Road Safety Report of the MTQ Roads in Nord-du-Québec

Work Document

September 2005

Plan de transport

CONSULTATION
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Québec
Ministère
des Transports

The cover page illustrates the various modes of transportation present in Nord-du-Québec.

The aerial view of the edge of Québec shows the importance of the surface of this region within the rest of the province. As a resource region, the road transport is represented by a heavy truck transporting lumber, and the marine transport by the native fishing boats. The snowmobile remains one of the means of transportation most frequently used for leisure and utility purposes. As for air transport, it is represented by a propeller airplane as it is the type of airplane most frequently used in Nord-du-Québec. The rail transport is also present on this territory, but it covers only the south of the region.

As for the logo, it repeats the theme of the three modes of transportation with the following symbols : the bird for air transport, the caribou for surface transport and the whale for marine transport. The doted line surrounding the logo represents the nine cree villages, the fourteen inuit municipalities, the five jamesian localities, the provincial government and the federal government all gathered around the same table in view of establishing a partnership in the planning process of the ***Transportation Plan of Nord-du-Québec***.

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Transportation Plan of Nord-du-Québec

Technical study

Road Safety Report of the MTQ Roads in Nord-du-Québec

Work Document

Transports Québec

September 2005

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ACKNOWLEDGEMENTS

We wish to thank all those who have contributed comments and suggestions to this document.

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ISBN-2-550-45734-X
Legal deposit
Bibliothèque nationale du Québec, 2005

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ACRONYMS

AMG	Serious and fatal accidents
ATV	All-terrain vehicle
DMS	Material damages only
MRC	County regional municipality
MTQ	Ministère des Transports du Québec
SAAQ	Société de l'assurance automobile du Québec

NOTE TO THE READER

Unless the context indicates a different meaning, the following words and expressions should be taken to convey:

"technical study"	**this technical study does not presume to be scientific in nature. In no instance does it constitute an opportunity study, nor a comprehensive study of the topic analyzed. It aims to provide a brief overview of the specific situation regarding transportation in Nord-du-Québec. Notwithstanding the document's internal nature, the Ministère is pleased to make this report available.**
"the Ministère"	**the Ministère des Transports du Québec.**

Words in the text that are italicized are included in the lexicon, except for titles of laws, regulations and various works.

SUMMARY

General information

Conducted as part of the process involved in preparing the *Transportation Plan of Nord-du-Québec*, the technical study on road safety aims to provide data for the *Analysis* and the exchanges between partners at the consultations. It can also be as a daily tool for the actors involved in improving road safety report of the region.

Road safety is a major issue for the Ministère des Transports (MTQ). Knowledge of the degree of safety of the road network can enable the Ministère to take action at dangerous sites. Understanding the degree of safety for a specific site calls for first analyzing the accidents that have occurred on the various transportation networks involved.

This study focuses on those accidents that occurred between 1995 and 1999 inclusively on the Ministère des Transport's network in Nord-du-Québec. Appendix 7, for its part, concerns the other roads of the region.

General road safety data for the Nord-du-Québec region

According to data from the Société de l'assurance automobile du Québec (SAAQ), Nord-du-Québec is, of the province's 17 administrative regions, the region where there were the fewest accidents. The annual average number of accidents per 100 inhabitants in Nord-du-Québec is 1.70, whereas the average for Québec is 2.14.

In Nord-du-Québec, there were 3,759 accidents in Nord-du-Québec between 1995 and 1999. From this count, 1,019 accidents, which 27.1% occurred on roadways managed by the Ministère des Transports, whereas 2,740 accidents, which 72.9% occurred on *other networks*[1]. Of these accidents, 38 were fatal, 9 on the Ministère's network (23.7%) while 29 on the *other networks* or off networks (76.3%). This can be explained by the fact that the MTQ network is not as large as all *other networks* combined. Fatal accidents in Nord-du-Québec represent 0.87% of all fatal accidents in Québec[2], while the region's population accounts for only 0.5 % of the province's total population.

The number of deaths following a road accident, per 10,000 inhabitants, is 1.8 in Nord-du-Québec. This figure is 1.1 for the province as a whole. Furthermore, the number of *serious injuries* per 10,000 inhabitants is 11.6 in Nord-du-Québec, whereas in Québec, it is 7.5. We therefore conclude that accidents in the region are more serious than they are in the province as a whole.

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1 Ministère des Transports du Québec, *Transportation Plan of Nord-du-Québec, Study on road accidents in Nord-du-Québec* (network of non-status, municipal, forest and mining roads), an analysis supporting this study.

2 Société de l'assurance automobile du Québec, *Bilan 1999, Accidents, parc automobile, permis de conduire, 2000,* p. 36 to 56.

1.0 INTRODUCTION

Several agencies are involved in the area of road safety legislation and regulation, the primary ones being the federal and provincial governments. At the provincial level, government Ministères, para-public agencies and partners all play a role, with the Ministère des Transports being one of the primary actors in this regard. Appendix 1, which addresses the Transportation safety policy, provides an overview of the actors and their roles. Appendix 2, in turn, concerns the legislative framework of road safety. Appendices 3 to 6 present the national laws and regulations.

Improving road safety is a major concern for the Ministère des Transports. The strategic plan it has prepared[3] favours actions for maintaining the transportation infrastructure and equipment in good condition, in order to ensure the mobility and safety of users. Its efforts, as well as those of its partners, have helped to improve road safety. In fact, the number of fatalities as a result of road accidents in Québec dropped from 1,085 in 1990 to 615 in 2001, and the number of *serious injuries* went from 6,831 in 1990 to 5,062 in 2001[4].

This technical study is part of the process of preparing the *Transportation Plan of Nord-du-Québec*. Its goal: to produce a first report on road safety for the region that will enable a better understanding of the current situation.

To do so, the report compares data on accidents in the Nord-du-Québec territory with data for the province as a whole. Then, a comparison of the accidents on the Ministère des Transports network and those on *other networks* is carried out. Lastly, the characteristics of accidents occurring on the MTQ network in Nord-du-Québec are analyzed. A section of the report is devoted to the portion of Road 167 located in the city of Chibougamau. It includes possible actions for decreasing the number of accidents in this agglomeration.

1.1 Territory and Population

Occupying 55% of the surface of Québec, Nord-du-Québec is spread out over 840 178 km^2 (Map 1). Bordered to the east by Labrador and Côte-Nord, to the south by the Saguenay-Lac-Saint-Jean, Mauricie and Abitibi-Témiscamingue and to the west by Ontario, Nord-du-Québec is also surrounded by the James bay, Hudson Bay, Hudson strait and Ungava bay. According to the 2001 census, the total population of Nord-du-Québec was be of 38 575 people, thus 0.5% of the Québécois population. In 2004, the population was of 39 234 people.

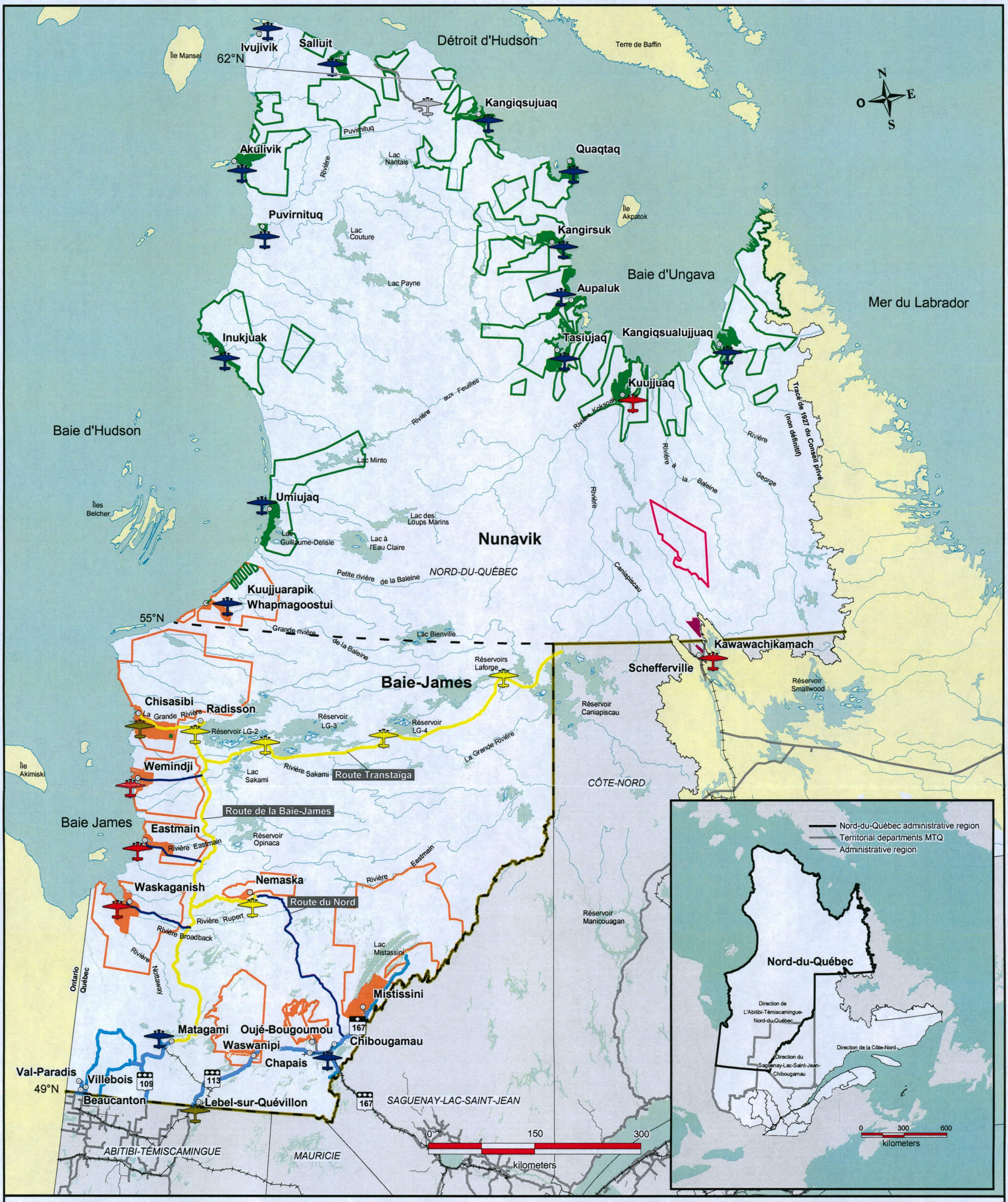
The region comprises two distinct territories: north of the 55th parallel, Nunavik covers nearly 490 000 km^2 for a population of 10 410 inhabitants (Statistics Canada, 2001).

3 Ministère des Transports du Québec, *Plan stratégique du MTQ 1998-2001*, January 1998, 53 pages.
4 Société de l'assurance automobile du Québec, *Bilan 2001, Accidents, parc automobile, permis de conduire*, 2002, p. 14.

The population is gathered in 14 Inuit municipalities and a Cree village located along the coasts of Hudson Bay, Hudson strait and Ungava Bay. There are Kuujjuarapik, Umiujaq, Inukjuak, Puvirnituq, Akulivik, Ivujivik, Salluit, Kangiqsujuaq, Quaqtaq, Kangirsuk, Aupaluk, Tasiujaq, Kuujjuaq, Kangiqsualujjuaq and of the Cree village of Whapmagoostui.

Between the 49th and 55th parallel, covering approximately 350 000 km^2, we find the territory of James Bay. This territory consists of the Municipalité de Baie-James (MBJ), of category I lands as defined by the James Bay and Northern Québec Agreement (JBNQA), as well as enclaved towns in the MBJ, thus Chibougamau, Chapais, Lebel-sur-Quévillon and Matagami. The Municipalité de Baie-James includes the localities of Radisson, Villebois and Valcanton (merge of Val-Paradis and Beaucanton), the hamlets of Miquelon, Desmaraisville and Rapide-des-Cèdres, as well as a vast wide spread little inhabited. In total, the MBJ and the enclaved towns count 16 314 people (Statistics Canada, 2001). As for the category I lands, defined by the JBNQA as being of exclusive use of the Crees and where are located the Cree villages, it counts 11 851 people divided in eight communities: Mistissini, Oujé-Bougoumou, Waswanipi, Nemaska, Waskaganish, Eastmain, Wemindji and Chisasibi.

The only Naskapi village, Kawawachikamach, is located at about fifteen kilometres at the north-east of Schefferville. It takes part of the Côte-Nord region (09), but the community has the use of category IB and II lands located in Nunavik, under the terms of the North-Eastern Québec Agreement (NEQA).



Transports Québec

Coordination du Nord-du-Québec

Map 1: Territory under Study

Transportation Plan of Nord-du-Québec

Road Safety Report of the MTQ Roads in Nord-du-Québec

Source:
- Ministère des Transports du Québec

Basic map:
- Ministère des Ressources naturelles, digital maps, scale 1 : 250,000 and 1 : 8,000,000

September 2005

Land regime

(category I) (category II)

- Cree
- Inuit
- Naskapi

Note: The limits of the Oujé-Bougoumou territory are defined under the Cree-Québec Agreement of February 7, 2002.

Administrative limit

- Municipalité de Baie-James
- South limit Nord-du-Québec region
- Other Québec regions

Others

- Railway
- City, village or town

Road

Financial responsability

- MTQ - National, regional, collector
- MTQ - Acces and mining
- MTQ - Other roads *
- Hydro-Québec

* Financial responsability for maintenance only

Airport

Financial responsability

- Ministère des Transports
- Transport Canada
- Hydro-Québec
- Cree council / Municipality
- Other

1.2 Objective

The primary objective of this study is to provide information on road safety for the roads on the Ministère des Transports du Québec's network for the administrative region of Nord-du-Québec. The study can also be useful to all actors in the area of road safety. In this sense, it must provide the Ministère and its partners with the tools necessary to assess the degree of safety of the various sites and subsequently eliminate subjective actions, in favour of objective measures addressing specific, identified problems.

1.3 Methodology

There are three levels of analysis when considering road safety: micro, meso and macro.

- Microanalysis serves to determine the circumstances or factors contributing to specific accidents.
- Mesoanalysis consists of conducting a comprehensive analysis of all accidents at a given site (intersection or short section of a roadway).
- A macroanalysis, in turn, involves studying all of the accidents for a given region or territory. The present study is conducted at the macroanalysis level.

The method adopted draws relationships between various elements of the road network and the number and severity of accidents. This regional data is then compared to provincial figures, hence making it possible to identify those issues that are specific to Nord-du-Québec.

1.3.1 Processing of the data

The detailed analysis of accidents in Nord-du-Québec is carried out by first grouping together accidents in a database, then querying this database according to the various parameters considered. Comparisons with national data, moreover, are conducted whenever possible.

1.4 Data sources

The figures used for analyses are drawn from the various databases available to the Ministère. They primarily originate from accident reports, inquiries as to *traffic flow*, *traffic counting* at specific *crossroads or intersections*, studies on infrastructures, and specific reports.

Accident data is obtained from the Société de l'assurance automobile du Québec's accident report database. These reports were prepared by police officers from the various police forces in Québec. Based on the data compiled by police officers, the Ministère des Transports identified the sites of all the accidents that occurred on its road network, using the *spatial reference mode: "route-tronçon-section-chaînage"*. The

accident reports used for this study cover the period between January 1, 1995 and December 31, 1999.

The *traffic flow* data used was obtained from the various *traffic counting* initiatives (automatic and specific), as well as from various data gathered on the flow of traffic in Québec.

Data on infrastructures was obtained from the Ministère des Transports du Québec's inventory on transportation infrastructures (system 0012).

The geometry of *crossroads* was addressed in special reports, in order to learn the specific configuration of each of the *crossroads* in the region.

The data on speed zones were derived from a field study conducted to identify, on the basis of the *spatial reference mode: "route-tronçon-section-chaînage"*, the location of each speed limit sign. This made it possible to determine the exact lengths of roadway for the various speed limits.

1.5 Validity of the data

The information contained in this document only represents a sampling of the accidents that occurred on the MTQ network in Nord-du-Québec. In fact, no information is available with regard to those accidents where a joint report was filed, seeing as the Ministère has no means of accessing this data. It is known, however, that such reports can be filled out for as many as 50% of the accidents in a given region[5]. Furthermore, certain incidents or accidents, such as skids, are not reported. It is currently impossible to accurately estimate the number of incidents that were never reported or for which no joint report was drawn up by the parties involved. The accidents evaluated, however, do include all of those where there were *bodily injuries.*

We must therefore bear in mind that accident data, which are gathered by the various police forces, only represent a percentage of all road accidents. As such, this report only offers a partial overview. By extension, an underlying assumption of this study would be that non-reported accidents are equally distributed throughout the Québec territory.

The degree of precision with which the site of a given accident can be determined is directly based on the accuracy of the information provided by the police officer in filling out the accident report. Properly locating the site of an accident requires that most of the sections of the report be accurately and carefully filled out. Yet, it is oftentimes hard for a police officer to accurately specify where an accident occurred, specifically in light of the vast size of the territory and the lack of physical markings. For cases where insufficient information was included on accident reports, accidents were logged as having taken place at *crossroads, or intersections.* The person who enters site information in the database must also have an excellent knowledge of the environment.

5 Personal communication (2002), Insurance Bureau of Canada.

The traffic flow data currently available mostly consists of information gathered outside of the national urban agglomerations. This may result in certain biases being introduced in *traffic flow* estimates for agglomerations or the roadways leading to these areas. Values measured at a traffic counting site are considered to apply to the entire roadway, which is deemed homogeneous as regards flow of traffic.

As regards the *traffic flow counting* at intersections, this type of activity is rather rare. In fact, the Ministère does not have specific *traffic counting* mechanisms for all *crossroads, or intersections.* Consequently, it becomes necessary to estimate, or rather, assume, that traffic flow is identical between two *crossroads or intersections* that were the object of specific *traffic counting* measures, and this up to a strategic point between the two sites. This is particularly the case in urban environments. Obtaining figures for the 102 *crossroads* on the Ministère's roadway network in the region would have been a costly and time-consuming task. Each such report requires a minimum of 12 hours of work, after which the data obtained must be processed. Even then, certain biases would remain, specifically because of traffic bypassing the crossroads being studied. The existing data is considered satisfactory for the purposes of our macroanalysis.

Lastly, not all collector roads and resource access roads are subject to *traffic counting* by the Ministère des Transports. Estimates were thus used for those sites where traffic flow data was unavailable. This may bias the analyses of certain roads in these categories.

2.0 GENERAL ROAD SAFETY DATA

It is critical that the degree of safety of the various sites be objectively assessed, in order to allow for taking the appropriate measures at those sites that may be dangerous to users. All initiatives to improve road safety should be defined on the basis of in-depth knowledge of the current situation.

As regards road safety, subjectivity may originate with user insecurity. A specific location felt to be dangerous may in fact, and objectively, be quite safe. For example, it could be a site that users feel is dangerous, but where there are few accidents, seeing as users are more careful and drive more slowly, because of the specifications of the site in question. However, an increased feeling of safety can also lead to a greater number of accidents, as drivers become less vigilant, while increasing their speed. Physical injuries are more severe, the greater the speed driven.

Objectivity, as opposed to subjectivity, requires knowledge of the entire road system. A site can objectively be considered dangerous - or not - by assessing its specific conditions and comparing them to those of other sites with similar characteristics. An analysis of the accidents at a specific site is thus a revealing and overriding indication of the degree to which a site is safe.

2.1 Concept of a network

Traffic flow on a roadway can be compared to a system with several elements that are in constant interaction. In the case of traffic flow, these elements are usually relegated to three basic factors: humans, vehicles and the environment[6]. This concept emphasizes the strong relationships between these three factors. Understanding road safety from the perspective of traffic flow is highly complex, and requires taking the human-vehicle-environment triumvirate of factors into consideration. Accidents are then considered as resulting from the failure of one or more of these factors, or a breakdown in the interactions (information exchange) between them.

Accident analysis is complex, for it seeks not only to identify the cause of accidents, but also, to identify the causal relationship leading to the accident in question. In systematically analyzing accidents, all three factors must absolutely be taken into consideration.

The human factor can be divided into four sub-factors[7]: perception, intellection, emotion and reaction. These sub-factors allow the driver to utilize all of his senses to better understand his environment. In this regard, vision is critical to the driver gathering information (perception sub-factor). The second sub-factor, intellection, enables the

6 Centre d'études des transports urbains, Service d'études techniques des routes et autoroutes, *Sécurité des routes et des rues,* September 1992, p. 18.

7 Baass, K., Introduction à la circulation routière-T-1, February 1995, p. 2-22.

driver to process and understand the information perceived. Thirdly, emotion is the sub-factor that influences or affects the message or information processed (e.g., panicking in an emergency). Lastly, the reaction sub-factor allows a driver to react, subsequent to his analysis of the situation and environment. As a group, these sub-factors are known as PIEV (Perception, Intellection, Emotion, Volition).

The vehicular factor comprises the mechanical and physical elements of a specific scenario. For example, a vehicle with bald tires will have less of a grip on the *roadway.*

Environmental factors, generally speaking, are all of the conditions under which driving is performed. For example, these can include weather conditions, the condition of the traffic lane or *road sides*, the type of crossroads, the other vehicles on the roadway, etc.

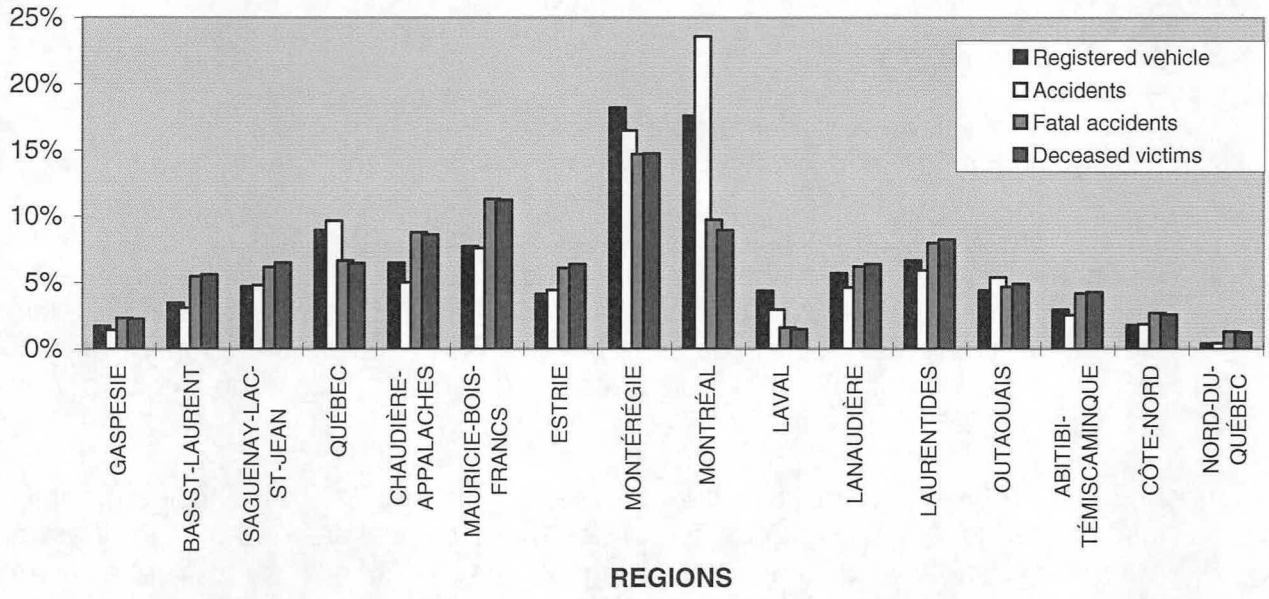
In line with its mission, the Ministère des Transports pays particular attention to the elements that may cause accidents and that are directly related to the roadway environment, and this without neglecting the other two factors.

3.0 REGION'S SITUATION, COMPARED TO THAT OF THE PROVINCE OF QUÉBEC

Between 1995 and 1999, accident reports were drawn up for over 797,807 accidents on the Québec territory[8]. 3,235 of them were written up in Nord-du-Québec. Note, however, that accidents with physical damages of less than $500, prior to July 1, 1999, and less than $1,000 thereafter, were not included in these statistics, and were only added thereafter. In this part of the study, all 3,759 accidents recorded in Nord-du-Québec are thus considered, whether these occurred on the MTQ road network (superior network and resource access roads), on other networks (roadways with no status, forest and mining roads, municipal roadways) or off networks. All of these accidents were logged in a police report and entered in the SAAQ database.

According to SAAQ data, Nord-du-Québec is the administrative region where the least accidents occurred (Figure 1)[9].

FIGURE 1
PERCENTAGE OF REGISTERED VEHICLES, ACCIDENTS, FATAL ACCIDENTS AND VICTIMS PER REGION



8 Société de l'assurance automobile du Québec, *Bilan 1999, Accidents, parc automobile, permis de conduire, 2000*, p. 37.

9 Société de l'assurance automobile du Québec, *Bilan 1999, Accidents, parc automobile, permis de conduire, 2000.*

We can consider the frequency of accidents in Nord-du-Québec and in the province of Québec as a whole, as a percentage of the total population. The number of accidents per 100 inhabitants per year in Nord-du-Québec is 1.70, whereas in the province of Québec, this average is 2.14. The number of accidents as a percentage of the population in Nord-du-Québec is henceforth lower than the average for all of Québec. Table 1 presents the data used in this analysis.

TABLE 1
ACCIDENTS AND POPULATION, BETWEEN 1995 AND 1999, NORD-DU-QUÉBEC AND QUÉBEC

Territory	Average number of accidents/yr	Average population	Accidents/100 inhabitants/yr
NORD-DU-QUÉBEC	647	38,133	1.70
PROVINCE	159,561	7,451,965	2.14

Source: Société de l'assurance automobile du Québec, Bilan 1999, Accidents, parc automobile, permis de conduire, 2000. p. 198-199.
Note: Accidents with bodily damages of less than $500 (prior to July 1st, 1999) or $1,000 (after July 1st, 1999) are not included.

This ratio must be used prudently, as it can include drivers from other regions, who have an accident while travelling in Nord-du-Québec.

3.1 Victims

A victim is a person who is injured or who dies as a result of a road accident. A serious accident is defined as one where at least one person is transported to a hospital.

There were 3,444 fatal accidents in Québec between 1995 and 1999. These accidents resulted in a total of 3,914 deaths. In Nord-du-Québec, for the same time period, there were 30 fatal accidents, accounting for a total of 35 deaths. These data exclude the eight fatal accidents which occurred off networks. Fatal accidents in Nord-du-Québec represent 0.87% of all fatal accidents in Québec[10], while the region's population accounts for 0.5% of the province's total population.

In Nord-du-Québec, the number of deaths following a road accident, per 10,000 inhabitants, is 1.8. This figure is 1.1 for the province as a whole. Furthermore, the number of *serious injuries* per 10,000 inhabitants is 11.6 in Nord-du-Québec, whereas in the province of Québec, it is 7.5. We therefore conclude that accidents in the region are more serious than they are in the province as a whole. The elements analyzed are presented in Table 2.

10 Société de l'assurance automobile du Québec, *Bilan 1999, Accidents, parc automobile, permis de conduire, 2000,* p. 36-56.

TABLE 2
ROAD ACCIDENT VICTIMS BETWEEN 1995 AND 1999, IN NORD-DU-QUÉBEC

Victims	NORD-DU-QUÉBEC	Victims/10,000 inhabitants	Province	Victims/10,000 inhabitants
Deaths	35	1.8	3,914	1.1
Severe injuries	221	11.6	27,957	7.5
Slight injuries	683	35.8	208,733	56.0
Total injuries	904	47.4	236,690	63.5
Total victims	939	49.2	240,604	64.6

Source: Société de l'assurance automobile du Québec, Bilan 1999, Accidents, parc automobile, permis de conduire, 2000 p. 56 - 57. "This data does not include accidents outside of the network, SAAQ, 1999."

We note that the number of slight injuries per 10,000 inhabitants in Nord-du-Québec is lower than it is for the province as a whole. The number of serious injuries and deaths per 10,000 inhabitants is, however, clearly higher than the figure for all of Québec. It should be noted that this last observation also applies to similar regions, such as Abitibi-Témiscamingue, the Côte-Nord and Gaspésie[11].

3.2 Ministère network, compared to the other networks

The Ministère network includes all of the roadways managed by the MTQ. The *other networks* are those roads, as well as streets, alleys, parking lots, forest roads, private roadways, etc., that are managed by other parties.

Between 1995 and 1999, there were 3,759 accidents in Nord-du-Québec. 27.1% of these occurred on roadways managed by the Ministère des Transports, whereas 72.9% occurred on *other networks or off networks*[12].

Over the same period, there were 38 fatal accidents in Nord-du-Québec, 9% of them on the Ministère network (23.7%) and 29% of them on other networks or off networks (76.3%). This can be explained by the fact that the MTQ network (1,247 kilometres) is not as large as all other networks combined (over 10,000 kilometres).

Results are presented in Table 3.

11 Société de l'assurance automobile du Québec, *Bilan 1999, Accidents, parc automobile, permis de conduire, 2000.*

12 See Appendix 7, *Analysis of road accidents in Nord-du-Québec* (network of non-status, municipal, forest and mining roads), an analysis supporting this study.

TABLE 3
SEVERITY OF ACCIDENTS PER JURISDICTION, BETWEEN 1995 AND 1999, IN NORD-DU-QUÉBEC

Network	Fatal	%	Serious	%	Slight	%	DMS	%	Total	%
Other networks or off networks	29	76.3	130	75.1	299	64.7	2,282	73.9	2,740	72.9
MTQ	9	23.7	43	24.9	163	35.3	804	26.1	1,019	27.1
Total	38	100	173	100	462	100	3,086	100	3,759	100

Source: Internal statistics.

Notably, the number of serious and fatal accidents per 100 accidents is similar for both networks (Table 4), which can be partially explained by the fact that both are comprised of high-speed roads in remote environments.

TABLE 4
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, PER JURISDICTION, BETWEEN 1995 AND 1999, IN NORD-DU-QUÉBEC

Network	Serious and fatal	Total	AMG/100 acc.
Other networks or off networks	159	2,740	5.8
MTQ	52	1,019	5.1
Total	211	3,759	5.6

Source: Internal statistics.

4.0 MINISTÈRE DES TRANSPORTS NETWORK

4.1 Accidents on the Ministère des Transports' network in Nord-du-Québec

This section of the study only considers the 1,019 accidents reported on the 1,247 kilometres of roadway in the MTQ network in Nord-du-Québec. This network includes the superior network (national, regional and collector roads) as well as resource access roads (map 2). The analyses conducted for accidents reported on other roadways (roads with no status, forest and mining roads, municipal roads) are presented in the document in Appendix 7.

The 1,019 accidents on this network between 1995 and 1999 occurred over some 366 kilometres of roadway, namely 27% of the network. By dividing the network into 1-kilometre long sections, we note that no accidents occurred on 73% of the network during this same five-year period. In fact, 45% (460/1,019) of the accidents were concentrated on 11 kilometres of the network. Accidents can thus be said to be very concentrated. Accident sites and circumstances will be further addressed in the next chapters. This data is presented in Table 5.

Table 5
DISTRIBUTION OF ACCIDENTS PER KILOMETRE OF ROADWAY, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Number of accidents per kilometre	Number of 1-km segments	%	Total accidents	%
0	911	73.1	0	0.0
1	200	16.0	200	19.6
2	70	5.6	140	13.7
3	30	2.4	90	8.8
4	12	1.0	48	4.7
5	5	0.4	25	2.5
6	3	0.2	18	1.8
7	2	0.2	14	1.4
8	3	0.2	24	2.4
10	2	0.2	20	2.0
>10	9	0.7	440	43.2
Total	1,247	100	1,019	100

In the region, the 1,019 accidents are distributed by type of road (without considering severity) as follows: 83.0% on national roads, 0.1% on regional roads, 10.1% on collector roads, and 6.8% on resource access roads. This distribution is given in Table 6.

Nunavik

Baie-James

NORD-DU-QUÉBEC

55°N

Petite rivière de la Baleine

Grande rivière de la Baleine

Lac Bienville

Réservoirs Laforge

Kuujjuarapik
Whapmagoostui

Chisasibi

La Grande Rivière

Radisson

Réservoir LG-2

Réservoir LG-3

Réservoir LG-4

La Grande Rivière

Wemindji

Lac Sakami

Rivière Sakami

Route Transtaïga

Route de la Baie-James

Baie James

Eastmain

Rivière Eastmain

Réservoir Opinaca

Eastmain Rivière

Nemaska

Waskaganish

Rivière Rupert

Rivière Broadback

Route du Nord

Lac Mistassini

Rivière Nottaway

Ontario

Québec

CÔTE-NORD

SAGUENAY-LAC-SAINT-JEAN

Mistissini

Matagami

Oujé-Bougoumou

Waswanipi

Chapais

Chibougamau

167

109

113

Val-Paradis
Villebois

Beaucanton

Lebel-sur-Quévillon

MAURICIE

ABITIBI-TÉMISCAMINGUE

0 50 100
kilometers

Détroit d'Hudson

Salluit

Kangiqsujuaq

Quaqtaq

0 50 100
kilometers

Transports Québec

Coordination du Nord-du-Québec

Map 2: Nord-du-Québec Road Network

Transportation Plan of Nord-du-Québec

Road Safety Report of the MTQ Roads in Nord-du-Québec

Source:
- Ministère des Transports du Québec

Basic map:
- Ministère des Ressources naturelles, digital maps, scale 1 : 250,000 and 1 : 8,000,000

September 2005

Road Network

Financial Responsability: Transports Québec

- Superior network and resources access road paved/gravel
- Non-status gravel road *

* Financial responsability for maintenance only

Financial Responsability: Other

- Non-status road paved/gravel
- Other gravel road
- Local road

Administrative limit

- South limit Nord-du-Québec region
- Other Québec regions

Others

- Railway
- City, village or town

TABLE 6
DISTRIBUTION OF ACCIDENTS PER CLASS OF ROAD, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Class	Number of kilometres	%	Number of accidents	%
National road	416.7	33.4	846	83.0
Regional road	7.9	0.6	1	0.1
Collector road	110.4	8.9	103	10.1
Resource access road	711.6	57.1	69	6.8
Total	1,246.6	100	1,019	100

Source: Internal statistics.
Note: The lengths given exclude ramps, wayside parks, inspection areas, rest areas and parking areas for heavy vehicles.

We note that the percentage of accidents per type of roadway does not correspond with that for the number of kilometres per type of roadway. Other characteristics also affect the number of accidents, among these the environment (rural, urban, forest) and the density of traffic. This statement will be validated in the following chapters.

4.1.1 Accidents according to municipality

In Nord-du-Québec, the Ministère network goes through numerous municipalities, including Baie-James, Chapais, Chibougamau, Lebel-sur-Quévillon and Matagami. The Municipalité de Baie-James is not an agglomeration, as it extends over a total area of 350,000 km². It includes a number of locations, among them Radisson, Villebois and Valcanton (amalgamation of Val-Paradis and Beaucanton), as well as the hamlets of Miquelon, Desmaraisville and Rapide-des-Cèdres. It is worth noting that police officers, when filling out accident reports, are responsible for indicating the name of the municipality. The absence of markings or landmarks makes it difficult for police officers to accurately pinpoint the sites of certain accidents. This can lead to errors, even in designating the municipality concerned.

Table 7 illustrates the number and severity of accidents in these municipalities. We note that nearly 82% of all accidents occur in the city of Chibougamau or the Municipalité de Baie-James.

TABLE 7
SEVERITY OF ACCIDENTS PER MUNICIPALITY, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Municipality	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%
Chibougamau	1	11.1	18	41.9	49	30.1	396	49.3	464	45.5
Baie-James	6	66.7	21	48.8	90	55.2	254	31.6	371	36.4
Chapais	1	11.1	2	4.7	13	8.0	79	9.8	95	9.3
Matagami	0	0.0	0	0.0	3	1.8	45	5.6	48	4.7
Lebel-sur-Quévillon	1	11.1	2	4.7	8	4.9	30	3.7	41	4.0
Total	9	100	43	100	163	100	804	100	1 019	100

Source: Internal statistics.
Note: The municipalities framed in grey account for 81.9% of accidents in the region.

The city of Chibougamau is an urban environment, whereas the Municipalité de Baie-James features a lengthy rural network of roadways, totalling 1,132.7 kilometres (90.8% of the network). Together, these two characteristics explain, at least in part, the numerous accidents in these two municipalities.

TABLE 8
LENGTH OF THE NETWORK PER MUNICIPALITY, MTQ NETWORK IN NORD-DU-QUÉBEC

Municipality	Kilometres of roadway, MTQ	%
Baie-James	1,132.7	90.8
Chapais	14.1	1.1
Chibougamau	66.4	5.3
Lebel-sur-Quévillon	12.4	1.0
Matagami	21.4	1.7
Total	1,247	100

Note: The lengths given exclude ramps, wayside parks, inspection areas, rest areas and parking areas for heavy vehicles.

4.1.2 Accidents according to specific Road number

Nearly 80% of all accidents occurred on two roadways, i.e., Road 167 and Road 113. Yet, these two roadways only represent 38% of the total length of the network. These are, however, the two roadways with the most traffic, and as such, they are the most important arteries in Nord-du-Québec.

TABLE 9
ACCIDENTS PER KILOMETRE, PER ROAD NUMBER, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Road	Number of kilometres	%	Total accidents	%	Acc./km/yr
167	225.2	18.1	486	47.7	0.43
113	252.0	20.2	311	30.5	0.25
Other	769.8	61.7	222	21.8	0.06
Total	1,247.0	100	1,019	100	0.16

Source: Internal statistics.

Of these two roadways, Road 113 has a greater number of serious or fatal accidents, per 100 accidents, than does the region (7.7, compared to 5.1). This observation indicates a major issue that could be the topic of more in-depth studies.

On the roadways where few accidents occurred, the number of serious and fatal accidents, per 100 accidents, may seem alarming. For example, six accidents, one of which was severe, occurred on Road Joutel-Poirier (20,280). This gives a ratio of severe and fatal accidents of 16.7. Statistically, however, the sampling is too small to be significant. Care must be exercised in using this ratio, and if necessary, a more specific analysis of various roads should be conducted. Table 10 provides an overview of the accidents on all of the roadways.

TABLE 10
SEVERITY OF ACCIDENTS PER ROAD NUMBER, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Road	Length	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	AMG/ 100 acc.
167	225.2	1	11.1	16	37.2	59	36.2	410	51.0	486	47.7	3.5
113	252.0	5	55.6	19	44.2	60	36.8	227	28.2	311	30.5	7.7
109	119.9	1	11.1	3	7.0	23	14.1	108	13.4	135	13.2	3.0
Mine Selbaie	110.6	1	11.1	1	2.3	4	2.5	24	3.0	30	2.9	6.7
Road du Nord	258.6	0	0.0	2	4.7	9	5.5	12	1.5	23	2.3	8.7
Authier-Nord-Joutel	70.9	0	0.0	1	2.3	3	1.8	8	1.0	12	1.2	8.3
393	23.0	1	11.1	0	0.0	2	1.2	7	0.9	10	1.0	10.0
Joutel-Poirier	24.0	0	0.0	1	2.3	1	0.6	4	0.5	6	0.6	16.7
Matagami airport road	10.2	0	0.0	0	0.0	0	0.0	2	0.2	2	0.2	0.0
Joutel-Selbaie	60.0	0	0.0	0	0.0	0	0.0	1	0.1	1	0.1	0.0
Mine Selbaie	20.3	0	0.0	0	0.0	1	0.6	1	0.1	2	0.2	0.0
De Mistissini	3.9	0	0.0	0	0.0	1	0.6	0	0.0	1	0.1	0.0
111	4.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Agnico-Eagle	5.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Junction, Roads 111-393	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Chibougamau airport road	2.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Forest road L-209N (Oujé-Bougoumou)	23.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Camchib mine road	1.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Chemin Joe Mann	18.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Chemin Campbell	11.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Total	1,247	9	100	43	100	163	100	804	100	1,019	100	5.1

Source: Internal data.
Note: The roads framed in grey account for 78% of accidents in the region.

Table 11 indicates the characteristics of roads in the Ministère des Transports network.

The table provides a more specific picture of the types of roads in Nord-du-Québec. A comparison of Tables 10 and 11 illustrates that the two roads where there are the most accidents, i.e., Road 167 and Road 113, are also among the longest in the region. They are also roads with a higher-than-average density of accidents.

TABLE 11
ROAD NUMBER, NETWORK LENGTH AND SPEED, ENVIRONMENT AND ROADWAY SURFACE CHARACTERISTICS, AS A PERCENTAGE OF NETWORK LENGTH, MTQ NETWORK IN NORD-DU-QUÉBEC

Road	Length	Density of accidents	Posted speed limit <= 50 km/h	Posted speed limit 70 km/h	Posted speed limit >= 80 km/h	Rural environment	Urban environment/ urban fringe	Gravel surface	Bituminous concrete surface
	km	Acc/km/yr	% km	% km	% km	% km	% km	% km	% km
113	252.0	0.25	1.3	0.2	98.4	98.4	1.6	-	100.0
167	225.2	0.43	1.8	77.6	20.6	98.2	1.8	77.6	22.4
109	119.9	0.23	0.3	-	99.7	99.7	0.3	-	100.0
111	4.7	0.00	-	-	100.0	100.0	-	-	100.0
393	23.0	0.09	4.0	-	96.0	96.0	4.0	0.0	100.0
Joutel-Poirier	24.0	0.05	-	16.4	83.6	100.0	-	16.4	83.6
Joutel-Selbaie	60.0	0.00	-	-	100.0	100.0	-	-	100.0
Agnico-Eagle	5.4	0.00	-	100.0	-	100.0	-	-	100.0
Matagami airport road	10.2	0.04	-	-	100.0	100.0	-	-	100.0
Mine Selbaie	110.6	0.05	0.5	70.8	28.7	99.5	0.5	70.8	29.2
Mine Selbaie	20.3	0.02	-	100.0	-	100.0	-	100.0	-
Authier-Nord-Joutel	70.9	0.03	-	100.0	-	100.0	-	100.0	-
Junction, Roads 111-393	0.3	0.00	-	100.0	-	100.0	-	-	100.0
Chibougamau airport road	2.8	0.00	-	-	100.0	100.0	-	-	100.0
Forest road L-209N (Oujé-Bougoumou)	23.5	0.00	-	100.0	-	100.0	-	100.0	-
Camchib mine road	1.4	0.00	-	100.0	-	100.0	-	100.0	-
Chemin Joe Mann	18.8	0.00	-	100.0	-	100.0	-	100.0	-
Chemin Campbell	11.4	0.00	-	100.0	-	100.0	-	100.0	-
De Mistissini	3.9	0.05	-	100.0	-	100.0	-	100.0	-
Road du Nord	258.6	0.02	-	100.0	-	100.0	-	100.0	-
Total	1,247	0.16	0.7	53.9	45.3	99.2	0.8	53.4	46.6

4.1.3 Accidents according to class of road

The Ministère des Transports classifies its roadways into five categories: highways, national, regional, collector and resource access roads. There are no highways in the region (map 1). Each category has a corresponding level of maintenance and development. The quality of the service for the roadway, and its geometry at the time of its construction, are linked to the category.

Ranking of road networks is very important, as it allows for targeting the clientele served and hence meeting its needs. The purpose of each of the categories can be summarized as follows: the higher the category, the more users travel on the road, in transit, and the fewer local users there are. The user travelling on the road, in transit, is covering longer distances. One of his objectives is to shorten his travelling time, whereas this is not as important a factor for local users. On the basis of their definition, national roads should have the following characteristics: transit flow of traffic, lanes that are 3.70 metres wide, *wide shoulders*, standard curves, quality *road sides* and few or no points of entry. When these rules are not followed, there is an increased risk of accidents, for example, when a superior network road cuts through an agglomeration.

Those responsible for management of the road network must pay specific attention to roads in the top categories, as regards road safety and quality, ensuring that they remain focused on their initial purpose.

In Nord-du-Québec, the density of accidents is 0.16 per kilometre of roadway per year, which is very low (for example, in the Laurentians region, the density is 2.8 acc./km/yr). While density on the national roads is 0.41 acc./km/yr., this figure is still lower than that for the Laurentians.

Table 12 indicates that the density of accidents is in line with ranking of the road network, except in the case of regional roads, where the length of the network is too short to be representative. 83.0% of accidents occur on the national network, despite the fact that the latter only represents 33.4% of the total length. The volume of *traffic flow* on these networks is responsible for this being so. Resource access roads, on the other hand, account for only 6.8% of accidents, despite representing 57.1% of the network.

TABLE 12
ACCIDENTS PER KILOMETRE, PER CLASS OF ROAD, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Class	Kilometre	%	Total accidents	%	Acc./km/yr
National road	416.7	33.4	846	83.0	0.41
Regional road	7.9	0.6	1	0.1	0.03
Collector road	110.4	8.9	103	10.1	0.19
Resource access road	711.6	57.1	69	6.8	0.02
Total	1,246.6	100	1,019	100	0.16

Source: Internal statistics.
Note: The lengths given exclude ramps, wayside parks, inspection areas, rest areas and parking areas for heavy vehicles.

The distribution of fatal accidents per type of roadway is as follows: 66.7% on national roads, none on regional roads, 22.2% on collector roads and 11.1% on resource access roads.

A very high percentage of accidents involving *serious injuries* or slight injuries occurred on national roads. Conversely, resource access roads count few accidents with victims, despite representing 57.1% of the length of the network. Results are affected by *traffic flow* and road characteristics. Table 13 gives the distribution of accidents and their severity according to the type or category of roadway.

TABLE 13
SEVERITY OF ACCIDENTS PER CLASS OF ROAD, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Road	% length	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%
National road	33.4	6	66.7	34	79.1	123	75.5	683	85.0	846	83.0
Regional road	0.6	0	0.0	0	0.0	0	0.0	1	0.1	1	0.1
Collector road	8.9	2	22.2	4	9.3	23	14.1	74	9.2	103	10.1
Resource access road	57.1	1	11.1	5	11.6	17	10.4	46	5.7	69	6.8
Total	100	9	100	43	100	163	100	804	100	1,019	100

Source: Internal statistics.

In Table 14, we observe that the number of serious and fatal accidents, per 100 accidents on the region's national and collector roads, are comparable to figures for the province as a whole. Data on collector roads cannot be compared. If we consider the total number of serious and fatal accidents per 100 accidents, we observe that it is higher than similar figures for the province. This is due to the severity of the accidents on resource access roads. The regional road category is not significant.

Note that the concept of serious and fatal accidents (AMG) per 100 accidents recurs throughout the study. It is used to compare regional data to figures for the province as a whole.

TABLE 14
NUMBER OF SERIOUS AND FATAL ACCIDENTS PER 100 ACCIDENTS, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Type	Fatal and serious	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
National road	40	846	4.7	4.6
Regional road	0	1	0.0	4.6
Collector road	6	103	5.8	5.3
Resource access road	6	69	8.7	N/A[13]
Total	52	1,019	5.1	4.7

Source: Internal statistics.

4.1.4 Accidents according to type

Data on accident type is culled from the initial description of the event, as recorded by the police officer. These data indicate whether the accident involved two motor vehicles, or a motor vehicle and a pedestrian, a non-motorized vehicle (bicycle or other), an animal, or a fixed object (tree, lamppost, rail, pillar). It will also indicate accidents where no collision is involved (overturning, leaving the *road surface*, fire). The type of accident involves several elements of road safety, including *conflict* between vehicles, pedestrians and *road sides*. Tables 15 and 16 include an overview of the elements addressed in this section.

The number of accidents will usually increase whenever there are more instances of *conflict* between vehicles. The number of *conflicts* between motor vehicles explains the large percentage of accidents involving road vehicles. These accidents generally reflect the number of potential conflicts. For example, a right-angle intersection is the site of 32 potential *conflicts*, and a "T"-shaped intersection, 9 *conflicts*. A more detailed explanation of these elements is provided in point 4.1.10.

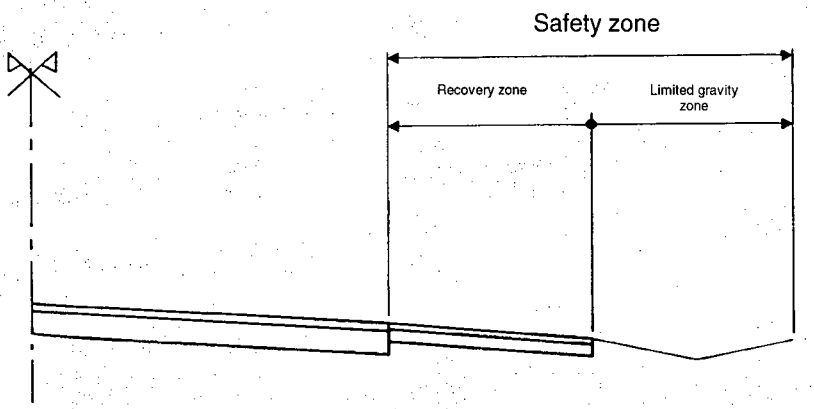
Accidents at road sides

Table 15 illustrates that the percentage of "single vehicle" accidents in Nord-du-Québec is significantly higher than it is on all of the province's roads. This could be explained by the density of the population, which is 0.04 inhabitants/km^2 in Nord-du-Québec, while it is 8.9 inhabitants/km^2 elsewhere in the province (Ministère du Développement économique et régional et de la recherche). This density has an impact on the probability of meeting another vehicle on a given Road, and in Nord-du-Québec, serves to lower the risk of collision with another vehicle. There are thus fewer conflicts between vehicles in the region than there are elsewhere in the province. The processing of the data related to roadway approaches is critical in such circumstances.

13 There are no provincial figures for resource access roads.

Accidents involving *road sides* are the second most important category of accidents, after those involving road vehicles. This type of accident includes instances where vehicles collide with fixed objects, single-vehicle accidents (overturning, leaving the *road surface*), and all other accidents occurring outside of traffic lanes. The *road sides* are divided into two zones: the recovery zone (*shoulder*) and the limited gravity zone (embankment, ditch). Figure 2 depicts the location of these two zones.

FIGURE 2
SAFETY ZONE



Source: Centre d'études des transports urbains (CETUR), Sécurité des Routes et des rues, en collaboration, September 1992, p. 262.

Drivers use the recovery zone in emergency situations, to avoid a collision or to right their vehicle in a skid. They can also use it to park their vehicle, to the side of the traffic lane, in the case of a breakdown. A U.S. study (Zeeger, 1987)[14] clearly shows that the number of accidents is inversely proportional to the width of the road *shoulders*. Accidents involving *road sides* could be reduced by 50% by increasing the asphalt *shoulder* to a width of 3 metres. This observation only holds true for roads in *rural environments*. In urban environments, the number of accidents tends to increase when the *shoulders* are widened, since it incites drivers to speed up, which is detrimental in such environments.

The limited gravity zone is the area that makes it possible to limit the severity of an accident when a vehicle leaves the roadway. In this zone, the embankment has a gradual slope, and all fixed objects are removed or weakened.

14 Zeeger, CV and Deacon (1987), Effect of lane, shoulder width, and shoulder type on highway safety, in State of Art Report. Transportation Research Board, Washington, DC.

Table 15 indicates that accidents involving *road sides* account for 39.0% of all accidents in Nord-du-Québec. This is greater than the figure for the province (29.5%).

Accidents involving pedestrians

There are proportionately a greater number of accidents involving pedestrians in Nord-du-Québec (1.2%) than there are in the rest of the province (0.7%) (Table 15). However, the number of serious and fatal accidents, per 100 accidents, involving pedestrians (Table 16), is lower in Nord-du-Québec than in Québec as a whole (25 vs. 35.1). More in-depth analyses would be required to fully explain this observation. The severity of accidents involving pedestrians is very high, given that the latter are extremely vulnerable when hit by a vehicle. Management of pedestrian traffic is a major issue for the Ministère des Transports, one that merits particular attention.

TABLE 15
SEVERITY OF ACCIDENTS ACCORDING TO TYPE OF ACCIDENT, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

	Type	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Collision with	Animal	0	0.0	0	0.0	3	1.8	31	3.9	34	3.3	7.9
	Non-motorized	0	0.0	1	2.3	4	2.5	5	0.6	10	1.0	0.9
	Not specified	0	0.0	2	4.7	4	2.5	22	2.7	28	2.7	3.8
	Pedestrian	1	11.1	2	4.7	9	5.5	0	0.0	12	1.2	0.7
	Road vehicle	3	33.3	10	23.3	44	27.0	481	59.8	538	52.8	57.2
	Sub-total	**4**	**44.4**	**15**	**34.9**	**64**	**39.3**	**539**	**67.0**	**622**	**61.0**	**70.5**
Road sides	Single-vehicle	5	55.6	24	55.8	96	58.9	198	24.6	323	31.7	14.8
	Fixed object	0	0.0	4	9.3	3	1.8	67	8.3	74	7.3	14.7
	Sub-total	**5**	**55.6**	**28**	**65.1**	**99**	**60.7**	**265**	**33.0**	**397**	**39.0**	**29.5**
	Total	**9**	**100**	**43**	**100**	**163**	**100**	**804**	**100**	**1,019**	**100**	**100**

Source: Internal statistics.

Single-vehicle accidents

We note that single-vehicle accidents are more serious in the region than they are elsewhere in the province. These accidents are usually the result of vehicles leaving the roadway. As will be shown later in the study, the severity of this type of accident can in part be explained by the type of vehicle (see section 4.1.13).

Serious and fatal accidents

As regards serious and fatal accidents according to type of accident, we note that in Nord-du-Québec, the accidents are proportionally more severe than in the rest of the province (5.1, compared to 4.2). Later in this report, we will explain how this observation is related to the type of accident and the type of vehicle involved.

TABLE 16
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO TYPE, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

	Type	Fatal and serious	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
Collision with	Animal	0	34	0.0	0.5
	Non-motorized	1	10	10.0	12.1
	Not specified	2	28	7.1	2.8
	Pedestrian	3	12	25.0	35.1
	Road vehicle	13	538	2.4	3.8
	Sub-total	**19**	**622**	**3.05**	**3.8**
Road sides	Single-vehicle	29	323	9.0	6.5
	Fixed object	4	74	5.4	3.6
	Sub-total	**33**	**397**	**8.3**	**5.5**
	Total	**52**	**1,019**	**5.1**	**4.2**

Source: Internal statistics.

4.1.5 Accidents according to the number of vehicles involved

The number of serious and fatal accidents per 100 accidents is significantly higher than provincial averages whenever these involve either one or more than two vehicles. However, the opposite can be observed in the case of accidents involving two vehicles (Table 17).

The observation for single-vehicle accidents is consistent with the previous data regarding *road sides*. The observation as regards accidents involving two vehicles can in part be explained by establishing the following general relations: serious accidents occur mostly in those areas where users drive at high speeds. In Nord-du-Québec, high-speed zones are located in sparsely populated areas. Note that this is not necessarily true in the rest of province, where the density of vehicles may be significant in high-speed zones. It is therefore more likely that a greater number of serious accidents involving two vehicles will occur elsewhere in the province than in the region. We noted, however, that accidents involving three or more vehicles were more serious in Nord-du-Québec. A more in-depth study would be necessary to fully explain this observation.

TABLE 17
SEVERITY OF ACCIDENTS ACCORDING TO THE NUMBER OF VEHICLES INVOLVED, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Vehicles	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %	Prov. AMG 100/acc.	
												NdQ	Prov.
1	5	55.6	22	51.2	84	51.5	279	34.7	390	38.3	39.5	6.9	4.0
2	4	44.4	17	39.5	69	42.3	510	63.4	600	58.9	54.2	3.5	4.0
3 or more	0	0.0	4	9.3	10	6.1	15	1.9	29	2.8	6.4	13.8	6.8
Total	9	100	43	100	163	100	804	100	1,019	100	100	5.1	4.2

Source: Internal statistics.

4.1.6 Accidents according to surface condition

These data concern the surface condition (dry, snow-covered, etc.) of the *road surface* at the time of an accident. It reflects the efficiency of the grip of a vehicle's tires on the *road surface* section of a roadway. The weaker the grip, the harder it will be for the driver to control his vehicle. If a specific location is the site of an inordinately high number of accidents on wet *road surface,* this is probably an indication that the roadway surface is improperly drained, or that the road has major ruts. If there are an inordinately high number of accidents on *road surface* that is snow-covered or icy, this is likely an indication of inadequate maintenance, or a specific local problem (microclimate), or possibly even both.

This analysis shows that the percentage of accidents on snow-covered or icy *road surface* is 48.0% for Nord-du-Québec. This is significantly greater than the situation elsewhere in Québec, where the percentage is 22.7%. This is in part most likely due to the fact that the winter season is longer in this specific region than it is elsewhere in Québec. Moreover, and taking into account the fact that maintenance standards are identical for all regions of Québec, the de-icing process may explain the *road surface* in such a region being more often snow-covered or icy. In fact, the speed at which a road is cleared will depend on the ambient temperature and the surface temperature. The ambient temperature has an impact on products used for de-icing, as these are relatively inefficient at temperatures below 15° C and completely ineffective at temperatures below 25° C. The surface temperature depends on the degree of sunshine and the flow of vehicular traffic; the greater the number of vehicles travelling on a roadway, the hotter of the *road surface* will be. It is difficult to de-ice roads in a region such as Nord-du-Québec, given that there is very little traffic flow, that winter temperatures are very low, and that the degree of sunshine is weak. Table 18 illustrates these elements.

TABLE 18
SEVERITY OF ACCIDENTS ACCORDING TO SURFACE CONDITION, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Surface	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Dry	5	55.6	26	60.5	68	41.7	282	35.1	381	37.4	57.5
Wet	1	11.1	5	11.6	13	8.0	102	12.7	121	11.9	18.1
Snow-covered or icy	2	22.2	10	23.3	78	47.9	399	49.6	489	48.0	22.7
Other	1	11.1	2	4.7	4	2.5	21	2.6	28	2.7	1.7
Total	9	100	43	100	163	100	804	100	1,019	100	100

Source: Internal statistics.

Note that the category "Other" involves accidents that occurred on surfaces that were covered with mud or oil, or in a condition other than those described above.

Accidents on *road surface* that is snow-covered or icy are less serious than accidents on *road surface* that is dry. The percentage of serious or fatal accidents, per 100 accidents, is 8.1 for *road surface* that is dry, and 2.5 for *road surface* that is snow-covered or icy. While this same situation has been observed elsewhere in Québec, the variance is much greater in the region in question (Table 19). This phenomenon can be explained by the fact that single-vehicle accidents (the most serious accidents) are less serious in the wintertime, due to the presence of snow on *road sides*, which absorbs the impact of collisions.

TABLE 19
SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO SURFACE CONDITIONS, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Surface	Serious and fatal	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
Dry	31	381	8.1	4.6
Wet	6	121	5.0	3.8
Snow-covered or icy	12	489	2.5	3.3
Other	3	28	10.7	3.8
Total	52	1,019	5.1	4.2

Source: Internal statistics.
Note: The "Other" category refers to rare surface conditions, such as muddy, oily or various conditions that are not covered by the other categories.

4.1.7 Accidents according to lighting level

This data indicates the degree to which a site is illuminated at the time of an accident. Lighting level specifically comprises two time periods in a day, notably daytime and nighttime. Much of the data required by a driver to control the movement of his vehicle is visual. Vision is the human sense most often used in driving. The national elements that provide a driver with guidance or directives include *road markings*, vertical and horizontal traffic signs, curbs, median strips and islands, as well as the surrounding environment. Road users must be able to note these elements ahead of time, regardless of the lighting level. For example, an island is visible during the daytime, but in the nighttime, a road user will be more likely to see Road markers and *road markings*. There is thus a difference between daytime and nighttime visibility. There may be areas where the number of accidents occurring in the nighttime is inordinately high.

The daytime/nighttime accident ratio for Nord-du-Québec is around 66/34. This is comparable to the average ratio for the province, which is 68/32. The elements analyzed are presented in Table 20.

TABLE 20
SEVERITY OF ACCIDENTS, ACCORDING TO LIGHTING LEVEL, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Lighting level	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Daytime	6	66.7	27	62.8	102	62.6	540	67.2	675	66.2	68.4
Nighttime	3	33.3	16	37.2	61	37.4	264	32.8	344	33.8	31.6
Total	9	100	43	100	163	100	804	100	1,019	100	**100**

Source: Internal statistics.

Table 21, below, indicates that the number of serious or fatal accidents, per 100 accidents, is higher in the nighttime (5.5) than it is in the daytime (4.9), and that this figure is greater than the average for the province. The reasons why this is so are complex, and explaining them would require obtaining additional information by means of an in-depth study.

TABLE 21
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO LIGHTING LEVEL, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Lighting level	Fatal and serious	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
Daytime	33	675	4.9	3.9
Nighttime	19	344	5.5	4.8
Total	52	1,019	5.1	4.2

Source: Internal statistics.

4.1.8 Accidents according to the month of the year

This data indicates that the greatest number of accidents occurred in the month of January, and that this value is comparable to the average for the province. However, in the month of February, the accident rate for the region is higher than the provincial average. As elsewhere in the province, more accidents occur during the winter than in the summer. Table 22 presents the figures for each month.

TABLE 22
SEVERITY OF ACCIDENTS ACCORDING TO THE MONTH OF THE YEAR, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Month	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
January	1	11.1	3	7.0	15	9.2	104	12.9	123	12.1	11.1
February	0	0.0	2	4.7	11	6.7	81	10.1	94	9.2	7.9
March	0	0.0	3	7.0	5	3.1	74	9.2	82	8.0	8.3
April	1	11.1		0.0	13	8.0	54	6.7	68	6.7	5.9
May	0	0.0	3	7.0	2	1.2	45	5.6	50	4.9	7.1
June	0	0.0	8	18.6	19	11.7	57	7.1	84	8.2	8.1
July	0	0.0	4	9.3	11	6.7	64	8.0	79	7.8	8.1
August	1	11.1	9	20.9	9	5.5	48	6.0	67	6.6	8.2
September	3	33.3	1	2.3	15	9.2	47	5.8	66	6.5	7.4
October	2	22.2	6	14.0	22	13.5	62	7.7	92	9.0	8.6
November	1	11.1	2	4.7	19	11.7	89	11.1	111	10.9	9.3
December	0	0.0	2	4.7	22	13.5	79	9.8	103	10.1	9.8
Total	9	100	43	100	163	100	804	100	1,019	100	100

Source: Internal statistics.

Table 23 divides up the year in quarters, grouping together those months with the most similar climates. It shows that 31.4% of accidents occur in the first quarter, which is notably the quarter that includes the majority of the winter season. The second and third quarters each account for around 20% of accidents. These quarters are mostly comprised of the spring and summer months. The fourth quarter, which coincides with the fall season, accounts for 26% of all accidents.

The greatest number of accidents with *serious injuries* in the region is during the third quarter. This quarter includes the summer season, a period during which drivers are prone to speeding. The fourth quarter, however, is the one with the greatest number of fatal accidents. A more detailed analysis would be necessary in order to identify the reasons of this finding.

TABLE 23
SEVERITY OF ACCIDENTS PER QUARTER, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Month	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Dec./Jan./ Feb.	1	11.1	7	16.3	48	29.4	264	32.8	320	31.4	27.3
March/April/ May	1	11.1	6	14.0	20	12.3	173	21.5	200	19.6	21.1
June/July/ August	1	11.1	21	48.8	39	23.9	169	21.0	230	22.6	23.7
Sept./Oct./ Nov.	6	66.7	9	20.9	56	34.4	198	24.6	269	26.4	27.8
Total	9	100	43	100	163	100	804	100	1,019	100	**100**

Source: Internal statistics.

While more accidents occur during the winter season, these accidents are less serious than those occurring at other times of the year. In fact, the number of serious or fatal accidents, per 100 accidents, is 9.6 for the period including June, July and August, while it is only 2.5 for the period including December, January and February. In Nord-du-Québec, the number of serious and fatal accidents per 100 accidents during the third and fourth quarters is greater than the average for the province. Table 24 presents the elements analyzed in this regard.

TABLE 24
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, PER QUARTER, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Month	Fatal and serious	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
Dec./Jan/Feb.	8	320	2.5	**3.1**
March/April/May	7	200	3.5	**4.8**
June/July/August	22	230	9.6	**5.2**
Sept./Oct./Nov.	15	269	5.6	**3.8**
Total	52	1,019	5.1	**4.2**

Source: Internal statistics.

4.1.9 Accidents according to the day of the week

This analysis indicates that Friday is the day of the week on which there are the most accidents. This observation differs from provincial figures, which illustrate that the greatest number of accidents occurs on Thursdays. Table 25 indicates that there are fewer accidents on Sundays in Nord-du-Québec than there are in the rest of the province.

TABLE 25
SEVERITY OF ACCIDENTS ACCORDING TO THE DAY OF THE WEEK, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Day of the week	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Sunday	0	0.0	7	16.3	19	11.7	83	10.3	109	10.7	13.4
Monday	2	22.2	8	18.6	20	12.3	133	16.5	163	16.0	13.6
Tuesday	1	11.1	6	14.0	21	12.9	110	13.7	138	13.5	13.9
Wednesday	1	11.1	4	9.3	28	17.2	106	13.2	139	13.6	15.4
Thursday	1	11.1	5	11.6	29	17.8	136	16.9	171	16.8	18.2
Friday	3	33.3	6	14.0	24	14.7	140	17.4	173	17.0	13.9
Saturday	1	11.1	7	16.3	22	13.5	96	11.9	126	12.4	11.5
Total	9	100	43	100	163	100	804	100	1,019	100	**100**

Source: Internal statistics.

The ratio of weekday/weekend accidents is 60/40. As regards road safety, Friday is considered as a weekend day. Figures for the region are close to provincial data, but

there are a few more accidents during the week than on weekends. Results are indicated in Table 26.

TABLE 26
SEVERITY OF ACCIDENTS ON WEEKDAYS VS. WEEKEND DAYS, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Day of the week	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Weekday	5	55.6	23	53.5	98	60.1	485	60.3	611	60.0	56.4
Weekend day	4	44.4	20	46.5	65	39.9	319	39.7	408	40.0	43.6
Total	9	100	43	100	163	100	804	100	1,019	100	100

Source: Internal statistics.

The number of serious and fatal accidents is generally the same on weekdays and weekend days (28 and 24, respectively). Nevertheless, the number of serious and fatal injuries **per 100 accidents** is higher on weekends. This result is similar to that observed on a province-wide basis. Results are presented in Table 27.

TABLE 27
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO THE PERIOD OF THE WEEK, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Day of the week	Fatal and serious	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
Weekday	28	611	4.6	3.7
Weekend day	24	408	5.9	4.8
Total	52	1,019	5.1	4.2

Source: Internal statistics.

4.1.10 Accidents at intersections and outside of intersections

According to the current databases, there are 102 intersections crossing roadways managed by the Ministère in Nord-du-Québec. At least one accident has occurred at 52 of these intersections. For the purposes of this study, we consider accidents at intersections to be those having occurred in a radius of 30 metres from an intersection. The term *outside of intersections* refers to currently used roadways that are beyond the aforementioned radius of 30 metres. Based on these definitions, our study indicates 297 accidents at intersections and 722 accidents outside of intersections. Results are presented in Table 28.

TABLE 28
SEVERITY OF ACCIDENTS AT AND OUTSIDE OF INTERSECTIONS, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Site	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%
Intersection	1	11.1	5	11.6	25	15.3	266	33.1	297	29.1
Outside of intersections	8	88.9	38	88.4	138	84.7	538	66.9	722	70.9
Total	9	100	43	100	163	100	804	100	1,019	100

Source: Internal statistics.

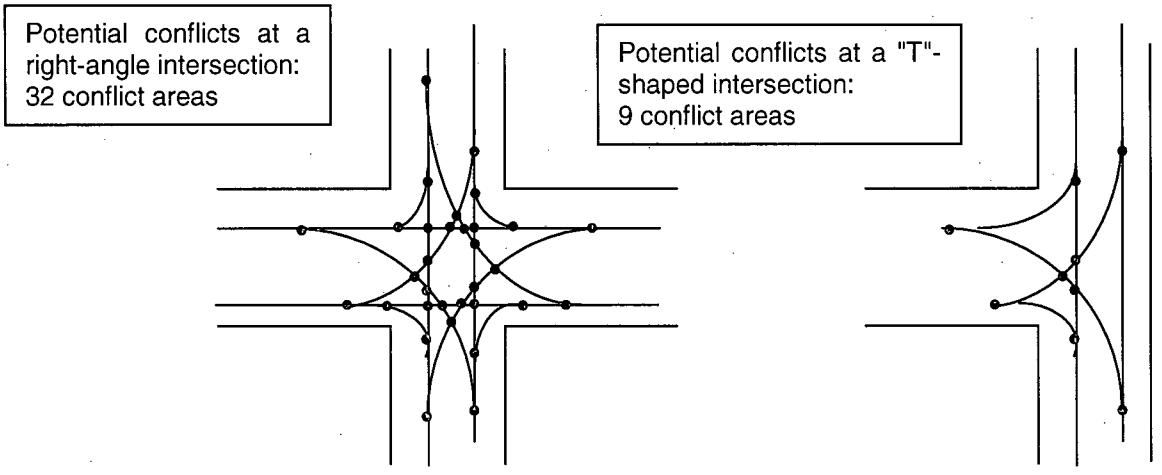
Accidents outside of intersections are much more frightening than those at intersections. In fact, the ratio of serious and fatal accidents per 100 accidents outside of intersections is 6.4, while at intersections, it is 2.0. Moreover, 89% of all fatal accidents occur outside of intersections (Table 29). This observation is further explained in point 4.1.11, where accidents are analyzed according to type of impact.

TABLE 29
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO SITE, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Site	Fatal and serious	Total accidents	Ser.-fatal*/100 acc.
Intersection	6	297	2.0
Outside of intersections	46	722	6.4
Total	52	1,019	5.1

The high number of accidents at intersections, given the time that vehicles spend at such sites, is easily explained when one considers the number of potential *conflicts* at intersections. As explained above, the more *conflicts* there are, the greater the number of accidents. This rule also applies to analyses of accidents based on the geometry of intersections. Figure 3 illustrates the various potential *conflicts* at a right-angle intersection and at a "T"-shaped crossroads.

FIGURE 3
POTENTIAL CONFLICTS AT INTERSECTIONS



The greater the number of *conflicts* and greater the *traffic flow*, greater the risk that accidents will occur. This is particularly true for crossroads, where the majority of vehicles are concentrated in a small area. In contrast, there are fewer accidents on roadways, where the number of *conflicts* is fewer. For example, we note that on highways with very little conflict yet a heavy flow of traffic, the number of accidents is proportionally 1.6 times less than that on national roads.

Table 30 shows that there are more accidents at right-angle intersections than there are at "T"-shaped intersections. In fact, 59.3% of accidents occur at right-angle intersections, which only account for 27.5% of all intersections.

TABLE 30
SEVERITY OF ACCIDENTS ACCORDING TO ROAD GEOMETRY, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Geometry	Number of intersections	%	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%
Right-angle intersection	28	27.5	1	100	1	20.0	14	56.0	160	60.2	176	59.3
"T"-shaped intersection	44	43.1	0	0.0	1	20.0	6	24.0	51	19.2	58	19.6
"X"-shaped intersection	2	2	0	0.0	0	0.0	0	0.0	8	3.0	8	2.7
"Y"-shaped intersection	25	24.5	0	0.0	2	40.0	5	20.0	39	14.7	46	15.5
Other	3	2.9	0	0.0	1	20.0	0	0.0	8	3.0	9	3.0
Total	102	100	1	100	5	100	25	100	266	100	297	100

Source: Internal statistics.

Table 31 illustrates that the average number of accidents for right-angle intersections (11.0) is more than 4 times higher than that for "T"-shaped intersections (2.8). While the number of potential *conflicts* does not fully explain this variance, authors such as Hedman (1990)[15] have clearly shown that the number of accidents at right-angle intersections is 1.5 to 2.0 times greater than it is at "T"-shaped intersections.

Moreover, we note that the ratio between the number of accidents and the number of intersections is higher for "Y"-shaped intersections than it is for "T"-shaped intersections, despite the fact that the number of potential conflicts is the same in both cases.

TABLE 31
AVERAGE NUMBER OF ACCIDENTS PER GEOMETRICAL TYPE OF INTERSECTION, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Geometry	Number of intersections where accidents occurred	%	Number of accidents	%	Number of accidents/ intersection
Right-angle intersection	16	30.8	176	59.3	11.0
"T"-shaped intersection	21	40.4	58	19.5	2.8
"X"-shaped intersection	1	1.9	8	2.7	8.0
"Y"-shaped intersection	12	23.1	44	15.5	3.8
Other	2	3.8	9	3.0	4.5
Total	52	100	297	100	5.71

Source: Internal statistics.

"Y"-shaped intersections are also those with the highest number of serious and fatal accidents per 100 accidents (4.3). The difficulty of merging onto a roadway at an oblique angle likely explains these results (Table 32).

15 Hedman KO (1990), Road design and safety. *VTI Report 351A*, Swedish Road and Traffic Research Institute, Linkoping, Sweden, 1990.

TABLE 32
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO GEOMETRY, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Geometry	Fatal and serious	Total accidents	Ser.-fatal*/100 acc.
Right-angle intersection	2	176	1.1
"T"-shaped intersection	1	58	1.7
"X"-shaped intersection	0	8	0.0
"Y"-shaped intersection	2	46	4.3
Other	1	9	11.1
Total	6	297	2.0

Source: Internal statistics.

4.1.11 Accidents according to type of impact

The type of impact is determined by the movement of one or more vehicles prior to impact. The police officer who fills out the accident report must include the impact code[16]. There are five major categories. These categories are used to determine the type of impact in this study.

Accidents at a "crossing" are accidents that occur when vehicles are moving in directions such that their paths cross (e.g.: right-angle collision). "Same direction" accidents are accidents involving two vehicles moving in the same direction (e.g.: rear end collision). "Opposite direction" accidents involve vehicles moving in opposing directions (e.g.: head on collision). There are also "single-vehicle" accidents, which only involve one vehicle (e.g.: skid, loss of control). Lastly, there are "other" accidents. This latter category includes all of those accidents that do not correspond to any of the previous definitions (e.g.: pedestrian, animal, vehicular fire, etc.).

Table 33 highlights the fact that nearly 67% of fatal accidents are single-vehicle accidents, whereas this category only represents 36.8% of all accidents. This type of accident mostly occurs outside of intersections.

16 Société de l'assurance automobile du Québec, *Guide rédaction du rapport d'accidents de véhicules routiers*, May 1991, p. 23 – 25.

TABLE 33
SEVERITY OF ACCIDENTS ACCORDING TO IMPACT CODE, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Type of impact	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Prov. %
Crossing	2	22.2	3	7.0	8	4.9	55	6.8	68	6.7	8.6
Same direction	0	0.0	5	11.6	17	10.4	117	14.6	139	13.6	30.3
Opposite direction	1	11.1	3	7.0	7	4.3	39	4.9	50	4.9	6.3
Single-vehicle	6	66.7	30	69.8	105	64.4	234	29.1	375	36.8	37.3
Other	0	0.0	2	4.7	26	16.0	359	44.7	387	38.0	17.5
Total	9	100	43	100	163	100	804	100	1,019	100	100

Source: Internal statistics.

As indicated in Table 34, 9.6% of single-vehicle accidents are serious or fatal, a figure greater than that elsewhere in the province.

As regards head on collisions, however, the figure for the region is lower than that for the province as a whole. This can be explained by the low *traffic flow* in Nord-du-Québec. This observation, moreover, is consistent with the elements (number of vehicles involved and types of accidents) described above.

TABLE 34
NUMBER OF SERIOUS AND FATAL ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO TYPE OF IMPACT, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Type of impact	Fatal and serious	Total accidents	AMG/100 acc.	Province-wide AMG/100 acc.
Crossing	5	68	7.4	6.1
Same direction	5	139	3.6	2.3
Opposite direction	4	50	8.0	13.6
Single-vehicle	36	375	9.6	4.7
Other	2	387	0.5	1.9
Total	52	1,019	5.1	4.2

Source: Internal statistics.

4.1.12 Accidents according to type of impact, at intersections and outside of intersections

Table 35 illustrates the difference between the types of accidents occurring at intersections and those occurring outside of intersections. Accidents outside of intersections are mostly "single-vehicle" accidents (46.8%). While there is no predominant type of accident occurring at intersections, "same direction" accidents do account for 17.5% of such accidents. Unfortunately, no province-wide data is available in this regard.

TABLE 35
SEVERITY OF ACCIDENTS ACCORDING TO IMPACT CODE, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

	Impact	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	AMG/100 acc.
Outside of intersections	Crossing	1	12.5	1	2.6	1	0.7	24	4.5	27	3.7	7.4
	Opposite direction	1	12.5	3	7.9	6	4.3	19	3.5	29	4.0	13.8
	Same direction	0	0.0	5	13.2	12	8.7	70	13.0	87	12.0	5.7
	Single-vehicle	6	75.0	28	73.7	100	72.5	204	37.9	338	46.8	10.1
	Sub-total	8	100	37	97.4	119	86.2	317	58.9	481	66.6	9.4
	Other	0	0.0	1	2.6	19	13.8	221	41.1	241	33.4	0.4
	Total	8	100	38	100	138	100	538	100	722	100	6.4
Intersections	Crossing	1	100	2	40.0	7	28.0	31	11.7	41	13.8	7.3
	Opposite direction	0	0.0	0	0.0	1	4.0	20	7.5	21	7.1	0.0
	Same direction	0	0.0	0	0.0	5	20.0	47	17.7	52	17.5	0.0
	Single-vehicle	0	0.0	2	40.0	5	20.0	30	11.3	37	12.5	5.4
	Sub-total	1	100	4	80.0	18	72.0	128	48.1	151	50.8	3.3
	Other	0	0.0	1	20.0	7	28.0	138	51.9	146	49.2	0.7
	Total	1	100	5	100	25	100	266	100	297	100	2.0

Source: Internal statistics.

4.1.13 Accidents according to type of vehicle

Table 36 depicts the distribution of accidents according to the types of vehicles involved. In this table, the figures indicate the number of vehicles involved in accidents, and not the number of accidents. Accidents in Nord-du-Québec involved 751 (44.2%) passenger vehicles, 582 (34.2%) light trucks and 218 (12.8%) heavy vehicles. These figures differ from those for the province in general, a variance that may be explained by the type of vehicles driven in Nord-du-Québec, which is the only region where the vehicle fleet includes more light trucks (mini-vans, sports utility vehicles (4X4), panel trucks) than automobiles. This category of vehicles represents 51% of the region's vehicle fleet, whereas it represents only 23% of the entire vehicle fleet for the province.

TABLE 36
NUMBER AND TYPE OF VEHICLES INVOLVED IN ACCIDENTS, ACCORDING TO SEVERITY, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Type of vehicle	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	AMG/ 100/acc.	Prov. %
Bus	0	0.0	1	1.4	1	0.4	8	0.6	10	0.6	10.0	0.5
Passenger vehicle	7	53.8	28	38.4	110	42.5	606	44.7	751	44.2	4.7	67.1
Pedestrian	1	7.7	2	2.7	9	3.5	0	0.0	12	0.7	25.0	0.4
Other	0	0.0	2	2.7	4	1.5	85	6.3	91	5.4	2.2	3.8
Bicycle	0	0.0	1	1.4	4	1.5	2	0.1	7	0.4	14.3	0.5
Light vehicle	2	15.4	31	42.5	83	32.0	466	34.4	582	34.2	5.7	17.4
Heavy vehicles	1	7.7	4	5.5	43	16.6	170	12.5	218	12.8	2.3	8.6
Motorcycle	0	0.0	2	2.7	3	1.2	0	0.0	5	0.3	40.0	1.1
Snowmobile	1	7.7	2	2.7	1	0.4	8	0.6	12	0.7	25.0	0.1
Emergency vehicle	0	0.0	0	0.0	1	0.4	9	0.7	10	0.6	0.0	0.3
ATV	1	7.7	0	0.0	0	0.0	1	0.1	2	0.1	50.0	0.2
Total vehicles	13	100	73	100	259	100	1,355	100	1,700	100	5.1	4.2

Source: Internal statistics.

The number of a given type of vehicle involved in accidents (all categories) is usually proportional to the percentage of this type of vehicle in the overall traffic flow. This is not the case for heavy vehicles, a category that numerous studies have shown is overrepresented in fatal accidents[17].

In Nord-du-Québec, results are the opposite. Heavy vehicles are involved in 12.8% of accidents, yet represent a significantly greater percentage of the traffic flow.

Accident analyses have enabled us to observe that for single-vehicle accidents (Table 37), 9.6% of accidents involving light-duty trucks are fatal or serious, whereby this figure is 5.6% for passenger vehicles. It is a known fact that certain vehicles in this category (some 4x4 vehicles) are more prone to fall on their sides than are passenger vehicles. This is particularly the case when such vehicles run off the road. The high number of light-duty trucks in the region partly explains the fact that the number of serious and fatal accidents for this vehicle category is higher than it is elsewhere in the province.

This last observation must be considered alongside the observations noted from the analyses of types of accidents, types of impacts, and number of vehicles involved. In fact, during our analysis of these elements, we observed that single-vehicle accidents in Nord-du-Québec were more serious than they were elsewhere in the province. The category of vehicles favoured by users in Nord-du-Québec seemingly has an impact on the severity of accidents.

TABLE 37
NUMBER OF SERIOUS AND FATAL SINGLE-VEHICLE ACCIDENTS, PER 100 ACCIDENTS, ACCORDING TO THE TYPE OF VEHICLE, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Type of impact	Fatal and serious	Total accidents (single-vehicle)	AMG/100 acc.
Passenger vehicle	9	162	5.6
Pedestrian	2	8	25.0
Light vehicle	13	136	9.6
Heavy vehicles	3	71	4.2
Motorcycle	1	1	100.0
Snowmobile	1	3	33.3
ATV	1	2	50.0
Total vehicles	30	399	7.5

Source: Internal statistics.

17 Analysis of heavy truck accident severity (1988), Journal of Advanced Transportation, Vol. 22. Le transport routier et la sécurité routière, OECD Symposium (1987). Causes and consequences of heavy freight vehicle accidents in Norway, OECD Symposium (1987).

4.1.14 Accidents according to posted speed limit

The MTQ network in the region comprises 565.4 kilometres of roadway where the posted speed limit is equal to or in excess of 80 km/h. These are considered as being high-speed roads.

Moreover, the region has 672.2 kilometres of roadway where the posted speed limit is 70 km/h. Speed limits of 70 km/h are usually posted in two areas, namely, rural gravel roads and roads in the urban fringe, which are generally made of asphalt. In the region, only 0.6 kilometres of road fall into the latter category. Most roads in rural areas are gravel, and have posted speed limits of 70 km/h, as per the provisions of the *Highway Safety Code.* However, a recent Ministère study (a study of the driving speed on the Parent Road, June 2002), showed that on a gravel road that has been levelled, the speed actually driven is 90 km/h, at the 85thpercentile. These roads were not, however, designed to be safely driven at high speeds.

In Nord-du-Québec, there are also 9.3 kilometres of roadway where the posted speed limit is 60 km/h or less. These are mostly found in the cities of Chapais and Chibougamau.

Table 38 presents the density of accidents according to the posted speed limit. The density of accidents per year per kilometre is a good indication of those sites where numerous accidents occur. The greatest number of accidents per kilometre occurs in areas where the posted speed limit is less than 60 km/h. As previously mentioned, this can in part be explained by a higher *traffic flow* and a greater number of *conflicts*, given that this speed is most often posted in urban areas.

Rural roads with a posted speed limit of 70 km/h have a very low density of accidents, namely, 0.03 per kilometre per year. These roads usually have a slighter *traffic flow*, over longer distances.

Roads where the posted speed limit is greater than 80 km/h are usually in a *rural environment.* The density of accidents per kilometre at this speed is greater than for those roadways, in *rural environments,* where the posted speed limit is 70 km/h. The former have a much greater *traffic flow* and hence, more instances of *conflict.*

TABLE 38
ACCIDENTS PER KILOMETRE, ACCORDING TO THE POSTED SPEED LIMIT, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Speed	Environment	Length	%	Accidents/km/yr
≥ 80 km/h	Rural	565.4	45.3	0.17
70 km/h	Rural	671.6	53.9	0.03
70 km/h	Urban fringe	0.6	0.1	1.27
≤60 km/h	Urban	9.3	0.7	9.38
Total		1,247.0	100	0.16

Source: Internal statistics.

On roadways where the posted speed limit is equal to or greater than 80 km/h, the percentage of fatal accidents with *bodily injuries* is more important. Roadways where such speeds are allowed count a greater percentage of victims, based on the number of accidents that occur. This indicates that *bodily injuries* increase with speed.

Roadways where the posted speed limit is 60 km/h or less have significantly fewer victims, as a percentage of the number of accidents. This data is presented in Table 39.

TABLE 39
SEVERITY OF ACCIDENTS ACCORDING TO THE POSTED SPEED LIMIT, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Speed	Environment	Fatal	%	Serious	%	Slight	%	DMS	%	Total	%	Prov. %
≥ 80 km/h	**Rural**	7	77.8	32	74.4	103	63.2	339	42.2	481	47.2	**43.5**
70 km/h	**Rural**	0	0.0	6	14.0	31	19.0	60	7.5	97	9.5	**20.5**[a]
70 km/h	**Urban fringe**	0	0.0	1	2.3	1	0.6	2	0.2	4	0.4	
≤60 km/h	**Urban**	2	22.2	4	9.3	28	17.2	403	50.1	437	42.9	**36**
Total		9	100	43	100	163	100	804	100	1,019	100	**100**

[a]A breakdown of this data is not available.

As mentioned previously, the risk of serious accidents is higher when the posted speed limit is above 80 km/h. This observation is much more evident in Nord-du-Québec than it is elsewhere in the province. In fact, the number of serious or fatal accidents per 100 accidents, for roads where the posted speed limit is 80 km/h, is 8.1 in Nord-du-Québec, whereas it is 6.6 elsewhere in the province. Results are presented in Table 40.

TABLE 40
NUMBER OF SERIOUS AND FATAL ACCIDENTS ACCORDING TO THE POSTED SPEED LIMIT, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Speed	Environment	Serious and fatal	Total	AMG/100 acc.	Province-wide AMG/100 acc.
≥ 80 km/h	Rural	39	481	8.1	6.6
70 km/h	Rural	6	97	6.2	3.5[a]
70 km/h	Urban fringe	1	4	25.0[b]	
≤60 km/h	Urban	6	437	1.4	2.5
TOTAL		52	1,019	5.1	4.2

[a]A breakdown of this data is not available.
[b]Given the low number of total accident, this data is not significant.

The types of accidents that occur vary significantly according to the site (urban or *rural environment).* As a result, issues are different for both environments. In *rural environments*, particular attention must be paid to *road sides*, while in urban environments, the focus must be on intersections and areas involving other road users. These observations clearly indicate that developing *hybrid environments* must be avoided. Such environments are often characterized by high-speed roadways with numerous points of entry.

4.2 Chibougamau

Of the 1,019 accidents on Ministère roadways in Nord-du-Québec, 464 (45.5%) occurred in the city of Chibougamau. Given these results, it appears necessary to carry out a summary study of the accidents in this agglomeration.

Data for accidents on Ministère network roads in the city of Chibougamau were compared to data for accidents on all of the Ministère's roadways in Nord-du-Québec. This comparison sought to identify the distinctive characteristics of the accidents that occurred in the city.

Table 41 provides a general overview of the accidents, based on several indicators.

Only one accident involved an animal. This accounted for 0.2% of all accidents, while the regional average of such accidents is 3.3%. Single-vehicle accidents accounted for 14.1% of accidents, which is clearly inferior to the statistic for the rest of the region (31.7%). A greater number of accidents tend to occur in the daytime, namely 75.9%. This figure is 66.2% for the rest of the region. This data is highly representative of the urban character of the city of Chibougamau.

TABLE 41
SEVERITY OF ACCIDENTS ACCORDING TO VARIOUS SAFETY INDICATORS, BETWEEN 1995 AND 1999, MTQ NETWORK IN THE CITY OF CHIBOUGAMAU

	Safety indicator	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Average*
Day	Weekend	0	0.0	7	38.9	18	36.7	151	38.1	176	37.9	40.0
	Weekday	1	100	11	61.1	31	63.3	245	61.9	288	62.1	60.0
Type	ANIMAL	0	0.0	0	0.0	0	0.0	1	0.3	1	0.2	3.3
	NON-VEHICULAR	0	0.0	1	5.6	4	8.2	4	1.0	9	1.9	1.0
	NOT SPECIFIED	0	0.0	0	0.0	1	2.0	13	3.3	14	3.0	2.7
	PEDESTRIAN	0	0.0	2	11.1	6	12.2	0	0.0	8	1.7	1.2
	SINGLE-VEHICLE	0	0.0	9	50	21	42.9	31	7.8	61	14.1	31.7
	FIXED OBJECT	0	0.0	2	11.1	2	4.1	32	8.1	36	7.8	7.3
	ROAD VEHICLE	1	100	4	22.2	15	30.6	315	79.5	335	72.2	52.8
Lighting level	Day	1	100	12	66.7	36	73.5	303	76.5	352	75.9	66.2
	Nighttime	0	0.0	6	33.3	13	26.5	93	23.5	112	24.1	33.8
Surface condition	Dry	1	100	10	55.6	21	42.9	123	31.1	155	33.4	37.4
	Wet	0	0.0	3	16.7	3	6.1	61	15.4	67	14.4	11.9
	Snow-covered/Icy	0	0.0	4	22.2	22	44.9	203	51.3	229	49.4	48.0
	Other	0	0.0	1	5.6	3	6.1	9	2.3	13	2.8	2.7
Type of impact	Crossing	1	100	1	5.6	0	0.0	31	7.8	33	7.1	6.7
	Same direction	0	0.0	3	16.7	7	14.3	68	17.2	78	16.8	13.6
	Opposite direction	0	0.0	1	5.6	3	6.1	19	4.8	23	5.0	4.9
	Single-vehicle	0	0.0	12	66.7	23	46.9	39	9.8	74	15.9	36.8
	Other	0	0.0	1	5.6	16	32.7	239	60.4	256	55.2	38.0
	Total accidents in Chibougamau	1	100	18	100	49	100	396	100	464	100	

* Average calculated using data for all accidents in Nord-du-Québec
Source: Internal statistics.

Table 42, which indicates the site of accidents, allows for observing that 95.5% of accidents occurred on Road 167, while the others occurred on Road 113. Given that Road 167 is a major roadway in Chibougamau, this finding comes as no surprise.

The overall density of accidents in the city is 1.92 accidents/km/yr (Table 42), which is twelve times greater than the density of accidents for the region, i.e., 0.16 (Table 9). Furthermore, we note that the density of accidents is particularly high in the 50 km/h zone (17.32 accidents/km/yr). In this area, 329 accidents occurred over 3.8 kilometres. It is quite astounding to note that these 329 accidents account for 32.3% of the accidents that occurred on the Ministère's entire roadway network in Nord-du-Québec, and this, over a mere 3.8 kilometres. Of the 329 accidents, 185 occurred while one of the two drivers was attempting to park his vehicle. Such scenarios explain 56% of accidents in the area, and 18% of all the accidents that occurred on the Ministère's network in the region. Note that the parking spaces in this area are oblique, i.e., angled.

TABLE 42
SITES OF ACCIDENTS BETWEEN 1995 AND 1999, MTQ NETWORK IN THE CITY OF CHIBOUGAMAU

Area	Number of kilometres	Number of accidents	%	Density of acc/km/yr	Parking
Road 113 Between Road 167 and the southern edge of the city	19.5	21	4.5	0.22	1
Road 167 Between the southern edge of the city and the beginning of the 50 km/h zone	21.3	67	14.4	0.63	7
50 km/h zone	3.8	329	70.9	17.32	185
Between 2e Rue and the northern edge of the city	3.8	47	10.1	2.47	8
Total - Road 167	28.9	443	95.5	3.07	200
Total	48.4	464	100	1.92	1

Source: Internal statistics.

Meanwhile, a study of accident sites indicates that 193 accidents occurred at intersections. This represents 41.6% of all accidents, while the regional average is only 29.1% (Table 43).

TABLE 43
SEVERITY OF ACCIDENTS ACCORDING TO SITE, BETWEEN 1995 AND 1999, MTQ NETWORK IN THE CITY OF CHIBOUGAMAU

Site	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%	Average
Intersection	0	0.0	3	16.7	14	28.6	176	44.4	193	41.6	29.1
Outside of intersections	1	100	15	83.3	35	71.4	220	55.6	271	58.4	70.9
Total	1	100	18	100	49	100	396	100	464	100	

* Average calculated using data for all accidents in Nord-du-Québec
Source: Internal statistics.

Those intersections where there were the most accidents are indicated in Table 44. Intersections with the highest number of accidents are controlled by traffic lights, and the intersections themselves are located in a busy urban environment, namely Chibougamau's commercial area.

TABLE 44
SEVERITY OF ACCIDENTS PER INTERSECTION, BETWEEN 1995 AND 1999, MTQ NETWORK IN THE CITY OF CHIBOUGAMAU

Intersection	Fatal	%	Serious	%	Minor	%	DMS	%	Total	%
Road 167 and 4e Avenue	0	0	0	0.0	2	13.3	35	19.8	37	18.9
Road 167 and rue Merill	0	0	3	75.0	3	20.0	26	14.7	32	16.3
Road 167 and 5e Avenue	0	0	0	0.0	0	0.0	16	9.0	16	8.2
Road 167 and rue Lafontaine	0	0	0	0.0	1	6.7	15	8.5	16	8.2
Road 167 and 2e Avenue	0	0	0	0.0	0	0.0	12	6.8	12	6.1
Road 167 and 3e Avenue	0	0	0	0.0	1	6.7	11	6.2	12	6.1
Road 167 and rue Jaculet	0	0	0	0.0	2	13.3	7	4.0	9	4.6
Road 167 and boul. Hamel	0	0	0	0.0	0	0.0	8	4.5	8	4.1
Road 167 and ch. Campbell	0	0	0	0.0	2	13.3	6	3.4	8	4.1
Other	0	0	1	25.0	4	26.7	41	23.2	46	23.5
Total	0	0	4	100	15	100	177	100	196	100

Source: Internal statistics.
Note: The intersections framed in grey are those where traffic is controlled through traffic lights.

The types of accidents are presented in Table 45.

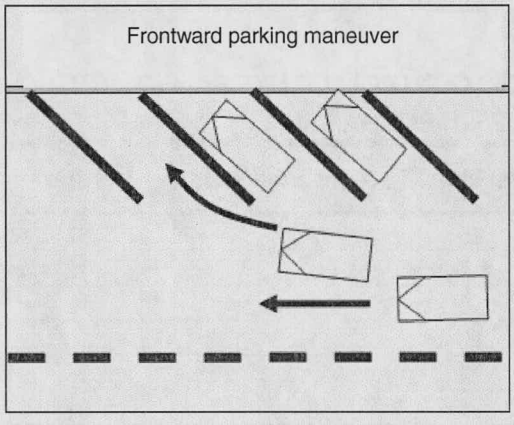
TABLE 45
TYPES OF ACCIDENTS AT INTERSECTIONS WHERE TRAFFIC IS CONTROLLED BY TRAFFIC LIGHTS, BETWEEN 1995 AND 1999, MTQ NETWORK IN THE CITY OF CHIBOUGAMAU

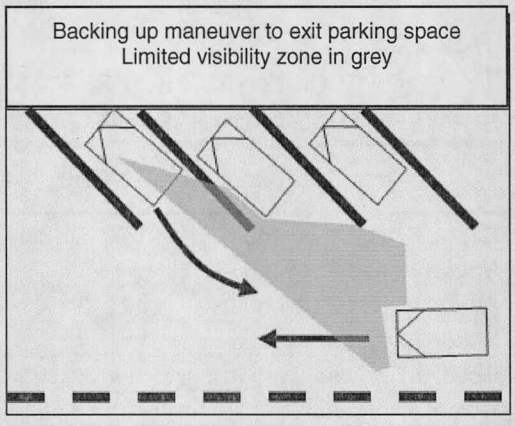
Intersection	Rear	Right	Left	Parking	Right angle	Other	Total
Road 167 and 4e Avenue	7		1	25	2	2	37
Road 167 and 2e Avenue		1	4	7			12
Road 167 and 3e Avenue	3		3	6			12
Road 167 and 5e Avenue	4			10	1	1	16
Road 167 and rue Lafontaine	5	2	4	2	2	1	16
Road 167 and rue Merrill	13	2	8	4	3	2	32
Total	32	5	20	54	8	6	125

Source: Internal statistics.

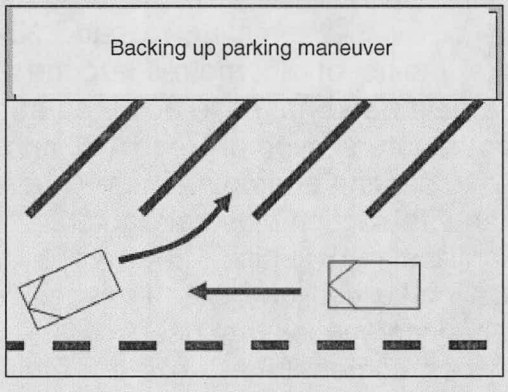
This table makes it possible to note, for the intersections listed, an unusually high number of accidents involving a vehicle where the driver is attempting to park. Note, however, that the intersection site also includes a radius of 30 metres around the intersection itself. As such, accidents included in the data need not have occurred at the exact site of the intersection in question. As regards the intersection of Road 167 and 4e Avenue, for example, 67% of accidents were related to parking attempts. There is hence surely a problem with parking and the presence of an intersection close at hand. Drivers approaching the traffic lights are not expecting conflicts with vehicles that are in the process of being parked, and that in so doing, must make use of the traffic lane. This problem is particularly evident for oblique or angled parking spaces that users must drive their vehicles into frontward, for visibility is limited when comes time to exit the parking space, which requires backing up. These facts lead us to conclude that parking spaces should not be located near intersections.

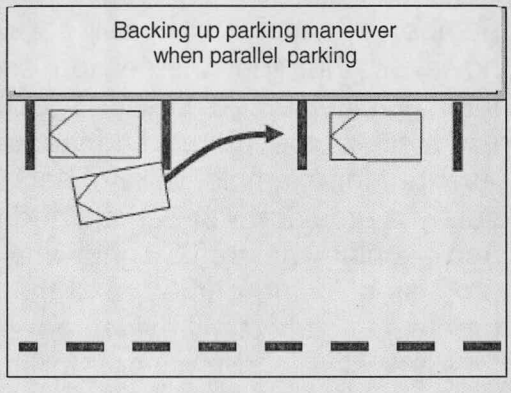
Vehicle movement, while parking in an oblique or angled space that must be driven into:



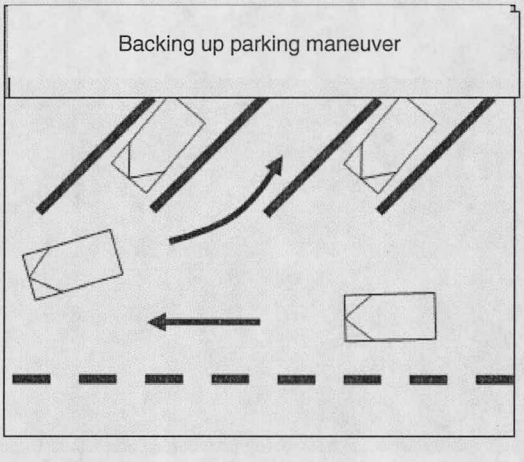


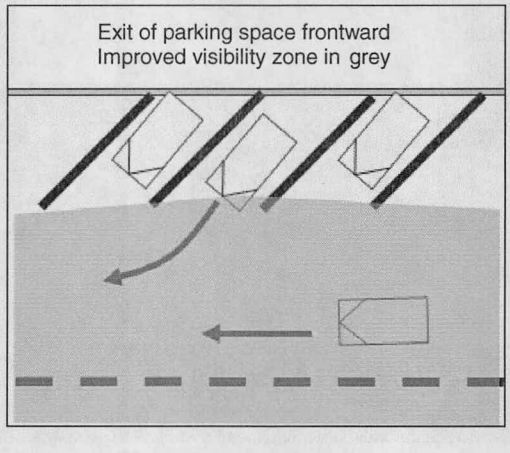
Another way of entering an oblique or angled parking space is to back into it, much as one needs to do when parallel parking:





Parallel parking offers improved visibility when exiting the parking space and driving into traffic (other advantage: packages can then be loaded into the trunk of the vehicle from the sidewalk):





The possibility of changing the angle of the parking spaces so that drivers can back into them should be discussed with local stakeholders.

To conclude, the accidents that occur in the city of Chibougamau are nationally related to the area's urban character. Accidents are predominant in the area where there is the most traffic, namely the 50 km/h zone, as well as near intersections and in areas where there is street parking. The problem of parking in the city will need to be addressed at some future point. The safety of the area could definitely be improved. Again, we must remember that 18% of all of the accidents in the region are related to the presence of parking spaces in the city of Chibougamau.

The last proposals constitute the onset of discussions and studies aiming to improve safety in the city of Chibougamau and, in so doing, in all of Nord-du-Québec.

5.0 DEGREE OF SAFETY AND ACCIDENT RATES

5.1 Degree of safety for a given site

A site is considered dangerous if it is the site of a higher number of accidents than is normal for the type of site in question. The number of accidents occurring at a site depends on the site's physical characteristics and *traffic flow*. For example, there will likely be more accidents at a right-angle intersection than at a "T"-shaped intersection (given the number of potential instances of conflict), and this for a similar *traffic flow*. Likewise, it is accepted that there will be more accidents when there is a higher *traffic flow*. Assessing the degree of safety of a site calls for comparing it to sites with similar characteristics, in order to assess the potential for improvement. The greater a site's potential for improvement, the more "dangerous" it is deemed to be. For example, a site with 25 accidents, when the normal number of accidents for such a site is 10, is considered as having potential for improvement. If the number of accidents at such a site were 7, its potential for improvement would be low. Making changes to a site with a low potential for improvement is risky, as the number of accidents occurring could actually increase subsequent to any actions taken. This would be counter-productive. However, where there is potential for improvement, measures can be taken that will likely reduce the number of accidents.

Establishing the degree to which a site is dangerous hence involves analyzing the accidents occurring at the site, based on the *traffic flow*, and comparing this data to that for sites with similar physical characteristics.

5.2 Accident rate

The accident rate is the primary value used to determine the degree of safety of a site. In this study, it is used to conduct a macroanalysis of the entire network. The accident rate is calculated through a simple equation that allows for establishing the number of accidents on the basis of *traffic flows* (the greater the *traffic flow*, the more accidents there will be). There is an average accident rate per physical characteristic, per site. For example, there is a rate for national roads and another one for collector roads. This equation enables comparing the sites, and this, regardless of the *traffic flow*.

An accident rate is not a fixed value. It varies over time and according to changes in the number of accidents and the flow of traffic. The equation is as follows:

$Ta = A \times 10^6 / (Q \times T \times L)$, where

Ta = accident rate (acc./10^6 vehicles.-km)
A = number of accidents during the period being considered (accidents)
Q = average daily flow of traffic (DJM) during the period (vehicles/day)
T = number of days in the period (days)
L = length of the section (km)[1]

Source: Ministère des Transports du Québec, Étude de besoins de dispositifs de contrôle (formation en sécurité routière), Thibault, Jacques and Langlois, Richard, p. 171, March 1998.

It was in the past possible to establish standard values for each type of roadway. However, the data used to date have consisted of figures for the province as a whole, given that regional values were not available. This study has enabled us to determine specific accident rates characteristic of Nord-du-Québec. Table 46 illustrates these values according to type of roadway and posted speed limit.

If we neglect to consider posted speed limit, the accident rate for national roads is slightly lower than the province-wide rate. We can then question the impact of speed on these results. Studies were thus intensified to target, in a more detailed fashion, accident rates based on the posted speed limit. The values thus obtained are also included in Table 46.

According to these values, the accident rate for national roads, where speed limits are less than 60 km/h, is significantly higher than the average for the province. Many of the accidents occurring at these speeds are due, as seen earlier, to *conflicts* involving parking spaces. However, we must bear in mind that the damages caused by these types of accidents are less severe than those in the case of high-speed accidents.

It is interesting to note that for the region's national roads with posted speed limits of 80 km/h or more, the accident rate is below the average for the province. Nevertheless, these are the roads where accidents involve the greatest number of victims.

It is important to specify that the low number of accidents recorded on regional roads, collector roads, and resource access roads is not sufficient to obtain a statistically significant rate. This data is nonetheless given in Table 46, for information purposes. Moreover, there is no province-wide data for resource access roads, as this type of road is not present everywhere in Québec.

TABLE 46
ACCIDENT RATE FOR NORD-DU-QUÉBEC AND QUÉBEC, BETWEEN 1995 AND 1999, MTQ NETWORK IN NORD-DU-QUÉBEC

Class	Speed	Number of accidents	Length (km)	Millions of vehicles per kilometre	Accident rate (per million vehicles)	Provincial accident rate (per million vehicles)[a]
National road	≤ 60	419	9.0	61.64	6.80	4.41
	70	0	0.6	1.95	0.00	3.07
	≥ 80	427	407.1	566.11	0.75	1.11
	Total	846	416.7	629.70	1.34	1.79
Regional road	≥ 80	1	7.9	3.91	0.26	4.87
	Total	1				2.24
Collector road	≤ 60	17	8.5	6.44	2.64	4.22
	70	52	64.4	46.00	1.13	2.15
	≥ 80	34	37.5	32.26	1.05	1.67
	Total	103	110.4	84.70	1.22	2.10
Resource access road	≤ 60	3	0.2	0.07	43.26	N/A
	70	45	600.4	159.10	0.28	N/A
	≥ 80	21	111.0	20.81	1.01	N/A
	Total	69	711.6	179.98	0.38	N/A
Total		1,019	1,247.0	898.29	1.13	N/A

Source: [a] Ministère des Transports (18/11/97).

6.0 HIGHLIGHTS

This chapter summarizes the data gathered in the report on road safety in Nord-du-Québec, as well as the elements specific to the region.

6.1 Region's situation, compared to that of the province of Québec

According to SAAQ data, Nord-du-Québec is the administrative region where there were the fewest accidents between 1995 and 1999.

The number of accidents per 100 inhabitants in Nord-du-Québec is 1.70, whereas the provincial average is 2.14. The number of accidents as a percentage of the population in Nord-du-Québec s henceforth lower than the average for all of Québec.

In Nord-du-Québec, the number of deaths following a road accident, per 10,000 inhabitants, is 1.8. This figure is 1.1 for the province as a whole. The number of serious injuries per 10,000 inhabitants is also clearly higher than that for Québec.

6.2 Ministère network, compared to the other networks

There were 3,759 accidents in Nord-du-Québec between 1995 and 1999. 27.1% of these occurred on roadways managed by the Ministère des Transports, whereas 72.9% occurred on *other networks or off networks.*

6.3 Ministère des Transports network

6.3.1 Accidents on the Ministère des Transports' network in Nord-du-Québec

The Ministère des Transports manages 1,247 kilometres of roads in Nord-du-Québec. The 1,019 accidents on this network between 1995 and 1999 occurred over some 336 kilometres of roadway, namely 27% of the network. Hence, no accidents occurred, over this same 5-year period, on 73% of the network.

In fact, 45% (460/1,019) of the accidents were concentrated on 11 kilometres of the network.

6.3.2 Accidents according to municipality

We noted that nearly 82% of all accidents occurred in the city of Chibougamau or the Municipality de Baie-James.

6.3.3 Accidents according to specific road number

Nearly 80% of all accidents occurred on two roadways, i.e., Road 167 and Road 113. Yet, these two roadways only account for 38% of the total kilometres in the network. These are, however, the two roadways with the most traffic, and as such, the most important arteries in Nord-du-Québec.

Of these two roadways, Road 113 has a greater number of serious and fatal accidents, per 100 accidents, than does the region (7.7, compared to 5.1).

6.3.4 Accidents according to type

Single-vehicle accidents account for 31.7% of all accidents in Nord-du-Québec. This is much greater than the figure for elsewhere in Québec (14.8%).

There are proportionately a greater number of accidents involving pedestrians in Nord-du-Québec (1.2%) than there are in the rest of the province (0.7%).

We also note that single-vehicle accidents are more serious in the region than they are elsewhere in the province.

All types considered, accidents are proportionally more serious than they are in the rest of the province.

6.3.5 Accidents according to the number of vehicles involved

The number of serious and fatal single-vehicle accidents, per 100 accidents, is 6.9, a figure significantly higher than the provincial average of 4.0.

6.3.6 Accidents according to surface condition

The percentage of accidents in Nord-du-Québec that occur on snow-covered or icy *roadways* is 48.0%. This is significantly greater than elsewhere in the province, where this percentage is 22.7%.

6.3.7 Accidents according to lighting level

The number of serious and fatal accidents, per 100 accidents, is higher in the nighttime (5.5) than in the daytime (4.9). This data, moreover, is higher than that for elsewhere in the province.

6.3.8 Accidents according to the month of the year

January is the month during which the most accidents occur. This data is comparable to that for the rest of the province.

In Nord-du-Québec, the number of serious and fatal accidents, per 100 accidents, is greater than the average for the province during the third (summer) and fourth (fall) quarters of the year.

6.3.9 Accidents according to the day of the week

Friday is the day of the week on which there are the most accidents. This observation is not congruent with provincial data, which indicates a greater number of accidents on Thursdays.

6.3.10 Accidents at intersections and outside of intersections

297 accidents were recorded at intersections and 722 outside of intersections.

The ratio of serious and fatal accidents, per 100 accidents, outside of intersections is 6.4, while at intersections, it is 2.0. More specifically, 89% of fatal accidents occur outside of intersections.

"Y"-type intersections are those where the number of serious or fatal accidents, per 100 accidents, is the greatest (4.3).

6.3.11 Accidents according to type of impact

67% of fatal accidents are single-vehicle accidents, despite the fact that the latter only account for 36.8% of all accidents.

9.6% of all single-vehicle accidents result in fatalities. This percentage is higher than that recorded elsewhere in the province.

6.3.12 Accidents according to type of vehicle

Accidents in Nord-du-Québec involved 751 (44.2%) passenger vehicles, 582 (34.2%) light trucks and 218 (12.8%) heavy vehicles.

These figures differ from those for the province in general. Such a difference may be explained by the make-up of the Nord-du-Québec vehicle fleet. Light-duty trucks represent 51% of the region's vehicle fleet, while they represent only 23% of the entire vehicle fleet for the province.

9.6% of single-vehicle accidents involving light-duty trucks are fatal or serious, whereby this figure is 5.6% for passenger vehicles.

6.3.13 Accidents according to posted speed limit

The greatest number of accidents per kilometre per year occurs in those areas where the posted speed limit is less than 60 km/h (9.38).

In Nord-du-Québec, the number of serious or fatal accidents per 100 accidents is 8.1 on roadways where the posted speed limit is 80 km/h, while this figure is 6.6 for the rest of the province.

6.3.14 City of Chibougamau

Of the 1,019 accidents on Ministère roadways in Nord-du-Québec, 464 (45.5% of the total) occurred in the city of Chibougamau.

In the 50 km/h zone, there were a total of 329 accidents over 3.8 kilometres of road. It is quite astounding to note that these accidents account for 32.3% of the accidents that occurred on the Ministère's entire roadway network in Nord-du-Québec. Of the 329 accidents, 185 occurred while one of the two drivers was attempting to park his vehicle. Such scenarios explain 56% of accidents in the 50 km/h zone, and by extension, 18% of all the accidents that occurred on the Ministère's network in Nord-du-Québec. Parking spaces in this area are oblique or angled, and have been identified as a contributing factor.

7.0 CONCLUSION

This study presents data on the number and severity of accidents in Nord-du-Québec according to various characteristics of the roadway network. The data was compared to province-wide figures, which made it possible to identify certain problems specific to the region.

The major issues thus identified are:

- The number and severity of single-vehicle accidents;
- The high percentage of accidents on snow-covered or icy roadways.
- The high number of accidents in the urban environment, nationally in the city of Chibougamau;
- The high number of accidents while drivers were attempting to park in or exit oblique parking spaces;

These analyses were conducted at a macro level. More detailed studies of the primary issues will be necessary in order to take appropriate action at specific sites.

These issues impact numerous road safety elements, for example, how to develop embankments, how to best develop the urban environment—notably parking spaces—the types of vehicles driven, roadway maintenance, etc. These, in turn, involve various fields of expertise, among them road engineering, urban development, roadway maintenance, and public safety (response time in the event of an accident). While this calls for cooperation from Ministère des Transports employees and elected officials, the support of municipalities, health agencies, citizens and merchants is also necessary. Road safety, in essence, can only be improved if all of these parties make a joint effort.

GLOSSARY

Accident rate
Value used in evaluating the dangerousness of a site, which takes into account the number of accidents over a given period and the volume of traffic at the site.

Collector road
Links smaller agglomerations (less than 5,000 inhabitants) to the larger ones.

Conflict
A conflict occurs each time the trajectories of vehicles converge, diverge or intersect.

Counting
A count of the number of vehicles that drive by a given site.

Crossroads
A relatively wide junction point, as opposed to a simple crossing, where several transportation corridors intersect.

Hybrid environment
Residential development with a variable mix of businesses and companies installed in the axis of the national road. This development is most often linear in form.

Ministère network
The Ministère des Transport's network includes the entire network that the Ministère manages. In Nord-du-Québec, this network consists of national, regional, collector and resource access roads.

National road
This essentially groups together interregional roads as well as those roads that link national urban agglomerations (usually over 25,000 inhabitants).

Other networks
All of the traffic lanes that are not managed by the Ministère des Transports, including streets, alleys, parking lots, forest roads, private roadways, snowmobile and all-terrain vehicle (ATV) trails, etc.

Regional road
Links together secondary agglomerations (usually between 5,000 and 25,000 inhabitants) and links the latter to the national urban agglomerations.

Resource access road
Roads leading to forestry or mining zones, to hydroelectricity production sites or to recreation or conservation zones under government authority.

Road marking

Signalling on the *road surface* indicating the measures to take to ensure proper use of the lane, as well as the safety of those who use it.

Road sides

In this study, the term *roadway approach* denotes all that is outside of the *road surface.* Accidents involving *roadway approaches* include: collision with a fixed object, overturning, submersion, or off-road accident (leaving the *road surface).*

Road surface

Roadway on which vehicles travel, but not including the *shoulders.*

Rural environment

For the purposes of this study, this environment consists of areas where the posted speed limit is at least 70 km/h. The *road surface* in such environments is generally made of asphalt, except for those roads where the posted speed limit is 70 km/h. Speed of traffic in these environments is usually fast, and such territories have a low occupancy rate.

Serious injuries

Personal injuries that require hospitalization.

Shoulder

Part of the platform that is situated between the *road surface* and the embankment, reserved for emergency vehicles needing to immobilize themselves, and serving as support for the *road surface.*

Slight injuries

Injuries that do not require hospitalization, but that do require visiting a medical centre or being treated by a doctor.

Spatial reference mode: "*route-tronçon-section-chaînage*"

Linear reference prepared by the Ministère des Transports to specifically identify a point or segment of a road. The codes includes designations for roadways (00000 @ 99999), road stretches (00 @ 99), and sections (000 @ 999); the road corresponds to a Road, the road stretch to a regional portion, and the section, to a local portion. This coding is usually in order, from west to east, and from south to north.

Traffic

Movement of all vehicles and goods on a given roadway. Traffic for a specific road can be expressed as the number of cars or trucks that travel on the road, in both directions.

Traffic flow

Number of vehicles per specific time unit.

Traffic signalling
Signalling using regulatory signs or traffic lights.

Type of accident
Characteristics of accidents, for a given environment.

Urban environment
For the purposes of this study, this environment consists of areas with higher occupancy rates and where the posted speed limit is usually 50 km/h. These areas represent the largest traffic flows in the region, as well as the greatest number of conflicts between users.

Urban fringe
For the purposes of this study, this environment consists of those areas where the posted speed limit is 70 km/h for asphalt *road surfaces* with numerous access roads serving various purposes, and able to accommodate a medium to high flow of traffic. These environments are often associated with *hybrid environments*.

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APPENDICES

APPENDIX 1
TRANSPORTATION SAFETY POLICY – ROAD COMPONENT

2001-2005 TRANSPORTATION SAFETY POLICY - ROAD COMPONENT

This document presents a summary of the 2001-2005 Transportation Safety Policy by providing a brief overview of its objectives, issues and actions leads. The complete policy is available on the Ministère des Transports du Québec Web site: www.mtq.gouv.qc.ca.

The Ministère des Transports du Québec and the Société de l'assurance automobile du Québec (SAAQ) undertook a major consultation process, communicating with the various partners concerned by road safety: representatives from the municipal level, the various police forces, the health field, the coroner's office and user associations. These partners had the opportunity to contribute, through numerous suggestions, to the development of this policy, the aim of which is to improve road safety.

Context

The Transportation Safety Policy – Road Component seeks to establish objectives and priorities for the Ministère des Transports and the SAAQ, in order to reduce the number and severity of road accidents, while continuing to ensure the mobility of persons and goods. The policy also serves as a guide to help partners develop their own initiatives with regard to road safety.

The change in the number of fatalities as a result of road accidents between 1985 and 2003 indicates a downward shift, despite a slight increase in the year 2002[18], and this, notwithstanding the continued increase in both the vehicle fleet and the number of kilometres driven. This decrease can be explained by the awareness-raising campaigns organized to improve user knowledge of the dangers of impaired driving and speeding, an increased police presence, a significant increase in the numbers of drivers who wear their seat belts, and the 1997 introduction of measures subsequent to the passing of Bill 12, regarding impaired driving, driving while under sanction and the new gradual licensing method.

Likewise, several measures seeking to increase the safety of the road network infrastructure have been implemented. These include improvements to sites where a high number of accidents were recorded. Improvements were also made to sites or network characteristics not yet identified as causing accidents, but where the risk of accidents, possibly severe, was obvious. For example, initiatives include the removal or repositioning of obstacles, the installation of safety rails in front of certain fixed objects, or the installation of impact absorbers or streetlight bases that crumble on impact. Lastly, certain changes were made to vehicle safety standards during the same period.

Despite the impressive improvement in the road safety record over the past 25 years, the trauma resulting from road accidents still constitutes a major public health problem. In fact, such trauma is the primary cause of death among those under 25 years of age. Road accidents have a costly social impact, valued at over two billion dollars per year.

Younger drivers (16 to 25 years of age) and the elderly (over 65) are the two groups most at risk of becoming road accident victims (rate per 10,000 inhabitants). While those in the 35 - 50 age group are less at risk, they constitute the majority of drivers (and users), and this for economic (they have the means to own and drive a vehicle) and demographic reasons (they represent the

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[18] Société de l'assurance automobile du Québec, *Bilan 2003, Accidents, parc automobile, permis de conduire*, 2004.

largest percentage of the population). Fatalities involving young drivers and users (16 to 25 years of age) represent the most significant social loss, for this group has the greatest number of years left in which to contribute to society.

The new transportation safety policy aims to increase road safety by 15% by the end of 2005. According to figures on road safety from 1995-2000, each year there are an average of 780 deaths, and 5,557 persons who sustain serious injuries. If the objective of 15% is reached in 2005, the number of deaths will drop to around 650, and the number of persons seriously injured, to 4,750. During the period from 1995-2000, the average number of fatalities on and off the road network increased to 818. Of this number, about 5% of fatalities were the result of accidents involving snowmobiles and all-terrain vehicles.

66% of all accidents occur on municipal roads (80% of the road network in Québec). However, 62% of fatal accidents occur on Ministère roads, notably in rural environments, and on national, regional and collector roads, where posted speed limits are in excess of 80 or 90 km/h.

Accidents with serious injuries are very frequent on municipal roads (52%), particularly on those roads where the posted speed limit is 50 km/h, and where there are usually a greater number of vulnerable users (pedestrians, cyclists, rollerbladers or elderly persons). Municipal roads are also the site of the most accidents with slight injuries (63%) and accidents causing only bodily injuries (68%).

Road safety is a key concern of the Ministère, the SAAQ, and all of their primary partners, among these the police forces, municipalities, coroners and organizations in the health field.

While the Ministère is responsible for infrastructures and transportation systems, the SAAQ oversees the promotion of road safety in those areas involving user behaviour and vehicle safety standards.

Police forces patrol the roadway network to ensure that drivers respect the *Highway Safety Code*. They are generally the first to arrive at the scene of an accident, and ensure that anyone injured receives appropriate medical attention as quickly as possible. Police accident reports constitute a critical source of data for improving road safety management.

Municipalities, as the administrators of a large portion of the road network, are also key partners. Municipalities are able to identify problematic sites, practices or behaviours on their territory, and consequently take the necessary measures to correct any deficiencies.

To these "natural" partners, we must add numerous government, paragovernmental and private organizations, many of them trucking associations. In this regard, we must mention the 1998 creation of the Table de concertation gouvernement-industrie sur la sécurité des véhicules lourds, a mechanism for overseeing safety in the trucking industry. Furthermore, in 1999, the Ministre des Transports set up a forum bringing together various experts in the field of motorcycles, and in 2001, an interdepartmental working group on the problems associated with impaired driving. The work carried out with key partners, from 1995 to 2000, was critical in reducing the number of road accident victims, notably bringing about a decrease of 18% in the number of fatalities and 16% in the number of persons serious injured. This work included:

- information and awareness-raising campaigns;
- corrections and improvements to certain elements of the roadway environment (slopes, curves, intersections, etc.);

- implementation of a trucking network (1997);
- the adoption or amendment of several standards, policies, regulations and laws (Act amending the *Highway Safety Code,* Bill 12, *An Act respecting off-highway vehicles* and *An Act respecting owners and operators of heavy vehicles*);
- numerous studies and a significant amount of research;
- implementation of the Table de concertation gouvernement–industrie sur la sécurité des véhicules lourds.

Policy directions

Given the impact on Québec's socioeconomic development of the movement of persons and goods, the balance between mobility and safety must be optimized. Hence, measures must be established that maintain mobility while seeking to reduce the risks of accidents to the greatest extent possible.

Within a context of shared responsibility, partners must be involved in building a global and integrated vision and local initiatives must be encouraged.

Quality data and excellent analytical methods will enable making sensible decisions, leading to realistic and sound initiatives.

The policy will be implemented in conjunction with the various actors involved, notably the police forces and municipalities. Lastly, given the success of the information and awareness-building campaigns, it is essential to maintain such efforts at communicating with road network users.

Intervention Framework

Road safety is extremely complex, with several factors acting together over time. The favoured approach focuses on the prevention of road accident trauma, using a model that breaks down the problem into three time-dependent phases (pre-impact, impact and post-impact) and four factors: human, vehicle and equipment, road environment and socioeconomic environment.

Given that this model concentrates on solutions, measures are designed and selected on the basis of their efficiency in reducing the number and severity of injuries, either through prevention (pre-impact), mitigation by means of lowering energy transfer (impact), or a reduction in the consequence of injuries through a rapid response (post-impact).

Issues

Subsequent to an analysis of the existing situation and the results of the previous policy, the 2001-2005 policy identifies 29 issues and nearly 100 areas for improvements on which efforts will focus, with the goal of improving road safety by 15% over the next five years. The table below presents the issues, broken down by factors. Key issues are in bold.

2001-2005 Transportation Safety Policy - Road Component

Distribution of issues according to factor			
Human	**Vehicle**	**Road environment**	**Socioeconomic environment**
1. Restraint systems	**9. Safer heavy vehicles**	11. Road development	**20. Management of speed**
2. Impaired driving	10. Integration of new technology	**12. Road marking**	21. Integrated data system
3. Vulnerable users		13. Road signs	22. Safety audit
4. Elderly drivers		**14. Road construction sites**	23. Research-development
5. High-risk drivers		15. Roadway lighting	24. Training
6. Gradual, safe licensing		16. Road surfaces	25. Transportation of goods – multimodal
7. Motorcycles		17. Land use planning and management of highway corridors	26. Integration of modes of passenger transportation
8. Road safety in schools and in school transportation		**18. Winter road conditions**	**27. Safety in the municipal road network**
		19. Road sides	28. Response to accidents
			29. Off-highway vehicles

Those issues considered a priority are in bold.

The issues are briefly described below, along with the primary initiatives identified in 2002. These actions will be implemented by the Ministère and the SAAQ during the time period for which the policy was developed. Other actions will be added, subsequent to annual reviews. Ministère initiatives focus mostly on the road environment, while activities by the SAAQ involve the human and vehicular factors. All Ministère and SAAQ initiatives are undertaken in collaboration with the partners involved.

A number of initiatives, seeking to increase public awareness, involve several issues. The Ministère will continue to create such information campaigns, in an effort to increase knowledge of safe driving practices and behaviours. The Ministère is also committed to:

- Continuing its campaign on winter road safety (ads, radio, magazines, displays);
- Developing an awareness-raising method and strategy as regards driving in icy conditions;
- Preparing a brochure on cycling safety, for actors in the field and regional offices;
- Carrying out an awareness-raising campaign for users regarding safety and speed of heavy vehicles;
- Producing a display and directory of all road signalling elements used in Québec;
- Developing an awareness-raising campaign for off-highway vehicle users, notably including the broadcasting of information capsules and participation in special symposiums and trade shows.

Human factor

Issue 1 — Restraint systems alone are insufficient

While nearly 95% of drivers wear seat belts, around 30% of victims of fatal accidents were not wearing them at the time the accident occurred. It thus appears appropriate, for 2005, to set an objective of 97%, as regards the wearing of seat belts by those sitting in the front seat of a vehicle. Furthermore, we are aiming to increase the percentage of those who wear seat belts while sitting in the back seat from 50% (1995) to 90% within the same time period. Airbags are a supplemental restraint system (SRS) now included as standard equipment on all vehicles, in accordance with Canadian standards.

As regards child safety restraints systems, we are aiming to increase the degree to which such devices are properly used (right seat, properly installed) by at least 10%. In 2000, child seats were only used properly in 32% of instances.

Issue 2 — Halt to impaired driving

Impaired driving is still the leading cause of fatalities on Québec roads. Over the past decade, it accounted for around 35% of deaths, 20% of serious injuries, and 5% of slight injuries, which equates to nearly 275 fatalities and 3,200 road accident victims a year. Since 1997, the fight against impaired driving has intensified, with the coming into force of the Act to amend the *Highway Safety Code* and other provisions, which impose more severe penalties on impaired drivers.

The policy seeks to reduce the number of fatalities and serious injuries due to impaired driving by 10% in 2005.

Issue 3 — Greater concern for the safety of vulnerable users

Pedestrians, cyclists and rollerbladers are particularly vulnerable in the event of a collision with a vehicle. From 1995 to 2000, pedestrian safety has improved continually, with an 18% drop in the number of fatalities and a 23% decrease in the number of serious injuries. However, young people, particularly those aged less than 14 years, and the elderly continue to represent the groups that are the most at risk.

The accident rate as regards cyclists has also improved, with a 27% decrease in the number of fatalities and a 31% drop in the number of serious injuries during the period from 1995 to 2000. Head trauma is the cause of death in 80% of cases, and of serious injuries in 30% of cases. Half of all rollerblade accidents occur on roadways, despite the fact that rollerblading is prohibited in these areas.

The development of bike paths and new standards for *traffic signalling*, including countdown traffic lights, has been effective. Unfortunately, a large percentage of pedestrians, cyclists and motor vehicle drivers infringe the *Highway Safety Code* and disregard traffic rules and signs.

The Ministère is planning to develop, over the period in question, 150 km of the "Route verte" and an additional 50 km of bike paths. The SAAQ will also implement a number of initiatives to increase the safety of vulnerable users, among them:

- for pedestrians: reduce the number of fatalities and serious injuries by 10%;
- for cyclists: increase the percentage of users who wear helmets to 75%;
- for rollerbladers: oversee the safe and balanced integration of the right to rollerblade on public roadways.

Issue 4 — Elderly drivers

In 2000, there were over 504,200 driver's licence holders aged 65 years and over, compared to around 378,000 in 1994. Generally speaking, we have noted that a growing number of drivers aged between 65 and 74 are involved in road accidents. We also note that this percentage increases for drivers aged in excess of 75 years, and that drivers aged 80 or more represent a risk equal to that regarding young drivers between the ages of 16 and 19. This risk, however, is mitigated by the fact that the elderly tend to drive fewer kilometres.

It is thus essential that drivers representing such a risk be identified, and initiatives adapted to their undesirable behaviour developed. This will require reviewing the measures currently in place (demerit points, etc.).

Issue 5 — High-risk drivers

High-risk drivers are those who regularly adopt dangerous behaviours: driving while impaired, driving at excessive speeds, running red lights and neglecting to wear a seat belt. According to numerous studies, drivers with one of these behaviours have a tendency to adopt one or more of the others.

It is thus essential that drivers representing such a risk be identified, and initiatives adapted to their undesirable behaviour developed. This will require reviewing the measures currently in

place (demerit points, etc.). The initiatives aim to decrease the number of fatalities and serious injuries due to high-risk drivers by 10%.

Issue 6 — Gradual, safe licensing

In July 1997, Québec adopted a gradual licensing system for new drivers. The initial effects of this reform were positive: a 5% drop in the number of fatalities and a 14% decrease in the number of serious injuries as a result of accidents involving young drivers. However, these data are limited, and focus only on a two-year period. Moreover, it would be appropriate to review the existing methods for evaluating drivers, and this so as to allow them to adapt to the new approach, hence maximizing the desired impact on road safety.

Issue 7 — Motorcycles are for experts only

Between 1990-1994 and 1995-2000, the number of motorcycles increased by 21%, yet the number of motorcycle-related fatalities dropped by 15%. There were, however, 65 deaths in 2000. This was the highest annual death toll in this category since 1991. Note that between 1990 and 1994, there was an average of 52 such fatalities per year.

41% of motorcycle accidents are single-vehicle accidents. In most cases, accidents are caused by excessive speed, and occur in curves. Among the victims of fatal accidents, we note a significant percentage of persons who were driving a new motorcycle or a motorcycle that they did not own. As is the case for automobile accidents, young drivers constitute a significant percentage of users involved in fatal accidents.

In May 2000, the members of a consultation committee set up by the Ministre des Transports proposed various means of improving road safety statistics for motorcyclists. These initiatives aimed to reduce the number of motorcycle-related fatalities by 10%.

Issue 8 — Optimize gains in road safety in schools and in school transportation

In the second half of the 1990s, the road safety report among young people improved notably. The number of fatalities in the under 14 age group dropped by 30%, and the number of serious injuries, by around 15%. Road safety statistics in the 15 to 24 age group also improved, but less significantly, particularly in terms of fatalities.

Since 1992, various products and programs have been designed to meet the needs of the education system. Some programs were successful, others less so. Despite this, teachers are still greatly interested in increasing student awareness of road safety issues. At the high school level, programs regarding impaired driving, the prevention of head injuries and the effects of speeding were given priority. The SAAQ will continue its initiatives in the educational environment, both at the elementary and high school levels, through use of information technology (CD-Roms, Internet).

Even if the number of accidents related to school transportation is very low, the Ministère has nonetheless implemented certain measures to render it even safer, including a training program for those in charge of planning school transportation networks.

The vehicle factor

Issue 9 — Safer heavy vehicles

Between 1990-1994 and 1995-2000, the average number of accidents involving heavy vehicles decreased by nearly 6%, and the number of fatalities, by nearly 11%. For the period from 1995 to 1999, the rate of fatal accidents per 100 million kilometres driven was twice as high in the case of heavy vehicles (2.19) as it was for motor vehicles (0.84), and this because of their weight. However, heavy vehicles were less involved than motor vehicles in accidents resulting in death or serious injuries, with an average rate of 40.08%, compared to 44.17% for motor vehicles.

The creation of the Table permanente gouvernement-industrie sur la sécurité des véhicules lourds, the adoption of *An Act respecting owners and operators of heavy vehicles*, and the creation of a trucking forum are all indications of the government's focus on improving road safety. The SAAQ is also involved in a nation-wide initiative to review the existing regulations concerning driving time and work hours. Other initiatives, however, will still be required in order to improve road safety as regards heavy vehicles.

In terms of buses (other than school buses), we note a 3% increase in the number of buses in use on roadways. Despite this, the number of accidents involving buses has decreased by 28%, and the number of victims of bus accidents, by 8.5%. In fact, data regarding the number of users-kilometres suggest that buses are much safer than motor vehicles.

This being said, the Ministère is committed to:

- Completing the 2nd and 3rd phases (four phases altogether) of the pilot project for assessing the effectiveness of onboard computers in countering speeding;
- Preparing three progress reports on the study of the advantages of investing in safety programs (three reports already submitted);
- Implementing a pilot project to identify the causes of major accidents;
- Conducting a feasibility study on the implementation of a test for new heavy vehicle owners and operators;
- Implementing 10 of the 18 recommendations of the evaluation report of *An Act respecting owners and operators of heavy vehicles*;
- Making certain modifications to legislation and regulations:
  - Assessing the possibility of amending the threshold for defining a heavy vehicle (3,000 kg net weight or 4,500 total weight, including load);
  - Reviewing tie-down standards;
  - Reviewing driving time standards;
  - Developing and implementing a new safety rating standard.

The SAAQ, in turn, has implemented a number of actions aiming to reduce the number of fatalities and serious injuries related to collisions involving heavy vehicles by 15%, the number of accidents caused by mechanical problems at 10%, and the percentage of vehicles with a serious mechanical failure at 20%.

Issue 10 — Rapid integration of new technologies

Over the past few years, there has been immense progress in the area of intelligent transportation systems. Because of the degree of uncertainty associated with these systems, encouraging their use must be tempered. Use of such systems could contribute to improvements as regards safety, the efficiency of transportation networks, the quality of the environment, as well as the competitiveness of transport companies.

New types of vehicles and accessories have recently been introduced. The degree of safety of the technical features of much of this equipment, however, remains unknown. Given that these new systems are not governed by federal standards, the potential safety risks will need to be assessed.

The Ministère will issue a call for tenders for the development of a strategic plan for an intelligent transportation system for Québec. A working group has already been created to follow up on this plan.

The road environment factor

Issue 11 — Road development that satisfies users' expectations

The infrastructure is responsible for around one-third of accidents in rural environments, and nearly 30% of accidents in urban environments. Two specific risk factors are associated to road development: those concerning the design of the road, and those involving the interaction between drivers and the infrastructure. This latter category includes the driver's ability to view and process, in a short period of time, a sequence of data on infrastructures, equipment and the roadway environment. Road development initiatives thereby contribute to improved safety, as they have a direct impact on drivers.

The Ministère will be making corrections to around thirty sites that have the potential for improvement, and in so doing, will modify 12 hills of the 72 that are actually considered dangerous. Moreover, 22 agglomerations will be impacted, as municipal activities address the approaches to these areas. Furthermore, major activities will be evaluated (plans include 11 before/after studies), and costs and benefits, assessment on major activities will be carried out (1 analysis planned).

Issue 12 — Road marking that is visible year round

Road markings are a critical source of information for road users. Highly visible markings facilitate movement, and as a result, increase the safety of road users. Improved markings are thus beneficial, and measures will be implemented to devise markings that will be visible year round. The Ministère will design a strategy for more long-lasting markings.

In conjunction with road markings, run-off-road rumble strips on shoulders can be used to warn inattentive or drowsy drivers before they drive off the road. These rumble strips started being installed as of the summer of 2001. The Ministère is planning to install 1,600 km of rumble strips on the shoulders of specific highways between then and 2003.

Issue 13 — Road signs geared to a better understanding of roads

It is acknowledged that road signs greatly contribute to improved road safety. However, to be fully efficient, road signs must be highly visible, as well as read and understood by drivers. Moreover, they must not lead to confusion. The Ministère has hence devised standards to ensure the uniformity and consistency of the various components of road signs.

Discussion of the issues related to the presence of billboards along roadways will continue, notably by means of working groups. If deemed necessary, legislation will be amended to address this issue.

Issue 14 — Greater safety on road construction sites

Each year, the Ministère des Transports carries out various road projects to maintain and improve the road network. In carrying out this work, the Ministère makes a specific effort to improve worksite safety for both road workers and users.

Despite these efforts, road projects continue to have a major impact on the flow of traffic. The traffic jams and delays that these projects can incur represent a major source of stress for all drivers. Moreover, a number of accidents also occur at such sites each year.

This is one of the Ministère's major concerns. It plans to address the dual challenge of improving worksite safety (and safety of the nearby environment) while also ensuring a smooth flow of traffic on those stretches where work is being carried out. The Ministère will also continue increasing the awareness of road users as to the dangers of worksites, namely by installing signs indicating that works will be conducted (one week ahead of time). It will also partner with the Sûreté du Québec to ensure that construction sites in 2002 are more closely monitored.

The Ministère will also implement management of traffic flow by axial highway rather than specific worksite. This will begin in 2002, on Highway 20 and Highway 40.

Road safety will also be improved by limiting traffic disruptions during peak periods (Monday mornings, holidays, etc.), and this for all worksites.

Issue 15 — Guidelines respecting roadway lighting are needed

Roadway lighting increases the comfort and safety of drivers, particularly in urban areas. In rural environments, it has the advantage of improving safety during poor weather conditions, but often leads to an increase in speed. In Québec, as in many other countries, roadway lighting standards are not all supported by quantitative road safety data.

With today's limited budgets, and the relatively high costs of installing and maintaining lighting systems, additional information on the impact of lighting on safety is necessary, and existing practices in this regard will need to be reviewed. A working group will be mandated to establish a departmental direction with regard to roadway lighting.

Issue 16 — Improved road surfaces and materials

Roughly 18% of accidents occur on wet pavement. The Ministère's Service des chaussées, in conjunction with the Sûreté du Québec, is currently studying the impact of surface grip on accidents. Poor surface grip and the poor condition of the pavement reduce the ability of drivers to properly control their vehicles in the case of an emergency.

Over 100 km of roadway shoulder will be paved as per existing standards. Roadway conditions can also be improved through better maintenance. A report will be prepared addressing the driver decision-making process in wintertime as well as the potential implementation of a deployment plan.

Issue 17 — Better land use planning and better management of highway corridors

For more than 20 years, various studies have illustrated the direct relationship between the growth of access Roads to local roads or adjacent property and a drop in road safety. When such access Roads are unlimited, the accident rate in a given area is twice as high. The Ministère has been focusing, since the early 1990s, on working with municipal partners to ensure they take transportation planning into consideration when developing their territory, and that they reduce the number of access roads to local roads.

Road safety, a balance between the transit flow of traffic and local traffic, and sustaining a quality of life near roadways, all require comprehensive and integrated management of highway corridors.

In the interim, the Ministère plans to modify various problematic access Roads, as part of 31 projects developed for the improvement of its roadway network.

Issue 18 — Winter road conditions: ensure safe, smooth driving

Precipitation and strong winds can result in icy pavement and reduced visibility. The Ministère has broken down the road network into categories, in an effort to render it as safe as possible and to meet the needs and expectations of users. These categories are based on the significance and purpose of roads, as well as on any technical limitations with regard to snow removal or de-icing. The Ministère has, among other initiatives, amended its emergency measures plan in order to assure the coherent and coordinated management of all stakeholder initiatives in the event roads are closed down. It has also set up roadside weather stations that quickly provide strategic information on the road conditions at strategic sites along the network.

Issue 19 — Safe road sides

Vehicles running off the road account for around 33% of all fatal accidents. Slightly over half of all accidents are due to vehicles overturning, while the rest are the result of collisions with fixed objects (streetlights, guardrails, pillars, utility poles, trees, etc.). Since 1995, numerous initiatives have allowed for improving the safety of roadway approaches: eliminating or moving obstacles, installing mechanisms to promote crumpling or restraining, etc. Between 1995 and 2000, the Ministère invested $73 million in the installation of safety mechanisms.

Initiatives will continue, and will include a complete inventory and correction (seven projects) of all unusual roadway approach components, according to the following priorities:

- Approaches to bridges and rigid separation walls;
- Pillars, viaduct abutments, tunnel entrances and overhead gantry sign;
- Streetlights;
- Lateral overhead gantry.

The Ministère will also, while rebuilding or repairing roads (particularly as part of the 21 improvement projects), make all of the necessary modifications to rails.

The socioeconomic environment factor

Issue 20 — Coherent initiatives governing the management of speed

Speed is the primary factor in 25% of fatal accidents, 19% of accidents with serious injuries and 13% of accidents involving minor injuries.

Speed is notably a problem involving a great number of factors. It is a result of the interaction between driver behaviour, the power of the vehicle, the road environment, and the socioeconomic environment. Type of road aside, we note that a majority of drivers regularly exceed posted speed limits.

Since 1995, a certain number of initiatives have been implemented to improve the management of speed: a guide for determining speed limits on the municipal network roads with at least two traffic lanes, as well as specific criteria for off-highway vehicle trails and roads managed by the Ministère des Ressources naturelles. Road network managers receive regular training on the efficient use of these tools. There have also been awareness-raising campaigns, speed control programs, monitoring of driving speeds and discussions on the use of photographic speed measuring devices.

Solutions to the speeding problem must reflect the multidimensional nature of the issue, and will hence require initiatives that address awareness, design, legislation and controls. The integration of all actions implemented must be emphasized: for example, before considering control measures, it must be checked that speed limits are appropriate. These control measures will need to be widely advertised, so that drivers and users accept that they are indeed necessary.

10 different projects will be carried out with regard to controlling excessive speed on the road network. Moreover, a pilot project involving the installation of interactive signs will also be conducted in 14 school zones.

The SAAQ's initiatives aim to reduce the number of fatalities and serious injuries caused by speeding by 10%.

Issue 21 — An integrated data system to enhance the road environment

Setting up an integrated data system involve several steps. Subsequent to a diagnosis of potentially dangerous sites or road sections, a safety analysis confirms the degree of

dangerousness related to the site and determines the factors causing accidents, prior to proposing solutions. This is followed by an economic analysis, which assesses projects, determines priorities for implementation, and establishes work and performance schedules. The last step consists of assessing the effect of initiatives on safety. This step, which also makes it possible to determine whether the measures implemented have had the desired results, can promote the effectiveness of future actions.

Over the next several years, the Ministère will strive to establish relationships between these data and other road environment data, in order to organize, make available and share the various sources of information necessary to implement a comprehensive road safety data information system. This will include preparing a summary report and setting up a data warehouse to allow regional offices to access information. Lastly, the integrated safety analysis system will be transferred to the "*directions territoriales*", and receive training on its use.

Issue 22 — The safety audit, a winning evaluation procedure

A safety audit is a formal and structured evaluation of the degree of safety of an existing roadway or road project. It is conducted by one or more qualified and independent auditors, who prepare a report on the danger of the road in question for various users.

Québec has very little experience in this regard, with the exception of a few isolated initiatives by several MTQ regional offices. Yet, the benefits of such audits are well known. Tools and mechanisms must therefore be developed in order to add these activities to the existing network analysis mechanisms. The Ministère will prepare an audit guide and perform two pilot projects.

Issue 23 — Research and development, an essential means of enhancing safety

Road safety guidelines are defined through programs carried out in conjunction with the Fonds de recherche pour la nature et les technologies (formerly FCAR). A number of research activities are also carried out by Ministère and SAAQ specialists. These aim to resolve specific problems, to determine the factors responsible for accidents, and to assess the effectiveness of the implemented measures.

All of these efforts must be sustained, in order to define or specify short-, medium- and long-term policy orientations and to monitor road safety issues. Furthermore, improvement of the current processes of technology transfer and monitoring must be emphasized.

The Ministère's research currently focuses on:

- Determining the costs of accidents, based on the type of accident and the impact on road safety;
- Developing a local road safety diagnostic process;
- Updating the preliminary guide for identifying slippery roadways and taking the necessary action;
- Conducting research on the characteristics (uniform, rutted, grip) and cross-profiles (overturning) of roadway surfaces which impact safety;
- Developing analytical and diagnostic methods for making improvements in those areas where the risk is greatest.

Other projects will be added over time, to meet future research needs.

Issue 24 — Training geared to a safer road environment

In 1994, the Ministère implemented a training program to promote increased awareness of safety in the planning, construction and operation of roadway infrastructures. Between 1994 and 2000, it established further training on the relationships between the human-vehicle-environment factors. This program will be retained and updated. Moreover, a new program will be designed to assess safety-related issues and conduct cost-benefit analyses (ongoing). This program will also address roadside approach safety, sharing of knowledge, and the capacity of existing road transportation components.

Given the scope of these programs, the frequent revision of their contents, and the limited resources it has available, the Ministère plans to partner with the top specialists from the "*directions territoriales*", universities and scientific bodies, to ensure dissemination of knowledge.

Other training initiatives include creating, developing and/or promoting technical tools and guides for partners:

- Guide on rotary intersections;
- Guide to determining speed limits;
- Guide to including safety in urban planning tools;
- International safety guide.

Issue 25 — Recourse to multimodal freight transportation

In addition to its role regarding the management of roadway infrastructures, it is in the interest of the Ministère to promote greater integration of transportation modes as well as the optimal use of existing infrastructures, in order to ensure a reliable and safe system for the transport of goods. With this in mind, the 1999-2000 budget introduced a railway infrastructure improvement assistance program to limit the abandonment of railway lines. Furthermore, a refundable tax credit equal to 75% of the property taxes paid by railway companies was also introduced.

The Ministère will also provide $2.3 million grant to restore secondary lines that constitute short line railway and $1.7 million grant for the implementation of infrastructures for railway lines with intermodal potential.

Moreover, the maritime and inland waterway transportation policy currently being prepared should incorporate incentives to promote a greater reliance on transportation via the St-Lawrence river. A university chair on maritime transport will be created in this regard. The Ministère will continue considering projects for replacing road transportation by maritime transportation, using an assistance program to this effect.

Issue 26 — Integration of modes of passenger transportation

Motor vehicles continue to be the preferred mode of transportation of Quebeckers. This, unfortunately, has negative impacts on both the movement and safety of persons. Any program for managing the movement of persons should focus on measures that are both economically

and ecologically sound. For example, we must note the Plan de transport de l'agglomération de la capitale nationale du Québec and the Plan de gestion des déplacements de la région métropolitaine de Montréal, which offer guidelines and solutions for meeting current and future passenger and freight transportation needs. We also need note that all the regions in Québec will have their own specific transportation plans over the course of the next few months. The Ministère must focus on developing and implementing methods for attaining its objectives as regards traffic flow and safety.

To improve mass transit, the Ministère will implement 18 measures (special parking lots, reserved lanes, parc-o-bus, viabus, etc.) aimed at decreasing the number of vehicles on the province's roadways.

Issue 27 — Potential safety enhancements in the municipal road network

Two-thirds of all accidents in the province occur on municipal roads. Of these, most occur in urban environments. Moreover, nearly 26% of all fatal accidents or accidents with injuries involve a pedestrian or cyclist. This reality requires that specific efforts, targeting municipalities, be made. These initiatives will need to provide appropriate measures in terms of urban development and the roadway infrastructure.

The Ministère and the SAAQ plan to strengthen the relationships with municipal partners, notably by providing them with diagnostic road safety tools. This issue primarily requires that a framework be devised for improving road safety at the municipal level. This will increase the awareness of municipal elected officials and managers, as well as residents, and incite them to collaborate at improving road safety and help them with their initiatives. Five elements come into play: training of technical personnel, increased awareness, technical assistance, technological support and financial assistance.

The Ministère has already planned symposiums, at the municipal level, organized by "*directions territoriales*".

Issue 28 — Prompt, efficient response to accidents

The entire trauma care system should include the processes ranging from emergency calls (911) to victim rehabilitation and re-entry into the community. Over the past few years, coordination of the various divisions has led to improvement in pre-hospitalization emergency services, and to the creation of trauma centres as well as rehabilitation services. A recent study shows that recorded fatalities in instances where death was considered "avoidable" dropped from 52% to 18% in the first five years that the integrated trauma system was in operation.

In this regard, the Ministère will contribute to improving the speed at which assistance is rendered to victims of accidents, notably by installing 61 cameras, 5 pre-emption traffic lights and an emergency phone line.

Moreover, the SAAQ proposes to support and improve the integrated trauma system by promoting institution accreditation in order to achieve the lowest possible rate of accidents involving serious injuries (no higher than 20%). It also aims to increase the percentage of persons seriously injured and hospitalized who are able to benefit from the rapid care plan for accident victims to 75%. It has also designed a 30-day rehabilitation plan.

Issue 29 — Better management of off-highway vehicles

The number of deaths from accidents involving off-highway vehicles (ATVs or snowmobiles) has remained constant since 1990. It bears noting, however, that while this statistic has not changed, the number of such vehicles has increased significantly. *An Act respecting off-highway vehicles*, adopted in 1997, regulates the use and movement of such vehicles on public and private land. The driving age for these vehicles is now 14 years, and in September 1999, mandatory training and competency certification were implemented for drivers aged between 14 and 16 years.

The Ministère will table the bill on off-highway vehicles, as well as the amendment on the law regarding groomers. Moreover, the working group on off-highway vehicle safety will continue its work, and the Ministère will implement a minimum of one initiative to improve safety in this regard. A dynamic study on passengers of all-terrain vehicles (4-wheelers) will be conducted, to determine how safe this practice actually is.

APPENDIX 2

LEGISLATION GOVERNING ROAD SAFETY

LEGISLATION GOVERNING ROAD SAFETY

Sharing of responsibility

Under *An Act respecting the Ministère des Transports*, **the Ministre des Transports:**

- is responsible for the application of the laws and regulations regarding transportation and the road network;
- develops policies regarding transportation and the road network, and proposes these to the government;
- implements these policies, overseeing and coordinating their application.

As regards road safety, the Ministre des Transports is responsible for establishing and implementing safety and accident prevention programs. He must also oversee application of the *Automobile Insurance Act* and the *Highway Safety Code,* except for those provisions regarding traffic control and prevention, which are the responsibility of the Minister of Public Security, and the provisions concerning legal action in the event of a violation, which are the purview of the Attorney-General.

As regards application of *An Act respecting the Société de l'assurance automobile du Québec*, **the SAAQ:**

- applies the compensation plan for victims with bodily injuries and the compensation plan for material damages, provided for by the *Automobile Insurance Act*;
- applies the *Highway Safety Code* and collects dues, fees and contributions;
- promotes road safety, from the perspective of user behaviour and vehicle safety standards.

As regards the *Highway Safety Code*, its application is the responsibility of the Ministre des Transports and the Minister of Public Security. The Ministre des Transports notably presents and recommends regulations regarding government traffic standards to the Executive Council. It is also responsible for agreements in areas that are under the Code's jurisdiction. After consultation with the SAAQ, it grants licences for exceptional cases.

The Ministère des Transports is responsible for several laws and regulations, notably those regarding road signs, off-highway vehicles, loads and dimensions of road vehicles and vehicle combinations, tie-down standards, hazardous material and transportation of schoolchildren. It grants special driver's licences for road vehicles and sets the standards for their use. In conjunction with the SAAQ, it develops the *Regulation respecting special permits* and the *Special Road Trains Operating Permits Regulation*. It is also responsible for the guidelines, policies and regulations ensuing from *An Act respecting owners and operators of heavy vehicles*, which the Government of Québec brought into force in July 1998.

This Act, jointly developed by the Ministère des Transports, the Commission des transportation du Québec and the SAAQ, allows the government to intervene when persons or businesses fail to respect the road network safety and protection standards. In addition to making registration in the Register of owners and operators of heavy vehicles mandatory, it also provides a system enabling the SAAQ to monitor the on- and off-road activities of such businesses. It assesses the behaviour of owners and operators as regards network safety and protection. *An Act respecting*

owners and operators of heavy vehicles also includes a system of penalties for those whose driving behaviour is deemed to infringe regulations.

Under this law, the SAAQ is mandated to provide the Commission des transports with files on all users whose behaviour endangers road users or may potentially damage the road network. As for the Commission, it is responsible for registering owners and operators, assigning and reviewing safety ratings, and, if applicable, penalizing businesses that represent a risk, through the setting of specific conditions or by cancelling their rights to operate or run heavy vehicles.

The SAAQ is also responsible for applying a number of standards and regulations. These are related, among others, to registration, driver's licences, driving schools, training, merchants, and registration and mechanical inspection certificates, with the government's approval. The SAAQ is also responsible for road checks of passenger and freight vehicles, notably with regard to their mechanical condition and adherence to load and dimension guidelines. It also has exclusive jurisdiction over the technical verification of rebuilt vehicles.

In December 1996, a major reform of the *Highway Safety Code,* covering the past 20 years, spearheaded a comprehensive initiative for improving road safety. A first measure, instituted on June 30, 1997, introduced safe, gradual licensing for new drivers. A second series of measures, introduced on December 1, 1997, implemented a series of laws that were among the most severe in North America, aiming to counter impaired driving and driving with a suspended or revoked driver's licence.

Legislation

The **Highway Safety Code** is the primary road safety legislation in force today. This law, and the related regulations, incorporate provisions and obligations regarding vehicular traffic on the entire Québec road network except those roads to which the Code does not apply.

As regards Nord-du-Québec, the roadways to which the Code does not apply are mostly located in territories under the responsibility of the Ministère des Ressources naturelles. These are primarily territories dedicated to forestry and mining operations.

The *Highway Safety Code* establishes traffic rules, standards regarding the behaviour of road users, and standards for the building and equipping of vehicles. The Ministre des Transports has the power to authorize any municipal regulation concerning driving speed, heavy vehicle traffic, transportation of hazardous material, and the movement of off-highway vehicles on public roads.

Below are the national regulations ensuing from the Code:

- *Regulation respecting road signs*;
- *Regulation respecting safety standards for road vehicles*;
- *Regulation respecting protective helmets for persons riding motorcycles, mopeds or snowmobiles and for their passengers*;
- *Regulation respecting hours of driving, hours of work and the heavy vehicle driver's record;*
- *Regulation regarding cargo securement standards;*
- *Vehicle Load and Size Limits Regulation*, applicable to road vehicles and vehicle combinations;
- *Regulation respecting demerit points;*
- *Transportation of Dangerous Substances Regulation;*
- *Regulation respecting the use of non-skid devices on the tires of certain road vehicles;*
- *Regulation respecting access to driving a road vehicle in connection with the health of drivers;*
- *Regulation respecting dealers and recyclers;*
- *Regulation respecting special permits;*
- *Special Road Train Operating Permits Regulation.*

An Act respecting the Ministère des Transports introduces the *Regulation respecting the provision of road service or towing on certain roads and autoroutes and on certain bridges or other infrastructures.* This Regulation acts in concert with traffic management systems, aiming to quickly assist drivers whose vehicles become immobilized in traffic lanes, and are hence a likely cause of accidents.

An Act respecting the Société de l'assurance automobile du Québec created the Société de l'assurance automobile du Québec (SAAQ), the activities of which are overseen by the Ministre des Transports. The SAAQ's primary mission consists of managing State insurance (the *Automobile Insurance Act*). The SAAQ also grants driver's licences and registration certificates, and is responsible for proposing road safety measures. The other activities carried out by the SAAQ include pre-departure inspections, the mechanical inspection program, preventive maintenance, driving hours and hours of work, control over road transportation, and the special driver's permit.

The **Transport Act**, passed in 1972, governs bulk trucking and bus transportation. Furthermore, it created the Commission des transports du Québec and the Conseil de la recherche et du développement en transport. The Commission des transports du Québec maintains the Register of owners and operators of heavy vehicles and the bulk trucking register.

The primary regulations in terms of road safety are:

- *Regulation respecting the training of drivers of buses and minibuses used for the transportation of schoolchildren;*
- *Regulation respecting road vehicles used for the transportation of schoolchildren.*

An Act respecting owners and operators of heavy vehicles establishes a new framework for the transportation of persons and merchandise on Québec roads. It aims to maintain the integrity of the road network, and increase the safety of network users. It targets heavy vehicle owners and operators who travel on public roads as well as other parties in the transportation services industry.

An Act respecting transportation services by taxi establishes a new framework for taxi services in Québec, and aims to improve the safety of users as well as the quality of the services offered. It targets all paid transportation services offered by taxis, limousines and stretch limousines. More specifically, it is designed for holders of taxi permits and taxi driver's licences, as well as other parties in the taxi industry. Among other measures, this Act introduces a licence system for the latter, determined by decree, for certain territories.

An Act respecting off-highway vehicles aims to regulate the use and movement of off-highway vehicles on both public and private roads. This Act has two corresponding regulations, the *Regulation respecting snowmobiles* and the *Regulation respecting all-terrain vehicles*. A Bill is currently being drafted to revise the Act and combine the two regulations.

The ***Roadside Advertising Act*** includes specific provisions regarding commercial or non-commercial advertising and incorporates a permit program for the former. It applies along the roadways, outside of those in cities, villages and on Indian reserves, that are managed by the Ministre des Transports. By defining advertising displays, the Act helps network managers with road signalling, specifically as regards the priority and positioning of signs on roadway networks.

An Act to prohibit commercial advertising along certain thoroughfares prohibits, unless specified otherwise, the installation of new billboards along express highways and on bridges or their approaches, in urban environments. It aims to reduce distracting drivers who are moving through more complex roadway environments.

APPENDIX 3

NATIONAL PROVINCIAL TRANSPORTATION LAWS AND REGULATIONS

NATIONAL PROVINCIAL TRANSPORTATION LAWS AND REGULATIONS

Highway Safety Code, (R.S.Q., c. C-24.2) and its 51 Regulations.

Transport Act (R.S.Q., c. T-12), article 5 of which establishes regulatory powers regarding the safety of transportation systems and methods, and articles 81 and following authorize the government to intervene, if necessary, to protect public health and safety.

Automobile Insurance Act (R.S.Q., c. A-25), which incorporates the terms and conditions for compensating and providing care to road accident victims.

An Act respecting owners and operators of heavy vehicles; (R.S.Q., c. P-30.3), which establishes specific rules for heavy vehicle owners and operators, with the goal of increasing user safety on public roads and preserving the integrity of the network.

An Act respecting off-highway vehicles (R.S.Q., c. V-1.2), which includes standards for the vehicles themselves, and regulations for their use as well as regarding the protective equipment that must be donned by users.

Code of Penal Procedure (R.S.Q., chapter C-25.1), which governs violations, and more specifically, violation reports.

An Act respecting municipal contribution to railway crossing protection (R.S.Q., cA-15), regarding the contribution of municipalities to the development of safe structures and facilities.

An Act to prohibit commercial advertising along certain thoroughfares (R.S.Q., c. A-7.0001), which even concerns private property located such that drivers on a bridge or road could be distracted by commercial advertising. It also prohibits advertising on public roads where the speed limit is 70 km/h or more.

Roadside Advertising Act (R.S.Q., c. P-44), concerning roads maintained by the Ministère des Transports, in application of *An Act respecting roads* (R.S.Q., c. V-9), as well as the edges of and approaches to rest areas and lookouts bordering them. It does not apply on municipal territory governed by the *Cities and Towns Act* (R.S.Q., c. C-19).

Police Act (R.S.Q., c. P-13.1), which concerns, among others, the Sûreté du Québec, the police force responsible for fighting crime and ensuring road safety.

An Act respecting the determination of the causes and circumstances of death (R.S.Q., c. R-0.2), which governs the coroner's investigations, and enables the coroner to make any recommendation necessary for the protection of human life.

An Act respecting petroleum products and equipment (R.S.Q., c. P-29.1), which establishes regulatory powers in the area of petroleum products transportation.

Cities and Towns Act (R.S.Q., c. C-19), article 415 of which grants municipalities numerous regulatory powers over public roads and squares.

An Act to promote good citizenship (R.S.Q., c. C-20), which is likely to apply to those who rescue or provide first-aid to those injured in an automobile accident.

Municipal Code of Québec (R.S.Q., c. C-27.1), article 631 of which grants municipalities regulatory powers over public roads and sidewalks.

An Act respecting explosives (R.S.Q., c. E-22), which establishes regulatory powers on the safe transportation of explosives.

Consumer Protection Act (R.S.Q., c. 40.1), certain provisions of which impact the automobile commerce, specifically used cars.

An Act respecting occupational health and safety (R.S.Q., c. S-2.1), the provisions of which apply to road construction worksites, where the work must sometimes be carried out while the road remains open to traffic.

An Act respecting roads (R.S.Q., c. V-9).

An Act respecting transport infrastructure partnerships (R.S.Q., c. P-9.001).

Expropriation Act (R.S.Q., c. E-24).

An Act respecting transportation services by taxi (R.S.Q., c. S-6.01).

Railway Act (R.S.Q., c. C-14.1).

An Act to ensure safety in guided land transport (R.S.Q., c. S-3.3).

An Act respecting the Agence métropolitaine de transport (R.S.Q., c. A-7.02).

An Act respecting the Société des traversiers du Québec (R.S.Q., c. S-14).

An Act respecting public transit authorities (R.S.Q., c. S-30.01).

An Act respecting intermunicipal boards of transport in the area of Montréal (R.S.Q., c. C-60.1).

An Act respecting the Société du port ferroviaire de Baie-Comeau-Hauterive (S.Q., 1975, c. 48).

Source: Transportation safety policy, road component, Ministère des Transports du Québec, 1995

APPENDIX 4
NATIONAL REGULATIONS MANAGED BY THE MINISTÈRE DES TRANSPORTS

REGULATIONS MANAGED BY THE MINISTÈRE DES TRANSPORTS

1. *Ministerial Order dated May 22, 10990 respecting the approval of weigh scales.*
2. *A Ministerial Order dated March 31 1999 respecting exemptions from stopping before crossing certain level crossings.*
3. *Vehicle Load and Size Limits Regulation*, applicable to road vehicles and vehicle combinations.
4. *Transportation of Dangerous Substances Regulation.*
5. *Regulation regarding cargo securement standards.*
6. *Regulation respecting all-terrain vehicles.*
7. *Regulation respecting snowmobiles.*
8. *Regulation respecting the training of drivers of buses and minibuses used for the transportation of schoolchildren.*
9. *Regulation respecting road vehicles used for the transportation of schoolchildren*, comprising minimum safety standards for buses and minibuses.
10. *Regulation respecting road vehicles adapted for the transportation of handicapped persons.*
11. *Regulation respecting road signs.*
12. *Regulation respecting special permits.*
13. *Special Road Train Operating Permits Regulation.*
14. *Regulation respecting the provision of road service or towing on certain roads and autoroutes and on certain bridges or other infrastructures.*
15. *Regulation respecting petroleum products and equipment.*
16. *Regulation respecting roadside advertising.*
17. *Regulation respecting the transport of passengers by water.*
18. *Bus Transport Regulation.*
19. *Regulation respecting transport by taxi.*

Source: Transportation safety policy, road component, Ministère des Transports du Québec, 1995

APPENDIX 5

NATIONAL REGULATIONS ADMINISTERED BY THE SOCIÉTÉ DE L'ASSURANCE AUTOMOBILE DU QUÉBEC

REGULATIONS ADMINISTERED BY THE SOCIÉTÉ DE L'ASSURANCE AUTOMOBILE DU QUÉBEC

1. *Regulation respecting protective helmets for persons riding motorcycles, mopeds or snowmobiles and for their passengers.*

2. *Regulation respecting the Reciprocal Agreement between the State of New York and Québec concerning Driver's Licences and Traffic Offences.*

3. *Regulation respecting a Memorandum of Understanding between the Ministère of National Defence (Canada) and Le ministère des Transports du Québec concerning Driver's Licences and certain Criminal Traffic Offences.*

4. *Regulation respecting a Reciprocal Agreement between the Province of Ontario and Québec concerning Driver's Licences and Traffic Offences.*

5. *Regulation respecting an agreement between the Gouvernement du Québec and the Government of the State of New York respecting the mechanical inspection of buses.*

6. *Regulation respecting costs and procedure in penal matters.*

7. *Regulation respecting hours of driving, hours of work and the heavy vehicle driver's record.*

8. *Regulation respecting road vehicle registration.*

9. *Regulation respecting access to driving a road vehicle in connection with the health of drivers.*

10. *Regulation respecting licences.*

11. *Regulation respecting demerit points.*

12. *Regulation respecting accident reports.*

13. *Regulation respecting the Canadian Agreement on Vehicle Registration.*

14. *Regulation respecting the Vehicle Registration Reciprocal Agreement between the Gouvernement du Québec and the Government of New Brunswick.*

15. *Regulation respecting reciprocal commercial vehicle registration agreements between the Gouvernement du Québec and certain American states.*

16. *Regulation respecting attendance allowances and other expenses of the members of the Comité consultatif médical et optométrique.*

17. *Regulation concerning the exchange of driver's licences between the Gouvernement du Québec and the Gouvernement de la République française.*

18. *Regulation respecting emergency vehicles, vehicles equipped with flashing or rotating amber lights and mopeds for handicapped persons.*

19. *Regulation respecting safety standards for road vehicles.*

20. *Regulation respecting identification stickers for using parking spaces reserved for handicapped persons.*

21. *Regulation respecting dealers and recyclers.*

22. *Regulation respecting fees exigible under the Highway Safety Code and the return of confiscated objects.*

23. *Regulation respecting Permanent Impairments.*

24. *Order respecting the approval of certain types of traffic lights, including mechanical.*

25. *Regulation respecting breath screening devices.*

Source: Transportation safety policy, road component, Ministère des Transports du Québec, 1995

APPENDIX 6
NATIONAL FEDERAL TRANSPORTATION LAWS AND REGULATIONS

FEDERAL LAWS AND REGULATIONS

1. *An Act to promote public safety in the transportation of dangerous goods* (S.C. 1992, c. 34).

2. *Motor Vehicle Safety Act* (R.S.C., c. M-10).

3. *Motor Vehicle Tire Safety Act* (R.S.C., c. M-11).

4. *Bridges Act* (R.S.C., c. B-8), which includes provisions as regards bridge safety inspections, and if necessary, the closing of bridges.

5. *An Act respecting motor vehicle transport by extra-provincial undertakings* (R.S.Q. (1985), chapter 29, 3rd supplementary), which provides, in article 9, that users requesting extra-provincial licenses must be competent as regards safety, and have received a certificate in this regard by the Vice-President of the *Highway Safety Code.*

6. *Criminal Code* (R.S.Q., c. 46), with provisions regarding reckless driving, criminal negligence and impaired driving that are critical to road safety.

7. *Transportation of Dangerous Goods Regulations* (SOR/2001-286, August 1, 2001), which also address materials handling and demand for transportation services in the area of dangerous goods.

8. *Motor Vehicle Safety Regulations* (C.R.C., chap. 1038).

9. *Motor Vehicle Tire Safety Regulations, 1995.*

Source: Transportation safety policy, road component, Ministère des Transports du Québec, 1995

APPENDIX 7
STUDY ON ROAD ACCIDENTS IN NORD-DU-QUÉBEC
(NETWORK OF NON-STATUS, MUNICIPAL, FOREST AND MINING ROADS)

Technical Study

Study on Road Accidents in Nord-du-Québec (Network of non-status, municipal, forest and mining roads)

WORKING DOCUMENT

Transports
Québec
September 2005

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ACKNOWLEDGEMENTS

We wish to thank all those who were instrumental in shaping this document through their comments and suggestions.

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ACRONYMS

HSC	Highway Safety Code
PDO	Property Damage Only
MBJ	Municipalité de Baie-James
MRN	Ministère des Ressources naturelles
MTQ	Ministère des Transports du Québec
SAAQ	Société de l'assurance automobile du Québec

NOTICE TO THE READER

Unless the context indicates otherwise the words and expressions listed below have the following meaning:

Technical Study	**This technical study has no scientific value. It is not an opportunity study, nor an exhaustive research on the subject dealt. This study aims to paint a summary portrait of the situation with regard to road transportation in Nord-du-Québec. Despite the internal character of this study, the Ministère is nevertheless pleased to make this document available.**
Ministère	**Ministère des Transports du Québec**

All words printed in italic in this text are listed in the glossary, except for laws, regulations and work titles.

SUMMARY

This technical study analyses traffic accidents that occurred on *non-status*, municipal, forest and mining roads in Nord-du-Québec, within a process leading up to the elaboration of the *Transportation Plan of Nord-du-Québec*. The study was conducted on the basis of information found in the SAAQ data bank of accident reports that were completed between January 1, 1995, and December 31, 1999. In total 2 591 accidents were reported on the roads under study during that period.

The road network under study is very vast. It accounts for 10 484 kilometers, of which approximately 9 000 kilometers are forest roads. To that number are added municipal roads, private roads and mining roads. The longest roads of this network are the James Bay Road (620 kilometers) and the Transtaïga Road (582 kilometers). The 1 247 kilometers of roads under MTQ management, including the Route du Nord and the access road to Oujé-Bougoumou, are covered by another study. In 1997, there were 12 487 registered vehicles in Nord-du-Québec, including only 128 in Nunavik.

Portrait of the Road Safety Situation in Nord-du-Québec

Out of 2 591 accidents, 353 (13.6%) caused bodily injuries. More than half (51.7%) took place in the James Bay enclaved cities (Chibougamau, Chapais, Matagami and Lebel-sur-Quévillon), where traffic is heavier and the number of conflicts higher. Often they are minor accidents causing property damage only.

The little number of accidents taking place in Nunavik could probably be explained by the low traffic flow and by the fact that many accidents are not declared, particularly those with material damages only.

On the roads under study, 183 accidents causing bodily injuries (51.8% of accidents with injuries) occurred outside agglomerations. It appears that accidents outside agglomerations cause more severe injuries, probably due to the intensity of the impact caused by high driving speed.

Accidents occur mainly in fair weather. A minority of accidents (20.6%) took place in condition of snow, rain, flurries, fog, high-velocity winds and ice rain. Nonetheless, accidents were more frequent from January to March (872 accidents out of 2,591, or 33.7%).

Accidents causing injuries mostly happened on a dry road, and most accidents causing property damage occurred on snow-covered or icy roads. It is known that drivers are inclined to drive faster on a dry road, and that speed plays a key role in the severity level of accidents.

For 57% of accident reports for which information is available, the top factors in road accidents are (1) inattention or distraction (386 accidents or 14.9%), and (2) careless driving and speed (211 accidents or 8.1%). In 69 cases (2.9%) impaired driving was

identified as the primary factor. Most accidents due to impaired driving took place in Nunavik.

Significant elements

The elements that came out more significantly in the study (in random order) are:

- The low number of accidents per kilometers can be explained by the extensive road network and low vehicle flow.
- Many accidents causing bodily injuries occur in little inhabited areas (51.8% of accidents took place outside agglomerations).
- Weather conditions prevailing in the region play a significant role in accident occurrences: nearly 52% of accidents occurred on snow-covered or icy roads.
- Long distances may cause fatigue, sometimes resulting in driver inattention. Given the long distances to cover, drivers are more likely to pick up speed.
- The large number of oversized heavy trucks on James Bay roads may contribute to increase safety problems, because of dust and rocks lifted up by their passage.
- The frequent use of off-road vehicles on town streets fosters increase of road vehicle accidents involving off-road vehicles. That is particularly true in Nunavik. In this context, streets are less safe, for they were not designed for common flow of these two vehicles.
- The *Highway Safety Code* does not fully apply to certain roads.

Avenues of Intervention to Improve Road Safety

Some actions can be considered as to make *non-status*, municipal, forest and mining roads of Nord-du-Québec safer. Such actions include:

- Conducting an awareness campaign intended for road users on risks of driving on James Bay roads: icy roads, isolated roads, long distances, heavy trucks, oversized trucks, etc.
- Suggesting new facilities and equipment: inspection areas for heavy trucks, kilometer posts, emergency phones, new road signs, etc.
- Improving visibility conditions on gravel and durt roads in order to improve safety. Such measure can also minimize mechanical problems related to dust.
- Clarifying the application of the *Highway Safety Code* while taking into account the specific characteristics of the roads in James Bay territory.
- Suggesting to the municipalities to regulate off-road vehicles traffic on municipal roads, and to bring changes to town road design and signing for safer cohabitation of road and off-road vehicles.

INTRODUCTION

This technical study analyses the road accidents that occurred on *non-status*, municipal, forest and mining roads in Nord-du-Québec and lies within the development process of the *Transportation Plan of Nord-du-Québec*. The roads under MTQ management, including the Route du Nord and the access road to the Cree community of Oujé-Bougoumou, are being dealt with in another study entitled *Safety Report for MTQ Roads*.

The main purpose of this study consists in analyzing the road accidents reported between January 1, 1995, and December 31, 1999, and registered in the data bank of the *Société de l'assurance automobile du Québec* (SAAQ).This analyze of road accidents allows for theories on the causes of the accidents that occurred in that time bracket.

In total, 2 591 road accidents on *non-status*, municipal, and forest roads were reported between 1995 and 1999. Each accident involved at least one road vehicle (automobile, *light truck*, heavy vehicle, motorcycle, etc.). Accidents involving off-road vehicles (ORV) only were dealt with in a separate technical study entitled *Overview of Safety in the Use of Off-road-Vehicles*. This study thus covers ORV accidents involving road vehicles.

This report divides in four sections. Section 1 briefly describes the region, its transportation network, population and number of moving vehicles. Section 2 draws a portrait of road vehicle safety on the road network under study, and provides accident theories. Sections 3 and 4 list the strengths and weaknesses of the road network with regard to road vehicle safety, and suggest avenues of solution for the future. It is noteworthy that the study entitled *Profile of the Networks, Infrastructures, Operations and Management of Road Transport in Nord-du-Québec* is complementary to this study.

1. CONTEXTUAL BACKGROUND OF THE NORD-DU-QUÉBEC REGION

1.1 Territory and Population

Occupying 55% of the surface of Québec, Nord-du-Québec is spread out over 840 178 km^2 (Map 1). Bordered to the east by Labrador and Côte-Nord, to the south by the Saguenay-Lac-Saint-Jean, Mauricie and Abitibi-Témiscamingue and to the west by Ontario, Nord-du-Québec is also surrounded by the James bay, Hudson Bay, Hudson strait and Ungava bay. According to the 2001 census, the total population of Nord-du-Québec was be of 38 575 people, thus 0.5% of the Québécois population. In 2004, the population was of 39 234 people.

The region comprises two distinct territories: north of the 55th parallel, Nunavik covers nearly 490 000 km^2 for a population of 10 410 inhabitants (Statistics Canada, 2001). The population is gathered in 14 Inuit municipalities and a Cree village located along the coasts of Hudson Bay, Hudson strait and Ungava Bay. There are Kuujjuarapik, Umiujaq, Inukjuak, Puvirnituq, Akulivik, Ivujivik, Salluit, Kangiqsujuaq, Quaqtaq, Kangirsuk, Aupaluk, Tasiujaq, Kuujjuaq, Kangiqsualujjuaq and of the Cree village of Whapmagoostui.

Between the 49th and 55th parallel, covering approximately 350 000 km^2, we find the territory of James Bay. This territory consists of the Municipalité de Baie-James (MBJ), of category I lands as defined by the James Bay and Northern Québec Agreement (JBNQA), as well as enclaved towns in the MBJ, thus Chibougamau, Chapais, Lebel-sur-Quévillon and Matagami. The Municipalité de Baie-James includes the localities of Radisson, Villebois and Valcanton (merge of Val-Paradis and Beaucanton), the hamlets of Miquelon, Desmaraisville and Rapide-des-Cèdres, as well as a vast wide spread little inhabited. In total, the MBJ and the enclaved towns count 16 314 people (Statistics Canada, 2001). As for the category I lands, defined by the JBNQA as being of exclusive use of the Crees and where are located the Cree villages, it counts 11 851 people divided in eight communities: Mistissini, Oujé-Bougoumou, Waswanipi, Nemaska, Waskaganish, Eastmain, Wemindji and Chisasibi.

The only Naskapi village, Kawawachikamach, is located at about fifteen kilometres at the north-east of Schefferville. It takes part of the Côte-Nord region (09), but the community has the use of category IB and II lands located in Nunavik, under the terms of the North-Eastern Québec Agreement (NEQA).

Transports Québec

Coordination du Nord-du-Québec

Map 1: Territory under Study

Transportation Plan of Nord-du-Québec

Study on Road Accidents in Nord-du-Québec (Network of non-status, municipal, forest and mining roads)

Source:
- Ministère des Transports du Québec

Basic map:
- Ministère des Ressources naturelles, digital maps, scale 1 : 250,000 and 1 : 8,000,000

September 2005

Land regime

(category I)	(category II)
Cree	
Inuit	
Naskapi	

Note: The limits of the Oujé-Bougoumou territory are defined under the Cree-Québec Agreement of February 7, 2002.

Administrative limit

- Municipalité de Baie-James
- South limit Nord-du-Québec region
- Other Québec regions

Others

- Railway
- City, village or town

Road

Financial responsability

- MTQ - National, regional, collector
- MTQ - Acces and mining
- MTQ - Other roads *
- Hydro-Québec

* Financial responsability for maintenance only

Airport

Financial responsability

- Ministère des Transports
- Transport Canada
- Hydro-Québec
- Cree council / Municipality
- Other

1.2 Road Network Under Study

This study covers the entire road network which is not under the jurisdiction of MTQ. This road network represents 10 484 kilometers of counted roads, of which approximately 8 600 kilometers are forest road and 1 800 kilometers are non-status road. The latest are:

Route de la Baie-James (Matagami-Radisson), Transtaïga road, and access roads to the communities of Waskaganish, Eastmain, Wemindji, Chisasibi and Nemaska (map 2 and table 1).

The network under study that is not counted includes municipal roads[1], private roads and mining roads, except the 98-kilometer road to Raglan mine.

1 Including airport roads

Transports Québec

Coordination du Nord-du-Québec

Map 2: Nord-du-Québec Road Network

Transportation Plan of Nord-du-Québec

Study on Road Accidents in Nord-du-Québec (Network of non-status, municipal, forest and mining roads)

Source:
- Ministère des Transports du Québec

Basic map:
- Ministère des Ressources naturelles, digital maps, scale 1 : 250,000 and 1 : 8,000,000

September 2005

Road Network

Financial Responsability: Transports Québec
- Superior network and resources access road paved/gravel
- Non-status gravel road *

* Financial responsability for maintenance only

Financial Responsability: Hydro-Québec
- Non-status paved road
- Non-status gravel road
- Other road paved/gravel

Financial Responsability: Other
- Non-status gravel road
- Main forest road
- Mining road/secondary mining road
- Local road

Administrative limit
- Municipalité de Baie-James
- South limit Nord-du-Québec region
- Other Québec regions

Others
- Railway
- City, village or town

Table 1
CHARACTERISTICS OF THE COUNTED ROAD NETWORK UNDER STUDY

Use Type	Road Name	Number of Kilometers	Road Type	Financial Responsibility
National	James Bay Road (Matagami – Radisson)	620.3	Asphalted	Hydro-Québec (non-status)
Collector	Waskaganish Road (77km) (1-B, II & III lands)	102.0	Gravel	MTQ (non-status)
	Eastmain Road	103.5	Gravel	MTQ (non-status)
	Wemindji Road	95.7	Gravel	MTQ (non-status)
	Chisasibi Road	90.6	Mostly asphalted	Hydro-Québec (non-status)
	Nemaska Road	148.0	Gravel	Hydro-Québec (non-status)
Access to Resources	Transtaïga Road	582.1	Gravel	Hydro-Québec (non-status)
Class	**Road Name**	**Number of Kilometers**	**Road Type**	**Financial Responsibility**
Forest Road	Forest roads, numbered	2,219.4	Gravel	Timber company
	Other forest roads, unnumbered	6,424.7	Gravel	Timber company and other users
Mining Road	Raglan Road (Deception Bay to Purtuniq)	64.0	Gravel	Raglan
Secondary Mining Road	Raglan Road (Purtuniq to Kattiniq)	34.0	Gravel	Raglan
	Total km:	10,484.3		

Source: Ministère des Transports

Note 1: Data on forest roads were obtained from the Direction de l'assistance technique, Ministère des Ressources naturelles, in Québec.

1.3 Road Vehicles in Nord-du-Québec

To determine the number of registered vehicles in Nord-du-Québec, it is necessary to consult the data bank of the *Société de l'assurance automobile du Québec* (SAAQ). The data shown in the following table dates back to the year 1997 (reference year). The table identifies the number of road vehicles on James Bay and Nunavik roads. Vehicle registration data by municipality or village was not available.

The SAAQ registration data divides in two categories. Category one, passenger vehicles, includes cars, light trucks (minivans, pick-up trucks, all-purpose vehicles (4x4)), motorcycles and mopeds. Category two is composed of institutional, professional and commercial vehicles.

With regard to passenger vehicles, it is noteworthy that there are more *light trucks* than automobiles (4,985 *light trucks vs.* 4,875 automobiles in 1997) on the roads of Nord-du-Québec. That is characteristic of Nord-du-Québec.

It is evident that for the number of registered vehicles is inferior to that of the actual number of vehicles on Nord-du-Québec roads, particularly in Nunavik where only 128 vehicles are registered.

TABLE 2
NUMBER AND TYPE OF REGISTERED ROAD VEHICLES IN 1997, JAMES BAY AND NUNAVIK

Territory	Passenger Vehicle	Institutional • Professional • Commercial	Total
Nunavik	96	32	**128**
James Bay	10,132	2,227	**12,359**
Total in Nord-du-Québec	**10,228**	**2,259**	**12,487**

Source: Société de l'assurance automobile du Québec (May 1998), *Dossier statistique, bilan 1997, Accidents, parc automobile, permis de conduire*, p. 186-188.

1.4 Road Network Users

The number of registered vehicles in Nord-du-Québec gives an order of magnitude of the road network users. It is noteworthy that the network is also used by a large number of users from outside the region, except for Nunavik, which does not connect to Québec road network.

In 1996, 84,392 vehicles[2] were driven on James Bay Road: 45% for forest development, 30% by permanent residents, 7% by hunters and anglers, 3% for public services, and 16% by other users. Since there are no timber activities north of kilometer 170, the traffic flow and user profile are different[3].

So far no traffic census has been completed for the Transtaïga Road. It appears to be used mostly by hunters (outfitter customers), Hydro-Québec employees, mining companies, and Cree villages residents to access their traplines.

2 Ministère des Transports du Québec, Internal document, 2002.
3 Idem.

2. PORTRAIT OF ACCIDENTS INVOLVING ROAD VEHICLES ON NON-STATUS, MUNICIPAL, FOREST AND MINING ROADS

2.1 Profile of Accidents

This section paints a portrait of the accidents that occurred in Nord-du-Québec and involved at least one road vehicle. Lets keep in mind that this study is about the accidents that occurred outside the network under MTQ management, i.e., accidents that took place on *non-status* roads, municipal streets, and forest and mining access roads. This portrait is reflective of the information found in the SAAQ data bank on accident reports reported between January 1, 1995 and December 31, 1999. In total, 2,591 road vehicle accidents were reported during that period.

The information found in the accident reports comes from the data bank. The MTQ has developed a safety diagnosis software (DSR) that efficiently processes the data. Main accident characteristics can be obtained by data bank interrogation.

It is possible that some accidents have failed to be reported. The level of accuracy of information found in accident reports depends on police officers' interpretation, and for that reason prudence is advisable. Accident reports are often incomplete or imprecise. For instance, the scene of accident (type of road and place) is unknown in nearly 80% of reports. However the name of the municipality or village where accidents take place is always mentioned. Sometimes accidents causing bodily injuries (353 in total) were used as samples for this study rather than all of the accidents (2,591 in total), for accidents causing bodily injuries provide more details. Even so the field *Speed* is not completed in 8 *fatal accident* reports out of 19.

2.1.1 Number and Severity Rate

Out of 2,591 accidents, 353 caused bodily injuries (13.6%), light injuries in most cases (243 or 68.8%). In total 19 *fatal accidents* (5.4%) and 91 *severe accidents* (25.8%) were reported. The following table shows the number of accidents by severity rate and year.

TABLE 3
NUMBER AND SEVERITY RATE OF TRAFFIC ACCIDENTS, 1995-1999

Severity	1995	1996	1997	1998	1999	Total	Percent
Fatal	5	2	4	3	5	**19**	0.7
Serious	20	27	14	14	16	**91**	3.5
Minor	59	45	39	56	44	**243**	9.4
Property Damage Only	508	532	476	347	375	**2 238**	86.4
Total	**592**	**606**	**533**	**420**	**440**	**2 591**	**100**

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.2 Number and Severity Rate of Accidents by Territory

The accidents that occurred in Nunavik caused more bodily injuries (proportionately) than in the other territories covered by this study: 31.7% of accidents in Nunavik caused bodily injuries compared to 25.6% in the MBJ, 8.3% in Cree villages, and 7.5% in the enclaved cities. It is possible that the Inuit do not systematically report road vehicle accidents with PDO, but that information remains to be validated.

In total, the 353 accidents with bodily injuries made 537 victims (21 deaths, 132 seriously injured, 384 lightly injured – see table 6).

TABLEAU 4
NUMBER AND SEVERITY RATE OF TRAFFIC ACCIDENTS BY TERRITORY, 1995-1999

Territory	Fatal Accidents		*Serious Injuries*		Minor Accidents		PDO		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Enclaved Cities	1	5.3	19	20.9	81	33.3	1,238	55.3	1,339	51.7
MBJ	13	68.4	33	36.3	98	40.3	418	18.7	562	21.7
Cree villages	2	10.5	14	15.4	23	9.5	433	19.3	472	18.2
Inuit villages	3	15.8	25	27.5	41	16.9	149	6.7	218	8.4
Total	19	100.0	91	100.0	243	100.0	2,238	100.0	2,591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

TABLE 5
NUMBER OF VICTIMS OF TRAFFIC ACCIDENTS BY SEVERITY RATE BY TERRITORY, 1995-1999

Territory	Deceased		Seriously Injured		Lightly Injured		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
MBJ	15	71.4	65	49.2	190	49.5	270	50.3
Enclaved Cities	1	4.8	20	15.2	95	24.7	116	21.6
Cree villages	2	9.5	17	12.9	40	10.4	59	11.0
Inuit villages	3	14.3	30	22.7	59	15.4	92	17.1
Total	21	100	132	100	384	100	537	100

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.3 Location of Accidents by Road and Scene Category

The type of road or location where accidents occurred is presented in the following table. DSR data base interrogation (by road category) fails to provide accurate details on accident location: only 568 accident reports provide such information. For the 353 accidents that caused bodily injuries, however, the response rate is satisfactory (the scene of accident is not mentioned in only 6.8% of the reports). That explains why this sample will be used in the following analysis.

Based on the information available, 183 accidents with bodily injuries (51.8% of accidents with injuries) occurred outside agglomerations (type of location: roads, forest or mining roads, numbered roads) compared to 108 accidents (30.6%) in agglomerations (streets, parking lots, alleys)[4]. *Fatal accidents* mostly occurred outside agglomerations in a proportion of 79%. The accidents outside agglomerations caused more severe injuries, probably due to the speed of the traffic which increases the force of the impact.

4 In 17.6% of accidents causing bodily injuries, accident reports do not specify the scene of accident or simply mention *Other*. As a result it is not possible to know about the type of scene.

TABLE 6
LOCATION OF TRAFFIC ACCIDENTS BY SEVERITY RATE AND TYPE OF ROAD OR SCENE OF ACCIDENT, 1995 TO 1999

Type of Road or Scene	Fatal Accidents		Accidents Causing Severe Injuries		Accidents Causing Light Injuries		Total of Accidents Causing Bodily Injuries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Road [a]	11	57.9	30	33.0	66	27.2	107	30.3
Municipal Road	1	5.3	24	26.4	74	30.5	99	28.0
Forest/Mining Road	3	15.8	15	16.5	48	19.8	66	18.7
Other	3	15.8	14	15.4	21	8.6	38	10.8
Numbered Road	1	5.3	3	3.3	6	2.5	10	2.8
Parking Lot	0	0.0	1	1.1	5	2.1	6	1.7
Alley	0	0.0	0	0.0	3	1.2	3	0.8
Not specified	0	0.0	4	4.4	20	8.2	24	6.8
Total	19	100.0	91	100.0	243	100.0	353	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

a The *Road* category includes access roads to communities, airports, or Hydro-Québec roads.

Note: The field *type of road or scene* comes from information provided by the police officers in accident reports.

2.1.4 Injury Severity Rate in Relation to Displayed Speed

The following table identifies the speed displayed on the road where accidents causing bodily injuries occurred, thus allowing to observe the severity of injuries in relation to speed.

When available, this type of information reveals that *fatal or serious accidents* mostly take place on roads where the speed limit is 70 km/h and more. A higher proportion of accidents causing light injuries take place in agglomerations, where the speed limit is inferior to 50 km/h.

TABLE 7
SEVERITY RATE OF ACCIDENTS IN RELATION TO DISPLAYED SPEED, 1995-1999

Displayed Speed	Fatal Accidents		Accidents Causing Severe Injuries		Accidents Causing Light Injuries		Total of Accidents Causing Bodily Injuries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
10 km/h	0	0.0	0	0.0	1	0.4	1	0.3
20 km/h	0	0.0	1	1.1	2	0.8	3	0.8
30 km/h	0	0.0	2	2.2	10	4.1	12	3.4
40 km/h	1	5.3	10	11.0	16	6.6	27	7.6
50 km/h	0	0.0	7	7.7	20	8.2	27	7.6
60 km/h	0	0.0	2	2.2	4	1.6	6	1.7
70 km/h	5	26.3	12	13.2	33	13.6	50	14.2
80 km/h	1	5.3	3	3.3	13	5.3	17	4.8
90 km/h	3	15.8	2	2.2	9	3.7	14	4.0
100 km/h	1	5.3	13	14.3	22	9.1	36	10.2
Other	0	0.0	0	0.0	3	1.2	3	0.8
Not specified	8	42.1	39	42.9	110	45.3	157	44.5
Total	19	100.0	91	100.0	243	100.0	353	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.5 Number of Vehicles Involved

The following table identifies the number of vehicles involved in indexed road accidents.

Most road vehicle accidents (68.4%) involved another vehicle. In 20 cases, there were more than two vehicles involved. In 2 cases, there were 7 and 8 vehicles involved (Lebel-sur-Quévillon and Chibougamau).

TABLE 8
NUMBER OF VEHICLES INVOLVED IN TRAFFIC ACCIDENTS, 1995-1999

Number of Vehicles	Number of Accidents	Proportion (%)
1	800	30.9
2	1,771	68.4
3	17	0.7
4	1	0.1
5	0	0.0
6	0	0.0
7	1	0.1
8	1	0.1
Total	2,591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

Note: *Number of vehicles* is a field completed by police officers.

2.1.6 Type of Vehicles Involved

Indexed accidents involved more *light trucks* (minivan, pick-up truck, all-purpose vehicle 4x4) than automobiles, which is representative of the composition of the region's vehicle fleet (there are more *light trucks* than automobiles). Note that 40 to 45% of heavy vehicles are found on certain roads under study[5].

Of all types of vehicles, *light trucks* cause more victims. Table 11 shows that this type of vehicle was involved in nearly 47% of fatal accidents, 35% of accidents causing serious injuries, and 37% of accidents causing light injuries. We know that certain vehicles of this category (ex.: 4x4) are more subject to over-turning when they go off the road.

In fact, *light trucks* and automobiles are particularly concerned in accidents causing bodily injuries. They were involved in nearly 60% of fatal accidents, 56% of accidents causing serious injuries, and 64% of accidents causing light injuries. Those vehicles contributed more to accidents involving bodily injuries than any other types of vehicles.

5 Ministère des Transports, Internal document, 2002.

TABLE 9
TYPE OF VEHICLES INVOLVED IN TRAFFIC ACCIDENTS, 1995-1999

Type of Vehicles Involved	Number of Vehicles Involved	Proportion (%)
Light truck	1 675	37.4
Automobile	1 642	36.6
Not specified	321	7.2
Truck (other than light)	232	5.2
Road tractor	133	3.0
Tool vehicle	97	2.2
Snowmobile	69	1.5
Other	68	1.5
Bicycle	41	0.9
Taxi	36	0.8
Minibus	34	0.8
Motorcycle	30	0.7
Emergency vehicle	25	0.6
Equipment vehicle	23	0.5
School bus	12	0.3
Recreational vehicle	12	0.3
Vehicle for hazardous materials transport	11	0.2
Bus	9	0.2
Moped	8	0.2
All-terrain vehicle	5	0.1
Total	4,483	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

TABLE 10
NUMBER AND TYPE OF VEHICLES INVOLVED IN TRAFFIC ACCIDENTS BY SEVERITY RATE, 1995-1999

Type of Vehicles	Deceased		Seriously Injured		Lightly Injured		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Light truck	15	46.9	44	35.2	129	36.8	188	37.0
Automobile	4	12.5	26	20.8	97	27.6	127	25.0
Not specified	1	3.1	2	1.6	11	3.1	14	2.8
Truck (other than light)	2	6.3	10	8.0	12	3.4	24	4.7
Road tractor	4	12.5	8	6.4	18	5.1	30	5.9
Tool vehicle	2	6.3	2	1.6	5	1.4	9	1.8
Snowmobile	0	0.0	10	8.0	12	3.4	22	4.3
Other	1	3.1	1	0.8	13	3.7	15	3.0
Bicycle	1	3.1	5	4.0	29	8.3	35	6.9
Taxi	1	3.1	0	0.0	0	0.0	1	0.2
Minibus	0	0.0	1	0.8	4	1.1	5	1.0
Motorcycle	1	3.1	9	7.2	14	4.0	24	4.7
Emergency vehicle	0	0.0	0	0.0	2	0.6	2	0.4
Equipment vehicle	0	0.0	1	0.8	0	0.0	1	0.2
School bus	0	0.0	0	0.0	0	0.0	0	0.0
Recreational vehicle	0	0.0	3	2.4	1	0.3	4	0.8
Moped	0	0.0	3	2.4	3	0.9	6	1.2
All-terrain vehicle	0	0.0	0	0.0	1	0.3	1	0.2
Total of vehicles	32	100	125	100	351	100	508	100

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.7 Scene of Accident

Table 11 indicates the scene of accident by municipality or village. Accidents occur more often in enclaved cities, where traffic is heavier and conflicts more frequent (particularly at intersections). Also accidents frequently occur in MBJ due to the vastness of the road network. Only 218 accidents occurred in Nunavik over the five-year period covered by this study. That is partly due to the low traffic flow. Also, it seems that many accidents are not declared, more so when only material damages occurred. That situation is explained by the fact that most vehicles do not have insurance coverage.

There were more road vehicle accidents in Chibougamau (681 accidents); MBJ comes next (562 accidents).

TABLE 11
SCENE OF TRAFFIC ACCIDENTS, 1995-1999

	Location	Fatal Accidents		*Serious Accidents*		Minor Accidents		PDO		Total	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
MBJ and enclaved cities	MBJ	13	68.4	33	35.9	98	40.3	418	18.7	562	21.7
	Chapais	0	0	1	1.1	4	1.7	57	2.6	62	2.4
	Chibougamau	1	5.3	12	13.0	48	19.8	620	27.7	681	26.3
	Lebel-sur-Quévillon	0	0	5	5.4	22	9.1	441	19.7	468	18.1
	Matagami	0	0	1	1.1	7	2.9	120	5.4	128	4.9
	Total	14	73.7	52	56.5	179	73.7	1 656	74.0	1 901	73.4
Cree villages	Chisasibi	1	5.3	2	2.2	1	0.4	138	6.2	142	5.5
	Eastmain	0	0	0	0	4	1.7	9	0.4	13	0.5
	Mistissini	0	0	7	7.6	6	2.5	122	5.5	135	5.2
	Nemaska	0	0	2	2.2	1	0.4	17	0.8	20	0.8
	Oujé-Bougoumou	0	0	1	1.1	0	0	3	0.1	4	0.2
	Waskaganish	0	0	0	0	1	0.4	39	1.7	40	1.5
	Waswanipi	0	0	2	2.2	4	1.7	36	1.6	42	1.6
	Wemindji	0	0	0	0	1	0.4	57	2.6	58	2.2
	Whapmagoostui	1	5.3	0	0	5	2.1	12	0.5	18	0.7
	Total	2	10.5	14	15.2	23	9.5	433	19.4	472	18.2
Inuit villages	Akulivik	0	0	0	0	0	0	1	0.1	1	0.04
	Aupaluk	0	0	0	0	0	0	0	0	0	0
	Inukjuak	0	0	1	1.1	4	1.7	9	0.4	14	0.5
	Ivujivik	0	0	0	0	1	0.4	2	0.1	3	0.1
	Kangiqsualujjuaq	0	0	3	3.3	0	0	2	0.1	5	0.2
	Kangiqsujuaq	0	0	1	1.1	0	0	1	0.1	2	0.1
	Kangirsuk	0	0	1	1.1	2	0.8	9	0.4	12	0.5
	Kuujjuaq	0	0	11	12.0	21	8.6	71	3.2	103	4.0
	Kuujjuarapik	1	5.3	3	3.3	3	1.2	25	1.1	32	1.2
	Puvirnituq	1	5.3	2	2.2	3	1.2	9	0.4	15	0.6
	Quaqtaq	0	0	1	1.1	1	0.4	6	0.3	8	0.3
	Salluit	0	0	2	2.2	4	1.7	9	0.4	15	0.6
	Tasiujaq	1	5.3	0	0	0	0	0	0	1	0.04
	Umiujaq	0	0	0	0	2	0.8	5	0.2	7	0.3
	Total	3	15.8	25	27.2	41	16.9	149	6.7	218	8.4
	Total	19	100.0	91	100.0	243	100.0	2,238	100.0	2,591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.8 Ratio of Inhabitants per Accident

The following table highlights the relative importance of accidents by municipality or village, for it gives the ratio of inhabitants per reported accident.

There were many accidents in MBJ and in the enclaved cities of Nord-du-Québec in relation to the population: 1 accident per 10 inhabitants (1,901 accidents for 18,450 inhabitants). It is important to notice that the road network located in MBJ is used by a high number of users that are not counted in the population.

The situation was less worrisome in Cree (1 accident per 25 inhabitants) and Inuit (1 accident per 42 inhabitants) territory.

A few municipalities differentiated themselves from the others with a very low accident ratio (more accidents in relation to the population): MBJ (3), Lebel-sur-Quévillon (8) and Chibougamau (13).

It is noteworthy that those ratios must be considered with precaution given that some drivers involved in accidents can come from other regions. Also, let remember that some accidents are not reported, especially in Nunavik.

In some municipalities or villages, just a few accidents in relation to their population were reported - Akulivik, Kangiqsujuaq, Tasiujaq and Aupaluk - which is big no surprise given the distance covered by their respective road network.

TABLE 12
RATIO OF INHABITANT PER ACCIDENT, BY MUNICIPALITY, 1995-1999

Location		Number of Inhabitants (1997)	Number of Accidents 95-99	Ratio Inhabitants/ Accident
MBJ and enclaved cities	MBJ	1,812	562	3
	Chapais	2,061	62	33
	Chibougamau	8,791	681	13
	Lebel-sur-Quévillon	3,549	468	8
	Matagami	2,237	128	17
	Total	18,450	1,901	10
Cree villages	Chisasibi	3,394	142	24
	Eastmain	549	13	42
	Mistissini	2,428	135	18
	Nemaska	506	20	25
	Oujé-Bougoumou	498	4	125
	Waskaganish	1,597	40	40
	Waswanipi	1,156	42	28
	Wemindji	1,012	58	17
	Whapmagoostui	626	18	35
	Total	11,766	472	25
Inuit villages	Akulivik	456	1	456
	Aupaluk	173	0	-
	Inukjuak	1,278	14	91
	Ivujivik	298	3	99
	Kangiqsualujjuaq	692	5	138
	Kangiqsujuaq	505	2	253
	Kangirsuk	401	12	33
	Kuujjuaq	1,877	103	18
	Kuujjuarapik	580	32	18
	Puvirnituq	1,235	15	82
	Quaqtaq	267	8	33
	Salluit	945	15	63
	Tasiujaq	216	1	216
	Umiujaq	328	7	47
	Total	9,251	218	42
	Total	39,467	2,591	15

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.9 Accidents at Intersections and Off Intersections

Only accidents causing bodily injuries (353 accidents) were analyzed in the following tables, for the information found on their respective accident reports is generally more exhaustive. Accidents within a distance of 30 m from an intersection were considered as having occurred at an intersection.

One quarter of the accidents causing bodily injuries took place at an intersection. The highest proportion of accidents at intersections (27.5%) is in Nunavik. That is probably due to the fact that the road network in Nunavik is found in a populated area, the only exception being the road to the Raglan Mine.

TABLE 13
NUMBER OF ACCIDENTS INVOLVING INJURIES AT INTERSECTIONS AND OFF INTERSECTIONS, 1995-1999

	MBJ and Enclaved Cities		Cree villages		Inuit villages		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Intersection	63	25.7	7	17.9	19	27.5	89	25.2
Off Intersection	182	74.3	32	82.1	50	72.5	264	74.8
Total	245	100.0	39	100.0	69	100.0	353	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

Note: Accidents within 30 m from an intersection were considered as having occurred at an intersection.

At intersections, *fatal accidents* occurred less frequently (total of 4) than accidents causing light injuries (total of 63), as shown in table 15.

TABLE 14
NUMBER OF TRAFFIC ACCIDENTS AT INTERSECTIONS AND OFF INTERSECTIONS IN RELATION TO SEVERITY RATE, 1995-1999

	Fatal Accidents		Accidents with Severely Injured		Accidents with Lightly Injured		Total Accidents Causing Bodily Injuries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Intersection	4	21.1	22	24.2	63	25.9	89	25.2
Off Intersection	15	78.9	69	75.8	180	74.1	264	74.8
Total	19	100.0	91	100.0	243	100.0	353	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

Note: Accidents within 30 m from an intersection were considered as having occurred at an intersection.

2.1.10 Type of Impact

The following table lists 18 motor vehicle accident impacts and their respective frequency. The type of impact must be interpreted as the movement of the vehicle(s) prior the impact. Some accidents involved only one vehicle (codes 15, 16 and 88 - see table below). In more than 60% of accident reports, there is not enough information to identify the type of impact, either because that particular field was left blank or says code 88 or 99.

Lets note that within the 40% of accidents where the type of impact was mentioned, straight-line collision is the most frequent type of impact (codes 2, 3, 8, 10, 13 and 14 - see table below), with 207 accidents (8.0%). Side-impact turn collisions (codes 1, 4, 5, 6, 7, 11 and 12 - see table below) come next with 183 accidents (7.1%), followed by side-impact without turn collisions (code 9) with 178 accidents (6.9%).

TABLE 15
TYPE OF TRAFFIC ACCIDENT IMPACTS 1995-1999

Type of Impacts		Total	
Code	**Sketch[6]**	**Number**	**Percent**
1		30	1.2
2		7	0.3
3		106	4.1
4		32	1.2
5		5	0.2
6		4	0.2
7		42	1.6
8		9	0.3
9		178	6.9
10		84	3.2
11		37	1.4
12		33	1.3
13		0	0.0
14		1	0.0
15		144	5.6
16		157	6.1
88	**One vehicle except 15 and 16**	275	10.6
99	**Two vehicles except 1 to 14**	987	38.1
XX (not specified)	-	460	17.8
Total		2,591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

6 The information on the sketch was taken in road vehicle accident reports.

2.1.11 Type of Accident

The following table lists the accidents that caused bodily injuries only (353 accidents). The information on the type of accident is taken from the description of the "first event", according to the interpretation of the police officer. It indicates if an accident occurred between two motor vehicles, a motor vehicle and an animal, etc. The type of accident refers to many aspects of road safety, such as conflicts between vehicles, pedestrians, roadside safety.

Collisions with another motor vehicle represent more than one-quarter (25.5%) of all accidents with bodily injuries, followed by rollover accidents (21.5%) and off-road accidents (16.7%). An analysis of the overall accidents (2,591 accidents) reveals that the proportion of "collision with another road vehicle" type of accident represents 66.7%. That is probably due to the great number of fender-bender type of accidents in agglomerations. We also notice that a high proportion (91%) of road vehicle accidents involving pedestrians caused injuries.

TABLE 16
TYPE OF ROAD VEHICLE ACCIDENTS IN RELATION TO SEVERITY RATE, 1995-1999

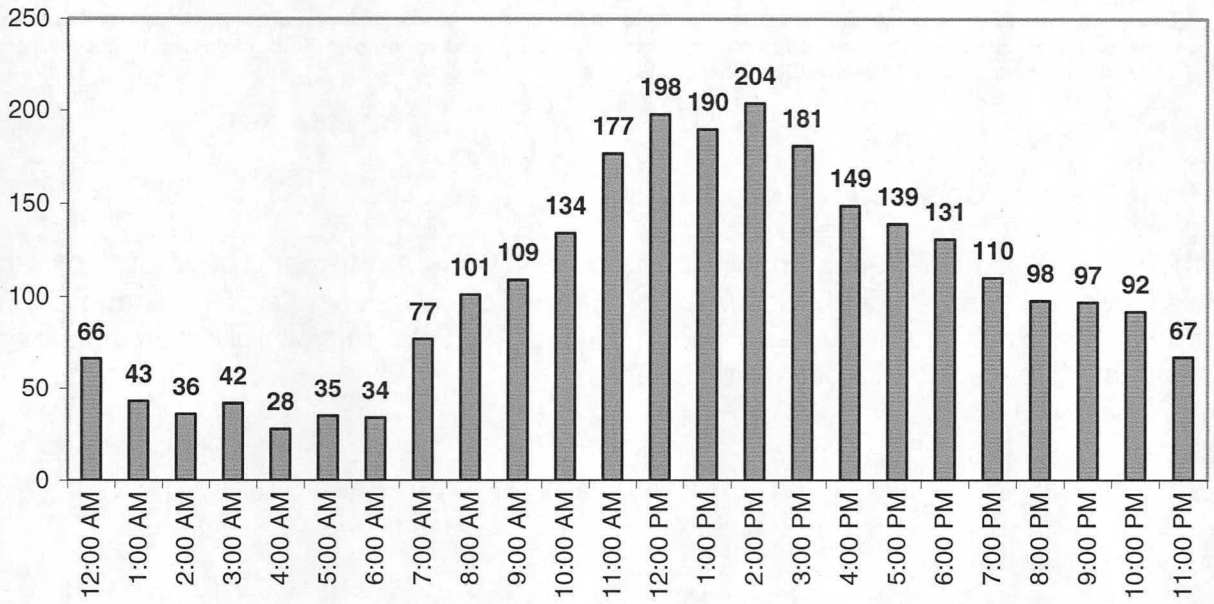
Type of accidents	Fatal Accident		Accident with Severely Injured		Accident with Lightly Injured		Total of Accidents Causing Bodily Injuries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Road vehicle	6	31.6	25	27.5	59	24.3	90	25.5
Rollover	4	21.1	23	25.3	49	20.2	76	21.5
Off-road	5	26.3	11	12.1	43	17.7	59	16.7
Pedestrian	1	5.3	16	17.6	25	10.3	42	11.9
Non-motorized	1	5.3	5	5.5	28	11.5	34	9.6
Other w/o collision	0	0.0	2	2.2	10	4.1	12	3.4
Fixed obstacles	1	5.3	5	5.5	4	1.6	10	2.8
Street lamps/posts	0	0.0	1	1.1	8	3.3	9	2.5
Temporary obstacle	0	0.0	1	1.1	1	0.4	2	0.6
Tree	0	0.0	0	0.0	2	0.8	2	0.6
Animal	0	0.0	0	0.0	2	0.8	2	0.6
Pillar (bridge, tunnel)	0	0.0	0	0.0	1	0.4	1	0.3
Parapet	0	0.0	0	0.0	1	0.4	1	0.3
Train	0	0.0	0	0.0	0	0.0	0	0.0
Submersion	0	0.0	0	0.0	0	0.0	0	0.0
Fire/explosion	0	0.0	0	0.0	0	0.0	0	0.0
Other: collisions or fixed objects	0	0.0	0	0.0	0	0.0	0	0.0
Not specified	1	5.3	2	2.2	10	4.1	13	3.7
Total	19	100.0	91	100.0	243	100.0	353	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.12 Time of Accident

The following figure indicates the time at which the accidents took place. Most of them occurred in the middle of the day (between 11 a.m. and 3:59 p.m.).

FIGURE 1
TIME OF TRAFFIC ACCIDENTS, 1995-1999



Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.13 Light Level

Road vehicle accidents mostly occur in daylight. Only 12.4% of accidents take place in darkness (at night or unlighted roads).

TABLE 17
NUMBER OF TRAFFIC ACCIDENTS IN RELATION TO LIGHT LEVEL, 1995-1999

	Light Level	Number of Accidents	Proportion (%)
Day	Daylight	1,660	64.1
Day	Half darkness	126	4.9
Night	Lighted road	390	15.1
Night	Unlighted road	322	12.4
	Not specified	93	3.6
	Total	2,591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.14 Weather Conditions

Although Nord-du-Québec is known for its severe winters, for many days of snow and violent winds, most accidents occur under clear or cloudy skies, i.e., 51.4% and 23.2% respectively. Snow, rain, flurries, fog, high winds and ice rain were circumstances in which only a few accidents occurred (20.6%).

TABLE 18
NUMBER OF TRAFFIC ACCIDENTS IN RELATION TO WEATHER CONDITIONS, 1995-1999

Weather Conditions	MBJ and Enclaved Cities		Cree villages		Inuit villages		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clear skies	945	49.7	249	52.8	138	63.3	1332	51.4
Cloudy skies	471	24.8	94	19.9	35	16.1	600	23.2
Snow/Hail	231	12.2	39	8.3	12	5.5	282	10.9
Rain/Drizzle	135	7.1	36	7.6	13	6.0	184	7.1
Flurries/Snowstorm	27	1.4	9	1.9	7	3.2	43	1.7
Fog/Haze	16	0.8	3	0.6	2	0.9	21	0.8
Other	5	0.3	12	2.5	0	0.0	17	0.7
High winds	3	0.2	7	1.5	4	1.8	14	0.5
Ice rain	7	0.4	1	0.2	1	0.5	9	0.4
Showers	1	0.1	1	0.2	0	0.0	2	0.1
Not specified	60	3.2	21	4.4	6	2.8	87	3.4
Total	1 901	100.0	472	100.0	218	100.0	2 591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.15 Road Surface Conditions

Road surface conditions have an impact on automobile adherence. Tables 19 and 20 provide indications on road surface conditions at time of accident (icy, wet, etc.). The first table concerns the 353 accidents with bodily injuries, and the second informs us about road surface conditions for the overall accidents by territory (2,591 accidents).

In Nord-du-Québec, the study reveals that accidents causing bodily injuries mostly occurred on a dry road (49.0% compared to 33.5% for the overall accidents). In addition severe winter conditions (snow-covered or icy roads) seem to be a factor of lesser importance in accidents causing bodily injuries (34.9% vs. 51.9% for the overall accidents). Speed could explain that fact, knowing that drivers tend to drive faster on a dry road. Also a high proportion of *fatal accidents* occurred (68.4%) on a dry road.

TABLE 19
NUMBER OF TRAFFIC ACCIDENTS IN RELATION TO ROAD SURFACE CONDITION AND SEVERITY OF INJURY, 1995-1999

Road Surface Condition	Fatal accidents		Accidents with Severely Injured		Accidents with Lightly Injured		Total of Accidents Causing Bodily Injuries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Dry	13	68.4	42	46.2	118	48.6	173	49.0
Snow-covered	3	15.8	12	13.2	52	21.4	67	19.0
Icy	1	5.3	15	16.5	40	16.5	56	15.9
Wet	0	0.0	17	18.7	24	9.9	41	11.6
Muddy	1	5.3	2	2.2	3	1.2	6	1.7
Other	1	5.3	2	2.2	2	0.8	5	1.4
Oily	0	0.0	0	0.0	0	0.0	0	0.0
Not specified	0	0.0	1	1.1	4	1.6	5	1.4
Total	19	100.0	91	100.0	243	100.0	353	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

TABLE 20
NUMBER OF TRAFFIC ACCIDENTS IN RELATION TO ROAD SURFACE CONDITION, 1995-1999

Road Surface Condition	MBJ and Enclaved Cities		Cree villages		Inuit villages		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Dry	664	34.9	130	27.5	74	33.9	868	33.5
Snow-covered	496	26.1	149	31.6	63	28.9	708	27.3
Icy	470	24.7	111	23.5	55	25.2	636	24.5
Wet	192	10.1	38	8.1	16	7.3	246	9.5
Muddy	17	0.9	9	1.9	6	2.8	32	1.2
Other	14	0.7	13	2.8	0	0.0	27	1.0
Oily	0	0.0	0	0.0	0	0.0	0	0.0
Not specified	48	2.5	22	4.7	4	1.8	74	2.9
Total	1 901	100.0	472	100.0	218	100.0	2 591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.16 Type of Road Surface

A little less than 44% of accidents causing bodily injuries occurred on asphalted roads vs. 41.6% on gravel roads. Further analysis would be required as to determine the influence of the type of road on the number and severity of accidents.

TABLE 21
NUMBER OF TRAFFIC ACCIDENTS IN RELATION TO TYPE OF ROAD SURFACE AND SEVERITY OF INJURY, 1995-1999

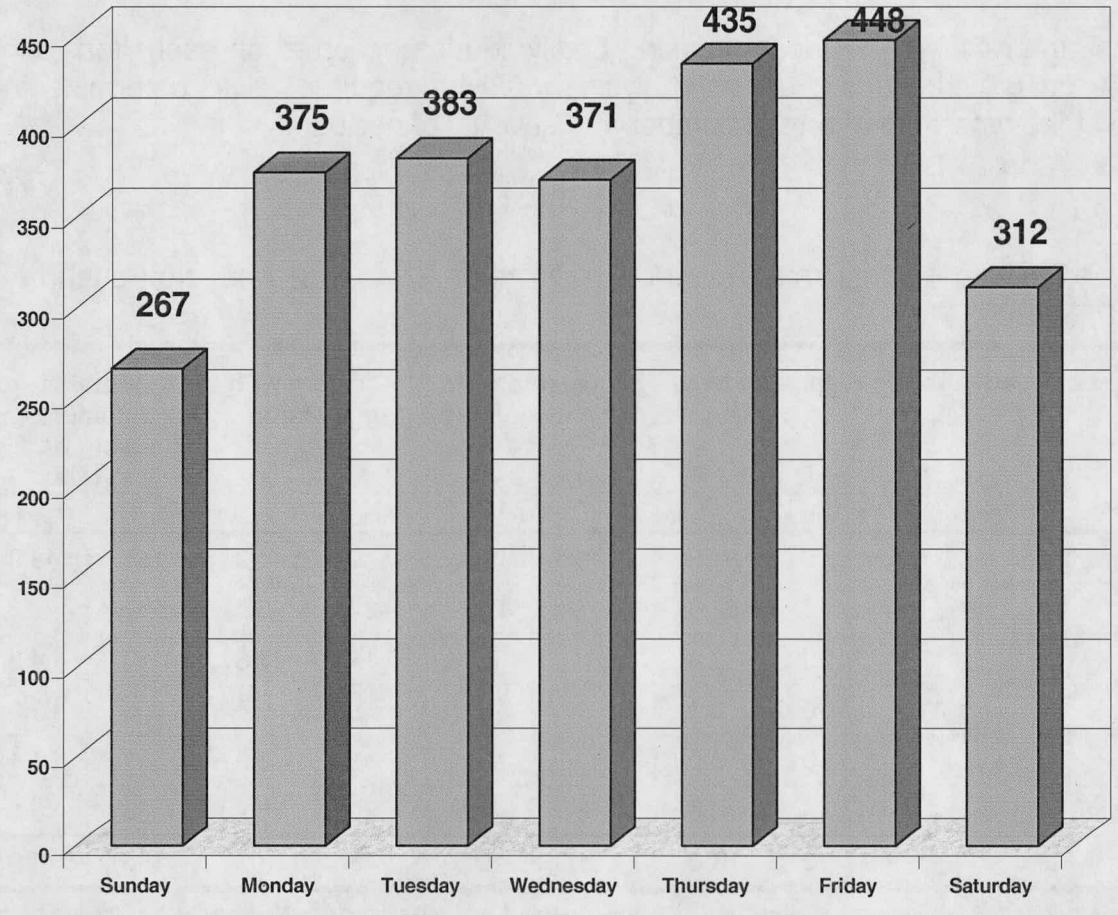
Type of Road	Fatal Accidents		Accidents with Severely Injured		Accident with Lightly Injured		Total of Accidents Causing Bodily Injuries	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Asphalt	6	31.6	40	44.0	109	44.9	155	43.9
Gravel	10	52.6	43	47.3	94	38.7	147	41.6
Dirt	3	15.8	3	3.3	11	4.5	17	4.8
Other	0	0.0	1	1.1	6	2.5	7	2.0
Concrete	0	0.0	1	1.1	3	1.2	4	1.1
Not specified	0	0.0	3	3.3	20	8.2	23	6.5
Total	19	100	91	100	243	100	353	100

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.17 Day of Accident

This study reveals that there are more accidents on Thursdays and Fridays and fewer on Saturdays and Sundays. That is perhaps due to the fact that road traffic flow slows down on weekends.

FIGURE 2
DISTRIBUTION OF TRAFFIC ACCIDENTS BY WEEKDAY, 1995-1999

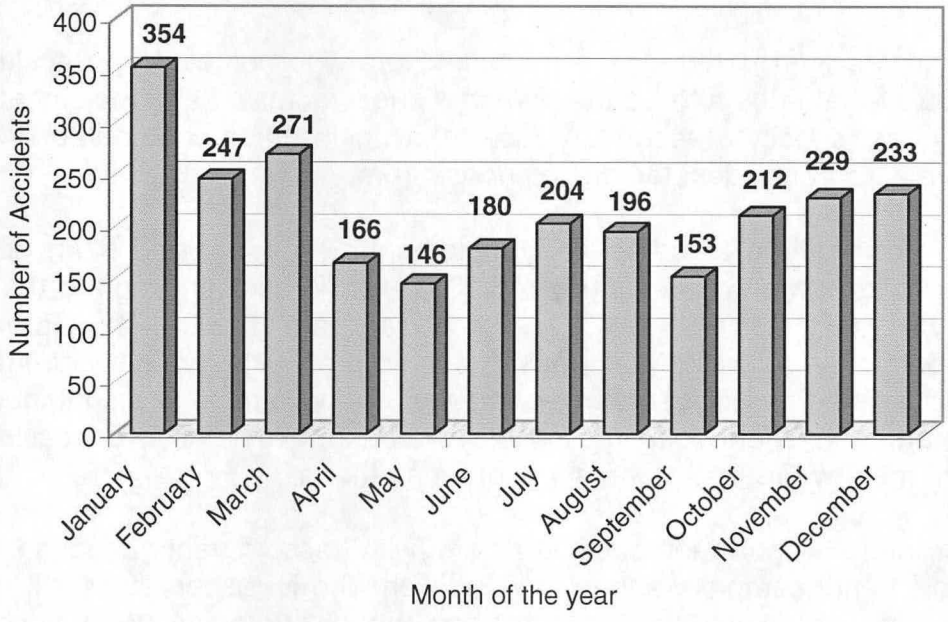


Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.18 Month of Accident

There are more accidents in January, February, and March (872 out of 2,591 accidents or 33.7%). That is probably due to winter weather conditions (see figure on following page). The proportion varies from one area to another (29.4% in Nunavik, 33.7% in MBJ and enclaved cities, and 35.6% in Cree villages). In Nunavik, accidents seem to space out more evenly throughout the year. Table 23 specifies the number of accidents by territory in relation to the month of the year.

FIGURE 3
DISTRIBUTION OF TRAFFIC ACCIDENTS BY MONTH, 1995-1999



Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

TABLE 22
DISTRIBUTION OF TRAFFIC ACCIDENTS BY MONTH, 1995-1999

Month	MBJ and Enclaved Cities		Cree villages		Inuit villages		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
January	266	14.0	68	14.4	20	9.2	354	13.7
February	176	9.3	52	11.0	19	8.7	247	9.5
March	198	10.4	48	10.2	25	11.5	271	10.5
April	106	5.6	39	8.3	21	9.6	166	6.4
May	118	6.2	19	4.0	9	4.1	146	5.6
June	129	6.8	32	6.8	19	8.7	180	6.9
July	155	8.2	40	8.5	9	4.1	204	7.9
August	138	7.3	35	7.4	23	10.6	196	7.6
September	110	5.8	23	4.9	20	9.2	153	5.9
October	155	8.2	37	7.8	20	9.2	212	8.2
November	171	9.0	38	8.1	20	9.2	229	8.8
December	179	9.4	41	8.7	13	6.0	233	9.0
Total	1,901	100.0	472	100.0	218	100.0	2 591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999

2.1.19 Accident Factors

CAUTIONARY NOTE

Causes of accidents are interpreted by the police officers who complete the accident reports. They indicate what seems to be the primary causal factor on a complementary report and, as required, specify a secondary factor that might have contributed to the accident. They have a list of accident factors to choose from.

Police officers are not required to complete complementary reports, and often don't. With regard to the road network under study, 43.8% of traffic accident reports do not specify any primary causal factor, and 59.4% any secondary causal factor. Therefore the study results provided in the following table must be interpreted with some discernment. For example, it is possible that accidents where alcohol or drug abuse is a contributing factor in accident are not reported, for police officers cannot mention it on accident reports unless confirmed by breathalyzer tests or other methods.

It is advisable to interpret accident causal factors with discernment, because the information available is not complete enough to establish who is responsible for it (is it the road vehicle driver's fault, the pedestrian's, the ORV driver's?) unless a complementary report clearly specifies it.

Results

The top 2 reported primary accident causal factors are inattention or distraction (386 accidents or 14.9%), and unsafe driving and speed (211 accidents or 8.1%).

Surprisingly, not far behind in primary accident causal factors, is illegal backward driving: 134 accidents or 5.2%: 3 occurred in Nunavik, 7 in Cree villages, and 124 in MBJ and enclaved cities. A partial analysis reveals that the accidents mostly occurred in agglomerations, chiefly in parking lots.

Impaired driving was reported the primary causal factors in 69 accidents. That represents 2.7% of all accidents reported. Based on the information found in accident reports, 33 accidents involving impaired driving occurred in Nunavik representing a high proportion (15%) of the accidents in that territory. In Cree villages, 3 cases (0.6%) were reported, and 33 others (1.7%) in MBJ and in the enclosed cities.

Most accidents were coded for a driver-related factor (or human factor), though a smaller but non-negligible number of accidents are not driver-related: road conditions (62), poor weather conditions (53), poor visibility — glare (42), mechanical disorders (brakes, headlights, flat tires, etc.) (38), animals on the road (22), and temporary road obstacles (11).

TABLE 23
PRIMARY AND SECONDARY CAUSAL FACTORS IN TRAFFIC ACCIDENTS, 1995-1999

Accident Causal Factors	Primary Factor		Secondary Factor	
	Number	Percent	Number	Percent
Inattention or distraction	386	14.9	208	8.0
Unsafe driving-speed	211	8.1	83	3.2
Other - specify	151	5.8	158	6.1
Illegal backward driving	134	5.2	71	2.7
Did not yield the right of way	80	3.1	49	1.9
Impaired driving	69	2.7	8	0.3
Poor road conditions	62	2.4	64	2.5
Weather conditions	53	2.0	116	4.5
Poor visibility, glare	42	1.6	32	1.2
Driving on the wrong side of road	25	1.0	9	0.3
Nothing to report – road user(s) condition	24	0.9	44	1.7
Non-respect of stop sign	23	0.9	11	0.4
Exceeded speed limit	22	0.8	22	0.8
Animal on the road	22	0.8	3	0.1
Driving too close to vehicle in front	19	0.7	15	0.6
Fatigue, sleep, sudden discomfort	17	0.7	10	0.4
Dangerous location	17	0.7	5	0.2
Other mechanical defects	16	0.6	3	0.1
Brake defect	13	0.5	7	0.3
Temporary obstacle on road	11	0.4	7	0.3
Pedestrian negligence	10	0.4	5	0.2
Non-conforming load	8	0.3	3	0.1
Hazardous passing or overtaking	7	0.3	1	0.0
Inadequate signs	5	0.2	9	0.3
Cyclist negligence	4	0.2	4	0.2
Flat tire	4	0.2	0	0.0
Trailer hitch defect	3	0.1	1	0.0
Driving under the influence – drugs, medication	3	0.1	0	0.0
Nothing to report (infrastructure)	2	0.1	5	0.2
Headlight defect	2	0.1	2	0.1
Inadequate track trace	2	0.1	1	0.0
Went through a red light	2	0.1	0	0.0
Poor lighting	1	0.0	9	0.3
No visible defect	1	0.0	4	0.2
Forbidden overtaking and passing	1	0.0	1	0.0
Faulty direction	1	0.0	0	0.0
Reduce intensity	1	0.0	0	0.0
Driving against traffic	1	0.0	0	0.0
Nothing to report (user behavior)	2	0.1	53	2.0
Nothing to report (other factors)	0	0.0	28	1.1
Physical defect	0	0.0	1	0.0
No factor noted	1,134	43.8	1,539	59.4
Total	2,591	100.0	2,591	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.20 Fatal and Serious Accident Causal Factors

Special attention was given to the 19 fatal accidents (one victim or more) and the 91 accidents with seriously injured (1 person or more). The following table lists the primary and secondary causal factors in *fatal accidents* and accidents causing serious injuries.

The table reveals that "unsafe driving-speed", "impaired driving" and "inattention or distraction" are factors that contributed most in *fatal accidents* or accidents causing serious injuries.

"Unsafe driving-speed", "impaired driving", and "fatigue, sleep or sudden discomfort" contributed much more often in serious accidents and fatal accidents than in accidents in general.

An analysis by territory reveals that "fatigue, sleep or sudden discomfort" is a factor that is almost exclusively observed in MBJ. The same applies to "unsafe driving and speed". The vast MBJ road network combined with the possibility to drive faster than on the other networks, mostly located in populated areas, can probably explain that.

In many cases (5 accidents out of 28) impaired driving was a contributing factor in *serious accidents* and *fatal accidents* reported in Nunavik. There is no specific observation with regard to *serious and fatal accidents* in Cree villages.

TABLE 24
PRIMARY AND SECONDARY CAUSAL FACTORS IN FATAL AND SEVERE INJURY ACCIDENTS, 1995-1999

Causal Factors	Primary Factors		Secondary Factors	
	Number	Percent	Number	Percent
Unsafe driving-speed	20	18.2	12	10.9
Impaired driving-alcohol	12	10.9	1	0.9
Inattention or distraction	11	10.0	9	8.2
Other - specify	8	7.3	8	7.3
Fatigue, sleep, sudden discomfort	7	6.4	2	1.8
Poor visibility, glare	5	4.5	2	1.8
Driving on the wrong wide of the road	4	3.6	1	0.9
Exceeded speed limit	3	2.7	4	3.6
Did not yield the right of way	3	2.7	1	0.9
Inobservance of stop sign	3	2.7	1	0.9
Weather conditions	2	1.8	3	2.7
Driving too close to vehicle in front	2	1.8	1	0.9
Other mechanical defects	2	1.8	0	0.0
Poor road condition	1	0.9	5	4.5
Pedestrian negligence	1	0.9	1	0.9
No mechanical defect	1	0.9	0	0.0
Hazardous passing or overtaking	1	0.9	0	0.0
Inadequate track trace	1	0.9	0	0.0
Reduce intensity	1	0.9	0	0.0
Nothing to report	0	0.0	7	6.4
Dangerous location	0	0.0	1	0.9
Cyclist negligence	0	0.0	1	0.9
No visible defect	0	0.0	1	0.9
Non-conforming load	0	0.0	1	0.9
Inadequate road signs	0	0.0	1	0.9
Poor lighting	0	0.0	1	0.9
No factor observed	22	20.0	46	41.8
Total	110	100.0	110	100.0

Source: Accident reports involving road vehicles on municipal, non-status and forest roads in Nord-du-Québec for the period extending from January 1, 1995, to December 31, 1999.

2.1.21 Accidents on Forest and Mining Roads

In total 75 accidents occurred on forest or mining roads, out of which 69 took place in the MBJ and in the enclaved cities, 4 in Cree villages, and 2 in Nunavik. The near totality of these roads is located in the MBJ.

Unsafe driving and speed were the most frequent accident factors (30) followed by "poor road condition" (19) and "inattention or distraction" (14). With regard to road surface condition, 42 occurred on a dry road, and 22 on snow-covered or icy roads.

There were 27 collisions with another road vehicle, 19 rollovers accidents, and 17 off-road accidents.

Out of the total number of accidents (75), 66 caused bodily injuries or death.

2.2 Theories Explaining some Accidents in Relation to with the Local Context

The following sections propose theories that can explain road accidents on *non-status*, municipal, forest and mining roads in Nord-du-Québec. This analysis covers the overall region of Nord-du-Québec, but specific characteristics were noted in the following places: Cree villages, Nunavik, MBJ and enclaved cities.

2.2.1 Driver-related Factors

Driver-related factors are by far the most significant causes of road accidents as evidenced by the top 4 frequently reported causal factors: inattention or distraction, unsafe driving-speed, illegal backward driving, impaired driving-alcohol. That also applies to Nord-du-Québec.

2.2.2 Significant Number of Accidents in Little Inhabited Areas

The Nord-du-Québec road network under study is characterized by its vastness and long distances through little inhabited areas. One can easily drive hundreds of kilometers before reaching an agglomeration. Most of the network running through little inhabited areas is part of MBJ: James Bay Road, Transtaïga Road and thousands of kilometers of forest and mining roads.

It is not possible to estimate accurately the number of accidents that occurred on the roads running through little inhabited areas in MBJ (James Bay Road, Transtaïga Road or Chisasibi Road), for such information was not available. However based on the "road category" code, a little more than half of accidents occurred on those roads.

2.2.3 Climatic Conditions and Road Maintenance

Considering all the accidents for which the information was available, "weather conditions" is stated as primary or secondary causal factors in 169 accidents out of 2,591. The majority of accidents occurred on a snow-covered or icy road (51.8%) as opposed to 33.5% on a dry road.

The climatic characteristics prevailing in Nord-du-Québec seem to have some incidence on the total of vehicle accident toll on the road network under study. Abundant snow, lengthy winter, high-velocity winds are among contributing elements in accident occurrences, though they do not seem to have any impact on their severity level. Accidents causing bodily injuries mostly occurred on a dry road.

High-velocity winds might have a significant impact on road conditions. Combined with frequent snow precipitations, high-velocity winds are likely to significantly deteriorate road conditions despite well-performed maintenance operations. The low rate of traffic flow has a negative effect on de-icing salt.

PHOTOGRAPH 1
TRANSTAÏGA ROAD IN WINTER, NEAR LAFORGE 2 DAM

Gilbert Fontaine, , © Le Québec en images, CCDMD.1997

Also, some gravel and dirt roads are affected by dust-related safety problems, but based on the information available, it is not possible to determine their extent. Dust has an impact on road safety, for it reduces visibility and produces vehicle breakdowns.

2.2.4 Long Distance Driving, Fatigue and Speed

Long and monotonous roads with never-changing landscapes, like the James Bay Road, can cause driver fatigue.

Only 27 accident reports identify sleep or sudden discomfort as primary or secondary causal factors. It is possible that fatigue due to long driving is in fact the contributing factor in accidents where "inattention or distraction" is mentioned as primary or secondary causal factor (594 accidents reports).

Given the distance to cover, it is possible that drivers have gotten into the habit of exceeding speed limits. 294 accidents reports indicate "unsafe driving-speed" as the primary or secondary causal factor.

2.2.5 Heavy Trucking on James Bay Roads

There is a great deal of freighting on the James Bay roads under study. Between 1995 and 1999, 365 accidents involved at least one heavy truck (code "truck other than light" and "road tractor"). That represents 8.1% of all vehicles involved in road accidents

It is possible that the presence of many trucks on the James Bay roads under study make people feel insecure: hazardous overtaking by passenger vehicles, reduced visibility, damaged roads, impatience, etc.

Oversized trucks on the roads under study are commonly used to transport merchandises, particularly tree-length wood. Their size (width and length) can also be a source of insecurity for road users. The number of accidents involving oversize trucks is unknown.

2.2.6 Local Habits Inherent to Remote Agglomerations

Nord-du-Québec agglomerations are isolated. If they connect by road, they are several tens of kilometers, sometimes several hundreds of kilometers apart. In such environment, drivers tend to develop local driving habits. Some of them might not be compatible with some of the *Highway Safety Code* safe driving principles and rules: failure to fasten seatbelts, presence of passengers in truck boxes, etc.

2.2.7 ORV in Agglomerations

Municipal roads in Nord-du-Québec are not designed for cohabitation of ORVs and road vehicles, and road signing is inadequate. As a result they are less safe. Between 1995 and 1999, 122 accidents involved off-road vehicles, with more than half in agglomerated areas[7]. Also 74 out of 2,591 road vehicle accidents involved at least one ORV (69 snowmobiles and four ATV).

7 Ministère des Transports du Québec, Direction de l'Abitibi-Témiscamingue–Nord-du-Québec, *Overview of Safety in the Use of Off-road Vehicles in Nord-du-Québec*, October 2002, p. 34.

2.2.8 Impaired Driving

Among the accident reports for which information was available, 77 identified "impaired driving" as a (primary or secondary) causal factor: 34 in Nunavik over a total of 218 accidents, representing 15% of the accidents which occurred in that territory.

Compared to Nunavik, "impaired driving" in Cree villages, MBJ and enclaved cities appeared to be a factor of lesser importance.

2.2.9 Inadequate Equipment

Consultation of the database used for the purpose of this study revealed that "inadequate road signs" was the primary or secondary factor in 14 accidents, "poor lighting" in 10 accidents, and "inadequate track trace" in 3 accidents. In most cases, there was no indication on the accident reports as to the type of road where the accidents occurred.

2.2.10 Enforcement of the Highway Safety Code

Presently the Highway Safety Code (HSC) does not fully apply to *non-status* roads or roads that belong to the *ministère des Ressources naturelles* (forest roads), since they are not ruled thereby[8]. However those roads are governed by certain provisions of the code by virtue of the *Act respecting owners and operators of heavy vehicles*, P-*30.3.*

This law provides for the application of sections of the HSC, including the following: driving permit, speed, hazardous behaviour, speed limit (70 km/h), seatbelts, mechanical check, breath analyzing, etc.

The speed limits in Nord-du-Québec are 100 km/h on James Bay Road, 80 km/h on Transtaïga Road, and 90 km/h on Chisasibi Road. Drivers frequently exceed those speed limits[9].

In a consultation tour organized for the Preanalysis of the *Transportation Plan of Nord-du-Québec*, some municipalities or villages south of the 55th parallel raised the issue of non-application of the *Highway Safety Code*. Given the increase in users of the Nord-du-Québec road network, it certainly would be in everyone's interest to enhance application of the HSC[10].

8 Ministère des Transports du Québec, Internal document, 2002.
9 Ministère des Transports du Québec, Internal document, 2003.
10 Ministère des Transports du Québec, Direction de l'Abitibi-Témiscamingue–Nord-du-Québec, *Plan de transport du Nord-du-Québec* : *Prédiagnostic*, juin 2001, p. 15.

3. Specific Strengths and Weaknesses Related to Road Safety on Road Networks Concerned

The following table lists the main strengths and weaknesses related to the safety of road vehicle drivers on *non-status*, municipal forest and mining roads.

Table 25
Specific Strengths and Weaknesses Inherent to Road Safety on the Road Network Under Study

Strengths	Weaknesses
• The James Bay roads under study were properly designed and built. With some exceptions, road signs are safe and comply with road standards. Asphalt is a positive safety aspect. • The ratio of inhabitants per accident in Nunavik (1 on 42) and Cree villages (1 on 25) seems relatively low compared to that of the MBJ and enclaved cities (1 on 10). It is known that many accidents are not reported, particularly in Nunavik. Furthermore, the road network located in MBJ is used by a high number of users that are not counted in the population. • The low traffic flow minimizes risks in road vehicle accidents.	• The non-application of certain provisions of the Highway Safety Code on most of the roads of the network under study can have an impact on road safety. • Severe climatic conditions in Nord-du-Québec can reduce road safety: icy roads, snow-covered roads, abundant snow, high-velocity winds, etc. • Despite the important use of ORVs in Nunavik municipalities, the streets are not developed for common use of road vehicles and ORVs. • Human factors cause many accidents: inattention and distraction, unsafe driving and excessive speed, impaired driving, etc. • Long distance driving can cause fatigue and different driving (speed, unsafe driving on icy roads). • Response time can be of some importance when accidents occur far away from service points. In addition low traffic and little means of communication can result in delays in emergency calls and aggravate the situation.

4. INTERVENTION LEADS TO IMPROVE ROAD SAFETY

The following section deals with avenues of intervention that should be considered in order to improve vehicle safety on *non-status*, municipal, mining and forest roads in Nord-du-Québec.

4.1 Interventions Leads

Education and Awareness

Hazards inherent to the James Bay road network: icy roads, long distance driving, speed, etc., can be the focus point of an awareness campaign intended for users: timber companies, residents, Hydro-Québec employees, etc.

Furthermore, users should be made aware of the significant presence of heavy traffic in Nord-du-Québec and of changes that need to be brought to make driving safer, particularly where oversize trucks are concerned.

Drink Drive campaigns must continue. However, they should be tailored to the reality of the local culture by using, for instance, the language spoken by the target clientele.

PHOTOGRAPH 2
OVERSIZE TRUCK ON JAMES BAY ROAD

MTQ, Anick Guimond, 2002

Improving Signing in Agglomerations

The municipal road signs, particularly in Cree villages, do not always meet safety standards: absence of road signs, deficient signing, non-conforming installation, etc.

To remedy the situation, local authorities must analyze the accidents likely related to deficient signing. Once they complete their analysis, they must take proper remedy measures, including installation of stop signs at certain intersections. In Nunavik, that procedure was completed by the local police force.

New Roadside Installations

In the course of the consultation tour, people asked for additional roadside heavy vehicle inspection areas. Carriers need to have access to safe areas for inspecting or cleaning[11] their vehicles. Installation of additional kilometer posts such as those along James Bay Road could improve road safety conditions.

Dust Reduction

Dust from gravel or dirt roads can have an impact on user's safety. Oiling them would enhance visibility conditions, and prevent mechanical troubles due to dust accumulation on parts.

Improving Road Conditions

It is necessary for authorities responsible for road maintenance to list on a regular basis all roads that need major repairs and are frequently used (road surface, bridges, culverts, etc.).

Additional Emergency Phones

There are several emergency phones along James Bay Road, but just a few along other roads[12]. Installation of emergency phones on those roads could prove useful. Emergency phones do not improve safety conditions itself, but can contribute to reduce response time and severity of injuries. They can make road users feel more secure. It is noteworthy that the cellular phone network in not available everywhere in James Bay and not at all in Nunavik. The radio communication network and satellite phones are functional.

11 Ministère des Transports du Québec, Direction de l'Abitibi-Témiscamingue–Nord-du-Québec, *Transportation Plan of Nord-du-Québec, Preanalysis*, June 2001, p. 16.

12 Ibid., p. 15.

4.2 Interventions Falling Under Provincial Authorities such as MTQ and Sûreté du Québec

The application of the *Highway Safety Code* on the James Bay road network is the main point to clarify in the coming years. It is necessary to target its integral application on most roads, and partial application on others in order to take particular conditions prevailing in Nord-du-Québec (forest transportation, off-road vehicles) into consideration, hence making police work easier. The Sûreté du Québec plays a significant role in road accident prevention.

4.3 Role of Municipalities and Regional Authorities

Municipalities have a significant role to play in improving road safety in agglomerations. Proper street layout (geometry, width, etc.), adequate signing and winter road maintenance are three elements that municipal authorities can control. A complementary analysis of accidents in agglomerated areas should contribute in making well-tailored interventions.

The Cree and Inuit police forces have the power to deliver infraction reports within their respective villages and on community access roads. They have an important role to play in preventing accidents. A portrait of accidents by village should help them sharpen the focus of their interventions.

The use of off-road vehicles in agglomerated areas, particularly in Nunavik, is a reality that must be taken into consideration. Municipalities have the power to authorize ORV traffic on municipal roads by regulating conditions, periods of time and types of vehicle.

CONCLUSION

The analysis of the data on the Nord-du-Québec road network reveals a low density of accidents given the vastness of the road network under study. In urban environments (MBJ locality and enclaved cities), it is believed that a significant portion of accidents result from wrong maneuvering in parking lots.

Based on the data analyzed for the purpose of this study, many accidents are related to long distance driving through non-agglomerated environments. The road accidents that caused bodily injuries occurred in little inhabited areas and involved *light trucks* (47%). Also regular users of the James Bay road network might find it hard after several hours to stay alert on long roads with never-changing landscapes. As a result they tend to drive much faster.

It is noteworthy that "impaired driving" is a causal factor that is more frequent in Nunavik than anywhere else on the road network under study.

Leads of intervention for upgrading the safety of users on the roads under study include users' awareness regarding particular driving habits in remote areas and impaired driving. Other leads for consideration in the implementation of the *Transportation Plan of Nord-du-Québec* include installation of signs in agglomerated areas, construction of safe roadside vehicle inspection areas, and identification of dust-control methods to be used on dirt and gravel roads. Nevertheless priority remains road users' awareness of the importance of adopting safe driving habits. In order to paint a true portrait of road accident occurrences in Nord-du-Québec and define safety orientations properly, it is essential for accident reports to be completed thoroughly.

GLOSSARY

Serious Accident

An accident in which at least one person is hospitalized as a result thereof.

Fatal Accident

An accident in which at least one person dies as a result thereof within eight days after the said accident occurs.

Light Truck

Any truck or derivative truck, including van and utility vehicles (4X4), with a gross weight of up to 3,000 kg.

Public Highway

The surface of land or of a structure, the maintenance of which is entrusted to a municipality, a government or one of its agencies, over part of which one or more roadways open to public vehicular traffic and, where such is the case, one or more cycle lanes are laid out, saving exceptions (*Highway Safety Code,* section 4.3).

Non-Status Road Network

Any road that is not considered a public highway within the meaning of the Québec *Highway Safety Code* and that does not correspond to a forest or mining road. The MTQ superior network roads and the municipal network are considered as public roads.

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APPENDIX

APPENDIX 1

LIST OF LEGAL PROVISIONS GOVERNING FOREST ROADS UNDER THE *ACT 430*

Section 35: Possession of registration certificate and certificate of insurance

Section 65: Driving permit required

Section 97: Possession of driving permit

Section 213: Vehicle in good working order

Section 320: Driving on the right lane of two-way traffic roads

Section 327: Dangerous speed or driving

Section 328: Speed limit (70 km/h)

Section 396: Seatbelts must be fastened (5 years of age and more)

Section 397: Seatbelts must be fastened (under 5 years old)

Section 471: Preventing load from moving, coming loose, compromising vehicle stability, reducing driver's sight, and covering headlights

Section 521: Mechanical inspection of hazardous vehicles

Section 636.1: Obligation to undergo breath analyzing tests

GRAPHISME : CONCEPTION GRAPHIQUE SIMAGRÉ