

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada

RAILWAY INVESTIGATION REPORT
R06D0044



PEDESTRIAN ACCIDENT

AGENCE MÉTROPOLITAINE DE TRANSPORT
COMMUTER TRAIN 928
MILE 13.40, DEUX-MONTAGNES SUBDIVISION
ROXBORO-PIERREFONDS, QUEBEC
22 NOVEMBER 2006

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Railway Investigation Report

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Summary

At approximately 0750 eastern standard time on 22 November 2006, *Agence métropolitaine de transport* commuter train 928, proceeding southward for the Montréal Central Station, Quebec, struck a passenger at the Roxboro-Pierrefonds Station in the Roxboro-Pierrefonds district of Montréal, at Mile 13.40 of Canadian National's Deux-Montagnes Subdivision. The passenger was struck when she started to cross the main track after reversing direction on the north platform link. The passenger sustained serious injuries.

Ce rapport est également disponible en français.

Other Factual Information

The Accident

At approximately 0737 eastern standard time¹ on 22 November 2006, *Agence métropolitaine de transport* (AMT) commuter train 928 (the train) on the Montréal/Deux-Montagnes line departed Deux-Montagnes and was proceeding southward for the Montréal Central Station, Quebec. The train consisted of 10 units, including 5 driving units supplied via a 25-kilovolt catenary. It was 850 feet long and was carrying about 1100 passengers. The train crew consisted of a locomotive engineer and a conductor. Both were qualified for their respective positions and met established fitness and rest standards.

At approximately 0750, the train was approaching the Roxboro-Pierrefonds Station on the main track when commuter train 912, which was on a trip between the Central Station and the Roxboro-Pierrefonds Station, entered the siding to pick up passengers. The crew saw a passenger cross the main track on the north platform link. Just before she reached the siding, the passenger turned around and started back across the main track. The locomotive engineer sounded the horn and initiated an emergency brake application. The passenger tried to get off the track but she was struck by the train just as she reached the outer rail of the main track. She was seriously injured and was immediately transported to hospital.

The passenger knew the train schedule. For about two years, she had been riding commuter train 912, which departs at 0800, to go to work in downtown Montréal. She would arrive at the station every morning at about 0755 from the parking lot on the east side of the tracks. She would walk across the tracks via the north platform link and would board train 912, which was normally standing at the west platform by 0750.

On the day of the accident, the passenger came in as usual from the parking lot on the east side of the tracks. When she arrived at the east platform, she made her way among the other commuters who were waiting for their train, looked to her left, and proceeded via the platform link toward the west platform to board train 912. Having crossed the main track, she noticed that train 912 was not at the west platform as usual, but was moving through the south switch and entering the siding. She realized that she was ahead of her normal schedule and that she could take the train that left just before her usual one. She therefore turned around and headed back toward the east platform, and she started across the main track without having seen or heard train 928, which was just entering the station.

The event recorder indicated that the train was approaching the platform link at a speed of 24 mph, the throttle was at position 7, and the locomotive bell was ringing. The brakes were applied when the train was 20 feet north of the platform link and the horn was sounded when the train was 90 feet further north. The train came to rest approximately 150 feet south of the platform link.

The weather was partly cloudy, visibility was good and the temperature was 4°C.

¹ All times are eastern standard time (Coordinated Universal Time minus five hours).

Train Operations

Trains on the Montréal/Deux-Montagnes line run on the Canadian National (CN) Deux-Montagnes Subdivision, which extends from the Montréal Central Station, Mile 0.00, to Saint-Eustache, Mile 21.80. Train movements are governed by the Centralized Traffic Control System authorized by the *Canadian Rail Operating Rules* (CROR) and supervised by a CN rail traffic controller in Montréal. From Mile 0.00 to Mile 8.45, the subdivision consists of a double main track. From Mile 8.45 to Saint-Eustache, there is one track, although there are sidings at the Roxboro-Pierrefonds and Deux-Montagnes stations.

In the Roxboro-Pierrefonds district, the Deux-Montagnes Subdivision includes five public crossings equipped with flashing lights, bell, and gates. Following the filing of a request by the municipality under the *Railway Safety Act*, the use of the horn at grade crossings is prohibited. However, trains sound the bell at grade crossings and in stations. Also, special instructions provided in the timetable authorize trains to use the horn to prevent accidents.

Section 5.3 of the timetable in effect requires that all trains observe a maximum approach speed of 30 mph at the platform links at the Roxboro-Pierrefonds Station. An additional speed restriction of 10 mph applies to southbound trains to provide at least 20 seconds of warning for pedestrians and vehicles arriving at the grade crossing just south of the station at Mile 13.23 (Centre Commercial Street). The English and French versions of the timetable that has been in effect since 2005 do not provide the same description of the area in which the speed limit of 10 mph applies. Section 5.1 of the French version indicates that the speed reduction applies between the circuit sign at Mile 13.50, which is 1026 feet north of the platforms, and the crossing. The English version states that the speed reduction applies only from Mile 13.30, which is south of the station.

The previous editions of the timetable, in both English and French versions, specify Mile 13.30, not Mile 13.50. The discrepancy between the English and French versions of the timetable is due to a typographical error and was not discovered when the timetables were revised. In practice, southbound trains do not comply with Section 5.1 of the French version. Instead, they reduce speed to less than 30 mph as they approach the station, but they do not go below 10 mph. They stop in the station to take on passengers, and then proceed on their run at a speed not exceeding 10 mph until they fully occupy the crossing, as prescribed in CROR Rule 103.1.²

Accident Site

The Roxboro-Pierrefonds Station has two platforms from which commuters can board commuter trains. The east platform runs alongside the main track and the west platform alongside the siding. Each platform consists of a concrete walkway 11 feet wide and approximately 960 feet long. Yellow lines have been painted over the full length of the platforms to show pedestrians how far back from the track they must stand when a train is

² Rule 103.1 states that, when a train movement is stopped or is going on the main track in proximity to a grade crossing, it must not exceed 10 mph until the crossing is fully occupied by the movement. Such movement must not obstruct the crossing until the warning devices have been operating for at least 20 seconds.

coming in. From the north end of the east platform, the view northward is partly obstructed by signs displaying information and restrictions and by the poles supporting surveillance devices, lights, and power lines. Rail Safety Information letter 06/06 on this matter was sent to Transport Canada on 11 December 2006.

There is a platform link at each end of the platforms, allowing commuters to move between the station's east and west platforms. The platform links cross the main track and siding at right angles. They are considered unrestricted access private crossings. They consist of rubber sheeting designed for road crossings (see Photo 1). They measure 22.5 feet long by 15 feet wide. There are no automatic protection devices to warn that a train is coming or to prevent commuters from crossing the tracks when a train is coming. Two signs are posted on the fence between the tracks, warning commuters to use caution when crossing the tracks.



Photo 1. Platform link at the north end of the Roxboro-Pierrefonds Station

Commuter Train Traffic Volume

The AMT commuter train network consists of 5 lines, which include 49 operational stations, 38 of which have more than one track (see Figure 1). Twenty-eight of these multi-track stations have tunnels or pedestrian bridges that give commuters access to the platforms without having to cross the tracks; the other 10 have platform links with no system to indicate that a train is approaching or to keep pedestrians off the tracks when a train is coming in.

AMT passenger statistics for the Montréal area commuter train network indicate that, in September 2006, there was a total of approximately 58 800 commuters concentrated in the peak periods (see Appendix A and Appendix B). The Montréal/Deux-Montagnes line is the busiest, with 49 trains carrying 27 400 commuters per day, which represents 47 per cent of the total number of AMT commuter train passengers. This line has 12 stations, including 8 with double tracks. At the Du Ruisseau, Bois-Francs, Roxboro-Pierrefonds and Deux-Montagnes stations, passengers have to use platform links when crossing the tracks between platforms.

About 5400 commuters per day use the Roxboro-Pierrefonds Station, making it the busiest in the network after the Montréal downtown stations (Central, Lucien L'Allier and Vendôme). During peak periods, the station handles about 2800 commuters in the morning and about 2400 in the afternoon. Some 1100 commuters board trains from the west platform. There are nine train meets per day. There are two parking lots, one with a capacity of 600 vehicles on the east side of the track, and the other with a capacity of 185 vehicles on the west side. Several bus routes serve the station, and most bus stops are on the east side of the track.

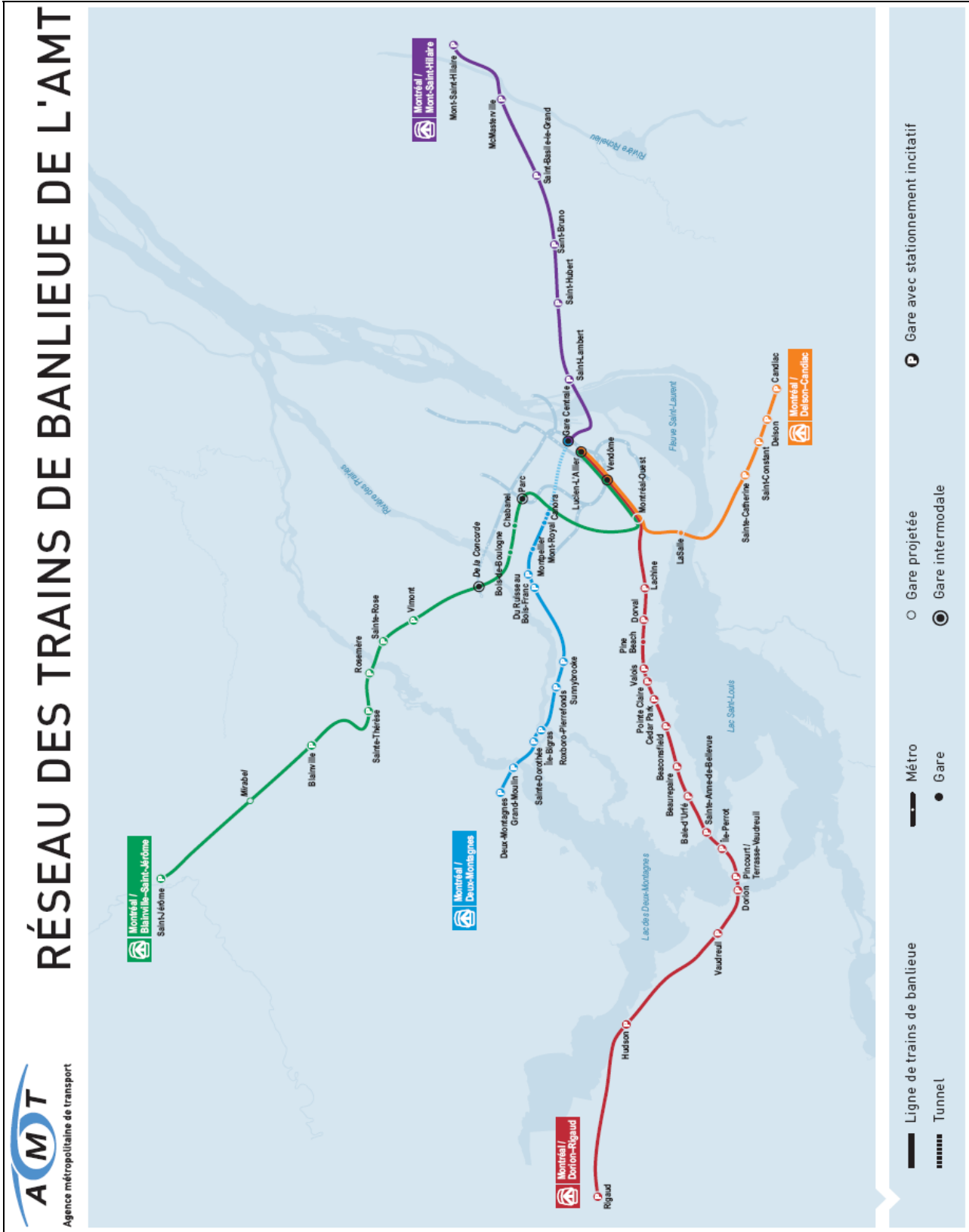


Figure 1. Commuter train station location plan (This figure does not exist in English.)

Accident Statistics

The TSB database revealed that, since 2000, there have been nine occurrences involving passengers on commuter trains in the Greater Montréal area. Four accidents occurred when commuters detrained before their train stopped, and one passenger was struck by a train that he intended to board. In the other four accidents, commuters were struck by a second train on platform links in stations with multiple tracks (TSB occurrences R00D0152, R04D0012, R05D0078, and R06D0044). Three of these four accidents occurred on the Montréal/Deux-Montagnes line (TSB occurrences R00D0152, R05D0078, and R06D0044).

Warning System

A second-train warning system was installed on a trial basis at Mile 7.57 of the Deux-Montagnes Subdivision on the sidewalks of the O'Brien Avenue crossing. Second-train warning systems are designed to warn that a second train is approaching, thereby reducing the risk of accidents that can result from pedestrians assuming that they can go through a crossing after the first train leaves. The trial showed that, after the second-train warning system was installed, the infraction rate (the number of pedestrians arriving at a crossing who go through the crossing while the gates are down compared to the number of pedestrians who use the crossing) decreased from 83.1 per cent to 30.8 per cent.

Analysis

The analysis focuses on the passenger's actions, train operations, the horn, and the platform links at multi-track stations.

Passenger's Actions

The passenger usually arrived at the station after train 928 had left and train 912 was standing at the west platform. She had almost never seen the two trains enter the station at the same time. As a result, she may have become less conscious of the hazards of rail traffic on multiple tracks and did not expect another train to come through on the second track. Because there was no system in place to keep passengers off the tracks and no visible or audible signal indicating that a second train was getting close to the platform link, the passenger started to cross the main track while train 928 was entering the station.

Despite the two caution signs advising commuters to be careful when crossing the tracks, she looked left as usual but did not look to the right. Consequently, she did not see train 928 coming. However, she did see train 912 pulling in, and realized that she was earlier than usual and could take train 928. She therefore turned back, but still did not look to the side from which train 928 was coming. Although the train's bell was ringing, the passenger did not realize that it was coming. When she heard the horn, she tried to get out of the way, but the train struck her.

Train Operations

Although it was introduced in 2005, the typographical error in the French version of the timetable concerning the area in which a reduced speed of 10 mph applies has not been corrected. Southbound trains have continued to operate as before, and consequently, there has been no impact on the safety of train passengers or vehicle and foot traffic at the Centre Commercial grade crossing. In any event, even if some trains had complied with the reduced speed starting at Mile 13.50, they would have covered a greater distance at a lower speed, including the area specified in the English version, which would not have created any additional safety hazard.

Horn

Although sounding the horn at crossings in Roxboro-Pierrefonds is prohibited, the special instructions permit it to be used to prevent an accident. The locomotive engineer is responsible for determining when an accident is imminent, so he or she has a short period of time in which to decide whether or not to use the horn based on the distance between the train and the person crossing the track. That distance may depend on the locomotive engineer's perception and reaction time and the braking distance of the train, as well as the speed at which the person is crossing.

When the locomotive engineer judges that the person crossing the track has time to clear the track, he does not sound the horn. However, if the person is close to the train, as in this occurrence, the locomotive engineer can immediately sound the horn and apply the emergency brakes. However, the horn is not necessarily a reliable means of prevention, since its effectiveness depends on how the person reacts. The horn may very well cause the person to clear the track, but it might also have the opposite effect, since the individual might be surprised and slow to react. In such cases, the accident would be unavoidable because it is impossible to stop the train with the emergency brakes in the distance available.

Platform Links

The circumstances surrounding the five accidents involving passengers that were struck by commuter trains in Greater Montréal since 2000 revealed that four of the five accidents were caused by a second train in stations where there were platform links and multiple tracks. It is no coincidence that three of these accidents occurred on the Montréal/Deux-Montagnes line because it is the busiest line in the AMT network in terms of the number of commuters and the number of trains and it has four stations with multiple tracks and platform links.

The Roxboro-Pierrefonds Station seems particularly susceptible because, apart from the stations in downtown Montréal, it is the busiest. It is the station with the greatest number of commuters exposed to the risk of being struck by a second train, with 1100 commuters boarding trains every day from the west platform. Most of those 1100 passengers come from the east side of the tracks, because that is where the great majority of parking spaces and bus stops are. They are compelled to cross the platform links while nine train meets are taking place.

However, several other AMT stations with multiple tracks also have platform links. Since the platform links have no devices to restrict commuter access to the tracks and no automatic signal systems, those stations also could be susceptible and could pose greater risks to commuters. Consequently, commuters at these stations are exposed to greater risks than those at the other stations, which have tunnels, pedestrian bridges and more active protection systems such as second-train warning systems.

Findings as to Causes and Contributing Factors

1. The train struck the passenger when she walked across the main track after reversing direction on the platform link.
2. Despite the two warning signs advising platform link users to use caution when crossing the tracks and the sounding of the train bell, the passenger did not look both ways on the tracks before entering the platform link.
3. Since there was no device to restrict commuter access to the tracks and no visual or audible signal to indicate that another train was entering the immediate vicinity of the platform link, the passenger started across the main track as train 928 was entering the station.

Findings as to Risk

1. The horn is not necessarily a reliable means of prevention, since its effectiveness depends on how the person reacts. The horn may very well cause the person to clear the track promptly, but it might also have the opposite effect, since the individual might be surprised and slow to react.
2. Commuters at train stations where the platform links have no device to restrict commuter access to the tracks and no automatic signal systems are exposed to greater risks than those at the stations that have tunnels, pedestrian bridges or more active protection systems such as second-train warning systems.
3. The Roxboro-Pierrefonds Station is the station with the greatest number of commuters exposed to the risk of being struck by a second train because there are 1100 passengers compelled to cross the platform links while nine train meets are taking place.

Other Finding

1. Despite the insertion in 2005 of a typographical error in the French version of the timetable concerning the area in which the speed reduction to 10 mph applies, southbound trains have continued to operate as before and, as a result, there has been no impact on passenger safety.

Safety Action Taken

The TSB sent Rail Safety Information letter 06/06 to Transport Canada on 11 December 2006 concerning the partial obstruction of the sightline from the east platform. In March 2007, Transport Canada confirmed that the railway relocated one sign to clear the sightline.

Canadian National (CN) issued a bulletin to correct the typographical error in the French version of the timetable. The correction was also included in the reissue of the timetable in December 2007.

In addition to Operation Lifesaver education and crossing-trespassing blitzes with local police departments, CN Police carried out passenger safety-related initiatives on the Deux-Montagnes line, more specifically with respect to commuters using platforms and platform links.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 05 February 2008.

Visit the Transportation Safety Board's Web site (www.tsb.gc.ca) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.

*Appendix A – Agence métropolitaine de transport Daily Trip
Volume by Line (September 2006)*

Line	Number of Commuters	
	Morning	Afternoon
Montréal/Deux-Montagnes	14 714	12 648
Montréal/Dorion-Rigaud	7050	6060
Montréal/Blainville	5068	4223
Montréal/Saint-Hilaire	3142	3223
Montréal/Delson	1372	1232
Total	31 346	27 386

Appendix B – Agence métropolitaine de transport Daily Trip Volume by Station (September 2006)

LINES	STATIONS	Daily Trips	Number of Tracks	Grade Platform Links	Tunnel or Ped. Bridge or Other
1 & 4	Gare Centrale	30 522	more than 4		YES
2,3 & 5	Lucien-L'Allier	11 839	more than 4		YES
2,3 & 5	Vendôme	5527	2		YES
1	Roxboro-Pierrefonds	5375	2	2	
1	Deux-Montagnes	5360	2	1	
3	Parc	4888	2	3	
1	Sainte-Dorothée	3716	1	1	
1	Sunnybrooke	3109	1	1	
2	Beaconsfield	2786	2		YES
1	Du Ruisseau	2782	2	2	
1	Bois-Franc	2737	2	2	
3	Sainte-Thérèse	2581	1	1	
1	Mont-Royal	2165	2		YES
2,3 & 5	Montréal-Ouest	2149	2		YES
1	Montpellier	2122	2		YES
3	Rosemère	1979	1		YES
3	Blainville	1826	1		YES
3	Sainte-Rose	1713	1		
1	Grand-Moulin	1603	1	1	
4	McMasterville	1341	2		YES
4	St-Basile-le-Grand	1205	2		YES
5	Sainte-Catherine	1192	2		YES
2	Pointe-Claire	1182	4		YES
4	Saint-Bruno	1155	2		YES
4	Mont-St-Hilaire	1153	2		YES
3	Saint-Martin	1116	2	3	
2	Vaudreuil	1108	1	1	
2	Dorval	1055	4		YES
2	Valois	1029	4		YES
1	Canora	1021	2		YES
2	Lachine	891	more than 4		YES
2	Cedar Park	864	2		YES
4	Saint-Lambert	782	2	4*	YES
2	Dorion	776	4	3	
5	Saint-Constant	766	2		YES
2	Ste-Anne-de-Bellevue	763	2		YES
4	Saint-Hubert	752	2		YES
2	Pincourt/T. Vaudreuil	644	4	1	
3	Bois-de-Boulogne	642	2	2	
2	Beaurepaire	589	4		YES
2	Île-Perrot	565	4		
1	Île-Bigras	554	1		YES
2	Pine Beach	462	4		YES
2	Baie-d'Urfée	313	4	1	YES
5	LaSalle	239	2		YES
5	Delson	197	more than 4		
5	Candiac	164	1		
2	Hudson	125	2		YES
2	Rigaud	40	1		
3	Saint-Jérôme		N/A	N/A	
3	Mirabel (Projetée)		N/A	N/A	
3	Concorde		N/A	N/A	
3	Chabanel (Projetée)		N/A	N/A	

Legend

- 1 - Montréal / Deux-Montagnes Line
- 2 - Montréal / Dorion-Rigaud Line
- 3 - Montréal / Blainville-St-Jérôme Line
- 4 - Montréal / Mont St-Hilaire Line
- 5 - Montréal / Delson-Candiac Line

* Additional protection provided by the rail traffic controller and an AMT ticket agent if available