

TRANS Committee

2007 Interprovincial Roadside Truck Survey

Summary of Results

National Capital Region

February 2011



TRANS Committee Members:

City of Ottawa

Ville de Gatineau

Société de transport de l'Outaouais

Ministry of Transportation of Ontario

Ministère des Transports du Québec

National Capital Commission

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1. INTRODUCTION

1.1 Purpose of Report

This report summarizes the findings of the 2007 Interprovincial Roadside Truck Survey in the National Capital Region (NCR) – a truck travel ‘origin-destination’ survey that was conducted in the summer of 2007. The survey was conducted for two of the five interprovincial crossings in the NCR – the Chaudière and MacDonald-Cartier bridge, as the movement of “heavy trucks” is prohibited on the remaining three bridges – the Alexandra, Portage and Champlain bridges. The roadside intercept data collection method was used to gather the information.

The findings are presented in tabular and graphical format. The findings include heavy truck characteristics and interprovincial movement patterns in the NCR including origin and destination.

Extra precaution should be applied in the use of this survey data. The data represents truck movements using these two interprovincial bridges only and does not cover all regional¹ and interprovincial² truck movements. A region-wide Goods Movement Survey is best tool to analyze truck movements of this nature.

This report reflects the expanded survey results. To this end, the survey results were first subjected to rigorous editing, imputation, expansion, and validation process prior to their tabulation and summary.

1.2 Organization of Report

The report is organized into three chapters. The remainder of Chapter 1 presents a glossary of key terms to help understand the findings. Chapter 2 provides some background information on the survey and Chapter 3 presents key findings from the survey.

1.3 Glossary

The following is a glossary of key terms and their meaning as applied to this report:

Trip is a one-directional movement of a truck from one point (origin) to a second point (destination), for a single purpose. Trips are classified into three categories based on their point of origin and/or destination.

- Local trip which is also known as an “internal/internal” trip and has both an origin and destination within the NCR. For example, a trip from Hull to the west end of Ottawa would be a local trip;

¹ For example, trips from Toronto to Ottawa were not captured in this survey because these trips didn’t cross the interprovincial bridges.

² There are bridge crossings which fall outside the NCR boundary and are not part of this survey data.

- Inter-regional trip which is also known as either an “internal/external” or an “external/internal” trip and has either origin or destination within the NCR. In the case of “internal/external” trip, an origin is within the NCR and destination is outside the region. In case of “external/internal” trip, an origin is outside the NCR and destination is within the region. For example, a trip from Gatineau to Montreal (crossing the Ottawa River) would be an “internal/external” trip and a trip from Kingston to Gatineau would be an “external/internal trip”;
- Through trip which is also known as an “external/external” trip and has both an origin and destination outside the NCR. For example, a trip from Montreal to Maniwaki which crosses the Ottawa River would be a through trip.

Origin is the location where a trip begins. It is described in terms of a longitude and latitude, a traffic zone, or a district. All survey origins have been geo-coded for precision.

Destination is the location where a trip ends. It has similar attributes as the trip origin.

Peak periods are the times of the day when transportation system typically carries the maximum number of vehicle trips. They typically correspond to the morning (AM) or evening (PM) commuter peak periods. For the purpose of this report, the AM peak period corresponds to trips intercepted between 6:30 and 08:59. The PM peak period corresponds to trips intercepted between 15:30 and 17:59.

Midday off-peak period is the time between AM and PM peak periods and corresponds to trips intercepted between 09:00 and 15:29.

Night time period is the time between PM and AM peak periods and corresponds to trips intercepted between 18:00 and 6:29.

Heavy Trucks include any vehicle with dual tires on one or more rear axles. For the purpose of this report, heavy trucks are classified into three types:

- 2 axle straight trucks – which represent trucks with 2 axles and six wheels such as tow trucks, large (3/4 ton, 1 ton) pick up trucks, small vans, small dump trucks, etc.;
- 3+ (3 or more) axle straight trucks – which represent medium size single unit trucks such as large dump trucks, straight trucks, concrete mix trucks etc.;
- Tractor trailer trucks – which represents the largest trucks such as tractor trailer trucks, flat-bed trucks etc.

2. ABOUT THE SURVEY

2.1 Purpose of Survey

Origin-destination surveys are used worldwide to provide a detailed picture of current trip patterns for different travel modes, including heavy trucks. Information about where, when, and why trucks go is an important resource for transportation planners.

In the summer of 2007 (June), an interprovincial roadside truck survey, co-ordinated by TRANS, was undertaken to establish a comprehensive database on interprovincial heavy truck travel characteristics in the National Capital Region (NCR). The survey was carried out on two of the five interprovincial bridges in the area – the Chaudière and Macdonald-Cartier bridges, as the movement of “heavy trucks” is prohibited on the remaining three bridges – the Alexandra, Portage and Champlain bridges.

The interprovincial roadside truck survey was part of a broader national roadside survey program led by Transport Canada with participation of the provinces.

Figure 2-1 shows the National Roadside Survey (NRS) sites in yellow colour and Ministry of Ontario (MTO) sites in red colour. The NRS sites captured cross border movement to and from the United States while the MTO sites captured truck movements in the province of Ontario.

Figure 2-1: National Roadside Survey Sites

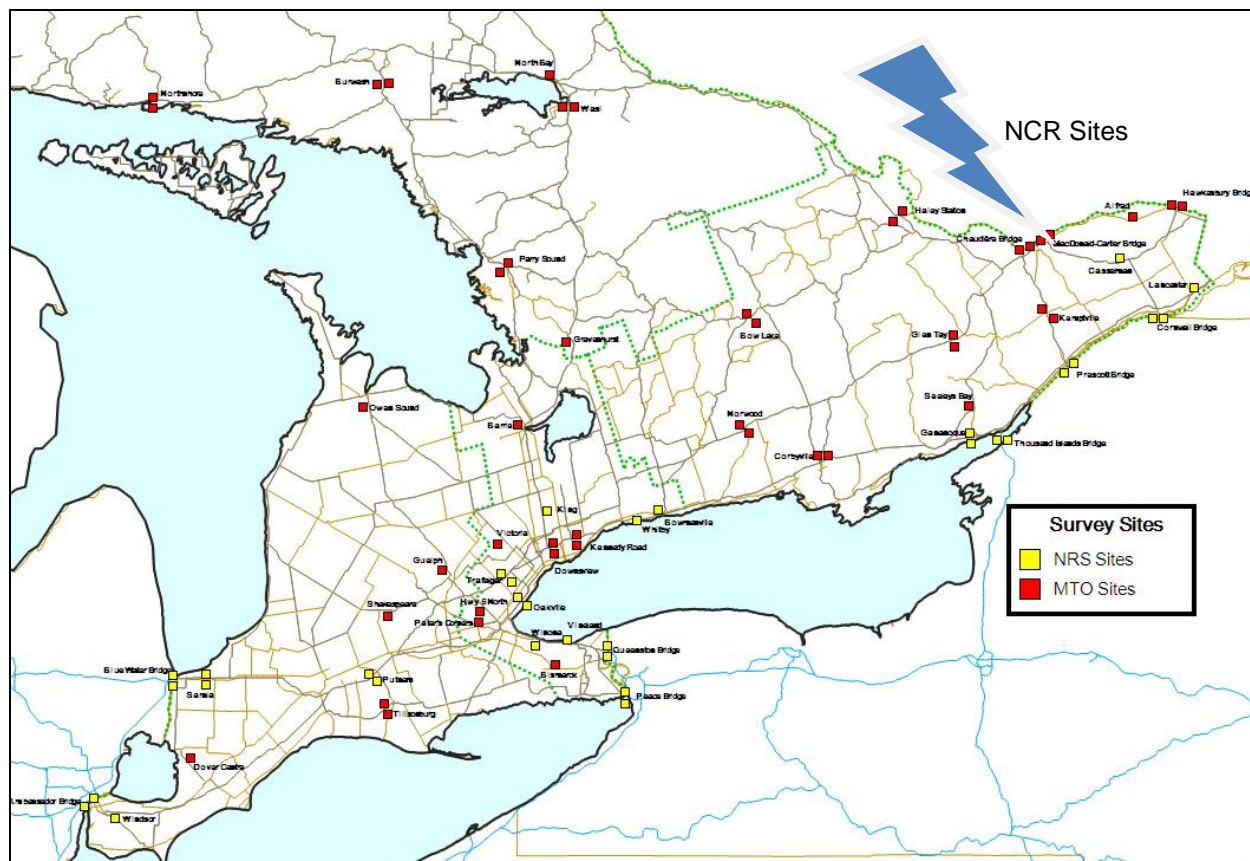


Figure 2-1 also shows two sites in the NCR that captured interprovincial heavy truck movements on Chaudière and Macdonald-Cartier bridges. A previous Interprovincial Roadside Truck Survey was undertaken in 1999-2000.

The data from this survey is critical in identifying area-wide transportation infrastructure needs and services, measuring trends, and monitoring progress in implementing transportation policies. In addition to collecting origin-destination information, Classification and Occupancy (C&O) counts and Automated Traffic Recorder (ATR) counts for vehicles travelling on the selected routes were also collected.

2.2 Roadside Intercept Survey

The purpose of the roadside intercept survey was to collect high quality data on the characteristics of heavy trucks, the travel patterns, including detailed information on the trip origin/destination, routes used and the commodity/goods carried. The roadside driver interview surveys were carried out by trained surveyors (under contract to the Ministry of Transportation Ontario) familiar with the form of data collection programs of the type applied in this study. Survey crews were stationed on the south side of the Ottawa River – on King Edward Avenue between Rideau Street and Murray Street, and on Booth Street between Ottawa River Parkway and the Chaudière Bridge – interviewed drivers of sampled trucks.

For the survey, trucks (weighing at least 4,500 kg with a minimum 2 axles/6 tires) were randomly selected from the stream of traffic by an Enforcement officer and directed to a location for vehicle weighing. The vehicle's axles and gross weight were collected and the truck's features recorded. At another area a surveyor conducted an interview with the truck driver. A pen-based hand-held tablet computer was used to collect data through a scripted questionnaire program. Along with this was a program which allowed the interviewer to plot the route taken by the driver from his start point to his destination.

Trucks with four wheels are considered to be light trucks and were not included in this survey. These include small (1/2 ton) pick-up trucks, such as the Toyota Tacoma/Chevrolet Sonoma, or a Jeep, or any SUV etc. with a commercial logo.

Two versions of the questionnaire were available for the survey, an English language version and a French language version. Truck driver had the option of doing the survey in either language.

In the survey, the origin and destination of the truck trips were recorded in very precise and specific terms (longitude and latitude) in order to apply the existing "traffic zone" system to yield valid origin-destination information.

Driver interviews were conducted on the same days for the two locations but on separate days for northbound and southbound traffic movements. The surveys were undertaken as follows:

DIRECTION	2007 SURVEY (12:01 am to 11:59 pm)
NORTHBOUND	June 12 to 14
SOUTHBOUND	June 19 to 21

2.2.1 Safety

Safety training was conducted by Earth Tech (as part of the five day comprehensive survey training program). This consisted of presentations of the following safety sessions.

- Field Orientation training
- Defensive Driving, and
- Traffic Protection

A Health and Safety plan was produced in accordance with the requirements of the Earth Tech Health & Safety Department. Included in the project safety plan were the emergency phone numbers along with a listing of addresses and phone numbers of the hospital nearest to the survey sites.

All Operational Safety activities related to the survey were to follow the regulations outlined in The Ministry of Labour “Occupational Health and Safety Act” and associated regulations, Workers Compensation Act, and The “Traffic Control Manual for Roadway Operations (Field Edition).

Prior to the setup at each site, a sketch was developed of the survey station showing the lanes, stop line and interviewers position. **Figure 2-2** shows a typical survey site set-up and lane closure layout.

Personal safety equipment was worn at all times when on site and while conducting surveys. Both MTO Enforcement and Ottawa City police were on site for traffic control.

2.2.2 Sample Selection

MTO issued following guidelines for sample selection:

- At the Survey Stations, the Enforcement Officer will turn on the signal lights indicating that the station is open.
- All trucks entering the survey station should be considered candidates for interviews e.g. empty trucks, utility trucks and tractors without trailers.
- The Enforcement Officer is responsible for selection of the trucks to be surveyed. The general intent is to have as many surveys conducted as possible. The general guidelines for selection are:
 - Select the next available truck when a surveyor is ready to conduct an interview; a survey is trying to collect a representative sample from all trucks through a random selection process
 - During periods of high truck volume, avoid selecting two trucks in a row (to avoid convoys);
 - During periods of low truck volumes, it is more important to keep the survey position occupied;
 - Surveyor should not be involved in the selection; extra long trucks, animal carriers, long distance carriers and non-Ontario are NOT to be avoided

2007 MTO Truck Survey
Booth St.

24 May 2007

The truck survey in the northbound direction begins at midnight on June 11th and ends midnight on June 14th. The truck survey will be suspended every day from 3:30 pm until 5:30 pm in the northbound lane and all signs and traffic control devices will be removed.

The truck survey in the southbound direction begins at midnight on June 18th and ends midnight on June 21st. If there is an issue with traffic congestion in the southbound direction the truck survey will be suspended from 7:30 am until 9:00 am in the southbound lane and all signs and traffic control devices will be removed.

Wellington St.

Booth St

Vimy Place Pr.

QC Transpo Bus Stop
To Be Temporarily Moved

Information Sign:
"ÉTUDE SUR LES CAMIONS
CAMIONNEURS PRÉPAREZ-VOUS
À ARRÊTER"

Information Sign:
"TRUCK SURVEY
TRUCKS PREPARE TO STOP"

TRUCKS
CAMIONS

MTO

TC-5A

TC-12

TC-12/1

TRUCKS
CAMIONS

Information Sign:
"TRUCK SURVEY
TRUCKS PREPARE TO STOP"

Information Sign:
"ÉTUDE SUR LES CAMIONS
CAMIONNEURS PRÉPAREZ-VOUS
À ARRÊTER"

LEGEND

- TC-5A
- TC-5A
- Sign
- MTO
- MTO Presence
- Static Sign
- TRUCKS
CAMIONS

Note:
All signs to be provided by Beacon Ltd. with the exception of the portable message sign. The information signs and "TRUCKS CAMIONS" signs to be provided by the City and delivered by the City on site by Beacon Ltd. to install.
Permit issued for Booth St. is 5.0km/h. The signs are designed for 70km/h.

2.2.3 Types of Data Collected

The following database fields from the interview surveys are relevant to the purpose of this study.

- The bridge used and direction of travel of the truck;
- The configuration of the truck (number of tires/axles);
- Additional descriptors identifying the configuration/body style of the truck (tractor trailer, straight truck, van etc.);
- Information on characteristics including number of stops, trip origin/destination details, intercept time etc.;
- Information on axle groupings of trucks etc.;
- Truck load information.

2.3 Automatic Traffic Recorder (ATR) Counts

Automatic Traffic Recorder (ATR) counts were another component of the survey and the information serves as a basis to expand the data collected from the C&O counts – which were collected on May 28th for a 12-hour time period, and to apply major truck type distribution to C&O expanded counts. ATR equipment was installed on both sites for consecutive five weekdays (in each direction) to record 24-hour traffic volumes by vehicle classification by direction. The ATR counts were done concurrently with the surveying. Heavy truck volume information was collected using the following vehicle classifications:

Class 5: heavy trucks (2-axle, 6-tire straight trucks)

Class 6 and 7: heavy trucks (3 or more axle straight trucks)

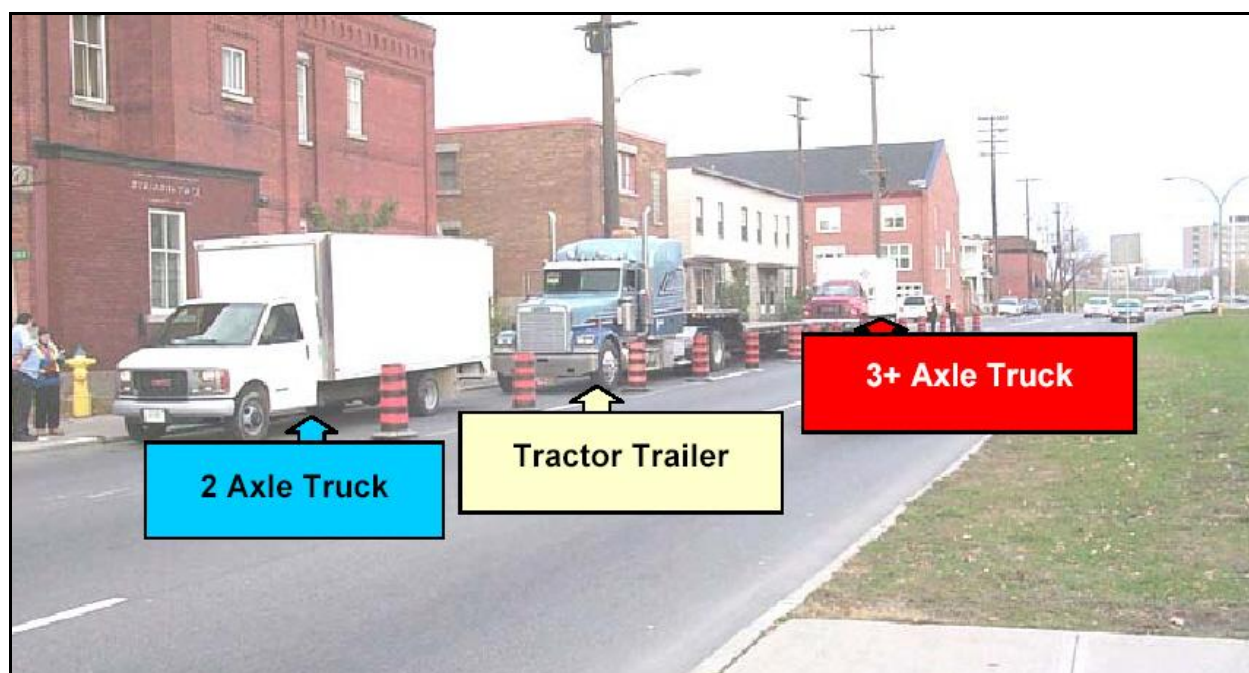
Class 8 to 13: heavy trucks (single or multi trailer trucks)

2.4 Classification and Occupancy (C&O) Counts

The City of Ottawa undertakes annually traffic counts along major travel corridors to establish trends related to vehicle traffic by classification and occupancy. These data are collected for one day for a 12 hour period (07:00 to 19:00) each year. These classification and occupancy data were available for all the interprovincial bridges including Chaudière and Macdonald-Cartier bridges. The C&O counts on these two bridges were conducted on May 28, 2007, a few weeks before this survey. Furthermore, the 12 hour C&O counts were expanded to 24 hour counts using the ATR counts which were undertaken during the survey time period for full five consecutive weekdays in each direction.

It should be noted that the C&O counting program use a single global heavy truck classification i.e. any vehicle with dual tires on one or more rear axles. A graphical representation of the various types of vehicles that are classified as “Heavy Trucks” in the C&O program is provided in **Appendix B**.

For the purpose of this report analysis, heavy trucks are grouped into three major types i.e. 2 axle straight trucks, 3+ axle straight trucks and tractor trailer trucks. These three major truck types are shown in **Figure 2-3**.

Figure 2-3: Study Truck Classifications

2.5 Data Processing

2.5.1 Survey Sample

The survey collected 1,482 samples of interprovincial heavy truck trips at two NCR sites i.e. Chaudière and Macdonald-Cartier bridges. After data cleaning and validation, the valid survey completions yielded detailed information on 1,410 weekday trips that crossed these two survey sites. The valid completions for each survey site are shown in **Table 2-1**.

Table 2-1: Valid Data Completion by Survey Site

Station Name	Number of Trips Surveyed	Sample Size
Macdonald-Cartier Bridge	865	33%
Chaudière Bridge	545	48%
Total	1,410	38%

The final dataset represents 38% of all heavy truck traffic passing through the survey sites during the 24-hour survey period and provides a rich, comprehensive database for the study area. The percentage of valid completions on Macdonald-Cartier Bridge and Chaudière were 33% and 48% respectively.

At the onset of the survey, the number of surveys per site was established and a benchmark productivity rate, per surveyor, of 2.75 surveys per productive hour was the target. Based on the total number of survey collected, this benchmark was achieved and overall, the productivity rate

was equal to 2.96 surveys per productive hour. **Table 2-2** summarizes the productivity of the survey by site.

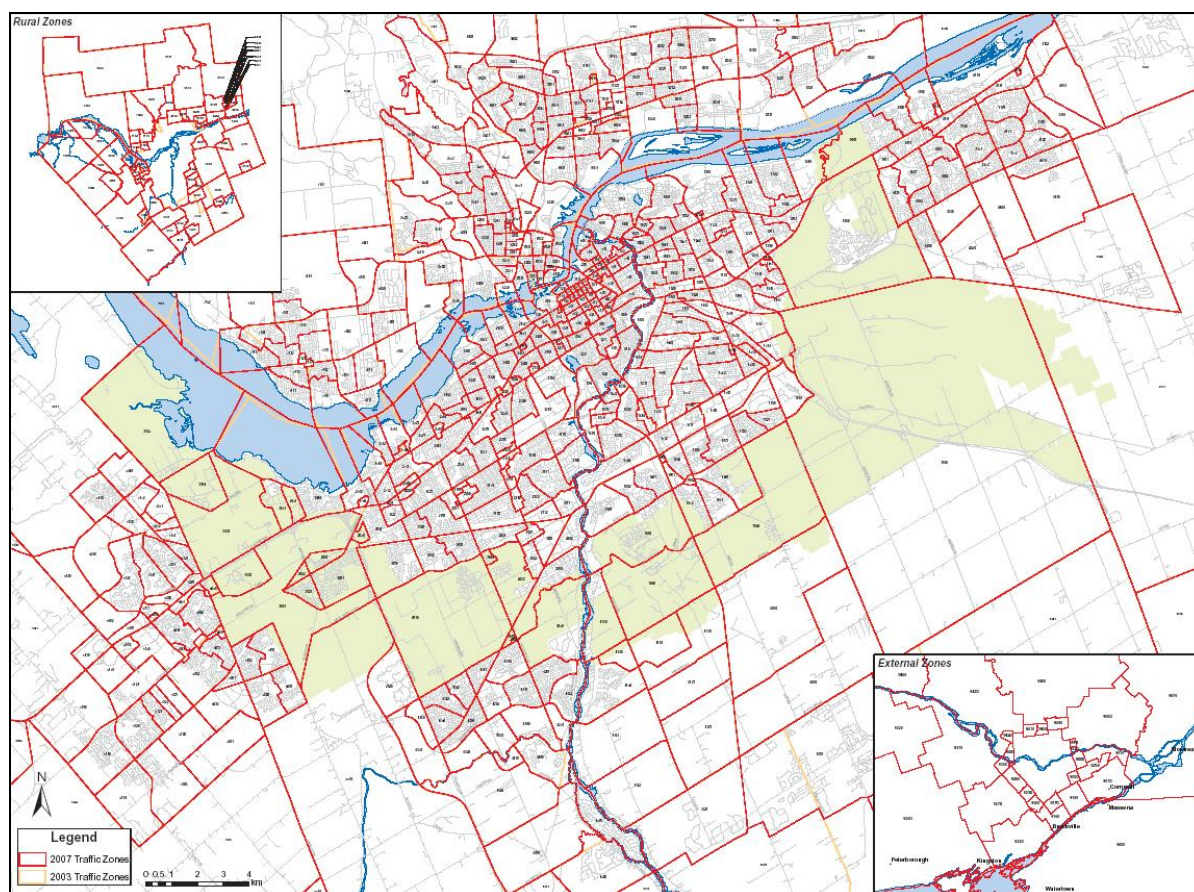
Table 2-2: Survey Productivity by Site

Site Name	Surveys per Productive Hour
Macdonald-Cartier Bridge (N/B)	3.48
Macdonald-Cartier Bridge (S/B)	3.27
Chaudière Bridge (N/B)	2.58
Chaudière Bridge (S/B)	2.53
Average	2.96

2.5.2 Geocoding

Origin-Destination information in the database was recorded in latitude-longitude format. This information was converted to the TRANS traffic zones system. The traffic zone system is shown in **Figure 2-4** below.

Figure 2-4: TRANS Traffic Zone System



2.5.3 Data Expansion Methodology

The number of surveyed trips passing through each site was expanded to equal number of heavy truck trips along the route during a typical weekday, by direction, by time of day, and by truck type (i.e. three major types), using the following expansion method.

1. *Average weekday truck volumes were determined by time period and direction for each site using C&O and ATR data. C&O data provided typical weekday heavy truck volume distributions by 15 min interval by direction. ATR counts were used to expand 12 hour C&O counts to 24 hour time period by hourly interval.*
2. *Distribution of truck types were determined by time periods and direction for each site. C&O counts have single global heavy truck classification. Therefore, ATR counts were used to determine truck type distribution by hour.*

3. *Number of heavy trucks trips by truck type was determined by time period and direction for each site.*

Average weekday truck volumes (step 1) were multiplied by the percentage of truck type trips (step 2) to determine the number of trucks by type passing through each site by time period and direction for a 24 hour survey period.

4. *Expansion factor was determined and applied.*

The expansion factor was determined by dividing the number of truck trips for each site by truck type, time period, and direction (step 3), by the number of surveyed trips for each group. The expansion factor was then applied to the surveyed trips to expand surveyed trips to match observed heavy truck trips.

Based on hourly traffic volumes from expanded C&O counts, 3,760 heavy trucks crossed the sites during the 24 hour survey period. Out of which, 1,410 valid trips were surveyed and expanded to 3,760 heavy truck trips for two sites over the 24 hour survey period. Expansion was done by site, direction, truck type, and time period.

3 KEY FINDINGS

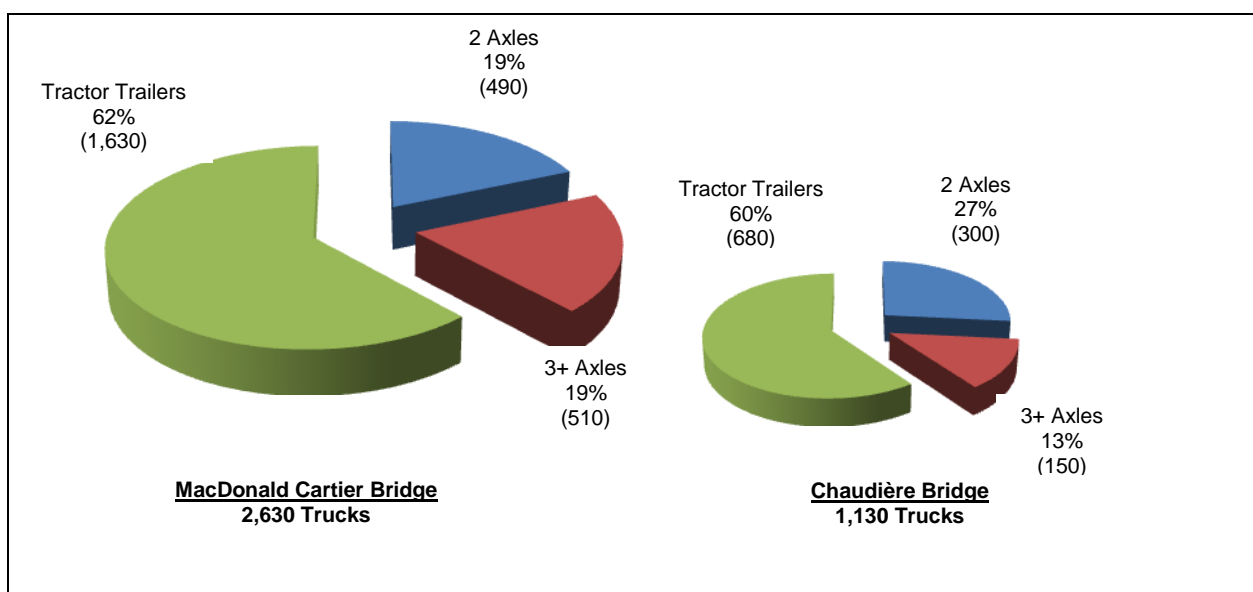
The numbers shown in the figures and tables in this chapter are based on the expanded results of the 2007 Interprovincial Roadside Truck Survey.

3.1 Truck Volumes by Types

Daily heavy truck volumes crossing the Ottawa River were 3,760 in 2007, which is 9% higher than in 1999-2000. In 1999-2000 approximately 3,450 daily heavy trucks crossed the Ottawa River. The MacDonald- Cartier bridge carried 2,630 trucks per day or 70% of total truck traffic while Chaudière bridge carried 1,130 trucks per day or 30% of total truck traffic.

Of the total, 790 were 2 axle (21%), 650 3+ axle (17%) and 2320 tractor trailer (62%) trucks. **Figure 3-1** shows the variation in the number of trucks on the two bridges for the three types of trucks.

Figure 3-1: Daily Truck volumes by Classification



The Macdonald-Cartier bridge carried by far, the largest number of the tractor trailers (1,630). When compared with the other two classes of trucks, the tractor trailers represented about 62% of the total trucks on that bridge. On the Chaudière bridge, the tractor trailer is also the largest vehicle class of truck (680) and dominates the composition (60%) of truck stream.

3.2 Trip Time Distributions

The peak to midday off-peak and night time period conversion factors represent the volume from the sum of two peak periods (AM and PM) divided by the midday off-peak period and night time period respectively. Therefore, a factor greater than 1 indicates that more trips take place during the sum of the peak period than in midday off-peak or night time periods. A factor less than 1 means the opposite.

Table 3-1 shows that truck movements on both bridges are more predominant during the midday off-peak period or night time period than in the commuter peak periods. The midday peaking phenomenon may be attributed to the need to meet the expectations of the business day and quite possibly truckers attempting to avoid the commute peak periods. Further, off-peak period is preferred over night period on the MacDonald Cartier bridge while the trend is opposite on the Chaudière bridge.

On average, there are 47% and 41% less trips during the peak periods than during the midday off-peak and night time periods respectively.

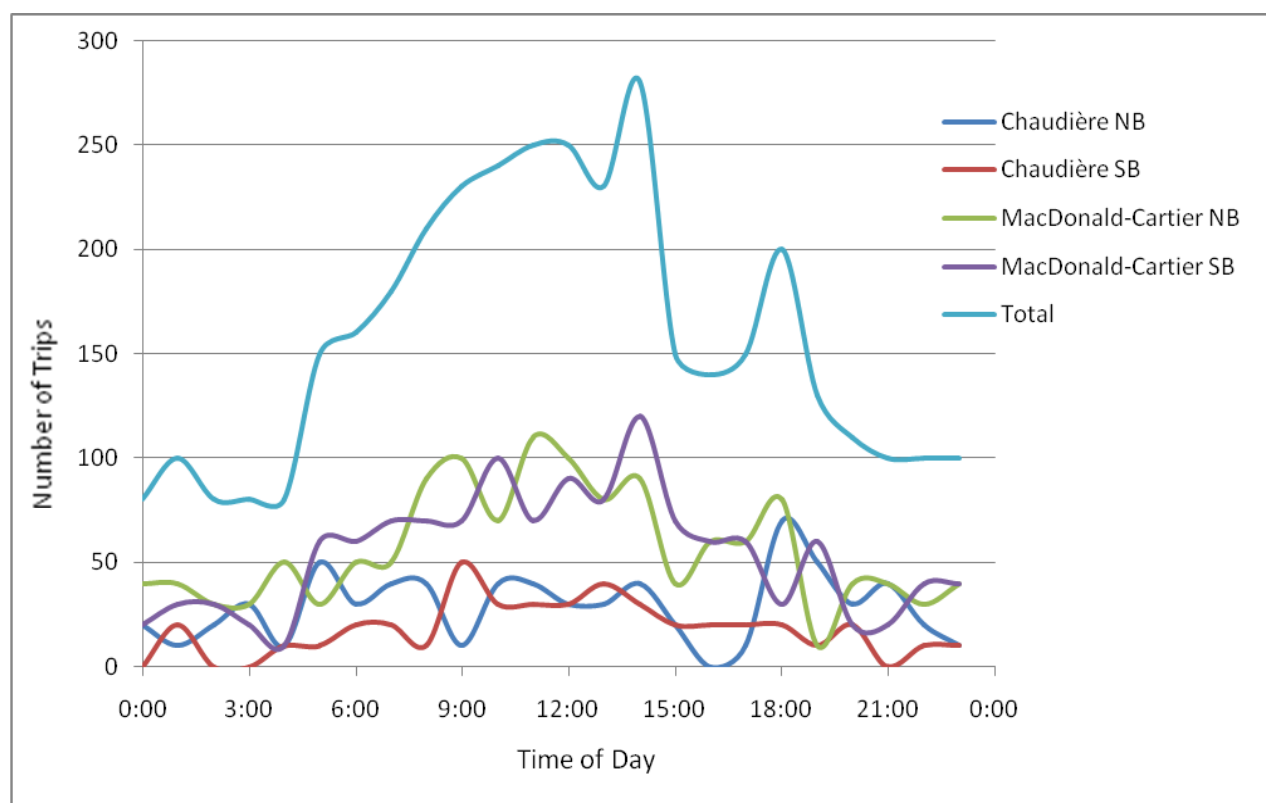
Table 3-1: Peak to Off-peak variability by bridge

Bridge	24 Hour Total	AM Peak Period (6:30-8:59)	PM Peak Period (15:30-17:59)	Midday Off-Peak Period (9:00-15:29)	Night Time Period (18:00-6:29)	Peak trips/Midday off-peak trips	Peak trips/Night time trips
Chaudière	1,130	150	70	420	490	0.52	0.45
Macdonald-Cartier	2,630	310	290	1,130	900	0.53	0.67
Total	3,760	460	360	1,550	1,390	0.53	0.59

Figure 3-2 shows time-of-day distribution for Chaudière and MacDonald- Cartier bridges by direction and over all totals.

Key points related to trip distribution by hour are as follows:

- Overall, midday off-peak period is the busiest time period for truck movement. The highest peak hour occurs at 14:00 hour. During the night time period the highest peak hour occurs at 18:00 hour.
- Highest peak direction for the Chaudière bridge is during night time period while it is during the midday off-peak period for the MacDonald-Cartier bridge.
- During AM peak period, southbound (which is also a commuter peak direction) truck traffic is lower than northbound on both bridges. The trend is opposite during the PM peak period, northbound (which is a commuter peak direction) truck traffic is higher than off peak direction.
- Total number of weekday trips is almost balanced in both directions for both bridges.
- Most truck traffic across the Ottawa River occurs between 05:00 and 21:00. Approximately 88% of the 2 axle trucks, 79% of the 3+axle trucks, and 80% of the tractor trailer crossings of the Ottawa River have occurred by 21:00. This suggests that bigger trucks tend to be more spread out across the 24 hour period than the smaller trucks.

Figure 3-2: Hourly trip variations by bridge by direction

3.3 Heavy Truck Share of Total Traffic

There was a total of 3,760 trucks per day in 2007, of which 2,630 used the Macdonald Cartier bridge – 1,310 northbound and 1,320 southbound; and 1,130 used the Chaudière bridge – 690 northbound and 440 southbound.

For comparative purposes, overall traffic levels crossing the Ottawa River in 2007 on all five bridges were about 133,000 during the 12 hour period (07:00 to 19:00). **Table 3-2** shows the truck modal share with respect to total traffic on the bridges for the AM & PM peak hours and 12 hour period (peak direction is also indicated in the table). For the morning peak hour, southbound is the commuter peak direction and opposite is true in the afternoon peak direction. Heavy truck modal share in the peak direction for both peak hours varies from 2 to 3% for both bridges. In off peak direction modal share varies from 2% to 5%. For a 12 hour time period truck modal share is about 3% to 4% for both bridges in both directions.

Table 3-2: Truck Shares per Bridge per Time of Day

Time of Day	Chaudière NB	Chaudière SB	Macdonald Cartier NB	Macdonald Cartier SB
AM Peak hour	4%	2%*	5%	2%*
PM Peak hour	3%*	2%	2%*	4%
Total 12 Hour	3%	4%	4%	4%

Note: * represents peak direction

3.4 Travel Breakdown by Origin / Destination

Based on point of origin and/or destination, three trip types are identified: local trips, inter-regional trips, and through trips.

Table 3-3 summarizes the total number of truck trips during the 24 hour survey period travelling within the NCR (local trips), those going between internal and external districts (inter-regional trips), and those travelling through (through trips) the NCR.

Table 3-3: Internal and External Truck Trips

Origin/Destination	NCR	External
NCR	2,080	620
External	830	230

Of the total, 2,080 (55%) of the trucks per day made “local” trips (an origin and destination within the NCR), 1,450 (39%) of the trucks made “inter-regional” trips (either an origin or a destination outside the NCR), while 230 (6%) of the trucks made a “through” trip (an origin and destination outside the NCR).

In **Figure 3-3**, National Capital Region (NCR) was further divided into two parts i.e. Ottawa and Gatineau side to see the travel patterns in more detail.

Key points related to trip origin and destination during the 24 – hour survey period are as follows:

- There are slightly more trips originating in Ottawa and going to Gatineau compared to the opposite direction.
- The large number of trips are made from Gatineau to External and opposite as compared to the Ottawa to External and opposite. This can be attributed to the trucks from Gatineau crossing the river to continue onto large cities such as Toronto, Montréal, and cities in the United States. Because there is no good highway link between Gatineau and Montreal, truckers mostly use Ontario highways to travel to Montreal. Similarly, the trips originating externally and going to Gatineau can also be explained the same way.

It should be noted that these are the trips crossing the Ottawa River at two interprovincial bridges only. Therefore, it can be explained why truck trips from Ottawa to External and the opposite direction are too small.

- An outlier in this data is the 1% of Ottawa/Ottawa trips. These trips originating in Ottawa and return to Ottawa after drop off on Gatineau side.

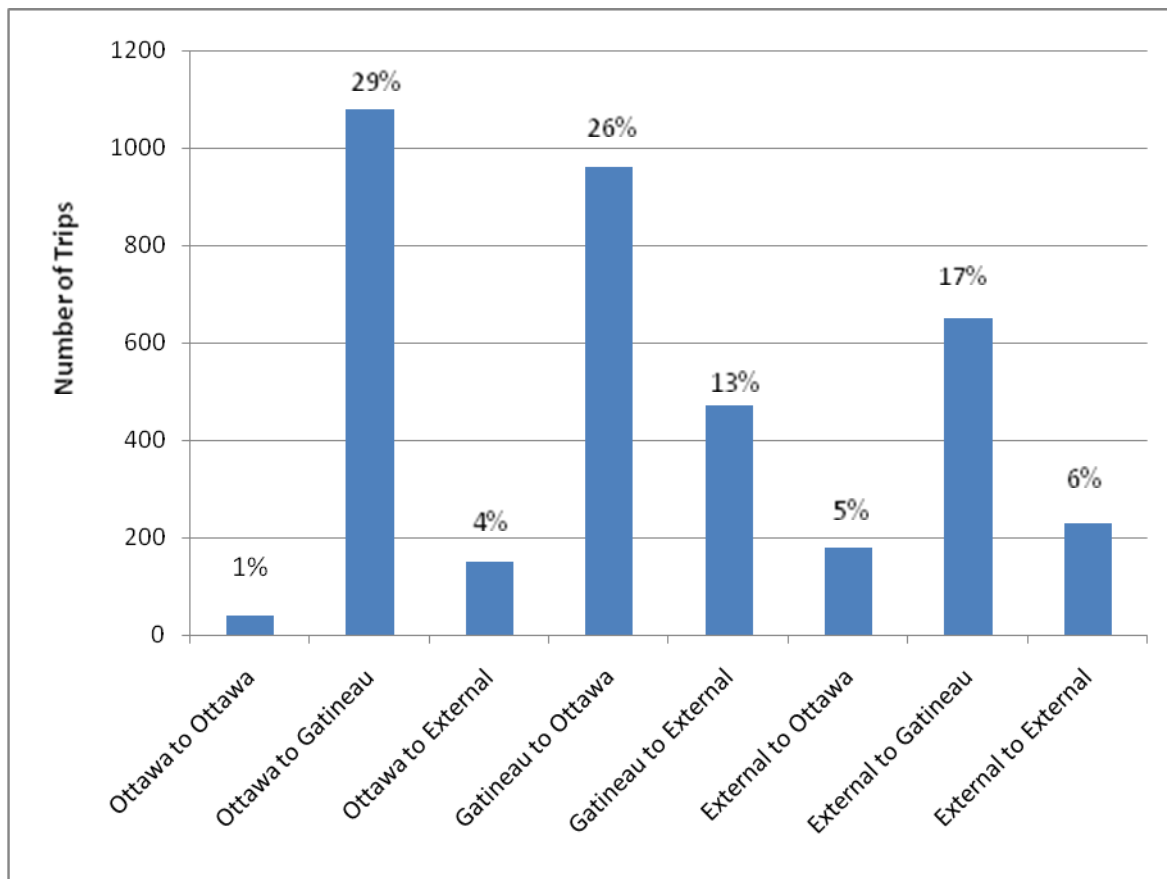
Figure 3-3: Origin and Destination for 24-Hour Survey Period

Figure 3-4 to 3-6 shows the trip origin-destination information by truck type, bridge, and time of day respectively.

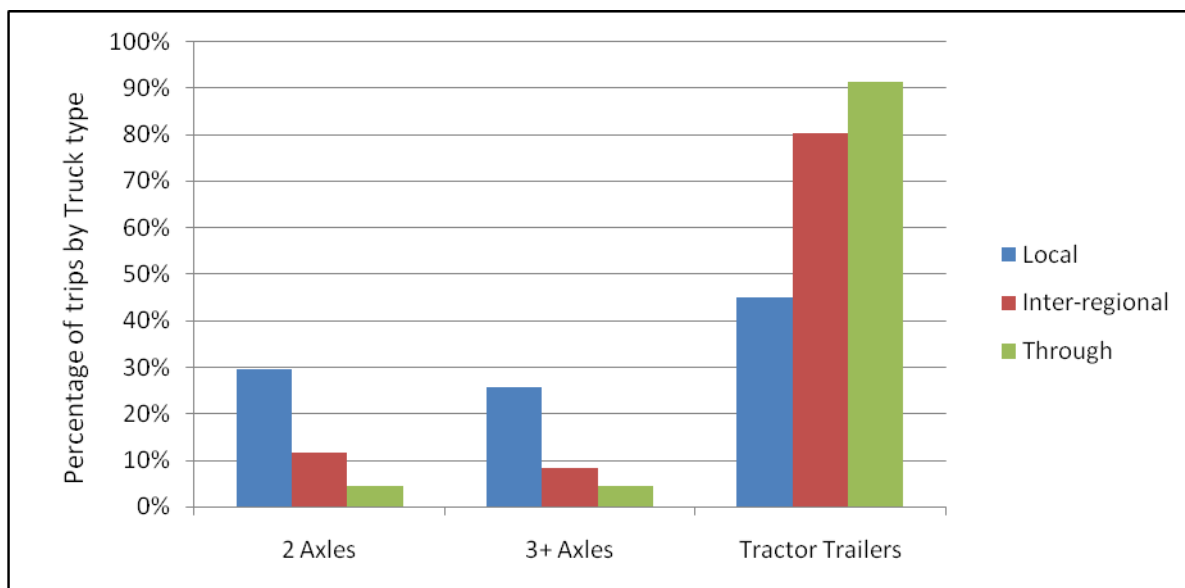
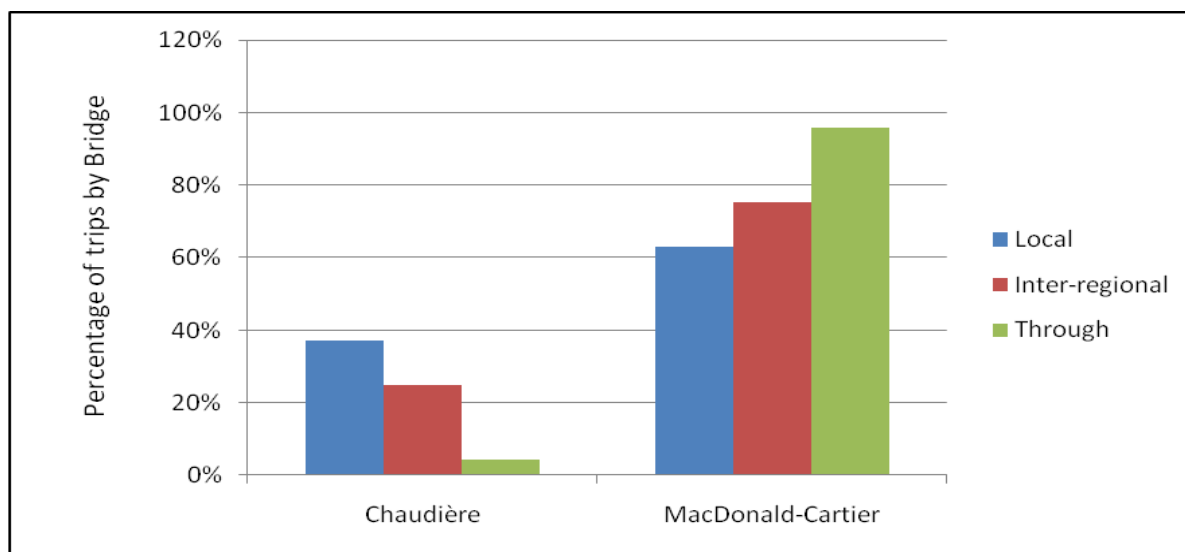
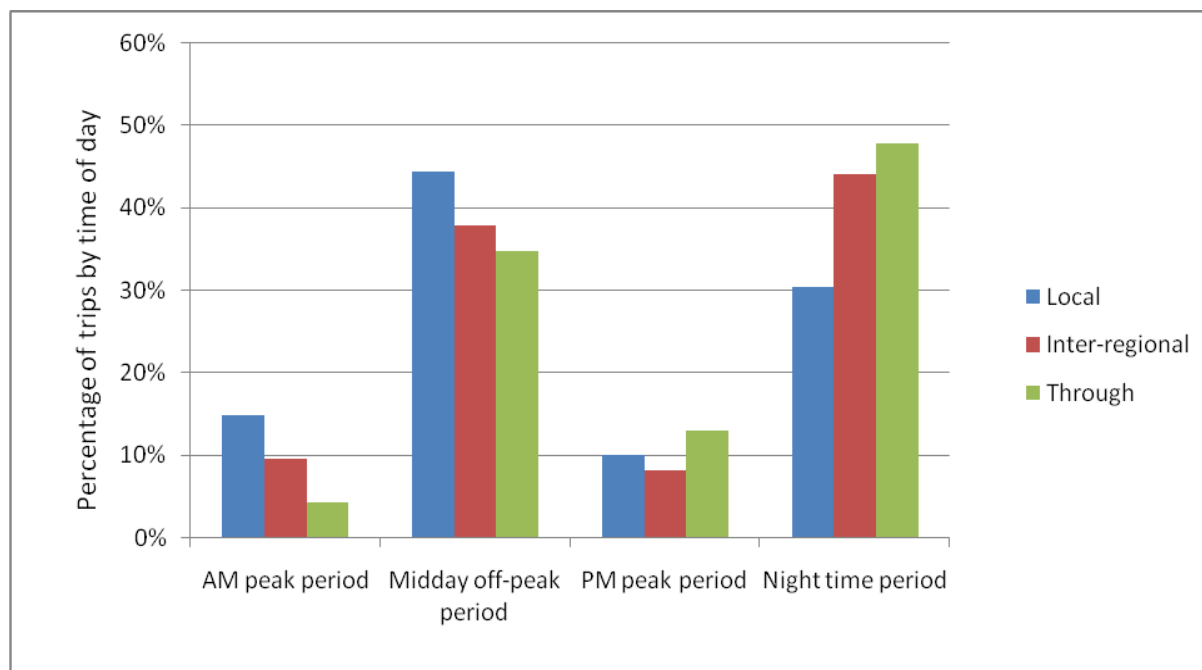
Figure 3-4: Origin-Destination by Truck type

Figure 3-5: Origin-Destination by Bridge**Figure 3-6: Origin-Destination by Time of Day**

Key points related to trip origin-destination by truck type, bridge, and times of day are as follows:

- For local trips, different truck types are used. It varies from 29% for 2 Axles truck to 45% for Tractor trailers. This shows mixed delivery demand within the region. For Inter-regional and through trips, tractor trailers were the dominant truck type. Almost 80% of inter-regional trips and 91% of through trips were made by tractor trailers.

- Almost 63% of local, 75% of inter-regional, and nearly 96% of through trips used the MacDonald-Cartier bridge. A high percentage of inter-regional and through trips using the MacDonald-Cartier bridge indicates better highway access as compare to the Chaudière.
- Truckers mostly avoid commuter peak periods i.e. AM and PM peak periods. A majority of the local trips (44%) used midday off-peak period and 30% night time period. Inter-regional and through trips mostly preferred the night time period – almost 44% of inter-regional and 48% of through trips.

3.5 Travel Breakdown by TRANS Districts/Zones

Figure 3-7 represents the 26 TRANS districts within the NCR and **Figure 3-8** represents the 29 TRANS external zones outside the NCR boundary.

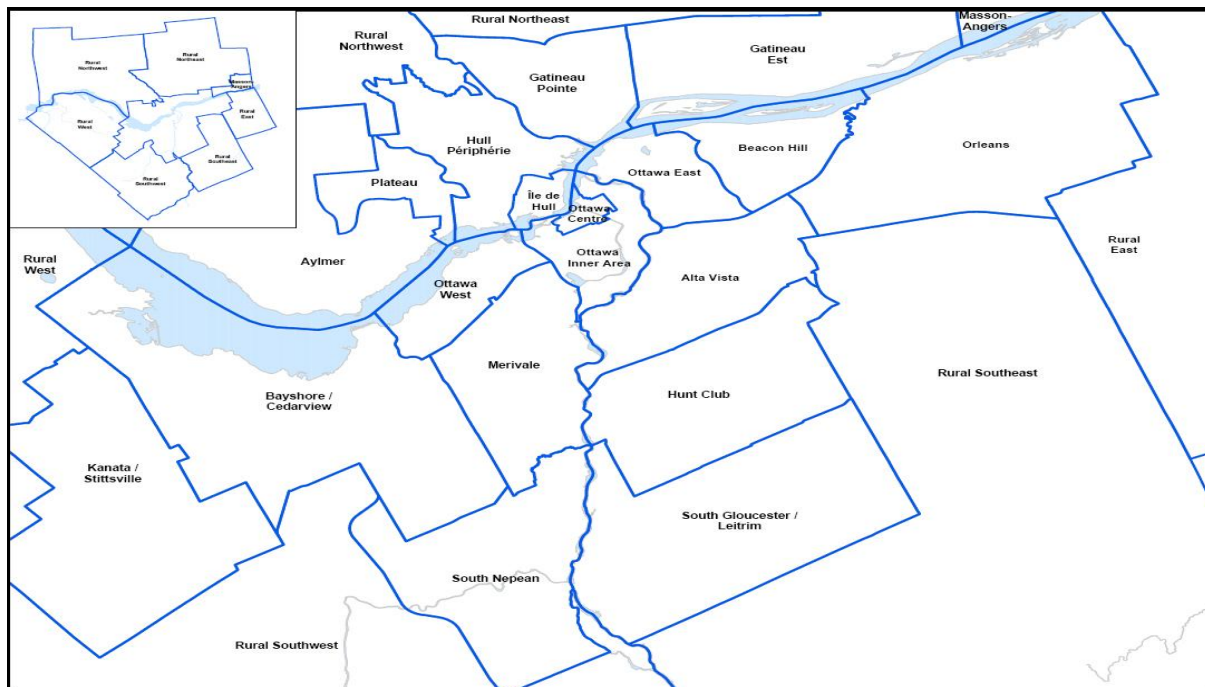
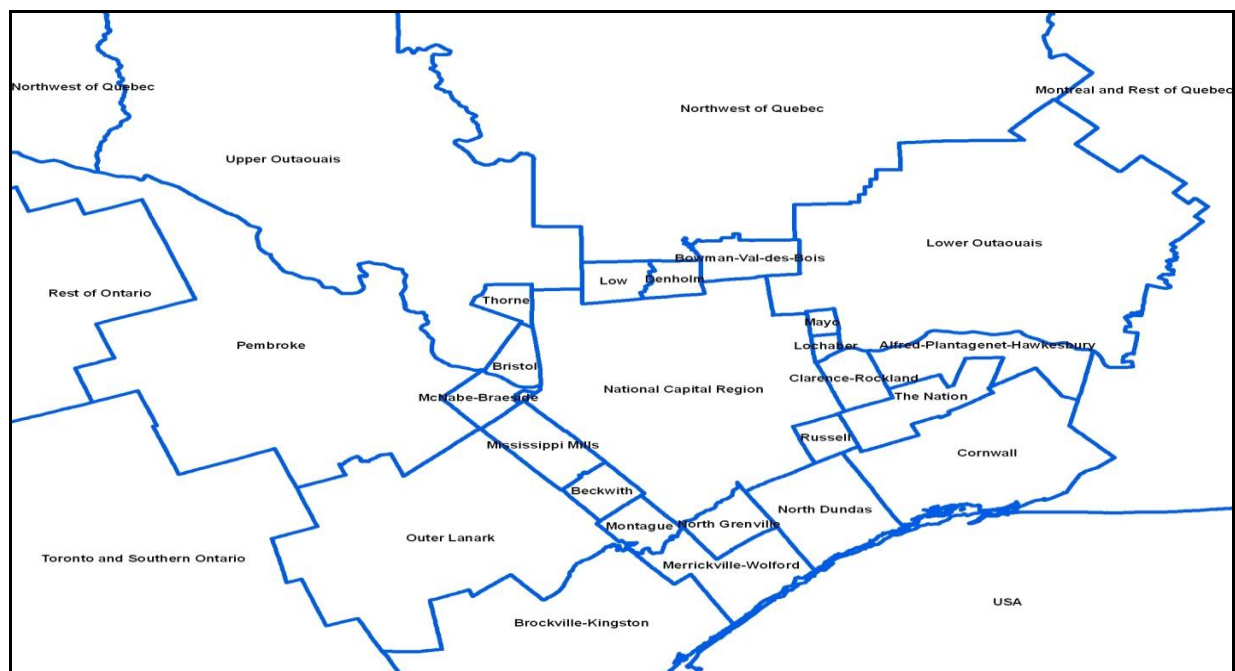
Figure 3-7: TRANS Districts**Figure 3-8: TRANS External Zones**

Figure 3-9 and 3-10 show the daily weekday origins and destinations respectively by TRANS Districts and External Zones ranked by largest to smallest. Those districts or zones which don't originate and destined any trips are not shown in the figures.

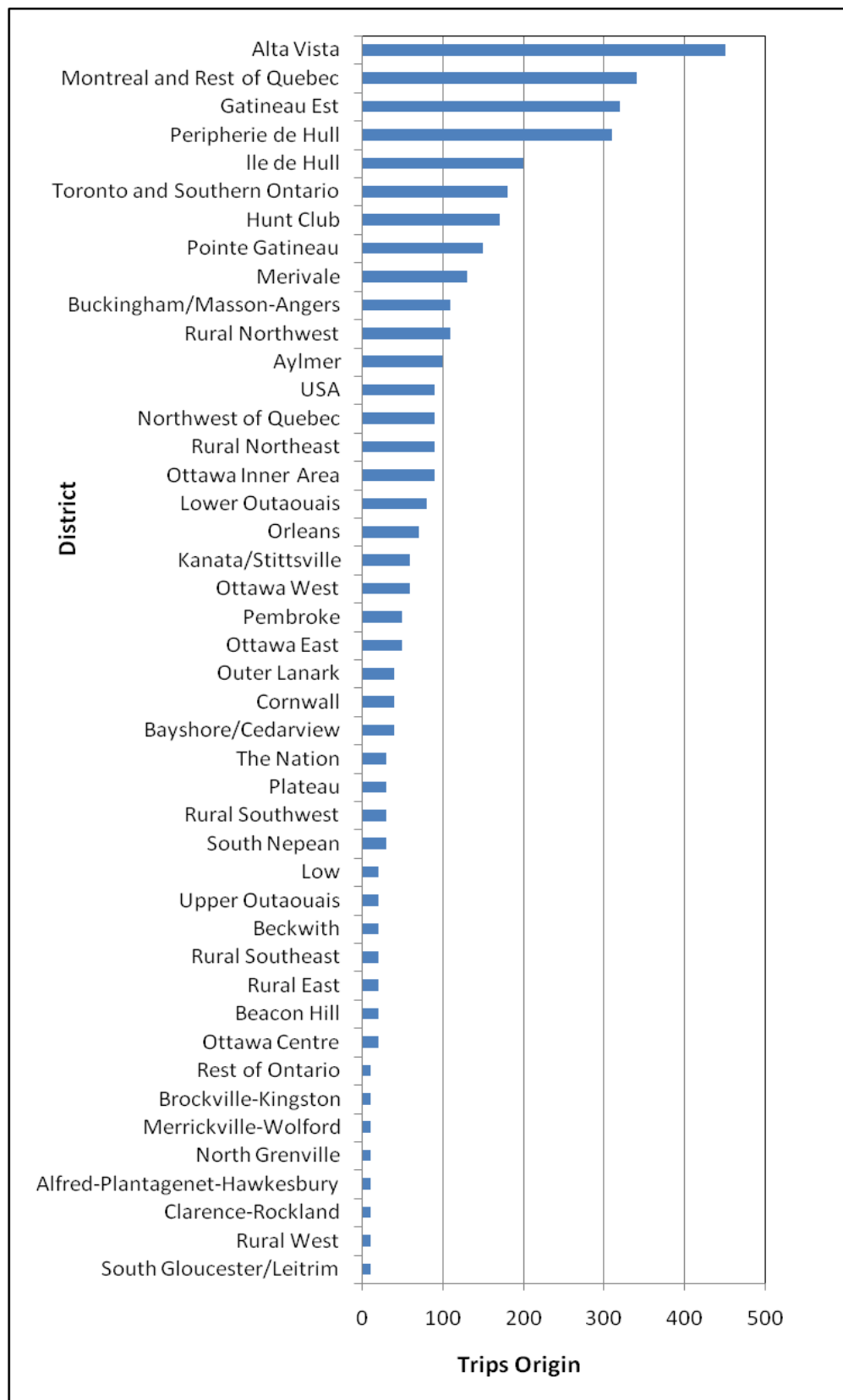
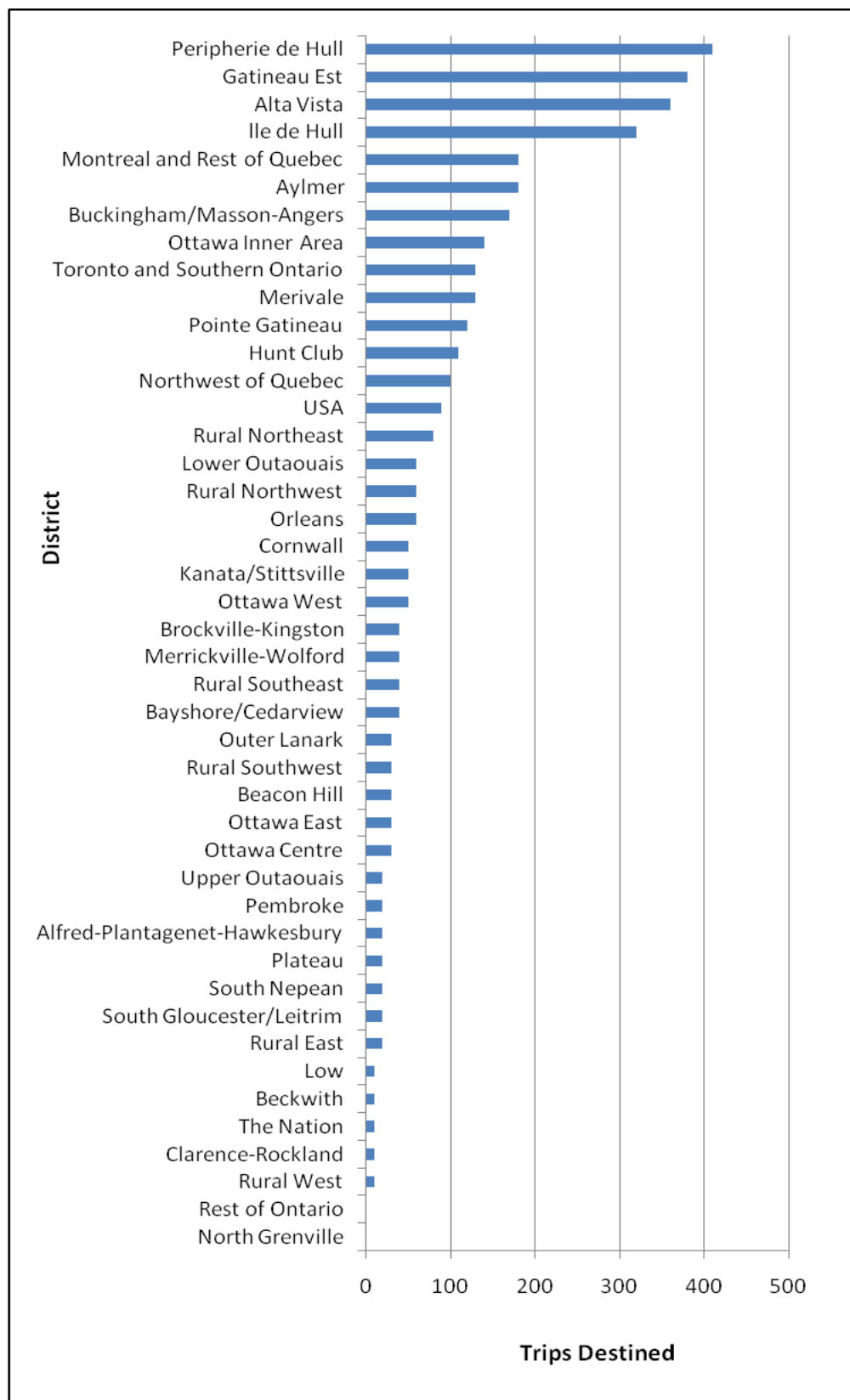
Figure 3-9: Daily Origins by TRANS Districts and External Zones

Figure 3-10: Daily Destinations by TRANS Districts and External Zones

Key points related to the trip origin and destinations of interprovincial trips during the 24-hour survey period are as follows:

- The top five origins (with trips and share) during the 24 hour time period are:
 - Alta Vista – 450 (12%)
 - Montreal and Rest of Quebec – 340 (9%)
 - Gatineau Est – 320 (9%)
 - Peripherie de Hull – 310 (8%)
 - Ile de Hull – 200 (5%)
- The top five destinations (with trips and share) during the 24 hour time period are:
 - Peripherie de Hull – 410 (11%)
 - Gatineau Est – 380 (10%)
 - Alta Vista – 360 (10%)
 - Ile de Hull – 320 (9%)
 - Montreal and Rest of Quebec and Aylmer – 180 (5%) each
- The majority of interprovincial truck movements occur within the NCR urban area.
 - 62% of total trips originate from Ottawa and 60% of total trips that destine to Ottawa are surrounded by the Ottawa Inner Area, Alta Vista, Hunt Club and Merivale districts
 - 70% of total trips originate from Gatineau side and 71% of total trips destine to Gatineau are surrounded by Ile de Hull, Peripharie de Hull, Pointe Gatineau and Gatineau Est
- Destinations outside of the NCR are smaller (26%) than the Origins (28%), especially for Toronto and Montreal. This trend can be explained by numerous factors. As explained earlier, this survey captured trips crossing the two interprovincial bridges only during weekday. Therefore, some trucks may use routes other than these two bridges to travel to these destinations.
- Within NCR the trips are well distributed and major generators are mostly major destinations with almost similar magnitude.

3.6 Major Desired Lines

Figure 3-11 graphically illustrates the truck major desire line flow using Chaudière and MacDonald-Cartier bridges during the 2007 weekday. Travel desire lines were established with a threshold of 25 district-to-district trips per day (see Appendix A for detail). The width of the line indicates the magnitude of travel.

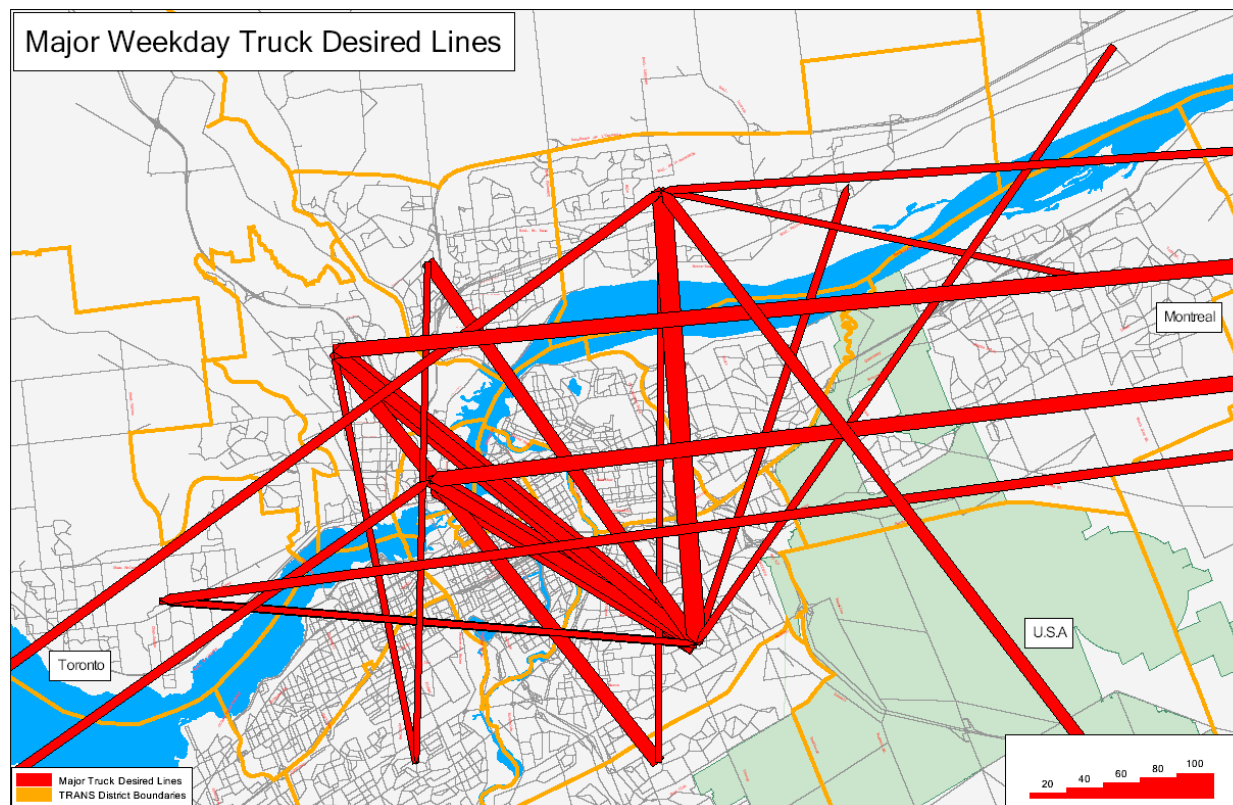
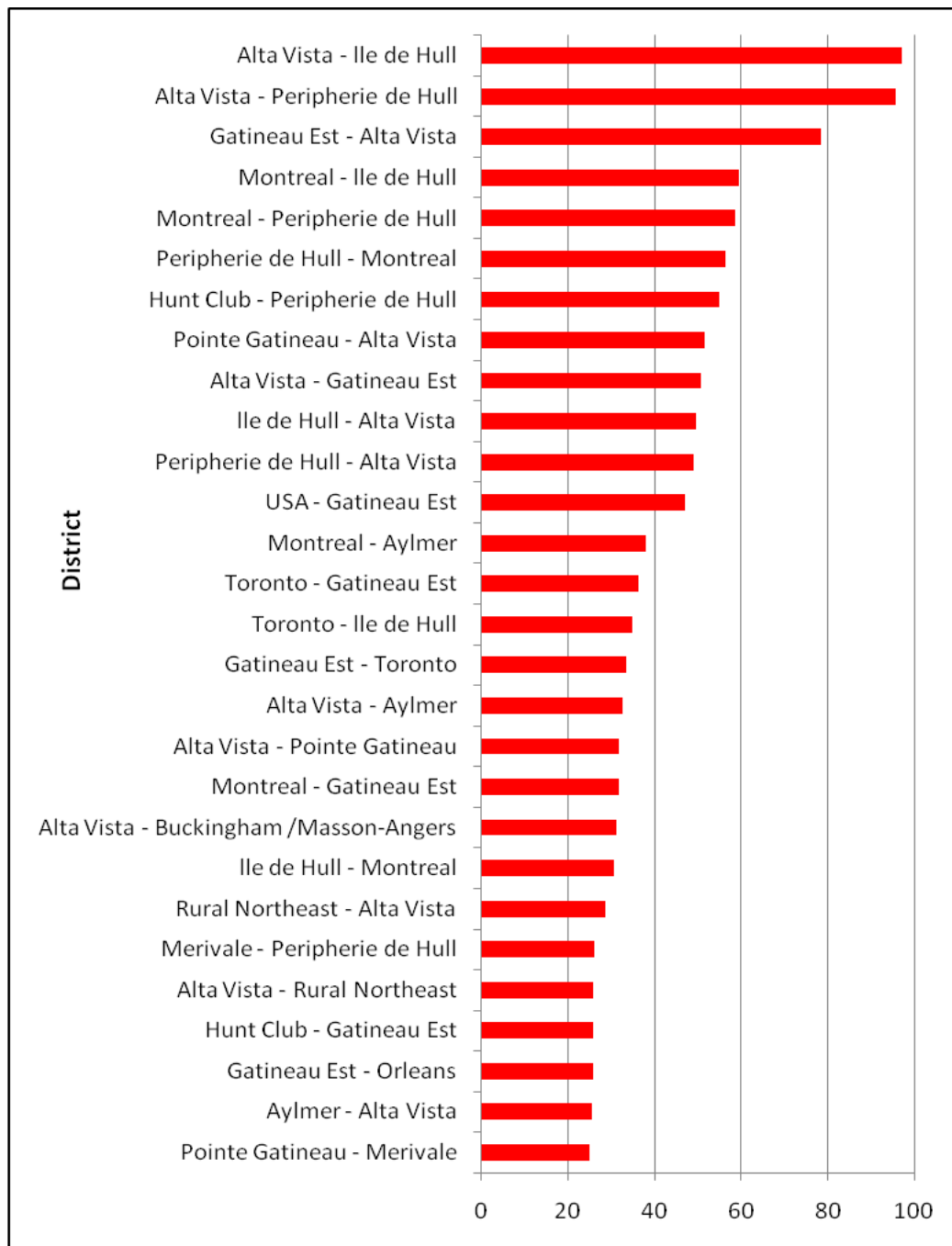
Figure 3-11: Truck Major Desired Lines

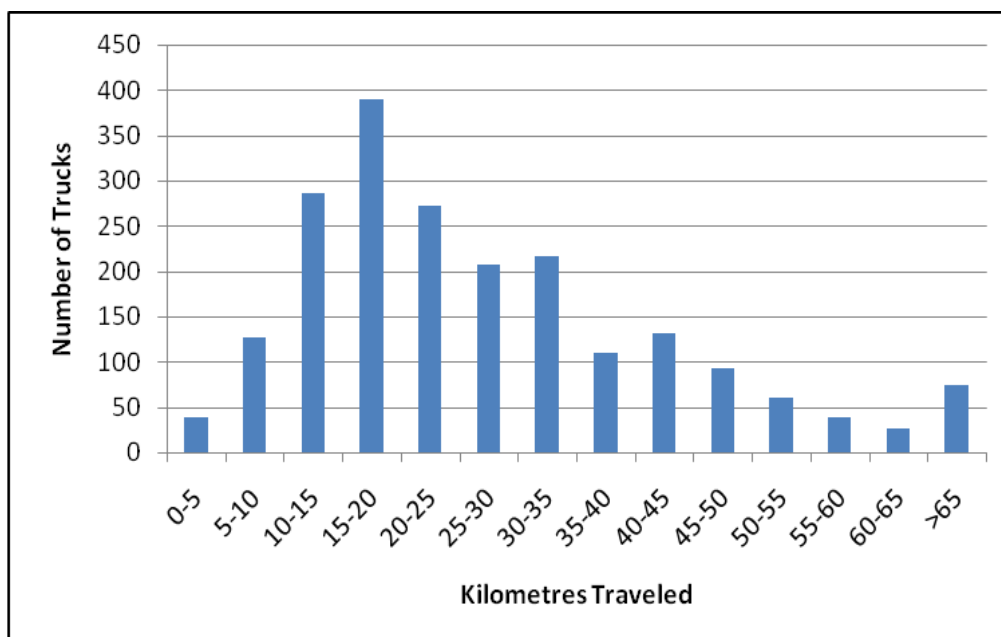
Figure 3-12 illustrates the demand among the different planning districts and external zones ranked by largest first. Largest flow is from Alta Vista to Ile de Hull with 97 trips/day, followed by Alta Vista to Peripherie de Hull with 96 trips/day. Other major flows are: Gatineau Est to Alta Vista (78), Montreal to Ile de Hull (59) and Montreal to Peripherie de Hull (59)

Figure 3-12: Truck Major Desired Lines

3.7 Analysis of Distance Traveled

Truck travel distance using interprovincial bridges varies depending on the nature of the trip. To analyze this, two different histograms were produced to show different trip patterns between local trips, inter-regional, and through trips (see definition of trips in section 1.3). **Figure 3-13** below shows the distribution of local truck trips.

Figure 3-13: Local Truck Trips Distance Distribution

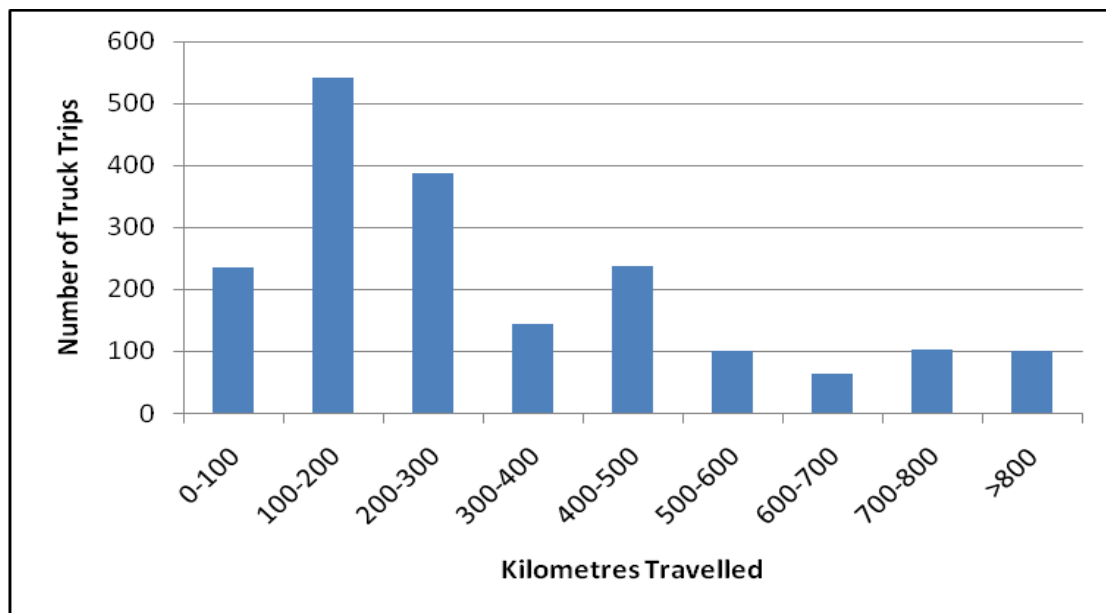


The figure above shows that the majority (66%) of the local trip's travel distance falls within the range of 10 to 35 kilometers.

However, inter-regional or through trips are different since they require longer distances of travel. **Figure 3-14** shows truck trips that either originate and/or terminate outside the NCR.

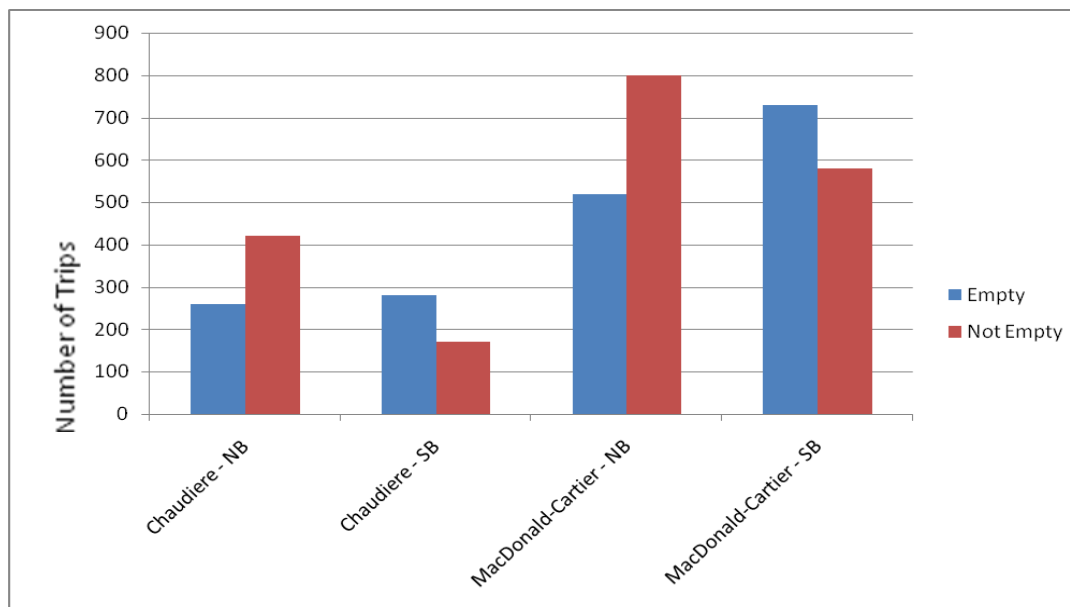
The majority (81%) of the trips fall in the range of 100 to 500 kilometers. This range reaches Toronto to the west and Montreal to the east where most of the inter-regional and through trips occur.

The tractor trailer trucks, which represented about 62% of all interprovincial truck trips, reported longer trip lengths and consequently were, as a category, responsible for approximately 80% of the total trip distance travelled by all trucks. In contrast, the 2 axle trucks, representing 21% of the truck trips, were responsible for 13% of the distance travelled by all trucks while the 3+ axle trucks, 17% of interprovincial truck trips, were associated with 7% of the distance travelled by trucks.

Figure 3-14: Inter-regional and Through Truck Trips Distance Distribution

3.8 Truck Load Analysis

Figure 3-15 illustrates the empty versus loaded truck volumes for each bridge by direction. At the survey site if a truck carried no commodity, it was designated as an “empty” truck and if it carried any load (e.g. half, full load etc.) was designated as a “not empty truck”.

Figure 3-15: Truck Load by Bridge

- On the Chaudière bridge, northbound direction i.e. from Ontario to Quebec, empty truck volumes are lower (38%) than not empty trucks (62%). The trend is reverse in the opposite direction for empty and not empty trucks with 62% and 38% respectively;
- On MacDonald-Cartier bridge, northbound empty trucks were lower (39%) versus not empty trucks (61%). The trend is reverse in the opposite direction for empty and not empty trucks being 56% and 44% respectively.

The above trend can be explained as trucks from Toronto, the United States, and Montreal returned empty after dropping off a load in Gatineau.

Appendix A

Origin-Destination Matrices

Origin – Destination Matrices

Table A-1 and A-2 are the conversion tables for the district and zone ID numbers listed in Table A-3 to Table A-6. **Table A-3 to A-6** presents' origin-destination matrices for the 24 hour period by major truck types as follows:

- 24 hour period – All truck types
- 24 hour period – 2 axle straight truck
- 24 hour period – 3+ axle straight truck
- 24 hour period – Tractor trailer

Note that those districts or zones, where total origin and destination trips are zero, are not shown in the matrices.

Table A-0-1: District ID Conversion

District	District ID
Ottawa Centre	1
Ottawa Inner Area	50
Ottawa East	100
Beacon Hill	120
Alta Vista	140
Hunt Club	180
Merivale	200
Ottawa West	240
Bayshore / Cedarview	260
Orleans	300
Rural East	350
Rural Southeast	360
South Gloucester / Leitrim	400
South Nepean	425
Rural Southwest	450
Kanata / Stittsville	500
Rural West	560
Île de Hull	600
Hull Périphérie	625
Plateau	650
Aylmer	700
Rural Northwest	750
Pointe Gatienu	800
Gatineau Est	820
Rural Northeast	840
Buckingham Masson-Angers	845

Table A-0-2: External Zone ID Conversion

External Zone	Zone ID
Clarence-Rockland	9000
Alfred-Plantagenet-Hawkesbury	9010
Russell	9050
The Nation	9060
Cornwall	9070
North Dundas	9100
North Grenville	9150
Merrickville-Wolford	9160
Montague	9200
Brockville-Kingston	9220
Beckwith	9250
Mississippi Mills	9260
Outer Lanark	9270
Toronto and Southern Ontario	9280
McNabe-Braeside	9300
Pembroke	9310
Rest of Ontario	9320
Bristol	9400
Thorne	9420
Upper Outaouais	9430
Northwest of Québec	9450
Low	9470
Denholm	9480
Bowman-Val-des-Bois	9490
Mayo	9510
Lochaber	9520
Lower Outaouais	9550
Montreal and Rest of Québec	9570
USA	9600

Table A-0-3: 24 Hour Trips – All Truck Types

Origin/Destination	Ontario																Quebec								Ontario External												Quebec External						U.S.A	Total												
	1	50	100	120	140	180	200	240	260	300	350	360	400	425	450	500	560	600	625	650	700	750	800	820	840	845	9000	9010	9050	9060	9070	9150	9160	9220	9250	9260	9270	9280	9300	9310	9320	9430			9450	9470	9480	9550	9570	9600						
Ontario	1																				10	10				10																										20				
	50																		20	10		10			10	10	10																							10						90
	100																		10	10																																	50			
	120																								10		10																										20			
	140		10				10												100	100		30	20	30	50	30	30																												450	
	180																		20	50		10		10	30	10																												170		
	200																		20	30		10			20	10	10																											130		
	240																																																						60	
	260																		10		10																																40			
	300																						10	10	20	10	10																												70	
	350																					10																																20		
	360																									10																												20		
	400																																																						10	
	425																						20		10																													30		
	450																		10						10																													30		
	500																			20	10			10	10	10	10																											60		
	560																																																						10	
Quebec	600	10	10		10	50	10	10	10	10																		10			10	10																					200			
	625		20		10	50	20	20	10	10		10																10			20																								310	
	650											10																																										30		
	700		20			30	10	10					10																																											100
	750	10			10	20	10	10					10																																										110	
	800					50		30		10	10				10																																								150	
	820	10	20	10		80	20	20	10			30																		10		10		10																			320			
	840					30	10					10																																									90			
845					10	10					10																																												110	
Ontario External	9000																					10																																10		
	9010																					10																																10		
	9050																																																						0	
	9060																							10																														30		
	9070																																																						40	
	9100																																																						0	
	9150																																																						10	
	9160																																																						10	
	9220																																																						10	
	9250																																																						20	
	9260																																																						0	
9270																																																						40		
9280		10																																																				180		
9310																																																						50		
9320																																																								

Table A-0-4: 24 Hour Trips – 2 Axle Straight Truck

Origin/Destination	Ontario																Quebec								Ontario External												Quebec External				Total						
	1	50	100	120	140	180	200	240	260	300	350	360	400	425	450	500	600	625	650	700	750	800	820	840	845	9000	9010	9050	9060	9070	9150	9160	9220	9250	9270	9280	9300	9310	9320	9430	9450	9550	9570				
Ontario	1																																												10		
	50																																												10		
	100																																												10		
	120																																												10		
	140				10													30	30		10	10	20	20		10																			140		
	180																	10	10																										20		
	200																	10	10		10			10																				50			
	240																		10																										20		
	260																																													20	
	300																																													20	
	350																																													0	
	360																																													0	
	400																																													10	
	425																																													0	
	450																																													0	
	500																	10																												20	
Quebec	600	10	10			10	10																																							60	
	625		20			20	10	10		10																																				100	
	650																																													10	
	700					10	10																																						30		
	750																																												10		
	800					20		10		10	10																																	60			
	820	10				10	10	10																																				40			
	840																																												20		
845																																												10			
Ontario External	9000																																														10
	9010																																													0	
	9050																																													0	
	9060																																													10	
	9070																																													0	
	9150																																													0	
	9220																																														

Table A-0-5: 24 Hour Trips – 3+ Axle Straight Truck

Origin/Destination		Ontario															Quebec										Ontario External	Quebec External					Total
		1	50	100	120	140	180	200	240	260	300	350	360	450	500	600	625	650	700	750	800	820	840	845	9220	9430	9470	9480	9570				
Ontario	1																	10													10		
	50															10			10					10			10				40		
	100																														10		
	140															20	30		10		10	20	20	10			10			130			
	180															10	10		10			10		10						50			
	200																														20		
	240																	10				10									20		
	260																														10		
	300																				10	10									20		
	350																															0	
	360																															0	
	400																															0	
	425																															10	
	500																	10														10	
	560																															0	
Quebec	600					10				10																				10		30	
	625					10				10																						30	
	650									10																						0	
	700									10																						30	
	750									10																						20	
	800																															30	
	820	10								40	10																					70	
	840									10																						10	
	845																															10	
Ontario External	9010																															0	
	9060																															0	
	9070																				10											10	
	9100																															0	
	9250									10																						10	
	9270																	10														10	
	9280																	10														10	
	9310																	10														10	
Quebec External	9430																															10	
	9450																															10	
	9550																															0	
	9570																															20	
Total		10	30	10	10	100	40	10	10	10	20	0	0	0	10	40	90	10	50	0	30	70	30	30	10	0	10	0	10		650		

Table A-0-6: 24 Hour Trips – Tractor Trailer
























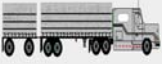
Origin/Destination	Ontario																Quebec								Ontario External										Quebec External					U.S.A	Total					
	1	50	100	120	140	180	200	240	260	300	350	360	400	425	450	500	560	600	625	650	700	750	800	820	840	845	9000	9010	9060	9070	9150	9160	9220	9250	9260	9270	9280	9310	9320	9430	9450	9470	9550	9570	9600	
Ontario	1																																													0
	50																	10						10	10																		10		40	
	100																																													20
	120																									10																			10	
	140	10																50	40		20	10	10	10		10																		190		
	180																	10	40		10		10	10																					100	
	200																	10	10					10																				60		
	240																	10						10																				20		
	260																	10																											20	
	300																					10		10																					40	
	350																				10																								10	
	360																								10																				10	
	400																																													0
	425																					20																								20
	450																	10							10																				30	
	500																		10						10	10		10																		30
	560																			10																										0
Quebec	600			10	30																									10													20	10		120
	625				20	10	10																						10		20											40	10		180	
	650																																													10
	700	10			10		10					10																																	50	
	750				10	10	10						10									10																							80	
	800				20		10							10																															60	
	820	10	10		30		20	10		10					10																													210		
	840				20						10																																		60	
845																																													90	
Ontario External	9000																																													10
	9010																																													10
	9060																																													10
	9070																																													40
	9150																																													10
	9160																																													10
	9220																																													10
	9250																																													10
	9270																																													20
	9280	10																																												160
9310																																													40	
9320																																													10	
Quebec External	9430																																													10
	9450						10			10																																				60
	9470																																													10
	9550				10																																									70
9570	10						10				10																																		270	
U.S.A	9600		10																																											90
Total		50	10	10	160	30	80	20	10	30	10	20	10	20	20	30	10	200	250	10	100	40	50	260	30	110	10	10	0	50	0	40	30	10	0	30	130	20	0	20	100	0	50	150	90	2,320

Appendix B

Heavy Truck Description

Heavy Truck Observance Study

Legend

Truck ID	Truck Description	
1	Tow truck with 2 axles	
2	Tow truck with 3 or more axles	
3	¾ or 1 ton pick-up truck with 2 axles	
4	Single unit with 2 axles. Cube van, step van, small dump trucks. Some types include soft drink companies, cabs without trailers & flat-bed tow trucks.	   
5	Single unit with 3 axles. Includes dump trucks, cabs without trailers, garbage trucks, flat-bed trucks with hydraulic arms.	   
6	Single unit truck with 4 or more axles	 
7	Single unit truck with "pup". Usually a 3 or 4 axle truck pulling a 2 or 3 axle pup. Also includes some single flat-beds with attached trailer	
8	Single trailer with 4 or less axles.	
9	Single trailer with 5 axles	   
10	Single trailer with 6 or more axles	 
11	Multi-trailer with 5 or less axles	
12	Multi-trailer with 6 axles	
13	Multi-trailer with 7 or more axles	  
14	Other truck style. If a particular heavy truck does not fit any of the above-noted configurations, indicate by #14 on your field sheet.	

NOTE:

The truck symbols listed in this table represent **axle configurations only**. Trailer and box styles will vary and will include tankers, flat-beds, and car carriers. For example, logging trucks may use 4, 5 or more axles but will consist of a flat-bed trailer instead of an enclosed box. In this case, a 4 axle logging truck will be identified on the field sheet by #8 if it is a single trailer. A dump truck with 3 axles will be identified by #5 since it is a single unit truck. If it is towing a "pup" with 2 axles, it will be identified by # 7.