
<tr><td>Autoroute 13 (NEW)</td><td>6</td></tr>
<tr><td>YUL (NEW)</td><td>11.6</td></tr>
</table>
Consideration of other routes which feed into the airport line at Autoroute 13 and Mont Royal
1. Deux Montagnes
2. Pointe Claire
3. Masouche (Mont Royal)
Seamless interchange (no major walking distance involved) is assumed between lines.</td></tr>
<tr><td>Competing modes</td><td>747 bus
• Different assumptions: as now, eliminated and different frequencies
Taxis
• Assumed to continue to run as now</td></tr>
</table>

Mascouche model

4.44 A separate model was developed to forecast Mascouche demand as no OD demand data was provided due to the recent opening of the line to the public in December 2014.

4.45 Generalized cost (including in-vehicle time, access time, transfer, wait time and fare and collected using Google) for the following options was estimated:

- Trips to downtown (SM101) using the Mascouche Line only
- Trips to downtown (SM 101) using the Mascouche and Orange Line (transfer at Sauve)
- Trips to downtown (SM 101) using the Mascouche and the proposed Train de l'Ouest (transfer at Mont Royal)

4.46 The resulting travel times are summarized in Table 4.5.

Table 4.5: Mascouche Generalized Cost Comparison

OD	Mascouche (mins)	Mascouche + Orange Line (mins)	Mascouche + Train de l'Ouest (mins)
611 to 101	80.0	86.4	91.0
109 to 101	47.7	50.1	58.7

4.47 The table shows the limited difference in generalized cost between the current alternatives (Mascouche only versus Mascouche and the Orange Line) and how the introduction of the new

alternative will increase generalised cost as result of the introduction of a transfer at the new station located on the A40.

4.48 As shown in Figure 3.21 the majority of the demand is currently using the Mascouche line directly downtown despite the limited difference in travel time. This suggests that the current transfer at Sauve (and the lower fares for TRAIN users compared to TRAM users) are dissuading a large proportion of users to use the Orange Line. However the introduction of a transfer for Mascouche users is likely to have a considerable impact and we estimate that 50% of the demand destinating downtown will transfer to the Orange Line.

4.49 Note that the analysis has been undertaken to a 'single' geographical point in SM 101 representing the entire downtown area and therefore the final destination could have an impact on whether users transfer at Sauve or Gare Centrale. Furthermore, congestion levels on the Orange Line have not been fully accounted for in this analysis.

Expansion Factors

4.50 The demand modelling has been carried out for the AM peak period (6am-9am). In order to translate peak period demand into daily and annual ridership, Steer Davies Gleave have reviewed a number of data sources. The daily and annual expansion factors estimated are shown in Table 4.6 using 2014 data.

Table 4.6: Expansion factor analysis

Transit Data	AM Peak (6am-9am) Demand	Daily Demand	AM Peak (6am-9am) to Daily	Annual Demand	Daily to Annual
BUSES					
Express bus routes	12,580	41,403	**3.3**	11,315,007	**273**
DM corridor	*4,744*	*18,373*	*3.9*		
V-H corridor	*4,001*	*13,217*	*3.3*		
Other	*3,835*	*9,813*	*2.6*		
Non-express bus routes	42,392	174,782	**4.1**	-	**-**
747 Airport service	500	5,304	**10.3**	1,471,637	**277**
All buses	55,465	221,490	**4.0**	-	-
RAIL					
Deux Montagnes	14,371	31,835	**2.2**	7,675,000	**241**
Vaudreuil-Hudson	8,450	17,588	**2.1**	3,763,500	**214**
Mascouche	2,421	4,905	**2.0**	-	-
P&R					
Deux-Montagnes	9,450	21,906	**2.3**	-	-
Vaudreuil-Hudson	5,245	11,425	**2.2**	-	-
METRO					
Orange Line	157,783	517,656	**3.3**		

Source: AMT and STM. No annual data available for non-express bus routes or Mascouche. Orange Line estimate based on Enquete 2008 data

Rail services

4.51 The ***daily*** expansion factors for the rail services and P&R are low and this reflects the commuting nature of the corridors, which are mainly used for trips to work. Furthermore the service provision in the non-peak hours is limited (60 minute headways on Deux Montagnes and just 4 services for the entire inter-peak period for Mascouche).

4.52 However, with the introduction of the LRT and the improved level of service during the off peak periods, we would expect that ridership in the off peak will increase, although we don't expect it to increase to the Express service levels (since many off peak trips are likely to be shorter distance).

4.53 The ***annual*** factor reflects the factor that should be applied to convert weekday demand into annual demand and therefore incorporates weekend, public holidays and seasonality (with commuter service demand reducing over the Xmas and summer holidays).

4.54 The data on Vaudreuil-Hudson reflects the low service provision and demand (and likely to be similar on Mascouche, although no annual data available as the service has only been in operation for just over a year) as the value is considerably less than 250, the number of weekdays in a year. The existing annual factor on DM is 241, still low compared to other services.

Express services in DM corridor

4.55 The bus demand observed in the DM corridor has a higher daily factor than rail, related in part to the higher frequency of off peak services. However, it is also worth noting, that off peak demand is partly comprised of shorter distance trips related to local access (shopping, errands, etc.) that will not be captured by the DM rail service.

Table 4.7: DM Corridor Express Bus Expansion Factors

	Route	AM Peak	Daily	AM Peak to Daily	Destination
Express Des Sources	409	650	1,442	2.2	Connects with orange line (du College)
Express Anse-à-l'Orme	425	258	1,053	4.1	Connects with orange line (Cote Vertu)
Express Pierrefonds / Gouin	468	811	2,715	3.3	Connects with orange line (Cote Vertu)
Express Pierrefonds	470	2,241	10,701	4.8	Connects with orange line (Cote Vertu)
Express Dollard-des-Ormeaux	475	235	374	1.6	Connects with orange line (Cote Vertu)
Express Antoine-Faucon	485	548	2,090	3.8	Connects with Orange and Green line (Lionel Groulx)
DM CORRIDOR		**4,744**	**18,373**	**3.9**	

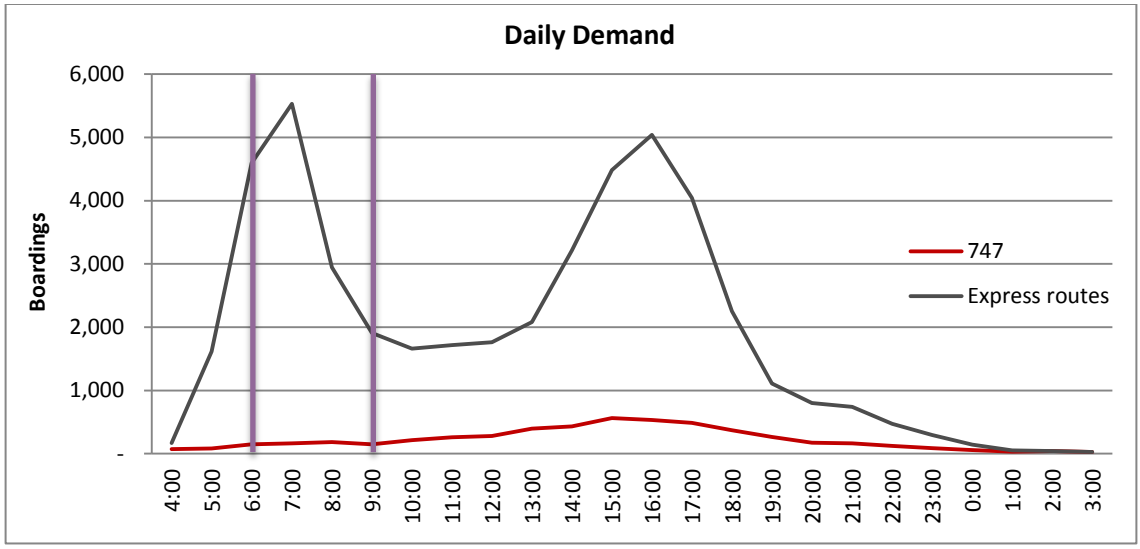
4.56 Analysis of the boarding/alighting data provided by SMT for the AM peak bus demand (towards Montreal) shows 67% of the trips go to the final station to connect with the Orange Line which shows that even in the peak over a third of the trips are 'local'. We would expect more local trips in the off peak as less commuter trips (and therefore shorter trips) than in the peak..

4.57 Based on this, we would propose to apply a daily factor of 3.0, which lies between the current rail (2.2) and the DM bus corridor (3.9) factors. Further analysis would be required in next stages to analyse the demand patterns in the off peak and potential capture.

Airport

4.58 The 747 has a very different hourly profile, since it reflects the airport demand based on the flight schedules, instead of commuting demand. The following figure shows how the peak period is between 3 and 4pm.

Figure 4.4: Airport Demand Profile



Summary

4.59 Table 4.8 presents a summary of the factors used for the base case for the various lines under consideration as well as the source for the values proposed.

Table 4.8: Summary of expansion factors

	AM Peak to Daily	Daily to Annual	AM Peak to Annual	Source
Deux Montagnes and Pointe-Claire (Transit)	3.0	273	820	Assume similar AM peak to daily factor as West Island express buses to reflect expanded provision. Factor lies between current rail (2.2) and the DM bus corridor (3.9) factors and slightly lower than Metro (3.3). Ramp up is applied to the AM peak to Daily factor to reflect 'conversion' from commuter to all day service.
Deux Montagnes and Pointe-Claire (P&R)	2.3	241	554	AM peak to Daily from AMT (2008 Enquête) for DM. Daily to Annual from DM demand profile.
Airport	10.3	277	2858	747 Service
Mascouche	2.1	214	445	Assume Vaudreuil-Hudson profile as no/limited increase in service provision between Mont-Royal and Mascouche expected.

Ramp Up

4.60 Ramp up is the reduction in potential ridership during the first years of operation until users are fully aware of the alignment, service patterns and benefits of the new system. The extent of the ramp up depends on the type of user captured. While users from the existing transit system are expected to transfer almost immediately (especially if existing rail/bus routes are removed), car shift and induced demand will take longer to be implemented.

4.61 Table 4.9 shows some examples of ramp up rates for LRT systems and estimate of the 747 airport service.

Table 4.9: Ramp Up in LRT Systems

	London, UK (Croydon)	Nottingham Line 1, UK	Manchester Metrolink, UK	Tren Urbano, Puerto Rico	747 service
Year 1	74%	83%	60%	75%	80%
Year 2	83%	96%	84%	83%	90%
Year 3	85%	99%	92%	89%	95%
Year 4	90%	100%	94%	100%	100%
Year 5	100%	100%	100%	100%	100%

4.62 We have applied the following ramp up factors for the West Island project.

Table 4.10: Train de l'Ouest Ramp Up Factors

	Deux Montagnes /Pointe-Claire		Airport		Mascouche	P&R	
	Existing	New	Existing	New	Existing	Existing	New
2022	80%	80%	90%	65%	120%	100%	70%
2023	90%	90%	95%	80%	110%	100%	80%
2024	95%	95%	100%	90%	100%	100%	90%
2025	100%	100%	100%	100%	100%	100%	100%

4.63 The rationale for the more marked ramp-up for Pointe-Claire and the Airport lines are that the LRT service 'replacement' will provide a considerable change in service quality and provision and therefore it will take passengers longer to realize the benefits provided. However, in the Deux Montagnes and Mascouche services, most of the demand will be existing demand already using the rail lines. However, still some shift from other competing transit modes and car is expected as a result of the improved quality service.

Station Demand Allocation

4.64 The Deux Montagnes and Pointe-Claire models estimate the demand that would be captured by the LRT for each origin and destination at the Sector Municipaux (SM) level.

4.65 In order to assign accurately the demand from each origin to a specific station, it would be necessary to understand in more detail the specific trip origin and destination and the bus feeder network that would be used to access the LRT and the demand associated with it.

4.66 For this phase of the project, we have allocated the SM demand to specific LRT station(s) based on current DM station boarding patterns, road and transit network characteristics and the location of each station relative to the SM.

4.67 A table summarizing the application of the resulting splits to the SMs is included in Appendix B.

5 Demand Growth

Background

5.1 Future transit demand in the corridor will depend on the following factors:

- **Background demand growth in the corridor** as a result of economic, population and employment growth in the area; and
- **Transit market share growth**: as a result of the competitiveness of the transit system compared to the auto. This is dependent on road congestion and pricing, as well as improvement on the transit network.

5.2 In order to assess the background demand growth, Steer Davies Gleave has analysed:

- Historic transit growth in the study area
- Growth forecasts produced by MTQ
- Airport demand growth

Historical Growth

5.3 Steer Davies Gleave has analysed how transit demand has grown since 2007 based on historical ridership on the Deux Montagnes and Vaudreuil-Hudson rail lines (data provided by AMT) and a number of express buses. The data is shown in table below.

Table 5.1: Historical Transit Demand (Annual)

	DM	V-H	401	407	409	411	419	460	468	470	491	496
2007	7,648,900	3,076,000	56,529	49,808	477,078	592,738	248,613	1,856,145	118,870	982,857	282,153	252,274
2008	7,809,700	3,166,000	69,164	74,509	486,293	571,362	335,603	1,859,570	254,505	1,624,698	338,776	307,779
2009	7,620,800	3,267,900	60,586	73,705	480,035	502,070	396,120	1,811,998	462,654	2,132,990	557,438	577,614
2010	7,687,200	3,565,000	61,039	80,045	463,344	455,782	445,854	1,724,380	574,705	2,426,330	546,850	657,528
2011	7,245,600	3,462,600	83,805	99,851	451,809	406,442	463,249	1,733,117	647,856	3,124,626	508,189	706,674
2012	7,347,200	3,421,700	91,134	102,967	424,231	337,503	497,878	1,762,359	686,297	3,598,825	538,074	846,166
2013	7,543,300	3,759,000	76,337	99,244	394,222	311,311	541,647	1,761,967	692,821	3,753,249	569,035	975,396
2014	7,864,800	3,869,500	74,837	105,474	362,185	277,314	552,101	1,764,216	698,683	3,541,217	549,610	1,037,925
2015	7,744,800	3,845,300										

Source: AMT and STM

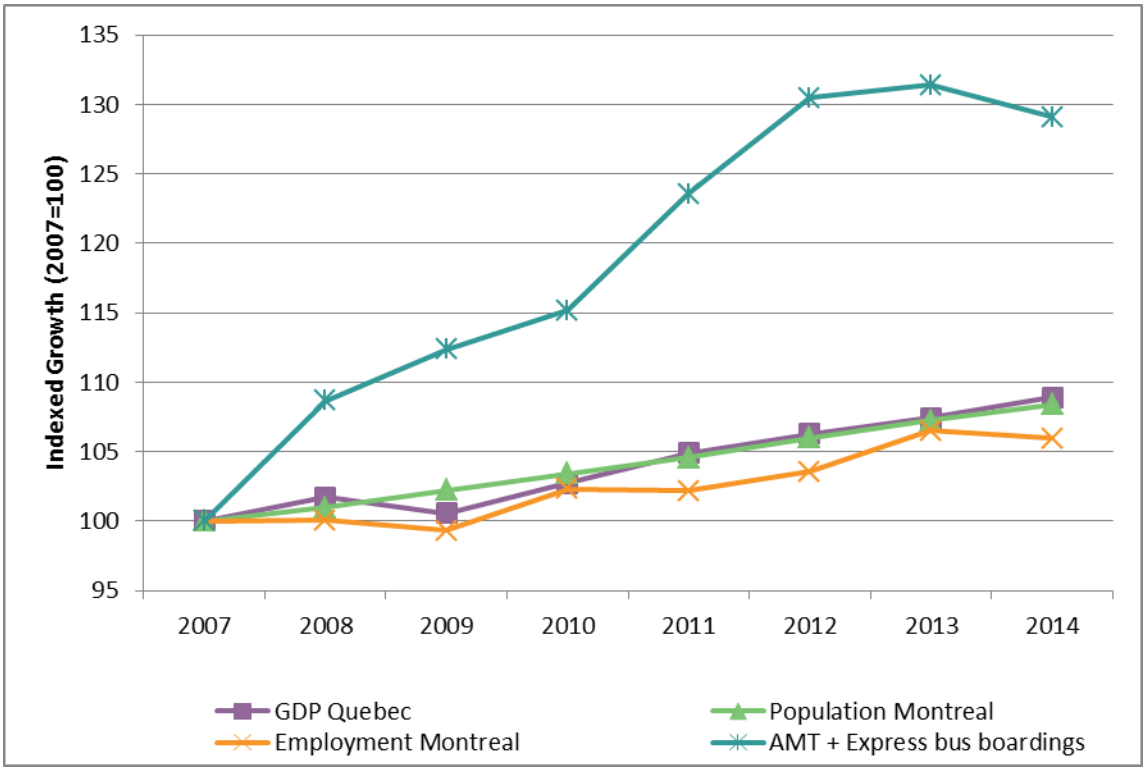
5.4 Figure 5.1 shows the data been presented as growth from 2007. This shows very low growth on AMT rail services, while very high growth in express bus demand. The low growth on AMT services is likely affected by the limited P&R capacity at stations and the high peak load on services already and therefore limited capacity for growth on the system. The very high growth on express bus services is linked to the improvement in the level of service which has resulted in dramatic increases in ridership.

Figure 5.1: West Island Historical Ridership Growth

Source: AMT and STM

5.5 Historical boardings were compared to a number of socioeconomic parameters in the region as shown in Figure 5.2. However, as shown in the figure, there is limited correlation between ridership and the socioeconomic variables examined.

Figure 5.2: Transit ridership and socioeconomic growth comparison



Source: AMT, STM and Statistics Canada

Growth Model

5.6 Based on the historical relationship observed between transit boardings and socioeconomic indicators shown above, it is challenging to develop an econometric growth model, since historic transit demand growth in the corridor has been affected by a number of external factors.

5.7 Based on the above we have applied the growth estimated by MTQ. MTQ develops transit and car demand growth forecasts which incorporate population projections taking into account the observed growth trends on the 2008 Enquête survey data. The overall population growth is aligned regionally with the ISQ (Institute de la Statistique du Quebec)[5] but is applied to each zone based on urban development trends. MTQ forecasts also reflect trends on car ownership, transit and active mode market share, etc.

5.8 The estimated growth forecasts for the region for AMT and MTQ are detailed below, together with GDP, population and employment forecasts for the socioeconomic variables identified above.

[5] http://www.stat.gouv.qc.ca/statistiques/population-demographie/perspectives/perspectives-2011-2061_an.html

Table 5.2: Regional Growth Comparisons

Annual Growth	2016-2021	2021-2031
Quebec GDP	1.9%	0.7%
Montreal population	1.3%	1.0%
Montreal employment	0.9%	0.6%
Auto (2008-2031)	0.48%	0.48%
Deux Montagnes (2008-2031)	1.1%	1.1%
Vaudreuil-Hudson (2008-2031)	1.2%	1.2%

Sources:
Quebec GDP: Moody's
Montreal population: Institute de la Statistique du Quebec (Référence)
Montreal employment: Conference Board of Canada
Auto: MTQ. Note that value presented is regional total and growth will vary by SM
Deux Montagnes and Vaudreuil-Hudson: AMT based on rail users. Estimate is total and growth will vary by SM

5.9 The table shows that the growth expected by MTQ and AMT is within the socioeconomic growth forecasts and this provides a further confidence in the growth assumptions to apply.

5.10 Note that MTQ and AMT growth is based on urban development trends. However the MTQ forecasts do not take into account the potential intensification along the corridor as a result of the implementation of the LRT system. At this stage we have not assumed any additional growth resulting from TOD around stations.

Airport demand

5.11 The airport line will experience a different growth profile as it is driven by airport passengers. For this study a set of air traffic forecasts for 2010-2028 provided by Aéroports de Montréal (ADM) and used for the original Aerotrain work were used. These forecasts are used internally by the airport for business planning purposes and are in themselves based on forecasts developed by Transport Canada on behalf of ADM. As part of the Aerotrain work the forecasts were reviewed and assumptions made for the period 2029-2051. The growth forecasts are presented in Table 5.3.

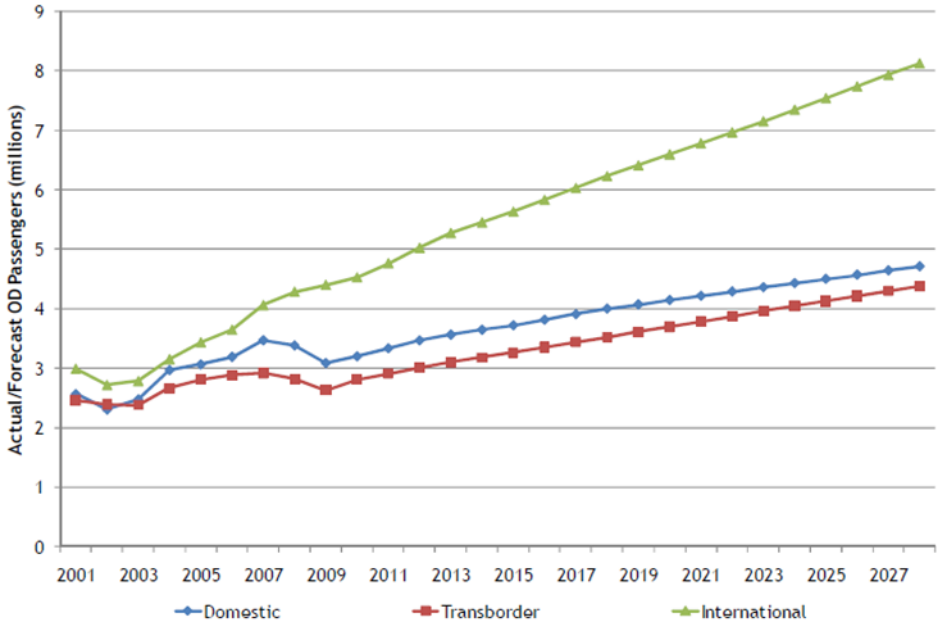
Table 5.3: Airport Line Forecasted Demand Growth

From	To	CAGR
2016	2022	2.9%
2022	2028	2.4%
2028	2038	2.1%
2038	2051	1.8%

Source: ADM based on Transport Canada forecasts

5.12 Forecasts by different key sector are shown in the figure below.

Figure 5.3: Airport Demand Forecasts by Key Sector



Source: ADM

6 Preliminary Forecasts

LRT Base Case

6.1 This base case scenario has been defined for dimensioning purposes and therefore the analysis has mainly focused on the most loaded period and direction (AM peak period towards Montreal). However we have also estimated daily and annual demand forecasts based on the AM peak demand estimated.

Assumptions

DM 2008 select link base demand

6.2 2008 Enquête data provided by AMT. However as discussed in Chapter 3, P&R estimated from the 2008 Enquête exceeds considerably P&R capacity and therefore demand has been adjusted to reflect the existing P&R capacity and to match total AM demand as provided by AMT rail boardings. The demand adjustments are shown in Table 6.1.

Table 6.1: 2008 demand adjustment (AM peak period)

	2008 Enquête	2008 Adjusted
DM (Transit Access)	8,311	8,311
DM (P&R Access)	9,540	5,981
Total DM	**17,851**	**14,292**

Transit assumptions

- Deux Montagnes/ Point Claire
  - Existing express routes remain as current
  - Vaudreuil-Hudson AM peak period service remains as current
  - Fairview bus station located in the new LRT station at Pointe-Claire
- Airport
  - 747 bus route is every 30 min
- Mascouche
  - Orange Metro Line interchange and service remains as current

P&R facilities

6.3 As presented in Table 2.3. New Park & Ride facilities at Autoroute 13 and Sources.

Other assumptions

6.4 Table 6.2 presents the expansion and ramp up assumptions as described in Chapter 4.

Table 6.2: Central Case expansion and ramp up factors

		DM and P-C			Mascouche			YUL			P&R		
Expansion Factors	2022	2.6	273	706	2.1	214	445	10.3	277	2,858	2.3	241	554
	2023	2.8	273	763	2.1	214	445	10.3	277	2,858	2.3	241	554
	2024	3.0	273	820	2.1	214	445	10.3	277	2,858	2.3	241	554
	2025	3.0	273	820	2.1	214	445	10.3	277	2,858	2.3	241	554
Ramp-up Expansion Factors	2022	60%			100%			100%			100%		
	2023	80%			100%			100%			100%		
	2024	100%			100%			100%			100%		
	2025	100%			100%			100%			100%		
Bus service		No change											
747 Service		747 service runs every 30 min											
Vaudreuil-Hudson line		Increase in rail service -Add trains as follows: no. 13B (11:15); no. 24B (15:15); no. 30A (18:08) and no. 31 A (19:30). Not required at this stage as AM peak period model.											
Ramp-up factors (existing)	2022	100%			120%			90%			100%		
	2023	100%			110%			95%			100%		
	2024	100%			100%			100%			100%		
	2025	100%			100%			100%			100%		
Ramp-up factors (new demand)	2022	80%			-			65%			70%		
	2023	90%			-			80%			80%		
	2024	95%			-			90%			90%		
	2025	100%			-			100%			100%		

Forecasts

Summary

6.5 Under this scenario, and based on the travel times extracted from Google, it is estimated that all of the existing transit demand on the Deux-Montagnes will be captured by the LRT. Given the LRT extension to Pointe-Claire and much improved service headway (12/6 min vs 20 min), it is anticipated that demand will be captured from both auto and other transit modes, with a resulting increase of total DM demand of over 22% between 2022 and 2041.

6.6 Majority of the demand growth will be driven by existing DM demand and mode shift from other transit as a result of overall travel time competiveness offered by LRT and increasing level of congestion in the future.

6.7 The resulting mode shift from auto users is estimated to be relatively small (around 1%) compared to the total Deux-Montagnes demand. This is because the improvement in LRT travel times is modest when compared to total auto travel time and transfer from auto to transit is always challenging to achieve.

6.8 For P&R facilities, we have assumed that all existing and new P&R spaces will be 90% full and with an average auto occupancy rate of 1.1 per auto. Due to the constraint in parking spaces, P&R demand will be reach its maximum capacity, totalling 8,800 users during the AM peak period (representing 37% to 32% from 2022 to 2041).

6.9 Similar to Deux Montagnes demand, it is estimated that additional demand will be captured from auto and other transit because of the direct connection from YUL to downtown Montreal and LRT travel time competitiveness compared to local buses.

6.10 Due to the truncation of Mascouche Line at A40 station, instead of connecting straight to Gare Centrale, between 1,900 and 2,200 forecasted Mascouche users will have to interchange to the Train de l'Ouest in order to access downtown Montreal or Mascouche for 2022 and 2041 respectively.

6.11 Table 6.3 shows the estimated AM peak demand from each of the market segments.

Table 6.3: Base Case Train de l'Ouest boardings (AM Peak Period, no ramp up)

Service	2022	%	2031	%	2041	%
DM						
Existing + MTQ Growth	9,800	41%	10,900	42%	11,500	42%
New (from Other Transit)	2,700	11%	3,400	13%	3,800	14%
New (from Auto)	300	1%	300	1%	300	1%
Total DM	**12,800**	**53%**	**14,500**	**55%**	**15,700**	**57%**
Park & Ride						
Existing	6,500	27%	6,500	25%	6,500	24%
New	2,200	9%	2,200	8%	2,200	8%
Total Park & Ride	**8,800**	**37%**	**8,800**	**34%**	**8,800**	**32%**
Airport						
Existing (747 + MTQ Growth)	500	2%	600	2%	600	2%
New	0	0%	100	0%	200	1%
Total Airport	**500**	**2%**	**700**	**3%**	**900**	**3%**
Total Mascouche	**1,900**	**8%**	**2,100**	**8%**	**2,200**	**8%**
TOTAL LRT Boardings	**24,000**		**26,100**		**27,500**	

6.12 Airport demand model is highly disaggregated into different market segments. Table 6.4 presents the capture rate for the airport demand. The majority of the demand will be captured from existing bus services (around 70%) while staff and taxi provide an additional 30% of the total demand.

Table 6.4: Base Case airport capture rate

Year	Bus	Taxi	Car (Park and Fly)	Car (Kiss and Fly)	Rental Car	Airport Staff	Total
2022	66%	13%	2%	2%	1%	17%	100%
2031	71%	15%	2%	5%	1%	18%	100%
2041	77%	17%	2%	6%	1%	18%	100%

6.13 Demand levels on the airport branch are different to previous Aerotrain forecasts and the differences are shown in Table 6.5.

Table 6.5: Airport demand comparison (weekday)

Concept	Headway	2016	2028	2038	2051
Aerotrain LRT service (V-H alignment)	4 mins all day	6,600	8,900	11,100	13,900
		2022	**2031**	**2041**	
West Island LRT (DM alignment, 747 operating at 30 min headway)	12 mins peak 15 mins off peak	4,800	7,400	9,000	

6.14 There are a number of reasons for the differences in the forecasts:

- Different opening and forecast years
- Increase in travel time (18 minutes for Aerotrain to Gare Centrale versus 33.7 minutes for West Island service)
- Reduced connectivity for the West Island service i.e. Aerotrain had connection to Metro network at Lionel Groulx in less than 18 minutes)
- Different headways
- Status of the 747 service

Station Boardings (AM Peak Period)

6.15 Data below shows the station boardings for a number of years (note that ramp up not included). As indicated previously (and shown in Appendix B) the allocation of demand to each station has been based on current DM station boarding patterns, road and transit network characteristics and the location of each station relative to the SM. their geographic location with regards to the closest rail station. Any changes to that allocation will change the forecasts and any detailed forecast would have to review these assumptions.

6.16 Station boardings and alightings are shown in Table 6.6and Figure 6.1 and Figure 6.2.

Table 6.6: Station boardings (AM Peak Base Case, no ramp up)

Station	2022	2031	2041
Deux-Montagnes	2,650	2,700	2,740
Grand-Moulin	700	720	730
Sainte-Dorothée	2,610	2,760	2,860
Île-Bigras	240	260	270
Roxboro-Pierrefonds	2,280	2,460	2,570
Sunnybrooke	1,110	1,170	1,210
Bois-Franc	1,970	2,190	2,330
Du Ruisseau	2,120	2,300	2,420
Montpellier	680	810	900
Mont-Royale	3,220	3,630	3,880
Canora	820	970	1,070
Centrale	430	590	710
Autoroute 13	1,430	1,530	1,590
des Sources	2,540	2,670	2,740
Pointe-Claire	1,010	1,090	1,130
YUL	180	260	310
TOTAL	**24,000**	**26,100**	**27,500**

Figure 6.1: 2041 Station boardings (AM Peak Base Case, no ramp up)

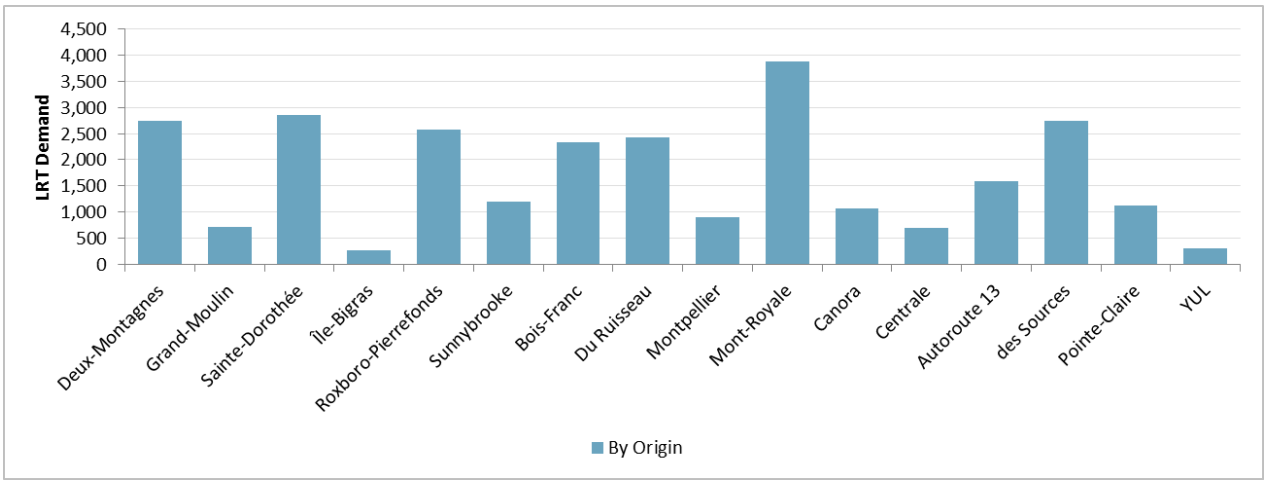
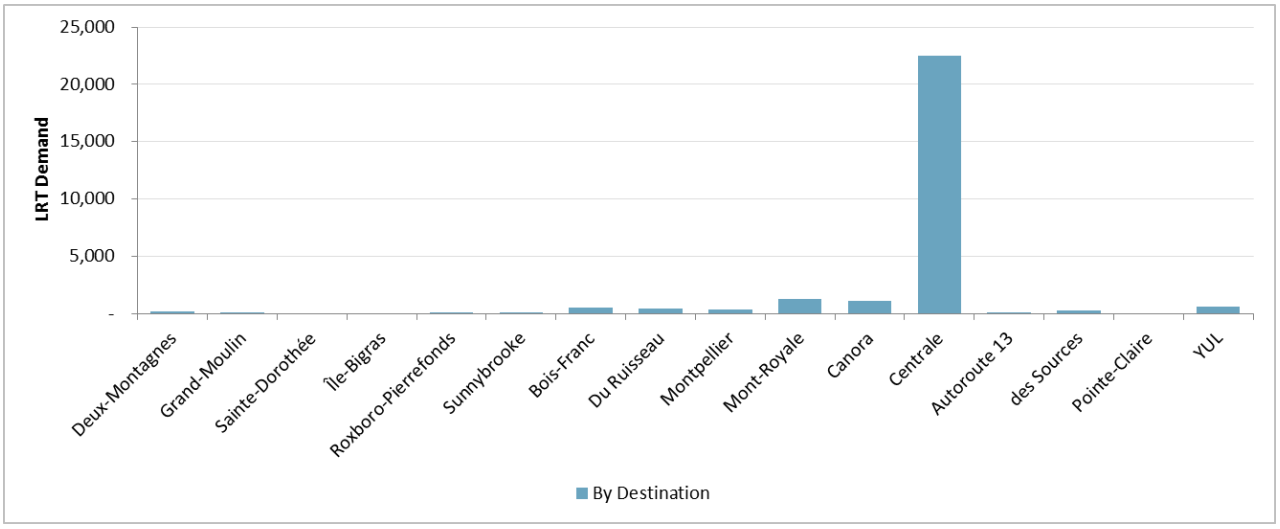


Figure 6.2: 2041 Station alightings (AM Peak Base Case, no ramp up)



6.17 Similar to current DM ridership profile, majority of the demand in the AM peak period will board at stations with well-integrated feeder bus networks and with P&R facilities, while most of the demand will alight in downtown Montreal.

6.18 There will be significant increases in boardings at Mont-Royal station due to the interchange demand from the Mascouche Line. The new station at Autoroute13 and the extension of the line to airport and Pointe-Claire will account for approximately 20% of total boardings during the 2041 AM peak period.

Line Loadings (AM Peak Period)

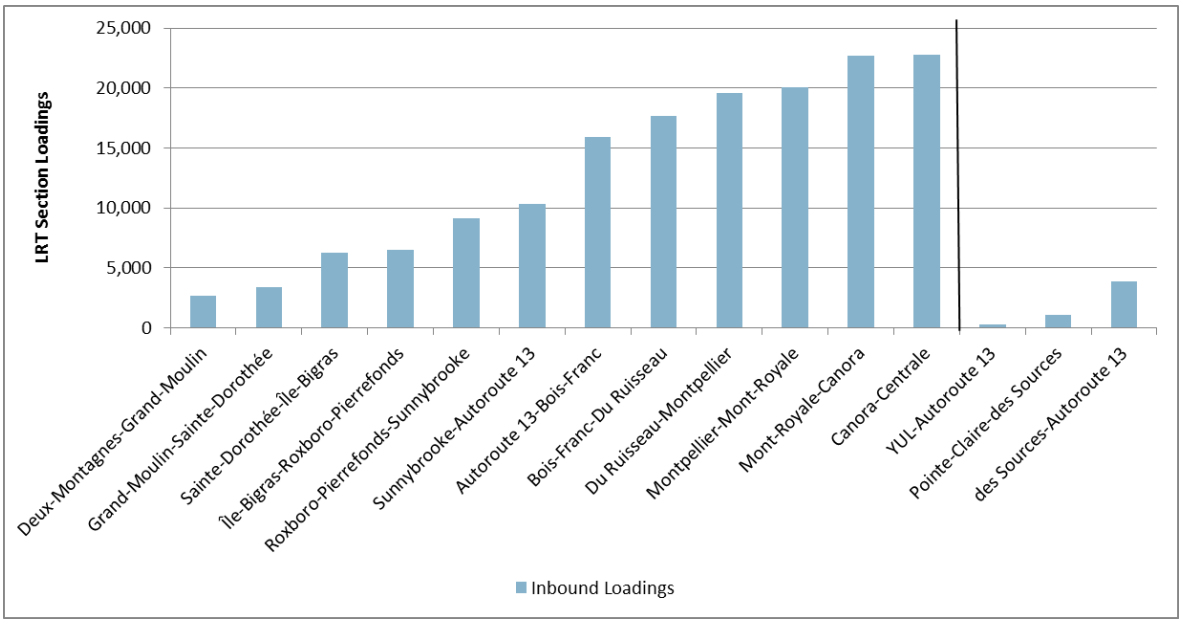
6.19 Table 6.7 presents the LRT line loadings for the Deux-Montagnes, Airport and Point-Claire LRT branches for each forecast year. The section between Mont-Royale and Gare Centrale is the most loaded on the LRT network, with more than 22,800 passengers in the AM peak period in 2041.

6.20 Note that the modelled AM peak period (6 AM to 9 AM) does not represent the real peak period for the airport (see Figure 4.4), and therefore ridership and loadings from the airport branch on the AM peak have a limited impact on the line's AM peak loads.

Table 6.7: Line Loadings: Inbound to Montreal (AM Peak Base Case, no ramp up)

Section	2022	2031	2041
Deux-Montagnes-Grand-Moulin	2,600	2,700	2,700
Grand-Moulin-Sainte-Dorothée	3,300	3,400	3,400
Sainte-Dorothée-Île-Bigras	5,900	6,100	6,300
Île-Bigras-Roxboro-Pierrefonds	6,100	6,400	6,500
Roxboro-Pierrefonds-Sunnybrooke	8,400	8,800	9,100
Sunnybrooke-Autoroute 13	9,500	9,900	10,300
Autoroute 13-Bois-Franc	14,500	15,300	15,900
Bois-Franc-Du Ruisseau	16,000	17,000	17,700
Du Ruisseau-Montpellier	17,700	18,800	19,600
Montpellier-Mont-Royale	18,000	19,300	20,100
Mont-Royale-Canora	20,200	21,700	22,700
Canora-Centrale	20,100	21,700	22,800
YUL-Autoroute 13	200	300	300
Pointe-Claire-des Sources	1,000	1,100	1,100
des Sources-Autoroute 13	3,600	3,800	3,900
Peak Load (Mont Royal-Canora)	**20,200**	**21,700**	**22,800**

Figure 6.3: 2041 Line Loadings: Inbound to Montreal (AM Peak Base Case, no ramp up)



Daily demand

6.21 Table 6.8 shows the estimated daily demand for each market segment respectively based on the expansion factors presented in Table 4.8.

Table 6.8: Daily Demand (Base Case, with ramp up)

Service	2022	2031	2041
DM	32,800	43,600	47,000
Park & Ride	18,600	20,200	20,200
Airport	4,800	7,400	9,000
Mascouche	4,700	4,300	4,500
TOTAL	61,000	75,500	80,600

6.22 As discussed previously, the majority of the LRT demand is driven by passengers using the Deux-Montagnes line as a result of improved service headway and the extension to Pointe-Claire.

Annual demand

6.23 Table 6.9 shows the estimated annual demand for each forecast year.

Table 6.9: Annual Demand (Base Case with Ramp Up)

	2022	%	2031	%	2041	%
DM	8,623,700	56%	11,927,800	60%	12,839,300	61%
Park & Ride	4,487,100	29%	4,858,700	25%	4,860,500	23%
Airport	1,335,700	9%	2,059,000	10%	2,485,100	12%
Mascouche	1,005,300	7%	916,200	5%	963,100	5%
TOTAL	**15,451,800**	**100%**	**19,761,700**	**100%**	**21,148,000**	**100%**

Sensitivity Tests

6.24 Two sensitivity tests were discussed and agreed with CDPQ Infra and we have named Low and High. Table 6.10 presents the lists and compares the assumptions for each test. Table 6.2 presented the Central Case assumptions for reference.

6.25 It includes different assumptions with regards to:

- Transit Growth
- Access times with feeder services (although this variations are minor and therefore with very limited impact)
- 747 operation assumptions
- Diversion from Mascouche line to the orange line
- Occupation rate of P&R facilities
- Expansion factors
- Ramp up

Table 6.10: Sensitivity test assumptions

		High Case (Base +0.3% Growth)												Low Case (Base -0.3% Growth)									
		DM and P-C			Mascouche			YUL			P&R			DM and P-C			Mascouche			YUL			P&R		
Expansion Factors	2022	2.7	273	734	2.2	214	471	10.3	277	2,858	2.4	241	579	2.5	273	677	2.1	214	445	10.3	277	2,858	2.2	241	530
	2023	2.9	273	791	2.2	214	471	10.3	277	2,858	2.4	241	579	2.7	273	734	2.1	214	445	10.3	277	2,858	2.2	241	530
	2024	3.0	273	820	2.2	214	471	10.3	277	2,858	2.4	241	579	2.9	273	791	2.1	214	445	10.3	277	2,858	2.2	241	530
	2025	3.0	273	820	2.2	214	471	10.3	277	2,858	2.4	241	579	3.0	273	820	2.1	214	445	10.3	277	2,858	2.2	241	530
Ramp-up Expansion Factors	2022	70%			100%			100%			100%			50%			100%			100%			100%		
	2023	90%			100%			100%			100%			70%			100%			100%			100%		
	2024	100%			100%			100%			100%			90%			100%			100%			100%		
	2025	100%			100%			100%			100%			100%			100%			100%			100%		
Bus service		Frequency increase by 10%												Frequency reduce by 10%											
747 Service		747 service is cancelled												747 service remains as present											
Vaudreuil-Hudson line		No Change												No Change											
Ramp-up factors (existing)	2022	100%			150%			95%			100%			100%			100%			85%			100%		
	2023	100%			140%			100%			100%			100%			90%			90%			100%		
	2024	100%			130%			100%			100%			100%			80%			95%			100%		
	2025	100%			120%			100%			100%			100%			80%			100%			100%		
Ramp-up factors (new demand)	2022	85%			-			70%			75%			75%			-			60%			50%		
	2023	95%			-			85%			85%			85%			-			75%			60%		
	2024	100%			-			95%			95%			90%			-			85%			70%		
	2025	100%			-			100%			100%			95%			-			95%			80%		

Outputs

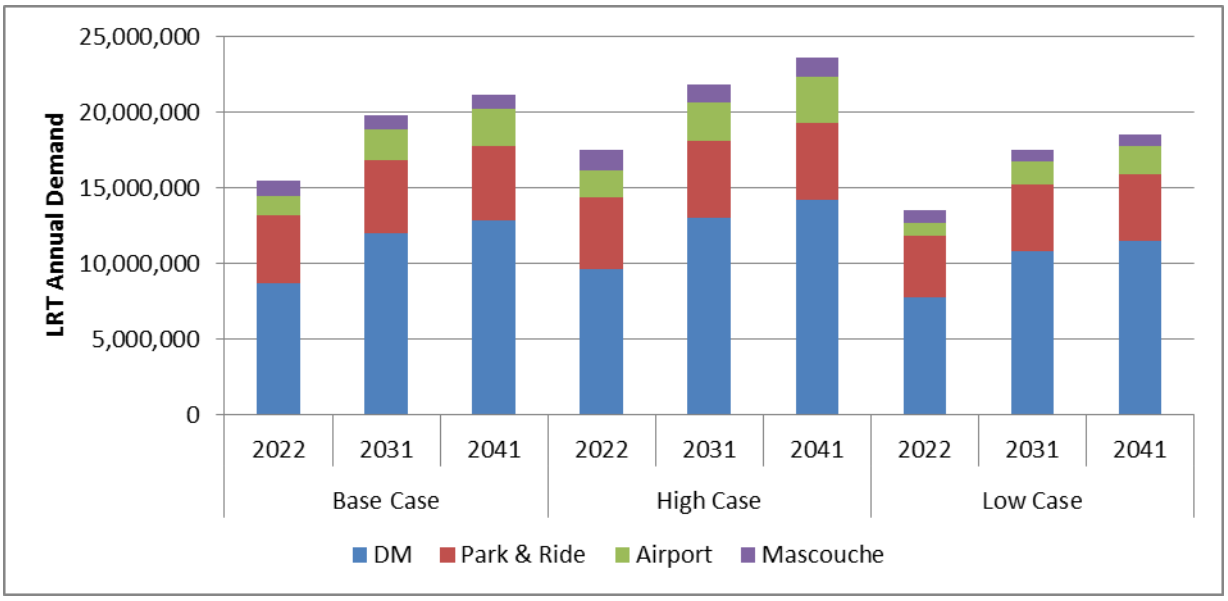
6.26 Table 6.11 and

6.27 Figure 6.4 presents the annual demand for the Base Case and the 2 sensitivities.

Table 6.11: Annual demand sensitivity (with ramp up)

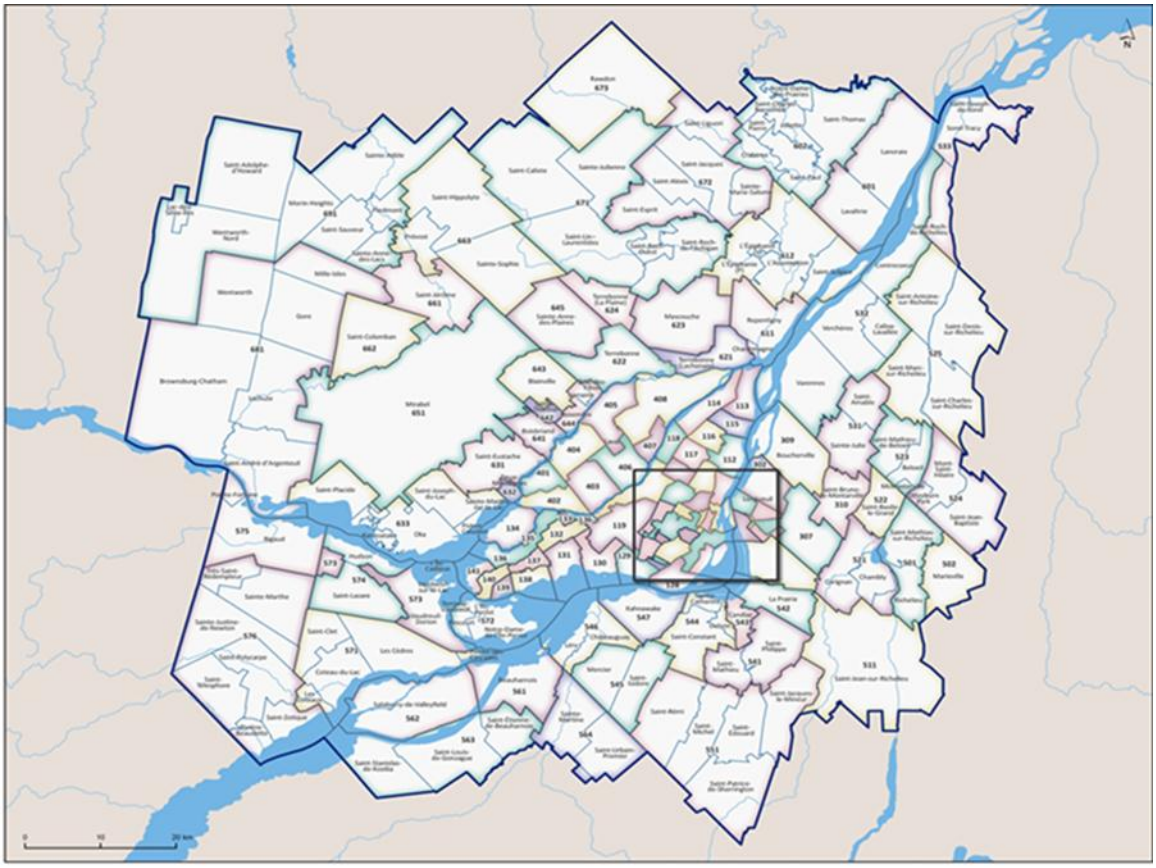
Scenario	Base Case			High Case			Low Case		
	2022	2031	2041	2022	2031	2041	2022	2031	2041
DM	8,623,700	11,927,800	12,839,300	9,592,000	12,948,700	14,145,200	7,723,700	10,803,800	11,452,400
Park & Ride	4,487,100	4,858,700	4,860,500	4,754,700	5,078,400	5,080,300	4,061,800	4,417,900	4,419,600
Airport	1,335,700	2,059,000	2,485,100	1,797,900	2,573,400	3,083,400	843,100	1,504,900	1,828,700
Mascouche	1,005,300	916,200	963,100	1,328,200	1,162,100	1,221,500	837,700	733,000	770,500
TOTAL	15,451,800	19,761,700	21,148,000	17,472,800	21,762,500	23,530,300	13,466,300	17,459,500	18,471,100

Figure 6.4: Annual demand sensitivity (with ramp up)



6.28 The annual demand range between the high and low scenarios and the base case forecasts is around +13%/-13%.

A Sector Municipaux (SM)



B Station Demand Allocation

	Deux-Montagnes	Grand-Moulin	Sainte-Dorothée	Île-Bigras	Roxboro-Pierrefonds	Sunnybrooke	Bois-Franc	Du Ruisseau	Montpellier	Mont-Royale	Canora	Centrale	Autoroute 13	des Sources	Pointe-Claire
SM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
101	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
102	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
103	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
104	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
105	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	84%	16%	0%	0%	0%
106	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
107	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%	45%	0%	0%	0%	0%
108	0%	0%	0%	0%	0%	0%	40%	35%	25%	0%	0%	0%	0%	0%	0%
109	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%	45%	0%	0%	0%	0%
110	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
111	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
112	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
113	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
114	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
115	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
116	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
117	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
118	0%	0%	0%	0%	0%	0%	40%	35%	25%	0%	0%	0%	0%	0%	0%
119	0%	0%	0%	0%	0%	0%	40%	35%	25%	0%	0%	0%	0%	0%	0%
120	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%
121	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
122	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
123	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
124	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%

	Deux-Montagnes	Grand-Moulin	Sainte-Dorothée	Île-Bigras	Roxboro-Pierrefonds	Sunnybrooke	Bois-Franc	Du Ruisseau	Montpellier	Mont-Royale	Canora	Centrale	Autoroute 13	des Sources	Pointe-Claire
125	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
126	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
127	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
128	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
129	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
130	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
131	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	36%	64%
132	0%	0%	0%	0%	29%	16%	0%	0%	0%	0%	0%	0%	0%	20%	35%
133	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
134	0%	0%	0%	0%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%
135	0%	0%	0%	0%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%	55%
136	0%	0%	0%	0%	28%	16%	0%	0%	0%	0%	0%	0%	36%	20%	0%
137	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
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140	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
141	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
301	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
302	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
303	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
304	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
305	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
306	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
307	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
308	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%

	Deux-Montagnes	Grand-Moulin	Sainte-Dorothée	Île-Bigras	Roxboro-Pierrefonds	Sunnybrooke	Bois-Franc	Du Ruisseau	Montpellier	Mont-Royale	Canora	Centrale	Autoroute 13	des Sources	Pointe-Claire
309	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
310	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
401	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
402	0%	0%	87%	13%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
403	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
404	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
405	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
406	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
407	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
408	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%
501	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
502	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
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521	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
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544	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%

	Deux-Montagnes	Grand-Moulin	Sainte-Dorothée	Île-Bigras	Roxboro-Pierrefonds	Sunnybrooke	Bois-Franc	Du Ruisseau	Montpellier	Mont-Royale	Canora	Centrale	Autoroute 13	des Sources	Pointe-Claire
545	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
546	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
547	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
551	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
561	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
562	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
563	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
564	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
571	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
572	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
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574	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
575	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
576	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
601	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
602	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
611	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
612	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
621	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
622	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
623	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
624	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
631	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
632	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
633	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Deux-Montagnes	Grand-Moulin	Sainte-Dorothée	Île-Bigras	Roxboro-Pierrefonds	Sunnybrooke	Bois-Franc	Du Ruisseau	Montpellier	Mont-Royale	Canora	Centrale	Autoroute 13	des Sources	Pointe-Claire
641	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
642	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
643	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
644	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
645	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
651	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
661	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
662	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
663	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
671	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
672	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
673	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
681	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
691	78%	22%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

CONTROL INFORMATION

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