Final Study Report
Operating Cost of Trucking
2017 Update

Prepared For

Transport Canada

ECONOMIC ANALYSIS DIRECTORATE

by

LOGISTICS SOLUTION BUILDERS INC.

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TABLE OF CONTENTS

1.0 Introduction

1.1 Background

Transport Canada has sponsored the publication of the Operating Cost of Trucks in Canada report series since 1972. The purpose of the study is to provide activity related cost estimates of operating trucks of various vehicle configurations in Canada and the United States. These cost estimates are relevant to the department in analysis where trucking plays a role. The most recent edition of the study was based on cost levels for the year 2013 and was published in 2014 (ref 1).

The objective of the present study titled Operating Costs of Trucking is to provide estimates for the year 2017 of the operating costs of trucks. The estimates are provided primarily for a sample of case studies in each of the provincial and territorial regions in Canada. In addition, five sample international trucking corridor cases are developed comparing costs for using Canadian and U.S. based trucks.

1.2 Current Requirements

The overall format of analysis of trucking costs in the study was mandated to remain the same as the 2013 version.

Vehicle Configurations

The estimates developed are reflective of the "standard" vehicle configurations that are operated in the different parts of Canada. These "standard" vehicle configurations are accepted by all jurisdictions as outlined in the Memorandum of Understanding that was signed by The Council of Deputy Ministers (ref 2). The vehicle configurations chosen for this study include:

- Straight Truck (urban van body)
- Tractor and Tandem Semi-trailer with 5 axles (van, flat deck, tanker and container chassis)
- Tractor and Tridem Semi-trailer with 6 axles (van, flat deck, tanker)
- Tractor and B Train Double with 8 axles (flat deck and tanker)

The foregoing vehicle configurations are essentially the same set of vehicle configurations investigated in the prior 2013 study edition (ref 1) as well as in prior study editions since the 2007 operating costs of trucks report where some changes to the selected vehicle configuration cases had been made.

Impact of Firm Size

Editions of Operating Costs of Trucks In Canada prior to 2013 were focused primarily on medium and larger sized company truck fleets. In the 2013 study, the Economic Analysis

Directorate sought to explore the impact of fleet size on operating cost and that report provided a comparative analysis and discussion of the impact of firm size by considering in some detail the comparative cost structure for fleets having more than 50 active power units (medium and larger fleets) and fleets up to and including 50 power units (smaller trucking fleets). As discussed in more detail in the prior study report, smaller firms tend to have a cost advantage derived from reduced administrative costs and possibly reduced compensation costs for drivers and larger fleets derive cost advantages from purchasing power and scale economies that translate into lower input costs for fuel, tires, equipment, parts, etc. These factors having been explored in the 2013 study, the case study findings from that work demonstrated that the magnitude of over-all costs that our analysis discovered were very comparable for both sizes of firm. This 2013 finding agreed with the principal analyst's prior consulting experience where smaller (for example start up or regionally based) trucking businesses are competing successfully with larger firms and offering comparable trucking rates to customers as larger firms.

Because of this 2013 finding, and also faced with resource constraints (budget scope) for the current study, Transport Canada agreed – for purposes of the current 2017 study – to return to the scope of all prior study reports in the Operating Costs of Trucks series, namely to develop the project's case studies assuming that trucking cases are undertaken by medium and larger trucking fleets of over 50 operating power units.

Cases using Owner Operator Trucks rather than Company Units

In addition to evaluating operating cost case studies for fleets operating company trucks, separate estimates were developed in the current study for fleets employing owner-operators for the tractor and tandem semi-trailer configurations with 5 axles (van, flat deck, tanker and container chassis). Again, due to budgetary limitations, the 2017 study did not replicate owner operator surveys that had been conducted in 2010 and 2013 and which were found in those studies to have limited reliability in terms of information gained from effort expended and sampling size/response rates obtained. As in the 2013 study, the comparative owner-operator trucking cost cases reported with this study are developed using 2017 compensation levels for owner operators as reported by company fleets that hire them.

Private Trucking

Although the report series Operating Costs of Trucks in Canada has focused on trucking case studies involving for hire trucking, the Economic Analysis Directorate notes that many businesses in Canada operate private trucking fleets. For this reason, a section has been added to this project since 2011 discussing how costs compare for private trucking operations versus using for hire operations.

1.3 Scope and Limitations

The trucking industry consists of many sectors: the *for-hire sector* which has historically been defined as consisting of those companies that haul freight owned by others, for compensation;

the *private sector* consisting of those companies who primarily haul their own freight, but may, from time to time, haul other people's goods for compensation; the *owner-operators,* small independent contractors working either for private carriers or for-hire companies or for both; and the Courier industry specialized in carrying small charges and parcels.

In this study, the bulk of the investigation is related to the for-hire fleet sector. We also gave brief consideration to comparisons with the private fleet sector, and a small examination of owner-operator sub-contracting versus company trucks. The courier industry is out of scope for this study.

1.4 List of Acronyms

AAR	Association of American Railroads
ASTM	American Society for Testing and Materials
ATRI	American Transportation Research Institute
BCTA	British Columbia Trucking Association
CITL, CITA	Canadian Industrial Traffic League, now known as CITA, the Canadian Industrial Transportation Association
CITT	Canadian Institute of Traffic and Transportation
CPI	Consumer Price Index
CTA	Canadian Trucking Alliance
CTRF	Canadian Transportation Research Forum
GCW	Gross Combined Weight
GVW	Gross Vehicle Weight
NGL	Natural Gas Liquids
OBAC	Owner-Operators' Business Association of Canada
PMTC	Private Motor Truck Council of Canada
PPI	Producer Price Index

2.0 TRUCK COSTING

2.1 Methodology

Historically, the basic methodology used for this study is the comparative development of case studies using an activity based analytical model of trucking operations.

Documentation of this approach has been widely described in prior editions of Operating Costs of Trucks in Canada, sponsored by Transport Canada, including:

- Operating Costs of Trucks In Canada, for Transport Canada, by Trimac Consulting Services Ltd., various (1972 – 2003) (ref 3)
- Operating Costs of Trucks in Canada, for Transport Canada, by Logistics Solution Builders Inc., 2005 (ref 4)
- Operating Costs of Trucking and Surface Intermodal Transportation in Canada, for Transport Canada, by Ray Barton & Associates in Association with Logistics Solution Builders Inc. and The Research and Traffic Group (2008, 2011) (ref 5). Note these latter two report editions assessed the prior year's average costs, thus reflecting base costs for years 2007 and 2010.

Over many years, this study's methodology has been presented by this report's principal author to open industry seminars, in what have been called "Know Your Truck Costs" presentations. These one-day events included the following:

- Two presentations in 1993 of the same seminar, one in Toronto, hosted by the Canadian Industrial Transportation League (CITL) (now known as the Canadian Industrial Transportation Association, CITA), and one in Calgary two weeks later hosted by the Propane Gas Association of Canada (ref 6),
- 1994 and 1996, the Alberta Motor Transport Association hosted "Know Your Truck Costs" workshops in Calgary, (ref 7),
- The British Columbia Trucking Association hosted "Know Your Truck Costs" workshops in Vancouver in 1995 and 1997 (ref 8),
- The Canadian Institute of Traffic and Transportation (CITT), Calgary Local Council and Students, hosted a "Know Your Trucks Costs" workshop in May 2014. (ref 9), and
- The British Columbia Trucking Association hosted a "Know Your Truck Costs" workshop at their Annual General Meeting and Management Conference held in Kelowna, June 2014. (ref 10)

In addition to these seminars, there have been presentations of findings from various editions of Operating Costs of Trucks in Canada series reports at various of the Annual Meetings of the Canadian Transportation Research Forum (CTRF), specifically in 1986 and 1997, and the same methodology was also used and cited in a related study that was tailored to hauling of mineral concentrates that was presented at the 2007 CTRF conference. (refs 11, 12)

In this context, the method has been widely exposed to industry and has been found to be generally accepted in these forums

The calculation is a replica of the methodology commonly used by fleet operators to determine costs, hence rates to quote customers for undertaking specific trucking activity. The project consultant has employed this methodology and used it to develop custom applications to consult within the for-hire trucking industry, and with operators of private trucking fleets, to undertake feasibility studies, quote new business, and benchmark cost efficiency of fleet operations. In addition, shippers negotiating prices with trucking firms have found these benchmark studies to give useful understanding of motor carrier cost structures and revenue needs.

This same activity based costing methodology is currently being employed by Logistics Solution Builders Inc in annual cost benchmarking assignments involving collection of bulk milk in stainless steel tank trucks for both the British Columbia Milk Marketing Board (most recent annual evaluation completed October 2017) and Milk Alberta (most recent annual case study developed and submitted in March 2018).

2.1.1 Cost Components Assumptions

The unit cost model used for this project, as in previous years, includes the following components of cost for each truck operating case study:

- Driver wage
- Power Unit Repairs
- Power Unit Transport
- Power Unit Depreciation
- Trailer Repairs
- Trailer Transport
- Trailer Depreciation
- Insurance Costs
- Equipment Financing Interest Costs
- Pickup and Delivery Costs
- Fuel Cost
- Power Unit Cleaning
- Power Unit Tires
- Power Unit Licenses
- Trailer Cleaning
- Trailer Tires
- Trailer Licenses
- Administration and Interest on Working Capital Costs
- Provision for Operator Profit (also depicting IRR for the Operation)

Essentially, the process followed in the study is to use the same computational methodology that a prudent trucking operator uses to devise and quote a "cost related" rate to a prospective customer -- with the component costs for each of the factors above estimated for and related to the operational factors for the specific case study being investigated. This modelling approach has proven to provide good overall replication of industry cost levels. The cost estimates reflect the standard vehicle configurations and gross vehicle weights that are commonly operated in the different parts of Canada.

The approach followed itemizes each case study's distance travelled, operating speeds, fuel consumption rates, and all additional work hours not driving (i.e. waiting time, loading / unloading time) where drivers and equipment are "on duty". The foregoing activity measurements result in specified costs for over the road operation of trucks.
In addition to the direct hauling activity related costs, provision is made for assignable indirect costs for the fleet business. These include over-all administrative activity (management and supervision, billing and accounting, information technology, sales and marketing, and provision of business premises for operating the fleets), interest costs for moneys invested in equipment and for working capital of the business, insurance costs and an operator profit margin.

Whether the trucking operation is for-hire, or part of a private fleet, providing an operator profit margin in the assessment of over-all operating cost (or user cost) covers the costs associated with the fleet business owner earning a "return on investment" -- either an operating margin to cover return for investment in a for-hire fleet, or for "opportunity cost" when a firm chooses to invest in a private fleet operation rather than undertaking another investment opportunity using the committed resources either directly invested or committed to an equipment lease.

In 1972, industry profit margins of for-hire trucking were generally significantly higher than is common today -- hence earlier Operating Costs of Trucks in Canada editions set operator profit at 10% of revenues. Currently, operator margins tend to be lower, perhaps averaging from 2.5 to 5% of revenues for industry leading fleet operations. Exceptional trucking operators can still earn margins around 10% -- for example these are comparable to margins reported by express transportation companies operating a premium service (e.g. trucking division of UPS, according to Transport Topics' Top 100 for 2004, for example).

In noting these values for profitability, one should take account of the economic downturn in the North American economy which saw traffic levels and profitability for all transportation businesses, including operators of trucks, in both Canada and the USA decline significantly during 2008 and 2009. Accompanying this loss of traffic, industry margins in both Canada and the USA virtually disappeared for the latter half of 2008 and through 2009. In 2010, however, because of a combination of traffic re-growth, industry rationalizing their operations (many companies undertook to reduce administrative costs and seek better fuel economy / driver management in order to survive), prudent trucking operations have reduced scale and costs and have experienced an improvement in their operating margins since 2010.

Many trucking firms are currently earning margins in the 2.5% to 5% range again though they remain vulnerable to traffic losses, business reduction due to driver shortages, volatile changes in fuel costs and other business uncertainties such as currency exchange rate and interest rate volatility that are potential threats in the current economic climate.

Two important factors that have impacted trucking operations in Canada generally since 2013 include an almost 30% change in the Canada / U.S. dollar exchange rate (from approximately 1 U.S. $ = 1.02 in 2013 to 1 U.S. $ = 1.30 during 2017) as well as a significant (approximately 15%

reduction) change in diesel fuel prices for truckers. In addition to these factors that impact costs for trucking across all Canadian regions, the world market price reductions for crude oil between 2013 and 2017 (which drove fuel prices downward, previously mentioned), has created a significant decline in Western Canadian business activity (principally the Alberta and Saskatchewan oil sectors) – putting downward business market pressure on trucking firms throughout Western Canada – a region that was previously very strong but is now much weaker than in 2017.

The current study compares three margin levels: 10%, 5% and 2.5% operator profit margin -- enabling the user to tailor the costs to their understanding of the particular trucking market being benchmarked.

To enumerate all of the foregoing cost components, an Excel based costing spreadsheet is used to calculate annual component costs for a single vehicle -- operated as part of a fleet operation -- for each of the vehicle configurations noted in Section 1.2. Costs are enumerated as total and component costs of the vehicle for a year, costs per hour, and costs per kilometre.

Input Unit Costs

To implement the methodology, a database of factor costs for wages, fuel, tires, repairs, equipment purchase and other cost inputs is maintained and updated from one report edition to the next.

This database has never made use of statistical sampling techniques, because of sampling limitations, but rather is more of an "expert system" designed to capture and reflect a smaller sampling of data sources, updated and applied to the database from prior report editions. Because of the number of case study / regional configurations considered, sample sizes are small and care must be taken when "parsing" the over-all truck costs down into specific unit cost components. (See later Discussion of Accuracy, Section 2.1.2)

For updating the database to 2017 from values used in the prior 2013 base year Operating Cost of Trucks in Canada study, four basic sources of information were consulted:

1. Truck Fleet Supplier Quotations (Equipment, tires, fuel).

2. Contacts With Trucking Associations: Canadian Trucking Alliance (CTA) and the Provincial Trucking Associations as well as the Private Motor Truck Council of Canada (PMTC)

3. Fleet Operator Expert Consultation for trucking firms that operate fleets in the Canadian study regions of interest.

4. Literature Review including
    - Online reference to provincial registration requirements (size and weight restrictions, license fees, fuel taxation, sales taxes)
    - Online reference to relevant economic measurements including CPI and PPI's from Statistics Canada, the US Bureau of Commerce, and currency exchange rates and borrowing rates from the Bank of Canada.
    - Energy Cost Statistics provided by Kent Energy Group (formerly MJ Ervin & Associates) and the U.S. Department of Energy concerning retail roadside prices for diesel fuels.
    - Reference to recent operating costs information for USA published by the American Transportation Research Institute (ATRI)
    - Reference to motor carrier energy efficiency studies documented in 2015 by USDOT
    - Reference to online hiring notices for drivers, notably the website Indeed.ca which operates in all Canadian regions and which has posted hiring notices for over 8300 commercial heavy driver positions over the past five years.
    - Reference to trucking industry publications including Western Canada Highway News, Pro Trucker and Equipment News (Marketbook.ca).
    - Reference to various motor carrier industry oriented websites including www.trucknews.com and www.todaystrucking.com.

Treatment of Trucks Based In USA

For the selected international corridor cases, when comparing Canadian based trucks with trucks domiciled in the US, unit costs for all inputs procured within the US were obtained in US $. These were then converted to equivalent Canadian $ costs using the average 2017 exchange rate of 1$ US = 1.2986 $ CDN (Source: Bank of Canada).

For operations on international Canada - US corridors, most costs were based on the assumed home country of domicile for the trucker, except that fuel costs for fuel burned in the US were based on US cost levels (reflecting ability to purchase fuel in US, taxed at US rates, for both truckers regardless of domicile). Similarly, fuel burned in Canada was costed based on applicable provincial prices and tax rates, giving a blended fuel price that was assumed to be the same for all truckers on the corridor (both Canadian and US based).

Standardized Vehicle Configurations and Equipment Life Cycle

For the vehicle configurations examined in this study, specifications can vary considerably for even a single equipment type. Such variations can reflect in significantly different costs for vehicle purchase, vehicle repairs and fuel consumption.

These significant variations are present, when considering the trucking industry as a whole. Specific fleet operators will be using their own chosen specifications, engine sizes and other equipment selection preferences. The "mix" of vehicles on the road will reflect all of these differences, together with a mix of vehicle ages -- since not all vehicles are brand new.

In order to better standardize Operating Costs of Trucks in Canada, some general vehicle specifications have been developed -- and these are reviewed every time that the study is updated -- by asking equipment suppliers and fleet owners whether the assumed basic specifications remain "representative" of what the majority of the industry is operating.

The specifications that were used to guide our current discussion with equipment suppliers are discussed in more detail in Appendix A.

Use of Day Cabs versus Sleeper Equipped Units

For the regional case studies, cabs were assumed to be NOT sleeper equipped (for purposes of estimating tare weight and purchase costs). For the longer distance corridor cases consideration was given to additional costs (and weight) to add to the basic power unit specifications to reflect a sleeper equipped power unit.

Vehicle Life Cycle for This Analysis

Whether a fleet operator buys a new or used vehicle, and how long it is retained, is a business decision reflecting the owner's business strategy and the trucking market segment served. For example, an agricultural producer often purchases older used equipment and retains it for many years -- reflecting low average annual mileage characteristics of this hauling, the fact that hauling is very "local" to the home base, etc.

For most for-hire line haul trucking operations, the "standard" life cycle management strategy is as follows:

For median utilization of 100,000 miles per year (160,000 km), operators will purchase new power units and retain them in line haul trucking service for 5 years. After 500,000 to 750,000 miles, (or 800,000 to 1.2 million km) the power unit will either be sold, or "retired" for use as an urban pick up and delivery unit, or a yard tractor.

Under the same utilization scenario, trailers will be purchased new and operated for an average of 8 years.

Fleet Size Assumptions

The presented case studies give annual costs to operate a single vehicle; however in the historic costing series, the costs were developed assuming the vehicle is part of a medium sized or larger trucking fleet (with no size threshold or definitions provided in the reports as to what this represents). For this reason, indirect costs for administration, interest, insurance and operator margin have been allocated to the single vehicle based on normal percentages for these cost components within trucking businesses in Canada and the US.

Standardized Truck Terminal (Loading and Unloading) Productivity Assumptions

For developing truck operating costs as impacted by terminal (load-unload) productivity, truck equipment ownership costs during wait time are excluded from analysis for the reason that the basic equipment utilization criteria, namely total kilometres travelled annually, implicitly already accounts for these costs. In other words, it is less feasible for an operator to realize a high number of kilometres annually as the proportion of equipment time spent loading and unloading increases.

Terminal productivity does directly influence driver wages and burden costs because whether the drivers are physically involved in commodity handling, they are often paid the representative hourly rate during the time involved for waiting to be loaded or unloaded or their distance related wage reflects a proportion of expected "waiting time" to be loaded / unloaded.

For this study, terminal handling performance is based on the following parameters:

Dry Freight in Combination Units: One origin-destination per trip is assumed, which reduces the time required to handle one payload. Realistically, the rate of loading-unloading varies with consignment type; however observation indicates that 4,500 kg per man-hour is representative of dry freight loading/unloading performance. Assuming an adequate availability of manpower, a handling time criteria of three hours for 27,270 kg has been applied to all applicable cases. That is, the driver will be on the job, but not driving, three hours for a 27,270 kg dry freight payload.

Bulk Commodities: A study of various bulk operations indicates that the following load/unload rates reflect a good average for bulk commodities: 40,900 kg in 1 hour and 15 minutes; 22,700 kg in 45 minutes; 9,100 kg in 15 minutes.

Dry Freight in Van Straight Trucks: The time spent loading and unloading freight was assumed to be 1 person hour per 1600 kg of consignment.

The above mentioned handling performances are used in the analysis to estimate the total time necessary during the operations to handle the commodities. During this time the driver is paid on an hourly rate basis. The same handling performances have been applied throughout with exception of the container chassis hauling evaluations where a time of 0.75 hours per trip was applied in total for all loading and unloading activity.

We are also assuming that the only handling cost to the truck operator is the wages and burden paid to the driver on duty during loading and unloading. The handling facilities and manpower are considered not to be under the trucker's management, or if so, that the costs for this operation are recovered against a “handling charge” and not included in the trucking cost.

Truck Operations Productivity and Cost Factors

These remain unchanged from prior studies.

Intra Regional Base Case Trip Distances: The combination units are assigned a round trip distance of 320 kilometres since they are assumed to be involved in predominantly "terminal-to-terminal" highway service. Urban two axle units are assigned a trip distance of 100 kms. These common trip distances tend to reflect average common operational factors within the industry -- recognizing there are shorter and longer distance market segments, for specific operations.

International Corridor Studies: Costs are developed for one-way travel based on trip distances taken from Google maps. Numbers of one-way trips annually, which reflect in annual distances travelled by units, reflect 3,000 working hours per unit divided by time required for a single one-way trip.

These corridor operations are applied to the line haul combination units and not to straight truck applications.

Annual Operating Distance

Annual operating distance is a convenient efficiency index that reflects factors such as seasonality, hauling distance, traffic congestion, or urban / inter-urban operation. This factor is also readily monitored and understood by fleet operators – usually in relation to specific hauling destination pairs. (trucks allocated to shorter routes generally do not achieve as high an annual mileage as trucks allocated to longer distance routes).

For the base cases in this study, three annual utilization scenarios were undertaken -- designed to reflect Low, Median, and High annual utilization of trucks. For line haul combination trucks, the scenarios used are:

- Low Annual Utilization (80,000 km per year, or 50,000 miles per year)
- Median Annual Utilization (160,000 km per year, 100,000 miles per year)
- High Annual Utilization (240,000 km per year, or 150,000 miles per year)

For the sample owner-operator case studies, only Median and High Annual Utilization cases were developed because the cost / compensation schemes discovered in this study would not be sufficiently compensatory for Low Annual Utilization scenarios. The Median Annual Utilization level of 160,000 km per year (100,000 miles per year) is very comparable to the average reported utility found in our 2013 owner operator survey which was 171,200 km per year (107,000 miles per year)

For the international city pair corridors, annual mileage reflected a median utilization based on 3000 worked hours per year, applied to the trip distance.

In the case of the urban two axle trucks, the utilization levels were 40,000 km; 80,000 km and 120,000 km annually for Low, Median and High cases.

Base scenarios evaluated in this study reflect paved road operations.

Average payload size was determined by applying the general density characteristics of the commodity type to the gross vehicle weight and with regard to the vehicle tare weight.

Local Cost Basis in Each Province and Territory

Main population centres of each region were assumed as the base of operation for assessing local costs such as fuel, wages, etc.

Region	**Assumed Population Centre**
British Columbia	Vancouver
Alberta	Calgary / Edmonton
Saskatchewan	Regina / Saskatoon
Manitoba	Winnipeg
Ontario	Toronto
Quebec	Montreal
New Brunswick	Moncton, St John
Nova Scotia	Halifax / Dartmouth
Prince Edward Island	Charlottetown
Newfoundland	St John's
North West Territories	Yellowknife
Yukon	Whitehorse

The life cycle policies previously discussed were used to assess equipment performance and maintenance cost levels -- to make the scenarios representative of the average vehicle in an actual fleet. Hence maintenance costs reflect averages for tractors in the first five years of their life and trailers in their first eight years.

For assessing vehicle write off costs, depreciation was related to purchasing new equipment and depreciating power over 5 years and trailers over 8 years.

2.1.2 Reliability and Accuracy of the Unit Costing Method

As noted previously, Operating Costs of Trucks in Canada is not a "statistical survey", but rather the application of an activity based unit cost model using information from expert opinion developed as an ongoing "database" supplemented by consultations with industry, suppliers to the industry, etc.

The motor carrier sector is a very diverse segment of the economy. This is one of the factors that has historically impeded the development of statistical models and is especially one that impedes the use of "statistical averages" for accurately estimating trucking costs in specific situations.

From the Central Limit Theorem, where σ (sigma) represents the statistical variance, in situations where the variance (σ) is quite large, a precise estimation of the mean value for an underlying process requires very large statistical sampling to be undertaken.

In the face of these difficulties and with the relatively small published statistical sampling of Canada's motor carrier industries, the cost modelling approach used in the Operating Costs of Trucks in Canada methodology -- is essentially that of applying an "expert system" for estimating total vehicle costs per kilometre.

Accurate Determination of Truck Costs: Rate Making

In considering the question of "accuracy" of our estimates, we look to the most precise determination of fleet costs -- that which is undertaken by firms when they are setting prices to bid for their services -- the rate making process.

As stated previously, the methodology laid out for this project is an enumerative process that relates costs to unit component costs (e.g. wage rates per hour, fuel prices per litre, repair costs per vehicle km operated, etc.) The unit costs, estimated separately, are then "summed up" to derive a total cost which can be expressed as a vehicle operating cost per kilometre…for a specific situation.

If we were a trucking company using a model similar to the one developed for this project to forecast the operating costs for a particular haul that we were bidding on -- we would require the accuracy of our cost forecast to be very precise. Given the low profit margins of the industry, and the competitiveness of the bidding process, one would expect that our over-all cost estimate -- for some new business -- will need to be accurate ± less than one percent. If we significantly over estimate the costs, our price will be too high and the business will be awarded to another bidder. If we under estimate the costs, the business will be awarded to us -- but will likely be unprofitable for us.

In this type of application of our methodology, of course, the firm would have the luxury of exact knowledge (a 100% sample, statistically) of the business's immediate prior unit cost structure. We would know current and immediate future wage levels of our drivers; we would have an exact recent fuel pricing and utilization structure, etc.

We would also have an exact specification for the haul in question -- providing such information as trip distance, trip cycle time, specific road speeds, etc.

At the same time, our firm would generally need to be "in synch" with the best practices of the industry as a whole -- otherwise our cost components might all be "too high", and we would not be awarded business -- using our cost estimates.

This being said, we know from experience that different truck operators pay different amounts for fuel. Different truck operators have different wage structures. Different truck operators have different purchase arrangements with different suppliers.

Some of the foregoing factors favour larger fleets, who generally command larger discounts from suppliers with whom they book larger amounts of business. Other cost factors (such as administrative costs) can be lower for smaller businesses. For these components, the variability (σ) is very large (commonly, variations can be found that are ± 10 or 20 percent, when looking at the individual components).

The evidence that larger and smaller trucking business tend to have a similar "bottom line cost structure" is provided by the marketplace. Frequently, larger firms as well as a large number of smaller fleet businesses are found coexisting within the same marketplace. That is to say, on similar routes, hauling similar products, etc. -- we find both large and small fleet operators.

<u>Less Accurate Estimating of Truck Costs: Benchmarking</u>

Moving one step away from the more exacting needs associated with "rate making", very often firms need to benchmark their practices against one another -- or against what would be considered "best practices" for the sector as a whole.

For this type of determination, over-all costs can be estimated within somewhat greater tolerances, perhaps ± 5 percent.

These kinds of cost determination can be useful for assessing questions such as:

- Should our company operate (or cease to operate) a private fleet?
- What transportation rates are we likely to be able to negotiate, if our company put this hauling out for bid?
- What would be the trucking costs to use for assessing investment grade feasibility of a new project (that trucking companies may be inclined not to waste much time at bidding -- since the hauling is only a hypothetical piece of business)?

For these types of exercises, the principal of Logistics Solution Builders Inc. has applied the methodology used in this present study, for over twenty years. Essentially, the model and the data sources used and described for each of the cost components, is the same quality of information that we have provided with this model.

The process provided is not a statistically based model, but it is an "expert system" that uses reasonable average information -- determined from discussions with industry experts, consultation with suppliers to the industry, etc.

These information are maintained in an ongoing live database of information that is augmented periodically with new experience -- from actual hauling applications, as they are evaluated and information gathered.

For updating cost and productivity coefficients for this study of 2017 operating cost levels from the values in the prior 2013 study database, Logistics Solution Builders directly obtained information from:

- Contact with 18 For Hire Fleet Operations, 10 of which had both company truck and owner operator operations.
- Contact with 3 Private Fleet Operators.
- Review of 28 current heavy truck driving hiring notices in all Canadian regions
- Review of the Manitoba Trucking Association 2017 Industry Wage Survey (provided in confidence to the consultant) which had 46 trucking industry respondents.
- 3 Major Oil Company Fleet Fuel Sales Representatives
- 3 Manufacturer/Dealers that Supply Power Units
- 6 Manufacturer/Suppliers of Trailer Units
- 2 Manufacturer/Suppliers of Tires
- 2 Insurance Representatives who Underwrite Commercial Trucking Policies
- 1 Full Service Leasing Representative

While obtaining information from these current sources provides a good current cross Canada representation of average industry costs and practices, recognizing the number of equipment case studies and regional combinations that are being investigated, one must recognize that the "sampling" underlying our estimates for any specific equipment case scenario in any given region is not a very large sample size. This is partially offset by firms that operate multiple vehicle configurations or in multiple jurisdictions (more than one scenario discussed for specific fleet operators), but still results in relatively small samples of information for updating particular unit cost and productivity coefficients.

Due to these limitations on achievable sample size, the approach is strictly not a "statistical survey" but rather a collection of anecdotal expert interviews. For example, especially when drilled down to specific smaller provinces in Atlantic Canada, or for private trucks, or for straight truck configurations, a factor such as "estimated wages" will often reflect a very small sample size of only 2 or 3 actual numerical values. This limitation of the data is less present for more common vehicle configurations or for larger provinces where more businesses operate, however even in these situations, specific wage estimates will still reflect perhaps only 8 or 10 different carrier estimates for operating that vehicle configuration in that province.

Over-all, and this is not a statistically tested value, such as a mathematically derived "confidence interval", but reflects in the author's experience with actual hauling applications, the benchmarking estimates developed from the system and provided in this report should

easily answer the need for the client to estimate total trucking costs on a cents per kilometre basis, for each of the vehicle populations in the sample, to within ± 5 per cent.

The above figure, which is the author's conservative opinion of the reliability of the estimates developed using this methodology, means that if our model estimates unit costs of $1.66 per kilometre for a specific configuration of vehicle….that it is safe to expect that unit operating costs over-all are likely to be between ± 5 % of this value, or between ± 8 cents per kilometre.

Drilling Down to Individual Cost Components

Operating Costs of Trucks In Canada is a model built for the purpose of answering the need to estimate vehicle costs per kilometre, over-all, for various types of vehicles operated in Canada and on selected origin-destination city corridors (including some international corridors). It is not represented as a tool for doing detailed unit cost component analysis.

The component sub estimates (such as driver costs, or fuel costs, for example) are interesting and useful by-products, of the over-all methodology…but should probably be treated with an understanding that they may have a wider tolerance for variation within them, than are the estimates derived for over-all costs using the model.

As already described in context of "firm size", the author's experience is that some unit costs tend to be lower for smaller firms (such as administrative cost) … but these are often offset due to scale economies in purchasing fuels, tires, consumables and equipment by the larger firms. As a result of these types of factor -- when one disaggregates to a specific cost component, larger variations between companies occur than when looking at over-all costs totaled.

Because of the types of variations noted, and known by the author to be present within the trucking industry, specific unit cost components derived from an expert opinion sampling, versus an over-all industry survey, are likely to be accurate only ± 15 to 20 per cent -- if compared to a specific hauling application. These are the calibre of information used within our model's look-ups, because the over-all sampling size is necessarily small -- when consulting such experts.

This is to say, for example, that if our model data "look up" quotes a unit maintenance cost of 27.8 cents per kilometre for tires and repairs, that a specific operator of similarly configured equipment may easily have a unit cost structure, for that same grouped component, that is ± 6 cents per kilometre in comparison to the lookup value noted.

Again, some of the component variation may be accounted for by different purchasing and life cycle strategies. In the author's fleet consulting and costing experience, we have encountered situations where operator A purchases a "sturdier" component or vehicle and may have a lower maintenance cost than operator B, but this is traded off with a higher capital cost. Also, some significant differences in maintenance costs are known to occur between fleet operators based on the driver skills, and management thereof -- that can vary between fleets.

Of course, when we are considering the use of the model to estimate the average maintenance costs across the entire trucking industry that uses those types of vehicles -- one would expect, from the central limit theorem of statistics -- that the mean average maintenance cost should lie within a closer tolerance than the 6 cent value reported above. Essentially we are saying that if 2σ (the 95 percent confidence limit on the maintenance costs for an individual firm) is roughly 6 cents per kilometre, then our "expert estimate" for the mean value of the industry as a whole, will be much closer -- perhaps ±2 cents per km, if we are only estimating the average value for the over-all industry. (Though no one has measured this hypothetical average value -- or we would have gladly used this for our "look up" table).

Because no one has specifically done surveys for each of the cost items in question, predicting the accuracy of each cost item in our model, as an estimate of the mean value, cannot be stated mathematically using an exact statistical confidence interval.

Estimated Error: Concluding Remarks

This being said, even if wider variations are present within individual model cost sub-components, the over-all purpose for which this model is intended, understanding the costs for motor carriage using various configurations of vehicle in Canada's regions, and on specific corridors, should be well served using the model results presented herein to within an accuracy level of ±5 percent over all.

2.2 Cost Components Summarized

As previously described, a unit cost review was undertaken by Logistics Solution Builders, to update all unit cost components for this project to 2017 average cost levels.

As noted previously, this update of Operating Costs of Trucking in Canada is built partially upon the regularity of updates -- hence the study was commenced using the data base of unit cost information compiled over the years, in previous studies, as a starting point of inquiry. This permitted us to seek information concerning absolute levels of cost, but also to understand changes over the past four years -- down to the regional and specific equipment configuration level of inquiry.

The following component by component discussion of unit costs is designed to give an understanding of our data collection efforts underlying this study. This methodology is essentially unchanged from prior studies in this report series.

Unit Costs for Drivers

Samples of 2017 hourly and distance base wage rates for drivers in regions were obtained by getting results from:

- Discussions with fleets that operate in all the regions.

- Reference to available collective bargaining results published in internet references and trade publications.
- Review of corporate web-sites, many of which publish driver compensation information (these were all reviewed prior to contacting fleet operators.)
- Review of newspaper classified advertisements and web-based driver recruitment sites for carriers and driver pools. (Note indeed.ca also publishes average / summary statistics on a province by province basis for advertisements they publish – they report statistics for in excess of 8300 specific advertisements in total for Canadian provinces and territories, over the past five years).
- The prior 2013 base wage rates escalated using regional CPI escalation rates from Statistics Canada and the US Bureau of Commerce.
- Comparison to the published study, "An Analysis of the Operational Costs of Trucking: A 2017 Update", published by ATRI (ref 13) which reported unit cost statistics from a survey and research conducted in 2017 in the United States.
- Review of the Manitoba Trucking Association confidential industry wage study undertaken in 2017 (ref 14).

Considering all these sources, Logistics Solution Builders developed our best estimate for 2017 average driver wages to use for the hauling cases in this study as shown in Table 1 on the page following.

Please note that when comparing Canada and US driver wage levels, the current 30% premium in the Canadian / US dollar exchange rates (see table) results in significantly higher driver wages for US based drivers, in Canadian $ equivalencies when compared to Canadian region based drivers. This factor tends to increase the competitiveness of Canadian versus US based trucking companies for the international trucking corridors from what was observed in the prior 2013 study when there was virtual parity in the two currencies. (1 US $ = 1.0299 Canadian in 2013).

In our consultations with carriers, the wage difference between straight trucks and combinations was noted and reflects a standard operating practice whereby carriers will often hire junior entry level drivers and employ them for operating these smaller truck configurations at a lower wage rate than is paid for operating the larger 5 axle semi-trailers.

Table 1: Representative Driver Wages Across Canada and in USA Regions (mid 2017 Canadian Costs)

	BULK COMMODITY						GENERAL COMMODITY						
	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents	6-Axle Vehicles per hr $	6-Axle Vehicles per km cents	7/8-Axle Vehicles per hr $	7/8-Axle Vehicles per km cents	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents	6-Axle Vehicles per hr $	6-Axle Vehicles per km cents	7/8-Axle Vehicles per hr $	7/8-Axle Vehicles per km cents	2 Axle Vehicles per hr $
British Columbia	$25.10	33.22	$25.36	33.86	$26.86	35.14	$24.96	31.02	$25.49	31.68	$25.49	33.00	$21.24
Alberta	$25.63	33.56	$25.90	34.20	$27.40	35.48	$25.03	30.45	$25.56	31.11	$25.56	32.43	$19.59
Saskatchewan	$23.58	31.11	$23.89	31.75	$25.39	33.37	$23.84	29.90	$24.06	30.57	$24.06	32.56	$19.09
Manitoba	$22.23	29.67	$22.23	30.32	$23.98	32.91	$21.22	27.04	$21.22	27.69	$21.22	31.65	$18.95
Ontario	$22.57	30.20	$23.41	30.84	$25.16	32.46	$22.84	29.32	$23.59	29.99	$23.59	31.98	$19.88
Quebec	$20.83	28.83	$22.71	29.47	$24.21	31.71	$19.92	27.22	$22.94	27.87	$22.94	31.10	$17.21
New Brunswick	$18.18	25.85	$19.20	26.52	$20.45	31.15	$18.46	25.85	$18.67	26.52	$19.38	31.15	$16.50
Nova Scotia	$18.01	25.41	$19.02	26.05	$20.27	30.54	$18.29	25.35	$18.30	26.00	$19.20	30.54	$16.34
P.E.I.	$17.97	25.35	$18.98	25.98	$20.23	30.39	$18.24	25.22	$18.21	25.87	$19.15	30.39	$16.30
Newfoundland	$19.67	27.68	$20.56	28.32	$22.06	32.12	$19.68	26.77	$19.39	27.44	$20.19	32.12	$18.12
Yukon	$25.36	33.55	$25.49	34.19	$26.99	35.14	$25.49	31.68	$25.75	32.34	$25.75	33.00	$21.24
N.W.T.	$25.90	33.89	$26.03	34.53	$27.53	35.48	$25.56	31.11	$25.83	31.78	$25.83	32.43	$20.24

U.S. DRIVER WAGES FOR FIVE-AXLE SEMI CONFIGURATION (mid 2017) in Canadian $/hr and cents/km

	BULK COMMODITY		GENERAL COMMODITY	
	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents	5-Axle Vehicles per hr $	5-Axle Vehicles per km cents
U.S. North East (NY,NJ, Mass)	$28.30	41.02	$29.38	43.74
U.S. Great Lakes (Ill,Mich)	$28.30	39.22	$29.38	41.93
U.S. Midwest (Nebr,Kans,Okl)	$26.64	38.47	$27.72	41.16
U.S. South (Ark, Alab, Geo)	$25.40	36.68	$26.43	39.24
U.S. West. (Wash, Oreg, Calif)	$27.63	38.86	$28.72	41.56

1.2986000 2017 U.S. to Can $ Exchange Rate

Source: Logistics Solution Builders Inc

Costs for Driving Activity

Driving costs are influenced by distance, hours and tonnage associated with a haul. Larger highway vehicles are costed on the basis of calculating driver wages on either a per-kilometre rate, or an hourly rate -- whichever is highest. This is standard procedure and results in most cases in line-haul pavement kilometres being rated on a distance basis and urban and gravel kilometres paid on an hourly basis, due to slower vehicle speed.

Urban straight truck operations are costed on an hourly pay basis.

Costs for Loading and Unloading Time

Cost for driver time resulting from loading and unloading of payloads is included using the appropriate hourly rate.

Wage Burden Costs

In addition to paying base hourly and mileage wages for driving and loading / unloading work performed, a wage burden percentage is applied to cover costs associated with non worked paid time (e.g. Vacation and Statutory Holidays), driver benefits such as pensions, medical premiums, etc. that are provided by the employer. Burden percentages used have been developed from analysis and consultation with fleet operators.

Fuel

Fuel costs are a result of the influence of distance travelled, vehicle fuel consumption, and of course fuel prices.

To support Operating Costs of Trucks in Canada, Logistics Solution Builders maintains a database of realistic fuel consumption rates for each case study hauling scenario. These are based on, and updated with, consultation of fleet operators, discussions with distributors of power units to the industry and review of published literature on fleet energy management benchmarks and targets.

In this regard, an important and comprehensive reference discussing vehicle fuel efficiency was published by the USDOT in 2015 (ref 15) and we also reviewed the "Green Trucking" Summer 2017 edition of Western Canada Highway News (ref 16). Various green trucking initiatives are also cited in recent articles in virtually every recent edition of Truck News and Todays Trucking online.

In relation to pricing, we reviewed average annual 2017 fleet discounted diesel fuel pricing in the most heavily populated areas of each region in consultation with diesel suppliers and in comparison with the online Kent Energy (formerly MJ Ervin) survey of retail pump prices in Canada and similar statistics for US published by the U.S. Bureau of Energy. Costs included provincial and state tax as well as Canadian excise tax on fuels.

Price levels used in our study are as cited in Table 2 following.

Table 2: Estimated Diesel Fuel Prices (Average) For Year 2017

						CANADIAN CENTS/LITRE
			PER LITRE TAXES COLLECTED			TRUCKER FUEL PRICE (incl tax)
NO	PROV	MJ ERVIN RETAIL PUMP LESS GST/HST	FEDERAL EXCISE	PROVINCIAL	LOCAL MUNI	LARGE FLEETS > 50 TRUCKS
1	BC	117.1	4	22.67	11	112.2
2	AB	101.8	4	18.35	0	97.3
3	SK	98.3	4	15	0	93.8
4	MB	100.2	4	14	0	94.6
5	ON	97.2	4	14.3	0	94.9
6	PQ	99.6	4	20.2	0	98.1
7	NB	99.7	4	21.5	0	95.7
8	NS	92.7	4	15.4	0	88
9	PE	100.9	4	20.2	0	96
10	NL	107.6	4	21.5	0	103.1
11	YT	112.5	4	7.2	0	108
12	NW	112.1	4	9.1	0	107.6

USA BASED DIESEL FUEL COST BASED ON US DOE REPORTS

		CAN $ CURRENCY BASIS	
NO	USA REGION	$/GALLON	CENTS/LITRE
13	U.S. NorthEast (basis NY)	$3.51	92.63
14	U.S. Great Lakes (Michigan)	$3.38	89.20
15	U.S. Midwest (Nebraska)	$3.38	89.20
16	U.S. Southern (Texas)	$3.23	85.43
17	U.S. Western (Calif,Colo)	$3.86	101.90

1 USD = 1.29860000 CDN $

NOTE: Costs shown reflect Oil Company Tank Wagon Prices, provincial fuel & carbon taxes, and expected discounts for fleet fuel purchases in major regional centers. Fuel purchase costs also exclude GST/HST which are refundable to the operator on application. Costs also include provision for DEF treatment

Source: Logistics Solution Builders Inc.

Note that for Owner Operator trucking, the more progressive carriers often include provision for payment to the operator of a fuel subsidy for trucking in addition to base payment rates for hauling that are in cents per mile for line haul and provision for hourly work (pickups and deliveries based on standard rates and other "delay factors" paid hourly). The intent of the owner operator fuel subsidy, which fluctuates according to variations in the retail pump price levels, essentially gives the Owner Operator businesses the benefit of the carrier's "discounted fuel price". This being said, in terms of the cost for trucking by owner operator fleets, the payment by the carrier of these fuel subsidies means that when a carrier is using an owner operator instead of a company truck, the fuel component of trucking cost that gets built in to the over all cost equation can be seen to basically reflect a "retail pump price" versus a corporate discounted price.

In developing our case studies for Owner Operator tractors as part of a larger corporate fleet, we noted that the corporate trucking firms tend to provide access to fuel to their Owner Operators at fuel prices equivalent to the corporate discounted fuel price through payment of this fuel subsidy. Hence, many of these corporations either sell fuel at the corporate price to the owner operator or pay a subsidy for fuel purchased at on road pump prices equal to the difference (discount) that the corporate fleet purchase discount represents. In addition, many of the corporate fleets pay all fuel taxes and license costs for their continuing Owner Operators.

Unit Costs For Repairs

Repair costs used in our study represent expected costs of parts, lubricants, oil, and labour associated with the maintenance and repair of the particular equipment type. Our database on repair costs was updated in consultation with equipment dealerships, fleet managers, and reference to US Bureau of Commerce and Statistics Canada Industrial Price Indices. Additional points of comparison included (1) review of the 2017 base year ATRI study and (2) additional confidential surveys of trucking operations in Alberta undertaken by Logistics Solution Builders in 2016 and 2017 for other trucking benchmarking assignments that involve 14 fleets operating in British Columbia and Alberta.

We have assumed that repairs were undertaken under efficient shop management and that a prudent preventive maintenance system was employed that was compatible with equipment manufacturer recommended service intervals, warranties and other best practices.

Unit Cleaning Costs

The cost of cleaning tractors, flat deck trailers and van freight trailers has minimal effect on total operating costs.

Annual costs of cleaning bulk tanks vary with the type of commodity carried and the quantity of different bulk commodities transported during the year. An average of tank trailer cleaning costs was developed from discussions with various bulk tank truck carriers as well as a review of prices charged at commercial tank cleaning facilities.

Transport Costs

The transport cost category is a miscellaneous category to reflect all those factors that may be attributed to extra equipment that are not normally viewed as part of a vehicle's standard configuration. This may represent special pumps, hoses, safety equipment, dunnage, small tools, chains, tarping, heaters* or refrigeration* equipment. These costs will vary with area of operation and also with the specific type of product hauled.

**Note: Starred items are not included for this analysis, but such items would normally be included in the category "transport costs", when evaluating these specialized trucking applications.*

Unit Costs For Tires

Base case unit tire costs are determined in this study by reviewing the per mile operating costs from the prior study and comparing these with:

- Price Quotations for Tires and average lifetimes for tires were obtained from two national tire suppliers for each type of tire (steering tires, drive tires and trailer tires) and converted to per mile costs for the various vehicle configurations in the study.
- PPI escalators (Canada and the US) were applied to the prior 2013 database to reflect updating costs to 2017.
- Values available from the US published ATRI study for 2017 levels and trends were compared.
- Confidential surveys of truckers in Alberta conducted by Logistics Solution Builders Inc in 2016 and 2017 for other trucking assignments.

Unit Depreciation Factors

"Normal" depreciation is used based on the 2017 equipment purchase cost obtained from dealer quotations. That is, one percent a month for trailers over a trailer life of eight years and 79.2 percent for tractors over a tractor life of five years. This assumption relates equipment write-off to current replacement cost rather than an arbitrary "book value" determination. Equipment values used for this study, inclusive of applicable provincial and state sales taxes, are tabulated in following Section 2.3.

Unit Licensing Costs

Canadian license costs reflect the provincial or territorial charges for licensing the vehicle configurations studied as found in the Truck License & Tax Manual: A Guide to Canadian Regulations, 2007 edition published by J.J. Keller and Associates, updated to 2017 levels through trucker interviews and from provincial websites. Two axle straight trucks were assumed licensed at 14,600 kg in all jurisdictions.

US license costs for our international corridors are based on registration of a Five Axle Tractor Semitrailer Combination to the accepted interstate highway standard of 80,000 lbs (36,364 kg) gross vehicle weight. The registration costs are based on selected state jurisdictions, within each region, and applicable charges were secured from Trucking Permit Guide, 2007 edition published by J.J. Keller and Associates updated to 2017 using IRP rates for base plating in various USA jurisdictions as published on the internet.

Values used for this study are in the following table.

Table 3: Vehicle Licensing Fees and Weights (2017 Canadian Dollars)

	GVW/GCW (kgs)	No. of Axles	($) Annual Fee for Power Unit	($) Annual Fee for Trailer
British Columbia	39,500	5	2297	30
	46,500	6	2867	30
	63,500	8	3973	60
	14,600	2	607	
Alberta	39,500	5	1815	20
	46,500	6	2383	20
	63,500	8	3452	40
	14,600	2	614	
Saskatchewan	39,500	5	2378	32
	46,500	6	2495	32
	63,500	8	4140	64
	14,600	2	656	
Manitoba	39,500	5	2291	$10 / 5 yrs
	46,500	6	2835	$10 / 5 yrs
	63,500	8	4175	$20 / 5 yrs
	14,600	2	556	
Ontario	45,000	5	2973	$35 / Life
	54,000	6	3626	$35 / Life
	63,500	8	4693	$70 / Life
	14,600	2	874	
Quebec	45,500	5	2745	42
	55,500	6	3637	42
	59,000	8	3637	84
	14,600	2	742	
New Brunswick	41,500	5	2405	16
	49,500	6	2847	16
	63,500	8	3515	32
	14,600	2	795	
Nova Scotia	40,500	5	2675	35
	49,000	6	3184	35
	62,500	8	4012	70
	14,600	2	928	
P.E.I.	40,600	5	1885	$65 / 5 yrs
	49,700	6	2173	$65 / 5 yrs
	62,500	8	3213	$130 / 5 yrs
	14,600	2	628	
Newfoundland	40,500	5	2498	25
	49,500	6	2982	25
	62,500	8	3771	50
	14,600	2	692	
Yukon Territory	43,800	5	1128	$1 / month
	53,300	6	1428	$1 / month
	63,500	8	1728	$2 / month
	14,600	2	240	
N.W.T.	39,500	5	1135	20
	46,500	6	1338	20
	63,500	8	1831	40
	14,600	2	410	

Source: Logistics Solution Builders Inc.

Table 3, Continued: Vehicle Licensing Fees and Weights (2017 Canadian Dollars)

	GVW/GCW (kgs)	No. of Axles	($) Annual Fee for Power Unit	($) Annual Fee for Trailer
U.S. North East				
basis NY	36,287	5	$7,502	$30
			$0.0585/laden mi	
			$0.015/empty mi	
	15,500	2	$793	
U.S. Great Lakes States				
basis Mich.	36,287	5	$2,870	$51
	15,500	2	$966	
U.S. Midwest				
basis Nebr.	36,287	5	$2,376	$8
	15,500	2	$706	
U.S. Southern				
basis Ark.	36,287	5	$2,731	$26
	15,500	2	$373	
U.S. Western Rocky Mtn.				
basis Wash.	36,287	5	$2,976	$47
	15,500	2	$449	
** Note: Values shown are in CDN EQUIVALENT $ and include U.S. Federal Heavy Vehicle Use Tax of $550 (U.S.) per year (resident)*				
1.2986	2017 U.S. to Can $ Exchange Rate			

Source: Logistics Solution Builders Inc.

Indirect Costs: Administration, Interest, and Insurance

Administration and interest on working capital costs have been applied to the hauling cases based on average industry levels for fleets and taking account of normal interest charges applicable to trucking businesses in Canada and the US during 2017. The applicable percentage amounted to 12% of total revenue for Canadian trucking businesses and 13% of total revenue for US based trucking businesses. Note these values reflect indications that trucking businesses have responded to the recent economic downturn of 2008/2009 by reducing overheads.

The Canada / US interest rate difference reflects information gained from the Bank of Canada Internet site concerning Chartered Bank Prime Interest Rates and US Prime Rates Charged by Banks during 2017 -- with borrowing rates adjusted to reflect expected credit treatment of reasonably creditworthy trucking enterprises having clean financial performance abstracts.

Interest costs for financing equipment purchase reflects an assumed borrowing cost of 4% in Canada (5.38% in the US), loan payback period equivalent to equipment life, and an assumed 75% of equipment purchase costs financed (25% down payment required).

Insurance rates, as a percent of total revenue, reflect recent risk and claims performance of the trucking industry, historically a value between 3% and 3.5% of total revenue.

Operator Profit Margin

Early editions of Operating Costs of Trucks in Canada provided for operator profit margin at the (then normal) level of 10 percent of total revenue. Since Canadian trucking industry entry deregulation in the 1980's, profit levels have eroded and it is very common for well managed trucking enterprises to earn margins between 2.5% and 5% of total revenue. Specialized fleets can still earn higher levels of margin (for example time sensitive express operations such as the land based trucking divisions of international courier / freight forwarding businesses, but these are arguably not strictly trucking "pure plays", and their financial returns are certainly exceptional).

Note that 2008 / 2009 saw trucking margins all but disappear, however since 2010, there have been margin levels firming up to the 2.5% to 5% levels for established prudent businesses, albeit based on some downsizing of operations and other operational cost control measures.

To aid in applying the case studies investigated to specific business circumstances, Operating Costs of Trucks in Canada continues to calculate over-all trucking costs using three alternative levels of margin: 10%, 5% and 2.5% of total revenue.

For readers who are uncertain of which margin to assume for a specific hauling situation, a median approach is recommended -- basing evaluations using the 5% margin cases provided.

For each of the three alternate levels of profitability, the expected internal rate of return on investment that the trucking fleet generates is computed, as follows.

Internal Rate of Return on Investment Calculation

The calculation used to estimate this internal rate of return is to evaluate the equivalent interest earned from a cash flow series as follows:

- Beginning of time period: A negative cash flow equal to monies spent for equipment purchase
- Each time period (year): A positive cash flow equal to margin earned plus depreciation and interest on equipment purchase
- End of time period: A positive cash flow equal to monies realized as salvage on equipment disposal.

The resulting calculation is a computation of the “cash flows” (since depreciation accrual is a “non cash item” in any given year) associated with the investment and is independent of

borrowed money -- hence representing a measure of the “internal rate of return” for investing money in the trucking asset.

A reader might be tempted to look at the calculated “rates of return” in this report and feel that these rates are quite high. It must be remembered, however, that the “rate of return” that is appropriate for an investment of capital also reflects the “risk factor” in owning the asset. Trucking has been historically viewed as a higher risk investment than owning shares in enterprises such as “utilities” or “bonds” -- reflecting what is usually a very competitive market situation in the trucking industry. As a result, the rates of return displayed by the model are generally appropriate for investment in trucking as viewed by the financial community.

It is also appropriate to consider the specialization or competitive factors that apply to given trucking markets (availability of capital).

Many non specialized sectors (e.g. Flatdeck hauling, Agricultural trucking) may provide a lower rate of return on investment than more specialized trucking equipment due to the low degree of specialization of the investment in trailer equipment and competitive factors associated with having many suppliers of these services. On the other hand, very specialized trucking services that involve expensive (single purpose) equipment (e.g. a trailer for compressed gases such as anhydrous ammonia or N.G.L.’s, or a pneumatic dry bulk unit for hauling cement or fly ash) may dictate a higher rate of return to attract capital investment in the enterprise.

2.3 Equipment Unit Cost Factors

Based on consultations with three suppliers of highway tractors and six trailer manufacturers, and compared with our prior base year pricing levels escalated using PPI indices for comparison purposes, the unit cost factors for 2017 listed in Tables 4 and 5, following, were developed for this study.

Table 4: Estimated Average Purchase Cost of Power Units
(2017 Canadian Dollars)

	Tractor For Five Axle Semi Combination	Tractor For Six Axle (triaxle) Semi Combination	Tractor For Eight Axle Semi Combination	Straight Truck Two Axle Dry Freight Van
B.C.	$140,100	$149,730	$161,500	$101,650
Alberta	$131,000	$140,000	$151,000	$95,000
Saskatchewan	$138,800	$148,340	$160,000	$100,700
Manitoba	$141,400	$151,120	$163,000	$102,600
Ontario	$131,000	$140,000	$151,000	$97,000
Quebec	$131,000	$140,000	$151,000	$97,000
New Brunswick	$131,000	$140,000	$151,000	$95,000
Nova Scotia	$131,000	$140,000	$151,000	$95,000
P.E.I.	$131,000	$140,000	$151,000	$95,000
Nfld	$131,000	$140,000	$151,000	$95,000
Y.T.	$131,000	$140,000	$151,000	$95,000
NWT	$131,000	$140,000	$151,000	$95,000
U.S. North East	$137,710	$141,937	$150,391	
U.S. Great Lakes	$137,710	$141,937	$150,391	
U.S. Midwest	$137,710	$141,937	$150,391	
U.S. South	$137,710	$141,937	$150,391	
U.S. West	$137,710	$141,937	$150,391	
Footnotes: Values shown for larger fleets (> 50 units) : Add $10000 for Sleeper				
1.2986	2017 U.S. to Can $ Exchange Rate			

Source: Logistics Solution Builders Inc.

Table 5: Estimated Average Purchase Cost of Trailer Units
(2017 Canadian Dollars)

	Trailer For Five Axle Combination Semi Van	Trailer For Five Axle Combination Flat Deck	Trailer For Five Axle Combination Bulk Liquid Tanker	Trailer For Five Axle Combination Container Chassis Trailer	Trailer For Six Axle Combination Triaxle Van
B.C.	$39,590	$37,450	$109,140	$34,240	$48,150
Alberta	$37,000	$35,000	$102,000	$32,000	$45,000
Saskatchewan	$39,220	$37,100	$108,120	$33,920	$47,700
Manitoba	$39,960	$37,800	$110,160	$34,560	$48,600
Ontario	$37,000	$35,000	$102,000	$32,000	$45,000
Quebec	$37,000	$35,000	$102,000	$32,000	$45,000
New Brunswick	$37,000	$35,000	$102,000	$32,000	$45,000
Nova Scotia	$37,000	$35,000	$102,000	$32,000	$45,000
P.E.I.	$37,000	$35,000	$102,000	$32,000	$45,000
Nfld	$37,000	$35,000	$102,000	$32,000	$45,000
Y.T.	$37,000	$35,000	$102,000	$32,000	$45,000
NWT	$37,000	$35,000	$102,000	$32,000	$45,000
U.S. North East	$38,000	$37,000	$107,000	$32,000	$46,000
U.S. Great Lakes	$38,000	$37,000	$107,000	$32,000	$46,000
U.S. Midwest	$38,000	$37,000	$107,000	$32,000	$46,000
U.S. South	$38,000	$37,000	$107,000	$32,000	$46,000
U.S. West	$38,000	$37,000	$107,000	$32,000	$46,000

	Trailer For Six Axle Combination Triaxle Flat Deck	Trailer For Six Axle Combination Bulk Liquid Tanker	Trailer For Eight Axle B Train Flat Deck	Trailer For Eight Axle B Train Bulk Liquid Tanker
B.C.	$43,000	$123,000	$64,000	$232,000
Alberta	$40,000	$115,000	$60,000	$217,000
Saskatchewan	$42,000	$122,000	$64,000	$230,000
Manitoba	$43,000	$124,000	$65,000	$234,000
Ontario	$40,000	$115,000	$60,000	$217,000
Quebec	$40,000	$115,000	$60,000	$217,000
New Brunswick	$40,000	$115,000	$60,000	$217,000
Nova Scotia	$40,000	$115,000	$60,000	$217,000
P.E.I.	$40,000	$115,000	$60,000	$217,000
Nfld	$40,000	$115,000	$60,000	$217,000
Y.T.	$40,000	$115,000	$60,000	$217,000
NWT	$40,000	$115,000	$60,000	$217,000
U.S. North East	$40,000	$120,000	$58,000	$245,000
U.S. Great Lakes	$40,000	$120,000	$58,000	$245,000
U.S. Midwest	$40,000	$120,000	$58,000	$245,000
U.S. South	$40,000	$120,000	$58,000	$245,000
U.S. West	$40,000	$120,000	$58,000	$245,000

1.2986	2017 U.S. to Can $ Exchange Rate

Source: Logistics Solution Builders Inc.

3.0 OVERVIEW OF FINDINGS AND TRENDS

3.1 Basic Over-All Cost Trends

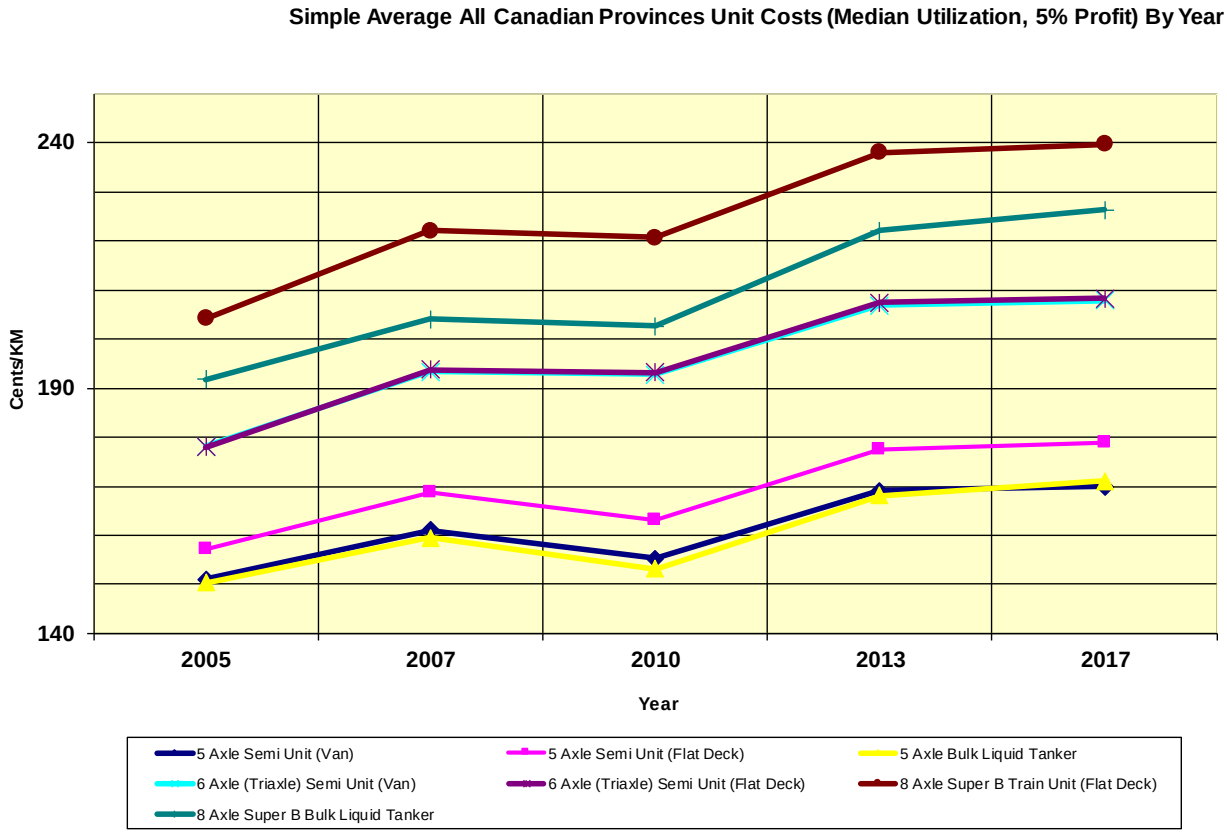
Prior editions of Operating Costs of Trucks in Canada (previously listed in Section 2.1) have portrayed historical cost trends in truck operating costs across the sum of all vehicle configurations and regions investigated.

Significant changes were made to equipment configurations in the 2007 base year report (published in 2008) and US regional cases were eliminated. These factors, taken together with changes in each of the prior three report editions to the international / city pair corridors, mean that comparisons and trends in truck operating costs are possible for only certain vehicle configurations.

Following Figure 1 plots trends in average truck operating costs per kilometer for the seven possible vehicle configurations that have been analysed in all of the most recent five study reports in the series.

The average costs shown on this graph are the simple arithmetic average of total costs across the Canadian regions investigated for base years 2005, 2007, 2010, 2013 and 2017 graphed for the median utilization and profit margin cases.

Figure 1: Trends in Total Truck Operating Costs For Seven Truck Configurations 2005-2017



Source: Logistics Solution Builders Inc.

In viewing these cost trends, we note that all of the seven vehicle configurations graphed exhibit the same general cost profile trends. That is, the unit cost graphs for all vehicle configurations tend to be parallel to each other and tend to show the same proportional change from one year to the next.

In comparing our case study costs for 2017 versus 2013, we note that average Canadian truck cost operation levels modelled by us in the activity costings have only risen moderately (approximately 0.5%) over all.

<u>Cost Factors Which Have Risen</u>

Between 2013 and 2017, there have been normal (approximately tracking various CPI and PPI trends) upward adjustments in all regions for driver wages, repairs, tires, cleaning and transport (miscellaneous) costs.

In addition to these normal upward adjustment trends, the price for acquiring new transportation equipment (power units and trailers) has increased substantially (essentially tracking local PPI factors) but also further related to price levels in the US as US dollar related

costs which are then discounted to Canadian dollars. The key factor that is operating here is the change in the Canada versus US Dollar exchange rate from near parity (1 US $ being worth approximately $1.02 Canadian) in 2013 to a level in 2017 where the US dollar is worth approximately 30% more than a Canadian dollar. This factor, which has impacted tractor and trailer acquisition costs in Canada, as well as costs for replacement parts, translates to a significant upward adjustment trend for power unit and trailer depreciation costs and a partial increase in repairs and maintenance costs (though these largely track Canadian wage adjustments which are in Canadian $ terms).

Cost Reduction

The cost increase factors described have been moderated due to the fact that these increases are substantially offset by a significant downward adjustment in fuel related costs for trucking when we compare the 2013 base year and 2017.

The first portion of fuel cost reduction relates to trends that are occurring in fuel productivity associated with various energy reduction technologies and practices that are happening in response to various Green Trucking Initiatives (refs 15, 16) and which have shown up in our discussions with carriers, power equipment suppliers and in fuel consumption standards that are published in cost studies such as the ATRI (ref 13).

In addition to this factor, the second portion of fuel cost reduction between 2013 and 2017 accompanied general price reductions for crude oil that has translated into reduced fuel pricing levels for truckers in Canada of approximately 15 percent as found on the Kent Energy (formerly M.J. Ervin) website. Note that our analysis also provides in the cost of fuel for the cost of operations using DEF (Diesel Emission Fluid treatment of fuels) which reflects current industry best practice.

Prior Trucking Cost Trends Between 2005 and 2013

As noted in the 2013 report, the 2010 base year study showed an interruption to the over-all observed pattern of upward cost trend over the time period 2005 through 2013. The apparent reduction in unit costs that occurred in the 2010 base year was a reflection of the 2008 – 2009 recessionary environment that had manifested itself in reduced purchasing costs for truckers to buy equipment and consumables as well as very flat wage increases during that time period.

For 2010 through 2013, the general upward cost trend can be attributed to normal escalations for wages and other factors and a significant firming up of diesel fuel prices that occurred over that time period.

3.2 Basic Canadian Regional Scenarios For Medium Sized and Larger Firms (>50 power units)

Appendix B provides a summary table of all the base case analyses for medium sized and larger firms (>50 power units) and for all configurations of trucks in all of the Canadian regions.

While the table in Appendix B provides comparisons for all regions, all three annual utilization scenarios and the three candidate levels of profit margin (2.5%, 5% and 10% respectively), following Table 6 compares the results in terms of the median annual utilization cases and 5% profit margin level.

From Table 6 we note the following highlights concerning truck operating cost results from this study.

Costs by Configuration

We note that generally the highest operating costs per kilometer are for the 2 Axle Straight Truck vehicle configurations. While having higher costs associated with smaller trucks is at first counter-intuitive, it should be noted that the average length of haul and duty cycle for these trucks reflects generally lower trip, daily and annual travel than for the larger articulated combinations, which results in a higher per kilometer cost.

As expected, for the articulated trucks, the 8 Axle Super B Train configurations are more expensive to operate than 6 Axle Tridem Semi Trailer units that are in turn more expensive than the 5 Axle Tandem Semi Trailer units. These comments are in relation to costs per kilometer over the road. The larger payloads for larger configurations result in lower unit transportation costs per item transported, when they are full.

Costs By Region

When we compare results in Table 6 for similar vehicle configurations across provinces, we note that British Columbia, the Yukon and Northwest Territories are the highest cost regions for trucking operations in Canada. Next most costly areas for trucking are Alberta and Ontario followed by Saskatchewan, Quebec and Manitoba. Atlantic Canada tends to be the lowest cost region for trucking operations.

The same patterns noted in Table 6 for median values are also exhibited for the lower and higher annual utilization scenarios and for the lower and higher profit margin cases. These values are contained in the base case tables of Appendix B.

In addition to the base case tables of Appendix B, detailed case scenario tabulations by cost component have been provided to Transport Canada under separate cover.

Table 6: Comparison of Total Unit Operating Costs Per Kilometer By Configuration & Region (All Values Canadian Cents/KM 2017 Base; Median Utilization, 5 % Margin)

Configuration	2 Axle Straight Truck Van	5 Axle Semi Unit (Van)	5 Axle Semi Unit (Flat Deck)	5 Axle Bulk Liquid Tanker	5 Axle Container Chassis	6 Axle (Triaxle) Semi Unit (Van)	6 Axle (Triaxle) Semi Unit (Flat Deck)	6 Axle Bulk Liquid Tanker	8 Axle Super B Train Unit (Flat Deck)	8 Axle Super B Bulk Liquid Tanker	Average
British Columbia	322.4	191.1	199.9	193.2	177.9	232.0	232.6	211.1	270.9	255.3	228.6
Alberta	286.7	172.3	182.4	176.1	162.0	210.5	211.2	189.3	247.0	231.0	206.9
Saskatchewan	269.2	168.9	174.1	165.7	152.1	199.5	199.9	180.9	235.2	218.8	196.4
Manitoba	268.9	161.4	168.7	165.6	151.6	193.8	193.9	178.6	230.6	220.8	193.4
Ontario	285.0	171.6	185.1	171.2	155.6	215.8	216.2	188.3	241.5	223.8	205.4
Quebec	271.8	162.4	177.5	169.2	153.5	213.6	214.0	186.6	232.7	220.9	200.2
New Brunswick	246.1	155.9	163.1	157.0	143.0	189.4	189.4	174.9	222.2	212.9	185.4
Nova Scotia	243.7	150.8	158.0	152.6	138.9	183.6	183.6	169.9	215.8	207.4	180.4
Prince Edward Island	246.0	153.8	160.8	155.8	142.0	187.6	187.5	173.7	219.7	211.6	183.9
Newfoundland	261.7	169.4	174.5	169.9	155.7	203.6	203.6	188.9	238.2	230.0	199.6
Yukon	313.6	193.3	201.9	190.3	173.4	235.3	236.2	208.7	262.4	245.3	226.0
Northwest Territories	305.5	186.5	193.0	186.0	171.3	221.2	222.3	200.9	258.0	240.6	218.5
Average	276.7	169.8	178.2	171.1	156.4	207.2	207.5	187.6	239.5	226.5	202.1

Source: Logistics Solution Builders Inc

3.3 Canada – USA Corridor Trucking For Medium Sized and Larger Firms (>50 Power Units)

In discussion with the client, it was decided for this study to choose a sample of 5 trucking corridors that were expected to carry significant traffic volumes and compare the costs of operation on these corridors by a Canadian trucker domiciled at the Canadian trip end or by a USA based trucker domiciled at the USA end.

Appendix C: presents the summary analysis results for operating five axle tandem semi trailer configurations by Canadian and USA Operators on the five selected routes.

The chosen corridors of interest are illustrated in following Figures 2 through 6.

Figure 2: Toronto, Ontario to Jacksonsville Florida (Corridor 1)
(1822 km)

Figure 3: Montreal Quebec to Los Angeles, California (Corridor 2)
(4557 km)

Figure 4: Edmonton, Alberta to Houston, Texas (Corridor 3)
(3520 km)

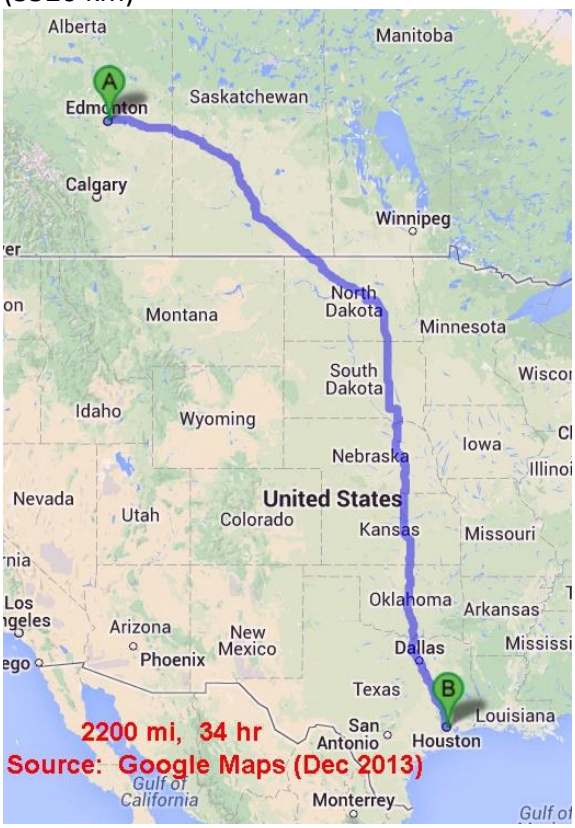


Figure 5: Vancouver, BC to San Diego, California (Corridor 4)
(2235 km)

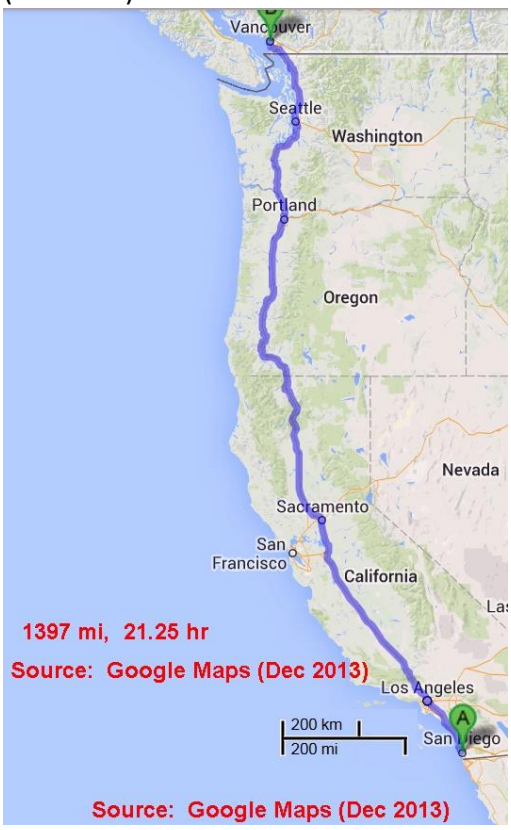


Figure 6: Halifax, Nova Scotia to Dayton, Ohio (Corridor 5)
(2392 km)

As noted previously, the results for Canadian domiciled versus USA domiciled carriers hauling on these corridors are tabulated in Appendix C.

As a result of the significant difference in the Canadian and US dollar exchange rate (2013 was practically “par” between the Canadian and US dollar, but now the US dollar averaged 1.2986 Canadian dollars for 2017), for this edition of Operating Costs of Trucks, Canadian based trucking operators enjoy a significant over-all trucking cost advantage.

This factor has changed since the earlier 2013 study where for some of the case studies, US domiciled truckers enjoyed a slight cost advantage. The change is driven by the currency exchange rate.

4.0 SPECIAL ANALYSES (VARIATIONS FROM BASIC FOR-HIRE TRUCKING CASES)

The original editions of Operating Costs of Trucks In Canada cited in Section 2.1 involved analysis and comparison of medium and larger for hire trucking fleets (specific fleet sizes for this were unspecified in these reports). This priority was established because of the assumption at the time that the majority of trucking tonnages are hauled by businesses with larger fleets, although it is recognized that for some specialized sectors (eg. Grain hauling in Western Canada), there may be a preponderance of activity conducted by a large number of smaller businesses having fewer trucking units.

In addition, it was generally assumed that the cost structure for private trucking would bear a general resemblance to that of for hire fleets, though it is widely recognized that businesses choosing private trucking often do so for non-economic reasons related to controlling their trucking service, advertising and market presence, and other business factors.

Another area of interest for Transport Canada has been the recognition that owner-operator trucking is a different business model than having a company truck perform hauling (whether the company truck is a for-hire carrier or a private fleet).

These three factors give rise to variations from the traditional base case trucking analyses described in Section 3, namely trucking by smaller fleets, use of private trucking, and owner-operator trucking. This report section describes the analyses and findings from investigating these three important aspects of trucking.

4.1 Effect of Fleet Size

As noted previously, the 2013 prior study (ref 1) explored firm size impacts in some detail and discovered that over-all costs were relatively the same when we compared Medium and Large Fleets (more than 50 power units) to Smaller Fleets (less than or equal to 50 units). Appendix D of that report describes the various cost components as impacted by firm size (Larger fleets enjoy scale economy discounts in purchasing various supplies yet smaller firms have lower administrative costs associated). Given these findings and coupled with a budgetary constraint for the current study, the variation of costs according to fleet size were not investigated in detail for this current edition of Operating Costs For Trucking.

4.2 Private Trucking

The trucking industry consists of two main sectors: the for-hire trucking sector and private trucking.

A for-hire carrier is one who is in the business of freight transportation for compensation. That is, they haul freight owned by others, for compensation. Private trucking occurs when a

business (often a manufacturer or service business) transports their own goods. A private carrier does not require an operating authority (beyond the registration plates on individual vehicles) in any Canadian jurisdiction.

Other operating requirements such as hours of service regulations, registration and safety are the same for private truckers as the for-hire industry. There are businesses who operate primarily as private fleets, but will participate sometimes In hauling other people's goods for compensation, in which case they will apply for an additional license (or authority) to do so. (ref 17)

According to CITT (ref 17), some key characteristics of private trucking include:

- Predominates in short haul, local trucking.
- Generally the fleets are smaller than for-hire carriers.
- Capacity utilization may be lower for private fleets when the purpose of having the fleet is for something other than cost reduction.

CITT also cites reasons for a business entering in to private trucking including:

- A desire to maintain absolute control over the hauling, the product, or the equipment.
- Use of equipment as advertising media.
- Use of the driver to perform additional customer service functions at destination such as stocking shelves, taking orders, etc.
- Controlling the service parameters, particularly the delivery times.

Although recent exact statistics are not readily available, it is widely believed that in dollar terms, the private trucking and for-hire sectors are nearly the same size. (ref 18)

According to Alberta Economic Development (ref 19), private trucking accounts for about 40% of intraprovincial and 25% of interprovincial trucking. Private trucking accounts for around 85% of freight moved within urban areas and about 90% of private trucking fleets include 10 vehicles or less. The businesses tend to be retailers or consumer product distributors moving their own goods within major urban areas.

This pattern of small fleets of urban based straight trucks is not true of the entire private trucking sector, however. As haul distance increases, the market share of private trucking versus for hire trucking drops, and with longer trip distances, larger vehicle configurations are increasingly used. For this reason, the prior 2011 study in the Operating Costs of Trucks series noted, "Truck size increases as trip distances increase to take advantage of the economics of the larger vehicles over these haul distances."

In a 1998 study,"Profile of Private Trucking In Canada" (ref 20), it was stated that private trucking is dominated by a large number of small fleets operating in and around urban areas, where it holds an 85% market share. The majority of fleets operating in this area consist of 1 or 2 vehicles and are typically straight trucks. As haul distance increases, this market share drops. Private trucking's market share is about 50% at trip distances of 200 km; decreasing to 10% at distances of 2000 km and greater. (Direct quotation of remarks from ref 21)

The original distinction between for-hire and private trucking was for purposes of granting a fleet an operating licence. However, with the easing of processes for securing an operating authority, there are less defined differences between private and for-hire trucking. There are examples of prominent trucking businesses, for example Sears Canada, who operate what is primarily a private fleet but who supplement their activity by having a for-hire authority that permits them to find backhaul on lanes where they would otherwise have to return empty. (ref 22)

Note that while most private fleets tend to be more local, with smaller vehicles and involving smaller businesses, there are some major players who operate private trucking with fleets of larger combination vehicles in Canada including Sears, Canadian Tire, Union Carbide, MacDonald's Consolidated (Canada Safeway), Gordon Foods and Federated Cooperatives.

The three main cost variables that could result in a cost differential between private and for-hire fleets are vehicle utilization (annual kilometres driven), driver wages and fuel.

Each of these was examined as follows.

Information available from the NRCan 2000 Fuel Economy Benchmarking Survey (while dated) indicates that the utilization of both private and for-hire fleets varies considerably depending upon the application. However, similar vehicles operated in similar circumstances have similar fuel consumption rates. (refs 13, 23)

The principal of Logistics Solution Builders has undertaken evaluations of private fleet operations for purposes of benchmarking these businesses against for-hire trucking options. An example study was petroleum hauling who tend to use their vehicles with two shifts a day, sometimes seven days a week resulting in annual utilization rates around 250,000 km whether private or for-hire. We have also noted single driver intercity van fleet utilization rates typically varying between 95,000 and 180,000 km whether private or for-hire. Vehicles used for single shift weekday delivery locally or regionally typically have utilization rates in the range of 40,000 to 80,000 km a year whether private or for-hire. This experience indicates that there are not any systematic differences in utilization rates between private and for-hire fleets. Rather, differences are hauling application specific.

Although not a large statistically reliable survey sample, for this study, Logistics Solution Builders did interview three major private fleet operators who operate across Canada and these

discussions indicated that the wage rates paid by these private fleets were similar to those cited in this report for similar businesses in the for-hire trucking sector.

In the discussions, it was noted that due to the generally shorter distance hauling operations, for a driver to work for a private fleet was a "lifestyle incentive" (versus being away from home on the road for long distance for-hire trucking) and that combined with generally good employee benefits and work environment, higher wages were not necessary to attract and retain drivers by the private trucking sector.

This discussion with individual fleet operators mirrored the main difference about private trucking cited by the Private Motor Truck Council of Canada. When contacted for this study, PMTCC cited "better driver working conditions" as an important factor, especially with the current widely publicized "driver shortage".

Based upon the available literature and the evidence we were able to gather, overall, it is the consultant's assessment that there are not any systematic differences in costs between private and for-hire fleets when operating under the same conditions.

This conclusion is (verbatim) the same finding as arrived at in prior 2010 and 2013 base year cost studies in this series (ref 1).

4.3 Owner Operator Trucking

For this 2017 study of Operating Costs of Trucks, the client requested us to develop full hauling case studies for Owner Operator Trucking for the five axle tandem semi trailer configurations of vehicle. These were developed using carrier provided compensation information from a review of 10 firms that hire owner operators to operate on longer distance operations.

OBAC Surveys

In both the 2013 and 2010 editions of the Operating Costs Study, we enlisted the assistance of the Owner Operators Business Association of Canada (OBAC) to conduct an online owner operator cost and operations survey. Based on the limitations of information that were developed in those studies, limited primarily by a very small response sample generated, it was decided not to repeat the detailed survey – which in the prior study had basically corroborated information obtained from carriers (our current approach) related to owner operator compensation levels built in to the cost for trucking.

Evaluating Motor Carrier Compensation for Owner Operators

In view of the client's interest in understanding trucking using owner operators, for 2017, we gathered information from 10 for hire carriers concerning owner operator compensation

amounts. This approach is an independent way of arriving at an estimate of the over-all costs of owner operator trucking.

Under this compensation scheme, the company hiring the owner operator for their fleet is paying the operator with a structure as follows:

- Base pay per mile
- Compensation per layover
- Compensation per pickup and per delivery (higher for flat deck loads)
- Payment of all taxes on fuel
- A Fuel Subsidy to Bring Road Fuel Purchase Costs to Company Discounted Levels (or Fuel Provided by the Company at Umbrella Cost)
- Payment of Vehicle Registration
- Access to Company Benefits (for an assessed premium contribution)
- Access to Company Insurance Top Up (reduced deductible costs for an assessed premium contribution)

Appendix D: Owner Operator Case Studies summarizes the hauling cases that generally reflect a national owner operator cost structure as developed from this study and described above. For trailer and other unit cost factors, we made use of the Ontario for hire unit cost cases in these evaluations.

Note that the case studies provided are only developed for Median and High Utilization case studies as the owner-operator survey average trip distances reported to us in 2013 are unlikely to generate Low Utilization scenarios and, in passing, when trial calculations were made in 2013 for such cases, they appeared to be uncompensatory for an owner operator. The median utilization case of 160,000 km (100,000 miles annually) is very comparable to the reported average of the OBAC owner operators who responded to the 2013 and 2010 surveys that they worked 173,420 km in a year (107,761 miles annually).

This is not to be construed as saying that shorter distance hauling scenarios involving owner operators does not occur, it is simply that the mileage basis compensation information, whe3n cross validated with OBAC in 2013, was more suitable for the median and higher utilization scenarios.

For shorter distance hauling, generally hourly compensation levels are used. Also note, in passing, that compensation payment to owner operators as a percent of total revenue, does take place in the trucking industry, though the incidence of this appears to be lower than the distance related cost basis found in this study.

When comparing the use of company trucks and hiring owner-operators, we note from Appendix D that the use of owner operators appears to be slightly less expensive, in terms of

costs per kilometer. Given that owner operator businesses are highly incented to want to have high utility, there appears to be an efficiency gain when using owner operators.

Factors that may constrain fleets from using owner operator units entirely, given this apparent cost advantage, relate to availability of sufficient numbers of owner operators and a constrained ability to exercise direct control and management of their activities. For these reasons, many fleets have significant numbers of company truck units as well as owner operators. Often, however, for longer distance lanes, there is a tendency for owner operators to be the preferred method of operation.

ENDNOTES	
1	Operating Costs of Trucks In Canada 2013, prepared for Transport Canada by Logistics Solution Builders Inc, 2014
2	Memorandum of Understanding on Heavy Truck Weight and Dimension Limits for Interprovincial Operations in Canada, Task Force on Vehicle Weights and Dimensions Policy (August 2005)
3	Operating Costs of Trucks In Canada, a report series prepared by Trimac Consulting Services Ltd., published by Transport Canada , 21 editions published 1972, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 93, 94, 95, 96, 97, 98, 99, 2000, 2001, and 2003
4	Operating Costs of Trucks in Canada, for Transport Canada, by Logistics Solution Builders Inc., 2005
5	Operating Costs of Trucking and Surface Intermodal Transportation In Canada, prepared by Ray Barton & Associates, in Association with Logistics Solution Builders Inc. and the Research and Traffic Group, published by Transport Canada, two editions (2008, 2011), reflecting base years 2007 and 2008.
6	"Know Your Truck Costs Seminar", presented by Trimac Consulting Services Ltd as two seminars, one in Toronto, Ontario, and one two weeks later in Calgary, Alberta, jointly sponsored by the CITL (Canadian Industrial Traffic League -- now known as CITA, the Canadian Industrial Transportation Association) and the Propane Gas Association of Canada, 1993
7	"Know Your Truck Costs Seminar", presented by Trimac Consulting Services Ltd, sponsored by the Alberta Motor Transport Association, 1994 & 1996
8	"Know Your Truck Costs Seminar", presented by Trimac Consulting Services Ltd, sponsored by the British Columbia Trucking Association, in Vancouver, 1995 & 1997
9	"Know Your Truck Costs 2014" presented by Logistics Solution Builders Inc to the Calgary Local Council and Students of the Canadian Institute of Traffic and Transportation, May 2014.
10	"Know Your Truck Costs 2014", presented by Logistics Solution Builders Inc at the 2014 Annual General Meeting and Management Conference sponsored by the British Columbia Trucking Association, Kelowna, June 2014.
11	Papers presented by Ash and Gardner at the 1986 and 1997 CTRF conferences and by Ash at the 2007 CTRF Conferences, see (http://ctrfcaa.ipower.com/CTRFBIBLIO/SearchAuthor.asp?authorkey= 244)
12	Paper by Ash and Landberg, at the 2007 CTRF Conference, "Enhancing Productivity for Truck Transportation of Mineral Concentrates" - 42nd Annual CTRF Proceedings

ENDNOTES, CONTD.	
13	An Analysis of the Operational Costs of Trucking: A 2017 Update, published by the American Transportation Research Institute (ATRI) (October 2017)
14	Manitoba Trucking Association - Confidential 2017 Trucking Industry Wage Survey Results - Compiled Dec 2017 (46 Industry Participants)
15	USDOT, Commercial Medium- and Heavy-Duty Truck Fuel Efficiency Technology Study – Report #1, Revised October 2015, Publication DOT HS 812 146
16	Western Canada Highway News, Green Trucking 2017 edition, Summer 2017.
17	Transportation Systems: A Canadian Perspective, published by the Canadian Institute of Traffic and Transportation (CITT), 2011, ISBN 978-0-9813318-4-3
18	A Review of Trucking Transportation in Canada Before and After Deregulation, presented by Joe Monteiro at the Canadian Transportation Research Forum, 2011
19	http://www.albertacanada.com/business/overview/trucking.aspx, browsed Feb 28, 2014
20	Profile of Private Trucking In Canada, by L.P.Tardif and Associates, prepared for the Private Motor Truck Council of Canada, 1998
21	TP18413, Trade and Competitiveness Assessment of Mandated Speed Limiters For Heavy Trucks Operating In Canada, by Ray Barton and Associates, sponsored by Transport Canada, 2010.
22	See SLH Transport Company at http://www.slh.ca/en/ browsed Feb 28, 2014
23	https://www.nrcan.gc.ca/energy/efficiency/transportation/commercial-vehicles/reports/7607 browsed Feb 28, 2014

APPENDIX A: EQUIPMENT CONFIGURATIONS

In order to have a standardized basis for discussing vehicle specifications with suppliers, to obtain current 2017 purchase cost estimates, the following vehicle configurations were assumed.

Power Unit Configurations

TRACTOR FOR A FIVE AXLE SEMI CONFIGURATION: Conventional configuration, Caterpillar C-13 Series Engine, 380 HP, 13 Speed Transmission, 40,000 lbs rear end, air ride suspension, 11R24.5 tires, 209" wheel base, 12,000 lbs front axle, GVW approximately 80,000 lbs USA, Canada 39,500 kg (87,100 lbs). Tractor Tare Weight: 7620 kg

TRACTOR FOR A SIX AXLE SEMI CONFIGURATION: Conventional configuration, Detroit Series 60 Engine, 430 HP, 18 Speed Transmission, 46,000 lbs rear axle, air ride suspension, 12,000 lbs front axle, 195" to 210" wheel base, 11R24.5 tires, 4.56 gear ratio, GVW 46,500 kg (102,500 lbs). Tractor Tare Weight: 7938 kg

TRACTOR FOR AN EIGHT AXLE SUPER B TRAIN CONFIGURATION: Conventional configuration, Caterpillar C-15 Series Engine, 475 HP, 18 speed transmission, 46,000 lbs rear axle, air ride suspension, 12,000 lbs front axle, 209" wheel base, 11R24.5 tires, 4.56 gear ratio, GVW 63,500 kg (140,000 lbs.) Tractor Tare Weight: 7938 kg

TWO AXLE STRAIGHT TRUCK (VAN) SPECIFICATION: 2 Axle Diesel Powered Straight Truck Cab and Chassis, 24 Foot Insulated Van Box. No Reefer, Rear Doors, GVW 14,600 kg

Trailer Configurations

FIVE AXLE SEMI VAN CONFIGURATION: Interior post insulated van, 1 1/8" - 1 ½" insulation, double doors at rear with 5 hinges per door, anti - rack door locks, vents front and back, air ride suspension, steel disk wheels, hardwood floors, undercoated, rear gear black finish, aluminium panels, prefinished white, 2 rows of cargo E-track. Trailer Tare Weight: 6,418 kg

FIVE AXLE SEMI FLAT DECK CONFIGURATION: Outside rail construction with stake pockets and rub rail, load winches at 3'-0" centres, air suspension, steel disc wheels, hardwood floor, 1 colour epoxy finish. Trailer Tare Weight: 5,897 kg

FIVE AXLE BULK LIQUID TANKER (MC307) 6000 Imperial gallons, type 316L Stainless Steel 2 B finish, bright annealed jacketing, 5" insulation compressed to 4", dimple style hot wall, 20" manway, fort vale super vent, 1" pressurization package, 2 x 20' - 0" S.S. hose trays, spring suspension, steel disk wheels, 1 colour epoxy finish, walkaround spill dam, curbside ladders, stainless steel fenders, aluminium catwalk, single compartment. Trailer Tare Weight: 5,942 kg

FIVE AXLE CONTAINER CHASSIS CONFIGURATION: 40' - 45’ Steel Extendable Gooseneck Container Chassis. Overall width 96 inches, main frame width 40 inches, Maximum rear height 48 inches, Twist lock and slide pins meet ISO specifications, Frame design and steel to ASTM A572 Grade 50 Specification, ICC Bumper, AAR approved landing gear of 50,000 lb lift capacity and 140,000 lb static capacity. Trailer Tare Weight: 6800 lbs

SIX AXLE TRIAXLE VAN SPECIFICATION: Interior post insulated van, 1 1/8” - 1 ½” insulation, double doors at rear with 5 hinges per door, anti-rack door locks, vents front and back, air suspension, steel disk wheels, hardwood floors, undercoated, rear gear black finish, aluminium panels prefinished white, 2 rows cargo E-track. Trailer Tare Weight: 8006 kg

SIX AXLE TRIAXLE FLAT DECK SPECIFICATION: Outside rail construction with stake pockets and rub rail, load winches at 3’ 0” centres, air suspension, steel disk wheels, hardwood floor, 1 colour epoxy finish. Trailer Tare Weight: 6804 kg

SIX AXLE TRIAXLE TANK TRAILER SPECIFICATION: (MC407) 8000 Imperial gallons, type 316L Stainless Steel 2 B finish, bright annealed jacketing, 5” insulation compressed to 4”, dimple style hot wall, 20” manway, fort vale super vent, 1” pressurization package, 2 x 20’ - 0” S.S. hose trays, spring suspension, steel disk wheels, 1 colour epoxy finish, walkaround spill dam, curbside ladders, stainless steel fenders, aluminium catwalk, single compartment. Trailer Tare Weight: 7,200 KG

EIGHT AXLE SUPER B FLAT DECK SPECIFICATION: Outside rail construction with stake pockets and rub rail, load winches at 3’ 0” centres, air suspension, steel disc wheels, hardwood floor, 1 colour epoxy finish. Trailer Tare Weight: 8845 kg

EIGHT AXLE SUPER B LIQUID TANK (MC 306) SPECIFICATION: Aluminium petroleum RTAC B-train, 4 compartment, double bulkheads, 20” fill covers, 4” air internal valves, 4” openable bottomload adapters, 63,500 litre capacity, four 20’-0” hose trays, prepared for vapour recovery, optic overfill sensors, 36”x30”x28” fitting box (aluminium). Trailer Tare Weight: 10659 kg.

Following Figure A-1 Illustrates these vehicle types.

Figure A.1: Equipment Configurations for Case Studies

Five Axle Semi Trailer (Van)

Five Axle Semi Trailer (Flat deck or Lowboy)

Figure A.1: Equipment Configurations for Case Studies

Five Axle Semi Trailer (Liquid Tank)

Five Axle Container Chassis

Figure A.1: Equipment Configurations for Case Studies

Six Axle Tridem Semi Trailer (Van)

Six Axle Tridem Semi Trailer (Flat Deck)

Figure A.1: Equipment Configurations for Case Studies

Six Axle Tridem Tank Trailer

Eight Axle Super B-Train (Flat Deck)

Figure A.1: Equipment Configurations for Case Studies

Eight Axle Super B-Train (Liquid Tank)

Two Axle Straight Truck (Van)

APPENDIX B: BASE CASE RESULTS

(All Results Canadian Currency Basis)

Summary of Base Case Analysis Results

Configuration	British Columbia 10% Profit Margin Total Costs (c/km)	British Columbia 5% Profit Margin Total Costs (c/km)	British Columbia 2.5% Profit Margin Total Costs (c/km)	Alberta 10% Profit Margin Total Costs (c/km)	Alberta 5% Profit Margin Total Costs (c/km)	Alberta 2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	228.6	216.6	211.0	206.8	195.9	190.9
160,000 km	201.7	191.1	186.2	181.9	172.3	167.9
240,000 km	192.8	182.6	177.9	173.6	164.5	160.3
5 Axle Semi Unit (Flat Deck)						
80,000 km	237.6	225.1	219.3	217.1	205.7	200.4
160,000 km	211.0	199.9	194.8	192.5	182.4	177.7
240,000 km	202.1	191.5	186.6	184.3	174.6	170.1
5 Axle Bulk Liquid Tanker						
80,000 km	239.0	226.4	220.6	218.3	206.9	201.6
160,000 km	204.0	193.2	188.3	185.9	176.1	171.6
240,000 km	192.3	182.2	177.5	175.1	165.9	161.6
5 Axle Container Chassis						
80,000 km	214.1	202.8	197.6	195.3	185.0	180.3
160,000 km	187.8	177.9	173.4	171.0	162.0	157.9
240,000 km	179.1	169.6	165.3	163.0	154.4	150.4
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	274.6	260.2	253.5	249.8	236.6	230.6
160,000 km	244.9	232.0	226.0	222.2	210.5	205.1
240,000 km	235.0	222.6	216.9	213.0	201.8	196.7
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	274.7	260.2	253.5	249.9	236.7	230.7
160,000 km	245.5	232.6	226.7	222.9	211.2	205.8
240,000 km	235.8	223.4	217.7	213.9	202.7	197.5
6 Axle Bulk Liquid Tanker						
80,000 km	261.5	247.7	241.3	235.7	223.3	217.5
160,000 km	222.8	211.1	205.7	199.8	189.3	184.4
240,000 km	209.9	198.9	193.8	187.8	177.9	173.4
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	320.2	303.4	295.6	292.5	277.1	270.0
160,000 km	285.9	270.9	263.9	260.7	247.0	240.6
240,000 km	274.5	260.1	253.4	250.1	236.9	230.8
8 Axle Super B Bulk Liquid Tanker						
80,000 km	323.4	306.4	298.5	294.0	278.6	271.4
160,000 km	269.5	255.3	248.8	243.9	231.0	225.1
240,000 km	251.5	238.3	232.2	227.1	215.2	209.7

		Saskatchewan			Manitoba		
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)						
	80,000 km	204.9	194.2	189.2	197.5	187.1	182.3
	160,000 km	178.2	168.9	164.5	170.4	161.4	157.3
	240,000 km	169.3	160.4	156.3	161.4	152.9	149.0
	5 Axle Semi Unit (Flat Deck)						
	80,000 km	210.2	199.1	194.0	204.9	194.1	189.2
	160,000 km	183.7	174.1	169.6	178.1	168.7	164.4
	240,000 km	174.9	165.7	161.4	169.1	160.2	156.1
	5 Axle Bulk Liquid Tanker						
	80,000 km	209.7	198.6	193.5	210.1	199.0	193.9
	160,000 km	174.9	165.7	161.4	174.8	165.6	161.3
	240,000 km	163.3	154.7	150.7	163.0	154.4	150.5
	5 Axle Container Chassis						
	80,000 km	186.6	176.8	172.3	186.5	176.7	172.1
	160,000 km	160.5	152.1	148.2	160.0	151.6	147.7
	240,000 km	151.8	143.8	140.1	151.2	143.3	139.6
	6 Axle (Triaxle) Semi Unit (Van)						
	80,000 km	239.8	227.2	221.3	234.5	222.1	216.4
	160,000 km	210.6	199.5	194.4	204.5	193.8	188.8
	240,000 km	200.9	190.3	185.4	194.5	184.3	179.6
	6 Axle (Triaxle) Semi Unit (Flat Deck)						
	80,000 km	239.5	226.9	221.1	233.9	221.6	215.9
	160,000 km	211.0	199.9	194.7	204.6	193.9	188.9
	240,000 km	201.4	190.8	185.9	194.8	184.6	179.9
	6 Axle Bulk Liquid Tanker						
	80,000 km	229.0	216.9	211.4	227.5	215.5	210.0
	160,000 km	191.0	180.9	176.3	188.5	178.6	174.0
	240,000 km	178.3	168.9	164.6	175.5	166.3	162.0
	8 Axle Super B Train Unit (Flat Deck)						
	80,000 km	282.4	267.6	260.7	278.1	263.5	256.7
	160,000 km	248.3	235.2	229.2	243.4	230.6	224.7
	240,000 km	236.9	224.5	218.7	231.9	219.6	214.0
	8 Axle Super B Bulk Liquid Tanker						
	80,000 km	284.5	269.5	262.6	287.5	272.4	265.4
	160,000 km	230.9	218.8	213.2	233.0	220.8	215.1
	240,000 km	213.1	201.9	196.7	214.8	203.5	198.3

Configuration	Ontario			Quebec		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	207.0	196.1	191.1	197.1	186.7	181.9
160,000 km	181.2	171.6	167.2	171.4	162.4	158.3
240,000 km	172.6	163.5	159.3	162.9	154.3	150.4
5 Axle Semi Unit (Flat Deck)						
80,000 km	220.9	209.3	203.9	212.8	201.6	196.4
160,000 km	195.4	185.1	180.3	187.4	177.5	172.9
240,000 km	186.9	177.0	172.5	178.9	169.5	165.1
5 Axle Bulk Liquid Tanker						
80,000 km	214.1	202.8	197.6	211.8	200.7	195.5
160,000 km	180.7	171.2	166.8	178.6	169.2	164.9
240,000 km	169.5	160.6	156.5	167.5	158.7	154.6
5 Axle Container Chassis						
80,000 km	189.5	179.5	174.9	187.1	177.3	172.7
160,000 km	164.2	155.6	151.6	162.1	153.5	149.6
240,000 km	155.8	147.6	143.9	153.7	145.6	141.9
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	256.3	242.8	236.6	254.1	240.7	234.5
160,000 km	227.8	215.8	210.2	225.5	213.6	208.1
240,000 km	218.2	206.7	201.4	215.9	204.6	199.3
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	256.2	242.7	236.5	253.9	240.6	234.4
160,000 km	228.2	216.2	210.6	225.9	214.0	208.5
240,000 km	218.8	207.3	202.0	216.6	205.2	199.9
6 Axle Bulk Liquid Tanker						
80,000 km	235.7	223.3	217.6	233.9	221.6	215.9
160,000 km	198.8	188.3	183.5	197.0	186.6	181.8
240,000 km	186.5	176.7	172.2	184.7	174.9	170.5
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	287.7	272.6	265.6	277.6	263.0	256.3
160,000 km	254.9	241.5	235.3	245.6	232.7	226.7
240,000 km	244.0	231.1	225.2	235.0	222.6	216.9
8 Axle Super B Bulk Liquid Tanker						
80,000 km	287.4	272.3	265.3	283.6	268.7	261.8
160,000 km	236.2	223.8	218.1	233.2	220.9	215.3
240,000 km	219.2	207.6	202.3	216.4	205.0	199.8

Configuration	New Brunswick			Nova Scotia		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	189.9	179.9	175.3	184.7	175.0	170.5
160,000 km	164.5	155.9	151.9	159.2	150.8	146.9
240,000 km	156.1	147.9	144.1	150.6	142.7	139.0
5 Axle Semi Unit (Flat Deck)						
80,000 km	197.3	186.9	182.1	192.1	182.0	177.3
160,000 km	172.2	163.1	158.9	166.7	158.0	153.9
240,000 km	163.8	155.2	151.2	158.3	150.0	146.1
5 Axle Bulk Liquid Tanker						
80,000 km	198.7	188.2	183.4	194.3	184.0	179.3
160,000 km	165.7	157.0	153.0	161.1	152.6	148.7
240,000 km	154.7	146.6	142.8	150.0	142.1	138.5
5 Axle Container Chassis						
80,000 km	175.7	166.4	162.2	171.6	162.6	158.4
160,000 km	150.9	143.0	139.3	146.6	138.9	135.4
240,000 km	142.7	135.2	131.7	138.3	131.0	127.7
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	227.8	215.8	210.3	222.1	210.4	205.0
160,000 km	199.9	189.4	184.5	193.8	183.6	178.9
240,000 km	190.6	180.5	175.9	184.4	174.7	170.2
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	227.2	215.3	209.8	221.5	209.8	204.4
160,000 km	199.9	189.4	184.5	193.8	183.6	178.9
240,000 km	190.8	180.7	176.1	184.6	174.9	170.4
6 Axle Bulk Liquid Tanker						
80,000 km	220.9	209.2	203.9	215.9	204.6	199.3
160,000 km	184.6	174.9	170.4	179.4	169.9	165.6
240,000 km	172.5	163.4	159.2	167.2	158.4	154.3
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	266.4	252.4	245.9	260.1	246.4	240.1
160,000 km	234.5	222.2	216.5	227.8	215.8	210.3
240,000 km	223.9	212.1	206.7	217.0	205.6	200.3
8 Axle Super B Bulk Liquid Tanker						
80,000 km	274.9	260.5	253.8	269.6	255.4	248.8
160,000 km	224.7	212.9	207.4	218.9	207.4	202.0
240,000 km	208.0	197.0	192.0	202.0	191.4	186.4

Configuration	PEI			Newfoundland		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	187.2	177.3	172.8	204.2	193.5	188.5
160,000 km	162.3	153.8	149.8	178.8	169.4	165.1
240,000 km	154.0	145.9	142.2	170.3	161.4	157.2
5 Axle Semi Unit (Flat Deck)						
80,000 km	194.4	184.2	179.5	209.4	198.3	193.3
160,000 km	169.8	160.8	156.7	184.2	174.5	170.0
240,000 km	161.6	153.1	149.1	175.8	166.5	162.3
5 Axle Bulk Liquid Tanker						
80,000 km	197.0	186.6	181.8	212.4	201.2	196.1
160,000 km	164.5	155.8	151.8	179.4	169.9	165.6
240,000 km	153.7	145.6	141.8	168.4	159.5	155.4
5 Axle Container Chassis						
80,000 km	174.2	165.1	160.8	189.2	179.3	174.7
160,000 km	149.9	142.0	138.4	164.4	155.7	151.7
240,000 km	141.8	134.4	130.9	156.1	147.9	144.1
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	225.4	213.5	208.0	243.0	230.2	224.3
160,000 km	198.0	187.6	182.8	214.9	203.6	198.4
240,000 km	188.9	178.9	174.4	205.5	194.7	189.7
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	224.7	212.9	207.4	242.4	229.7	223.8
160,000 km	197.9	187.5	182.7	215.0	203.6	198.4
240,000 km	189.0	179.0	174.4	205.8	195.0	190.0
6 Axle Bulk Liquid Tanker						
80,000 km	219.0	207.5	202.2	235.7	223.3	217.6
160,000 km	183.3	173.7	169.2	199.4	188.9	184.0
240,000 km	171.4	162.4	158.3	187.2	177.4	172.8
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	263.5	249.6	243.2	283.5	268.6	261.7
160,000 km	231.9	219.7	214.0	251.4	238.2	232.1
240,000 km	221.3	209.7	204.3	240.7	228.1	222.2
8 Axle Super B Bulk Liquid Tanker						
80,000 km	273.3	258.9	252.3	293.2	277.8	270.7
160,000 km	223.4	211.6	206.2	242.8	230.0	224.1
240,000 km	206.7	195.8	190.8	226.0	214.1	208.6

Configuration	Yukon			Northwest Territories		
	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)						
80,000 km	228.3	216.3	210.8	221.1	209.5	204.1
160,000 km	204.1	193.3	188.4	196.8	186.5	181.7
240,000 km	196.0	185.7	180.9	188.8	178.8	174.2
5 Axle Semi Unit (Flat Deck)						
80,000 km	237.1	224.6	218.9	227.7	215.7	210.2
160,000 km	213.1	201.9	196.7	203.7	193.0	188.0
240,000 km	205.1	194.3	189.3	195.7	185.4	180.6
5 Axle Bulk Liquid Tanker						
80,000 km	232.7	220.5	214.8	228.2	216.2	210.7
160,000 km	200.9	190.3	185.4	196.4	186.0	181.3
240,000 km	190.2	180.2	175.6	185.7	176.0	171.4
5 Axle Container Chassis						
80,000 km	206.8	195.9	190.9	204.5	193.7	188.8
160,000 km	183.1	173.4	169.0	180.8	171.3	166.9
240,000 km	175.2	166.0	161.7	172.9	163.8	159.6
6 Axle (Triaxle) Semi Unit (Van)						
80,000 km	275.1	260.6	253.9	260.2	246.5	240.2
160,000 km	248.4	235.3	229.3	233.5	221.2	215.5
240,000 km	239.4	226.8	221.0	224.6	212.8	207.3
6 Axle (Triaxle) Semi Unit (Flat Deck)						
80,000 km	275.5	261.0	254.3	260.8	247.0	240.7
160,000 km	249.4	236.2	230.2	234.7	222.3	216.6
240,000 km	240.6	228.0	222.1	226.0	214.1	208.6
6 Axle Bulk Liquid Tanker						
80,000 km	255.3	241.9	235.7	247.1	234.1	228.1
160,000 km	220.2	208.7	203.3	212.1	200.9	195.7
240,000 km	208.6	197.6	192.5	200.4	189.8	185.0
8 Axle Super B Train Unit (Flat Deck)						
80,000 km	307.3	291.1	283.7	302.8	286.9	279.5
160,000 km	276.9	262.4	255.6	272.4	258.0	251.4
240,000 km	266.8	252.8	246.3	262.2	248.4	242.1
8 Axle Super B Bulk Liquid Tanker						
80,000 km	307.7	291.5	284.0	302.8	286.9	279.5
160,000 km	259.0	245.3	239.1	254.0	240.6	234.5
240,000 km	242.7	230.0	224.1	237.7	225.2	219.4

2 Axle Straight Truck Configuration Summary			
Province:	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
British Columbia			
40,000 km	370.7	351.2	342.2
80,000 km	340.3	322.4	314.1
120,000 km	330.1	312.7	304.7
Alberta			
40,000 km	331.2	313.7	305.7
80,000 km	302.6	286.7	279.3
120,000 km	293.1	277.7	270.5
Saskatchewan			
40,000 km	314.4	297.9	290.2
80,000 km	284.1	269.2	262.3
120,000 km	274.0	259.6	253.0
Manitoba			
40,000 km	314.5	297.9	290.3
80,000 km	283.8	268.9	262.0
120,000 km	273.6	259.2	252.6
Ontario			
40,000 km	330.4	313.0	305.0
80,000 km	300.8	285.0	277.7
120,000 km	291.0	275.6	268.6
Quebec			
40,000 km	316.2	299.6	291.9
80,000 km	286.9	271.8	264.8
120,000 km	277.1	262.5	255.8
New Brunswick			
40,000 km	288.7	273.5	266.5
80,000 km	259.8	246.1	239.8
120,000 km	250.2	237.0	230.9
Nova Scotia			
40,000 km	286.3	271.3	264.3
80,000 km	257.3	243.7	237.5
120,000 km	247.6	234.5	228.5
P.E.I.			
40,000 km	288.2	273.0	266.0
80,000 km	259.6	246.0	239.7
120,000 km	250.1	236.9	230.9
Newfoundland			
40,000 km	304.9	288.8	281.4
80,000 km	276.2	261.7	255.0
120,000 km	266.6	252.6	246.1
Yukon			
40,000 km	359.0	340.1	331.4
80,000 km	331.1	313.6	305.6
120,000 km	321.7	304.8	297.0
N.W.T.			
40,000 km	350.7	332.2	323.7
80,000 km	322.4	305.5	297.6
120,000 km	313.0	296.6	289.0

APPENDIX C: CANADA – USA CORRIDOR RESULTS
(All Results Canadian Currency Equivalent Costs)

Corridor 1:

Domicile:	Ontario	Corridor:	Toronto to Jacksonville, FL	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	149.8	141.9	138.3
	5 Axle Semi Unit (Flat Deck)	150.4	142.5	138.8
	5 Axle Bulk Liquid Tanker	160.0	151.6	147.7
	5 Axle Container Chassis	148.7	140.9	137.3

Domicile:	Jacksonville, FL	Corridor:	Jacksonville to Toronto	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	169.1	160.2	156.1
	5 Axle Semi Unit (Flat Deck)	170.2	161.2	157.1
	5 Axle Bulk Liquid Tanker	171.2	162.2	158.0
	5 Axle Container Chassis	161.1	152.6	148.7

Corridor 2:

Domicile:	Quebec	Corridor:	Montreal to Los Angeles	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	145.0	137.4	133.9
	5 Axle Semi Unit (Flat Deck)	144.6	137.0	133.5
	5 Axle Bulk Liquid Tanker	158.0	149.7	145.8
	5 Axle Container Chassis	146.8	139.1	135.5

Domicile:	Los Angeles	Corridor:	Los Angeles to Montreal	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	177.9	168.5	164.2
	5 Axle Semi Unit (Flat Deck)	178.0	168.6	164.3
	5 Axle Bulk Liquid Tanker	181.7	172.1	167.7
	5 Axle Container Chassis	171.5	162.5	158.3

Corridor 3:

Domicile:	Edmonton	Corridor:	Edmonton to Houston	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	149.3	141.4	137.8
	5 Axle Semi Unit (Flat Deck)	149.2	141.4	137.7
	5 Axle Bulk Liquid Tanker	164.6	155.9	151.9
	5 Axle Container Chassis	153.0	144.9	141.2

Domicile:	Houston	Corridor:	Houston to Edmonton	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	166.6	157.8	153.8
	5 Axle Semi Unit (Flat Deck)	166.9	158.1	154.1
	5 Axle Bulk Liquid Tanker	170.0	161.1	157.0
	5 Axle Container Chassis	160.2	151.8	147.9

Corridor 4:

Domicile: Vancouver **Corridor: Vancouver to San Diego**

Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)	166.9	158.1	154.0
5 Axle Semi Unit (Flat Deck)	167.4	158.6	154.5
5 Axle Bulk Liquid Tanker	181.6	172.0	167.6
5 Axle Container Chassis	168.6	159.7	155.6

Domicile: San Diego **Corridor: San Diego to Vancouver**

Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
5 Axle Semi Unit (Van)	185.1	175.3	170.8
5 Axle Semi Unit (Flat Deck)	186.0	176.2	171.6
5 Axle Bulk Liquid Tanker	187.8	177.9	173.4
5 Axle Container Chassis	177.3	168.0	163.7

Corridor 5:

Domicile:	Halifax	Corridor:	Halifax to Dayton, Ohio	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	138.9	131.6	128.2
	5 Axle Semi Unit (Flat Deck)	139.2	131.9	128.5
	5 Axle Bulk Liquid Tanker	149.3	141.4	137.8
	5 Axle Container Chassis	137.8	130.6	127.2

Domicile:	Dayton, Ohio	Corridor:	Dayton Ohio to Halifax	
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)	180.7	171.1	166.8
	5 Axle Semi Unit (Flat Deck)	181.6	172.0	167.6
	5 Axle Bulk Liquid Tanker	183.3	173.6	169.2
	5 Axle Container Chassis	172.7	163.6	159.4

APPENDIX D: OWNER OPERATOR CASE STUDIES

Province :	Canada Owner Operator			
	Configuration	10% Profit Margin Total Costs (c/km)	5% Profit Margin Total Costs (c/km)	2.5% Profit Margin Total Costs (c/km)
	5 Axle Semi Unit (Van)			
	160,000 km	171.7	162.7	158.5
	240,000 km	169.9	161.0	156.9
	5 Axle Semi Unit (Flat Deck)			
	160,000 km	187.0	177.2	172.6
	240,000 km	185.3	175.6	171.1
	5 Axle Bulk Liquid Tanker			
	160,000 km	179.5	170.1	165.7
	240,000 km	175.2	166.0	161.7
	5 Axle Container Chassis			
	160,000 km	165.8	157.1	153.1
	240,000 km	164.2	155.6	151.6

Note(s): When comparing the median utilization owner-operator cases above to Ontario company truck cost levels in Appendix B, the following comparisons are noted (in the 5% margin case):

	Owner Op (median)	Company (median)
Van Semi Trailer	162.7	171.6
Flat Deck Semi Trailer	177.2	185.1
Bulk Liquid Semi Trailer	170.1	171.2
Container Chassis	157.1	155.6