WARNING

Data included in this Report have not been thoroughly validated and some inconsistencies were detected. Therefore, the results cannot be used as is. This Report is currently being revised in order to include better quality data.

MISE EN GARDE

Les données contenues dans ce rapport n'ont pas fait l'objet d'une validation systématique et certaines incohérences y ont été décelées. Donc, les résultats ne peuvent être utilisés tels quels. Ce document est présentement en révision et intégrera, dans sa nouvelle version, des données de meilleure qualité.

March 31, 2006

ESTIMATION OF THE REPRESENTATIVE ANNUALIZED CAPITAL AND MAINTENANCE COSTS OF ROADS BY FUNCTIONAL CLASS

FINAL REPORT

By:

Applied Research Associates, Inc.
5401 Eglinton Avenue West, Suite 204
Toronto, Ontario M9C 5K6
Telephone: (416) 621-9555 Facsimile: (416) 621-4917
Web: www.ara.com/transportation

EXECUTIVE SUMMARY

This report describes procedures for estimating annualized life-cycle unit costs of roads for different geographical regions of Canada by road functional class. In addition, the report provides data on the size (length) of the Canadian road infrastructure and on traffic using the infrastructure. The work is part of an Investigation of the Full Cost of Transportation, a project initiated by Transport Canada in collaboration with Provincial and Territorial transportation agencies.

Annualized road costs for one-lane, one-kilometre-long road sections were developed separately for the following parameters:

- 14 geographical regions – two regions each for Québec, Ontario, and British Columbia, one region for each of the remaining seven provinces, and one combined region for the three territories.
- 2 jurisdictions within the geographical region – provincial/territorial and municipal.
- 2 types of alignment – rural or urban.
- 4 functional road classes – freeway, arterial, collector, and local.
- 3 types of infrastructure – pavements, bridges, and all other road infrastructure components.
- 4 types of costs – initial construction, maintenance and rehabilitation, routine maintenance, and winter maintenance.

Thus, for example, a separate annualized unit cost estimate, in terms of dollars per one-kilometre-long single traffic lane, is provided for the cost of the initial pavement construction on a rural municipal arterial road located in Northern Ontario.

The estimates of annualized unit costs were carried out using an Excel-based computational model. The model links together individual highway infrastructure components and their unit costs and quantities. The structure of the model is modular to facilitate improved cost estimates if additional data becomes available and to enable what-if sensitivity analysis of model estimates.

Data on the size of Canadian road infrastructure and on traffic using the infrastructure is reported separately for the 14 geographical regions, three jurisdictions (federal, provincial/territorial, and municipal), two types of alignment, and four functional classes. The road inventory data includes road lengths, number of bridges, and the corresponding average size of the bridge deck area, and data on the age of pavements and bridges. Traffic data include Annual Average Traffic Volumes for both passenger cars and commercial vehicles.

Annualized cost estimates, road inventory data, and traffic data are based on extensive surveys of federal, provincial, territorial, and municipal agencies, and on engineering judgement. Survey responses were obtained from nearly all senior Canadian transportation agencies and from 15 municipalities. The 15 municipalities included both small and large municipalities and were distributed across all main geographic regions.

The report also compares the annualized operating and capital costs estimated by the model with annual operating and capital costs reported by all levels of government. The results of the comparison indicate that the model estimates are in line with the expenditures reported by highway agencies.

TABLE OF CONTENTS

LIST OF APPENDICES

ADDENDUM

The addendum contains 196 Road Construction Sheets

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Applied Research Associates, Inc. (ARA) was retained by Transport Canada to estimate the annualized unit costs by functional class of road for Canadian road infrastructure. The cost estimates should reflect the existing service levels and utilize existing practice of design, construction, rehabilitation, and maintenance of road infrastructure. The cost estimates are to represent all federal, provincial and territorial highways, and selected municipal roads.

The project included two additional tasks:

A/ Identification and classification of Canadian road infrastructure by functional class of the road. Road inventory is to be reported separately for each province or territory, jurisdiction within the province or territory (federal, provincial/territorial, and municipal), by road design features (rural or urban), and by functional class of road.

B/ Estimation of traffic volumes on the road network identified and classified in the course of Task A.

The two additional tasks can be viewed as separate tasks because the estimation of annualized unit road costs is independent of the actual extent of the road infrastructure inventory, and to some extent, of the actual traffic using the infrastructure. For example, it is possible to estimate the total annualized costs (per one-km-long single traffic lane) of an arterial municipal road with urban design features in Ontario without knowing the total length of such roads in Ontario.

The work described in this report is part of a project on the Investigation of the Full Cost of Transportation. The project was initiated by Transport Canada in collaboration with Provincial and Territorial transportation agencies and is steered by a Task Force reporting to the Policy and Planning Support Committee of the Council of Deputy Ministers Responsible for Transportation and Highway Safety.

The cost estimation methodology is based on the use of many small elements of verifiable data. For example, in the case of pavements, the specific data elements identify thickness, width, type, and unit cost of the surface layer on a provincial rural collector road in northern Ontario. Because the total cost estimation is based on hundreds of data elements (in terms of quantities and unit costs), the total cost estimates should remain reliable even if the estimates for some of the data elements are off. All estimated data elements are identified in the model and can be changed by the user (e.g., if better estimates become available). It is easy to change input data and re-run the cost estimation model for anybody with the basic knowledge of Excel.

The results presented in this report are based on the information and data available at the end of 2005. Annualized unit cost estimates can easily be updated using the procedures outlined in the description of the computational model.

The report consists of 12 primary chapters, 4 appendixes, an addendum, and an MS Excel®-based computational model. All chapters, appendices and the addendum are also available electronically.

Because of the large amount of data constituting the results of this project, most of the project results are given in the appendices. Results concerning road inventory and traffic data are given in Appendix C; results concerning annualized unit costs by functional class of road are given in Appendix E.

The computational model is a separate electronic document that can be opened by Microsoft Excel. The computational model, and its user guide, are described in Chapter 9. Appendix D provides a print-out of the main worksheets of the computational model.

The Addendum contains 196 Road Construction Sheets that provide detailed information on the geometric and physical features of all road segments included in the study.

2. SURVEY METHODOLOGY

A preliminary literature review at the commencement of this project indicated that the vast majority of the required information and data to complete this project would need to be obtained directly from Canadian transportation agencies. Consequently, a survey of federal, provincial and municipal transportation agencies has been the key component of the study. Agency surveys have been carried out using a network of regional representatives stationed in all major Canadian geographical regions. To maximize the efficiency of the survey, ARA developed a comprehensive survey package consisting of the survey questionnaires and procedures, and carried out pilot surveys, before launching the detailed agency surveys. This chapter describes the survey design, the contents of the survey questionnaires, and outlines the results of the surveys.

Survey Design

The survey design utilized a network of four regional representatives stationed in four major regions of the country:

- Atlantic Canada;
- Québec;
- Ontario; and
- Western Canada and Prairies.

The ARA regional representatives are professional engineers, with extensive experience in highway engineering, that live and work in the regions. They have been able to establish rapport with the representatives of key provincial and municipal transportation agencies in their regions, and are familiar with local highway technology.

The survey procedure included the following steps:

1. *Development of a summary list of survey data items.* Based on the objectives of the study, ARA developed a comprehensive list of all data items that needed to be obtained through the surveys. Considering the reluctance of people to spend time responding to external surveys, the list was scrutinized to ensure that it contains only essential data items.

2. *Development of survey package.* Data items were grouped into three separate provincial survey questionnaires and one municipal survey questionnaire. The three provincial survey questionnaires were an investment questionnaire, road inventory questionnaire, and a unit cost questionnaire. The grouping was designed to ensure that each questionnaire could be addressed by one specific respondent or an organizational unit within an agency.

3. *Preparation of the list of agencies to survey.* The objective of this task was to survey all provincial and territorial transportation agencies and approximately 20 municipalities representing both large and small communities in all regions of the country. The survey list included not only the names of the agencies, but also the names of specific agency representatives.

4. *Pilot testing.* Pilot testing of the survey package was completed to ensure that survey questions were unequivocal and practical.

5. *Review and approval of survey package.* The survey package was submitted for review and approval to Transport Canada. Full-scale survey work was carried out after the survey package was pilot-tested and approved.

6. *Survey administration.* The survey questionnaires were sent to specific representatives of transportation agencies rather than to an agency address. Often, the intended recipient of the survey was contacted in advance of sending the survey questionnaires to ensure that the right recipient (and potential respondent) had been selected, and to introduce the survey. The survey questionnaires also included an introductory letter prepared by Transport Canada and a document explaining the purpose of the survey. The mailing of questionnaires was followed by telephone calls and/or personal visits to obtain responses. Survey responses were acknowledged and in may instances followed by clarifying questions. The survey administration was the responsibility of the appropriate regional representatives. The regional representatives also notified the provincial members the Transport Canada Full Cost Investigation Task Force about survey activities in their provinces.

7. *Data recording and analysis*. All survey data were tabulated and analysed. Survey results are presented in the subsequent chapters.

Survey Package

In order to provide a customized (province and municipality-specific) survey package, a model survey package, intended for distribution to provincial and municipal transportation agencies, was originally developed for Ontario. The model package was then customized by the regional representatives for other provinces and territories to reflect local provincial and municipal conditions. The model survey package is given in Appendix A.

The model survey package consists of four individual survey packets:

- Provincial Investment Survey;
- Provincial Highway Inventory Survey;
- Provincial Cost Survey; and
- Municipal Survey.

The use of the individual packets was necessary because the different survey packets were directed to different survey respondents within the agencies. In many cases, the four survey packets were further subdivided and sent to different respondents. For example, one part of the Provincial Highway Inventory Survey packet was sent to a respondent responsible for road inventory and the second part to a respondent responsible to bridge inventory.

Table 1 provides a brief description of the model survey package, including information on the administration of the surveys, the description of the individual survey packets, and size of the packets.

In addition to the surveys that were part of the survey package, ARA has also carried out an extensive literature review, an internet search of databases posted by Canadian transportation agencies, and consulted many individual experts regarding specific topics. The topics for which additional expert advice was obtained included the cost of winter maintenance, grading (earth work) quantities, and the use of fencing along roadways.

Table 1. Main Components of the Model Survey Package

Name of Survey Packet	How was Survey Administered	Survey Subject	Main Components of the Survey Packet	Number of Pages
Provincial Expenditure Survey (PES)	Centrally by ARA	Routine maintenance costs; winter maintenance costs; access road (extent and costs)	Introduction letter for PES	1
			Survey Questionnaire PES	2
			Letter from Transport Canada	1
Provincial Highway Inventory Survey (PHIS)	By Regional Representatives	Extent and classification of roads and bridges; age of roads and bridges; traffic volumes	Introduction letter for PHIS	1
			Survey Questionnaire PHIS	4
			Letter from Transport Canada	1
Provincial Cost Survey (PCS)	By Regional Representatives	Unit costs of road materials; pavement preservation strategies and costs	Introduction letter for PCS	1
			Survey Questionnaire PCS	4
			Pavement Preservation Plans PCS	4 to 10
			Letter from Transport Canada	1
Municipal Survey (MS)	By Regional Representatives	Extent and classification of roads and bridges; unit cots costs of highway material; pavement preservation strategies and costs; traffic volumes	Introduction letter for MS	1
			Survey Questionnaire MS	4
			Pavement Preservation Plans MS	4
			Letter from Transport Canada	1

Survey Results

The response rate was at least 83 percent for provincial surveys and 60 percent for municipal surveys (Table 2). These response rates are unusually high considering the demanding nature of the surveys and response rates achieved by others. For example, a recent survey of 545 Canadian municipalities (with population of 5,000 people or more) achieved response rate of 12 percent [1]. The response rate of Ontario municipalities, achieved by the Ontario Roads Coalition, was about 20 percent [2].

Table 2. Response Rate for Surveys

Survey Packet	Number Distributed	Number of Responses Obtained	Response Rate, %
Provincial Expenditure Survey	12	10	83%
Provincial Highway Inventory Survey	12	11	92%
Provincial Cost Survey	12	11	92%
Municipal Survey	25	15	60%

The list of agencies and their representatives that have received the survey is presented in Appendix B.

Survey results are presented in different chapters of the report as summarized in Table 3. All survey responses were inventoried and will be submitted to Transport Canada.

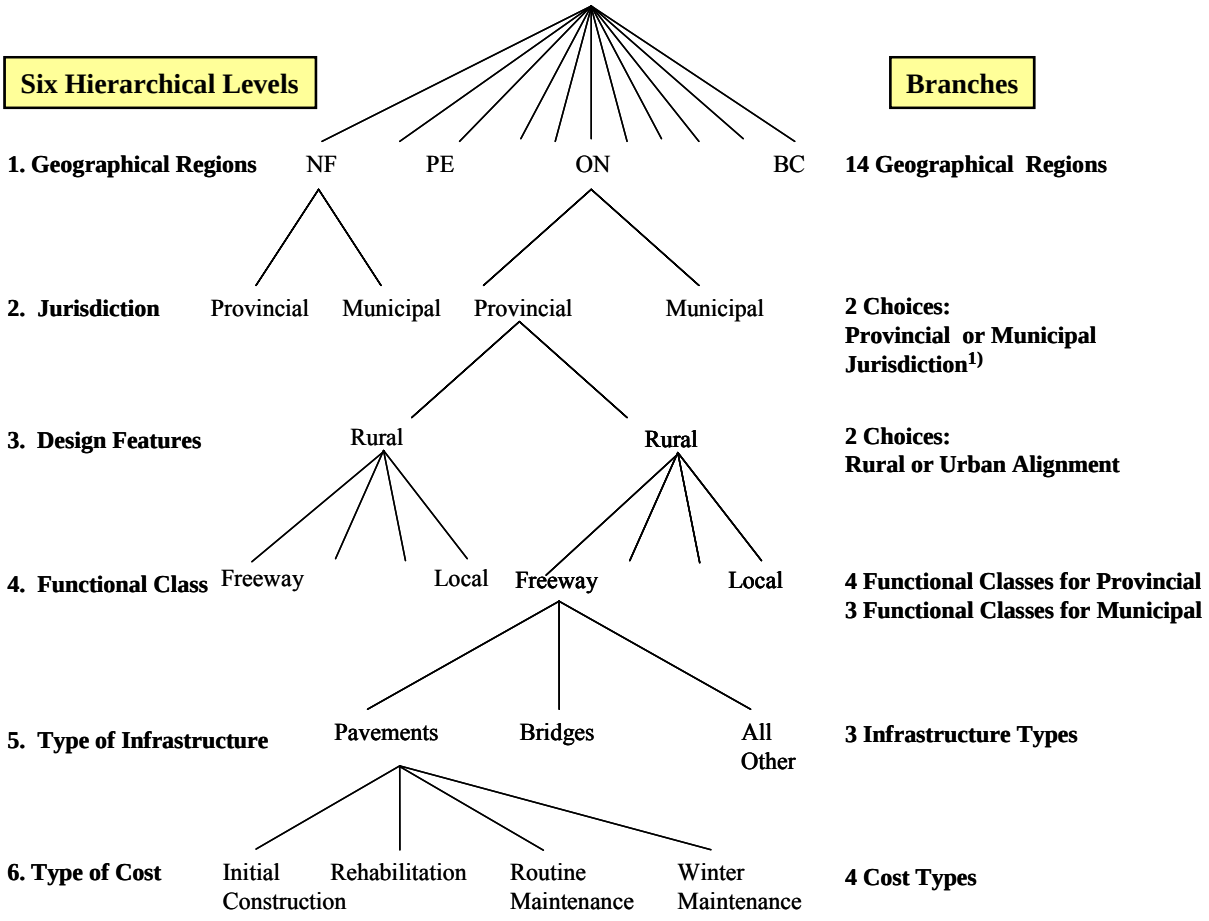
Table 3. Presentation of Survey Results

Type of Survey Data	Chapter No.
Road inventory, age of pavements and bridges	4
Traffic volumes	5
Unit costs of road infrastructure materials	8
Pavement preservation strategies and costs	7
Routine maintenance costs	8
Winter maintenance costs	8

3. CLASSIFICATION OF ROAD INFRASTRUCTURE

This chapter describes the classification procedure used to obtain specific road segments for which the annualized unit road costs were estimated. The specific roadway segments were defined by their geographical location (province, combined territories, or a part of province), jurisdiction (provincial or municipal), road design features (rural or urban), and by functional road class (e.g., arterial or local).

Annualized costs estimated for the specific road segments were further classified by the type of infrastructure (pavements, bridges, and all other components), and by types of costs (initial construction, maintenance and rehabilitation, routine maintenance, and winter maintenance). The overall road classification schema, with six hierarchical levels, is shown in Figure 1.



1) Annualized costs were estimated for two jurisdictions (provincial and municipal).
Road inventory data were provided for three jurisdictions (federal, provincial, and municipal)

Figure 1. Classification Schema

Classification Types

The annualized road costs were estimated for specific cost types obtained by classifying the road infrastructure and costs by:

- Type of road;
- Type of infrastructure; and
- Type of cost.

The classification by the type of road used the following four levels:

- Geographical location;
- Jurisdiction;
- Rural or urban road design features; and
- Road functional type.

The classification by the type of infrastructure resulted in the following three categories:

- Pavements;
- Bridges; and
- All other components (earthwork, culverts, safety appurtenances, etc.).

The classification by the type of costs resulted in the following categories:

- Initial construction costs;
- Rehabilitation and maintenance costs;
- Routine maintenance costs; and
- Winter maintenance costs.

Classification by the Type of Road

Classification by Geographical Location

For the purpose of estimating annualized costs, the classification by the geographical location recognizes all Provinces (10) and one combined "territory". Northwest Territories, Nunavut, and Yukon Territory were combined into one unit for cost-estimating purposes. In other words, only one set of annualized costs for the three territorial jurisdictions was estimated. However, road inventory, if available, was reported separately for each territory.

The grouping of all three territories for the purpose of estimating annualized costs has several advantages:

- The probability of obtaining key survey data for the combined territory is significantly improved;
- Road infrastructure costs are expected to be similar in all three territories;
- The combined cost estimates are more robust and reliable compared to estimates for individual territories;
- The size of the road network in the individual territories is quite small in comparison with the road network in the individual provinces; and
- The municipal road costs in each of the three territories are governed by one or two municipalities. For example, municipal road costs in Nunavut will depend entirely on the City of Iqaluit.

To account for the variation in environmental conditions that exist within a single province, Québec, Ontario, and British Columbia were each subdivided as follows:

- Québec was subdivided into Québec Champlain Plain and Québec Nord (mountainous region typically north of Champlain Plain);
- Ontario was subdivided into Southern Ontario (area south of the French River) and Northern Ontario (area north of the French River); and
- British Columbia was subdivided into Coastal region (including Greater Vancouver, the Fraser Valley, and Vancouver Island) and Interior and Northern BC region (including regions around Kelowna, Kamloops, Prince George, and other regions).

Consequently, there are 14 categories based on geographical location (7 provinces, 6 "half" provinces, and one combined territory).

Classification by Jurisdiction

Classification of road infrastructure by jurisdiction considered the following categories:

- *Federal* – Roads under federal jurisdiction or under the jurisdiction of crown agencies;
- *Provincial* – Roads under provincial or territorial jurisdiction;
- *Municipal* – Roads under municipal jurisdiction;
- *Access roads* – Roads that are located on public (crown) land and are typically constructed and maintained by the private industry to provide access to resources (forest, mineral extraction, recreation areas, etc.); and
- *Private road infrastructure* – Roads built and maintained by private interests.

Federal Jurisdiction

There are several federal agencies, or crown agencies, that own road infrastructure including:

- Public Works and Government Services Canada;
- Department of National Defence;
- Parks Canada;
- Indian and Northern Affairs Canada; and
- Federal Bridge Corporation Ltd.

For the estimation of annualized total road costs, road infrastructure under federal jurisdiction was divided into two categories:

- Federal road infrastructure included in the project; and
- Federal road infrastructure not included in the project.

Federal Road Infrastructure Included in the Project

Federal road infrastructure included in the project encompasses roads and bridges under Federal jurisdiction that are maintained by the provinces in which they are located as well as the roads and bridges maintained by the Federal Bridge Corporation Ltd. For the purposes of estimating annualized costs, ARA has "merged" this road infrastructure with the corresponding roads under the individual provincial jurisdictions.

As an example, British Columbia has 9,010 km of provincial rural arterial highways. There are also 1,306 km of rural arterial highways in British Columbia under Federal jurisdiction. For the cost estimating purposes, the two categories of roads were merged and treated equally.

Typically, major roads under federal jurisdiction are maintained by the provinces in which they are located. For example, winter maintenance is completed, or contracted out, by the Province. Construction activities may be paid for by the federal government, but roads are designed according to provincial geometric design standards and built using provincial construction specifications and local materials. Consequently, from the cost point of view, the road cost of an arterial highway is the same whether or not it is under the federal or the provincial jurisdiction.

Federal Road Infrastructure not Included in the Project

Federal road infrastructure not included in the project encompasses local roads serving the First Nations communities, located on reserves, and funded by Indian and Northern Affairs Canada (INAC). Some of these roads are paved and some are gravel roads. The owners of this infrastructure may be the individual First Nations or INAC. These roads are considered to have the predominant characteristics of residential roads and streets.

Provincial Jurisdiction

Road infrastructure under provincial jurisdiction includes highways managed by provinces and territories. For the purposes of calculating annualized road costs, provincial road infrastructure also includes Federal Road Infrastructure Included in the Project.

Municipal Jurisdiction

Data on road infrastructure under municipal jurisdiction was requested from provincial and territorial sources. We have also obtained data from 15 individual municipalities. All provincial and territorial representatives indicated that they do not track or store complete municipal road infrastructure information in their provinces or territories that is required for the purposes of this study. To obtain data on the overall extent of municipal road infrastructure within a province (or a geographical region), a provincial source, or a source that collects road inventory data from all municipalities within a province, is required. Similarly, to obtain data on the typical municipal unit costs applicable to the whole province, a centralized source is needed.

Access Roads

Typically, access roads (or resource access roads) have been built by the industry (e.g., forest companies) on Crown land, and are maintained by the industry. The public has the right to use them, but the industry has no obligation to maintain them for public use. Some access roads that were originally constructed by the industry are now maintained using public money. This report contains an inventory of access roads, but does not contain annualized unit cost estimates for access roads.

Private Road Infrastructure

Private road infrastructure is built and maintained by private interests and is not included in the study. Notable private road infrastructure assets include Express Toll Road 407 near Toronto and Confederation Bridge between New Brunswick and Prince Edward Island.

Classification by Road Functional Type

The following classification was used for provincial, territorial, and federal road infrastructure:

Freeway: A divided highway with full control of access.
Arterial: A two-lane or a multi-lane road that carries significant volumes of long distance traffic at high speeds. There is a high degree of access control.
Collector: A two-lane or a multi-lane road that balances traffic flow needs with access. Access to the road is governed by traffic flow considerations and by safety concerns.
*Local***:** A two-lane or a multi-lane road that primarily provides access to local land users. Access to the highway is controlled by safety concerns.

The following classification was used for Municipal Road Infrastructure:

*Arterial***:** Resembles a highway going through a municipality.
Collector: Feeds traffic from an Arterial to the Local roads or vice-versa.
Local: All other roadways that are not residential streets and are also not arterials and collectors.
Residential: Residential streets provide direct access to residences. All municipal roadways that are not arterial, collector or local are residential. Residential roads and streets are not included in the study.

Classification by Rural/Urban Road Design Features

Rural: Road with open roadside ditches and typically without curb-and-gutter. Road may have rural road design features even if it is located within municipal boundaries and is classified (by the type of jurisdiction) as a municipal road.

Urban: Road has predominantly an urban alignment, including curb and gutter and closed (storm sewer) drainage system. Road is considered to be urban only when more than 50 percent of its design features (alignment) is urban.

Classification by the Type of Infrastructure Component

Road infrastructure was grouped into three infrastructure types: pavements, bridges, and all other infrastructure component.

Pavements

Pavements include all material layers above the subgrade soil. Subgrade soil consists of native soil left after the removal of the existing overlaying material, as well as soils used as earth borrow to construct embankment fills or to replace existing unsuitable soils [3]. Pavement costs include pavement subdrains, but do not include the cost of curb-and gutter or the drainage system.

Bridges

For the purposes of this project, bridges also include road tunnels longer than 80 m, retaining walls with the exposed surface area greater than 400 m^2, and roadway snow sheds longer than 80 m.

According to the Canadian Bridge Code [4], bridges are structures with the span of at least 6 m and with the top part of the structure directly supporting vehicle loads (i.e. the structure has a bridge deck). A structure without a bridge deck, where the top of the structure is separated from the pavement by a layer of granular material, is a defined in the Canadian Bridge Code as a culvert.

For this study, culverts are defined as structures with a span greater than 0.5 metres, or a pipe with the diameter greater than 0.5 m, buried in soil or covered with a granular fill material. Culverts typically run underneath and across the roadway, connect two opposing ditch lines, and are day-lighted.

Although all Provinces recognize the Canadian Bridge Code regarding the bridge structural design, provincial transportation agencies use their own definitions of bridges when it comes to bridge management (such as maintenance and rehabilitation of bridges and record keeping). In other words, provincial and municipal transportation agencies make independent decisions about the type of structures they want to keep in their bridge management databases. Consequently, bridge data available from provincial databases do not use a uniform definition of bridges and a "bridge" database may also include data on short-span structures and large culverts. This situation complicated the retrieval of bridge data from the provincial and municipal databases.

The definition of a bridge, used by the each responding province, is given in Chapter 4. The definition is in terms of the minimum bridge span in metres. Data in Chapter 4 also include the number and size of the bridges.

All Other Infrastructure Component

All other infrastructure component includes all road infrastructure components that are not a pavement or a bridge, for example, earth work, drainage structures, landscaping and fencing, lighting, and safety and traffic control appurtenances.

Classification by the Type of Costs

The following four types of costs were established in view of the budgeting and asset management practices of transportation agencies:

Initial Construction Costs

Initial construction costs are costs incurred during the initial construction of road infrastructure. Initial construction costs do not include the cost of land. Initial construction costs were estimated separately for the three road infrastructure components.

Rehabilitation and Maintenance Cost

Rehabilitation and maintenance costs include all expenditures that provide a measurable and lasting improvement (improvement lasting more than a year) in the condition of a road infrastructure asset and increase the value of the asset. Typically, during the budgeting process, rehabilitation and maintenance costs are assigned to specific projects. Rehabilitation and maintenance costs were estimated separately for the three road infrastructure components.

Routine Maintenance Cost

Routine maintenance costs include expenditures that do not increase asset value (measurably and lastingly). Typically, the cost for routine maintenance of road infrastructure is not assigned to specific projects and is budgeted as a lump sum. Routine maintenance costs include minor repairs such as filling of potholes, minor guide rail repairs and bridge repairs, cutting grass, maintenance of the right-of-way, and the removal of debris. Routine maintenance costs were estimated as a combined cost for all three infrastructure components.

Winter Maintenance Costs

The cost of winter maintenance includes the cost of the field operations for snow removal and ice control and the costs of all other associated and supporting activities and facilities. Winter maintenance costs were estimated as a combined cost for all three infrastructure components.

Statistics Canada Definition of Capital and Maintenance Costs

The above definitions of types of costs differ from the definitions used by Statistics Canada [5]. Statistics Canada defines (a) capital expenditure and repair and (b) maintenance expenditures.

Capital expenditure -- Includes modifications, additions and major renovations, and conversions and alterations where either a structural change takes place or the life of an existing asset is extended beyond its normal expectancy. Considering the classification of costs used in this study, capital expenditure, as defined by Statistics Canada, may be an initial construction cost or a maintenance and rehabilitation cost.

Repair and maintenance expenditure (or repair expenditure) – According to Statistics Canada [5], repair and maintenance expenditure "…include expenditures which do not extend useful life of the structure, increase its capacity or otherwise raise its capacity and may include the routine care of assets such as snow removal and/or salting and sanding." Considering the classification of costs used in this study, repair and maintenance expenditure, as defined by Statistics Canada, may be a maintenance and rehabilitation cost, routine maintenance cost, or winter maintenance cost.

Number of Cost Categories

The theoretical number of possible combinations resulting from the six hierarchical levels of segregation and the number of branches at the six levels (Figure 1) is 1568 different annualized road "unit" costs. For example, an annualized unit cost was estimated for the cost *of initial construction* (type of cost, Level 6) *of pavements* (type of infrastructure, Level 5) *located on rural* (rural/ urban alignment, Level 4) *municipal* (jurisdiction, Level 2) *arterial roads* (functional class, Level 3 *in the interior of British Columbia* (geographical region, Level 1).

Not all combinations of the hierarchical and branch levels probably exist in the field. For example, there was probably no urban provincial freeway in Newfoundland and Labrador in 2003. However, ARA has provided cost estimates for all combinations of hierarchical levels and branches given in Figure 1. The complete set of estimates was provided because it was requested by Transport Canada. It can be argued that the estimation of unit road costs for road categories that do not exist is inappropriate. Nevertheless, it is not always clear if indeed a particular road category exists or is expected to exist in near future.

For provincial roads some categories may not exist at present, or exist in very limited quantities (e.g., freeways in Newfoundland and Labrador). However, such categories may exist in the future or already exist in very limited quantities. Thus, if the inventory changes, the estimated annualized costs are already available. For municipal roads, the annualized costs for all combinations (arterial, collector and local, both rural and urban) need to be estimated. The estimates are necessary because the actual segment lengths of the municipal road categories, particularly the division between rural and urban alignments, are not currently known.

The inventory of road infrastructure is further discussed in Chapter 4. Procedures used to estimate unit costs are discussed in Chapters 6 to 9.

4. INVENTORY OF ROAD INFRASTRUCTURE

This chapter presents road infrastructure inventory data obtained through the Provincial Inventory Survey and the Municipal Survey. These surveys are described in Chapter 2. Road infrastructure inventory data were classified by geographical location, jurisdiction, rural or urban road design features, functional class, and by the type of infrastructure. Classification procedures are given in Chapter 3.

Road infrastructure data for each Province or Territory are summarized separately in Road Inventory Sheets. An example of a Road Inventory Sheet for Southern Ontario is provided in Table 4. All of the Road Inventory Sheets are given in Appendix C. There is one one-page Road Inventory Sheet per province or territory with the exception of Québec, Ontario, and British Columbia which each have a two-page Road Inventory Sheet. The two-pages are required because each of these provinces was subdivided into two geographic regions.

Each Road Inventory Sheets (Table 4) contains the following data:

- *Road inventory* – includes the length of roads in terms of 2-lane equivalent km[1];
- *Bridge inventory* – includes number of bridges, average bridge size (in terms of square metres of the bridge deck area), and the minimum bridge span (the minimum span the road structure must have to be classified as a bridge);
- *Average age of road infrastructure* – includes the age since the initial construction and the age since rehabilitation for both pavements and bridges; and
- *AADT volumes and AADT volumes of commercial vehicles* – includes Annual Average Daily Traffic (AADT) volumes and the AADT volumes of commercial vehicles (AADTT). Also included are AADT and AADTT ranges. Traffic data are discussed in Chapter 5.

Road infrastructure inventory data are for the most recent year for which data was available, typically for 2004. All of the road inventory sheets are also available in Excel format.

Data Challenges

This section contains background information on road infrastructure data summarized on the Road Inventory Sheets. The main data deficiencies are in the area of municipal infrastructure. In particular, ARA has been unable to obtain accurate data on the distribution of municipal roads by rural versus urban alignment for any provincial or territorial jurisdiction.

In general, road lengths reported herein do not include additional lanes at intersections and at interchanges. For freeways, the additional length of on-and-off ramps and acceleration and deceleration lanes is about 5 percent of the total (freeway) length.

<u>Newfoundland and Labrador</u>

ARA has received a complete set of provincial road and bridge inventory data classified by the road functional class. Municipal road inventory data are missing.

[1] A "two-lane equivalent" is a length of road measured as if there were only two lanes. For example, one kilometre of four-lane highway is the equivalent of two kilometres of two-lane equivalent highway.

Table 4. Example Road Inventory Sheet for Ontario

Ontario

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway		2,261	2,043	N/A	N/A
Arterial		6,120	145		
Collector		4,981	128		
Local	75	3,860	48		
Total	75	17,222	2,364		

Rural-Urban split for freeways was based on 1995 data

Bridge inventory for Ontario

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway						3.0
Arterial	7					
Collector						
Local	48					
Total	55	2646		1000		

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	30.9
	of resurfacing or rehabilitation	17.6
Bridges	since the time of initial construction	36
	of rehabilitation	25

AADT volumes for Southern Ontario, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	64,425	5,450 - 102,600	70,847	17,400-410,000
Arterial	12,053	610 - 46,000	12,978	5,700 - 41,700
Collector	7,604	650 - 50,400	5,689	2,050-33,300
Local	9,917	150 - 22,300		

Percent commercial vehicles, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	21.6%	3.0 - 50.8%	11.5%	4.2 - 20.0%
Arterial	10.5%	3.3 - 33.3%	9.6%	3.2 - 21.8%
Collector	10.3%	2.8 - 26.8%	10.4%	2.0 - 19.6%
Local	9.6%	3.9 - 30.4%		

Prince Edward Island

Inventory data have not been received from Prince Edward Island. The Prince Edward Island Department of Transportation and Public Works is responsible for over 5,600 of (2-lane equivalent) km of roads [6].

Nova Scotia

A complete set of provincial road and bridge inventory data classified by the road functional class, and the total length of municipal roads have been received from Nova Scotia. Nova Scotia also provided the age of pavements and bridges since the time of the last construction or reconstruction. The original submission of the road length provided by Nova Scotia was changed based on subsequent discussions regarding he split of all arterial roads to freeway and arterial category.

New Brunswick

New Brunswick provided a combined provincial road inventory data for both rural and urban roads, and the total number of provincial bridges. Municipal road inventory data were provided for only roads "for grant" formula. New Brunswick includes freeways in the class of arterial highways.

As indicated on the Road Inventory Sheet for New Brunswick, the road-length data provided are in terms of centreline kilometres. Two-lane equivalent kilometres are be about 10 to 20 percent higher for freeway and arterial roads, and about 2 to 10 percent higher for local and collector roads.

Québec

Québec provided provincial road lengths and bridge data classified by functional class, but combined for both southern and northern Québec. Also, only total municipal road lengths, for southern and northern Québec combined, were provided.

According to Ministère des Transports du Québec (MTQ), road lengths provided by the MTQ for the study could be slightly different than the actual lengths that are under the responsibility of the MTQ. These differences could be due to the need to merge and combine information for different dimensions of the network (environment, road class, AADT, and weighted length) and from different sources. Also, the distinction between northern and southern regions of Québec is unreliable. The MTQ management system is not organized by such a breakdown and therefore some questions in the questionnaire were difficult to answer.

Ontario

Ontario provided a complete set of provincial road length inventory data. Data regarding the municipal road inventory were not provided. The latest year for which Ontario municipal road inventory data were available was 1995. These data were considered to be out of date and are not included in this report

The split between rural and urban roads provided by Ontario Ministry of Transportation (MTO) was adjusted to recognize the definition of the rural and urban design features used in this study and provided in Chapter 3. The data submitted by Ontario were based on the following definition: "All Freeways are appraised as rural even if they are within an urban environment due to speed limit considerations (maximum speed for urban and semi-urban environments is restricted to less than 100 km/h.)."[2] The adjustment was completed using data obtained from Reference 7. The unadjusted, as-submitted Ontario

[2] Communication with Ontario Ministry of Transportation on June 6, 2005.

road length data are given in Table 5. Using the MTO definition, there are only 145 km (2-lane equivalent km) of urban freeways in southern Ontario. The corresponding adjusted number is 2,043 km.

Bridge data provided by Ontario are for all road classes combined.

Table 5. Original Submission of Road Inventory Data by Ontario

Provincial Highways, 2-lane equivalent km				
Functional Class	**Southern Ontario**		**Northern Ontario**	
	Rural	**Urban**	**Rural**	**Urban**
Freeway	3,828	145	331	0
Arterial	2,226	87	3,894	58
Collector	1,692	115	3,289	13
Local	160	0	3,700	48
Total	**7,906**	**347**	**11,214**	**119**

Manitoba

Manitoba provided a complete set of provincial road and bridge inventory data. No municipal inventory data were provided. Manitoba's definition of an expressway (freeway) differs from that used in this study. Manitoba defines expressways as "generally multi-lane, divided highways (or highways that may/should be expanded to multi-lane facilities in the next 30 years) that carry large high speed traffic volumes under close free flow conditions. They connect, and sometimes bypass, cities and larger towns."

This definition explains the relatively large length of freeways in Manitoba. It appears that the Manitoba's definition for other road classes does not include forward-looking considerations of future developments.

Saskatchewan

Saskatchewan provided a complete set of provincial and municipal road inventory data. The relatively large length of freeways in Saskatchewan (1,499 2-lane km of rural freeways and 167 2-lane km of urban freeways) is probably caused by the definition of the freeway road functional type used by Saskatchewan.

Saskatchewan has the largest lengths of municipal rural collector roads and municipal rural local roads of all provinces. Municipal rural collector roads include Saskatchewan Class 6 roads[3]. Class 6 roads are all-weather roads that serve as the primary access road to individual rural residents and school bus routes. Municipal rural local roads include Saskatchewan Class 7 roads. Class 7 roads serve as access to farmland and other properties. It is possible that many of the Saskatchewan Class 6 and Class 7 roads would be classified by other jurisdictions as residential or access roads.

Alberta

Road length inventory data (provincial and municipal) were estimated using information supplied by Alberta and summarized in Table 6 and Table 7. Briefly, Alberta road-length inventory data were obtained through an iterative process of evaluating and reconciling data from different sources and submitting them to the representatives of Alberta Transportation for comments. Useful information on

[3] According to Saskatchewan Rural Road Classification System developed in 2000 to classify provincial and rural municipal roads.

municipal roads was obtained from the municipal affairs web site (http://www.municipalaffairs.gov.ab.ca/ms/mfistable/ emfis_table.cfm).

Both provincial and municipal bridge data are available by road functional class.

British Columbia

British Columbia provided limited provincial road length inventory data. Bridge data and municipal inventory data were not provided. It was assumed that the road-length data provided by British Columbia were in terms of 2-lane equivalent km.

Yukon Territory

Yukon Territory provided a complete set of territorial and municipal road infrastructure inventory data. Information provided is in a broad agreement with information in Reference 6 which states that Yukon Territory has 3,624 kilometres of "trunk" highways and 1,863 kilometres of recreational and multipurpose industrial roads.

Northwest Territories

Northwest Territories provided a complete set of territorial and municipal road infrastructure inventory data.

Nunavut

No road infrastructure data were received from Nunavut.

Table 6. Background Data for Mapping Alberta Provincial Roads to the Common Road Functional Classes

Original submission[a)]		Data provided by Steve Otto, March 2005			Stantec 2001 data[b)]		Hwy Classifications Nov 2003			Transport Canada Study [c)]		
Class	Length, Centerline km	Class	Length, Centerline km		Functional Class	Length, Centerline km	Class	2-lane Km	Centerline	Functional Class	2-lane Km	
			Rural	Urban							Rural	Urban
Freeway	242	Freeway		100	Freeway	540	1A	5,880.24	3,690.44	Freeway	208	292
Expressway	1,526.14	Arterial	12,690		Expressway	1870	1B	9,703.68	9,434.25	Arterial	15,418.48	
Multilane	2,437.92				Multi-lane art.	1510						
Major arterial	8,925.84				Major arterial	7920						
Minor Arterial	11,064.32	Collector	11,800		Minor arterial	9650	2	11,542.03	11,339.58	Collector	11,542.03	
Low volume	5,842.67	Local	4,980		Low volume	3260	3	5,038.49	5,505.63	Local	5,038.49	
Total	30,751.61	Total	29,570		Total	24,750		32,164.44	29,469.89	Sub-total	32,207[d)]	292[d)]
										Total	**32,499**	

Notes:

a) Data received from Transport Canada in March 2005.

b) Stantec's Feb. 13, 2001 Provincial Highway Classification Update

c) Data were obtained from File *Hwy Classifications Nov2003* provided by Mr. M. Clulow on June 10, 2005

d) Totals provided by Steve Otto / Michael Clulow on June 10, 2005

Table 7. Background Data for Mapping Alberta Municipal Roads to the Common Road Functional Classes

Summary for Cities[a]			Local Roads not Including Cities[b]			Transport Canada Study[c]		
Functional Class	**Length[d], km**	**Percentage (of total)**	**Class**	**Length[e], km**	**Percentage (of total)**	**Functional Class**	**2-lane equivalent km**	**Percentage Urban, %**
Arterial	4,133	33.1 %				Arterial	4,133	95
Collector	2,192	17.5%				Collector	2,192	85
Local	6,173	49.4 %	Paved	2,249	1.7	Local	16,615	90
			Based	1,805	1.4			
			Oiled	6,388	4.9			
			Gravel	107,301[f]	82.0			
			Graded	13,180[f]	10.0			
Total	12,498	100 %		130,923			22,940	

Notes
[a] Data received from. Alberta Transportation on May 27, 2005 and subsequently updated by removing 1,069 km of "rear lot lanes" from local roads
[b] Data received from Alberta Transportation on May 27, 2005. Does not include municipal infrastructure.
[c] Suggested data for the current study
[d] Length in 2-lane equivalent kilometres. Original data were in lane kilometres.
[e] Assumed to be in centreline km.
[f] Not included in the total of local municipal roads. It is assumed that these roads are residential roads or streets.

Roads Excluded from the Study

In accordance with the terms of reference, ARA has not calculated annualized road costs for the following types of roads.

- Federal road infrastructure not included in the project;
- Access roads;
- Residential roads and streets; and
- Private roads.

Federal Road Infrastructure not Included in the Project

Federal road infrastructure not included in the project includes road infrastructure administered by INAC (Table 8) and by the Department of National Defence.

Table 8. Road Infrastructure Administered by Indian and Northern Affairs Canada

Roads or Bridges	Province or Territory										
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT
Centreline km	25.2	8.64	75.02	90.76	480.6	2651.94	1648.67	3264.55	3133.35	1068.7	65.7
No. of bridges	2	1	2	1	6	77	31	16	35	48	0

Access Roads

Table 9 provides a summary of currently available data on access roads.

Table 9. Access Road Information

Province or Territory	Description of Access Roads	Length, km
NL	17,140 Industry access roads and 3,100 Crown access roads	20,240
PE	No access roads were reported	
NS	Roads on Crown land (516 km) and service roads (140)	656
NB	Resource Access Roads (127 km). Non-maintained public roads that provide access to woodlots, camps, and cottages (approximately 3,400 km)[a)].	3,527
QC	Access to forestry and mineral resources	60,668
	Hydro Québec	3,325
	Access to resources	1,443
	Federal	536
ON	Assess roads in Ontario are called Forest Assess Roads (FAR). An area-type permit to build FAR is given to the industry by the Ministry of Natural Resources. No systematic inventory of FAR is presently available.	100,000
MB	Access roads[c)]	486
SK	None reported	
AB	None reported	
BC	Unnumbered highways under Provincial jurisdiction[b)]	30,450
YT	Unspecified	675
NT	Information on access roads is not available	
NU	Information on access roads is not available	

Notes
Lengths of access roads are given as centreline kilometres.
[a)] Includes Property Access Roads which are built when new construction cuts off access to land.
[b)] In some cases, due to developments over time, access roads originally built by forest companies are maintained by the province.
[c)] Provide links between population centres, resource developments, recreational areas and other highway classifications designated as provincial roads.

Residential Roads and Private Roads

The terms of reference for this project do not include the collection of any data for residential roads and streets, and for private road infrastructure.

Pavement Surface Type by Road Functional Class

In addition to the length of roadway, it was important to estimate the type of pavement surface that was used on the various road functional classes in the 14 geographic regions. A single, typical pavement surface type was assigned to each functional class for the purposes of generating a pavement cross section, initial pavement design, and pavement preservation plan. The pavement surface types used were hot-mix asphalt (HMA), asphalt surface treatment (AST), and gravel surface (Gravel). The pavement type distribution can be seen in Table 10.

Table 10. Estimated Pavement SurfaceTypes by Functional Class

Description and type of work item	Region	Provincial							
		Rural				Urban			
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local
Pavement Surface Type	NL	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	PE	HMA	HMA	HMA	AST	HMA	HMA	HMA	HMA
	NS	HMA	HMA	HMA	AST	HMA	HMA	HMA	HMA
	NB	HMA	HMA	HMA	AST	HMA	HMA	HMA	HMA
	QC-1	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	QC-2	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	ON-1	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	ON-2	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	MB	HMA	HMA	HMA	AST	HMA	HMA	HMA	HMA
	SK	HMA	HMA	AST	AST	HMA	HMA	HMA	HMA
	AB	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	BC-1	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA
	BC-2	HMA	HMA	HMA	AST	HMA	HMA	HMA	HMA
	TR	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA

Description and type of work item	Region	Municipal					
		Rural			Urban		
		Arterial	Collector	Local	Arterial	Collector	Local
Pavement Surface Type	NL	HMA	HMA	Gravel	HMA	HMA	HMA
	PE	HMA	HMA	Gravel	HMA	HMA	HMA
	NS	HMA	HMA	Gravel	HMA	HMA	HMA
	NB	HMA	HMA	Gravel	HMA	HMA	HMA
	QC-1	HMA	HMA	Gravel	HMA	HMA	HMA
	QC-2	HMA	HMA	Gravel	HMA	HMA	HMA
	ON-1	HMA	HMA	Gravel	HMA	HMA	HMA
	ON-2	HMA	HMA	Gravel	HMA	HMA	HMA
	MB	HMA	HMA	Gravel	HMA	HMA	HMA
	SK	HMA	AST	Gravel	HMA	HMA	AST
	AB	HMA	HMA	Gravel	HMA	HMA	HMA
	BC-1	HMA	HMA	Gravel	HMA	HMA	HMA
	BC-2	HMA	HMA	Gravel	HMA	HMA	HMA
	TR	HMA	AST	Gravel	HMA	HMA	HMA

HMA - Hot Mix Asphalt Surface
AST - Asphalt Surface Treatment
Gravel - Gravel Surface

Comparison of NRCan Road Lengths with the Study Road Lengths

Road inventory data, developed by the Natural Resources of Canada (NRCan) study[4], and obtained from Transport Canada on July 18, 2005, were compared with road inventory data reported by provincial transportation agencies. For comparison purposes, NRCan data, reported in lane kilometres, were converted to two-lane equivalent kilometres (by dividing the lane km by two). NRCan study included all public roads. Numbered highways were classified as freeway or expressway/highway, whereas unnumbered highways were primarily classified as collector or local roads.

The comparison of the NRCan road lengths with the road lengths established in this study was done for the following three cases:

- Comparison of total freeway road lengths;
- Comparison of total provincial/territorial road lengths; and
- Comparison of total municipal road lengths.

Comparison of Total Freeway Road Lengths

The freeway functional class was selected for comparison because both NRCan and provincial highway agencies probably use a similar definition of the freeway road functional class. The definition of other road classes was more divergent. The results are presented in Table 11. Data for rural and urban freeways are reported together because NRCan defines rural or urban design features by a geographical location (outside or inside municipal boundaries), whereas the agencies use actual roadway design features.

The results indicate that there are significant differences between the freeway road lengths reported by the NRCan and by the individual provincial and territorial transportation agencies. However, the glaring differences are probably attributable to the differences in the definition of freeways. For example, Manitoba definition of freeways included freeways that are still in planning stages. For the two provinces with most of the freeways, Ontario and Québec, the differences between NRCan and this study are about plus-minus 20 percent.

Comparison of Total Provincial/Territorial Road Length

The comparison of the total provincial/territorial road length was selected because it does not depend on the definition of road functional classes or on the rural – urban split. The results presented in Table 12 indicate a much better agreement between NRCan road lengths and the lengths reported by the agencies than the agreement obtained for freeways. The largest differences occurred for Nova Scotia and New Brunswick. The NRCan study appears to have under-reported the total provincial road lengths for these two provinces by 48 and 66 percent respectively.

[4] NRCan system utilized GIS and provincial input.

Table 11. Comparison of Road Lengths for Federal and Provincial Freeways

Jurisdiction	Road length for freeways 2-lane equivalent km		
	NRCan [a] km	This study [b] km	Difference %
Newfoundland and Labrador	374	0	+100%
Prince Edward Island	0		
Nova Scotia	1,108	1,834	-40%
New Brunswick	1,397	0	
Québec	3,953	5,001	-21%
Ontario	5,144	4,304	20%
Manitoba	24	1,831	-99%
Saskatchewan	83	1,666	-95%
Alberta	1,032	602	-72%
British Columbia	1,549	1,113	39%
Nunavut	0		
Northwest Territories	0		
Yukon Territory	0		

Notes:
[a] Data obtained from Transport Canada on July 18, 2005.
[b] As reported by provincial transportation agencies. The length does not include municipal freeways (if any).

Table 12. Comparison of Road Lengths for the Total of Federal, Provincial and Territorial Roads

Jurisdiction	Road length 2-lane equivalent km		
	NRCan [a] km	This study [b] km	Difference %
Newfoundland and Labrador	7,063	9,722	-27%
Prince Edward Island	6,001	?	
Nova Scotia	7,524	22,910	-66%
New Brunswick	9,128	18,028	-48%
Québec	24,286	28,348	-11%
Ontario	16,203	19,661	-18%
Manitoba	19,188	18,693	3%
Saskatchewan	32,450	26,263	25%
Alberta	32,335	32,499	-1%
British Columbia	14,417	12,516	17%
Nunavut	0	?	
Northwest Territories	2,039	2,143	-5%
Yukon Territory	3,577	4,760	25%

Notes:
[a] Data obtained from Transport Canada on July 18, 2005.
[b] Obtained in this study as reported by provincial transportation agencies.

Comparison of Total Municipal Road Lengths

Total municipal road lengths reported by NRCan and this study are compared in Table 13. Also shown are corresponding road lengths reported by the Transportation Association of Canada (TAC) in 1995 [8]. This was the last year that Canada-wide road infrastructure data were reported by TAC.

Data presented in Table 13 show large differences between data obtained by different sources. The discrepancies are probably caused by differences in the definition of municipal roads. Municipal roads reported by provinces or territories are probably roads that are recognized and possibly financially supported by provinces or territories. NRCan data may also include residential and access roads. Reference 8 does not provide the definition of municipal roads reported by TAC.

Table 13. Comparison of Road Lengths for all Municipal Roads

Jurisdiction	Road length 2-lane equivalent km			
	1995 TAC[a] km	NRCan[b] km	This study[c] km	Difference[d] Percent
Newfoundland and Labrador	4,127	12,127		
Prince Edward Island	502	0		
Nova Scotia	2,330	19,355	2,330	-93%
New Brunswick	3,185	22,182		
Québec	90,000	119,349	61,358	-58%
Ontario	137,087	173,586		
Manitoba	64,500	65,406		
Saskatchewan	172,522	173,244	181,996	5%
Alberta	159,172	192,989	22,940	-90%
British Columbia	21,399	49,444		
Nunavut	N/A	0		
Northwest Territories	4,307	817	40	-99%
Yukon Territory	4,697	2,176	28	-99+

Notes:
[a] Based on Reference 8.
[b] Data obtained from Transport Canada on July 18, 2005.
[c] Obtained in this study as reported by provincial transportation agencies.
[d] Between NRCan study and this study.

Total Composite Inventory

The total composite inventory of Canadian roads was established by combining information obtained in this study (through the surveys of Canadian transportation agencies), data provided by NRCan, and additional information provided by Transport Canada[5] that included a spreadsheet called crosscheck sheet. The total composite inventory, presented in Table 14, was used in Chapter 11 to compare estimated road infrastructure costs using data generated by this study with expenditures reported by transportation agencies.

[5] Calibration Methodology Regarding Unit Costs, a report received from Transport Canada on November 7, 2005.

Table 14. Total Composite Inventory of Canadian Roads

Region	Federal and Provincial									Municipal							Total
	Rural				Urban				Total	Rural			Urban			Total	
	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local		Arterial	Collector	Local	Arterial	Collector	Local		
NL	0	2,543	3,795	2,695	0	0	0	689	9,722	807	807	6,460	150	150	1,203	9,579	19,300
PE	0.0	1,237.5	2,478	1,793	9	103	225	163	6,010	0	0	0	0	0	0	0	6,010
NS	1,700	1,974	2,522	14,928	144	167	213	1,262	22,910	359	359	2,868	60	60	484	4,190	27,100
NB	250	1,690	2,764	11,967	8	150	225	974	18,028	1,177	1,177	9,419	170	170	1,359	13,472	31,501
QC-1	3,066	7,917	11,633	75	478	280	146	38	23,632	8,263	8,263	66,104	793	793	6,347	90,563	114,195
QC-2	341	880	1,293	8	1,116	652	340	88	4,716	855	855	6,840	1,724	1,724	13,791	25,789	30,505
ON-1	1,930	2,226	1,692	235	2,043	87	115	0	8,328	11,993	11,993	95,942	1,311	1,311	10,489	133,039	141,367
ON-2	331	3,894	3,289	3,700	0	58	13	48	11,333	1,162	1,162	9,296	2,668	2,668	21,344	38,300	49,633
MB	1,706	3,651	4,238	8,814	125	33	73	53	18,693	6,377	6,377	51,016	414	414	3,310	67,908	86,600
SK	1,499	3,165	5,263	16,063	167	167	0	0	26,324	12,200	82,670	67,868	2,777	2,556	4,296	172,367	198,691
AB	310	15,567	11,870	5,262	292	0	0	0	33,301	17,764	17,764	142,111	1,536	1,536	12,288	193,000	226,300
BC-1	928	491	9,010	0	62	64	153	0	10,707	3,718	3,718	29,743	589	589	4,711	43,067	53,775
BC-2	103	55	1,001	0	144	149	357	0	1,809	359	359	2,869	1,193	1,193	9,544	15,516	17,325
TR	0	4,874	344	1,685	0	0	0	0	6,903	0	0	0	20	24	24	68	6,971
Total	**12,164**	**50,164**	**61,191**	**67,225**	**4,587**	**1,910**	**1,860**	**3,314**	**202,415**	**65,034**	**135,504**	**490,537**	**13,406**	**13,189**	**89,190**	**806,858**	**1,009,273**

The total composite inventory utilized and combined the best available information from the three sources: the provincial and municipal surveys, the NRCan study, and the crosscheck sheet. In general, federal, provincial and territorial road lengths were obtained from the surveys of transportation agencies because senior transportation agencies have the most reliable highway inventory data. Municipal road lengths were obtained from the NRCan study because this study was the only source of municipal data in many provinces. Also, in general, the total length of the road network (federal, provincial/territorial, and municipal) in a particular region was established using NRCan data. Consequently, the municipal road length in a given geographical region was calculated as the difference between (a) the total length of the road network obtained by NRCan study and (b) the total length of the federal and provincial/territorial road network obtained by surveys of transportation agencies.

Crosscheck sheet data were used to divide provincial roads between rural and urban (for provinces which did not provided pertinent data), and to divide Québec and British Columbia into two geographical regions (QC-1 and QC-2, BC-1 and BC-2).

Notable exceptions from the general rules are summarized in the following:

PE: All road lengths were based on data from NRCan study.
SK: All road lengths were obtained by surveys (data supplied by the Saskatchewan Highways and Transportation).
AB: Municipal rural road lengths were established by considering both survey data and NRCan study data.
TR: All road lengths were obtained by surveys.

5. TRAFFIC CHARACTERISTICS

This chapter contains results of traffic volume estimates for the same road segments for which we estimated annualized road costs. Traffic volume estimates were obtained through the responses to the Provincial Highway Inventory survey and the subsequent communication with the provincial and territorial representatives. The results are presented in the Road Inventory Sheets introduced in Chapter 4 as Table 4**,** and presented in Appendix C. There is one one-page Road Inventory Sheet for each province or territory. Québec, Ontario, and British Columbia have a two-page Road inventory Sheet because each of these provinces was subdivided into two geographic regions.

Results

An example of traffic data reporting format used for the Road Inventory Sheets is shown in Table 15. Table 15 was extracted from the Road Inventory Sheet for Ontario.

Table 15. Example of Traffic Data Reporting Format

AADT volumes for Southern Ontario, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	64,425	5,450 - 102,600	70,847	17,400-410,000
Arterial	12,053	610 - 46,000	12,978	5,700 - 41,700
Collector	7,604	650 - 50,400	5,689	2,050-33,300
Local	9,917	150 - 22,300		

Percent commercial vehicles, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	21.6%	3.0 - 50.8%	11.5%	4.2 - 20.0%
Arterial	10.5%	3.3 - 33.3%	9.6%	3.2 - 21.8%
Collector	10.3%	2.8 - 26.8%	10.4%	2.0 - 19.6%
Local	9.6%	3.9 - 30.4%		

The following traffic characteristics are reported on Road Inventory Sheets (Appendix C):

- Average AADT (Annual Average Daily Traffic) volume;
- Range of AADT volumes;
- Average AADT of commercial vehicles (trucks and buses); and
- Range of AADT of commercial vehicles.

The traffic characteristics are typically for year 2003 or for the most recent year for which data are available.

The Use and Definition of Traffic Data

Traffic characteristics, such as traffic speed and volume, are important considerations for classifying road network by functional class. For example, arterial roads are typically associated with high traffic volumes of cars and commercial vehicles and with high traffic speeds. Traffic volumes are also required for estimating road costs per vehicle kilometre of travel.

Road costs per vehicle km of travel depend mainly on traffic volumes rather than on road costs alone. For example, the cost of a freeway lane is typically about 3 or 4 times higher than the corresponding costs of a traffic lane on a collector road. On the other hand, the traffic volume on a freeway lane can be about 100 times higher than traffic volume on a collector lane. The difference in traffic volumes is even larger for truck traffic. Truck traffic (in terms the Equivalent Single Axle Loads, a measure of pavement damage caused by trucks) can be 1000 times higher on a freeway lane than on a collector lane. Consequently, road costs per vehicle km of travel are effectively governed by the assumptions made regarding traffic volumes.

In order to estimate road costs per vehicle km of travel for different road functional classes and categories, it is necessary to know traffic volumes associated with these classes and categories.

Annual Average Daily Traffic (AADT) Volume

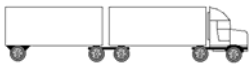
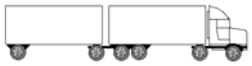
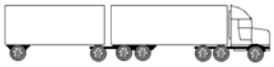
Canadian provincial highway agencies typically estimate AADT using the AASHTO method [9]. According to the AASHTO method, for each month of the year, seven monthly average days of the week are computed. (All Mondays for a month are averaged, all Tuesdays for a month are averaged, etc.) Then the twelve Mondays are averaged, the twelve Tuesdays are averaged, etc. This results in seven yearly average days of the week, which are averaged to obtain an annual average daily volume estimate. AADT volumes are reported as a combined volume for all vehicles (motorcycles, passenger cars, buses, and trucks) and for all traffic lanes in the highway corridor (all lanes in both directions).

AADT of Heavy Vehicles

Canadian provincial highway agencies do not use a standard method to classify highway vehicles. However, the agencies, through their participation in SHRP (Strategic Highway Research Program) and C-SHRP (Canadian SHRP) Long term Pavement Performance Studies, are familiar with and tend to use the United States Federal Highway Administration classification of highway vehicles [10]. This classification is presented in Table 16.

All vehicles listed in Table 16 (Vehicle classes 4 to 13) are considered to be commercial vehicles and are included in the AADT of commercial vehicles given on road inventory sheets.

Table 16. FHWA Commercial Vehicle Classification (Based on Reference 10)

Vehicle Class	Typical Configuration	Description
4		Buses
5		Two-Axle, Six-Tire, Single Unit Trucks
6		Three-Axle Single Unit Trucks
7		Four or More Axle Single Unit Trucks
8		Four or Less Axle Single Trailer Trucks
9		Five-Axle Single Trailer Trucks
10		Six or More Axle Single Trailer Trucks
11		Five or Less Axle Multi-Trailer Trucks
12		Six-Axle Multi-Trailer Trucks
13		Seven or More Axle Multi-Trailer Trucks

Data Challenges

This section contains background information on traffic data summarized in the Road Inventory Sheets given in Appendix C. The main data deficiencies are in the area of traffic on municipal roads. It appears that provincial agencies do not have records of traffic usage on municipal roads. ARA has obtained traffic data from several municipalities. However, traffic data obtained from individual municipalities are insufficient for the estimation of traffic characteristics that would be applicable across the entire municipal road network within a province or territory.

Newfoundland and Labrador

Only traffic data for provincial arterial roads were received.

Prince Edward Island

No traffic data were received from Prince Edward Island.

Nova Scotia

Traffic data were received for provincial roads (per road functional classes).

New Brunswick

No traffic data were received traffic data from New Brunswick.

Québec

Québec provided a complete set of traffic data for provincial roads.

Ontario

Ontario provided a complete set of traffic data for provincial roads.

Manitoba

Manitoba provided a complete set of AADT data for provincial roads. Data for the AADT of commercial vehicles are incomplete.

Saskatchewan

Saskatchewan provided a complete set of traffic data for provincial roads.

Alberta

Alberta provided a complete set of traffic data for provincial roads.

British Columbia

No traffic data were received from British Columbia.

Yukon Territory

Yukon Territory provided a fairly complete set of traffic data for territorial roads.

Northwest Territories

Northwest Territories provided a complete set of AADT data for territorial roads. AADT of commercial vehicles was not provided.

Nunavut

No traffic data were received from Nunavut.

6. ANALYSIS METHODOLOGY

This chapter describes the methodology for estimating total annualized costs of roads by functional class. The emphasis is on financial or economic aspects of the methodology. The procedures used to estimate the physical features of the road infrastructure and quantities of materials are described in Chapter 7. The procedures used to estimate unit costs of road infrastructure components and materials are described in Chapter 8. Finally, the computational model that provides annualized unit cost estimates is presented in Chapter 9.

Definitions

The total annualized costs are defined as the entire cost of providing and maintaining the road infrastructure, and were obtained as the sum of four types of costs:

1. Annualized cost of initial construction for the following three road infrastructure components including:
    - Pavements;
    - Bridges; and
    - All other infrastructure component (items that are not pavements or bridges).
2. Annualized cost of rehabilitation and maintenance activities for the three road infrastructure components including:
    - Pavements;
    - Bridges; and
    - All other infrastructure component.
3. Annualized cost of routine maintenance for all road infrastructure components combined; and
4. Annualized cost of winter maintenance for all road infrastructure components combined.

A schematic diagram showing the four types of costs is given Figure 2. Altogether the total annualized road cost consists of eight cost items:

- Annualised initial pavements construction costs.
- Annualised initial bridge construction costs.
- Annualised initial construction costs for all other component.
- Annualised pavement maintenance and rehabilitation costs.
- Annualised bridge maintenance and rehabilitation costs.
- Annualised maintenance and rehabilitation costs for all other component.
- Annualized routine maintenance costs for all infrastructure components.
- Annualized winter maintenance costs for all infrastructure components.

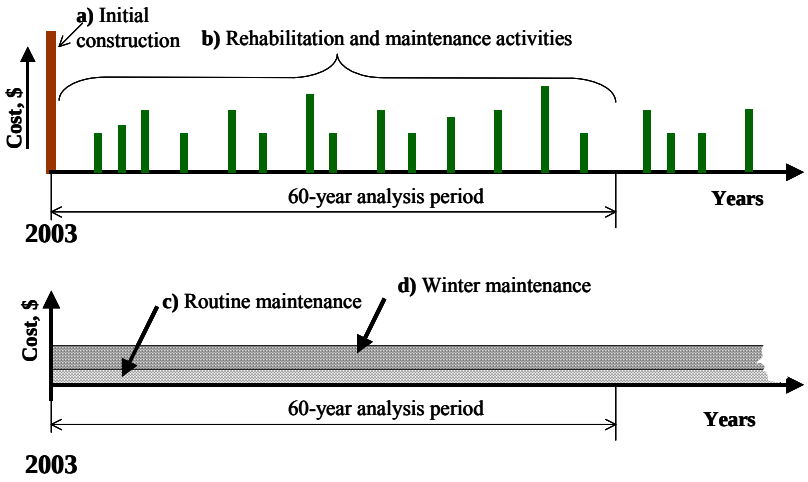


Figure 2. Cost Streams for the Calculation of Annualized Costs

Summary and Principles

Calculation of Annualized Cost

1. Annualized (and annual) costs were estimated in terms of the cost for one traffic lane that is one kilometre long. However, all underpinning estimates and calculations were carried out for one 2-lane equivalent kilometre.
2. Annualized costs were expressed as the Equivalent Uniform Annual Costs (EUAC). In other words, the present worth (PW) of costs was converted into annualized costs over the analysis period. The equations used for the calculation of PW and EUAC are given in the subsequent section of this chapter.
3. The basic analysis period was 60 years
4. The basic discount rate was 6 percent.
5. A sensitivity analysis was carried out to assess the impact of discount rate on total costs.

Initial Construction Costs

6. Initial construction costs were obtained as the sum of the initial construction costs for the three road infrastructure components (pavements, bridges, and all other infrastructure component).
7. Initial construction costs were calculated as a product of 2003 unit costs and 2003 unit quantities (quantities per 1-km-long single traffic lane).
8. Initial construction costs were annualized as outlined in Items 2 to 4.
9. The estimation of the initial construction costs for bridges and all other infrastructure component took into account the average age of infrastructure. The reasons for taking into account the age of road infrastructure and the methodology used are summarized in the next section.

Rehabilitation and Maintenance Costs

10. Rehabilitation and maintenance costs represent the cost of road infrastructure preservation actions that:
    - Significantly improve the condition of the road infrastructure components for at least one year; and
    - Occur during the analysis period.
11. Rehabilitation and maintenance costs were estimated and reported separately for the three road infrastructure components – pavements, bridges, and all other infrastructure component.
12. Rehabilitation and maintenance costs were calculated as a product of 2003 unit costs and 2003 unit quantities.
13. Rehabilitation and maintenance costs were annualized as outlined in Items 2 to 4.

Routine Maintenance Costs

14. Routine maintenance costs represent the cost of maintaining road infrastructure using activities that do not significantly improve the condition of the infrastructure.
15. Routine maintenance costs were estimated for all three road infrastructure components combined.
16. Routine maintenance costs were expressed in terms of 2003 costs.
17. The 2003 annual routine maintenance costs were assumed to occur in each year of the analysis period.
18. Routine maintenance costs were annualized as outlined in Items 2 to 4.

Winter Maintenance Costs

19. Winter maintenance costs represent the cost of snow removal, ice control, and other activities required to maintain roads operational during winter.
20. Winter maintenance costs were estimated for all three road infrastructure components combined.
21. Winter maintenance costs were expressed in terms of 2003/04 costs.
22. The 2003/04 annual winter maintenance costs were assumed to occur in each year of the analysis period.
23. Winter maintenance costs were annualized as outlined in Items 2 to 4.

Estimation of Unit Quantities

24. The estimation of unit quantities was done for one traffic lane that is one km long. For practical purposes, the initial estimation of quantities was done for a 2-lane road facility and the resulting quantities will be divided by two.
25. The estimation of quantities assumed the current (2003) road infrastructure conditions and design parameters. The examples of road infrastructure design parameters include the width of a traffic lane, the width of the paved shoulder (if any), or the slope of earth work in the cuts and fills. The road design parameters differ by jurisdiction (Level 2 in Figure 1, Chapter 3) and by the functional class of the roadway (Level 3).
26. The estimation of quantities for earth work (grading, excavating, and landscaping) assumed the existence of the original terrain features that have not been modified by any previous road construction.
27. The estimation of quantities for clearing and grubbing assumed typical 2003 conditions.

Estimation of Unit Costs

28. Unit construction costs were 2003 costs. These costs are most readily available from the transportation agencies, and were obtained through provincial and municipal surveys (Chapter 2).
29. For the pavement component and for the all other roadway infrastructure component, the initial construction costs and the rehabilitation and maintenance costs were increased by 25 percent to include administrative cost (such as cost of engineering, construction supervision and quality assurance, sundries and claims).
30. For bridges, the initial construction costs and the future rehabilitation and maintenance costs were increased by 35 percent to include administrative costs (the cost of engineering, construction supervision and quality assurance, sundries and claims) as well as the cost of building temporary bridges.
31. Routine maintenance costs and winter maintenance costs were increased by 10 percent to reflect administrative costs and in-house costs.

Interpretation of Total Annualized Costs

The total annualized costs include the cost of initial construction of road infrastructure that occurred in the past. The inclusion of the past initial construction costs means that the total annualized costs will not be comparable to the costs an agency may need in the future to preserve road infrastructure. Agencies budget for the future, not for the past. The total annualized costs estimated in this report represent the total theoretical expenditure of providing and maintaining road infrastructure for the users.

Calculation of Annualized Costs

Annualized Cost of Initial Construction

To convert initial construction costs to the equivalent uniform annual cost (EUAC), Equation 1 was used.

$$EUAC = \text{Initial Construction Cost}\frac{i(1+i)^n}{(1+i)^n - 1} \qquad \text{Equation 1}$$

Where:

Initial construction cost for pavements, bridges, or all other road infrastructure component, $

i = Discount rate (%/100). The basic computational model incorporates the discount rate equal to 0.06.

n = Number of years of the analysis period. The basic model has n equal to 60 years.

The initial EUAC costs were calculated separately for pavements, bridges, or all other road infrastructure component.

Annualized Cost of Rehabilitation and Maintenance Activities

To convert costs of rehabilitation and maintenance activities to their equivalent present costs, the present worth calculation of costs as defined in Equation 2 was used. To obtain annualized costs (EUAC), Equation 3 was used.

$$PW = \sum_{1}^{k} \text{Cost of Rehabilitation and Maintenance Activities}\frac{1}{(1+i)^n} \qquad \text{Equation 2}$$

$$EUAC = PW \frac{i(1+i)^n}{(1+i)^n - 1}$$ Equation 3

Where:

PW = Present worth value of rehabilitation and maintenance activities, $
Cost of Maintenance and Rehabilitation Activity k in year n, $
i = Discount rate (%/100). The basic model will incorporate 0.06 discount rate.
n = Number of years.
For PW, n is number of years between the base year and a future year.
For EUAC, n is the number of years for which EUAC is calculated.
For EUAC calculation, the basic model will use n equal to 60 years
k = Number of rehabilitation and maintenance activities during the analysis period.

EUAC of rehabilitation and maintenance activities were calculated separately for pavements, bridges, and all other road infrastructure component.

Annualized Cost of Routine Maintenance and Winter Maintenance

The annual costs of routine and winter maintenance activities were also annualized. The calculation of annualized costs was based on Equations 3 and 4. It was assumed that the 2003 routine (or 2003/04 winter) maintenance costs will occur in each year of the analysis period.

$$PW = \sum_{1}^{n} \text{Annual Cost in year } n \frac{1}{(1+i)^n}$$ Equation 4

Where:

Annual Cost = 2003 annual cost of routine maintenance (or 2003/04 annual cost of winter maintenance) in year n
i = Discount rate (%/100). The basic model incorporated 0.06discount rate.
n = The number of years between the base year and the year in which the annual cost occurred.

Age of Road Infrastructure and its Impact on Road Costs

The calculation of the EUAC for initial construction using by Equation 1 attributes all initial construction costs to the current 60-year period. However, some of the initial construction costs occurred more than 60 years ago and need not be included in the total annualised cost estimates[6]. This section describes how the initial construction costs were adjusted to exclude initial construction costs that occurred more 60 years ago. The adjustments are based on the average age of main road infrastructure components.

[6] The exclusion of some of the past initial construction costs was initiated by Transport Canada as part of its coordinating role of estimating infrastructure costs of all transportation modes using comparable methodology.

Age of Infrastructure

The average age of road infrastructure (for roads and bridges) was obtained as part of the Provincial Highway Inventory Surveys and the Municipal Surveys. The survey results obtained from the provincial surveys are given in Road Inventory Sheets in Appendix C. The results for both the provincial and municipal surveys are summarized in Table 20.

Table 17. Age of Infrastructure Obtained by Surveys

Region	Average Pavement Age, years				Average Bridge Age, years			
	Provincial		Municipal		Provincial		Municipal	
	Since Construction	Since Rehabiltation	Since Construction	Since Rehabiltation	Since Construction	Since Rehabilitation	Since Construction	Since Rehabiltation
NL								
PE			75	28				
NS		16	24	12	53			
NB			30	25				
QC		12.5	22		38.2	20		
ON	30.9	17.6	37	22	36	25	34	23
MB	45	25	75	35			32	32
SK	30	13	33	23	37		42	
AB	34	9.9			34	25	34	
BC								
TR	12	12	15	15	23	6.5	20	20
Average	**30.4**	**15.1**	**38.9**	**22.9**	**36.9**	**19.1**	**32.4**	**25.0**

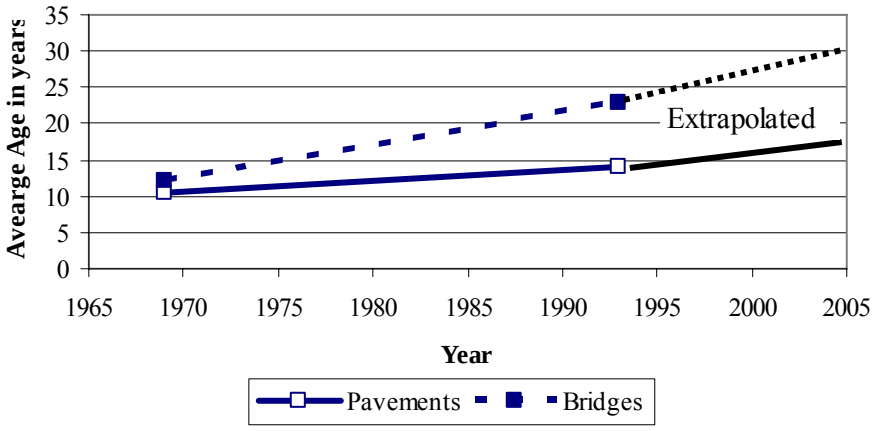
Origin of municipal data
PE City of Summerside
NS Regional Municipality of Halifax
NB City of Edmunston. The age is at least the stated age.
QC City of Ville de Longueuil
ON Average of cities of Brampton, Niagara Falls, Ottawa, and Toronto
MB City of Winnipeg
SK Average of cities of Regina and Saskatoon
AB City of Edmonton
TR City of Yellowknife, NT

The average pavement and bridge ages in Table 17 are given for two conditions: The average age since the time of construction and the average age since the time of rehabilitation. For pavements, the average age since the time of construction includes also reconstruction, and the average time since the time of rehabilitation includes also resurfacing. Survey data presented in Table 17 contain many gaps. Attempts to supplement survey data with published data were unsuccessful with the exception of data obtained from a 1996 publication by Transport Canada[7]. However this data, presented in Figure 3, is from 1993 and apparently does not distinguish between the age since the initial construction of the infrastructure and the age since its reconstruction or rehabilitation[8]. Nevertheless, the Transport Canada data is in general agreement with the survey data.

Based on the available data and using engineering judgement, the best estimate of the average age of the main components of Canadian road infrastructure is summarized in Table 21. The average age probably depends on the geographical region. In the absence of better information, the same set of average age data was used for all provinces. A different set of average age data was used for the combined territories.

[7] Richardson, Stephanie, Valuation of the Canadian Road and Highway System, Report TP 12794E, Transport Canada, June 1996.

[8] A recent report by Statistics Canada, *Age of Public Infrastructure Canada* by Valérie Gaudreault and Patric Lemeire, Statistics Canada -- No11-621-MIE2006035, contains a new set of age numbers. However, these are not "age numbers", but expected service lives numbers reported by survey respondents. There is no distinction in the report between the age of pavement since the last resurfacing and the age of the road itself.



Source: Transport Canada, Report TP 12794E, June 1996.

Figure 3. Average Age of Road Infrastructure

Table 18. Average Age of Infrastructure Used in the Model

Geographical Region	Average Age Since Construction, years					
	Pavements		Bridges		All Other Component	
	Provincial	Municipal	Provincial	Municipal	Provincial	Municipal
All Provinces[1)]	30	30	37	33	33	31
Combined Territories	23	23	23	23	23	23

[1)] Computational model accommodates different ages for all geographical regions.

The average provincial age since construction for the all other component, given in Table 18, was estimated to be the mid-point of the average age of pavements and bridges. The provincial average age since construction for bridges is higher than the corresponding municipal age. On the other hand, the raw data in Table 17 suggest that the average municipal age of pavements is higher than the corresponding provincial age. However, it is possible that average age of municipal pavements includes also residential streets, and that the results are unduly influenced by data from the City of Summerside and the City of Winnipeg (75 years in each city). For this reason, the average age of municipal pavements was assumed to be equal to that of the provincial pavements[9].

Accounting for the Age of Infrastructure

The age of infrastructure was used to adjust the initial construction costs that occurred over 60 years ago. For illustrative purposes, let us assume that the average age of roads is 30 years. Let us further assume that the 30-year average occurs because 50 percent of the roads are 60 years old and 50 percent of roads are new. If we included 100 percent of the initial construction costs in the total costs we would assumes that 100 percent of roads are new. Yet, returning to the above example, 50 percent of initial construction

[9] The removal of the two highest and the two lowest average municipal ages from Table 17 (75, 75, 15, 22) results in the average municipal pavement age since initial construction of 31 years.

costs occurred 60 years ago, and these initial costs that occurred 60 years ago are already fully depreciated and should not be included again in the current 60-year analysis period. The existing analysis period should include only the 50 percent of the initial construction costs.

The methodology used to adjust the initial construction costs (that are part of the total estimated annualized road cost) was established using the following considerations:

- Recognition of comments received from Transport Canada.
- Systematic utilization of the age of road infrastructure.
- Transparent and justifiable procedure.
- Compatibility with other cost estimation assumptions.
- Provision for changing the average age of main road infrastructure components by geographical regions.

Computational Methodology

The following methodology was used for the estimation of initial construction costs taking into account the age of road infrastructure.

1. The age of infrastructure was used for the estimation of two types of initial construction costs, namely:
    - Initial construction cost of bridges, and
    - Initial construction costs of all other component of road infrastructure.

    Initial pavement construction costs were not adjusted by age because pavement age seldom exceeds 60 years (the length of the analysis period).

2. Initial construction cost of bridges were calculated using Equation 5:

$$Initial\ construction\ cost\ of\ bridges = Initial\ construction\ cost\ of\ new\ bridges \times \left(1 - \frac{Average\ bridge\ age}{60}\right)$$

Equation 5

Where:

Initial construction cost of bridges = Annualized initial construction cost of bridges.

Initial construction cost of new bridges = Annualized initial construction cost of new bridges calculated using Eq.1. Eq. 1, assumes that bridges were built at the beginning of the analysis period and that their cost was annualized over the 60-year analysis period.

Average bridge age = Estimated average bridge age of bridges for a given geographical region (Table 18).

3. Initial construction cost of the all other road component was calculated using the following formula:

$$Initial\ construction\ cost, other = Initial\ construction\ cost; new\ other \times \left(1 - \frac{Average\ age\ of\ roads}{60}\right)$$

Equation 6

Where:

Initial construction cost, other = Annualized initial construction cost for the all other component (such as grading).

Initial construction cost, new other = Annualized initial construction cost of new all other component calculated using Eq. 1. Eq. 1 assumes that that all

other component was built at the beginning of the analysis period and that its cost was annualized over the 60-year analysis period.

Average age of roads = Estimated average bridge age of all other component for a given geographical region (Table 18).

The all other component was defined previously as all roadway items that are not bridges or pavements. The list of these roadway items is provided Chapter 6. The most expensive items are earthwork, grading, and drainage structures. Some of the additional items that are included in the all other component have shorter expected life-spans than 60 years. The inclusion of these additional items, and their use for adjusting the initial annualized construction costs by age, is compatible with other estimating assumptions.

Pavement Costs

Pavement costs were calculated as a product of the unit costs presented in Chapter 8 (e.g., cost for one tonne of asphalt concrete) and the unit quantities presented in Chapter 7 (e.g., the number of tonnes of asphalt concrete per one 2-lane equivalent km). Pavement costs were expressed in terms of the cost for a single traffic lane that is one kilometre long.

Initial Construction

The initial pavement construction cost were based on current (2003) pavement designs that are appropriate for the functional class of the road, anticipated traffic loads, and the environmental zone. Pavement designs, developed by ARA, were reviewed by the provincial and municipal agencies to ensure that they reflect current (2003) local practice. Unit costs were obtained through the provincial and municipal surveys.

An example of geometric design features -- for a provincial rural arterial pavement in southern Ontario -- is shown in Table 19. The geometric design features given in Table 19 are needed to establish the quantities of pavement and other materials for cost calculations. An example calculation of EUAC for the initial pavement construction (for a provincial rural arterial pavement in southern Ontario) is given in Table 20.

Table 19: Example of Geometric Design Features for a Provincial Rural Arterial Highway in Southern Ontario

Design feature	Dimension
Width of the two traffic lanes, m	7.50
Total width of both shoulders, m	6.00
Total width of both paved shoulders, m	1.00
Average AC thickness of the paved shoulders, mm	90

Rehabilitation and Maintenance

Pavement rehabilitation and maintenance activities were formulated to reflect present economic conditions and present (actual) level of service (pavement serviceability or pavement condition), and were submitted agency representatives for review. Calculation of EUAC of rehabilitation and maintenance activities for a provincial rural arterial highway in Southern Ontario is given in Table 21.

Table 20: Example Calculation of EUAC for Initial Pavement Construction. The Example is for a Pavement on a Provincial Rural Arterial Highway in Southern Ontario

Pavement layer	Description of pavement layer, Amount (Quantity)	Amount	Quantity per km	Price per unit of quantity	Cost
Surface	Hl-1, mm (t)	40	750	$ 68.75	$ 51,563
Binder	Medium Duty Binder, mm (t)	60	1125	$ 53.70	$ 60,413
Extra layer	Medium Duty Binder, mm (t)	60	1125	$ 53.70	$ 60,413
OGDL				$ -	$ -
Base	Granular A, mm (t)	150	6991	$ 13.01	$ 90,951
Subbase	Granular B, mm (t)	450	15206	$ 6.71	$ 102,031
Shoulder	HL-1, mm (t)	40	100	$ 68.75	$ 6,875
Shoulder	Medium Duty Binder, mm (t)	50	125	$ 53.70	$ 6,713
Subgrade	Subgrade improvement, % area (m^2)		500	$ 5.00	$ 2,500
Subdrains	Includes trenching and outlets, % of occurrence (m)	0		$ 18.00	$ -
Drainage	Closed drainage, % of occurrence (m)	5		$ -	$ -
Total					**$ 381,456**
EUAC					**$ 23,603**

Table 21: Example of Calculation of EUAC for Pavement Maintenance and Rehabilitation Activities. Example is for a Pavement on a Provincial Rural Arterial Highway in Southern Ontario

Pavement Preservation Action Plan

Years after initial construction	Description of pavement layer, Amount (Quantity)	Amount	Quantity per km	Price per unit of quantity	Cost	Net present worth
5	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 747
9	Spot repairs - mill and patch, % Area (m2)	10	750	$ 7.70	$ 5,775	$ 3,418
15	Mill AC, mm (t)	40	750	$ 11.00	$ 8,250	$ 3,442
15	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 21,515
15	Resurface with Medium Duty Binder, mm (t)	50	938	$ 53.70	$ 50,344	$ 21,007
19	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 331
19	Spot repairs - mill and patch, % Area (m2)	20	1500	$ 7.70	$ 11,550	$ 3,817
27	Mill AC, mm (t)	40	750	$ 11.00	$ 8,250	$ 1,711
27	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 10,692
27	Resurface with Medium Duty Binder, mm (t)	50	938	$ 53.70	$ 50,344	$ 10,440
31	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 164
35	Spot repairs - mill and patch, % Area (m2)	20	1500	$ 7.70	$ 11,550	$ 1,503
38	Mill AC, mm (t)	40	750	$ 11.00	$ 8,250	$ 901
38	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 5,633
38	Resurface with Medium Duty Binder, mm (t)	50	938	$ 53.70	$ 50,344	$ 5,499
42	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 87
42	Spot repairs - mill and patch, % Area (m2)	20	1500	$ 7.70	$ 11,550	$ 999
48	Mill AC, mm (t)	130	2438	$ 11.00	$ 26,813	$ 1,636
48	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 3,145
48	Resurface with Heavy Duty Binder, mm (t)	40	750	$ 53.91	$ 40,433	$ 2,466
48	Resurface with HL-8, mm (t)	50	938	$ 49.42	$ 46,331	$ 2,826
53	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 46
57	Spot repairs - mill and patch, % Area (m2)	10	750	$ 7.70	$ 5,775	$ 209
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
Total					**$ 546,808**	**$ 102,234**

Bridge Costs

Bridge costs were estimated in terms of a cost per one meter squared of the bridge deck area. Bridge costs were estimated as a product of 2003 unit costs presented in Chapter 8 (i.e., cost per one square metre of the bridge deck area) and 2003 unit quantities presented in Chapter 7 (i.e., number of square metres of a bridge deck area per one two-lane equivalent km).

Initial Construction

Initial construction costs for bridges were estimated using the procedure shown in Table 22. To obtain initial construction costs per two-lane equivalent km, quantities of bridge deck area per one 2-lane equivalent km were multiplied by the unit costs of the bridge deck area per metre squared.

Table 22: Schema for Estimation of EUAC for Initial Bridge Construction

Provincial functional highway class (rural)	Bridge deck area		Initial construction costs		
	Total	Per 2-lane equivalent km	Unit cost per m^2 of bridge deck	Per 2-lane equivalent km	EUAC cost for 2-lane equivalent km
1	*2*	*3*	*4*	*5*	*6*
Freeways					
Arterial					
Collector					
Local					

Notes:
Column 1: Similar calculations will be completed for other road classes (e.g., municipal and urban)
Column 5: Product of Columns 3 and 4
Column 6: Annualized cost of the cost in Column 5 calculated using Equation 1.

The annualized initial construction costs for bridges were adjusted using Equation 5 to take into account the average age of bridges in a given geographical region.

Rehabilitation and Maintenance

The cost of rehabilitation and maintenance activities for bridges were estimated as the function of typical cost of a bridge rehabilitation treatment (in dollars per square metre of the bridge deck area) and the frequency a typical rehabilitation and maintenance treatment is applied. The calculation procedure used to estimate EUAC costs of rehabilitation and maintenance activities for bridges is outlined in Major Highway Structures

The bridge costs (cost of initial construction and costs of rehabilitation and maintenance activities) can be supplemented by costs of major highway structures. Major structures were defined to include bridges longer than 200 m (provided that these bridges are not already included in the overall bridge data), tunnels longer than 80 m, retaining walls with the exposed surface area greater than 400 m2, and snow sheds longer than 80 m. The cost of major structures was added to the bridge costs by increasing the overall bridge deck area.

Table 23.

Major Highway Structures

The bridge costs (cost of initial construction and costs of rehabilitation and maintenance activities) can be supplemented by costs of major highway structures. Major structures were defined to include bridges longer than 200 m (provided that these bridges are not already included in the overall bridge data), tunnels longer than 80 m, retaining walls with the exposed surface area greater than 400 m^2, and snow sheds longer than 80 m. The cost of major structures was added to the bridge costs by increasing the overall bridge deck area.

Table 23: Schema for the EUAC for Bridge Maintenance and Rehabilitation (M&R) Activities

Provincial functional highway class	Unit cost for a typical R&M activity (per m^2 of bridge deck area)	Estimated typical frequency between R&M activities (years)	Present value of R&M activities (per m^2 of bridge deck area)	Bridge deck area for 2-lane equivalent km	Present value of R&M cost for 2-lane equivalent km	EUAC ($ per 2-lane equivalent km)
1	*2*	*3*	*4*	*5*	*6*	*7*
Freeway						
Arterial						
Collector						
Local						

Notes
Columns 2 and 3: Data obtained through Provincial Cost Inventory Survey or through Municipal Survey
Column 4: Calculated using Equation 2
Column 6: Product of Columns 4 and 5.
Column 7: Annualized cost calculated using Equations 3.

The process involves (a) converting the area of a major highway structures into an equivalent number of square metres of bridge deck area (considering the size of the major structure and cost of the major structure) and (b) including the converted area into the bridge deck area. For example, a 400 m long 2-lane roadway tunnel is 10 m wide, and its construction cost per metre square of the floor area is twice the typical construction cost per metre square of the bridge deck area. In this case, to include the cost of the tunnel as part of the overall bridge deck area, the total bridge deck area is increased by 8,000 square metres (the floor area of the tunnel – 4,000 square metres -- multiplied by two). This procedure is further discussed in Chapter 7.

All Other Road Infrastructure Component

The *all other road infrastructure component* consists of hundreds of individual items. It was not practical to estimate unit costs and quantities for all these individual items. For this reason, the individual items were grouped into main components that were characterized by a set of characteristic items. The characteristic items represent major contract items and were used to account for the cost of all road infrastructure components. The main components and their characteristic items are listed in Table 24.

In addition to the characteristic items, there are many additional supplementary items that influence the cost of the main components. The supplementary items are typically relatively inexpensive or occur infrequently. Some of these supplementary items are listed in Table 24 Column 4. The cost of supplementary items was estimated as a percentage of the total cost of the main components and is given in Table 20, Column 5.

The estimation of costs for the *all other road infrastructure component* using characteristic items is compatible with financial data available from transportation agencies. Typically, transportation agencies can only provide reliable unit costs for characteristic items[10]. In addition to the difficulties of obtaining unit costs for small or infrequently used items (i.e., the additional supplementary items), it is also impractical to estimate quantities for these items.

[10] The procedure is also compatible with cost estimates used by HERS [11]

The annualized initial construction costs for the all other component were adjusted using Equation 6 to take into account the average age of roads in a given geographical region.

Example

An example use of the characteristic items to estimate costs for *all other infrastructure component* is provided for the main component called *traffic control* (last row in Table 24). There are many individual items that constitute the cost of the traffic control component – painting of traffic control lines, traffic and directional signs, shoulder markers, and traffic lights. However, the cost of the traffic control component is accounted for by only one characteristic item called *Painting of traffic control lines.* Painting of traffic control lines is part of the permanent pavement marking, and typically represents the predominant (most frequently occurring and costliest) element of the main component called *traffic control*. To account for the presence of many other items that are part of the traffic control component (e.g., those listed in Table 6 as supplementary items), the cost of *Painting of traffic control lines* was increased by 30 percent.

Table 24. Description of Characteristics Item for All Other Infrastructure Component

Main component	Characteristic items		Supplementary items	
	Description	**Unit**	**Description**	**Allowance, %**
1	*2*	*3*	*4*	*5*
Clearing of vegetation	Clearing and grubbing	m^2	Clearing of brush and trees, removal of top soil.	20
Grading; earth work	Earth excavation or fill	m^3	Rock face work and rock face protection, earth fill or rock fill required, grading of subgrade and subgrade compaction, removal of boulders underneath subgrade	10
	Percent of rock excavation/fill	%		
Landscaping	Sodding and top soil	m^2	Staked and unstaked sodding, water for sod, seeding + mulching + top soil, silt fence barriers, rest areas, flow checks	15
	Top soil	m^3		
Drainage of the right-of-way	Curb and gutter (PCC, straight)*	m	Culverts of larger diameter or size, excavation, bedding and granular back fill for culverts, inspection openings, catch basins, rip-rap on spillways, sedimentation ponds, etc.	25
	500 mm pipe culvert + end sections	m		
	1500 mm wide box culvert	m		
	Storm water sewers	m		
Guard rail and safety appurtenances	Concrete median	m	Anchor blocks for barriers, rumble strips, energy attenuators, truck run-away beds, warning signs	10
	Steel guardrail at shoulder	m		
	3-cable guide rail at shoulder	m		
Fencing and gates	Chain link fence	m	Farming and walk gates, anti-glare screens, privacy fences, and noise barriers and berms.	10
	Wire fence	m		
Lighting; electrical work	High mast	piece	Concrete foundation for poles, luminaries, wiring (power, lighting, ground), rigid ducts or conduits, power supply points and substations, etc.	50
	Standard	piece		
Traffic control	Painting of traffic control lines	km	Traffic control devises (erected or painted signs, traffic lights, truck inspection stations, directional and message signs, etc	30

* Included in pavement costs

Initial Construction

The cost of initial construction for the all other road infrastructure component was estimated using the schema shown in Table 25. The unit costs in Table 25 (Column 4) were estimated through provincial and municipal surveys and are presented in Chapter 8.

The quantities in Table 25 (Column 5) were estimated using contract documents for new road construction or reconstruction as discussed in Chapter 7.

Rehabilitation and Maintenance

The cost of rehabilitation and maintenance activities for the all other road infrastructure component was estimated using the procedure schematically shown in Table 26.

Table 26 lists only the characteristic items that have expected life-span of less than the length of the analyses period (60 years), and will need to be replaced during the analysis period. The cost of replacing these items was used as a proxy for the estimation of costs of maintenance and rehabilitation activities for all items in the all other road infrastructure component. Present worth was calculated using Equitation 2 and EUAC (last row in Table 26) was calculated using Equitation 3.

Table 25: Example of Estimation of Costs for Initial Construction for the All Other Component

Main component	Characteristic items	Unit	Unit cost	Per two-lane equivalent km	
				Quantity	Cost
1	*2*	*3*	*4*	*5*	*6 = 4 x 5*
Clearing of vegetation	Clearing and grubbing	m^2			
Grading; earth work	Earth excavation or fill	m^3			
	Percent of rock excavation or fill	%			
Landscaping	Sodding and top soil	m^2			
	Top soil	m^3			
Drainage of the right-of-way	Curb and gutter (PCC, straight)	m			
	500 mm pipe culvert + end sections	m			
	1500 mm wide box culvert	m			
	Storm water sewers	m			
Guard rail and safety appurtenances	Concrete median	m			
	Steel guardrail at shoulder	m			
	3-cable guide rail at shoulder	m			
Fencing and gates	Chain link fence	m			
	Wire fence	m			
Lighting	High mast	piece			
	Standard	piece			
Traffic control	Painting of traffic control lines	km			

Routine and Winter Maintenance

The cost of routine and winter maintenance was based on provincial and municipal surveys and expressed in terms of annual costs per single one-km long traffic lane. Routine and winter maintenance costs were segregated by the geographical location, jurisdiction, and the functional road class (Figure 1).

Annualized costs of routine and winter maintenance were calculated using Equations 3 and 4. Routine and winter maintenance costs are discussed in Chapter 8.

Table 26: Schema for the Estimation of EUAC for Rehabilitation and Maintenance Activities for the All Other Component

Main parts	Characteristic item	Unit	Unit cost	Per one, one km-long traffic lane		
				Life-span, years	Quantity	Cost
1	*2*	*3*	*4*	*5*	*6*	*7 = 4 x 6*
Drainage of the right-of-way	Curb and gutter (PCC, straight)	m				
	500 mm pipe culvert + end sections	m				
Guard rail and safety appurtenances	Concrete median	m				
	Steel guardrail at shoulder	m				
	3-cable guide rail at shoulder	m				
Fencing, Gates	Chain link fence	m				
	Wire fence	m				
Lighting; electrical work	High mast	piece				
	Standard	piece				
Present Worth (PW) of rehabilitation and maintenance activities (replaced characteristic items)						
EUAC of rehabilitation and maintenance activities						

Notes:
Column 4: Based on provincial and municipal cost surveys.
Column 5: The number in Column 5 represents year n in Equation 2.
Column 6: Same as Column 5 in Table 25.

7. PHYSICAL FEATURES OF ROAD INFRASTRUCTURE

This chapter describes procedures that were used to estimate the size of physical features and quantities of the road infrastructure and the results achieved. The estimates were based on the provincial and municipal surveys (described in Chapter 2), the examination of contract documents, and on engineering judgement[11]. The estimates of quantities of road infrastructure were made for the following components:

- Roadway and pavements;
- Bridges; and
- All other road infrastructure component.

Quantities of road infrastructure depend on the geographical location, jurisdiction, road functional class, and alignment (rural versus urban). This necessitated the estimation of over 1,000 different quantities. Only example results of quantities, obtained through surveys or estimated (when survey data were unavailable), are presented herein. The rest of the data are given in Appendix D.

Roadways and Pavements

The key step in the estimation of physical features of road infrastructure was the development of Road Construction Sheets. An example of a Road Construction Sheet is presented in Table 27 for a provincial rural arterial road in Southern Ontario. A Road Construction Sheet has three sections:

- *Road Geometric Design* – Pavement and shoulder widths, the width of the paved shoulders, and the thickness of the paved shoulder;
- *Initial Pavement Structure* – Detailed description of the initial pavement structure; and
- *Pavement Preservation Action Plan* – Description of pavement maintenance and rehabilitation treatments during the 60-year analyses period.

Road Construction Sheets were prepared for all road segments for which annualized costs were estimated. As discussed at the end of Chapter 3, annualized unit costs were estimated even for road categories that may not exist or may exist in very small quantities. This necessitated the development of Road Construction Sheets for the full combination of geographical regions, jurisdictions (provincial or municipal), road alignment (rural or urban) and road functional class.

Consequently, considering the 14 geographical locations, 8 types of provincial roads, and 6 types of municipal roads, 196 Road Construction Sheets were developed. All Road Construction Sheets are

[11] Note on Engineering Judgement

Engineering judgement was used throughout this study to estimate values of many input variables for the computational model. The engineering judgement refers to the process of estimating values by interpolating and extrapolating survey data using engineering experience, the experience acquired by professional engineers working for many years in the area of highway transportation. To harness engineering judgement, all input data that may have been initially estimated by a single individual, for example a Regional Representative, were systematically reviewed by the project team consisting of at least the following three individuals, Mr. D. Hein, Dr. J. Hajek, and Mr. D.J. Swan. As the final check, all estimates were reviewed by the Regional Representatives. The role of Regional Representatives is described in Chapter 2.

Table 27. Example of Road Construction Sheet for Provincial Rural Arterial Roads in Southern Ontario

Region: **Ontario, South**
Category: **Provincial Rural Arterial**
All quantities and costs are for one km of 2-lane highway

Geometric Design

Design feature	Dimension
Width of the two traffic lanes, m	7.50
Total width of both shoulders, m	6.00
Total width of both paved shoulders, m	1.00
Average AC thickness of the paved shoulders, mm	90

Initial Pavement Structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Amount	Quantity per km	Price per unit of quantity	Cost
Surface	Hl-1, mm (t)	40	750	$ 68.75	$ 51,563
Binder	Medium Duty Binder, mm (t)	60	1125	$ 53.70	$ 60,413
Extra layer	Medium Duty Binder, mm (t)	60	1125	$ 53.70	$ 60,413
OGDL				$ -	$ -
Base	Granular A, mm (t)	150	6991	$ 13.01	$ 90,951
Subbase	Granular B, mm (t)	450	15206	$ 6.71	$ 102,031
Shoulder	HL-1, mm (t)	40	100	$ 68.75	$ 6,875
Shoulder	Medium Duty Binder, mm (t)	50	125	$ 53.70	$ 6,713
Subgrade	Subgrade improvement, % area (m^2)		500	$ 5.00	$ 2,500
Subdrains	Includes trenching and outlets, % of occurrence (m)	0		$ 18.00	$ -
Drainage	Closed drainage, % of occurrence (m)	5		$ -	$ -
Total					**$ 381,456**

Pavement Preservation Action Plan

Years after initial construction	Description of pavement layer, Amount (Quantity)	Amount	Quantity per km	Price per unit of quantity	Cost	Net present worth
5	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 747
9	Spot repairs - mill and patch, % Area (m2)	10	750	$ 7.70	$ 5,775	$ 3,418
15	Mill AC, mm (t)	40	750	$ 11.00	$ 8,250	$ 3,442
15	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 21,515
15	Resurface with Medium Duty Binder, mm (t)	50	938	$ 53.70	$ 50,344	$ 21,007
19	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 331
19	Spot repairs - mill and patch, % Area (m2)	20	1500	$ 7.70	$ 11,550	$ 3,817
27	Mill AC, mm (t)	40	750	$ 11.00	$ 8,250	$ 1,711
27	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 10,692
27	Resurface with Medium Duty Binder, mm (t)	50	938	$ 53.70	$ 50,344	$ 10,440
31	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 164
35	Spot repairs - mill and patch, % Area (m2)	20	1500	$ 7.70	$ 11,550	$ 1,503
38	Mill AC, mm (t)	40	750	$ 11.00	$ 8,250	$ 901
38	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 5,633
38	Resurface with Medium Duty Binder, mm (t)	50	938	$ 53.70	$ 50,344	$ 5,499
42	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 87
42	Spot repairs - mill and patch, % Area (m2)	20	1500	$ 7.70	$ 11,550	$ 999
48	Mill AC, mm (t)	130	2438	$ 11.00	$ 26,813	$ 1,636
48	Resurface with HL-1, mm (t)	40	750	$ 68.75	$ 51,563	$ 3,145
48	Resurface with Heavy Duty Binder, mm (t)	40	750	$ 53.91	$ 40,433	$ 2,466
48	Resurface with HL-8, mm (t)	50	938	$ 49.42	$ 46,331	$ 2,826
53	Rout and seal, m (m)		500	$ 2.00	$ 1,000	$ 46
57	Spot repairs - mill and patch, % Area (m2)	10	750	$ 7.70	$ 5,775	$ 209
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
				$ -	$ -	$ -
Total					**$ 546,808**	**$ 102,234**

presented in the Addendum. The following Road Construction Sheets were prepared for each geographical location:

Provincial rural freeway
Provincial rural arterial road
Provincial rural collector road
Provincial rural local road

Provincial urban freeway
Provincial urban arterial road
Provincial urban collector road
Provincial urban local road

Municipal rural arterial road
Municipal rural collector road
Municipal rural local road

Municipal urban arterial road
Municipal urban collector road
Municipal urban local road

Roadway Inventory Sheets were initially developed by the project team, mainly by the regional representatives. Subsequently, Roadway Inventory Sheets were then sent to the provincial and municipal agencies for review and modifications. After implementing the changes suggested by the agencies, the project team reviewed all Roadway Inventory Sheets for consistency. Roadway Inventory Sheets reflect the existing practice of design, construction, and maintenance of road infrastructure.

Table 28 shows which Road Construction Sheets were reviewed by provincial and municipal agencies.

Table 28. Number of Road Construction Sheets

Jurisdiction	Number of Road Construction Sheets	Reviewed by Provincial Agency	Reviewed by Municipal Agency
NF	14	Yes	No
PE	14	No	No
NS	14	Yes	Yes
NB	14	Yes	Yes
QC-1	14	Yes	Yes
OC-2	14	Yes	No
ON-1	14	Yes	Yes
ON-2	14	Yes	Yes
MB	14	Yes	Yes
SK	14	Yes	Yes
AB	14	Yes	Yes
BC-1	14	No	No
BC-2	14	No	No
TR	14	Some	Some
Total	196		

Bridges

The bridge quantities were measured in terms of the bridge deck area in square metres. In order to obtain bridge costs associated with one 2-lane equivalent km of road, the amount of bridge area was expressed in terms of the number of square metres of bridge deck area per 2-lane equivalent km. Table 29 provides a summary of bridge quantities based on provincial and municipal surveys. The number of square metres of bridge deck area, per one 2-lane equivalent km, ranges from 10 to 300.

Typically, bridge survey data received from provincial and municipal agencies were in terms of the total number of bridges and the average bridge deck size. For example, Ontario Ministry of Transportation reported that there are 2,646 bridges with the average bridge deck size of 1,000 m^2. (The distribution of bridges into the different road categories was not typically available.) Consequently, the total amount of the bridge deck area for provincial bridges in Ontario was 2,646,000 m^2. This total bridge deck area was distributed using engineering judgement and reported in Table 29.

The distribution of the total bridge deck area was carried out using an estimation process illustrated using Ontario data and summarized in Table 30.

The total number of provincial highways in Ontario (19,586 2-lane equivalent km) was divided into five major road categories (Column 1 in Table 30). The desired distribution of the bridge deck area (Column 4) was established for each major road class using engineering judgement and survey data obtained from jurisdictions that have reported distribution of bridges by road class. For example, considering that all the lengths of all major road categories are equal, 29 percent of all bridges were assigned to urban freeways and 25 percent to rural freeways. Thus, it was expected that the spacing of interchanges on urban freeways is shorter than on rural freeways. The lowest percentage (8 %) was assigned to local roads because they do not have interchanges and generally follow the existing terrain. The desired distribution was adjusted by the actual length of the major road categories (Column 5 is the product of Columns 3 and 4). The resulting distribution of the total bridge deck area (2,646,000 m^2) was distributed using the percentage given in Column 6. The bridge deck area per one 2-lane equivalent km was obtained by dividing Column 8 with Column 1.

Major Highway Structures

The procedure to account for the additional cost of major structures (large bridges, retaining walls, snow sheds and tunnels) was introduced in Chapter 6. The procedure converts the major structures into an equivalent bridge deck area. For example, this procedure has been used to account for the cost of two roadway tunnels in Ontario. The addition of the two tunnels changed the total amount of the total bridge deck area by less than 3 percent as outlined in the following example for Ontario.

Ontario provincial bridge deck area in m^2 per one 2-lane equivalent km was further adjusted to include the contribution (cost) of major structures. The procedure is illustrated Table 31

Column 2 in Table 31 corresponds to Column 8 in Table 30. Ontario reported the presence of only two major structures (tunnels) that are listed in Column 3 (Table 31). Long bridges were included in the bridge averages and are not included in Table 31. Floor area of the tunnels (Column 4) was multiplied by 2.53 because MTO estimated that it costs 2.53 times more to build one square metre of a tunnel floor than to build one square metre of a bridge deck (Column 5). The comparison of the adjusted bridge deck area per km (Table 31, Column 8) with the unadjusted bridge deck area per km (Table 30, Column 9) indicates that the addition of the major structures has only a marginal influence.

The rates of the bridge deck area per one 2-lane equivalent km given in Table 31, Column 7 are also given in Table 29 as quantities based on surveys.

Considering the uncertainties associated with estimating the bridge deck area and bridge unit costs, ARA did not adjust the estimated bridge deck area for the presence of major structures for other provinces. Most of the data presented in Table 32 are estimated data because data was not received for bridges from several provinces and those that were received were typically combined data for all road classes. The adjustment of these estimated numbers for the presence of major structures would be misleading because it would imply a level of detail and thus a degree of precision that is not warranted.

Table 29. Quantities of Bridge Deck Area per One 2-Lane Equivalent km Based on Surveys, m^2

Survey Results

Quantity of bridge deck (m^2-lane km)		NL						NS					
		Rural		Urban		Total		Rural		Urban		Total	
		Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total
Provincial	Freeway	0.00	0%	0.00	0%			354.81	38%	354.81	38%		
	Arterial	49.22	40%	49.22	40%			277.11	30%	277.11	30%		
	Collector	7.07	11%	7.07	11%			215.41	23%	215.41	23%		
	Local	33.39	49%	33.39	49%			92.03	10%	92.03	10%		
Provincial average													
Municipal	Arterial												
	Collector												
	Local												
Municipal average													
Provincial & municipal average													

Quantity of bridge deck (m^2-lane km)		QC-1						QC-2					
		Rural		Urban		Total		Rural		Urban		Total	
		Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total
Provincial	Freeway	412.57	47%	412.57	47%			412.57	47%	412.57	47%		
	Arterial	104.99	23%	104.99	23%			104.99	23%	104.99	23%		
	Collector	52.70	16%	52.70	16%			52.70	16%	52.70	16%		
	Local	4254.10	13%	4254.10	13%			4254.10	13%	4254.10	13%		
Provincial average													
Municipal	Arterial												
	Collector												
	Local												
Municipal average													
Provincial & municipal average													

Quantity of bridge deck (m^2-lane km)		ON-1						ON-2					
		Rural		Urban		Total		Rural		Urban		Total	
		Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total
Provincial	Freeway	181.16	17%	210.14	21%			181.16	17%				
	Arterial	145.79	42%		40%			145.79	42%				
	Collector	133.90	31%	133.90	30%			133.90	31%				
	Local	57.97	10%		10%			57.97	10%				
Provincial average													
Municipal	Arterial												
	Collector												
	Local												
Municipal average													
Provincial & municipal average													

Quantity of bridge deck (m^2-lane km)		MB						SK					
		Rural		Urban		Total		Rural		Urban		Total	
		Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total	Area	% of Total
Provincial	Freeway	92.06	16%	92.06	16%			49.08	32%	49.08		49.08	32%
	Arterial	144.28	49%	144.28	49%			18.17	24%	18.17		18.17	24%
	Collector	81.27	33%	81.27	33%			14.04	29%			14.04	29%
	Local	2.26	2%	2.26	2%			2.53	16%			2.53	16%
Provincial average													
Municipal	Arterial											10.75	9%
	Collector											12.77	13%
	Local											5.90	58%
Municipal average													
Provincial & municipal average													

Quantity of bridge deck (m^2/2-lane km)		AB					
		Rural		Urban		Total	
		Area	% of Total	Area	% of Total	Area	% of Total
Provincial	Freeway			42.29		42.29	0.01
	Arterial	32.27				32.27	0.53
	Collector	25.59				25.59	0.39
	Local	11.13				11.13	0.07
Provincial average							
Municipal	Arterial						
	Collector						
	Local						
Municipal average							
Provincial & municipal average							

Table 30. Example of Distribution of the Total Bridge Deck Area into Road Classes

Major road category	Road length[1)], km	Road length, %	Desired distribution of the bridge deck area, %	Desired distribution adjusted by road length	Desired distribution adjusted by road length, %	Resulting distribution of bridge deck area, m^2	Bridge deck area per one 2 –lane equivalent km
1	*2*	*3*	*4*	*5*	*6*	*8*	*9*
Freeway Urban	2,257	12%	29	334.2	17.9	474,289	210.14
Freeway Rural	2,047	10%	25	261.3	14.0	370,827	181.16
Arterial, total	6,265	32%	20	639.7	34.3	907,956	144.93
Collector, total	5,109	26%	18	469.5	25.2	666,380	130.43
Local, total	3,908	20%	8	159.6	8.6	226,547	57.97
Total	19,586	100%	100	1,864.4	100	2,646,000	

1) 2-lane equivalent km

Table 31. Example Adjustment of the Bridge Deck Area for the Presence of Major Structures

Major road category	Resulting distribution of bridge deck area, m^2	Major Structures, length in m	Floor area of tunnels, m^2	Cost-adjusted floor area, m^2	Total adjusted bridge deck area, m^2	Adjusted bridge deck area per 2 – lane equivalent km
1	*2*	*3*	*4*	*5*	*6*	*7*
Freeway Urban	474,289				474,289	210.14
Freeway Rural	370,827				370,827	181.16
Arterial, total	907,956	Tunnel, 213	2,130	5,389	913,345	145.79
Collector, total	666,380	Tunnel, 700	7,000	17,710	684,090	133.90
Local, total	226,547				226,547	57.97
Total	**2,646,000**				**2,669,099**	

Estimated Bridge Quantities

Data given in Table 29, together with engineering judgement, were used to estimate bridge deck quantities for provincial roads given in Table 32. A similar table of quantities was also developed for municipal roads. A comparison of data presented in Table 29 and Table 32 indicates that data in Table 32 are smoothed-out by considering the distribution of bridge quantities across all jurisdictions.

All Other Road Infrastructure Component

The quantities for all other infrastructure component were estimated using contract documents (for new road construction or reconstruction) and engineering judgement.

As an example, Table 34 and Table 35 provide data on contract documents that were examined to obtain information on typical quantities of road infrastructure items in Ontario. Contract documents typically list quantities for characteristic items.

Table 33 shows an example of estimated quantities for the All Other Road Infrastructure Component used in the computational model. The example is for only one of the major characteristic items (listed in Table 24) – clearing and grubbing, and only for provincial roads. Similar estimates were carried out for all characteristic items and both for provincial and municipal roads. Additional data on the physical features and quantities of road infrastructure are given in Appendix D.

Table 32. Example of Estimated Bridge Quantities, m^2 of Bridge Deck Area per 2-lane Equivalent km.

Description and type of work item	Region	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Area of bridge deck (m^2/2-Lane km)	NL	0	49	7	33	0	49	7	33	25	4	5	25	4	10
	PE	49	18	14	3	49	18	0	0	9	7	5	9	10	10
	NS	177	139	108	46	177	139	108	46	69	54	5	69	54	10
	NB	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	QC-1	200	100	60	90	250	110	60	90	50	30	5	55	30	10
	QC-2	160	80	48	72	200	88	48	72	40	24	5	44	24	10
	ON-1	100	90	80	50	120	90	100	35	45	40	5	45	50	10
	ON-2	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	MB	92	144	81	2	92	144	81	2	72	41	5	72	41	10
	SK	49	18	14	3	49	18	0	0	9	7	5	9	10	10
	AB	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	BC-1	100	90	80	50	120	90	100	35	45	40	5	45	50	10
	BC-2	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	TR	49	18	14	3	49	18	0	0	9	7	5	9	10	10

Table 33. Estimated Quantities (partial table) for Clearing and Grubbing for Provincial Roads

Description and type of work item	Region	Provincial							
		Rural				Urban			
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local
Clearing and grubbing (m^2)	NL	4500	6000	6750	7200	1875	2700	4050	5100
	PE	1500	2000	2250	2400	625	900	1350	1700
	NS	4500	6000	6750	7200	1875	2700	4050	5100
	NB	3000	4000	4500	4800	1250	1800	2700	3400
	QC-1	3000	4000	4500	4800	1250	1800	2700	3400
	QC-2	4500	6000	6750	7200	1875	2700	4050	5100
	ON-1	3000	4000	4500	4800	1250	1800	2700	3400
	ON-2	4500	6000	6750	7200	1875	2700	4050	5100
	MB	1500	2000	2250	2400	625	900	1350	1700
	SK	1500	2000	2250	2400	625	900	1350	1700
	AB	1500	2000	2250	2400	625	900	1350	1700
	BC-1	3000	4000	4500	4800	1250	1800	2700	3400
	BC-2	6000	8000	9000	9600	2500	3600	5400	6800
	TR	4500	6000	6750	7200	1875	2700	4050	5100

Table 34. List of Contract Documents Used to Verify Material Quantities in Ontario

No	Contract Documents No.	Type of Construction	Hwy. No	Road Class	South or North	Prov. or Mun.	Rural or Urban	Contract Length, km	No. of lanes	Pavement Width, m	Shoulder Width, m	Paved Shoulder width, m
1	95-212	Reconstruction	520	L	S	M	R	11.6	2	6.50	1.0	0
2	95-213	Reconstruction	17	A	N	P	R	19.8	2	7.50	5.5	5.5
3	82-51	New construction	427	F	S	P	U	1.40	4	7.20	5.0	5.0
4	2002-4003	Partial reconstruction	41	C	S	P	R	12.0	2	7.00	4.0	1.0
5	96-240	Partial reconstruction	16.5	A	S	P	R	16.5	2	7.50	4.8	1.0
6	95-203	Partial reconstruction	11	A	S	P	R	14.4	2	7.5	6.0	1.0
7	77-133	6 to 8 lane widening	401	F	S	P	R	7.8	10	7.3	2.9	2.9
7	77-133	6 to 8 lane widening	401	F	S	P	U	2.6	10	6.8	2.4	2.4
8	2000-0035	Rehabilitation	401	F	S	P	U	1.2	14	6.8	2.3	2.3
9	2002-2021	Rehabilitation	401	F	S	P	U	8.1	15	7.5	1.5	1.5
10	2003-5114	New construction	101	C	N	P	R	1.4	2	7.5	6.0	1.0
11	85-64	Widening + Rehabilitation	407	F	S	P	U	2.7	8	7.0	2.1	2.1
12	2003-4027	Widening + Rehabilitation	407	F	S	P	R	17.0	4	7.5	4.0	4.0
13	96-240*	Widening + Rehabilitation	11	A	N	P	R	16.5	2	7.5	5.8	1.0
14	83-27	New construction	427	F	S	P	R	3.0	6	7.3	1.4	1.2
15	83-04	Widening	11	A	S	P	R	7.8	4	7.0		
16	84-66	Widening	3	C	S	P	R	1.2	2	7.5	5.0	1.0
17	84-07	Widening	12	C	S	P	R	6.9	2	7.5	6.0	1.0
18	80-86	Widening	62	L	S	P	R	0.9	2	6.5	3.0	0.0

* Material quantities are not included in the contract document

Table 35. Estimation of Material Quantities Based on Ontario Contract Documents

Work Item (supply and install)			South													North		
Functional Class			F						A			C		L		A		C
Rural or Urban			U	R	U	U	R	R	R	R	R	R	R	R	R	R	R	R
Contract No*			3	14	11	9	7	12	5	6	15	4	16	17	1	18	2	13	10
Clearing and grubbing, 1000's		m^2	5.2	0							4.7		4.4			3.3			1.4
Grading	Earth excavation, 1000's	m^3	45	58.5						30			17.0			9.7			55
	Rock excavation, % of earth	m^3	0	0							36		0	0		53			
	Fill required	m^3	43	56.7												9.4			33.4
Land-scaping	Sodding and top soil, 1000's	m^2	23.8	20.2									2.1						18.9
	Top soil, 1000's	m^3	2.0	1.4									1.1			0.5			0.95
Drainage	Subdrains		380	498	500			0	137	286				82	46	32	43		41
	PCC Curb and gutter	m	802	46	750	1333	400	28	30	180	48		220	423	31	51			47
	500 mm pipe culvert + end sections	m	17	8	0	0	0	3.4	20+	49+	63		266		27	401	29	12 2	130
	1500 mm wide box culvert	m	42			10	25	60										25	
	Storm water sewers	m	435	351	750	1000	200			123	11.8		20	17	10				
Guard rail	Concrete median	m		83	659	333	250												
	Steel guardrail	m	287	166	0	0	0	0	80	25	104	1037	127	209	27	137			780
	3-cable guide rail at shoulder	m	0	0					438	162	185		585		178				
Fencing, Gates	Chain link fence	m	863	90	250														
	Wire fence	m	118	300							397		1009			647			
Lighting	High mast	km	0	0		1.4	2.3												
	Standard	km	10	7										5					
Painting of traffic lanes		km		3.2			3.87	3.7	3.96	3.5					2.92		3.61		

* See Table 34 for contract numbers

8. UNIT COSTS OF ROAD INFRASTRUCTURE COMPONENTS

This chapter describes procedures used to estimate unit costs of all major road infrastructure components and the results achieved. Unit cost estimates were based on provincial and municipal surveys and on engineering judgement. The estimates were carried out for the following components:

- Pavements;
- Bridges;
- All other road infrastructure component;
- Routine maintenance; and
- Winter maintenance.

Unit costs of road infrastructure components depend on the geographical location (e.g., province, part of a province) and on jurisdiction (provincial or municipal). Only example results of unit costs obtained through surveys and estimated unit costs (when survey data were unavailable) is presented herein. The remainder of the unit cost data is given in Appendix D.

Definition of Unit Costs

Unit costs include the cost of materials, transportation of the materials to the site, the placement of the material, and quality control on the part of the contractor. For example, the unit cost for a granular material includes the cost of the material, its transportation to the construction site, placement and compaction in the field, and testing to ensure that the material is well compacted. The unit costs do not include the cost of engineering, quality assurance carried out by the investor (the owner of the facility under construction), and other administrative costs. For this reason, the following adjustment factors were used to account for overhead costs:

25 percent increase – Pavements and all other infrastructure component. Initial construction costs and the rehabilitation and maintenance costs were increased by 25 percent to include administrative cost (such as cost of planning, programming, budgeting and engineering, construction supervision and quality assurance, sundries and claims).

35 percent increase – Bridges. The initial construction costs and the future rehabilitation and maintenance costs were increased by 35 percent to include administrative costs (the cost of planning, programming, budgeting and engineering, construction supervision and quality assurance, sundries and claims) as well as the cost of building temporary bridges.

10 percent increase -- Routine maintenance and winter maintenance costs were increased by 10 percent to reflect administrative costs and in-house costs.

The estimation of unit costs was necessary whenever specific unit cost data were not generated by surveys. To the extent possible, unit costs reported by a provincial agency were left unchanged or were rounded. In some situations, the values were adjusted to take into account costs reported by adjacent jurisdictions, or because, based on engineering judgement, they were considered to be incorrect. Unit costs reported by a municipality were adjusted by considering costs reported by other municipalities located in the same geographical area (a single set of municipal unit costs was used for the entire geographical area), by considering costs reported by adjacent municipalities, and by engineering judgement.

Pavements

Initial Costs

Unit costs for paving materials and for pavement preservation treatments were included in the Road Construction Sheets (Table 27), and were submitted for review and modifications to provincial and municipal agencies. In addition, ARA also directly asked provincial and municipal agencies for unit costs of pavement materials used for initial pavement construction. Table 36 contains of unit costs for the initial pavement construction obtained from provincial surveys. Table 37 contains corresponding data obtained from municipal surveys.

To obtain unit costs for geographical locations, jurisdiction and types of costs for which survey data were not available, ARA used the available survey data and engineering judgement to estimate missing survey data. As an example of estimated unit costs, Table 38 provides estimated unit costs for the initial pavement structure for the first nine geographical locations (NL to MB). Unit costs for the rest of the geographical locations are given in Appendix D. Appendix D lists all input data used in the model. Unit costs given in Table 38 are provincial costs with the estimated municipal costs, given in Appendix D, being generally higher.

The higher unit costs for municipal construction of pavements are caused by a number of factors including smaller-size of construction contracts (compared to provincial contracts), higher costs for the protection of pedestrians and for traffic control during construction, the more frequent need to relocate underground utilities, higher demands for environmental protection, and increased incidence of utility openings and boxes in pavements, etc.

Maintenance and Rehabilitation Costs

Pavement maintenance and rehabilitation unit costs obtained through provincial surveys are summarized in Table 39. Corresponding estimated costs are shown in Table 40. The comparison of unit costs given in Table 39 and Table 40 indicates that survey data provide a reliable guidance for the estimation of unit costs (in Table 40) for provinces that have provided unit cost data. Table 40 contains provincial unit costs for selected geographical locations only. The purpose of the Table 40 is to provide an example of the type of unit cost estimates required for jurisdictions that have not provided survey data and an example of data used in the computational model. A full version of Table 40 is given in Appendix D.

Bridges

Initial Construction

Initial unit construction costs for bridges, obtained from provincial surveys are summarized in Table 41. The corresponding estimated costs are shown in Table 42. Estimated costs are based on the survey costs and engineering judgement.

Maintenance and Rehabilitation

The calculation of maintenance and rehabilitation cost for bridges required the knowledge of the unit cost of maintenance and rehabilitation treatments, as well as the frequency of the treatments. Table 43 shows unit maintenance and rehabilitation costs and the frequency of the maintenance and rehabilitation treatments obtained from provincial surveys. The estimated unit costs for maintenance and rehabilitation treatments are given in Table 44.

Table 36. Unit Costs of Pavement Materials used for Initial Construction Obtained from Provincial Surveys

Provinces and Territories

Pavement Layer	Description of pavement material	Unit Cost from Survey											
		NL	NS	ON-1	ON-2	QC-1	QC-2	MB	SK	AB	BC-1	BC-2	TR
Surface	HMA surface course, premium, t		$66.54	$68.88	$62.23	$85.00	$75.00		$50.00	$57.30			
	HMA surface course, typical, t	$60.00	$53.25	$57.29	$57.64	$75.00	$65.00	$50.00	$45.00	$45.26	$60.00	$70.00	$128.00
	Asphalt surface treatment, m^2							$1.50	$2.00				$5.27
	Gravel surface, t							$11.00					$12.00
	Gravel shoulder, mm, t												
Binder	HMA base course, premium, t		$48.47	$53.91	$54.54	$70.00	$60.00			$38.33			
	HMA base course, typical, t	$57.00	$48.47	$49.42	$49.42			$50.00		$37.52	$55.00	$60.00	
OGDL				$45.00									
Base	Crushed granular base, t	$12.60	$12.20	$13.01	$10.90	$15.00	$12.00	$10.60	$12.00	$16.00	$20.00	$25.00	$18.85
Subbase	Granular subbase, t	$10.40	$11.00	$6.71	$7.97	$12.50	$10.00	$8.60	$10.00	$11.73	$12.00	$20.00	$13.70
Subdrains	Subdrains, m			$18.00	$20.00	$115.00	$100.00						$18.00
Drainage	Closed drainage, m		$84.00										$260.00

Table 37. Unit Costs of Pavement Materials used for Initial Construction Obtained from Municipal Surveys

Municipalities

Pavement Layer	Description of pavement material	Unit Cost from Survey								
		NS	NB		ON-1				ON-2	TR
		Halifax	Edmunston	Moncton	Brampton	Ottawa	Toronto	Niagara Falls	Thunder Bay	Yellowknife
Surface	HMA surface course, premium, t					$74.00				$128.00
	HMA surface course, typical, t	$110.00	$65.00	$65.75	$45.00	$63.00	$46.00	$49.42	$63.00	$128.00
	Asphalt surface treatment, m^2									$5.27
	Gravel surface, mm, t									$12.00
	Gravel shoulder, mm, t									
Binder	HMA base course, premium, t									
	HMA base course, typical, t	$100.00	$60.00	$60.40	$39.00	$46.00	$49.00	$45.83	$60.00	
OGDL								$45.00		
Base	Crushed granular base, t	$30.16	$9.50	$10.60	$16.00	$17.37	$22.00	$13.01	$13.00	$18.85
Subbase	Granular subbase, t	$24.21	$9.00	$11.33		$12.75	$15.00	$6.71	$8.50	$13.70
Subdrains	Subdrains, m				$17.50	$25.00		$18.00		$18.00
Drainage	Closed drainage, m									$260.00

Table 38. Estimated Provincial Unit Costs for the Initial Pavement Construction (Partial Table)

Pavement Layer	Description of pavement material	Unit Cost from Survey							
		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2
Surface	HMA surface course, premium, t	$ 65.00	$ 65.00	$ 66.54	$ 65.00	$ 65.00	$ 65.00	$ 68.88	$ 62.23
	HMA surface course, typical, t	$ 60.00	$ 50.00	$ 53.25	$ 50.00	$ 50.00	$ 50.00	$ 57.29	$ 57.64
	Asphalt surface treatment, m^2	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00
	Gravel surface, t	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
	Gravel shoulder, mm, t	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Binder	HMA base course, premium, t	$ 60.00	$ 60.00	$ 48.47	$ 60.00	$ 60.00	$ 60.00	$ 53.91	$ 54.54
	HMA base course, typical, t	$ 57.00	$ 50.00	$ 48.47	$ 50.00	$ 50.00	$ 50.00	$ 49.42	$ 49.42
OGDL		$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00
Base	Crushed granular base, t	$ 12.60	$ 12.00	$ 12.20	$ 12.00	$ 12.00	$ 12.00	$ 13.01	$ 10.90
Subbase	Granular subbase, t	$ 10.40	$ 10.00	$ 11.00	$ 10.00	$ 10.00	$ 10.00	$ 6.71	$ 7.97
Subdrains	Subdrains, m	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 18.00	$ 20.00
Drainage	Closed drainage, m			$ 84.00					
Subbase	Subgrade spot improvement, m^2	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00

Table 39. Unit Costs for Pavement Maintenance and Rehabilitation Treatments Obtained from Provincial Surveys

Provinces

Description of Maintanance and Rehabilitation Treatments	Unit Cost from Survey										
	NL	NS	ON-1	ON-2	QC-1	QC-2	MB	AB	BC-1	BC-2	TR
Crack seal, m	$1.50	$2.00	$2.00	$2.00	$2.50	$2.50	$2.00	$5.53	$1.50	$1.50	
Spot seal, m^2							$1.75				
Seal coat, m^2		$3.00					$1.50				
Spot repairs, Mill 40 to 50 and patch, m2	$7.00	$7.35	$7.70	$7.50	$26.00	$26.00	$5.80		$15.00	$20.00	
Milling, t	$10.00	$10.50	$7.50	$7.50	$6.00	$12.00		$3.69	$4.00	$5.00	
Milling (about 50 mm), m^2		$3.50									
Reconstruction, m2											
Microsurfacing or thin overlay, m2		$5.00									
Recycle AST and replace, m2											$13.50

Table 40. Estimated Provincial Unit Costs for Pavement Maintenance and Rehabilitation Treatments

Provinces and Territories

Pavement Layer	Description of pavement material	Unit Cost from Survey							
		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2
Surface	HMA surface course, premium, t	$ 65.00	$ 65.00	$ 66.54	$ 65.00	$ 65.00	$ 65.00	$ 68.88	$ 62.23
	HMA surface course, typical, t	$ 60.00	$ 50.00	$ 53.25	$ 50.00	$ 50.00	$ 50.00	$ 57.29	$ 57.64
	Asphalt surface treatment, m^2	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00	$ 2.00
	Gravel surface, t	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
	Gravel shoulder, mm, t	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Binder	HMA base course, premium, t	$ 60.00	$ 60.00	$ 48.47	$ 60.00	$ 60.00	$ 60.00	$ 53.91	$ 54.54
	HMA base course, typical, t	$ 57.00	$ 50.00	$ 48.47	$ 50.00	$ 50.00	$ 50.00	$ 49.42	$ 49.42
OGDL		$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00	$ 45.00
Base	Crushed granular base, t	$ 12.60	$ 12.00	$ 12.20	$ 12.00	$ 12.00	$ 12.00	$ 13.01	$ 10.90
Subbase	Granular subbase, t	$ 10.40	$ 10.00	$ 11.00	$ 10.00	$ 10.00	$ 10.00	$ 6.71	$ 7.97
Subdrains	Subdrains, m	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 20.00	$ 18.00	$ 20.00
Drainage	Closed drainage, m			$ 84.00					
Subbase	Subgrade spot improvement, m^2	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00

Table 41. Initial Bridge Construction Costs Obtained from Provincial Surveys, $ per m^2 of the Bridge Deck Area

Survey Results

Initial cost, $/m^2 of bridge deck		Initial unit construction cost from survey											
		NL	NS	ON-1	ON-2	MB	QC-1	QC-2	SK	AB	BC-1	BC-2	TR
Provincial	Freeway	$ -	$ 4,400.00	$ 2,675.00	$ 3,350.00	$ 3,700.00	$ 1,850.00	$ 1,850.00		$ 2,500.00	$ 1,800.00	$ 1,900.00	
	Arterial	$ 2,500.00	$ 3,800.00	$ 2,675.00	$ 3,350.00	$ 3,300.00	$ 1,850.00	$ 1,850.00		$ 2,500.00	$ 1,800.00	$ 1,900.00	$ 4,800.00
	Collector	$ 2,500.00	$ 3,600.00	$ 2,675.00	$ 3,350.00	$ 2,500.00	$ 1,850.00	$ 1,850.00		$ 2,500.00	$ 1,800.00	$ 1,900.00	$ 4,800.00
	Local	$ 2,500.00	$ 3,100.00	$ 2,675.00	$ 3,350.00	$ 2,100.00	$ 1,850.00	$ 1,850.00		$ 2,500.00	$ 1,800.00	$ 1,900.00	$ 4,800.00
Provincial average													
Municipal	Arterial						$ 1,757.50	$ 1,850.00					
	Collector						$ 1,757.50	$ 1,850.00					
	Local						$ 1,757.50	$ 1,850.00					
Municipal average													
Provincial & municipal average													

Table 42. Estimated Unit Costs for Initial Bridge Construction, $ m^2 of Bridge Deck Area

Initial cost, $/m^2 of bridge deck		Initial unit construction cost from survey							Unit Cost from Survey						
		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	TR
Provincial	Freeway	$ 2,500.00	$ 4,000.00	$ 4,400.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 2,675.00	$ 3,350.00	$ 3,700.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 4,800.00
	Arterial	$ 2,500.00	$ 3,600.00	$ 3,800.00	$ 3,600.00	$ 3,600.00	$ 3,600.00	$ 2,675.00	$ 3,350.00	$ 3,300.00	$ 3,600.00	$ 3,600.00	$ 4,000.00	$ 4,000.00	$ 4,800.00
	Collector	$ 2,500.00	$ 3,000.00	$ 3,600.00	$ 3,000.00	$ 3,000.00	$ 3,000.00	$ 2,675.00	$ 3,350.00	$ 2,500.00	$ 3,000.00	$ 3,000.00	$ 4,000.00	$ 4,000.00	$ 4,800.00
	Local	$ 2,500.00	$ 2,600.00	$ 3,100.00	$ 2,600.00	$ 2,600.00	$ 2,600.00	$ 2,675.00	$ 3,350.00	$ 2,100.00	$ 2,600.00	$ 2,600.00	$ 4,000.00	$ 4,000.00	$ 4,800.00
Provincial average															
Municipal	Arterial	$ 2,800.00	$ 4,000.00	$ 4,200.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 3,000.00	$ 3,700.00	$ 3,600.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 5,300.00
	Collector	$ 2,800.00	$ 4,000.00	$ 4,200.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 3,000.00	$ 3,700.00	$ 3,600.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 5,300.00
	Local	$ 2,800.00	$ 4,000.00	$ 4,200.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 3,000.00	$ 3,700.00	$ 3,600.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ 5,300.00
Municipal average															
Provincial & municipal average															

Table 43. Top Part: Unit cost of Bridge Maintenance and Rehabilitation Treatments Obtained from Provincial Surveys, $ per m^2 of the Bridge Deck Area

Bottom Part: Frequency of Bridge Maintenance and Rehabilitation Treatments Obtained from Provincial Surveys, Years

Cost of M&R treatments, $/m^2 of bridge deck		Unit M&R cost from survey											
		NL	NS	ON-1	ON-2	MB	QC-1	QC-2	SK	AB	BC-1	BC-2	TR
Provincial	Freeway	$ -	$ 500.00	$ 750.00	$ 975.00	$ 1,600.00	$ 92.00			$ 9.50	$ 1,000.00	$ 1,000.00	
	Arterial	$ 574.00	$ 400.00	$ 666.67	$ 866.67	$ 1,600.00	$ 103.00			$ 9.50	$ 1,000.00	$ 1,000.00	$ 1,028.00
	Collector	$ 500.00	$ 325.00	$ 541.67	$ 704.17	$ 1,600.00	$ 127.00			$ 9.50	$ 1,000.00	$ 1,000.00	$ 1,028.00
	Local	$ 750.00	$ 250.00	$ 450.00	$ 585.00	$ 1,600.00	$ 125.00			$ 9.50	$ 1,000.00	$ 1,000.00	$ 1,028.00
Provincial average													
Municipal	Arterial												
	Collector												
	Local						$ 195.00						
Municipal average													
Provincial & municipal average													

Frequency between M&R treatments (years)		Frequency between M&R treatments from survey											
		NL	NS	ON-1	ON-2	MB	QC-1	QC-2	SK	AB	BC-1	BC-2	TR
Provincial	Freeway	0	17	30	25	20	25	20		4	35	35	
	Arterial	25	17	30	25	20	25	20		4	35	35	17
	Collector	25	17	30	25	20	25	20		4	35	35	17
	Local	25	17	30	25	20	25	20		4	35	35	17
Provincial average													
Municipal	Arterial												
	Collector												
	Local												
Municipal average													
Provincial & municipal average													

Table 44. Estimated Unit Costs for Bridge Maintenance and Rehabilitation, m^2 of Bridge Deck Area

Cost of M&R treatments, $/m^2 of bridge deck		Unit M&R cost from survey							Unit M&R cost from survey						
		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	TR
Provincial	Freeway	$ 750.00	$ 750.00	$ 500.00	$ 750.00	$ 750.00	$ 750.00	$ 750.00	$ 975.00	$ 1,600.00	$ 750.00	$ 750.00	$ 1,000.00	$ 1,000.00	$ 1,028.00
	Arterial	$ 574.00	$ 600.00	$ 400.00	$ 600.00	$ 600.00	$ 600.00	$ 666.67	$ 866.67	$ 1,600.00	$ 600.00	$ 600.00	$ 1,000.00	$ 1,000.00	$ 1,028.00
	Collector	$ 500.00	$ 500.00	$ 325.00	$ 500.00	$ 500.00	$ 500.00	$ 541.67	$ 704.17	$ 1,600.00	$ 500.00	$ 500.00	$ 1,000.00	$ 1,000.00	$ 1,028.00
	Local	$ 750.00	$ 400.00	$ 250.00	$ 400.00	$ 400.00	$ 400.00	$ 450.00	$ 585.00	$ 1,600.00	$ 400.00	$ 400.00	$ 1,000.00	$ 1,000.00	$ 1,028.00
Provincial average															
Municipal	Arterial	$ 650.00	$ 675.00	$ 450.00	$ 700.00	$ 700.00	$ 700.00	$ 750.00	$ 950.00	$ 1,750.00	$ 700.00	$ 700.00	$ 1,100.00	$ 1,100.00	$ 1,150.00
	Collector	$ 650.00	$ 675.00	$ 450.00	$ 700.00	$ 700.00	$ 700.00	$ 750.00	$ 950.00	$ 1,750.00	$ 700.00	$ 700.00	$ 1,100.00	$ 1,100.00	$ 1,150.00
	Local	$ 650.00	$ 675.00	$ 450.00	$ 700.00	$ 700.00	$ 700.00	$ 750.00	$ 950.00	$ 1,750.00	$ 700.00	$ 700.00	$ 1,100.00	$ 1,100.00	$ 1,150.00
Municipal average															
Provincial & municipal average															

All Other Road Infrastructure Component

Initial Construction

Unit costs for the initial construction of the all other infrastructure component, obtained from provincial surveys to date are summarized in Table 45. Corresponding estimated costs are shown in Table 46. Estimated costs are based on the survey costs and engineering judgement. A full version of Table 46 is given in Appendix D.

Table 45. Unit Costs for the Initial Construction of the All Other Component Obtained by Provincial Surveys

Work item (supply and install)												
Description and type of work item		QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	YK	TR
Clearing and grubbing (m^2)		$ 3.00	$ 3.00	$ 2.09	$ 0.80	$ 0.20	$ 0.20		$ 5.00	$ 5.00	$ 0.90	
Grading	Earth moving (m^3)	$ 11.00	$ 6.00	$ 7.15	$ 5.50	$ 2.42	$ 1.45		$ 10.00	$ 10.00	$ 4.35	$ 12.50
	Rock moving (m^3)	$ 75.00	$ 12.00	$ 19.56	$ 86.74	$ 12.96	$ -	$ 6.24	$ 15.00	$ 15.00	$ 14.00	
Land-Scaping	Sodding and top soil (m^2)	$ 6.00	$ 6.00	$ 3.32	$ 4.35	$ 7.70		$ 0.23	$ 10.00	$ 10.00		
	Top soil (m^3)	$ 3.00	$ 3.00	$ 1.80	$ 2.40	$ 64.40		$ 0.42	$ 10.00	$ 10.00		
Drainage	PCC curb and gutter (m)	$ 50.00	$ 40.00	$ 50.00	$ 55.00	$ 40.32			$ 2,000.00	$ 2,000.00		
	500 mm Pipe culvert & end sections (m)	$ 250.00	$ 200.00	$ 112.21	$ 139.25	$ 40.32	$ 50.00	$ 126.84	$ 1,500.00	$ 1,500.00	$ 380.00	$ 620.00
	1500 mm wide box culvert (m)	$ 800.00	$ 1,000.00	$ 1,534.70	$ 1,700.00				$ 3,000.00	$ 3,000.00		
	Storm water sewers (m)	$ 250.00	$ 250.00	$ 50.00	$ 60.00				$ 3.00	$ 3.00		
Guard Rail	Concrete median (m)	$ 60.00	$ 300.00	$ 200.18	$ 220.00	$ 140.00			$ 100.00	$ 100.00		
	Steel guiderail (m)	$ 65.00	$ 80.00	$ 65.98	$ 70.00	$ 74.00		$ 62.80			$ 160.00	$ 500.00
	3-Cable guiderail (m)	$ 155.00	$ 155.00	$ 15.40	$ 18.00			$ 130.75				
Fencing, Gates	Chain link fence (m)	$ 30.00	$ 75.00	$ 44.44	$ 70.27				$ 60.00	$ 60.00		$ 30.00
	Wire fence (m)	$ 40.00	$ 40.00	$ 8.54	$ 13.09	$ 4.00	$ 3.50	$ 3.98	$ 15.00	$ 15.00		
Lighting	High mast (each)	$ 350,000.00	$ 350,000.00	$ 29,635.78	$ 29,000.00				$ 200,000.00	$ 200,000.00		
	Standard (each)	$ 75,000.00	$ 75,000.00	$ 1,297.61	$ 1,300.00	$ 2,000.00		$ 3,654.00	$ 150,000.00	$ 150,000.00	$ 10,000.00	
Painting of Traffic Lanes (m)		$ 2.00	$ 2,000.00	$ 0.91	$ 1.03	$ 300.00			$ 2,000.00	$ 2,000.00		

Notes:

Top soil costs include seeding and mulching for all regions outside of Ontario.
Lighting costs for British Columbia and Quebec are per km.

Table 46. Estimated Unit Costs for the Initial Construction of the All Other Component Used in the Computational Model (Partial Table)

Work item (supply and install)		Provincial Costs								
Description and type of work item		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB
Clearing and grubbing (m^2)		$ 2.00	$ 1.00	$ 2.00	$ 2.00	$ 3.00	$ 3.00	$ 2.09	$ 2.00	$ 1.00
Grading	Earth moving (m^3)	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 7.15	$ 5.50	$ 2.42
	Rock moving (m^3)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 75.00	$ 40.00	$ 86.74	$ 50.00
Land-Scaping	Sodding and top soil (m^2)	$ 4.00	$ 4.00	$ 4.00	$ 4.00	$ 6.00	$ 6.00	$ 3.32	$ 4.35	$ 7.70
	Top soil (m^3)	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 15.00	$ 10.00
Drainage	PCC curb and gutter (m)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 40.00	$ 50.00	$ 55.00	$ 40.32
	500 mm Pipe culvert & end sections (m)	$ 125.00	$ 100.00	$ 125.00	$ 125.00	$ 250.00	$ 200.00	$ 112.21	$ 139.25	$ 40.32
	1500 mm wide box culvert (m)	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 800.00	$ 1,000.00	$ 1,534.70	$ 1,700.00	$ 2,000.00
	Storm water sewers (m)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 60.00	$ 50.00
Guard Rail	Concrete median (m)	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 60.00	$ 300.00	$ 200.18	$ 220.00	$ 140.00
	Steel guiderail (m)	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 65.00	$ 80.00	$ 65.98	$ 70.00	$ 74.00
	3-Cable guiderail (m)	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.40	$ 18.00	$ 15.40	$ 18.00	$ 15.00
Fencing, Gates	Chain link fence (m)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 30.00	$ 75.00	$ 44.44	$ 70.27	$ 50.00
	Wire fence (m)	$ 7.00	$ 7.00	$ 7.00	$ 7.00	$ 40.00	$ 40.00	$ 8.54	$ 13.09	$ 4.00
Lighting	High mast (each)	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 35,000.00	$ 35,000.00	$ 29,635.78	$ 29,000.00	$ 30,000.00
	Standard (each)	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,297.61	$ 1,300.00	$ 2,000.00
Painting of Traffic Lanes (m)		$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 2.00	$ 2.00	$ 0.91	$ 1.03	$ 1.00

Maintenance and Rehabilitation

Maintenance and rehabilitation costs for the all other infrastructure component were estimated using the unit costs for the initial construction costs (Table 46). It was assumed that some of the initially constructed components will need replacement during the 60-year analysis period. The estimated initial life spans for the major items of the all other component are given in Table 47.

Table 47. Estimated Life Span of the All Other Infrastructure Component

Work item (supply and install)		Region													
Description and type of work Item		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	TR
Clearing and grubbing (m^2)															
Grading	Earth moving (m^3)														
	Rock moving (m^3)														
Land-Scaping	Sodding and top soil (m^2)														
	Top soil (m^3)														
Drainage	PCC curb and gutter (m)	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	500 mm Pipe culvert & end sections (m)	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	1500 mm wide box culvert (m)	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Storm water sewers (m)	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Guard Rail	Concrete median (m)	50	50	50	50	50	50	50	50	50	50	50	50	50	50
	Steel guiderail (m)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	3-Cable guiderail (m)	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Fencing, Gates	Chain link fence (m)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	Wire fence (m)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Lighting	High mast (each)	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Standard (each)	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Painting of Traffic Lanes (m)		20	20	20	20	20	20	20	20	20	20	20	20	20	20

Routine Maintenance Costs

Routine maintenance includes minor repairs to road infrastructure (such as filling potholes, minor guide rail repairs, minor bridge repairs, and repairs to electrical systems), roadside maintenance (such as cutting grass, litter removal, and maintenance of ditches and drainage channels), maintenance of traffic control devices (such as painting of traffic control lines, maintenance of traffic signs and lights), and miscellaneous expenses (such as cost electricity to operate lighting)..

Many factors influence routine maintenance costs. Routine maintenance costs per lane km depend on the width of the traffic lane and the associated features (shoulder type and width, roadside width), traffic volumes, pavement type and condition, age of pavement and other infrastructure components, environmental region, and the level of service.

Data Challenges

Missing data. Typically, agencies do not record routine maintenance costs segregated by road functional class. Also ARA has not received data from some of the provincial agencies.

Definition of routine maintenance costs. There is no universally accepted definition of routine maintenance treatments or activities in Canada. For example, some agencies consider sealing of cracks in asphalt concrete pavements to be a routine maintenance activity, whereas other agencies consider this treatment to be a rehabilitation activity requiring capital cost because it was planned in advance and carried out by external forces.

Accounting for the full cost of routine maintenance. It is not always clear from the survey responses if the reported routine maintenance costs include all in-house costs. For example, an agency may include in the routine maintenance costs the labour and material costs for painting of traffic control lines, but not the

associated cost for the purchase of the painting equipment and for the facilities to store and maintain the equipment.

Estimation of the 2-lane equivalent kilometres. To obtain consistent results, the centreline km reported by some of the survey respondents were converted to 2-lane equivalent kilometres. The conversion was done by considering the network size and its division among arterial, collector, and local roadways.

Inclusion of residential streets. Several municipalities reported the total cost of routine maintenance expenditures that included residential streets. Unit routine maintenance expenditures on residential streets are typically lower than for other roads.

Effect of sidewalks. Using the survey data obtained from municipalities, it was not always possible to ensure that routine maintenance costs for sidewalks are fully accounted for and excluded from the total cost estimates for routine maintenance.

Survey Data

Unit costs for routine maintenance are summarized in Table 48 in terms of an annual cost per 2-lane equivalent km. In addition, Table 48 provides unit routine maintenance costs obtained from literature survey and other sources.

Estimated Routine Maintenance Cost

An example of estimated routine maintenance costs used in the computational model is shown in Table 49. The estimated unit costs are based on survey data and engineering judgement.

Winter Maintenance Costs

The cost of winter maintenance includes the cost of the field operations and the costs of all other associated and supporting activities and facilities. The supporting activities and facilities include, for example, storage of salt and winter sand, snow removing equipment, facilities that house the equipment, and weather reporting and communication systems. Pick-up and disposal (or recycling) of winter sand is part of the routine maintenance.

There are several factors influencing winter maintenance costs. Winter maintenance costs depend on environmental zone (snow and ice precipitation), the level of service, traffic volumes, and the application of technology to minimize snow drifting (such as geometric highway design, snow fences) and to clear snow and ice (e.g., weather reporting, pavement sensors, pre-wetting of salt, etc.).

Data Challenges

Missing data. Typically, agencies do not record winter maintenance costs segregated by road functional class. Also, data has not been received from some of the provincial agencies.

Accounting for full costs. It is not always clear from survey responses if the reported winter maintenance costs fully account for in-house costs. For example, an agency may report the annual labour and material costs for winter maintenance, but not the associated costs for the purchase of snow removing equipment and for facilities to store road salt.

Table 48. Annual Cost of Routine Maintenance Operations Obtained from Surveys

Province	Total annual routine maintenance budget, millions of $	Total length of 2-lane equivalent km	Routine maintenance cost per 2-lane equivalent km, $	Source and comments
NF	21.0	8,898	2,360	**Province**. Budget included administration costs and equipment maintenance cost of $966 per 2-lane equivalent km
PE	0.275	156	1,762	**City of Summerside**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.2
NS	50.0	22,789	2,194	**Province**. Includes 8,980 km of gravel roads
	8.07	2,318	3,483	Regional Municipality of Halifax. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.3.
NB	42.6	17,965	1,186	**Province**. The type of road length is not defined
	1.15	250	4,604	**Ville d'Edmunston**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.2
	1.05	796	1,324	City of Moncton. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.2
QC	125	28,273	4,421	**Province**
	10.4	2,463	4,222	**City of Ville de Longueuil**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.5.
ON			2,666	**A representative of IMOS** (a private company specializing in road maintenance). Estimates given for Southern Ontario
	2.39	3,148	759	**City of Brampton**
	23.77	7,057	3,369	**City of Ottawa**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.8
	2.64	854	3,097	**City of Niagara Falls**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.3
MB	44.6	19,112	1,167	**Province**. Only total amount was provided
	17.7	8,620	2,052	**City of Winnipeg**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.6
SK	46.6	44,636	1,045	**Province**. Total length includes 25,883 km of local roads
	2.81	1,332	2,106	**City of Regina**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.3
AB				
BC	113.75	13,074	8,700	**Province**. The type of road length is not defined
YT	6.495	4,760	1.364	**Territory**
NT	0.250	82	3,049	**City of Yellowknife**
California	767	80,000	9,587	**Reference 13**. 35.5 % of the cost is for roadside maintenance. Costs are in USD.

Note: Province (in the column entitled Comment) means that the data are based on a survey carried out as part of this study.

Table 49. Annual Unit Routine Maintenance Costs Used in the Computational Model

Description and type of Work Item	Regions	Provincial							
		Rural				Urban			
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local
Routine maintenace	NL	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250
	PE	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250
	NS	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250
	NB	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400
	QC-1	$ 4,000	$ 3,750	$ 3,500	$ 3,250	$ 4,250	$ 4,000	$ 3,750	$ 3,500
	QC-2	$ 3,750	$ 3,500	$ 3,250	$ 3,000	$ 4,000	$ 3,750	$ 3,500	$ 3,250
	ON-1	$ 3,500	$ 3,250	$ 3,000	$ 2,750	$ 3,750	$ 3,500	$ 3,250	$ 3,000
	ON-2	$ 3,250	$ 3,000	$ 2,750	$ 2,500	$ 3,500	$ 3,250	$ 3,000	$ 2,750
	MB	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400
	SK	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400
	AB	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250
	BC-1	$ 3,250	$ 3,000	$ 2,750	$ 2,500	$ 3,500	$ 3,250	$ 3,000	$ 2,750
	BC-2	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250
	TR	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400

Note: All costs are per two lane equivalent kilometre.

Description and type of Work Item	Regions	Municipal					
		Rural			Urban		
		Arterial	Collector	Local	Arterial	Collector	Local
Routine maintenace	NL	$ 2,000	$ 1,750	$ 750	$ 2,250	$ 2,000	$ 1,750
	PE	$ 1,850	$ 1,750	$ 750	$ 2,000	$ 1,900	$ 1,800
	NS	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	NB	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	QC-1	$ 3,500	$ 3,250	$ 1,250	$ 3,750	$ 3,500	$ 3,250
	QC-2	$ 3,250	$ 3,000	$ 1,000	$ 3,500	$ 3,250	$ 3,000
	ON-1	$ 3,250	$ 3,000	$ 1,000	$ 3,500	$ 3,250	$ 3,000
	ON-2	$ 3,000	$ 2,750	$ 750	$ 3,250	$ 3,000	$ 2,750
	MB	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	SK	$ 2,000	$ 500	$ 250	$ 2,500	$ 2,250	$ 2,000
	AB	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	BC-1	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	BC-2	$ 2,000	$ 1,850	$ 1,000	$ 2,500	$ 2,250	$ 2,000
	TR	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000

Estimation of the 2-lane equivalent kilometres. To obtain consistent results, we have converted centreline km reported by some of the survey respondents to 2-lane equivalent kilometres. The conversion was done by considering the network size and its division among arterial, collector, and local roadways.

Inclusion of residential streets. Several municipalities reported the total cost of winter maintenance expenditures that included residential streets. Unit winter maintenance expenditures on residential streets are typically lower than for other roads.

Effect of sidewalks. Using the survey data obtained from municipalities, it was not always possible to ensure that winter maintenance costs for sidewalks are fully accounted for and excluded from the total cost estimates for winter maintenance.

Survey Data

Unit cost data for winter maintenance received to date are summarized in Table 50 in terms of annual costs per 2-lane equivalent km. In addition, Table 50 provides unit winter maintenance costs obtained from a literature survey and other sources.

Estimated Winter Maintenance Cost

Estimated winter maintenance costs used in the computational model are summarized in Table 51. The estimates are based on survey data and engineering judgement. According to Table 51, winter maintenance costs are higher, for the same road class, on provincial roads than on municipal roads. The higher costs on provincial roads are due to higher winter maintenance standards on provincial roads necessitated by higher traffic volumes and speeds.

Table 50. Annual Cost of Winter Maintenance Operations Obtained from Surveys

Province	Total annual routine maintenance budget millions of $	Total length of 2-lane equivalent km	Routine maintenance cost per 2-lane equivalent km	Comment
NF	60.8	8,898	6,833	**Province.** Budget included administration costs and equipment maintenance cost of $1,821per 2-lane equivalent km
PE	0.40	156	2,564	**City of Summerside**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.2
NS	44	22,789	1,931	**Province.** Includes 8,980 km of gravel roads
			$1,087	**NCHRP Synthesis 344 [12]**
	8.5	2,318	3,667	**Regional Municipality of Halifax**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.3.
NB	62.2	17,965	1,731	**Province.** Road length is for centreline kilometres
			3,600	**NCHRP Synthesis 344**
	1.25	250	5,000	**Ville d'Edmunston**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.2
	1.05	796	1,324	**City of Moncton.** 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.2
QC	240	28,273	8,489	**Province**
			10,090	**NCHRP Synthesis 344 [12]**
	25.3	2,463	10,275	**City of Ville de Longueuil**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.5. Cost may include sidewalks.
ON			5,333	**IMOS** (a private company specializing in road maintenance) for Southern Ontario
			5,000 to 3,000	**Ontario Roads Coalition [2]** $5,000 per 2-lane km for Regional roads and about $3,000 for county roads in Southern Ontario
	3.82	3,148	1,214	**City of Brampton**
	37,59	7,057	6,743	City of Ottawa. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.8
	0.87	344	2,543	**City of Niagara Falls**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.3
MB	27.0	18,626	706	**Province.** Only total amount was provided
	14.2	8,620	1,646	**City of Winnipeg**. 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.6
SK	24.5	44,616	549	**Province.** total length includes 25,883 km of local roads
			1,375	**NCHRP Synthesis 344 [12]**
	1.95	1,332	1,468	**City of Regina.** 2-lane equivalent km estimated from centreline km by multiplying non-residential roads by 1.3
AB			4,344	**NCHRP Synthesis 344 [12]**. The cost was the highest cost per lane km in 10 years prior to 96/97. Assumes that NCHRP data are in CND per mile.
			12,000	**NCHRP Synthesis 344 [12]**
BC	113.75	13,074	16,158	**Province.** The type of road length is not defined
YT	6.495	4,760	1,364	**Territory**
YT	0.325	82	3,963	**City of Yellowknife**
Minnesota			835	**NCHRP Synthesis 344 [12]**. In USD

Note: Province (in the column entitled Comment) means that the data are based on a survey carried out as part of this study.

Table 51. Annual Unit Winter Maintenance Costs used in the Computational Model

Description and type of work item	Regions	Provincial							
		Rural				Urban			
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local
Winter maintenance	NL	$ 7,500	$ 7,000	$ 6,500	$ 6,000	$ 8,000	$ 7,500	$ 7,000	$ 6,500
	PE	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500
	NS	$ 4,500	$ 4,000	$ 3,500	$ 3,000	$ 5,000	$ 4,500	$ 4,000	$ 3,500
	NB	$ 4,500	$ 4,000	$ 3,500	$ 3,000	$ 5,000	$ 4,500	$ 4,000	$ 3,500
	QC-1	$ 10,000	$ 8,000	$ 7,000	$ 6,000	$ 12,000	$ 10,000	$ 8,000	$ 7,000
	QC-2	$ 9,000	$ 7,000	$ 6,000	$ 5,000	$ 10,000	$ 9,000	$ 7,000	$ 6,000
	ON-1	$ 6,000	$ 5,000	$ 4,000	$ 4,000	$ 6,000	$ 5,500	$ 5,000	$ 5,000
	ON-2	$ 5,500	$ 4,000	$ 3,000	$ 2,000	$ 5,500	$ 5,000	$ 4,500	$ 4,500
	MB	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500
	SK	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500
	AB	$ 4,500	$ 4,000	$ 3,500	$ 3,000	$ 5,000	$ 4,500	$ 4,000	$ 3,500
	BC-1	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500
	BC-2	$ 5,500	$ 4,000	$ 3,000	$ 2,000	$ 5,500	$ 5,000	$ 4,500	$ 4,500
	TR	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500

Note: All costs are per two lane equivalent kilometre.

Description and type of work item	Regions	Municipal					
		Rural			Urban		
		Arterial	Collector	Local	Arterial	Collector	Local
Winter maintenance	NL	$ 6,500	$ 6,000	$ 2,500	$ 7,000	$ 6,500	$ 6,000
	PE	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500
	NS	$ 3,500	$ 3,000	$ 2,500	$ 4,000	$ 3,500	$ 3,000
	NB	$ 3,500	$ 3,000	$ 2,500	$ 4,000	$ 3,500	$ 3,000
	QC-1	$ 7,500	$ 6,500	$ 2,500	$ 8,500	$ 7,500	$ 6,500
	QC-2	$ 7,000	$ 6,000	$ 2,500	$ 8,000	$ 7,000	$ 6,000
	ON-1	$ 4,500	$ 3,500	$ 2,500	$ 5,000	$ 4,000	$ 3,500
	ON-2	$ 4,000	$ 3,000	$ 2,000	$ 4,500	$ 3,500	$ 3,000
	MB	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500
	SK	$ 2,500	$ 1,500	$ 500	$ 3,000	$ 3,000	$ 2,500
	AB	$ 3,500	$ 3,000	$ 2,500	$ 4,000	$ 3,500	$ 3,000
	BC-1	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500
	BC-2	$ 4,000	$ 3,000	$ 2,000	$ 4,500	$ 3,500	$ 3,000
	TR	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500

9. COMPUTATIONAL MODEL

The calculation of annualized costs was carried out using an Microsoft Excel©-based computational model. The computational model represents the core of the study because it links extensive arrays of input data with the end result: estimated annualized full cost of road infrastructure by representative road classes (per one kilometre of a single traffic lane).

The functional capabilities of the model include the following features:

- Automated linkage between input values and calculated results. For example, it is possible to change a unit construction cost for a specific part of the road infrastructure and the change is automatically reflected in the end result.
- Suitability for sensitivity analysis. For example, it is possible to change key input data in the Universal Input Sheet to carry out sensitivity analysis in terms of the discount rate.
- Aggregation of results. The model enables to aggregate annualized costs and road inventory data across the entire road network or part of the network.
- Modular design. The key input unit cost and quantity data are grouped in specific worksheets for clarity and ease of future modifications.

Description of the Computational Model

The model was created in Excel© because of its versatile nature and its ability to facilitate the investigation of the "what if" situations associated with this project. The model allows for the input values to be easily changed with the annualized costs automatically recalculating.

Due to the large number of input parameters associated with the cost of roadway infrastructure, the computational model incorporates a series of workbooks representing the different components of roadway inventory. Each workbook is then subdivided into a series of worksheets that contain the input values, the intermediate calculations, and the required output values.

The main parts of the computational model are shown in the model flowchart in Figure 4. Table 52 outlines the workbooks and worksheets that compose the computational model. A complete set of input and output tables for the computational model is given in Appendix D.

How to use the Model

The computational model used to estimate the life cycle cost model was developed as a suite of Excel© worksheets that are linked together. Changes in one worksheet are automatically propagated throughout the suite. Thus, changing input data in one worksheet automatically changes the results.

Workbook Linkage

As can be seen in the upper left hand corner of Figure 4, the Main.xls workbook is used to contain not only the universal inputs, but also the summary of the entire roadway infrastructure. This workbook is the central link combining all of the other workbooks.

When opening any of the workbooks, Microsoft© Excel will verify that the user wants to maintain the linkage between the various workbooks. The screen capture shown in Figure 5 shows this screen from Excel© 2003.

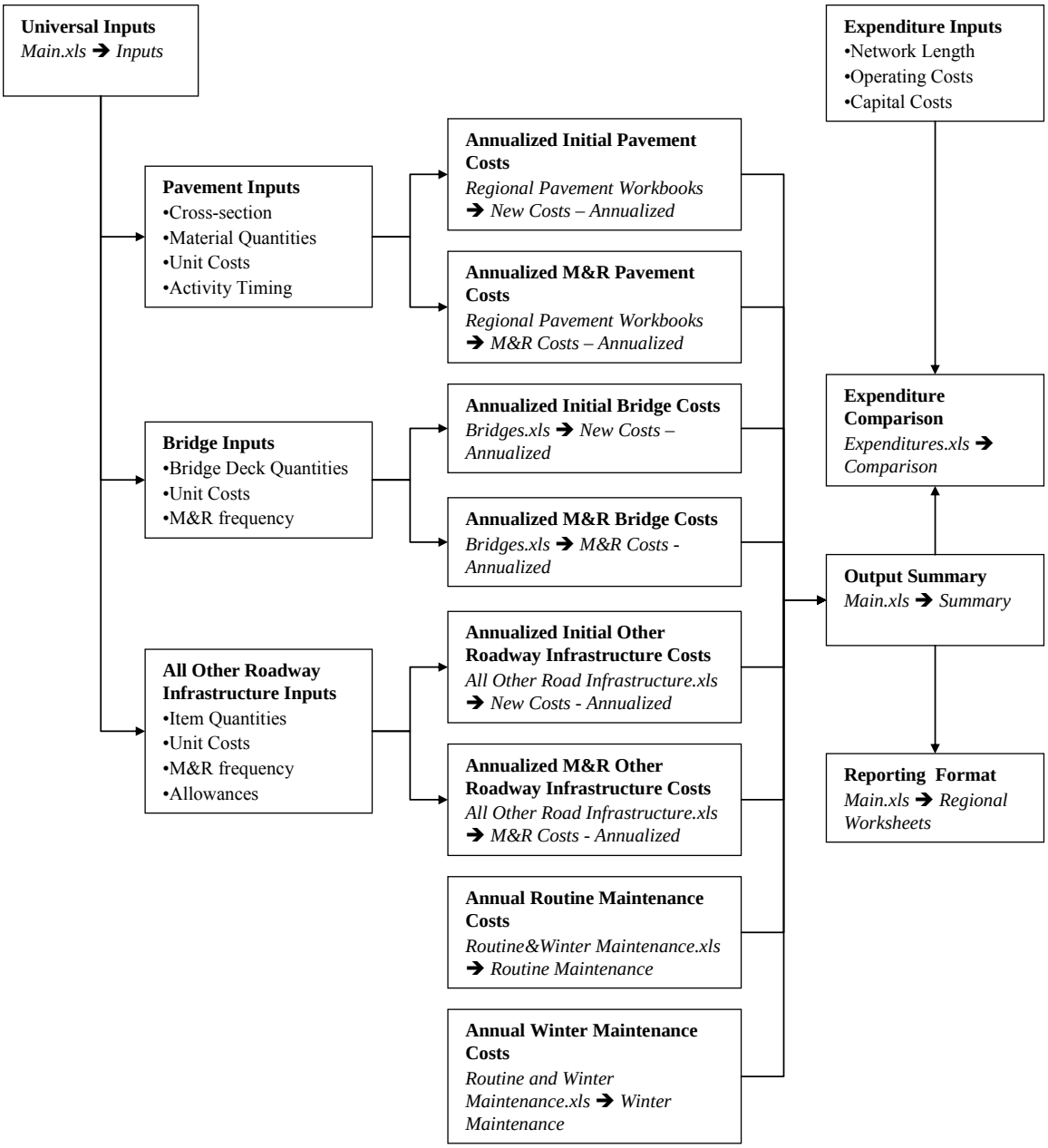


Figure 4. Computational Model Flowchart

Table 52. Description of Computational Model Files

Workbook name	Worksheet name	Worksheet description
Main.xls	Input	This worksheet contains the universal inputs that affect the annualized costs.
	Age	This worksheet contains the average age of the infrastructure components.
	Raw Summary	This worksheet is used to summarize the annualized costs of all roadway infrastructure components provided in the various other workbooks, in terms of a 2-Lane km roadway.
	Summary	This worksheet is used to summarize the deteriorated, adjusted, annualized costs of all roadway infrastructure components per single Lane km roadway.
	Region Worksheets (NL, PE, NS, NB, QC-1, QC-2, ON-1, ON-2, MB, SK, AB, BC-2, BC-2, TR)	These worksheets contain the final reporting format. They show the annualized roadway costs per lane km of roadway.
Bridges.xls	Quantities	This worksheet contains the values that show the average number of square metres of bridge deck per 2-lane km of roadway.
	Unit Costs	This worksheet contains the initial construction cost, the maintenance and rehabilitation costs, and the frequency of the maintenance.
	New Costs	This worksheet uses the quantities and unit costs to calculate the cost of new bridges per 2-lane km.
	New Costs – Annualized	This worksheet contains the new costs calculated in the previous sheet as an annualized value over the analysis period at the discount rate.
	M&R Costs - Annualized	This worksheet contains the annualized costs (per 2-lane km) of all the bridge maintenance and rehabilitation activities within the analysis period annualized over the design period.
All Other Road Infrastructure.xls	Unit Costs	This worksheet contains the unit costs of the key items representing all other road infrastructure.
	Quantities	This worksheet contains information on the quantity of the various items on the different road categories.
	Service Lives	This worksheet contains the expected service lives of the other road infrastructure items. These represent the age at which these items need to be replaced.
	Allowances	This worksheet contains the mark up rate that will be used to account for all other road infrastructure components that are not specifically listed.

Workbook name	Worksheet name	Worksheet description
	New Costs	This worksheet has the cost of all key items per 2-lane km.
	New Costs – Annualized	This worksheet contains the new costs calculated in the previous sheet as an annualized value over the analysis period at the discount rate.
	M&R Costs - Annualized	This worksheet contains the annualized costs (per 2-lane km) of the maintenance and rehabilitation of the key items within the analysis period annualized over the design period.
Routine and Winter Maintenance.xls	Routine Maintenance	This worksheet contains the annual cost of performing routing maintenance on a 2-lane km of roadway.
	Winter Maintenance	This worksheet contains the annual cost of performing winter maintenance on a 2-lane km of roadway.
Pavement_XX.xls (one file for each of the 14 region)	Unit Costs	This worksheet contains the unit cost of all roadway materials and construction activities.
	PRF, PRA, PRC, PRL, PUF, PUA, PUC, PUL, MRA, MRC, MRL, MUA, MUC, MUL	These 14 worksheets contain the cross section dimensions, material quantities, and costs associated with the initial construction and the expected maintenance and rehabilitation plan.
	Summary	This worksheet contains the annualized initial construction and M&R costs for all of the categories within the province.
Expenditures.xls	Expenditure Summary	This worksheet contains the un-depreciated, annualized, adjusted costs of the road infrastructure components per lane km.
	Capital and Operating Costs	The worksheet evaluates the estimated capital and operating costs (per lane km) based on the annualized cost and expected frequency of initial construction activities.
	Comparison	This worksheet calculates the expected total capital and operating costs based on estimates of network length and compares the prediction to values reported by the provincial and municipal agencies.

To work with the computational model click on the button labelled ‘Update’ as seen in Figure 5.

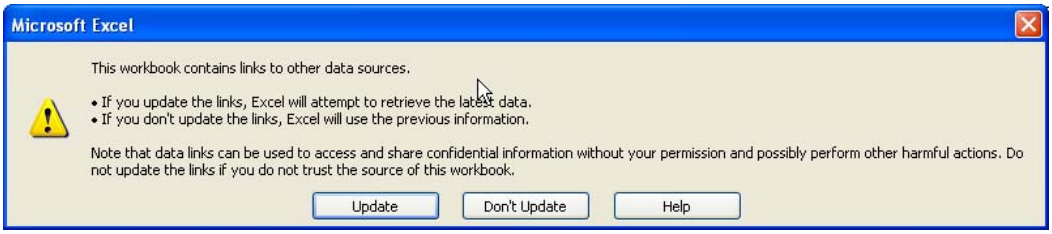


Figure 5. Dialog Box to Update Worksheet Connectivity

The computational model is designed to read the worksheets located within the same directory as the Main.xls file. To verify the location of the linked workbooks, a list of the linked workbooks can be found by clicking the 'Links' item under the Edit menu.

The easiest way to work with the model and keep all values current in all worksheets is to open the Main.xls workbook first. As values are updated in the linked sheets, they will then automatic update in the Main.xls summaries as well.

Excel will not recalculate values in worksheets that are not currently open. This means that in order to completely recalculate the model after a change in a universal input, such as the discount rate, it is necessary to open all of the workbooks. Consequently, it is recommended to have all of the workbooks open simultaneously when updating universal inputs.

Protection of Formulas

The computational model contains a large quantity of both model inputs, as well as calculated values. To prevent accidentally over writing calculated values, the workbooks have all values, except for the model inputs, locked so they cannot be edited.

It is possible to unlock the worksheets within Excel by using the 'Protection' option under the 'Tools' menu. No password has been set-up to facilitate formula changes if required.

In order to simplify long and complicated excel function and to make the model easier to trace, custom functions were developed to calculate the EUAC, the present worth, and EUAC of regularly occurring payments. The custom formulas were created with Visual Basic for Applications and are stored within each of the workbooks. The equations for these formulas can be found in Chapter 6. The custom formulas should not be changed.

Layout of Data

Each of the workbooks contains a series of worksheets that represent the various steps in the computational model. The general format of the each work book is that the worksheets flow from left to right in the sequence of unit costs, quantities, service life (if applicable), annualized initial road infrastructure costs, and annualized maintenance and rehabilitation of road infrastructure costs.

The summary of the tables and the information they contain can be found in Table 52. Each of these worksheets contains a table for each parameter. The tables contain the data for all road infrastructure categories established in Chapter 3. Consequently, all unit costs and quantities are provided for all the 14 geographic regions and for all 14 possible combinations of jurisdiction, rural-urban alignment, and functional class.

When applicable, the input data, calculations, and summary results are stored in 14 by 14 tables are thus used through out the computational model. The 14 by 14 tables also contain the unit costs, quantities,

service lives, and calculations for the various infrastructure components. Some unit costs were not expected to vary based on the functional class of road and hence are presented in a manner more applicable to the data.

A reporting format was developed in order to facilitate printing the final results of the model. The reporting format consists of one page of results per geographic region and contains the costs for each of the roadway infrastructure items as well as the total cost. The estimated annualized roadway infrastructure costs are found in the cost reporting sheets in Main.xls file.

10. ESTIMATED REPRESENTATIVE ANNUALIZED COSTS

This chapter provides estimated representative annualized unit costs for road infrastructure. The costs were estimated for all 196 road segments classified using the classification system described in Chapter 3.

For each of the 196 road segments the following eight separate annualized costs and one combined (total) cost were estimated:

- Initial construction costs for pavements;
- Maintenance and rehabilitation costs for pavements;
- Initial construction costs for bridges;
- Maintenance and rehabilitation costs for bridges;
- Initial construction costs for all other infrastructure;
- Maintenance costs for all other infrastructure:
- Routine maintenance costs;
- Winter maintenance costs; and
- Total costs.

The chapter also includes the results of sensitivity analysis regarding the discount rate.

Results

Estimated representative annualized costs are reported using a uniform format of Cost Reporting Sheets. There are 14 Cost Reporting Sheets, one sheet for each geographical region (NL, PE, NS, NB, QC-1, QC-2, ON-1, ON-2, MB, SK, AB, BC-1, BC-2, TR). Each Cost Reporting Sheet provides unit cost estimates for 14 road categories. An example of the Cost Reporting Sheet is shown in Table 53 which provides results for Southern Ontario (ON-1). All Cost Reporting Sheets are given in Appendix E.

All cost estimates provided in the Cost Reporting Sheets have the following properties:

- They are annualized 2003 costs for one-kilometre-long single traffic lane.
- The costs include administrative costs as outlined in Chapter 8 (additional 25 percent for pavements and the all other component, 35 percent for bridges, and 10 percent for routine and winter maintenance).
- The costs were calculated using 6 percent discount rate and annualized over 60-year analysis period.
- The costs reflect current design, rehabilitation and maintenance standards and practices.
- The costs do not include the cost of land.
- The costs include all expenditures associated with earth work (grading, excavating, landscaping, etc.) assuming that the original terrain features have not been changed by any previous road construction.
- The cost for clearing the land (clearing and grubbing) assumed the existence of typical 2003 conditions.

Table 53. Cost Reporting Sheet for Southern Ontario

Ontario - South

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 24,476	$ 25,451		
Arterial	$ 14,752	$ 16,663	$ 14,705	$ 18,005
Collector	$ 13,363	$ 15,517	$ 12,075	$ 15,138
Local	$ 9,230	$ 7,864	$ 2,947	$ 11,450

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,026	$ 2,090		
Arterial	$ 3,954	$ 3,954	$ 2,881	$ 2,881
Collector	$ 3,754	$ 3,464	$ 2,155	$ 2,155
Local	$ 2,854	$ 2,854	$ 314	$ 2,035

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 4,283	$ 5,139		
Arterial	$ 3,854	$ 3,854	$ 2,537	$ 2,537
Collector	$ 3,426	$ 4,283	$ 2,255	$ 2,819
Local	$ 2,141	$ 1,499	$ 282	$ 564

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 545	$ 654		
Arterial	$ 436	$ 436	$ 245	$ 245
Collector	$ 315	$ 394	$ 218	$ 273
Local	$ 164	$ 115	$ 27	$ 55

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 15,516	$ 16,084		
Arterial	$ 11,247	$ 12,437	$ 8,273	$ 9,698
Collector	$ 7,320	$ 10,576	$ 6,158	$ 9,117
Local	$ 3,883	$ 5,656	$ 3,667	$ 6,210

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 389	$ 1,439		
Arterial	$ 449	$ 1,012	$ 459	$ 1,104
Collector	$ 461	$ 1,076	$ 493	$ 1,190
Local	$ 442	$ 1,150	$ 492	$ 1,283

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,925	$ 2,063		
Arterial	$ 1,788	$ 1,925	$ 1,788	$ 1,925
Collector	$ 1,650	$ 1,788	$ 1,650	$ 1,788
Local	$ 1,513	$ 1,650	$ 550	$ 1,650

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,300	$ 3,300		
Arterial	$ 2,750	$ 3,025	$ 2,475	$ 2,750
Collector	$ 2,200	$ 2,750	$ 1,925	$ 2,200
Local	$ 2,200	$ 2,750	$ 1,375	$ 1,925

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 53,459	$ 56,221		
Arterial	$ 39,230	$ 43,307	$ 33,363	$ 39,147
Collector	$ 32,490	$ 39,847	$ 26,929	$ 34,678
Local	$ 22,427	$ 23,538	$ 9,655	$ 25,171

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Observations

The following observations are based on the results presented in the Cost Reporting Sheets.

Initial construction costs dominate the total costs. For example, in the case of provincial rural arterial roads in Southern Ontario, the initial construction costs represent about 76 percent of the total cost (Figure 6).

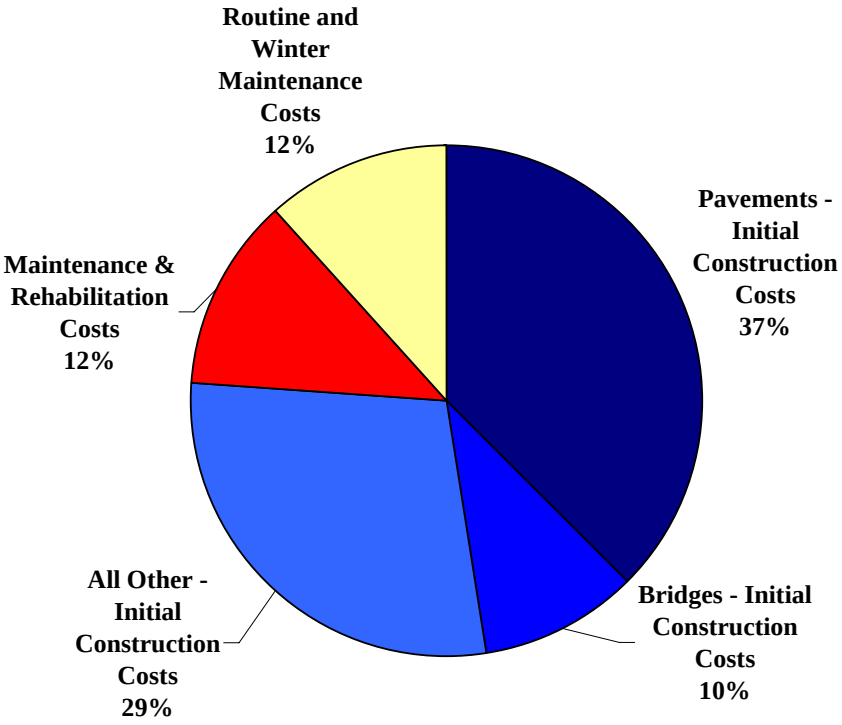


Figure 6. Distribution of the Total Cost for Provincial Rural Arterial Roads in Southern Ontario

Considering the initial construction costs alone, the highest initial construction costs are for all other infrastructure component, then for pavements, and lastly for bridges.

All costs tend to increase with the higher functional class of the road. This is expected because, for example, arterial roads are built to higher standards than collector roads (with wider shoulders, longer sight distances and better quality materials; arterial roads are also maintained at higher standards because of higher traffic volumes and speeds). However, there are few exceptions. For example, the pavement maintenance and rehabilitation costs for provincial arterial roads in Southern Ontario are higher than the corresponding costs for freeways (Table 49, second table from the top on the left-hand side). This anomaly is caused by the high-performance initial pavement construction of freeways in Southern Ontario. By increasing the initial pavement construction costs (initial pavement construction costs for freeways are about 64 percent higher than the corresponding costs for arterial roads), the subsequent pavement maintenance and rehabilitation costs are lowered.

Municipal roads have typically lower costs than the corresponding provincial roads. The difference is mainly in terms of the initial construction costs for the "all other component." Municipal roads typically

follow the existing terrain and municipalities tend to be located on terrain suitable for building roads (and other structures).

In general, urban roads have higher costs than the corresponding rural roads. For example, urban roads have more expensive drainage systems, tend to have more bridges per given road length, and have higher routine and winter maintenance costs.

Winter maintenance costs are typically higher than routine maintenance costs.

Winter maintenance costs are generally at par with the pavement maintenance and rehabilitation costs. In some provinces (e.g., Québec), winter maintenance costs significantly exceed the pavement maintenance and rehabilitation costs.

Because the total road costs include initial construction costs, they do not reflect current spending by transportation agencies.

Updating Costs

Unit costs used in this report are for 2003 construction season. In global terms, a cost update can be accomplished by applying construction cost indicators developed by Statistics Canada to the total road cost. A detailed update would require the assessment and update of all unit cost entries, applicable to a given jurisdiction, in all unit cost tables. All input tables, including unit cost tables are given in Appendix D. It is easy to change input data and re-run the cost estimation model for anybody with the basic knowledge of Excel.

Sensitivity Analysis

The majority of input data are in the form of small elements of verifiable and changeable data items. For example, input data are in the form of the thickness of the pavement surface layer (and the unit cost of the layer) for provincial rural arterial roads in Saskatchewan, or in the form of the cost for square metre of a bridge deck on an urban expressway in Southern Québec. If any element of the input data is questionable, the user can easily change the element, re-run the computational model (as outlined in Chapter 9) and assess the impact of the change on the result.

Sensitivity Analysis of the Discount Rate

In order to illustrate the influence of the discount rate on the total costs, and to demonstrate the robustness of the computational model, a sensitivity analysis of the impact of changing discount rate was carried out.

As an example, the analysis used the rural provincial arterial highway in Southern Ontario. A series of discount rates used was 4%, 6%, 8%, and 10%. The results are presented using as “stacked” bar graph given in Figure 7. The Y-axis in Figure 7 shows 2003 annualized costs for one-km long single traffic lane in thousands of dollars.

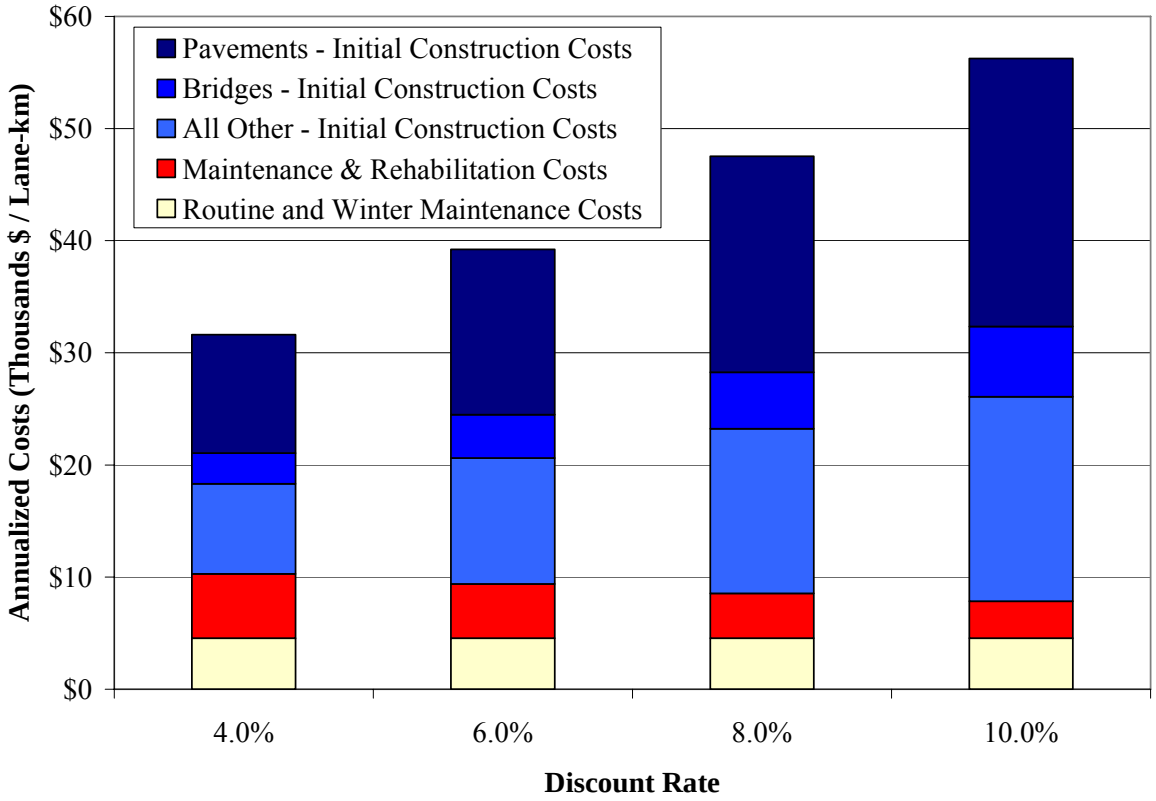


Figure 7. The Effect of the Discount Rate on Annualized Unit Costs of Rural Provincial Arterial Highways in Southern Ontario

The initial construction costs dominate the total annualized costs for all discount rates. The annualized initial construction costs increase linearly with the increase in the discount rate. This trend takes place because the payments for the initial construction are incurred at the beginning of the 60-year analysis period and are annualized (recouped) over the analysis period.

The maintenance and rehabilitation costs shown in Figure 7 are the total maintenance and rehabilitation costs for pavements, bridges, and all other road infrastructure component. Maintenance and rehabilitation costs decrease with the increasing discount rate. This trend takes place because the bulk of maintenance and rehabilitation costs occur in the latter part of the analysis period.

The routine maintenance and the winter maintenance costs are annually occurring costs and are unaffected by the discount rate.

11. COMPARISON OF MODEL COSTS WITH ANNUAL EXPENDITURES REPORTED BY TRANSPORTATION AGENCIES

Annualized costs required to preserve road infrastructure estimated in this study were compared to average annual expenditures reported by Canadian transportation agencies. The objective of the comparison was to assist in verifying and improving estimated annualized road costs produced by the computational model. This section of the report describes the methodology and the results of the comparison.

The estimated annualized costs required to preserve road infrastructure were obtained by adjusting the total infrastructure costs reported in Chapter 10. The annual expenditures, provided to the study by Transport Canada, were in terms of 5-year-averages of annual capital and operating expenditures reported by all levels of government. The basic premise for the comparison of the costs estimated by the model and the reported expenditures was that there should be a correspondence between the annualized capital and operating costs estimated by the computational model and the average annual capital and operating expenditures reported by all levels of government. The comparison was carried out for individual provinces (and a combined territory), and for both the provincial and municipal networks.

The results of matching the model costs with the annual expenditures provided to the study by Transport Canada should be used with a significant degree of caution. Our review of published values of budgets of provincial transportation agencies indicates that there is a very wide variation of the items that agencies include in operating and capital costs. For example, a provincial agency may include the cost of vehicle and driver licensing in the reported operating costs whereas the model's operating costs include only costs for routine and winter maintenance of roads. In addition, there are significant discrepancies in the road lengths and their functional classes for which expenditures were reported and those assumed by the model. The discrepancies in road lengths and their functional classification apply mainly to the municipal sector. Nevertheless, overall, there is a correspondence between the model's costs and the reported expenditures.

Calculation Procedure

The calculation model developed in this study was used to estimate the total annualized costs required for preserving, as well as constructing, the Canadian road infrastructure included in the study. Consequently, the total cost includes past construction costs or sunk costs. Annual expenditures reported by government agencies include only expenditures that are needed to cover future expenditures for preserving road infrastructure and for future system expansion. For this reason, the total unit costs calculated by the computational model were adjusted to exclude sunk costs. The adjusted annualized costs were then compared with the annual expenditures reported by the agencies. The comparisons were done in terms of capital and operating costs for both the provincial and municipal sectors.

The calculation procedure used to obtain and compare annual costs is schematically illustrated in Figure 8 as an six-step process. Steps 1 to 4 result in estimated annualized costs that are expected to be compatible with the reported annual expenditures. The last step yields the difference between the capital and operating costs estimated using the computational model and the capital and operating expenditures reported by the agencies. All costs discussed in the following description of the six calculation steps are annualized or annual costs that include overhead costs.

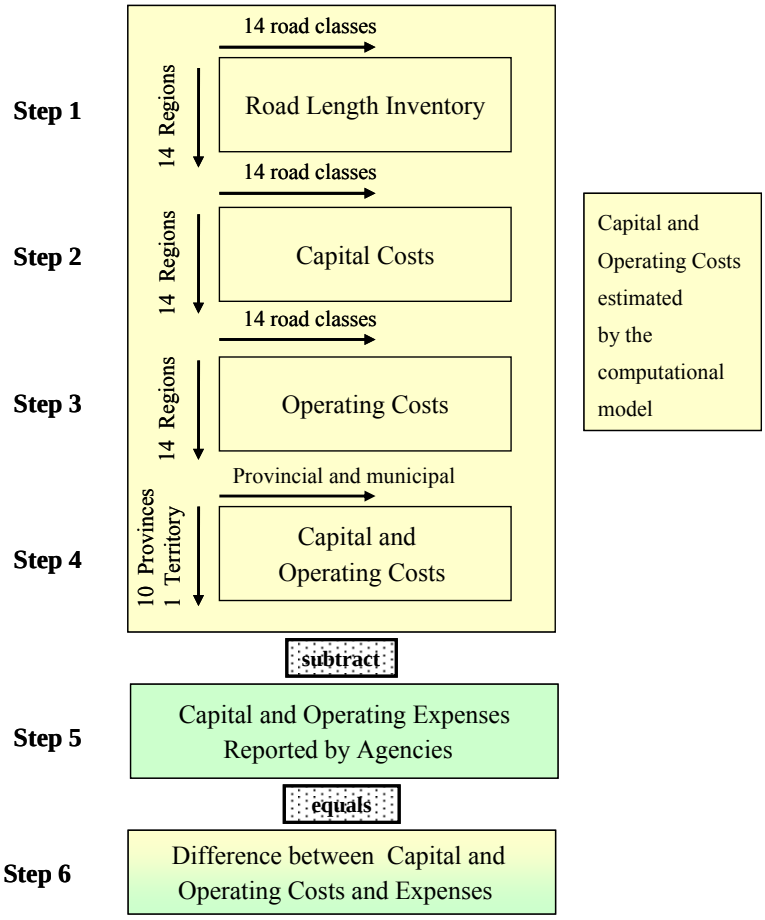


Figure 8. Schematic Diagram of the Comparison of Costs and Expenditures

Step 1 -- Development of Road Length Inventory

The road length inventory used for the cost comparison was the total composite inventory established in Chapter 6 and given in Table 14. The inventory was established using the best available data obtained from different sources. The inventory is in the form of a matrix with 14 rows representing the 14 geographical regions and 14 columns representing the14 road functional classes (Figure 8).

Step 2 -- Calculation of Capital Costs

The objective was to calculate capital costs that would correspond to capital expenditures reported by the agencies. Consequently, the calculation of capital costs included the addition of all maintenance and rehabilitation costs and a portion of the initial construction costs.

Maintenance and rehabilitation costs used in this study were defined as costs for specific preservation activities that are planned at least a year in advance. Consequently these costs are likely to correspond to capital expenditures reported by the agencies. Maintenance and rehabilitation costs – included in the capital costs – consisted of the maintenance and rehabilitation costs for pavements, bridges, and all other infrastructure component.

Initial construction costs included only a portion of the total construction costs that is likely to correspond to that portion of capital expenditures (reported by the agencies) that is used for new (initial construction). The portion of the initial construction costs that was included in the capital costs was based on the

average renewal rate of road infrastructure components. The renewal rate was, in turn, based on the average age of road infrastructure components established in Chapter 6, and given in Table 17 and Table 18. It was assumed that the existing renewal rate will remain unchanged in the future. For example, if the average age of bridges is 50 years, two percent of bridges are built or rebuilt every year, and the renewal rate of bridges is 0.02. Consequently, the model's capital cost that corresponds to the expenditure capital cost (reported by the agencies) can be calculated as the product of the total initial bridge cost and the renewal rate of 0.02. The calculation formula is given by Equation 6.

$$\sum_{1}^{3} Capital\ \cos t\ of\ a\ component = Initial\ \cos t\ of\ the\ component \times \left(\frac{1}{Average\ age\ of\ the\ component} \right) \quad \text{Equation 6}$$

Where:

Capital cost of a component =	The portion of the initial cost of a road infrastructure component that corresponds to the capital cost reported by agencies.
Component =	There are three different components, pavements, bridges and all other infrastructure. The summation sign applies to the three components.
. Initial cost of the component =	Initial cost of the component as calculated by the computational model and given on Cost Reporting Sheets Appendix E).
Average age of the component =	Estimated average of the component for a given geographical region (Table 18)

Step 3 -- Calculation of Operating Costs

Operating costs were calculated by adding routine maintenance costs and winter maintenance costs.

Step 4 – Summation of Capital and Operating Costs

Capital and operating costs established in Steps 2 and 3 were subdivided by road class, rural and urban design features, and by geographical regions. In Step 4, the disaggregated costs produced by the computational model were summarized to match the level of cost aggregation used by the reporting agencies, namely, capital and maintenance costs per province or territory reported separately for provincial and municipal infrastructure.

Step 5 – Summary of Capital and Operating Expenditures

The 5-year-average capital and operating expenditures reported by all levels of government, obtained from Transport Canada, were assembled in a tabular format. The tabular format matched the format of capital and operating costs calculated in Step 4.

Step 6 – Calculation of the Difference Between Costs and Expenditures

The difference between the capital and operating costs estimated by the computational model and the capital and operating expenditures reported by the agencies was summarized in a tabular format. The entire table of the estimated costs and reported expenditures, as well as differences between the two, is given at the end of Appendix D (Computational Model). Partial tables of the differences are presented and discussed in the following section.

Comparison of Model Costs with Reported Expenditures

The comparison of the annualized costs estimated by the model with the annual expenditures reported by the agencies has been done separately for operating and capital expenses and for provincial and municipal expenses.

Comparison of Provincial Operating Costs

Operating costs include routine road maintenance costs and winter road maintenance costs. Estimated and reported operating costs are compared in Table 54.

Table 54. Comparison of Annual Provincial Operating Costs

Province or Combined Territory	Provincial Operating Costs, millions of dollars			Difference Between Reported Expenditures and Costs Estimated by Model, %	
	Costs Estimated by Model	Reported Expenditures			
		Reported by Agency	Survey Results	Reported by Agency	Alternative Reporting
NL	93.4	63.0		-48%	
PE	30.6	50.0		39%	
NS	137.8	129.0	94.0	-7%	-47%
NB	90.1	139.0	104.8	35%	14%
QC	359.1	448.0	365.0	20%	2%
ON	152.3	512.0	150.0	70%	-2%
MB	76.2	155.0	71.6	51%	-6%
SK	103.2	193.0		47%	
AB	220.4	359.0		39%	
BC	75.8	485.0	325.0*	84%	77%
TR	29.4	51.0		42%	
Total	1,368.3	2,584.0		47%	

* Includes minor betterments

There are two types of *reported expenditures* in Table 54: Expenditures r*eported by agency* that are 5-year-average operating expenses that this study obtained from Transport Canada. Reported expenditures labelled *survey results* were obtained through Provincial Expenditure Surveys (discussed in Chapter 2). There are substantial differences in the values of these two types of expenditures. For example, for Ontario, operating costs *reported by agency* were $512.0 million whereas operating costs *survey results* were $150.0 million. Consequently, the difference between the reported expenditures and the estimated costs, given as a percentage in the last two columns of Table 54, depends on the type of *reported expenditures*.

It is believed that expenditures obtained through the surveys reflect better the definition of operating expenditures used in this study. The survey respondents answered a set of specific questions that contained the definition of operating expenditures. Unfortunately, only five provinces responded to the expenditure portion of the survey. The survey response obtained from British Columbia was not clear because operating costs included “minor betterments” which were not defined.

Alternative Sources of Provincial Expenditures

The possibility of obtaining additional information on provincial and municipal road-related expenditures by examining current provincial budget and expenditure statements available on the Internet was investigated. The results show that budget and expenditure statements available on the Internet are insufficient for reliable classification of various reported expenditure items into the categories of road operating expenditures and road capital expenditures. Two brief examples of challenges encountered are provided for Ontario and Saskatchewan.

Ontario Example

An excerpt from an Ontario expenditure statement, obtained from the Ontario Ministry of Transportation web site http://www.mto.gov.on.ca/english/about/bplan/2002_03.htm#performance is given in Table 55.

Table 55. Actual Spending by Ontario Ministry of Transportation in 2001/2002

Program	Expenditures, millions of dollars		Staff	Comments by ARA
	Operating	Gross Capital		
Transportation Policy and Planning	139.6	131.3	140	May include all transportation modes
Provincial Highways Management	260.0	659.7[(a)]	2,350	
Road User Safety	189.5	0.0	1,820	Mainly driver and vehicle licensing
Business Support	45.2	0.0	200	May include all transportation modes
Transportation Information and IT	46.7	0.0	190	
Total	681.0	791.0	4700	

(a) Does not include capital expenditures transferred from Ministry of Northern Development and Mines. These expenditures were over $210 million in 2001/02

According to data presented in Table 55, the operating cost for *Provincial Highways Management* in 2001/2002 was $260.0 millions, about 40 percent of the total operating cost ($681.0 million). The reported 5-year-average operating cost, (obtained through the auspices of Transport Canada) given in Table 54, was 512.0 million. The 2002/2003 operating cost, obtained through the Provincial Expenditure Survey, was $150.0 million. It is believed that the last number ($150.0 million) is the most reliable estimate of operating expenditures for provincial road infrastructure in Ontario.

Saskatchewan Example

Expenditure data extracted from Saskatchewan Highways and Transportation web site http://www.gov.sk.ca/finance/budget/budget03/estimates.pdf, are shown in Table 56. The operating expenditure of $193 million given in Table 54 is considerably higher than -- what appears to be a corresponding expenditure given in Table 56 -- of $59.3 million. However, it is possible that some of the expenditures reported for other programs, such as *Preservation of Transportation System,* belong to the operations.

Table 56. Estimated Spending by Saskatchewan Highways and Transportation

Summary of Expenditures	Estimated Expenditures, millions of dollars	
	2003-04	2002-03
Preservation of Transportation System	135.7	132.9
Operation of Transportation System	59.3	59.2
Construction of Transportation System	84.8	83.7
Other (Administration, accommodation, policy, etc.)	16.5	17.1

Summary

The comparison of (a) operating expenditures available from budget and expenditure statements with (b) operating costs estimated by the model indicates that without an additional guidance from provincial transportation agencies, preferably in the form of answers to the questions given in the Provincial Expenditure Survey, it is not possible to reconcile the differences between the model's operating costs and the expenditures reported by agencies.

There is a very good agreement between the reported expenditures and model costs for jurisdictions for which reported expenditures were obtained by surveys. The exception is Nova Scotia where the model costs are 47 percent higher than the expenditures. The reason for this discrepancy may be that the model assumes higher maintenance standards for local rural roads and perhaps for other roads as well, than the standards used in practice.

Comparison of Provincial Capital Costs

Capital costs include road maintenance costs and rehabilitation costs and the cost of new road construction. Estimated and reported operating costs are compared in Table 57.

In an ideal situation, if the model overestimates the reported capital expenditures, it means that the province is renewing its road infrastructure at a lower renewal rate than assumed by the model. This would apply to PE, NS, MB, SK, and TR (combined Territories). On the other hand, if the model underestimates the reported capital expenditures, it means that the province is renewing its road infrastructure at a higher renewal rate than assumed by the model. This would apply NL, NB, QC, ON, AB, and BC. However, as discussed in connection with data presented in Table 55 and Table 56, the reported capital expenditures are not considered to be reliable as it is unclear exactly what is included in the capital expenditures reported by the provinces. Also, capital expenditures estimated by the model depend on the assumed renewal rate, that was established as the rate required to maintain the average age of road infrastructure.

Table 57. Comparison of Annual Provincial Capital Costs

Province or Combined Territory	Provincial Capital Costs, millions of dollars		Difference Between Reported Expenditures and Costs Estimated by Model, %
	Costs Estimated by Model	Reported Expenditures	
NL	77.8	129.0	40%
PE	31.7	29.0	-9%
NS	185.8	49.0	-279%
NB	109.6	166.0	34%
QC	339.8	821.0	59%
ON	246.3	931.0	74%
MB	140.9	105.0	-34%
SK	82.6	67.0	-23%
AB	211.1	268.0	21%
BC	134.0	635.0	79%
TR	94.0	46.0	-104%
Total	1,653.5	3,246.0	49%

The significant influence of the average age on provincial capital costs in Ontario estimated by the model is shown in Figure 9. The average combined age of road infrastructure (for pavements and bridges, see Table 18) was estimated to be 31 years. If the combined age were estimated to be, for example, 20 years, the capital costs would be almost three times higher.

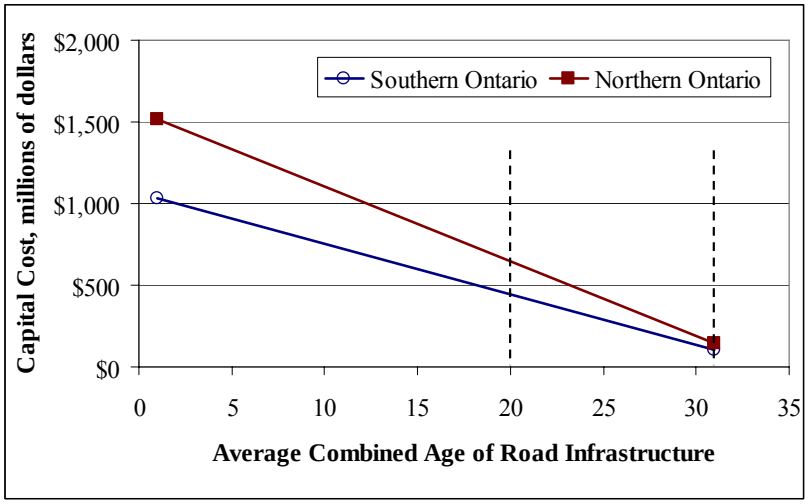


Figure 9. Influence of Average Combined Age on Capital Costs

It is also possible that the average ages of road infrastructure assumed by the model are approximately correct, but that the different average ages should be applied to different road classes. Particularly freeways should have a shorter average age than other roads. The shorter average age of freeways would increase the capital costs estimated by the model, particularly in Ontario, Québec, and British Columbia.

The two jurisdictions with salient differences between the estimated costs and reported expenditures are Nova Scotia and the combined Territories. Nova Scotia has about 20 percent larger provincial road network than New Brunswick, and has much larger freeway network. Yet, New Brunswick reported 3.4 times higher capital expenditures than Nova Scotia. The model, with its assumptions of expected costs and quantities, cannot fit both provinces simultaneously. It is possible that the rate of road investments in Nova Scotia is significantly lower than the rate in New Brunswick. The discrepancy for the combined territories are probably caused by the high renewal rate assumed by the model which assumes the average age of road infrastructure of only 23 years (Table 18).

Comparison of Annual Municipal Operating Costs

Municipal operating costs estimated by the model are compared with operating expenditures reported by agencies in Table 58.

Table 58. Comparison of Annual Municipal Operating Costs

Province or Combined Territory	Provincial Operating Costs, millions of dollars		Difference Between Reported Expenditures and Costs Estimated by Model, %
	Costs Estimated by Model	Reported Expenditures	
NL	50.7	61.0	17%
PE	0.0	8.0	
NS	17.8	86.0	79%
NB	56.8	82.0	31%
QC	771.9	1,102.0	30%
ON	876.3	1,490.0	41%
MB	237.7	158.0	-50%
SK	351.1	192.0	-83%
AB	798.6	640.0	-25%
BC	239.4	374.0	36%
TR	0.4	17.0	98%
Total	3,400.7	4,210.0	19%

The challenges and possible discrepancies of working with operating and capital expenditures reported by agencies, discussed in connection with provincial costs, apply also to municipal operating and capital expenditures. For this reason, they need not be repeated herein. However, there are three additional large potential sources of discrepancies between the costs and expenditures on the municipal level as discussed under the following headings:

- Discrepancies due to the differences in the municipal road network.
- Discrepancies due to inclusion of extraneous costs.
- Discrepancies due to the split between capital and maintenance expenditures.

Discrepancies due to the Differences in the Municipal Road Network

The municipal operating and capital costs estimated by the model are for the road network defined in Table 14 (Chapter 4). There is a nearly linear relationship between the estimated costs and the size of the

network. For example, a ten percent increase in the size of the network results in a 10 percent increase in the estimated operating and capital costs. However, the municipal expenditures reported by the agencies are for the network that has not been defined. It can only assumed that this road network is similar to the network given in Table 14 that was used for the model estimates. The differences in the network size may lead to insurmountable differences between the estimated costs and reported expenditures. For example, the estimated operating cost in Prince Edward Island is zero because there are no municipal roads in Table 14 for Prince Edward Island. (The NRCan study reported that there are no municipal roads in Prince Edward Island apart from residential roads and streets). Given that there were no roads reported, there were no operating costs. On the other hand, the reported operating cost given in Table 58 is 8.0 million -- given for a network of unknown length and characteristics.

Discrepancies due to Inclusion of Extraneous Costs

It is probable that the municipal operating and capital costs reported by agencies include extraneous costs such as costs for residential streets, sidewalks, costs associated with underground utilities and the restoration of cuts in pavements for utilities, and possibly even transit costs. The inclusion of extraneous costs could significantly inflate the reported operating and capital expenditures.

Discrepancies due to the Split between Capital and Maintenance Expenditures

The distinction between the operating and maintenance expenditures may not be as rigorously observed on the municipal level as it is observed on the provincial level.

Summary

Considering the uncertainties stemming from possible discrepancies in reporting municipal operating expenditures, it would be speculative at best to discuss individual expenditure numbers given in Table 58 at this time.

Comparison of Annual Municipal Capital Costs

Municipal capital costs estimated by the model are compared with capital expenditures reported by agencies in Table 59. In most provinces, the municipal operating costs given in Table 59 are higher then the corresponding municipal capital costs given in Table 58. The reverse is true for provincial costs: Provincial operating costs tend to be lower than provincial capital costs. These trends apply to both costs estimated by the model and those reported by the agencies. This conclusion supports the assumption that the average age of municipal road infrastructure is higher than the average age of provincial road infrastructure (Table 18).

Table 59. Comparison of Annual Municipal Capital Costs

Province or Combined Territory	Muncipal Capital Costs, millions of dollars		Difference Between Reported Expenditures and Costs Estimated by Model, %
	Costs Estimated by Model	Reported Expenditures	
NL	43.7	32.0	-37%
PE	0.0	7.0	
NS	25.9	40.0	35%
NB	54.2	43.0	-26%
QC	650.7	558.0	-17%
ON	875.3	1,135.0	23%
MB	206.6	79.0	-161%
SK	390.2	96.0	-306%
AB	614.0	461.0	-33%
BC	389.6	319.0	-22%
TR	0.9	11.0	92%
Total	3,251.1	2,781.0	-17%

Comparison of Annual Municipal Total Costs

Total municipal costs were obtained by adding operating costs (Table 58) and capital costs (Table 59). The result is presented in Table 60.

Overall, according to Table 60, the difference between the total municipal costs estimated by the model and the total municipal costs reported by the agencies is about five percent. While this result is very encouraging, there are many discrepancies between the estimated and reported operating and capital costs for individual provinces.

The improvement in the correspondence between the costs estimated by the model and expenditures reported by the agencies requires a two-prong approach including more reliable expenditure data from the agencies and improved estimates from the model. Specific recommendations for improvements in the model are summarized in the following Chapter.

Table 60. Comparison of Annual Municipal Total Costs

Province or Combined Territory	Muncipal Total Costs, millions of dollars		Difference Between Reported Expenditures and Costs Estimated by Model, %
	Costs Estimated by Model	Reported Expenditures	
NL	94.4	93.0	-2%
PE	0.0	15.0	
NS	43.7	126.0	65%
NB	111.0	125.0	11%
QC	1,422.6	1,660.0	14%
ON	1,751.6	2,625.0	33%
MB	444.2	237.0	-87%
SK	741.3	288.0	-157%
AB	1,412.6	1,101.0	-28%
BC	629.0	693.0	9%
TR	1.3	28.0	95%
Total	6,651.8	6,991.0	5%

12. RECOMMENDATIONS

This chapter provides a summary of main recommendations to improve project results. The recommendations are grouped under the following headings:

- General recommendations.
- Identification and sectioning of road infrastructure.
- Cost estimates.
- Comparison of estimated costs and reported expenditures.
- Traffic characteristics.

General Recommendations

1. All cost estimates should be updated when more or improved information and data become available. The updates can be easily accomplished using the computational model.

2. The procedures developed in this study for the estimation of the total annualized unit costs of road infrastructure can easily be adapted for the estimation of investments required in various regions of Canada to preserve road infrastructure, or to estimate the level of investments required to maintain road infrastructure at the desired level of service.

3. Results of this study can be used as the basis for the development of marginal costs for vehicle miles of travel for different vehicle types. This favourable situation arises from the development of life-cycle costs for 14 road categories in each geographical region. The 14 categories provide sufficiently detailed cost trends for the development of marginal cost functions [3].

4. The results of the study can be used to allocate annualized road costs to different vehicle types, such as cars and trucks.

Identification and Sectioning of Road Infrastructure

5. Ideally, all provincial and territorial jurisdictions should use a similar definition of road functional classes. The use of a uniform definition of road functional classes would eliminate the need to assign agency-specific road classes to the functional classes established in this study. The use of uniform road classes is also recommended on the municipal level.

6. In general, provinces do not maintain the inventory of municipal infrastructure and the extent of the municipal infrastructure is unknown. To obtain the inventory of the municipal infrastructure, it is necessary for provinces, or other provincial-level institutions, to systematically gather and manage municipal infrastructure data.

Cost Estimates

7. The accuracy of cost estimates can be improved by dividing the road network into more road categories. There are over 200,000 2-lane equivalent kilometres of provincial and territorial roads in Canada. ARA has characterized this provincial and territorial network by 112 different road categories. However, virtually each road kilometre has unique cost features. A similar situation exists for the municipal road network where over 650,000 2-lane equivalent kilometres was divided into 84 road categories.

8. Bridge costs can be improved by obtaining data on the distribution of bridges into road functional classes. Most agencies do not have such data and their development will require considerable time and effort. Consideration should be given to the data development well ahead of the expected use.

9. Estimates of quantities (e.g., the expected length of steel guide rail per kilometre of arterial road) should be improved by more rigorous examination of construction documents. For example, HERS estimates [14] were based on detailed examination of more than 2,300 projects[12].

10. The cost estimates for terrain changes, and for clearing and grubbing prior to road construction, often constitute a substantial part of capital costs and are particularly difficult to establish. Additional work involving the examination of past construction contracts is needed to obtain more reliable estimates for earth work quantities.

11. Considering that the average age of road infrastructure components has a large impact on the estimated capital costs, age estimates should be improved. In particular, consideration should be given to obtaining (and using) different average ages for different geographical areas and for different road classes (e.g., freeways versus local roads).

Comparison of Estimated Costs and Reported Expenditures

12. The improvement in the correspondence between the costs estimated by the model and expenditures reported by the agencies requires a two-prong approach: More reliable expenditure data from the agencies and improved estimates from the model.

13. Operating and capital expenditures for road infrastructure reported by agencies need to be judiciously assessed. Some of the problems encountered include unclear definitions of operating and capital costs, missing links between road expenditures and the specific road network, and the inclusion of extraneous expenditures.

Traffic Characteristics

14. Traffic data presented in Chapter 5 should be improved by securing additional data from provincial and municipal agencies.

15. The reporting of municipal traffic data by province (or by geographical region) masks large differences between traffic characteristics of large and small municipalities. For example, it is questionable to provide an average AADT volume on municipal arterial roads that includes both Toronto and Caledonia, Ontario. It would be preferable to provide traffic characteristics separately for large, medium, and small municipalities.

16. For cost allocation purposes, traffic characteristics should be provided for more than the current two vehicle types (passenger cars and commercial vehicles). The lowest recommended number of vehicle types is 4: Passenger cars and motorcycles, 2 and 3-axle trucks, 5-axles trucks, and 6-and-more-axle trucks.

[12] However, in spite of this large sample size, there were still significant gaps in data [14].

13. CONCULDING REMARKS

This technical report and its findings are based on information provided to ARA by Canadian Transportation Agencies and is supplemented by our experience with economic analysis, life-cycle costing and pavement maintenance and rehabilitation design. While ARA has endeavoured to ensure the accuracy of the information, caution should be exercised when using isolated pieces of information. Canadian Transportation Agencies do not have a standard format of data reporting across the country.

APPLIED RESEARCH ASSOCIATES, INC.

Dr. Jerry Hajek, P.Eng.
Principal Engineer

David K. Hein, P.Eng.
Principal Engineer

14. REFERENCES

[1] Vanier, D.J., and Rahman, S. A Summary of the Canadian Survey on Municipal Infrastructure Assets, Report NRC-47046, http://irc.nrc-enrc.gc.ca/irpubs. Also published in Public Sector Digest, November 2004, pp. 1-3.

[2] Ontario Roads Coalition, Ontario's Municipal Roads 2003. www.orga.org

[3] Hajek, J.J., Smith, K.L., Rao, S.P., and Darter, M.I., Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Condition", Report MI-183, Ontario Ministry of Transportation, March 2001, ISBN 0-7794-0807-1.

[4] Canadian Standards Association, Canadian Highway Bridge Design Code, CAN/CSA-S6-00, Toronto, Ontario.

[5] Statistics Canada, Catalogue No. 61-205-XIB, Private and Public Investment in Canada, Intentions 2004. Also, private communication with Mr. Gilbert Paquette, Statistics Canada, Investment and Capital Stock Division.

[6] Treff, K, and Perry, D.B., Finances of the Nation 2003, Canadian Tax Foundation 2003, http://www.ctf.ca/FN2003/finances2003.asp.

[7] Agrawal, A.C., Hajek, J.J. et al, Impact on the Highway Infrastructure of Existing and Alternative Vehicle Configurations and Weight Limits, Technical Report and General Report, Ministry of Transportation of Ontario, 1201 Wilson Ave., Downsview, Ont., M3M 1J8, May 1997.

[8] Transportation Association of Canada, Transportation in Canada, A Statistical Overview, 1995.

[9] Joint task force on Traffic Monitoring Standards, AASHTO Guidelines for Traffic Data Programs, ISBN 1-56051-054-4, 1992.

[10] U.S. Department of Transportation, Federal Highway Administration, *2001 Traffic Monitoring Guide*, www.fhwa.dot.gov/ohim/tmguide/index.htm

[11] Cambridge Systematics, *Highway Economic Requirements System*, HERS Technical Report, U.S. Department of Transportation, Federal Highway Administration December 2000.

[12] Conger, S.M., *Winter Highway Operations*, NCHRP Synthesis 344, Transportation Research Board, Washington, D.C., 2005.

[13] California Department of Transportation, *Analysis of the 2004-05 Budget Bill*, California Department of Transportation, Legislative Analyst's Office, site www.lao.ca.gov/analysis_2004/Transportation.

[14] Alam, M., Timothy D., and Sissel, S., *Development of Highway Improvement Capital Cost Table for System-Wide Cost-Benefit and Life Cycle Cost Analysis of Highway Investment Need*, paper presented at the 2005 Annual Meeting of the Transportation Research Board, Washington, D.C., January 2005.

Appendix A

Model Survey Package

This Appendix contains a model survey package. The model survey package was developed to provide customized (province and/or municipality-specific) survey questionnaires. The model survey package was originally developed for Ontario and was then customized by the regional representatives for other provinces and territories to reflect local provincial and municipal conditions.

The model survey package consists of four individual survey packets summarized in the following table.

Name of Survey Packet	**Main Parts of the Survey Packet**	**Number of pages**
Provincial Expenditure Survey (PES)	Introduction letter from Transport Canada*	1
	Introduction letter for PES	1
	Survey Questionnaire, PES	2
Provincial Highway Inventory Survey (PHIS)	Introduction letter from Transport Canada	1
	Introduction letter for PHIS	1
	Survey Questionnaire, PHIS	4
Provincial Cost Survey (PCS)	Introduction letter from Transport Canada	1
	Introduction letter for PCS	1
	Survey Questionnaire, PCS	4
	Road Inventory Sheet**	1
Municipal Survey (MS)	Introduction letter from Transport Canada	1
	Introduction letter for MS	1
	Survey Questionnaire, MS	3
	Road Inventory Sheet**	1

Notes:
* This letter is also available in French and the French version of the letter was used in Québec.
** Only one Road Inventory Sheet is included in this Appendix. Typically, there are 5 to 8 Road Inventory Sheets for provincial roads and 6 Road Inventory Sheets for municipal roads.

The electronic version of the model survey package highlights those parts of the package that need to be customized by using a blue font.

The rest of Appendix A provides a copy of the entire survey package arranged in the order used in the above table.

Transport Canada / Transports Canada

Your file Votre référence

Our file Notre référence

February 08, 2005

Dear Sir\Madam:

At the beginning of 2004, a project was initiated by a federal-provincial-territorial Task Force to investigate the "full costs" of transportation, including the financial costs of the provision and use of transport facilities and services, as well as the non-monetary costs of the impacts of congestion delays, accidents and environmental damage. The investigation includes all modes of transport and their networks and services, whether provided by governments or the private sector. The project is expected to take three years to complete.

As part of the project, Transport Canada is seeking to estimate road costs by the various levels of government, including those costs incurred by municipalities. In order to develop the cost estimates of the road network, Transport Canada has engaged the consulting firm Applied Research Associates (ARA). On behalf of the federal-provincial-territorial Task Force, we most sincerely request your full cooperation in assisting the consulting team and Transport Canada in completing this project, and express our appreciation in advance for all the assistance you can provide.

If you have further questions regarding the nature and scope of this project please contact the project manager, Bruno Jacques, at 613-990–5340.

Yours sincerely,

Roger Roy

Roger Roy
Director General
Economic Analysis
Policy Group
Transport Canada

Canada

Transports Canada Transport Canada

Your file Votre référence

Our file Notre référence

Le 8 février 2005

Madame, Monsieur,

Au début de 2004, un projet a été lancé par un groupe de travail fédéral-provincial-territorial afin d'examiner les "coûts totaux" du transport, y compris les coûts financiers liés à la fourniture et à l'usage des installations et des services de transport, ainsi que les coûts non-monétaires des retards dus à la congestion, des accidents et des dommages environnementaux. L'examen porte sur tous les modes de transport ainsi que sur leurs réseaux et services, qu'ils soient fournis par les gouvernements ou le secteur privé. Le projet devrait être complété en trois ans.

Dans le cadre de ce projet, Transports Canada cherche à estimer les coûts liés aux routes pour tous les niveaux de gouvernement, y compris les coûts assumés par les municipalités. Afin de développer des estimations de coûts du réseau routier, Transports Canada a retenu les services de la société d'experts-conseils *Applied Research Associates* (ARA). Au nom du groupe de travail fédéral-provincial-territorial, nous sollicitons très sincèrement votre entière collaboration afin d'aider l'équipe d'experts-conseils et Transports Canada à compléter ce projet. Nous aimerions vous exprimer à l'avance notre gratitude pour toute l'aide que vous pourrez nous accorder.

Si vous avez des questions sur la nature et la portée de ce projet, veuillez communiquer avec le gestionnaire responsable, Monsieur Bruno Jacques, au (613) 990–5340.

Veuillez agréer, Madame, Monsieur, l'expression de mes sentiments distingués,

Roger Roy

Roger Roy
Directeur général
Analyse économique
Groupe des politiques
Transports Canada

Canada

Introduction Letter for Provincial Expenditure Survey

March, 2005

Mr. Alan Stillar
Team Leader – Federal Provincial Relations
Strategic Policy and Planning Office
Ontario Ministry of Transportation
439 University Ave., 2nd Floor, Suite 200
Toronto, ON M5G 1Y8

Subject: Study on Representative Capital and Maintenance Costs of Roads

Dear Mr. Stillar:

As discussed during our recent telephone conversation, Applied Research Associates Inc. (ARA) have been engaged by Transport Canada to work on the above Study. Additional information about this study is provided in the attached letter from Mr. Roger Roy, Director General, Economic Analysis, Transport Canada.

We have already received summary information regarding the extent of the provincial highway network in Ontario through your auspices. However, the study design calls for additional data, including data on access roads and on maintenance expenditures for highways in Ontario. The specific data that we hope to obtain from your office are summarized in the attached survey questionnaire.

If need be, we are prepared to participate actively in the data processing that may be required. Please let me know when and how we can work with you to obtain data for this important study.

Thank you for your help.

Sincerely,

Jerry Hajek, Ph.D., P. Eng.
Principal Engineer

Encl.: A survey questionnaire
A letter from Mr. Roger Roy, Transport Canada

Study of Representative Capital and Maintenance Costs of Roads
Provincial Expenditure Survey, March 2005

This questionnaire is distributed to the members of the Full Cost Investigation Task Force, Policy Planning and Support Committee. The questionnaire is about infrastructure investments. We respectfully ask you to complete the survey. If some answers require calculations, we are prepared to do them. Thank you for your help.

Respondent Information

Name: _____ Title: _____

Agency: _____

Phone: _____ Fax: _____

Email: _____

Cost of Routine Highway Maintenance

What is your typical (or 2003) annual budget (or expenditure) for routine maintenance of highways? _____* (Routine maintenance includes minor repairs such as filling potholes, minor guide rail repairs, and minor bridge repairs.)

Are there any additional in-house (material and/or labour) expenditures for routine maintenance?

Yes ☐ No ☐

If Yes, what is the amount of the additional annual in-house expenditures? _____

Is there somebody else in your organization we should contact regarding expenditures on routine maintenance?

Name:_____ Tel. No._____ Email_____

Cost of Winter Maintenance

What is your typical (or 2003) annual budget (or expenditure) for winter maintenance (snow removal and ice control)? _____ *

Are there any additional in-house (material and labour) expenditures for winter maintenance?

Yes ☐ No ☐

If Yes, what is the amount of the additional annual in-house expenditures? _____

Is there somebody else in your organization we should contact regarding expenditures on winter maintenance?

Name:_____ Tel. No._____ Email_____

* **Recommended format for reporting expenditures on routine maintenance and winter maintenance**

Functional class	Routine maintenance		Winter maintenance	
	Southern Ontario	Northern Ontario	Southern Ontario	Northern Ontario
Arterial				
Collector				
Local				
Total				

Freeway: A divided highway with full control of access.
Arterial: A two-lane or a multi-lane highway that carries significant volumes of long distance traffic at high speeds. There is a high degree of access control.
Collector: A two-lane or a multi-lane highway that balances traffic flow needs with access. Access to the highway is governed by traffic flow concerns and by safety.
***Local*:** A two-lane or a multi-lane highway that primarily provides access to local land users. Access to the highway is controlled by safety.

Expenditures on Access Roads

Access roads are located on public (crown) land and provide access to resources (forest, mineral extraction, recreation areas, etc.). Typically, they are not part of the numbered highway network. Access roads are typically built by the industry, but some may be constructed and maintained using public money.

What is the total length of access roads in your Province? _____

Which percentage of access roads were constructed using public funds? _____

Which percentage of access roads is maintained using public funds? _____

What is your typical (or 2003) annual budget (or expenditure) for the construction and maintenance (summer maintenance only) of access roads? _____

Which percentage of the above budget (or expenditure) is for maintenance only? _____

Are there any restrictions on the use of access roads by general public? Yes ☐ No ☐
If Yes, please describe the restrictions _____

Is there somebody else in your organization we should contact regarding expenditures on access roads?
Name:_____ Tel. No._____ Email_____

Thank you for your participation and help. Please send the completed questionnaire to Jerry Hajek by fax (416-621-4917) or by email Hajek@sprint.ca.

Jerry Hajek, Ph.D., P.Eng., Principal Engineer
Applied Research Associates, Inc.
5401 Eglinton Avenue West, Suite 204
Toronto, Ontario M9C 5K6
Telephone: 416-621-9555; Facsimile: 416-621-4917
Email hajek@sprint.ca

Introduction Letter for Provincial Highway Inventory Survey

March, 2005

Mr. Sarath Liyanage
Head, Program Planning and Evaluation Office
Program Development Branch, 4th Floor
301 St. Paul Street, St. Catharines
ON L2R 7R4

Subject: Study on Representative Capital and Maintenance Costs of Roads

Dear Mr. Liyanage:

As discussed during our recent telephone conversation, Applied Research Associates Inc. (ARA) have been engaged by Transport Canada to work on the above Study. Additional information about this study is provided in the attached letter from Mr. Roger Roy, Director General, Economic Analysis, Transport Canada.

The study is supported by the Council of Deputy Ministers Responsible for Transportation and Highway Safety, and is directed by the Full Cost Investigation Task Force. The Ontario representative on this Task Force is Mr. Alan Stillar, Strategic Policy and Planning Office, Ontario Ministry of Transportation, 439 University Ave., 2nd Floor, Suite 2000, Toronto, ON M5G 1Y8, (416) 212-1931; Alan.Stillar@mto.gov.on.ca.

We have already received summary information regarding the extent of the provincial highway network in Ontario through of Mr. Stillar's auspices. However, the study design calls for additional data on provincial and municipal highways and bridges in Ontario. The data that we seek are summarized in the attached questionnaire.

We do not expect you to have all the answers. I would like to discuss with you the feasibility of obtaining the data and the work required to succeed. We are prepared to participate actively in the data processing that may be required. Please let me know when and how we can work with you to obtain data for this important study.

Thank you for your help.

Sincerely,

Jerry Hajek, Ph.D., P. Eng.
Principal Engineer

Encl.: A letter from Mr. Roger Roy, Transport Canada and a survey questionnaire
cc: Mr. Alan Stillar, Strategic Policy and Planning Office

Study of Representative Capital and Maintenance Costs of Roads
Provincial Highway Inventory Survey, March 2005

This questionnaire is about the size, type, and age of provincial and municipal infrastructure in Ontario. We respectfully request your assistance in completing the survey. If some answers require calculations, we are prepared to do them. Thank you for your participation in this survey.

Respondent Information

Name: _____ Title: _____

Agency: _____

Phone: _____ Fax: _____

Email: _____

Please forward the completed questionnaire to:

Jerry Hajek, Ph.D., P.Eng., Principal Engineer
Applied Research Associates, Inc.
5401 Eglinton Avenue West, Suite 207
Toronto, Ontario M9C 5K6
Telephone: 416-621-9555; Facsimile: 416-621-4917
Email hajek@sprint.ca

Provincial Highway Inventory

Please enter the numbers in terms of 2-lane equivalent km.

Provincial Highways, 2-lane equivalent km				
Functional Class	Southern Ontario		Northern Ontario	
	Rural	Urban	Rural	Urban
Freeway				
Arterial				
Collector				
Local				
Total				

Freeway: A divided highway with full control of access.
Arterial: A two-lane or a multi-lane highway that carries significant volumes of long distance traffic at high speeds. There is a high degree of access control.
Collector: A two-lane or a multi-lane highway that balances traffic flow needs with access. Access to the highway is governed by traffic flow considerations and by safety concerns.
***Local*:** A two-lane or a multi-lane highway that primarily provides access to local land users. Access to the highway is controlled by safety concerns.

Urban Highway section has predominantly an urban alignment, including curb and gutter and a closed drainage system.

Traffic Volumes on Provincial Highways

Please enter the average 2003 AADT (Annual Average Daily Traffic) volume, and the range of AADT volume, for the highway sections belonging to a given functional class. If you do not have 2003 data, please enter the most recent data.

Provincial Highways, Average AADT and AADT range for Year:_____								
Functional Class	Southern Ontario				Northern Ontario			
	Rural		Urban		Rural		Urban	
	Average	Range	Average	Range	Average	Range	Average	Range
Freeway								
Arterial								
Collector								
Local								

Please enter the 2003 average percentage of commercial vehicles (trucks and buses) and the range of commercial vehicles in the traffic stream. If you do not have 2003 data, please enter the most recent data.

Provincial Highways, Percentage of Commercial Vehicles for Year:_____								
Functional Class	Southern Ontario				Northern Ontario			
	Rural		Urban		Rural		Urban	
	Average	Range	Average	Range	Average	Range	Average	Range
Freeway								
Arterial								
Collector								
Local								

Is there a province-wide database that contains traffic data (traffic volumes, truck percentages) for municipal roadways? If yes, how can we gain access to it? _____

Is there somebody else in your organization we should contact regarding traffic volumes?

Name:_____ Tel. No._____ Email_____

Inventory of Provincial Highway Bridges

What is the minimum span of a structure to be classified as a bridge? ☐ 3 m ☐ 6 m Other:_____

Estimated Number and Size of Highway Bridges

Functional Class*	**Number of bridges***	**Estimated average bridge deck size**, m^2**
Freeway		
Arterial		
Collector		
Local		
Total*	*	**

* If unavailable by functional class, please provide the total number of bridges.
** If unavailable by functional class, please provide an average bridge deck area for all bridges combined.

Inventory of Major Provincial Highway Structures

Please complete the following table by listing all major highway structures in Ontario. Major structures include bridges longer than 200 m, tunnels longer than 80 m, retaining walls with the exposed surface are greater than 400 m^2, and snow sheds longer than 80 m.

Major highway structure							
Description of Structure	Size[1)]	Age[2)]	Functional Class[3)]	Southern Ontario		Northern Ontario	
				Rural	Urban	Rural	Urban

[1)] Please use m for the length of bridges, tunnels, and snow sheds; m^2 for the exposed area of retaining walls.
[2)] Age of the structure in years since the time of the initial construction or a major reconstruction
[3)] Functional class of the highway where the structure is located. Please use the following abbreviations:
F = Freeway, A = Arterial, C = Collector, L = Local.

Is there somebody else in your organization we should contact regarding the inventory of provincial bridges and major structures?
Name:_____ Tel. No._____ Email_____

Estimated Age of Provincial Highway Infrastructure, years

	Years
Average age of pavements since the time of the last major reconstruction*	
Average age of pavements since the time of the last resurfacing or rehabilitation	
Average age of bridges since the time of the initial construction or major reconstruction**	
Average time of bridges since the time of a significant maintenance or a rehabilitation action	

* Typically includes changes to granular layers of the pavement structure. If there was no major reconstruction, please consider the age since the initial construction.
** Typically includes substantial changes in the bridge superstructure.

Is there somebody else in your organization we should contact regarding the age of highway infrastructure?
Name:_____ Tel. No._____ Email_____

Municipal Roads

Please enter the numbers in terms of 2-lane equivalent kilometres. (Please do not include residential streets.)

Municipal Roads, 2-lane equivalent km		
Functional Class	Southern Ontario	Northern Ontario
Arterial		
Collector		
Local		
Total		

Arterial Resembles a highway going through a municipality.
Collector Feeds traffic from an *Arterial* to the *Local* roads or vice-versa.
Local All other roadways that are not residential streets and are also not arterial or collector roads.

Municipal Bridges

What is the minimum span of a structure to be classified as a bridge? ☐ 3 m ☐ 6 m Other:_____

Estimated Number and Size of Municipal Highway Bridges

Functional class*	**Number of bridges***	**Estimated average bridge deck size**, m^2**
Arterial		
Collector		
Local		
Total*		

* If unavailable by functional class, please provide the overall total number of bridges.
** If unavailable by functional class, please provide an overall average bridge deck size

Please estimate the percentage of municipal highway bridges that are on residential streets _____

Thank you for your participation and help. Please send the completed survey to Jerry Hajek by fax (416-621-4917).

Introduction Letter for Provincial Cost Survey

February 15, 2005

Mr. XXX
Manager, Pavements and Foundations Section
Materials, Engineering, and Research Office
2nd Floor, Central Building
1201 Wilson Avenue
Downsview, ON M3M 1J8

Subject: Study of Representative Capital and Maintenance Costs of Roads

Dear Mr. XXX

As discussed during our recent telephone conversation, Applied Research Associates Inc. (ARA) have been engaged by Transport Canada to work on the above Study. Additional information about this study is provided in the attached letter from Mr. Roger Roy, Director General, Economic Analysis, Transport Canada.

The study is supported by the Council of Deputy Ministers Responsible for Transportation and Highway Safety, and is directed by the Full Cost Investigation Task Force. The Ontario representative on this Task Force is Mr. Alan Stillar, Strategic Policy and Planning Office, Ontario Ministry of Transportation, 439 University Ave., 2nd Floor, Suite 2000, Toronto, ON M5G 1Y8, (416) 212-1931; Alan.Stillar@mto.gov.on.ca.

As part of the study, we require information on highway construction costs as summarized in the attached survey questionnaire. The questionnaire deals with miscellaneous highway construction costs, bridge costs, and pavement costs. It is in the last area where we hope to benefit most from your expertise and the expertise of your staff.

I would like to discuss with you the feasibility of obtaining the data, and the work required to succeed. We are prepared to participate actively in the data processing that may be required. Please let me know when and how we can work with you to obtain data for this important study.

Thank you for your help.

Sincerely,

Jerry Hajek, Ph.D., P. Eng.
Principal Engineer

Encl.: A letter from Mr. Roger Roy, Transport Canada and a survey questionnaire.

cc: Mr. Alan Stillar, Strategic Policy and Planning Office

Study of Representative Capital and Maintenance Costs of Roads
Provincial Cost Survey, March 2005

This questionnaire is about typical 2003 highway construction costs. We respectfully request your assistance in completing the survey.

- If you do not have a cost for an item on the list, but have it for a similar item, please provide the cost of the similar item. Also, if your have costs for other than 2003 year, please provide them.
- If you are making key assumptions when estimating costs, please note them on the questionnaire.
- If some answers require calculations, we are prepared to do them.

Respondent Information

Name: _____ Title: _____

Agency: _____

Phone: _____ Fax: _____

Email: _____

If you have any questions or concerns please contact:

Jerry Hajek, Ph.D., P.Eng., Principal Engineer
Applied Research Associates, Inc.
5401 Eglinton Avenue West, Suite 207
Toronto, Ontario M9C 5K6
Telephone: 416-621-9555; Facsimile: 416-621-4917
Email hajek@sprint.ca

Highway Construction Costs
(2003 supply and install costs)

Work Item (supply and install)			**Provincial**		**Municipal**	
Description	**Type**	**Unit**	**South**	**North**	**South**	**North**
Clearing and grubbing		m^2		Typical change in unit costs compared to South, percent _____%	Typical change in unit costs compared to Provincial costs, percent _____%	Typical change in unit costs compared to South, percent _____%
Grading	Earth excavation	m^3				
	Rock excavation	m^3				
	Extra fill	m^3				
Landscaping	Sodding and top soil	m^2				
	Seeding + mulching + top soil	m^2				
Drainage	Curb and gutter (PCC, straight)	m				
	500 mm pipe culvert + end sections	m				
	1500 mm wide box culvert	m				
	Storm water sewers for two-lane road	km				
Guard rail	Concrete median	m				
	Steel guardrail at shoulder	m				
	3-cable guide rail at shoulder	m				
Fencing, Gates	Chain link fence	m				
	Wire fence	m				
Lighting	High mast	km				
	Standard	km				
Painting of traffic lanes (for a two-lane highway)		km				

Bridge Construction Costs

Highway Functional Class*	Typical New Construction Cost per m^2 of Bridge Deck			
	Provincial		Municipal	
	South	North	South	North
Freeway		Typical change in unit costs compared to South, percent _____%	Typical change in unit costs compared to Provincial costs, percent _____%	Typical change in unit costs compared to South, percent _____%
Arterial				
Collector				
Local				
Average*	*			

* For the definition of Highway Functional Classes, please see the last page.

* If unavailable by highway functional class, please estimate the average cost per m^2 of bridge deck for all bridges. combined. If the average cost is not available, please estimate the cost for the most typical bridge type used.

If specific cost information is available by bridge type, and the bridge type correlates with the highway functional class, please provide us with this information.

Bridge Maintenance and Rehabilitation Treatments in Southern Ontario

Highway Functional Class*	Estimated cost for a typical maintenance or rehabilitation treatment† (per m^2 of bridge deck area)		Estimated typical frequency between maintenance and rehabilitation treatments (years)	
	Provincial Bridges	Municipal Bridges	Provincial Bridges	Municipal Bridges
Freeway				
Arterial				
Collector				
Local				
Average*	*	*	*	*

* For the definition of Highway Functional Classes, please see the last page.

* If unavailable by highway functional class, please estimate the overall average cost per m^2 of bridge deck.

† Includes major treatments such as installation of cathodic protection, waterproofing of deck, repairs to superstructure, modification/replacement of expansion joints and bearings, and coating of all structural steel in structure.

- Estimated change in typical maintenance or rehabilitation costs in Northern Ontario compared to Southern Ontario _____%
- Estimated change in typical frequency of maintenance or rehabilitation treatments in Northern Ontario compared to Southern Ontario _____%

Do you have any additional information that would enable us to estimate new construction costs, and maintenance and rehabilitation costs, for bridges by highway functional class?

Yes ☐ No ☐ If Yes, how can we obtain the data? _____

Is there somebody else in your organization we should contact regarding the construction and maintenance costs of bridges?

Name:_____ Tel. No._____ Email_____

Pavement Construction, Maintenance and Rehabilitation Costs

1996 unit construction costs for paving materials given in the table below were obtained from the MTO's Project Value System (the predecessor of Highway Costing system). The costs are "supply and install" costs.

Would you please:

- Update the table by adding the most recent costs for which data are available (say for 2003) **or** estimate the overall percentage increase in unit costs between 1996 and 2003. _____%

- Estimate the overall difference between provincial unit costs and municipal unit costs. (E.g., to obtain municipal unit costs multiply the provincial units cost by 1.05.)
  Recommended multiplication factor to estimate municipal costs (using provincial costs) is: _____

Item	Description	Units	1996 Unit Costs		2003 Unit Costs	
			South	North	South	North
Surface	Open Friction Course	tonne	$66.54			
	Dense Friction Course	tonne	$51.50	$51.50		
	HL-1	tonne	$45.78	$47.84		
	HL-4	tonne	$41.52	$41.52		
Binder	Heavy Duty Binder	tonne	$41.93	$45.78		
	Medium Duty Binder	tonne	$41.93	$43.91		
	HL-8	tonne	$36.72	$37.44		
OGDL	Open Graded Drainage Layer	tonne	$31.79			
Base	Granular A	tonne	$9.40	$9.10		
Subbase	Granular B	tonne	$7.00	$7.00		
Subdrains	Includes trenching and outlets, m	m				

Unit costs for selected maintenance and rehabilitation actions

Description	Units	1996 Unit Costs		2003 Unit Costs	
		South	North	South	North
Rout and seal	m	$1.50	$1.50		
Milling of asphalt pavement	tonne	$10.00	$10.00		
Spot repairs of 10 to 20 percent of a section: Milling 40 mm of the surface AC layer and repaving	m^2	$7.00	$7.00		

Pavement Preservation Plans

Attached are nine pages that show typical features of provincial pavements in Ontario. These features include geometric design, pavement design, maintenance and rehabilitation treatments, and typical unit costs for pavement materials and treatments. There are separate pages for freeways, arterial, collector, and local highways, both for northern and southern Ontario. (For the definition of Highway Functional Classes, please see the last page.)

Would you please comment on the appropriateness of the information provided on these pages. Do the features described on the attached pages reflect the pavement technology used on provincial highways in Ontario?

Yes ☐ No ☐ If No, what changes do you recommend? Please provide your comments directly on the attached pages.

Definition of Highway Functional Classes

Freeway: A divided highway with full control of access.

Arterial: A two-lane or a multi-lane highway that carries significant volumes of long distance traffic at high speeds. There is a high degree of access control.

Collector: A two-lane or a multi-lane highway that balances traffic flow needs with access. Access to the highway is governed by traffic flow considerations and by safety concerns.

Local: A two-lane or a multi-lane highway that primarily provides access to local land users. Access to the highway is controlled by safety concerns.

Urban Highway section has predominantly an urban alignment, including curb and gutter.

Is there somebody else in your organization we should contact regarding pavement features?

Name:_____ Tel. No._____ Email_____

Thank you for your participation and help. Please send the completed survey to Jerry Hajek by fax (416-621-4917) or by email Hajek@sprint.ca.

Examples of Road Inventory Sheets for Ontario

Road Inventory Sheets were prepared for the following provincial road categories

- Rural and urban freeway in Southern Ontario
- Urban freeway in Northern Ontario
- Rural arterial highway in Southern and Northern Ontario
- Rural and urban collector highway in Southern Ontario
- Rural collector in Northern Ontario
- Rural local highway in Southern and Northern Ontario

As an example, Road Inventory Sheet for rural urban freeway in Southern Ontario is provided on the next page. All completed Road Inventory Sheets for Ontario, as well as for other Provinces, are summarized in Appendix C.

Example of Road Inventory Sheet for Ontario

Province: **Ontario**
Category: **Provincial Rural Freeway, South**
Code: ONP RFS
All Quantities and Costs are for one km of 2-lane highway

Geometric Design

Design Feature	Dimension
Width of the two traffic lanes, m	7.50
Total width of both shoulders, m	7.00
Total width of both paved shoulders, m	7.00
Average AC thickness of the paved shoulders, mm	120

Initial Pavement Structure

Pavement Layer	Description of Pavement Layer, Amount (Quantity)	Amount	Quantity	Price per Unit of Quantity	Cost
Surface	Dense Friction Course, mm (t)	40		$73.19	
Binder	Heavy Duty Binder, mm (t)	80		$46.12	
Extra layer	Hl-8, mm (t)	120		$40.39	
Base	Granular A, mm (t)	200		$10.34	
Subbase	Granular B, mm (t)	450		$7.70	
Subdrains	Includes trenching and outlets, m (m)	1,500		$110.00	
OGDL	Open Graded Drainage Layer, mm (t)	100		$34.97	
Drainage	% of section with closed drainage, % (m)	100		$110.00	

Pavement Preservation Action Plan

Years after Initial Construction	Description of Maintanance and Rehabil. Treatments, Amount (Quantity)	Amount	Quantity	Price per Unit of Quantity	Cost
5	Rout and seal, m (m)	500		$1.65	
9	Spot repairs - mill 40 mm and patch, % (m^2)	10		$7.70	
15	Mill AC, mm (t)	40		$11.00	
15	Resurface with DFC, mm (t)	40		$56.65	
19	Rout and seal, m (m)	500		$1.65	
19	Spot repairs - mill 40 mm and patch, % (m^2)	20		$7.70	
22	Mill AC, mm (t)	80		$11.00	
22	Resurface with DFC, mm (t)	40		$56.65	
22	Resurface with HDB, mm (t)	40		$46.12	
26	Rout and seal, m (m)	500		$1.65	
31	Spot repairs - mill and patch, % (m^2)	20		$7.70	
36	Mill AC, mm (t)	40		$11.00	
36	Resurface with DFC, mm (t)	40		$56.65	
39	Rout and seal, m (m)	500		$1.65	
39	Spot repairs - mill 40 mm and patch, % (m^2)	20		$7.70	
43	Partial depth removal, mm (t)	160		$11.00	
43	Resurface with DFC, mm (t)	40		$56.65	
43	Resurface with HDB, mm (t)	80		$46.12	
43	Resurface with HL-8, mm (t)	40		$40.39	

Introduction Letter for Municipal Survey

February 8, 2005

Mr. XXXXX
Manager, Works Department
Regional Municipality of Durham
825 Conlin Road
P.O. Box 623
ON L1N 6A3

Subject: Study of Representative Capital and Maintenance Costs of Roads

Dear Mr. XXXXXX:

As discussed during our recent telephone conversation, Applied Research Associates Inc. (ARA) have been engaged by Transport Canada to work on the above Study. Additional information about this study is provided in the attached letter from Mr. Roger Roy, Director General, Economic Analysis, Transport Canada.

The study is supported by the Federation of Canadian Municipalities and the Council of Deputy Ministers Responsible for Transportation and Highway Safety. The Ontario representative on a Task Force responsible for the study is Mr. Alan Stillar from the Ontario Ministry of Transportation.

As part of this study, we are approaching leading representatives of roadway departments in selected Canadian municipalities and asking them for input regarding the extent and type of roadway infrastructure, the maintenance of pavements and bridges, and the size of roadway construction and maintenance budgets. The information that we seek is summarized in the attached questionnaire.

I would very much appreciate if you would complete the attached survey. If you prefer to do so through an interview, please let me know so that I can arrange a telephone interview or a visit. I would also appreciate the opportunity to discuss some of the material in the questionnaire with you.

Thank you very much for your help.

Sincerely,

Jerry Hajek, Ph.D., P.Eng.
Principal Engineer

Encl.: A copy of a survey questionnaire
Letter from Mr. Roger Roy, Transport Canada

Study of Representative Capital and Maintenance Costs of Roads
Municipal Survey, March 2005

This questionnaire is distributed to leading representatives of road departments in selected municipalities across Canada. It is about the extent, cost, and funding of municipal road infrastructure. We respectfully request your assistance in completing the survey. If some answers require data processing, we are prepared to do it. Thank you for your help.

Respondent Information

Name: _____ Title: _____

Agency: _____

Phone: _____ Fax: _____

Email: _____

Please forward the completed survey to:

Jerry Hajek, Ph.D., P.Eng., Principal Engineer
Applied Research Associates, Inc.
5401 Eglinton Avenue West, Suite 207
Toronto, Ontario M9C 5K6
Telephone: 416-621-9555; Facsimile: 416-621-4917
Email hajek@sprint.ca

Roadway Inventory

What is the total length of all your roads not including residential streets? _____
What is the total length of all your roads including residential streets? _____

Are the above numbers in: Centreline km □ 2-lane equivalent km □ lane km □

Type of Roadway	Percentage of the total roadway length	Which percentage of roadways has urban alignment*?	Average AADT**		Average percentage of trucks	
			Average	Range	Average	Range
Arterial Roads						
Collector Roads						
Local Roads						

* Urban alignment typically means curb-and-gutter and a closed drainage system.
** Annual Average Daily Traffic volume (in both directions).

Arterial Resembles a highway going through a municipality.
Collector Feeds traffic from an *Arterial* to the *Local* roads or vice-versa.
Local All other roads that are not residential streets and are also not arterials and collectors.
Urban Road section has predominantly an urban alignment, including curb and gutter.

Is there somebody else in your organization we should contact regarding the road inventory or traffic data?
Name:_____ Tel. No._____ Email_____

Inventory of Roadway Bridges

What is the minimum span of a structure to be classified as a bridge? ☐ 3 m ☐ 6 m Other:_____

Estimated Number and Size of Bridges

Type of Road*	**Number of bridges***	**Estimated average bridge deck size****	**Estimated average construction cost per m^2 of bridge deck†**
Arterial			
Collectors			
Local			
Total*			

* If unavailable by road type, please estimate the total number of bridges in your municipality.
** If unavailable by road type, please estimate an average bridge deck area in your municipality.
† If unavailable by road type, please estimate an average construction cost per m^2 of bridge deck.

If specific cost information is available by bridge type, and the bridge type correlates with the road type, please provide us with this information.

Is there somebody else in your organization we should contact regarding the inventory of bridges?

Name:_____ Tel. No._____ Email_____

Estimated Age of Roads and Bridges

	Years
Average age of pavements since the time of the last major reconstruction*	
Average age of pavements since the time of the last resurfacing or rehabilitation	
Average age of bridges since the time of the initial construction or major rehabilitation**	
Average age of bridges since the time of a significant maintenance or a rehabilitation action	

* Typically includes changes in granular layers of the pavement structure. If there was no major reconstruction, please consider the age since the initial construction.

** Typically includes substantial changes in the bridge superstructure.

Is there somebody else in your organization we should contact regarding the age of roadway infrastructure?

Name:_____ Tel. No._____ Email_____

Pavement Design and Maintenance

Attached are three pages that show typical features of municipal pavements in Southern (Northern) Ontario. These features include geometric design, pavement design, maintenance and rehabilitation treatments, and typical unit costs for pavement materials and treatments. There are separate pages for arterial, collector, and local roads

.

Do the features described on the attached pages properly reflect the use of pavement technology in your municipality?

Yes ☐ No ☐ If No, what changes do you recommend?

Is there somebody else in your organization we should contact regarding pavement features?

Name:_____ Tel. No._____ Email_____

Cost of Routine Road Maintenance

What is your typical (or 2003) annual budget (or expenditure) for routine maintenance of roads? _____
(Routine maintenance includes sweeping and minor repairs such as filling potholes, minor guide rail repairs, and minor bridge repairs.)

Are there any additional in-house expenditures (for materials and/or labour) on routine maintenance?

Yes ☐ No ☐

If Yes, what is the amount of the additional annual in-house expenditures? _____

What percentage of the budget (or expenditure) is for residential streets and sidewalks? _____

Is there somebody else in your organization we should contact regarding expenditures on routine road maintenance?

Name:_____ Tel. No._____ Email_____

Cost of Winter Maintenance for Roads

What is your typical (or 2003) annual budget (or expenditure) for winter maintenance (snow removal and ice control)? _____

Are there any other additional in-house expenditures (material and labour) on winter maintenance?

Yes ☐ No ☐

If Yes, what is the amount of the additional annual expenditures? _____

What percentage of the budget (or expenditure) is for residential streets and for sidewalks? _____

Is there somebody else in your organization we should contact regarding expenditures on winter maintenance?

Name:_____ Tel. No._____ Email_____

Thank you for your participation and help. Please send the completed survey to Jerry Hajek by fax (416-621-4917) or by email Hajek@sprint.ca.

Example of Municipal Road Inventory Sheet for Ontario

Province: **Ontario**
Category: **Municipal Arterial Roadway, South**
Code: ONM AS
All Quantities and Costs are for one km of 2-lane highway

Geometric Design

Design Feature	Dimension
Width of the two traffic lanes, m	7.50
Total width of both shoulders, m	6.50
Total width of both paved shoulders, m	5.00
Average AC thickness of the paved shoulders, mm	80

Initial Pavement Structure

Pavement Layer	Description of Pavement Layer, Amount (Quantity)	Amount	Quantity	Price per Unit of Quantity	Cost
Surface	Hl-1, mm (t)	40		$50.36	
Binder	HL-8, mm (t)	80		$40.39	
Extra layer					
Base	Granular A, mm (t)	150		$10.34	
Subbase	Granular B, mm (t)	450		$7.70	
Subdrains	Includes trenching and outlets, m (m)	1,000		$110.00	
Subgrade	Subgrade improvement, m^2 (m^2)				
Drainage	% of section with closed drainage, % (m)	50		$7.70	

Pavement Preservation Action Plan

Years after Initial Construction	Description of Maintanance and Rehabil. Treatments, Amount (Quantity)	Amount	Quantity	Price per Unit of Quantity	Cost
5	Rout and seal, m (m)	500		$1.65	
10	Spot repairs - mill and patch, % (m^2)	10		$7.70	
15	Mill AC, mm (t)	40		$11.00	
15	Replace with HL-1, mm (t)	40		$50.36	
18	Rout and seal, m (m)	500		$1.65	
25	Mill AC, mm (t)	80		$11.00	
25	Replace with HL-1, mm (t)	40		$50.36	
25	Replace with HL-8, mm (t)	40		$40.39	
29	Rout and seal, m (m)	500		$1.65	
34	Spot repairs - mill and patch, % (m^2)	20		$7.70	
39	Mill AC, mm (t)	40		$11.00	
39	Replace with HL-1, mm (t)	40		$50.36	
42	Rout and seal, m (m)	500		$1.65	
49	Full depth removal, mm (t)	120		$11.00	
49	Replace with HL-1, mm (t)	40		$45.67	
49	Replace with HL-8, mm (t)	80		$40.39	
49	Add to Granualar A	50		$11.37	

Appendix B

Agency Contact Information

Jurisdiction	Survey	Contact(s)
Federal Government	Inventory	Dr. D.R. MacLeod Manager, Highways and Bridges Public Works and Government Services, Canada Tel. 818-956-3303, Fax 819-956-389 donaldson.macleod@pwgsc.gc.ca
Newfoundland and Labrador	Expenditure and Inventory	Wanda Lundrigan Director, Policy and Planning Department of Transportation and Works Confederation Building, West Block PO Box 8700 St. John's, NL A1B 4J6 (709) 729-5344 wlundrigan@gov.nf.ca
Newfoundland and Labrador	Cost	Don Brennan, Manager, Materials Engineering
PE	Inventory and Cost	Allan H. (Jake) Bartlett Director and Chief Engineer Capital Projects PEI Transportation and Public Works PO Box 2000, Park Street Charlottetown, PE, C1A 7N8 (902) 368-5105 ahbartlett@gov.pe.ca
Nova Scotia	Expenditure	Greg Penny Transportation and Public Works Government of Nova Scotia PO Box 186 Halifax, NS B3J 2N2 (902) 424-3893 PENNYGR@gov.ns.ca
Nova Scotia		William van Lingen, Technical Services Specialist
Nova Scotia		Kent Speiran Manager, Asset Management (902) 424-3510
New Brunswick	Expenditure	Susi Derrah Policy Anaylst Strategic Development Kings Place 440 King Street Fredericton, NB E3B 5H8 (506) 453-5818 Susi.Derrah@gnb.ca
New Brunswick		James Knox, Assistant Director of Paving
New Brunswick		Mike Stanley, Highway Design Assistant Director

Jurisdiction	Survey	Contact(s)
Québec	Expenditure	Évangéline Lévesque Chef du service Économie et Plan directeur Direction de la planification Ministère des Transports du Québec 700, boulevard René Levesque Est, 25e étage Québec, QC G1R 5H1 (418) 644-0447 ext. 2321 elevesque@mtq.gouv.qc.ca Mme Anne Baril, ing. Chef de service Service des technologies d'exploitation (418) 643-0674 Fax: (418) 644-6963 Anne.Baril@mtq.gouv.qc.ca
Québec	Inventory and Report Review Inventory	Simon Plante, ing Service Orientations stratégiques 418-644-0097 Fax: 418-5287917 simon.plante@mtq.gouv.qc.ca Mr Bernard Letarte Service des orientations stratégiques Direction de la planification Ministère des Transports du Québec 700, boul. René-Lévesque Est, 25e étage Québec (Québec) G1R 5H1 Tél. : (418) 643-4606, poste 2306
Québec	Cost	Jocelyn Beaulieuitle, ing Service Orientations stratégiques 418-643-7517 Fax: 418-528-7917 jocelin.beaulieu@mtq.gouv.qc.ca
Ontario	Expenditure	Alan Stillar Team Leader - Federal Provincial Relations Strategic Policy and Planning Office 439 University Ave 2nd Floor, Suite 200 Toronto, ON M5G 1Y8 (416) 212-1931 Alan.Stillar@mto.gov.on.ca
Ontario	Cost	Tom Kazmierowski Pavements & Foundations Section (416) 235-3512 tom.kazmierowski@mto.gov.on.ca
Ontario	Bridge Inventory and Cost	Tony Merlo Head of Bridge Systems (905) 704-2384 tony.merlo@mto.gov.on.ca

Jurisdiction	Survey	Contact(s)
Ontario	Inventory	Sarath Liyanage, P.Eng. Team Leader, Information Management Program Development Branch, 4th Floor 301 St. Paul Street, St. Catherines ON L2R 7R4 (905) 704-2623 sarath.liyanage@mto.gov.on.ca
Manitoba	Expenditure	Amar Chadha Director Transportation Systems Planning and Development Department of Transportation and Government Services 15 - 215 Garry Street Winnipeg, MB R3C 3Z1 (204) 945-2269 AChadha@gov.mb.ca
Manitoba	Inventory and Cost	Ray Van Cauwenberghe, P.Eng. Director of Materials and Research 12th Floor – 215 Garry Street Winnipeg, Manitoba R3C 3Z1 (204) 945-0560 RVanCauwen@gov.mb.ca
Saskatchewan	Expenditure	Andrew Liu 9th Floor, 1855 Victoria Avenue Regina, SK S4P 3V5 (306) 787-4784 aliu@highways.gov.sk.ca
Saskatchewan	Inventory	Allan Widger Executive Director, Engineering Services Branch 1630 Park Street Regina, Saskatchewan S4P 3V7 (306) 787-4858 allan.widger.hi0@govmail.gov.sk.ca
Saskatchewan	Cost	P. Jorge Antunes, P.Eng. Senior Engineer 1630 Park Street Regina, Saskatchewan S4P 3V7 (306) 787-4640 jantunes@highways.gov.sk.ca
Alberta	Expenditure	Rod Thompson Executive Director, Transportation Policy and Economic Analysis 3rd Floor, Twin Atria Building 4999 - 98 Avenue Edmonton, AB T6B 2X3 (780) 415-0685 rod.thompson@gov.ab.ca

Jurisdiction	Survey	Contact(s)
Alberta	Inventory, Cost and Report Review	Mr. Steve Otto, P.Eng. Roadway Preservation Engineer, Maintenance & Materials Planning, Programming & Technical Services Division 1st Floor, Twin Atria Building 4999-98 Avenue Edmonton, AB T6B 2X3 (780) 422-9972 steve.otto@gov.ab.ca
British Columbia	Expenditure	Brenda Janke Manager, Economic Analysis Highway Planning Branch, Department of Transportation 940 Blanshard Street Victoria, BC V8W 3E6 (250) 356-0772 Brenda.Janke@gems5.gov.bc.ca
British Columbia	Inventory and Cost	Mike Oliver Chief Geotechnical, Materials and Pavements Engineer PO Box 9850, Stn Prov Govt Victoria, BC V8W 9T5 (250) 387-3353 mike.oliver@gov.ab.ca
Northwest Territories	Expenditure, Inventory and Cost	Jim Stevens Director of Planning and Policy Department of Transportation Box 1320 Yellowknife, NT X1A 2L9 (867) 920-3366 jim_stevens@gov.nt.ca
Yukon	Expenditure, Inventory and Cost	Robert Magnuson Assistant Deputy Minister of Highways and Public Works Box 2703 Whitehorse, YK Y1A 2C6 (867) 667-5196 robert.magnuson@gov.yk.ca
Nunavut	Expenditure, Inventory and Cost	Mathusalah Kunuk Assistant Deputy Minister of Transportation P.O. Box 1000 Iqaluit, NU X0A 0H0 (867) 975-5925 mkunuk@gov.nu.ca
City of St. John's, NL	Municipal	John Barry, Art Cheeseman
City of Gander, NL	Municipal	Cluney Matchim
City of Charlottetown, PE	Municipal	Paul Johnston Manager of Public Works

Jurisdiction	Survey	Contact(s)
City of Summerside, PE	Municipal	Tony Gallant Assistant Municipal Engineer, Technical Services Department 275 Fitzroy Street, 3rd Floor Summerside, PE C1N 1H9 (902) 432-1252 tgallant@city.summerside.pe.ca
City of Halifax, NS	Municipal	Dave Hubley Manager Design and Construction Services (902) 490-4845 hubleyd@region.halifax.ns.ca
City of Moncton, NB	Municipal	Bruce Tait, Project Engineer 655 Rue Main Street Moncton, NB E1C 1E8 (506) 383-6709 rene.lagace@moncton.org
City of Saint John, NB	Municipal	Tim O'Reilly Project Engineer
City of Edmunston, NB	Municipal	Laurent Maltais Technical Manager
Ville de Longueuil, QC	Municipal	Louis Racicot, Directeur des infrastructures 2001 Boulevard Rome Brossard, QC J4W 3K5 (450) 463-7000 Louis.racicot@ville.longueuil.qc.ca
Ville de Montréal, QC	Municipal	André Campeau, Chef de service laboratoire 275 Notre-Dame Est Montréal, QC H2Y 1C6 (514) 872-3142 acampeau@ville.montreal.qc.ca
Ville de Laval, QC	Municipal	Mr. Claude Asselin Directeur général 1, place du souvenir, C.P. 422, Succursale Saint-Martin Laval, QC H7V 3Z4 c.asselin@ville.laval.qc.ca
Ville de Québec, QC	Municipal	Mr. Hervé Brosseau Directeur des travaux publics 2 Rue des Jardins, H.V. C.P. 700 Québec, QC G1R 4S9 herve.brosseau@ville.quebec.qc.ca
Ville de Gatineau, QC	Municipal	Mr Marc B. Laroche 25 Rue Laurier, C.P. 1970, succursale Hull, Gatineau, QC J8X 3Y9 laroche.marc@ville.gatineau.qc.ca

Jurisdiction	Survey	Contact(s)
City of Toronto, ON	Municipal	John Neidra Station 1170, 17th Floor 55 John St. Toronto, ON M5V 3C6 (416) 338-5377 jniedra@city.toronto.on.ca
City of Niagara Falls, ON	Municipal	David Watt, C.E.T. Manager of Infrastructure 4310 Queen Street Niagara Falls, ON L2E 6X5 (905) 356-7521 Ext 4340 dwatt@city.niagarafalls.on.ca
City of Brampton, ON	Municipal	John Brophy, P.Eng. Director, Maintenance and Operations 2 Wellington Street West Brampton, ON L6Y 4R2 (905) 874-2553 john.brophy@city.brampton.on.ca
City of Ottawa, ON	Municipal	Steve Goodman Senior Pavement Engineer 110 Laurier Avenue West Ottawa, ON K1P 1J1 (613) 580-2424 x28583 steve.goodman@ottawa.ca
City of Thunder Bay, ON	Municipal	John Husiak, Roads Manager P.O. Box 800 Thunder Bay, ON P7C 5K4 (807) 684-2195 jhusiak@thunderbay.ca
County of Grey, ON	Municipal	Gary Shaw 595 9th Ave. E Owen Sound, ON N4K 3E3 (519) 376-7337 gshaw@greycounty.on.ca
United Counties of Stormont, Dundas, and Glengarry, ON	Municipal	Donald McDonald County Engineer, Road Department 20 Pitt St. Cornwall, ON K6J 3P2 (613) 932-1515 djmcdonald@sdgcounties.ca
City of Winnipeg, MB	Municipal	Aubrey Hope, P.Eng. Department of Public Works 106 - 1155 Pacific Avenue Winnipeg, Manitoba, R3E 3P1 (204) 986-3619 ahope@winnipeg.ca

Jurisdiction	Survey	Contact(s)
City of Brandon, MB	Municipal	Steve Hayward Department of Engineering 410 9th Street Brandon, MB R7A 6A2 (204) 729-2215 s.hayward@brandon.ca
City of Thompson, MB	Municipal	Nathan Steuart Building and Roads Technician City of Thompson 226 Mystery Lake Road Thompson, Manitoba R8N 1S6 (204) 677-7907 nsteuart@city.thompson.mb.ca
City of Regina, SK	Municipal	Norm Wong Roadway Engineer, Municipal Engineering Dept. 2476 Victoria Avenue P.O. Box 1790 Regina, Saskatchewan S4P 3C8 (306) 777-7425 nwong@regina.ca
City of Saskatoon, SK	Municipal	Colin Prang E.I.T. Project Engineer for Roadway preservation 222 - 3rd Ave. N. Saskatoon, SK S7K 0J5 (306) 975 2270 colin.prang@city.saskatoon.sk.ca
City of Yorkton, SK	Municipal	Jeffery Humble Director of Planning and Engineering 37 - 3rd Avenue North Yorkton, SK S3N 2W3 (306) 786-1727 jhumble@yorkton.ca
City of Calgary, AB	Municipal	Mr. Bill Biensch, P.Eng. Maintenance Project Engineer P.O. Box 2100 Station M #31 T2P 2M5 (403) 268-1098
City of Edmonton, AB	Municipal	Mr. Al Cepas, P.Eng. Pavement Management Engineer, Roadway Maintenance 10517-95 Street P.O. Box 2610 Edmonton, AB T5J 3R5 (780) 496-4676

Jurisdiction	Survey	Contact(s)
City of Vancouver, BC	Municipal	Don Brynildsen, P.Eng. Assistant City Engineer 6th Floor City Hall 453 West 12th Avenue V5Y 1V4 (604) 873-7313 don.brynildsen@vancouver.ca
Municipality of Saanich, BC	Municipal	Dal Haftner Sr. Engineering Technician 770 Vernon Avenue Victoria, BC V8X 2W7 (250) 475-1775 ext. 3459 haftnerd@gov.saanich.bc.ca
City of Whitehorse, YK	Municipal	George Farrow Engineering and Environmental Services 2121 2nd Avenue Whitehorse, YK Y1A 1C2 (867) 668-8310 george.farrow@city.whitehorse.yk.ca
City of Yellowknife, NT	Municipal	Dennis Kefalas Manager, Public Works 4807 - 52 Street P.O. Box 580 Yellowknife, NT X1A 2N4 (867) 920-5639 dkefalas@yellowknife.ca
City of Iqaluit, NU	Municipal	Brad Sokach Director of Engineering and Planning P.O. Box 460 Iqaluit, NU X0A 0H0 (867) 975-8501 b.sokach@city.iqaluit.nu.ca

Appendix C

Road Inventory Sheets

Newfoundland and Labrador

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	0.0	0		N/A	N/A
Arterial	42.1	2,501			
Collector	101.8	3,693			
Local*	22.6	2,672	689		
Total	166.5	8,866			

*Local roads include 1,595 km of gravel roads

"Secondary " roads (1,314 km) were divided equally between Arterial and Collector roads

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway		N/A				3.0
Arterial	5	181		435		
Collector	18	87		300		
Local	8	550		200		
Total	31	818				

Average age of road infrastructure, years

Pavements since the time of construction / reconstruction	
of resurfacing or rehabilitation	
Bridges since the time of initial construction	
of rehabilitation	

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial	6,000	1,300 - 20, 000		
Collector				
Local				

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial	10%	6 % - 20 %		
Collector				
Local				

Prince Edward Island

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	0.0			N/A	N/A
Arterial	0.0				
Collector	24.5				
Local	16.2				
Total	40.7				

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway						3.0
Arterial						
Collector	1					
Local*						
Total	1					

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	
	of resurfacing or rehabilitation	
Bridges	since the time of initial construction	
	of rehabilitation	

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Nova Scotia

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	0.0	1,834		N/A	N/A
Arterial	0.0	2,130			
Collector	80.6	2,721			
Local	40.0	16,104			
Total	120.6	22,789		2,330	

*Local roads include 8,980 km of gravel roads

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway		535				3.0
Arterial						
Collector	13	3550				
Local	10					
Total	23					

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	16
	of resurfasing or rehabilitation	
Bridges	since the time of initial construction	53
	of rehabilitation	

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	3,700	? - 22,600		
Arterial	3,700	150 - ?	6,900	390 - 47,900
Collector	1,100	200 - 5,000	3,400	200 - 1,350
Local	500	70 - 2,500	1,500	10 - 24,200

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	13.2%	1 - 31%	10.4%	3 - 25%
Arterial	13.2%	1 - 31%	10.4%	3 - 25%
Collector	8.8%	3 - 18%	8.6%	3 - 20%
Local			5.4%	1 - 15%

New Brunswick

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads [1]		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	0.0	2,090			
Arterial	0.0				
Collector	20.1	2,979			
Local	42.5	12,896			
Total	62.6	17,965			

1 Provincial data are in terms of centerline km

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway						6.0
Arterial	1					
Collector	8					
Local*	10					
Total	19	147		1138		

Average age of road infrastructure, years

Pavements since the time of construction / reconstruction	
of resurfasing or rehabilitation	
Bridges since the time of initial construction	
of rehabilitation	

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Quebec

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway		3,407	1,594		
Arterial		8,797	932		
Collector		12,925	485		
Local	75	8	125		
Total	75	25,137	3,136		

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway	2	1156		1785		3.0
Arterial		1134	23	795	0	
Collector		1532	32	461	0	
Local	67	606	4277	934	0	
Total	69	4428	4332			

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	
	of resurfacing or rehabilitation	12.5
Bridges	since the time of initial construction	38.2
	of rehabilitation	20

AADT volumes for Southern Quebec, average and range

Functional Class	Provincial Roads, Southern Quebec			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	10,100	1,400 - 60,000	33,000	4,500 - 95,500
Arterial	3,800	450 - 30,500	11,500	800 - 43,000
Collector	2,600	130 - 19,000	5,700	460 - 17,000
Local	1,600	140 - 12,350	6,600	200 - 59,000

Percent commercial vehicles, average and range

Functional Class	Provincial Roads, Southern Quebec			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	18.0%	10 - 45%	10.0%	2 - 40%
Arterial	18.9%	10 - 45%	13.0%	2 - 40%
Collector	13.8%	2 - 35%	11.0%	2 - 30%
Local	11.3%	1 - 36%	10.0%	1 - 17%

Quebec (Cont…)

Road inventory for Southern and Northern , 2-lane equivalent km

Functional Class	Southern Quebec			Nothern Quebec		
	Rural	Urban	Municipal	Rural	Urban	Municipal
Freeway						
Arterial						
Collector						
Local						
Total			4,539			56,819

Inventory of major structures

Description	Jurisdiction	Size (length), m	Functional Class	Alignment	
				Rural	Urban
Tunnel L.-H. Lafontaine	Provincial, S	1,993	F		X
Tunnel Ville-Marie	Provincial, S	6,495	F		X
Tunnel de Liesse	Provincial, S	907	F		X
Tunnel Viger	Provincial, S	638	F		

AADT volumes for Northern Quebec, average and range

Functional Class	Provincial Roads, Nothern Quebec			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	13,200	300 - 61,500	33,300	3,700 - 95,500
Arterial	3,900	220 - 43,800	10,500	850 - 44,000
Collector	3,000	130 - 22,200	6,700	250 - 26,000
Local	1,650	80 - 18,500	4,000	300 - 59,000

Percent commercial vehicles, average and range

Functional Class	Provincial Roads, Nothern Quebec			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	16.0%	10 - 45%	10.0%	2 - 40%
Arterial	16.9%	10 - 45%	13.0%	2 - 40%
Collector	13.0%	2 - 35%	11.0%	2 - 30%
Local	10.9%	1 - 36%	10.0%	1 - 17%

Ontario

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway		2,261	2,043	N/A	N/A
Arterial		6,120	145		
Collector		4,981	128		
Local	75	3,860	48		
Total	75	17,222	2,364		

Rural-Urban split for freeways was based on 1995 data

Bridge inventory for Ontario

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway						3.0
Arterial	7					
Collector						
Local	48					
Total	55	2646		1000		

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	30.9
	of resurfacing or rehabilitation	17.6
Bridges	since the time of initial construction	36
	of rehabilitation	25

AADT volumes for Southern Ontario, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	64,425	5,450 - 102,600	70,847	17,400-410,000
Arterial	12,053	610 - 46,000	12,978	5,700 - 41,700
Collector	7,604	650 - 50,400	5,689	2,050-33,300
Local	9,917	150 - 22,300		

Percent commercial vehicles, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	21.6%	3.0 - 50.8%	11.5%	4.2 - 20.0%
Arterial	10.5%	3.3 - 33.3%	9.6%	3.2 - 21.8%
Collector	10.3%	2.8 - 26.8%	10.4%	2.0 - 19.6%
Local	9.6%	3.9 - 30.4%		

Ontario (Cont…)

Road inventory for Southern and Northern Ontario, 2-lane equivalent km

Functional Class	Southern Ontario		Northern Ontario	
	Rural	Urban	Rural	Urban
Freeway	1,930	2,043	331	0
Arterial	2,226	87	3,894	58
Collector	1,692	115	3,289	13
Local	160	0	3,700	48
Total	6,008	2,245	11,214	119

Rural-Urban split for freeways was based on 1995 data

AADT volumes for Northern Ontario, average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	8,934	5,500 - 16,600		
Arterial	8,014	520 -25,600	5,851	1,100 - 27,400
Collector	1,681	120 - 20,500	1,162	
Local	623	30 - 6,200	1,070	160- 12,500

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	13.1%	4.0 - 51.5%		
Arterial	26.8%	4.0 - 47.0%	14.5%	2.5 - 27.1%
Collector	15.0%	2.0 - 48.8%	7.4%	4.2 - 11.3%
Local	10.5%	1.7 - 58.0%	9.2%	2.3 -23.1%

Manitoba

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	0	1,706	125		
Arterial	55	3,596	33		
Collector		4,238	73		
Local	12	8,802	53		
Total	67	18,342	284		

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway		301		560		6.0
Arterial	3	935		560		
Collector		1001		350		
Local	5	160		195		
Total	8	2397				

Average age of road infrastructure, years

Pavements since the time of construction / reconstruction	45
of resurfasing or rehabilitation	25
Bridges since the time of initial construction	
of rehabilitation	

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	5,000	2,900 - 11,000	10,000	4,600 - 21,000
Arterial	3,000	700 - 16,000	8,000	9,000 - 17,000
Collector	800	100 - 6,000	8,000	5,000 - 17,000
Local				

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	18%	4.5 - 30%	9%	
Arterial	9%	8 - 12%		
Collector				
Local				

Saskatchewan

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	0.0	1,499	167	N/A	N/A
Arterial	0.0	3,165	167	12,200	2,777
Collector	46.9	5,216		82,670	2,556
Local	14.1	16,049		67,868	4,296
Total	61.0	25,930	333	162,738	9,629

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway		170	N/A	481	N/A	6.0
Arterial		171	204	354	90	
Collector	2	250	306	293	90	
Local	31	249	1381	163	90	
Total	33	840	1891			

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	30
	of resurfasing or rehabilitation	13
Bridges	since the time of initial construction	37
	of rehabilitation	

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	2,943	250 - 38,800		
Arterial	885	30 - 12960		
Collector	382	20 - 7,100	N/A	N/A
Local	113	5 - 2,130	N/A	N/A

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	22.1%	3 - 35%		
Arterial	15.8%	1 - 40%		
Collector	13.0%	1 - 40%	N/A	N/A
Local	17.7%	0 - 30%	N/A	N/A

Alberta

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway	101.6	208	292	N/A	N/A
Arterial	149.0	15,418		3,926	207
Collector	327.7	11,542		1,863	329
Local	223.2	5,038		14,953	1,662
Total	801.5	32,207	292	20,742	2,198

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway	30					1.5
Arterial	36					
Collector	11					
Local	27					
Total	104	10,350		75		

Bridge Deck Sizedoes not include culverts.

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	11.1
	of resurfasing or rehabilitation	9.9
Bridges	since the time of initial construction	34
	of rehabilitation	25

AADT volumes, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway			69,000	15,000 - 143,000
Arterial	4,160	700 - 16,000	19,500	5,000 - 40,000
Collector	1,160	100 - 6,000		
Local	320	40 - 32,400		

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway			8.6%	2- 40%
Arterial	11.8%	0 - 50%	10.8%	2 - 35%
Collector	10.3%	0 - 60%		
Local	9.4%	0 - 50%		

British Columbia

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Provincial Roads[1]		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway		928	185	N/A	N/A
Arterial	1,022	491	192		
Collector	43	9,010	459		
Local	186				
Total	1,251	10,429	836		

1 Estimated data

Bridge inventory

Functional Class	Number of bridges			Av. bridge deck size,m^2		Min. bridge span, m
	Federal	Provincial	Municipal	Provincial	Municipal	
Freeway						3.0
Arterial	69					
Collector	5					
Local	2					
Total	76					

Average age of road infrastructure, years

Pavements since the time of construction / reconstruction	
of resurfacing or rehabilitation	
Bridges since the time of initial construction	
of rehabilitation	

AADT volumes for Coastal average and range

Functional Class	Provincial Roads, Southern Ontario			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

British Columbia (Cont…)

Road inventory for Coatal and Interior 2-lane equivalent km

Functional Class	Southern BC		Northern BC	
	Rural	Urban	Rural	Urban
Freeway				
Arterial				
Collector				
Local				
Total				

Inventory of major structures

Description	Jurisdiction	Size, m	Functional Class	Alignment	
				Rural	Urban
Snow shed	Federal	258	Arterial	X	
Snow shed	Federal	588	Arterial	X	
Snow shed	Federal	269	Arterial	X	
Snow shed	Federal	183	Arterial	X	
Snow shed	Federal	212	Arterial	X	

AADT volumes for interior average and range

Functional Class	Provincial Roads, Southern			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Percent commercial vehicles, average and range

Functional Class	Provincial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Northwest Territories

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Territiorial Roads		Municipal Roads
		Rural	Urban	
Freeway		N/A		N/A
Arterial		1,962		20
Collector		111		11
Local*		70		9
Total		2,143		40

Bridge inventory

Functional Class	Number of bridges		Av. bridge deck size,m^2		Min. bridge span, m
	Territorial	Municipal	Territorial	Municipal	
Freeway					
Arterial					
Collector					
Local*					
Total	70		350		

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	12
	of resurfasing or rehabilitation	12
Bridges	since the time of initial construction	23
	of rehabilitation	6.5

AADT volumes, average and range

Functional Class	Territiorial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	N/A	N/A		
Arterial	558	130 - 1,490		
Collector	690	100 - 1,240		
Local	455	121 - 623		

Percent commercial vehicles, average and range

Functional Class	Territiorial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	N/A	N/A		
Arterial	19.7%			
Collector				
Local				

Yukon Territory

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Territiorial Roads		Municipal Roads
		Rural	Urban	
Freeway		N/A		0
Arterial		2,912	0	0
Collector		233	0	13
Local		1,615	0	15
Total		4,760	0	28

Bridge inventory

Functional Class	Number of bridges		Av. bridge deck size,m^2		Min. bridge span, m
	Territorial	Municipal	Territorial	Municipal	
Freeway					
Arterial	61		782		
Collector	7		773		
Local	61	1	105	1168	
Total	129				

Average age of road infrastructure, years

Pavements	since the time of construction / reconstruction	25
	of resurfasing or rehabilitation	16
Bridges	since the time of initial construction	34
	of rehabilitation	26

AADT volumes, average and range

Functional Class	Territiorial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	N/A	N/A		
Arterial	867	85 - 3,704		
Collector	362	239 - 750		
Local			N/A	N/A

Percent commercial vehicles, average and range

Functional Class	Territiorial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway	N/A	N/A		
Arterial	3.8%	1.6 - 5.8%		
Collector				
Local				

Nunavut

Road inventory, 2-lane equivalent km

Functional Class	Federal Roads	Territiorial Roads		Municipal Roads	
		Rural	Urban	Rural	Urban
Freeway				N/A	N/A
Arterial					
Collector					
Local*					
Total					

Bridge inventory

Functional Class	Number of bridges		Av. bridge deck size,m^2		Min. bridge span, m
	Territorial	Municipal	Territorial	Municipal	
Freeway					
Arterial					
Collector					
Local*					
Total					

Average age of road infrastructure, years

Pavements since the time of construction / reconstruction	
of resurfasing or rehabilitation	
Bridges since the time of initial construction	
of rehabilitation	

AADT volumes, average and range

Functional Class	Territiorial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Percent commercial vehicles, average and range

Functional Class	Territiorial Roads			
	Rural		Urban	
	Average	Range	Average	Range
Freeway				
Arterial				
Collector				
Local				

Appendix D

Computational Modal

Main.xls - Input

Universal Inputs

Discount Rate	6.0%	
Analysis Period	60	Years

Cost Adjustment for Design and Administration

Pavements	25%
Bridges	35%
All Other Road Infrastructure	25%
Routine and Winter Maintenance	10%

Pavements_NL.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Newfoundland

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$60.00	$65.00
	Seal coat, % area (m2)	$2.00	$2.50
Binder	Binder HMA, mm (t)	$57.00	$50.00
OGDL			
Base	Granular Base, mm (t)	$12.60	$12.00
Subbase	Granular Subbase, mm (t)	$10.40	$10.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$20.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.00

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$1.50	$2.00
Spot repairs - mill and patch, % Area (m^2)	$7.00	$6.00
Seal coat, % area (m2)	$2.00	$2.00
Mill AC, mm (t)	$10.00	$10.00
Resurface with Surface HMA, mm (t)	$60.00	$66.00
Resurface with Binder HMA, mm (t)	$57.00	$62.70
Add to Granular Base, mm (t)	$12.60	$13.86
Spot repairs - spray patch, % Area (m2)	$2.00	$2.00
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_PE.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Prince Edward Island

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$50.00	$65.00
	Seal coat, % area (m2)	$2.00	$2.50
Binder	Binder HMA, mm (t)	$50.00	$50.00
OGDL			
Base	Granular Base, mm (t)	$12.00	$14.00
Subbase	Granular Subbase, mm (t)	$10.00	$12.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$20.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.00

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.00
Spot repairs - mill and patch, % Area (m^2)	$7.50	$6.00
Seal coat, % area (m2)	$2.00	$2.00
Mill AC, mm (t)	$7.50	$10.00
Resurface with Surface HMA, mm (t)	$50.00	$55.00
Resurface with Binder HMA, mm (t)	$50.00	$55.00
Add to Granular Base, mm (t)	$12.00	$13.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.00
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_NS.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Nova Scotia

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$53.25	$110.00
	Seal coat, % area (m2)	$2.00	$2.50
Binder	Binder HMA, mm (t)	$48.47	$60.00
OGDL			
Base	Granular Base, mm (t)	$12.20	$15.00
Subbase	Granular Subbase, mm (t)	$11.00	$12.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$20.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.00

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.20
Spot repairs - mill and patch, % Area (m^2)	$7.35	$6.00
Seal coat, % area (m2)	$3.00	$2.00
Mill AC, mm (t)	$10.00	$10.00
Resurface with Surface HMA, mm (t)	$53.25	$110.00
Resurface with Binder HMA, mm (t)	$48.47	$60.00
Add to Granular Base, mm (t)	$12.20	$15.00
Spot repairs - spray patch, % Area (m2)	$2.00	$2.50
Microsurface, % Area (m2)	$4.00	$4.00
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_NB.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: New Brunswick

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$65.00	$71.50
	Seal coat, % area (m2)	$1.50	$1.65
Binder	Binder HMA, mm (t)	$60.00	$66.00
OGDL			
Base	Granular Base, mm (t)	$10.60	$11.66
Subbase	Granular Subbase, mm (t)	$8.60	$9.46
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.20
Spot repairs - mill and patch, % Area (m^2)	$5.80	$6.38
Seal coat, % area (m2)	$1.50	$1.65
Mill AC, mm (t)	$7.50	$8.25
Resurface with Surface HMA, mm (t)	$65.00	$71.50
Resurface with Binder HMA, mm (t)	$60.00	$66.00
Add to Granular Base, mm (t)	$10.60	$11.66
Spot repairs - spray patch, % Area (m2)	$1.50	$1.65
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_QC1.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Quebec, Champlain Plain

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$85.00	$85.00
	Seal coat, % area (m2)	$2.00	$2.00
Binder	Binder HMA, mm (t)	$70.00	$70.00
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$15.00	$15.00
Subbase	Granular Subbase, mm (t)	$12.50	$12.50
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$20.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.50	$2.50
Spot repairs - mill and patch, % Area (m^2)	$26.00	$26.00
Mill AC, mm (t)	$6.00	$6.60
Resurface with Surface HMA, mm (t)	$85.00	$93.50
Resurface with Binder HMA, mm (t)	$70.00	$77.00
Add to Granular Base, mm (t)	$15.00	$16.50
Seal coat, % area (m2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_QC2.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Quebec, Nord

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$75.00	$75.00
	Seal coat, % area (m2)	$2.00	$2.20
Binder	Binder HMA, mm (t)	$65.00	$65.00
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$12.00	$12.00
Subbase	Granular Subbase, mm (t)	$10.00	$10.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.50	$2.50
Spot repairs - mill and patch, % Area (m^2)	$26.00	$26.00
Mill AC, mm (t)	$12.00	$12.00
Resurface with Surface HMA, mm (t)	$75.00	$82.50
Resurface with Binder HMA, mm (t)	$65.00	$71.50
Add to Granular Base, mm (t)	$12.00	$13.20
Seal coat, % area (m2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_ON1.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Ontario, South

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	SMA, mm (t)	$75.00	
	Dense Friction Course, mm (t)	$68.88	$74.00
	HL-1, mm (t)	$68.75	$74.00
	HL-4, mm (t)	$45.83	$54.00
Binder	Heavy Duty Binder, mm (t)	$53.91	$63.00
	Medium Duty Binder, mm (t)	$53.70	$63.00
	HL-8, mm (t)	$49.42	$58.00
OGDL	Open Graded Drainage Layer, mm (t)	$45.00	
Base	Granular A, mm (t)	$13.01	$13.00
Subbase	Granular B, mm (t)	$6.71	$8.50
Subdrains	Includes trenching and outlets, % of occurrence	$18.00	$20.00
Drainage	Closed drainage, % of occurrence (m)		
Subgrade	Subgrade improvement, % area (m^2)	$5.00	$5.00

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.00
Spot repairs - mill and patch, % Area (m^2)	$7.70	$7.00
Mill AC, mm (t)	$11.00	$10.00
Resurface with SMA, mm (t)	$75.00	
Resurface with Dense Friction Course, mm (t)	$68.88	$74.00
Resurface with Medium Duty Binder, mm (t)	$53.70	$63.00
Resurface with Heavy Duty Binder, mm (t)	$53.91	$63.00
Resurface with HL-1, mm (t)	$68.75	$74.00
Resurface with HL-4, mm (t)	$45.83	$54.00
Resurface with HL-8, mm (t)	$49.42	$58.00
Add to Granular Base, mm (t)	$13.01	$13.00
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_ON2.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Ontario, North

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	SMA, mm (t)	$75.00	$75.00
	Dense Friction Course, mm (t)	$62.23	$75.00
	HL-1, mm (t)	$60.20	$63.00
	HL-4, mm (t)	$55.08	$60.59
Binder	Heavy Duty Binder, mm (t)	$54.54	$60.00
	Medium Duty Binder, mm (t)	$53.47	$60.00
	HL-8, mm (t)	$49.42	$60.00
OGDL	Open Graded Drainage Layer, mm (t)		$0.00
Base	Granular A, mm (t)	$10.90	$13.00
Subbase	Granular B, mm (t)	$7.97	$8.50
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$20.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m^2)	$80.00	$80.00

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.00
Spot repairs - mill and patch, % Area (m^2)	$7.50	$6.00
Mill AC, mm (t)	$7.50	$10.00
Resurface with SMA, mm (t)	$75.00	$75.00
Resurface with Dense Friction Course, mm (t)	$62.23	$75.00
Resurface with Medium Duty Binder, mm (t)	$53.47	$60.00
Resurface with Heavy Duty Binder, mm (t)	$54.54	$60.00
Resurface with HL-1, mm (t)	$60.20	$63.00
Resurface with HL-4, mm (t)	$55.08	$60.59
Resurface with HL-8, mm (t)	$49.42	$60.00
Add to Granular Base, mm (t)	$10.90	$13.00
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_MB.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Manitoba

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$65.00	$71.50
	Seal coat, % area (m2)	$1.50	$1.65
Binder	Binder HMA, mm (t)	$60.00	$66.00
OGDL			
Base	Granular Base, mm (t)	$10.60	$11.66
Subbase	Granular Subbase, mm (t)	$8.60	$9.46
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.20
Spot repairs - mill and patch, % Area (m^2)	$5.80	$6.38
Seal coat, % area (m2)	$1.50	$1.65
Mill AC, mm (t)	$7.50	$8.25
Resurface with Surface HMA, mm (t)	$65.00	$71.50
Resurface with Binder HMA, mm (t)	$60.00	$66.00
Add to Granular Base, mm (t)	$10.60	$11.66
Spot repairs - spray patch, % Area (m2)	$1.50	$1.65
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_SK.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Saskatchewan

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$65.00	$71.50
	Seal coat, % area (m2)	$2.00	$2.20
Binder	Binder HMA, mm (t)	$60.00	$66.00
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$12.00	$13.20
Subbase	Granular Subbase, mm (t)	$10.00	$11.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.20
Spot repairs - mill and patch, % Area (m^2)	$2.00	$2.20
Mill AC, mm (t)	$7.50	$8.25
Resurface with Surface HMA, mm (t)	$65.00	$71.50
Resurface with Binder HMA, mm (t)	$60.00	$66.00
Add to Granular Base, mm (t)	$12.00	$13.20
Seal coat, % area (m2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_AB.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Alberta

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$57.30	$63.03
	Seal coat, % area (m2)	$2.00	$2.20
Binder	Binder HMA, mm (t)	$38.33	$42.16
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$16.00	$17.60
Subbase	Granular Subbase, mm (t)	$11.73	$12.90
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$5.53	$5.53
Spot repairs - mill and patch, % Area (m^2)	$2.00	$2.20
Mill AC, mm (t)	$3.69	$4.06
Resurface with Surface HMA, mm (t)	$57.30	$63.03
Resurface with Binder HMA, mm (t)	$38.33	$42.16
Add to Granular Base, mm (t)	$16.00	$17.60
Seal Coat (m^2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_BC1.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: British Columbia, Coastal

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$65.00	$71.50
	Seal coat, % area (m2)	$2.00	$2.20
Binder	Binder HMA, mm (t)	$60.00	$66.00
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$20.00	$22.00
Subbase	Granular Subbase, mm (t)	$12.00	$13.20
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$1.50	$1.65
Spot repairs - mill and patch, % Area (m^2)	$15.00	$16.50
Mill AC, mm (t)	$4.00	$4.40
Resurface with Surface HMA, mm (t)	$65.00	$71.50
Resurface with Binder HMA, mm (t)	$60.00	$66.00
Add to Granular Base, mm (t)	$20.00	$22.00
Seal coat, % area (m2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_BC2.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: British Columbia, Interior

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$70.00	$77.00
	Seal coat, % area (m2)	$2.00	$2.20
Binder	Binder HMA, mm (t)	$60.00	$66.00
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$25.00	$27.50
Subbase	Granular Subbase, mm (t)	$20.00	$22.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$1.50	$1.65
Spot repairs - mill and patch, % Area (m^2)	$20.00	$22.00
Mill AC, mm (t)	$5.00	$5.50
Resurface with Surface HMA, mm (t)	$70.00	$77.00
Resurface with Binder HMA, mm (t)	$60.00	$66.00
Add to Granular Base, mm (t)	$25.00	$27.50
Seal coat, % area (m2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$250.00	$150.00
Granular Roadway Ditching, km (km)	$1,500.00	$1,000.00

Pavements_TR.xls – Unit Costs

Initial Provincial Pavement Construction Costs
Province: Territories

Initial pavement structure

Pavement layer	Description of pavement layer, Amount (Quantity)	Unit costs	
		Provincial	Municipal
Surface	Surface HMA, mm (t)	$65.00	$71.50
	Seal coat, % area (m2)	$2.00	$2.20
Binder	Binder HMA, mm (t)	$60.00	$66.00
OGDL	Open Graded Drainage Layer, mm (t)		
Base	Granular Base, mm (t)	$12.00	$13.20
Subbase	Granular Subbase, mm (t)	$10.00	$11.00
Subdrains	Includes trenching and outlets, % of occurrence	$20.00	$22.00
Drainage	Closed drainage, % of occurrence (m)		
Subbase	Subgrade improvement, % area (m2)	$5.00	$5.50

Pavement preservation treatments

Description of maintenance and rehabilitation treatments	Unit costs	
	Provincial	Municipal
Rout and seal, m (m)	$2.00	$2.20
Spot repairs - mill and patch, % Area (m^2)	$2.00	$2.20
Mill AC, mm (t)	$7.50	$8.25
Resurface with Surface HMA, mm (t)	$65.00	$71.50
Resurface with Binder HMA, mm (t)	$60.00	$66.00
Add to Granular Base, mm (t)	$12.00	$13.20
Seal coat, % area (m2)	$2.00	$2.20
Spot repairs - spray patch, % Area (m2)	$2.00	$2.20
Granular Roadway Grading, km (km)	$350.00	$250.00
Granular Roadway Ditching, km (km)	$2,500.00	$1,500.00

Pavements_NL.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 629,166	$ 181,571	$ 181,571	$ 356,810	$ 649,166	$ 201,571	$ 181,571	$ 134,169	$ 176,269	$ 176,269	$ 45,346	$ 215,045	$ 176,269	$ 130,398
Annualized Initial Construction Cost	$ 38,930	$ 11,235	$ 11,235	$ 22,078	$ 40,168	$ 12,472	$ 11,235	$ 8,302	$ 10,907	$ 10,907	$ 2,806	$ 13,306	$ 10,907	$ 8,068
M&R Construction Cost (Not Discounted)	$ 491,250	$ 362,100	$ 362,100	$ 336,450	$ 491,250	$ 362,100	$ 362,100	$ 336,450	$ 387,670	$ 387,670	$ 30,655	$ 343,780	$ 387,670	$ 379,765
M&R Construction Cost (Discounted)	$ 81,207	$ 57,726	$ 57,726	$ 54,025	$ 81,207	$ 57,726	$ 57,726	$ 54,025	$ 61,650	$ 61,650	$ 8,537	$ 60,583	$ 61,650	$ 59,142
Annualized M&R Constuction Cost	$ 5,025	$ 3,572	$ 3,572	$ 3,343	$ 5,025	$ 3,572	$ 3,572	$ 3,343	$ 3,815	$ 3,815	$ 528	$ 3,749	$ 3,815	$ 3,659

Pavements_PE.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 366,112	$ 335,233	$ 266,701	$ 169,638	$ 339,862	$ 323,000	$ 217,168	$ 205,697	$ 320,150	$ 280,838	$ 67,262	$ 236,092	$ 221,556	$ 211,449
Annualized Initial Construction Cost	$ 22,653	$ 20,743	$ 16,502	$ 10,496	$ 21,029	$ 19,986	$ 13,437	$ 12,728	$ 19,810	$ 17,377	$ 4,162	$ 14,608	$ 13,709	$ 13,084
M&R Construction Cost (Not Discounted)	$ 284,038	$ 284,038	$ 284,038	$ 103,600	$ 284,038	$ 284,038	$ 284,038	$ 284,038	$ 316,505	$ 316,505	$ 29,500	$ 316,505	$ 316,505	$ 316,505
M&R Construction Cost (Discounted)	$ 53,786	$ 53,786	$ 53,786	$ 23,968	$ 53,786	$ 53,786	$ 53,786	$ 53,786	$ 59,683	$ 59,683	$ 8,220	$ 59,683	$ 59,683	$ 59,683
Annualized M&R Constuction Cost	$ 3,328	$ 3,328	$ 3,328	$ 1,483	$ 3,328	$ 3,328	$ 3,328	$ 3,328	$ 3,693	$ 3,693	$ 509	$ 3,693	$ 3,693	$ 3,693

Pavements_NS.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 491,156	$ 269,763	$ 239,639	$ 105,949	$ 511,156	$ 289,763	$ 259,639	$ 147,756	$ 476,623	$ 324,358	$ 72,066	$ 496,623	$ 252,612	$ 227,957
Annualized Initial Construction Cost	$ 30,391	$ 16,692	$ 14,828	$ 6,556	$ 31,628	$ 17,929	$ 16,065	$ 9,143	$ 29,491	$ 20,070	$ 4,459	$ 30,729	$ 15,631	$ 14,105
M&R Construction Cost (Not Discounted)	$ 335,025	$ 315,483	$ 315,483	$ 114,615	$ 334,025	$ 315,483	$ 315,483	$ 217,645	$ 576,969	$ 557,225	$ 32,650	$ 576,969	$ 557,225	$ 557,225
M&R Construction Cost (Discounted)	$ 89,136	$ 70,417	$ 70,417	$ 35,317	$ 89,020	$ 70,417	$ 70,417	$ 52,457	$ 108,228	$ 104,547	$ 9,085	$ 108,228	$ 104,547	$ 104,547
Annualized M&R Constuction Cost	$ 5,515	$ 4,357	$ 4,357	$ 2,185	$ 5,508	$ 4,357	$ 4,357	$ 3,246	$ 6,697	$ 6,469	$ 562	$ 6,697	$ 6,469	$ 6,469

Pavements_NB.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 399,888	$ 394,300	$ 231,702	$ 160,681	$ 372,800	$ 394,298	$ 284,295	$ 274,406	$ 314,263	$ 234,811	$ 68,355	$ 259,735	$ 209,752	$ 199,974
Annualized Initial Construction Cost	$ 24,743	$ 24,398	$ 14,337	$ 9,942	$ 23,067	$ 24,397	$ 17,591	$ 16,979	$ 19,445	$ 14,529	$ 4,230	$ 16,071	$ 12,979	$ 12,374
M&R Construction Cost (Not Discounted)	$ 272,250	$ 272,250	$ 168,650	$ 168,650	$ 272,250	$ 346,272	$ 346,272	$ 346,272	$ 247,869	$ 247,869	$ 26,805	$ 270,762	$ 270,762	$ 270,762
M&R Construction Cost (Discounted)	$ 43,731	$ 43,731	$ 31,419	$ 31,419	$ 43,731	$ 65,146	$ 65,146	$ 65,146	$ 44,350	$ 44,350	$ 7,480	$ 47,823	$ 47,823	$ 47,823
Annualized M&R Constuction Cost	$ 2,706	$ 2,706	$ 1,944	$ 1,944	$ 2,706	$ 4,031	$ 4,031	$ 4,031	$ 2,744	$ 2,744	$ 463	$ 2,959	$ 2,959	$ 2,959

Pavements_QC-1.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 839,962	$ 793,361	$ 601,894	$ 522,752	$ 790,382	$ 773,601	$ 592,074	$ 542,752	$ 429,932	$ 354,045	$ 87,935	$ 403,319	$ 274,058	$ 238,388
Annualized Initial Construction Cost	$ 51,973	$ 49,090	$ 37,243	$ 32,346	$ 48,905	$ 47,867	$ 36,635	$ 33,583	$ 26,602	$ 21,907	$ 5,441	$ 24,956	$ 16,958	$ 14,750
M&R Construction Cost (Not Discounted)	$ 363,938	$ 363,938	$ 363,938	$ 363,938	$ 363,938	$ 363,938	$ 363,938	$ 363,938	$ 396,656	$ 396,656	$ 35,275	$ 382,125	$ 382,125	$ 382,125
M&R Construction Cost (Discounted)	$ 56,831	$ 56,831	$ 56,831	$ 56,831	$ 56,831	$ 56,831	$ 56,831	$ 56,831	$ 75,934	$ 75,934	$ 9,806	$ 73,683	$ 73,683	$ 73,683
Annualized M&R Constuction Cost	$ 3,516	$ 3,516	$ 3,516	$ 3,516	$ 3,516	$ 3,516	$ 3,516	$ 3,516	$ 4,698	$ 4,698	$ 607	$ 4,559	$ 4,559	$ 4,559

Pavements_QC-2.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 727,069	$ 683,376	$ 517,765	$ 444,664	$ 680,380	$ 665,268	$ 509,184	$ 464,664	$ 447,717	$ 296,924	$ 70,348	$ 352,468	$ 238,934	$ 210,398
Annualized Initial Construction Cost	$ 44,988	$ 42,284	$ 32,037	$ 27,514	$ 42,099	$ 41,164	$ 31,506	$ 28,751	$ 27,703	$ 18,372	$ 4,353	$ 21,809	$ 14,784	$ 13,019
M&R Construction Cost (Not Discounted)	$ 353,625	$ 353,625	$ 353,625	$ 353,625	$ 353,625	$ 353,625	$ 353,625	$ 353,625	$ 380,813	$ 380,813	$ 29,500	$ 367,688	$ 367,688	$ 367,688
M&R Construction Cost (Discounted)	$ 55,216	$ 55,216	$ 55,216	$ 55,216	$ 55,216	$ 55,216	$ 55,216	$ 55,216	$ 72,947	$ 72,947	$ 8,220	$ 70,913	$ 70,913	$ 70,913
Annualized M&R Constuction Cost	$ 3,417	$ 3,417	$ 3,417	$ 3,417	$ 3,417	$ 3,417	$ 3,417	$ 3,417	$ 4,514	$ 4,514	$ 509	$ 4,388	$ 4,388	$ 4,388

Pavements_ON-1.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 632,900	$ 381,456	$ 345,549	$ 238,666	$ 658,126	$ 430,884	$ 401,235	$ 203,360	$ 380,244	$ 312,229	$ 76,211	$ 465,576	$ 391,433	$ 296,084
Annualized Initial Construction Cost	$ 39,161	$ 23,603	$ 21,381	$ 14,768	$ 40,722	$ 26,661	$ 24,827	$ 12,583	$ 23,528	$ 19,319	$ 4,716	$ 28,808	$ 24,220	$ 18,320
M&R Construction Cost (Not Discounted)	$ 472,469	$ 546,808	$ 510,952	$ 360,826	$ 306,241	$ 546,808	$ 474,747	$ 360,826	$ 437,345	$ 358,048	$ 29,150	$ 437,345	$ 358,048	$ 356,025
M&R Construction Cost (Discounted)	$ 78,240	$ 102,234	$ 97,070	$ 73,796	$ 54,037	$ 102,234	$ 89,563	$ 73,796	$ 74,511	$ 55,724	$ 8,124	$ 74,511	$ 55,724	$ 52,613
Annualized M&R Constuction Cost	$ 4,841	$ 6,326	$ 6,006	$ 4,566	$ 3,344	$ 6,326	$ 5,542	$ 4,566	$ 4,610	$ 3,448	$ 503	$ 4,610	$ 3,448	$ 3,255

Pavements_ON-2.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 665,823	$ 460,062	$ 446,326	$ 298,948	$ 618,661	$ 486,946	$ 457,868	$ 216,458	$ 428,332	$ 356,939	$ 62,457	$ 510,314	$ 441,258	$ 275,900
Annualized Initial Construction Cost	$ 41,198	$ 28,467	$ 27,617	$ 18,498	$ 38,280	$ 30,130	$ 28,331	$ 13,393	$ 26,503	$ 22,086	$ 3,865	$ 31,576	$ 27,303	$ 17,072
M&R Construction Cost (Not Discounted)	$ 435,820	$ 503,377	$ 468,657	$ 380,485	$ 291,858	$ 284,826	$ 431,112	$ 380,485	$ 406,265	$ 378,887	$ 29,150	$ 406,265	$ 378,887	$ 374,471
M&R Construction Cost (Discounted)	$ 73,673	$ 94,302	$ 89,375	$ 78,336	$ 51,974	$ 51,735	$ 81,589	$ 78,336	$ 67,784	$ 59,172	$ 8,124	$ 67,784	$ 59,172	$ 55,543
Annualized M&R Constuction Cost	$ 4,559	$ 5,835	$ 5,530	$ 4,847	$ 3,216	$ 3,201	$ 5,048	$ 4,847	$ 4,194	$ 3,661	$ 503	$ 4,194	$ 3,661	$ 3,437

Pavements_MB.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 388,807	$ 394,300	$ 231,702	$ 160,681	$ 372,800	$ 271,105	$ 192,023	$ 192,023	$ 314,263	$ 234,811	$ 32,480	$ 259,735	$ 209,752	$ 199,974
Annualized Initial Construction Cost	$ 24,058	$ 24,398	$ 14,337	$ 9,942	$ 23,067	$ 16,775	$ 11,882	$ 11,882	$ 19,445	$ 14,529	$ 2,010	$ 16,071	$ 12,979	$ 12,374
M&R Construction Cost (Not Discounted)	$ 272,250	$ 272,250	$ 168,650	$ 168,650	$ 272,250	$ 272,250	$ 168,650	$ 168,650	$ 247,869	$ 247,869	$ 11,828	$ 270,762	$ 270,762	$ 270,762
M&R Construction Cost (Discounted)	$ 43,731	$ 43,731	$ 31,419	$ 31,419	$ 43,731	$ 43,731	$ 31,419	$ 31,419	$ 44,350	$ 44,350	$ 3,416	$ 47,823	$ 47,823	$ 47,823
Annualized M&R Constuction Cost	$ 2,706	$ 2,706	$ 1,944	$ 1,944	$ 2,706	$ 2,706	$ 1,944	$ 1,944	$ 2,744	$ 2,744	$ 211	$ 2,959	$ 2,959	$ 2,959

Pavements_SK.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 363,924	$ 413,525	$ 190,940	$ 45,427	$ 450,557	$ 283,140	$ 202,945	$ 200,590	$ 407,217	$ 63,170	$ 36,770	$ 271,878	$ 220,756	$ 48,655
Annualized Initial Construction Cost	$ 22,518	$ 25,587	$ 11,815	$ 2,811	$ 27,879	$ 17,519	$ 12,557	$ 12,412	$ 25,197	$ 3,909	$ 2,275	$ 16,823	$ 13,659	$ 3,011
M&R Construction Cost (Not Discounted)	$ 287,050	$ 287,050	$ 183,450	$ 48,000	$ 287,050	$ 287,050	$ 238,655	$ 183,450	$ 262,521	$ 66,000	$ 13,060	$ 285,414	$ 285,414	$ 60,115
M&R Construction Cost (Discounted)	$ 47,185	$ 47,185	$ 35,271	$ 13,183	$ 47,185	$ 47,185	$ 44,096	$ 35,271	$ 48,506	$ 15,785	$ 3,723	$ 51,979	$ 51,979	$ 12,313
Annualized M&R Constuction Cost	$ 2,920	$ 2,920	$ 2,182	$ 816	$ 2,920	$ 2,920	$ 2,728	$ 2,182	$ 3,001	$ 977	$ 230	$ 3,216	$ 3,216	$ 762

Pavements_AB.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 477,226	$ 456,419	$ 410,011	$ 383,206	$ 471,764	$ 459,444	$ 404,548	$ 362,743	$ 370,427	$ 341,566	$ 103,177	$ 266,415	$ 249,729	$ 238,250
Annualized Initial Construction Cost	$ 29,529	$ 28,241	$ 25,370	$ 23,711	$ 29,191	$ 28,428	$ 25,032	$ 22,445	$ 22,920	$ 21,135	$ 6,384	$ 16,485	$ 15,452	$ 14,742
M&R Construction Cost (Not Discounted)	$ 229,768	$ 229,768	$ 229,768	$ 229,768	$ 229,768	$ 229,768	$ 229,768	$ 229,768	$ 251,086	$ 251,086	$ 37,200	$ 251,086	$ 251,086	$ 251,086
M&R Construction Cost (Discounted)	$ 36,246	$ 36,246	$ 36,246	$ 36,246	$ 36,246	$ 36,246	$ 36,246	$ 36,246	$ 48,220	$ 48,220	$ 10,334	$ 48,220	$ 48,220	$ 48,220
Annualized M&R Constuction Cost	$ 2,243	$ 2,243	$ 2,243	$ 2,243	$ 2,243	$ 2,243	$ 2,243	$ 2,243	$ 2,984	$ 2,984	$ 639	$ 2,984	$ 2,984	$ 2,984

Pavements_BC-1.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial Construction Cost	$ 517,686	$ 481,367	$ 433,653	$ 370,395	$ 543,611	$ 507,292	$ 410,828	$ 203,526	$ 529,504	$ 477,019	$ 128,972	$ 340,521	$ 266,717	$ 223,878
Annualized Initial Construction Cost	$ 32,032	$ 29,785	$ 26,833	$ 22,918	$ 33,636	$ 31,389	$ 25,420	$ 12,593	$ 32,763	$ 29,516	$ 7,980	$ 21,070	$ 16,503	$ 13,853
M&R Construction Cost (Not Discounted)	$ 344,200	$ 344,200	$ 344,200	$ 284,075	$ 344,200	$ 344,200	$ 344,200	$ 344,200	$ 378,620	$ 378,620	$ 29,500	$ 378,620	$ 378,620	$ 378,620
M&R Construction Cost (Discounted)	$ 61,706	$ 61,706	$ 61,706	$ 59,883	$ 61,706	$ 61,706	$ 61,706	$ 61,706	$ 67,876	$ 67,876	$ 8,220	$ 67,876	$ 67,876	$ 67,876
Annualized M&R Constuction Cost	$ 3,818	$ 3,818	$ 3,818	$ 3,705	$ 3,818	$ 3,818	$ 3,818	$ 3,818	$ 4,200	$ 4,200	$ 509	$ 4,200	$ 4,200	$ 4,200

Pavements_BC-2.xls - Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	**Freeway**	**Arterial**	**Collector**	**Local**	**Freeway**	**Arterial**	**Collector**	**Local**	**Arterial**	**Collector**	**Local**	**Arterial**	**Collector**	**Local**
Initial Construction Cost	$ 666,440	$ 629,434	$ 565,403	$ 297,547	$ 692,440	$ 655,434	$ 538,903	$ 255,815	$ 692,377	$ 621,943	$ 161,215	$ 441,250	$ 352,794	$ 281,397
Annualized Initial Construction Cost	$ 41,236	$ 38,947	$ 34,985	$ 18,411	$ 42,845	$ 40,555	$ 33,345	$ 15,829	$ 42,841	$ 38,483	$ 9,975	$ 27,303	$ 21,829	$ 17,412
M&R Construction Cost (Not Discounted)	$ 374,725	$ 374,725	$ 374,725	$ 103,600	$ 374,725	$ 374,725	$ 374,725	$ 374,725	$ 412,198	$ 412,198	$ 35,275	$ 412,198	$ 412,198	$ 412,198
M&R Construction Cost (Discounted)	$ 67,439	$ 67,439	$ 67,439	$ 23,968	$ 67,439	$ 67,439	$ 67,439	$ 67,439	$ 74,183	$ 74,183	$ 9,806	$ 74,183	$ 74,183	$ 74,183
Annualized M&R Constuction Cost	$ 4,173	$ 4,173	$ 4,173	$ 1,483	$ 4,173	$ 4,173	$ 4,173	$ 4,173	$ 4,590	$ 4,590	$ 607	$ 4,590	$ 4,590	$ 4,590

Pavements_TR-2.xls – Summary

	Provincial								Municipal					
	Rural				Urban				Rural			Urban		
Item	**Freeway**	**Arterial**	**Collector**	**Local**	**Freeway**	**Arterial**	**Collector**	**Local**	**Arterial**	**Collector**	**Local**	**Arterial**	**Collector**	**Local**
Initial Construction Cost	$ 287,388	$ 195,478	$ 183,388	$ 138,884	$ 227,851	$ 195,478	$ 183,388	$ 138,884	$ 215,025	$ 114,135	$ 63,418	$ 237,025	$ 223,727	$ 210,741
Annualized Initial Construction Cost	$ 17,782	$ 12,095	$ 11,347	$ 8,594	$ 14,098	$ 12,095	$ 11,347	$ 8,594	$ 13,305	$ 7,062	$ 3,924	$ 14,666	$ 13,843	$ 13,040
M&R Construction Cost (Not Discounted)	$ 317,125	$ 317,125	$ 185,875	$ 185,875	$ 317,125	$ 317,125	$ 317,125	$ 185,875	$ 204,463	$ 204,463	$ 33,100	$ 335,713	$ 335,713	$ 335,713
M&R Construction Cost (Discounted)	$ 49,230	$ 49,230	$ 35,727	$ 35,727	$ 49,230	$ 49,230	$ 49,230	$ 35,727	$ 39,300	$ 39,300	$ 9,282	$ 53,440	$ 53,440	$ 53,440
Annualized M&R Constuction Cost	$ 3,046	$ 3,046	$ 2,211	$ 2,211	$ 3,046	$ 3,046	$ 3,046	$ 2,211	$ 2,432	$ 2,432	$ 574	$ 3,307	$ 3,307	$ 3,307

Bridges.xls - Quantities

Description and type of work item	Region	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Area of bridge deck (m^2/2-Lane km)	NL	0	49	7	33	0	49	7	33	25	4	5	25	4	10
	PE	49	18	14	3	49	18	0	0	9	7	5	9	10	10
	NS	177	139	108	46	177	139	108	46	69	54	5	69	54	10
	NB	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	QC-1	200	100	60	90	250	110	60	90	50	30	5	55	30	10
	QC-2	160	80	48	72	200	88	48	72	40	24	5	44	24	10
	ON-1	100	90	80	50	120	90	100	35	45	40	5	45	50	10
	ON-2	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	MB	92	144	81	2	92	144	81	2	72	41	5	72	41	10
	SK	49	18	14	3	49	18	0	0	9	7	5	9	10	10
	AB	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	BC-1	100	90	80	50	120	90	100	35	45	40	5	45	50	10
	BC-2	80	72	64	40	96	72	80	28	36	32	5	36	40	10
	TR	49	18	14	3	49	18	0	0	9	7	5	9	10	10

Bridges.xls – Unit Costs

Description and type of work item	Region	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial construction cost ($/m^2)	NL	$ 2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,800.00	$2,800.00	$2,800.00	$2,800.00	$2,800.00	$2,800.00
	PE	$ 4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	NS	$ 4,400.00	$3,800.00	$3,600.00	$3,100.00	$4,400.00	$3,800.00	$3,600.00	$3,100.00	$4,200.00	$4,200.00	$4,200.00	$4,200.00	$4,200.00	$4,200.00
	NB	$ 4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	QC-1	$ 4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	QC-2	$ 4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	ON-1	$ 2,675.00	$2,675.00	$2,675.00	$2,675.00	$2,675.00	$2,675.00	$2,675.00	$2,675.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00	$3,000.00
	ON-2	$ 3,350.00	$3,350.00	$3,350.00	$3,350.00	$3,350.00	$3,350.00	$3,350.00	$3,350.00	$3,700.00	$3,700.00	$3,700.00	$3,700.00	$3,700.00	$3,700.00
	MB	$ 3,700.00	$3,300.00	$2,500.00	$2,100.00	$3,700.00	$3,300.00	$2,500.00	$2,100.00	$3,600.00	$3,600.00	$3,600.00	$3,600.00	$3,600.00	$3,600.00
	SK	$ 4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	AB	$ 4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$3,600.00	$3,000.00	$2,600.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	BC-1	$ 4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	BC-2	$ 4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
	TR	$ -	$4,800.00	$4,800.00	$4,800.00	$4,800.00	$4,800.00	$4,800.00	$4,800.00	$5,300.00	$5,300.00	$5,300.00	$5,300.00	$5,300.00	$5,300.00
Maintenance and rehabilitation construction cost ($/m^2)	NL	$ 750.00	$ 574.00	$ 500.00	$ 750.00	$ 750.00	$ 574.00	$ 500.00	$ 750.00	$ 650.00	$ 650.00	$ 650.00	$ 650.00	$ 650.00	$ 650.00
	PE	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 675.00	$ 675.00	$ 675.00	$ 675.00	$ 675.00	$ 675.00
	NS	$ 500.00	$ 400.00	$ 325.00	$ 250.00	$ 500.00	$ 400.00	$ 325.00	$ 250.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00
	NB	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00
	QC-1	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00
	QC-2	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00
	ON-1	$ 750.00	$ 666.67	$ 541.67	$ 450.00	$ 750.00	$ 666.67	$ 541.67	$ 450.00	$ 750.00	$ 750.00	$ 750.00	$ 750.00	$ 750.00	$ 750.00
	ON-2	$ 975.00	$ 866.67	$ 704.17	$ 585.00	$ 975.00	$ 866.67	$ 704.17	$ 585.00	$ 950.00	$ 950.00	$ 950.00	$ 950.00	$ 950.00	$ 950.00
	MB	$ 1,600.00	$1,600.00	$1,600.00	$1,600.00	$1,600.00	$1,600.00	$1,600.00	$1,600.00	$1,750.00	$1,750.00	$1,750.00	$1,750.00	$1,750.00	$1,750.00
	SK	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00
	AB	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 750.00	$ 600.00	$ 500.00	$ 400.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00	$ 700.00
	BC-1	$ 1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00
	BC-2	$ 1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00	$1,100.00
	TR	$ 1,028.00	$1,028.00	$1,028.00	$1,028.00	$1,028.00	$1,028.00	$1,028.00	$1,028.00	$1,150.00	$1,150.00	$1,150.00	$1,150.00	$1,150.00	$1,150.00
Maintenance and rehabilitation frequency (Years)	NL	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	PE	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	NS	17	17	17	17	17	17	17	17	17	17	17	17	17	17
	NB	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	QC-1	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	QC-2	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	ON-1	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	ON-2	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	MB	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	SK	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	AB	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	BC-1	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	BC-2	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	TR	17	17	17	17	17	17	17	17	17	17	17	17	17	17

Bridges.xls – New Costs

Description and type of work item	Region	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Initial bridge construction cost ($/2-Lane km)	NL	$ -	$ 123,046	$ 17,669	$ 83,487	$ -	$ 123,046	$ 17,669	$ 83,487	$ 68,906	$ 9,894	$ 14,000	$ 68,906	$ 9,894	$ 28,000
	PE	$ 196,327	$ 65,403	$ 42,130	$ 6,575	$ 196,327	$ 65,403	$ -	$ -	$ 36,335	$ 28,087	$ 20,000	$ 36,335	$ 40,000	$ 40,000
	NS	$ 780,587	$ 526,516	$ 387,731	$ 142,653	$ 780,587	$ 526,516	$ 387,731	$ 142,653	$ 290,969	$ 226,177	$ 21,000	$ 290,969	$ 226,177	$ 42,000
	NB	$ 320,000	$ 259,200	$ 192,000	$ 104,000	$ 384,000	$ 259,200	$ 240,000	$ 72,800	$ 144,000	$ 128,000	$ 20,000	$ 144,000	$ 160,000	$ 40,000
	QC-1	$ 800,000	$ 360,000	$ 180,000	$ 234,000	$1,000,000	$ 396,000	$ 180,000	$ 234,000	$ 200,000	$ 120,000	$ 20,000	$ 220,000	$ 120,000	$ 40,000
	QC-2	$ 640,000	$ 288,000	$ 144,000	$ 187,200	$ 800,000	$ 316,800	$ 144,000	$ 187,200	$ 160,000	$ 96,000	$ 20,000	$ 176,000	$ 96,000	$ 40,000
	ON-1	$ 267,500	$ 240,750	$ 214,000	$ 133,750	$ 321,000	$ 240,750	$ 267,500	$ 93,625	$ 135,000	$ 120,000	$ 15,000	$ 135,000	$ 150,000	$ 30,000
	ON-2	$ 268,000	$ 241,200	$ 214,400	$ 134,000	$ 321,600	$ 241,200	$ 268,000	$ 93,800	$ 133,200	$ 118,400	$ 18,500	$ 133,200	$ 148,000	$ 37,000
	MB	$ 340,618	$ 476,131	$ 203,172	$ 4,743	$ 340,618	$ 476,131	$ 203,172	$ 4,743	$ 259,708	$ 146,284	$ 18,000	$ 259,708	$ 146,284	$ 36,000
	SK	$ 196,327	$ 65,403	$ 42,130	$ 6,575	$ 196,327	$ 65,403	$ -	$ -	$ 36,335	$ 28,087	$ 20,000	$ 36,335	$ 40,000	$ 40,000
	AB	$ 320,000	$ 259,200	$ 192,000	$ 104,000	$ 384,000	$ 259,200	$ 240,000	$ 72,800	$ 144,000	$ 128,000	$ 20,000	$ 144,000	$ 160,000	$ 40,000
	BC-1	$ 400,000	$ 360,000	$ 320,000	$ 200,000	$ 480,000	$ 360,000	$ 400,000	$ 140,000	$ 180,000	$ 160,000	$ 20,000	$ 180,000	$ 200,000	$ 40,000
	BC-2	$ 320,000	$ 288,000	$ 256,000	$ 160,000	$ 384,000	$ 288,000	$ 320,000	$ 112,000	$ 144,000	$ 128,000	$ 20,000	$ 144,000	$ 160,000	$ 40,000
	TR	$ -	$ 87,204	$ 67,408	$ 12,139	$ 235,592	$ 87,204	$ -	$ -	$ 48,144	$ 37,215	$ 26,500	$ 48,144	$ 53,000	$ 53,000

Bridges.xls – New Costs Annualized

Description and type of work item	Region	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Annual bridge construction cost ($/2-Lane km)	NL	$ -	$ 7,614	$ 1,093	$ 5,166	$ -	$ 7,614	$ 1,093	$ 5,166	$ 4,264	$ 612	$ 866	$ 4,264	$ 612	$ 1,733
	PE	$ 12,148	$ 4,047	$ 2,607	$ 407	$ 12,148	$ 4,047	$ -	$ -	$ 2,248	$ 1,738	$ 1,238	$ 2,248	$ 2,475	$ 2,475
	NS	$ 48,299	$ 32,579	$ 23,991	$ 8,827	$ 48,299	$ 32,579	$ 23,991	$ 8,827	$ 18,004	$ 13,995	$ 1,299	$ 18,004	$ 13,995	$ 2,599
	NB	$ 19,800	$ 16,038	$ 11,880	$ 6,435	$ 23,760	$ 16,038	$ 14,850	$ 4,505	$ 8,910	$ 7,920	$ 1,238	$ 8,910	$ 9,900	$ 2,475
	QC-1	$ 49,501	$ 22,275	$ 11,138	$ 14,479	$ 61,876	$ 24,503	$ 11,138	$ 14,479	$ 12,375	$ 7,425	$ 1,238	$ 13,613	$ 7,425	$ 2,475
	QC-2	$ 39,600	$ 17,820	$ 8,910	$ 11,583	$ 49,501	$ 19,602	$ 8,910	$ 11,583	$ 9,900	$ 5,940	$ 1,238	$ 10,890	$ 5,940	$ 2,475
	ON-1	$ 16,552	$ 14,897	$ 13,241	$ 8,276	$ 19,862	$ 14,897	$ 16,552	$ 5,793	$ 8,353	$ 7,425	$ 928	$ 8,353	$ 9,281	$ 1,856
	ON-2	$ 16,583	$ 14,924	$ 13,266	$ 8,291	$ 19,899	$ 14,924	$ 16,583	$ 5,804	$ 8,242	$ 7,326	$ 1,145	$ 8,242	$ 9,158	$ 2,289
	MB	$ 21,076	$ 29,461	$ 12,571	$ 293	$ 21,076	$ 29,461	$ 12,571	$ 293	$ 16,070	$ 9,051	$ 1,114	$ 16,070	$ 9,051	$ 2,228
	SK	$ 12,148	$ 4,047	$ 2,607	$ 407	$ 12,148	$ 4,047	$ -	$ -	$ 2,248	$ 1,738	$ 1,238	$ 2,248	$ 2,475	$ 2,475
	AB	$ 19,800	$ 16,038	$ 11,880	$ 6,435	$ 23,760	$ 16,038	$ 14,850	$ 4,505	$ 8,910	$ 7,920	$ 1,238	$ 8,910	$ 9,900	$ 2,475
	BC-1	$ 24,750	$ 22,275	$ 19,800	$ 12,375	$ 29,700	$ 22,275	$ 24,750	$ 8,663	$ 11,138	$ 9,900	$ 1,238	$ 11,138	$ 12,375	$ 2,475
	BC-2	$ 19,800	$ 17,820	$ 15,840	$ 9,900	$ 23,760	$ 17,820	$ 19,800	$ 6,930	$ 8,910	$ 7,920	$ 1,238	$ 8,910	$ 9,900	$ 2,475
	TR	$ -	$ 5,396	$ 4,171	$ 751	$ 14,577	$ 5,396	$ -	$ -	$ 2,979	$ 2,303	$ 1,640	$ 2,979	$ 3,279	$ 3,279

Bridges.xls – M&R Costs Annualized

Description and type of work item	Region	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Annual bridge maintenance and rehabilitation construction cost ($/2-Lane km)	NL	$ -	$ 502	$ 63	$ 445	$ -	$ 502	$ 63	$ 445	$ 284	$ 41	$ 58	$ 284	$ 41	$ 116
	PE	$ 932	$ 276	$ 178	$ 26	$ 932	$ 276	$ -	$ -	$ 155	$ 120	$ 85	$ 155	$ 171	$ 171
	NS	$ 3,076	$ 1,922	$ 1,214	$ 399	$ 3,076	$ 1,922	$ 1,214	$ 399	$ 1,081	$ 840	$ 78	$ 1,081	$ 840	$ 156
	NB	$ 1,519	$ 1,093	$ 810	$ 405	$ 1,822	$ 1,093	$ 1,012	$ 283	$ 638	$ 567	$ 89	$ 638	$ 709	$ 177
	QC-1	$ 3,796	$ 1,519	$ 759	$ 911	$ 4,745	$ 1,670	$ 759	$ 911	$ 886	$ 531	$ 89	$ 974	$ 531	$ 177
	QC-2	$ 3,037	$ 1,215	$ 607	$ 729	$ 3,796	$ 1,336	$ 607	$ 729	$ 709	$ 425	$ 89	$ 780	$ 425	$ 177
	ON-1	$ 808	$ 646	$ 467	$ 242	$ 970	$ 646	$ 584	$ 170	$ 364	$ 323	$ 40	$ 364	$ 404	$ 81
	ON-2	$ 1,387	$ 1,109	$ 801	$ 416	$ 1,664	$ 1,109	$ 1,001	$ 291	$ 608	$ 540	$ 84	$ 608	$ 675	$ 169
	MB	$ 3,728	$ 5,843	$ 3,291	$ 91	$ 3,728	$ 5,843	$ 3,291	$ 91	$ 3,195	$ 1,800	$ 221	$ 3,195	$ 1,800	$ 443
	SK	$ 932	$ 276	$ 178	$ 26	$ 932	$ 276	$ -	$ -	$ 161	$ 124	$ 89	$ 161	$ 177	$ 177
	AB	$ 1,519	$ 1,093	$ 810	$ 405	$ 1,822	$ 1,093	$ 1,012	$ 283	$ 638	$ 567	$ 89	$ 638	$ 709	$ 177
	BC-1	$ 805	$ 725	$ 644	$ 403	$ 966	$ 725	$ 805	$ 282	$ 398	$ 354	$ 44	$ 398	$ 443	$ 89
	BC-2	$ 644	$ 580	$ 515	$ 322	$ 773	$ 580	$ 644	$ 225	$ 319	$ 283	$ 44	$ 319	$ 354	$ 89
	TR	$ 1,750	$ 648	$ 501	$ 90	$ 1,750	$ 648	$ -	$ -	$ 362	$ 280	$ 199	$ 362	$ 399	$ 399

All Other Road Infrastructure.xls – Unit Costs

Work item (supply and install)		Provincial Costs													
Description and type of work item		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	TR
Clearing and grubbing (m^2)		$ 2.00	$ 1.00	$ 2.00	$ 2.00	$ 3.00	$ 3.00	$ 2.09	$ 2.00	$ 1.00	$ 1.00	$ 2.00	$ 5.00	$ 5.00	$ 3.00
Grading	Earth moving (m^3)	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 7.15	$ 5.50	$ 2.42	$ 1.45	$ 2.50	$ 5.00	$ 5.00	$ 12.50
	Rock moving (m^3)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 75.00	$ 40.00	$ 86.74	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 100.00
Land-Scaping	Sodding and top soil (m^2)	$ 4.00	$ 4.00	$ 4.00	$ 4.00	$ 6.00	$ 6.00	$ 3.32	$ 4.35	$ 7.70	$ 4.00	$ 4.00	$ 10.00	$ 10.00	$ 10.00
	Top soil (m^3)	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 15.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
Drainage	PCC curb and gutter (m)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 40.00	$ 50.00	$ 55.00	$ 40.32	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 75.00
	500 mm Pipe culvert & end sections (m)	$ 125.00	$ 100.00	$ 125.00	$ 125.00	$ 250.00	$ 200.00	$ 112.21	$ 139.25	$ 40.32	$ 50.00	$ 60.00	$ 250.00	$ 500.00	$ 620.00
	1500 mm wide box culvert (m)	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 800.00	$ 1,000.00	$ 1,534.70	$ 1,700.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 3,000.00	$ 3,000.00	$ 3,000.00
	Storm water sewers (m)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 60.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 75.00
Guard Rail	Concrete median (m)	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 60.00	$ 300.00	$ 200.18	$ 220.00	$ 140.00	$ 200.00	$ 200.00	$ 100.00	$ 100.00	$ 200.00
	Steel guiderail (m)	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 65.00	$ 80.00	$ 65.98	$ 70.00	$ 74.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 500.00
	3-Cable guiderail (m)	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.40	$ 18.00	$ 15.40	$ 18.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 15.00	$ 75.00
Fencing, Gates	Chain link fence (m)	$ 50.00	$ 50.00	$ 50.00	$ 50.00	$ 30.00	$ 75.00	$ 44.44	$ 70.27	$ 50.00	$ 50.00	$ 50.00	$ 60.00	$ 60.00	$ 30.00
	Wire fence (m)	$ 7.00	$ 7.00	$ 7.00	$ 7.00	$ 40.00	$ 40.00	$ 8.54	$ 13.09	$ 4.00	$ 3.50	$ 7.00	$ 15.00	$ 15.00	$ 15.00
Lighting	High mast (each)	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 35,000.00	$ 35,000.00	$ 29,635.78	$ 29,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00	$ 30,000.00
	Standard (each)	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,297.61	$ 1,300.00	$ 2,000.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 2,500.00
Painting of Traffic Lanes (m)		$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 2.00	$ 2.00	$ 0.91	$ 1.03	$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 1.00	$ 1.00

Work item (supply and install)		Municipal Costs													
Description and type of work item		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	TR
Clearing and grubbing (m^2)		$ 2.20	$ 1.10	$ 2.20	$ 2.20	$ 2.20	$ 2.20	$ 2.30	$ 2.20	$ 1.10	$ 1.10	$ 2.20	$ 5.50	$ 5.50	$ 3.30
Grading	Earth moving (m^3)	$ 5.50	$ 5.50	$ 5.50	$ 5.50	$ 5.50	$ 5.50	$ 7.87	$ 6.05	$ 2.66	$ 1.60	$ 2.75	$ 5.50	$ 5.50	$ 13.75
	Rock moving (m^3)	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 82.50	$ 44.00	$ 95.41	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 110.00
Land-Scaping	Sodding and top soil (m^2)	$ 4.40	$ 4.40	$ 4.40	$ 4.40	$ 4.40	$ 4.40	$ 3.65	$ 4.79	$ 8.47	$ 4.40	$ 4.40	$ 11.00	$ 11.00	$ 11.00
	Top soil (m^3)	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 16.50	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00	$ 11.00
Drainage	PCC curb and gutter (m)	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 60.50	$ 44.35	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 82.50
	500 mm Pipe culvert & end sections (m)	$ 137.50	$ 110.00	$ 137.50	$ 137.50	$ 137.50	$ 165.00	$ 123.43	$ 153.18	$ 44.35	$ 55.00	$ 66.00	$ 275.00	$ 550.00	$ 682.00
	1500 mm wide box culvert (m)	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 2,200.00	$ 1,688.17	$ 1,870.00	$ 2,200.00	$ 2,200.00	$ 2,200.00	$ 3,300.00	$ 3,300.00	$ 3,300.00
	Storm water sewers (m)	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 66.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 82.50
Guard Rail	Concrete median (m)	$ 220.00	$ 220.00	$ 220.00	$ 220.00	$ 220.00	$ 220.00	$ 220.20	$ 242.00	$ 154.00	$ 220.00	$ 220.00	$ 110.00	$ 110.00	$ 220.00
	Steel guiderail (m)	$ 82.50	$ 82.50	$ 82.50	$ 82.50	$ 82.50	$ 82.50	$ 72.58	$ 77.00	$ 81.40	$ 82.50	$ 82.50	$ 82.50	$ 82.50	$ 550.00
	3-Cable guiderail (m)	$ 16.50	$ 16.50	$ 16.50	$ 16.50	$ 16.94	$ 19.80	$ 16.94	$ 19.80	$ 16.50	$ 16.50	$ 16.50	$ 16.50	$ 16.50	$ 82.50
Fencing, Gates	Chain link fence (m)	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 55.00	$ 82.50	$ 48.88	$ 77.30	$ 55.00	$ 55.00	$ 55.00	$ 66.00	$ 66.00	$ 33.00
	Wire fence (m)	$ 7.70	$ 7.70	$ 7.70	$ 7.70	$ 7.70	$ 7.70	$ 9.39	$ 14.40	$ 4.40	$ 3.85	$ 7.70	$ 16.50	$ 16.50	$ 16.50
Lighting	High mast (each)	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 32,599.36	$ 31,900.00	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 33,000.00	$ 33,000.00
	Standard (each)	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,427.37	$ 1,430.00	$ 2,200.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 1,650.00	$ 2,750.00
Painting of Traffic Lanes (m)		$ 1.10	$ 1.10	$ 1.10	$ 1.10	$ 1.10	$ 1.10	$ 1.00	$ 1.13	$ 1.10	$ 1.10	$ 1.10	$ 1.10	$ 1.10	$ 1.10

Description and type of work item		Region	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Clearing and grubbing (m^2)		NL	4500	6000	6750	7200	1875	2700	4050	5100	4275	5100	6000	1275	1680	2250
		PE	1500	2000	2250	2400	625	900	1350	1700	1425	1700	2000	425	560	750
		NS	4500	6000	6750	7200	1875	2700	4050	5100	4275	5100	6000	1275	1680	2250
		NB	3000	4000	4500	4800	1250	1800	2700	3400	2850	3400	4000	850	1120	1500
		QC-1	3000	4000	4500	4800	1250	1800	2700	3400	2850	3400	4000	850	1120	1500
		QC-2	4500	6000	6750	7200	1875	2700	4050	5100	4275	5100	6000	1275	1680	2250
		ON-1	3000	4000	4500	4800	1250	1800	2700	3400	2850	3400	4000	850	1120	1500
		ON-2	4500	6000	6750	7200	1875	2700	4050	5100	4275	5100	6000	1275	1680	2250
		MB	1500	2000	2250	2400	625	900	1350	1700	1425	1700	2000	425	560	750
		SK	1500	2000	2250	2400	625	900	1350	1700	1425	1700	2000	425	560	750
		AB	1500	2000	2250	2400	625	900	1350	1700	1425	1700	2000	425	560	750
		BC-1	3000	4000	4500	4800	1250	1800	2700	3400	2850	3400	4000	850	1120	1500
		BC-2	6000	8000	9000	9600	2500	3600	5400	6800	5700	6800	8000	1700	2240	3000
		TR	4500	6000	6750	7200	1875	2700	4050	5100	4275	5100	6000	1275	1680	2250
Grading	Material moved (m^3)	NL	100000	65000	35000	10000	100000	65000	45000	12500	75000	20000	5000	75000	25000	7500
		PE	25000	15000	10000	2500	25000	15000	15000	4000	10000	7500	1500	10000	10000	2500
		NS	100000	65000	35000	10000	100000	65000	45000	12500	75000	20000	5000	75000	25000	7500
		NB	50000	40000	25000	5000	50000	40000	35000	3500	25000	15000	2500	25000	20000	4000
		QC-1	50000	40000	25000	5000	50000	40000	35000	3500	25000	15000	2500	25000	20000	4000
		QC-2	100000	65000	35000	10000	100000	65000	45000	12500	75000	20000	5000	75000	25000	7500
		ON-1	50000	40000	25000	5000	50000	40000	35000	3500	25000	15000	2500	25000	20000	4000
		ON-2	100000	65000	35000	10000	100000	65000	45000	12500	75000	20000	5000	75000	25000	7500
		MB	25000	15000	10000	2500	25000	15000	15000	4000	10000	7500	1500	10000	10000	2500
		SK	25000	15000	10000	2500	25000	15000	15000	4000	10000	7500	1500	10000	10000	2500
		AB	25000	15000	10000	2500	25000	15000	15000	4000	10000	7500	1500	10000	10000	2500
		BC-1	50000	40000	25000	5000	50000	40000	35000	3500	25000	15000	2500	25000	20000	4000
		BC-2	150000	85000	50000	15000	150000	85000	60000	17500	50000	35000	7500	50000	40000	10000
		TR	100000	65000	35000	10000	100000	65000	45000	12500	75000	20000	5000	75000	25000	7500
Grading	Rock % of material moved (%)	NL	20	20	10	10	20	20	10	10	15	15	10	15	15	10
		PE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		NS	20	20	10	10	20	20	10	10	15	15	10	15	15	10
		NB	10	10	5	5	10	10	5	5	5	5	5	5	5	5
		QC-1	10	10	5	5	10	10	5	5	5	5	5	5	5	5
		QC-2	20	20	10	10	20	20	10	10	15	15	10	15	15	10
		ON-1	10	10	5	5	10	10	5	5	5	5	5	5	5	5
		ON-2	20	20	10	10	20	20	10	10	15	15	10	15	15	10
		MB	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		SK	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		AB	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		BC-1	10	10	5	5	10	10	5	5	5	5	5	5	5	5
		BC-2	50	50	30	30	50	50	30	30	20	20	20	20	20	20
		TR	20	20	10	10	20	20	10	10	15	15	10	15	15	10

All Other Road Infrastructure.xls – Quantities (Cont…)

Description and type of work item		Region	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Land-scaping	Sodding & top soil (m^2)	NL	500	250	225	200	4000	2800	2800	1750	300	262.5	225	5250	3600	2812.5
		PE	250	125	112.5	100	2000	1400	1400	875	100	87.5	75	1750	1200	937.5
		NS	500	250	225	200	4000	2800	2800	1750	300	262.5	225	5250	3600	2812.5
		NB	1000	500	450	400	8000	5600	5600	3500	400	350	300	7000	4800	3750
		QC-1	1000	500	450	400	8000	5600	5600	3500	400	350	300	7000	4800	3750
		QC-2	500	250	225	200	4000	2800	2800	1750	300	262.5	225	5250	3600	2812.5
		ON-1	1000	500	450	400	8000	5600	5600	3500	400	350	300	7000	4800	3750
		ON-2	500	250	225	200	4000	2800	2800	1750	300	262.5	225	5250	3600	2812.5
		MB	250	125	112.5	100	2000	1400	1400	875	100	87.5	75	1750	1200	937.5
		SK	250	125	112.5	100	2000	1400	1400	875	100	87.5	75	1750	1200	937.5
		AB	250	125	112.5	100	2000	1400	1400	875	100	87.5	75	1750	1200	937.5
		BC-1	1000	500	450	400	8000	5600	5600	3500	400	350	300	7000	4800	3750
		BC-2	100	50	45	40	800	560	560	350	80	70	60	1400	960	750
		TR	500	250	225	200	4000	2800	2800	1750	300	262.5	225	5250	3600	2812.5
Land-scaping	Top soil (m^2)	NL	9500	4750	4275	3800	1000	1200	1200	1750	5700	4987.5	4275	0	900	937.5
		PE	4750	2375	2137.5	1900	500	600	600	875	1900	1662.5	1425	0	300	312.5
		NS	9500	4750	4275	3800	1000	1200	1200	1750	5700	4987.5	4275	0	900	937.5
		NB	19000	9500	8550	7600	2000	2400	2400	3500	7600	6650	5700	0	1200	1250
		QC-1	19000	9500	8550	7600	2000	2400	2400	3500	7600	6650	5700	0	1200	1250
		QC-2	9500	4750	4275	3800	1000	1200	1200	1750	5700	4987.5	4275	0	900	937.5
		ON-1	19000	9500	8550	7600	2000	2400	2400	3500	7600	6650	5700	0	1200	1250
		ON-2	9500	4750	4275	3800	1000	1200	1200	1750	5700	4987.5	4275	0	900	937.5
		MB	4750	2375	2137.5	1900	500	600	600	875	1900	1662.5	1425	0	300	312.5
		SK	4750	2375	2137.5	1900	500	600	600	875	1900	1662.5	1425	0	300	312.5
		AB	4750	2375	2137.5	1900	500	600	600	875	1900	1662.5	1425	0	300	312.5
		BC-1	19000	9500	8550	7600	2000	2400	2400	3500	7600	6650	5700	0	1200	1250
		BC-2	1900	950	855	760	200	240	240	350	1520	1330	1140	0	240	250
		TR	9500	4750	4275	3800	1000	1200	1200	1750	5700	4987.5	4275	0	900	937.5
Drainage	Curb and gutter (PCC, Straight) (m)	NL	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		PE	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		NS	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		NB	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		QC-1	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		QC-2	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		ON-1	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		ON-2	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		MB	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		SK	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		AB	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		BC-1	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		BC-2	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000
		TR	50	70	90	110	1600	1800	1900	2000	70	90	110	1800	1900	2000

All Other Road Infrastructure.xls – Quantities (Cont…)

Description and type of work item		Region	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Drainage	500 mm Pipe culvert & end sections (m)	NL	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		PE	5	25	75	125	2.5	12.5	37.5	62.5	30	90	150	15	45	75
		NS	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		NB	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		QC-1	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		QC-2	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		ON-1	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		ON-2	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		MB	5	25	75	125	2.5	12.5	37.5	62.5	30	90	150	15	45	75
		SK	5	25	75	125	2.5	12.5	37.5	62.5	30	90	150	15	45	75
		AB	5	25	75	125	2.5	12.5	37.5	62.5	30	90	150	15	45	75
		BC-1	10	50	150	250	5	25	75	125	60	180	300	30	90	150
		BC-2	5	25	75	125	2.5	12.5	37.5	62.5	30	90	150	15	45	75
		TR	10	50	150	250	5	25	75	125	60	180	300	30	90	150
Drainage	1500 mm Wide box culvert (m)	NL	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		PE	10	7.5	5	5	5	3.75	2.5	2.5	7	4.5	4.5	3.5	2.5	2
		NS	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		NB	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		QC-1	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		QC-2	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		ON-1	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		ON-2	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		MB	10	7.5	5	5	5	3.75	2.5	2.5	7	4.5	4.5	3.5	2.5	2
		SK	10	7.5	5	5	5	3.75	2.5	2.5	7	4.5	4.5	3.5	2.5	2
		AB	10	7.5	5	5	5	3.75	2.5	2.5	7	4.5	4.5	3.5	2.5	2
		BC-1	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
		BC-2	10	7.5	5	5	5	3.75	2.5	2.5	7	4.5	4.5	3.5	2.5	2
		TR	20	15	10	10	10	7.5	5	5	14	9	9	7	5	4
Drainage	Storm water sewers for 2-Lane road (m)	NL	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		PE	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		NS	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		NB	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		QC-1	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		QC-2	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		ON-1	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		ON-2	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		MB	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		SK	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		AB	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		BC-1	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		BC-2	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200
		TR	110	90	50	30	1000	1100	1150	1200	110	50	30	1100	1150	1200

All Other Road Infrastructure.xls – Quantities (Cont…)

Description and type of work item		Region	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Guiderail	Concrete barrier (m)	NL	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		PE	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		NS	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		NB	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		QC-1	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		QC-2	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		ON-1	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		ON-2	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		MB	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		SK	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		AB	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		BC-1	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		BC-2	120	0	0	0	350	0	0	0	0	0	0	0	0	0
		TR	120	0	0	0	350	0	0	0	0	0	0	0	0	0
Guiderail	Steel guiderail (m)	NL	15	200	160	80	12	25	20	10	200	160	80	12.5	10	5
		PE	2.5	80	16	8	2	10	2	1	80	16	8	5	1	0.5
		NS	15	200	160	80	12	25	20	10	200	160	80	12.5	10	5
		NB	10	160	160	80	8	20	20	10	160	160	80	10	10	5
		QC-1	10	160	160	80	8	20	20	10	160	160	80	10	10	5
		QC-2	15	200	160	80	12	25	20	10	200	160	80	12.5	10	5
		ON-1	10	160	160	80	8	20	20	10	160	160	80	10	10	5
		ON-2	15	200	160	80	12	25	20	10	200	160	80	12.5	10	5
		MB	2.5	80	16	8	2	10	2	1	80	16	8	5	1	0.5
		SK	2.5	80	16	8	2	10	2	1	80	16	8	5	1	0.5
		AB	2.5	80	16	8	2	10	2	1	80	16	8	5	1	0.5
		BC-1	10	160	160	80	8	20	20	10	160	160	80	10	10	5
		BC-2	20	320	160	80	16	40	20	10	240	160	80	15	10	5
		TR	15	200	160	80	12	25	20	10	200	160	80	12.5	10	5
Guiderail	3-Cable guide rail (m)	NL	0	325	200	100	0	0	0	0	225	140	70	0	10	30
		PE	0	52	20	10	0	0	0	0	45	14	7	0	1	3
		NS	0	325	200	100	0	0	0	0	225	140	70	0	10	30
		NB	0	260	200	100	0	0	0	0	180	140	70	0	10	30
		QC-1	0	260	200	100	0	0	0	0	180	140	70	0	10	30
		QC-2	0	325	200	100	0	0	0	0	225	140	70	0	10	30
		ON-1	0	260	200	100	0	0	0	0	180	140	70	0	10	30
		ON-2	0	325	200	100	0	0	0	0	225	140	70	0	10	30
		MB	0	52	20	10	0	0	0	0	45	14	7	0	1	3
		SK	0	52	20	10	0	0	0	0	45	14	7	0	1	3
		AB	0	52	20	10	0	0	0	0	45	14	7	0	1	3
		BC-1	0	260	200	100	0	0	0	0	180	140	70	0	10	30
		BC-2	0	520	200	100	0	0	0	0	270	140	70	0	10	30
		TR	0	325	200	100	0	0	0	0	225	140	70	0	10	30

Description and type of work item		Region	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Fencing & gates	Chain link fence (m)	NL	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		PE	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		NS	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		NB	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		QC-1	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		QC-2	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		ON-1	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		ON-2	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		MB	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		SK	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		AB	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		BC-1	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		BC-2	30	0	0	0	600	0	0	0	0	0	0	0	0	0
		TR	30	0	0	0	600	0	0	0	0	0	0	0	0	0
Fencing & gates	Wire fence (m)	NL	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		PE	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		NS	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		NB	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		QC-1	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		QC-2	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		ON-1	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		ON-2	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		MB	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		SK	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		AB	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		BC-1	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		BC-2	600	0	0	0	50	0	0	0	0	0	0	0	0	0
		TR	600	0	0	0	50	0	0	0	0	0	0	0	0	0
Lighting	High mast (each)	NL	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		PE	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		NS	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		NB	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		QC-1	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		QC-2	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		ON-1	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		ON-2	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		MB	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		SK	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		AB	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		BC-1	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		BC-2	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
		TR	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0

All Other Road Infrastructure.xls – Quantities (Cont…)

Description and type of work item		Region	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Lighting	Standard (each)	NL	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		PE	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		NS	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		NB	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		QC-1	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		QC-2	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		ON-1	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		ON-2	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		MB	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		SK	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		AB	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		BC-1	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		BC-2	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
		TR	1	2	3	4	4.5	8	6	6	4	5	2	10	8	6
Painting of traffic lanes (m)		NL	3200	4200	3000	2800	3200	1440	1100	1000	2800	2400	2000	1200	1100	1100
		PE	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		NS	3200	4200	3000	2800	3200	1440	1100	1000	2800	2400	2000	1200	1100	1100
		NB	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		QC-1	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		QC-2	3200	4200	3000	2800	3200	1440	1100	1000	2800	2400	2000	1200	1100	1100
		ON-1	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		ON-2	3200	4200	3000	2800	3200	1440	1100	1000	2800	2400	2000	1200	1100	1100
		MB	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		SK	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		AB	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		BC-1	3200	3500	3000	2800	3200	1200	1100	1000	2800	2400	2000	1200	1100	1100
		BC-2	3200	5250	3000	2800	3200	1800	1100	1000	2800	2400	2000	1200	1100	1100
		TR	3200	4200	3000	2800	3200	1440	1100	1000	2800	2400	2000	1200	1100	1100

All Other Road Infrastructure.xls – Service Lives

Work item (supply and install)		Region													
Description and type of work Item		NL	PE	NS	NB	QC-1	QC-2	ON-1	ON-2	MB	SK	AB	BC-1	BC-2	TR
Clearing and grubbing (m^2)															
Grading	Earth moving (m^3)														
	Rock moving (m^3)														
Land-Scaping	Sodding and top soil (m^2)														
	Top soil (m^3)														
Drainage	PCC curb and gutter (m)	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	500 mm Pipe culvert & end sections (m)	35	35	35	35	35	35	35	35	35	35	35	35	35	35
	1500 mm wide box culvert (m)	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Storm water sewers (m)	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Guard Rail	Concrete median (m)	50	50	50	50	50	50	50	50	50	50	50	50	50	50
	Steel guiderail (m)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	3-Cable guiderail (m)	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Fencing, Gates	Chain link fence (m)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	Wire fence (m)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Lighting	High mast (each)	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Standard (each)	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Painting of Traffic Lanes (m)		20	20	20	20	20	20	20	20	20	20	20	20	20	20

All Other Road Infrastructure.xls – Allowances

Work item (supply and install) Description and type of work Item		Allowances (%)
Clearing and grubbing (m^2)		20
Grading	Earth moving (m^3)	10
	Rock moving (m^3)	10
Land-Scaping	Sodding and top soil (m^2)	15
	Top soil (m^3)	15
Drainage	PCC curb and gutter (m)	25
	500 mm Pipe culvert & end sections (m)	25
	1500 mm wide box culvert (m)	25
	Storm water sewers (m)	25
Guard Rail	Concrete median (m)	10
	Steel guiderail (m)	10
	3-Cable guiderail (m)	10
Fencing, Gates	Chain link fence (m)	10
	Wire fence (m)	10
Lighting	High mast (each)	50
	Standard (each)	50
Painting of Traffic Lanes (m)		30

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Clearing and grubbing (m^2)		NL	$ 10,800	$ 14,400	$ 16,200	$ 17,280	$ 4,500	$ 6,480	$ 9,720	$ 12,240	$ 11,286	$ 13,464	$ 15,840	$ 3,366	$ 4,435	$ 5,940
		PE	$ 1,800	$ 2,400	$ 2,700	$ 2,880	$ 750	$ 1,080	$ 1,620	$ 2,040	$ 1,881	$ 2,244	$ 2,640	$ 561	$ 739	$ 990
		NS	$ 10,800	$ 14,400	$ 16,200	$ 17,280	$ 4,500	$ 6,480	$ 9,720	$ 12,240	$ 11,286	$ 13,464	$ 15,840	$ 3,366	$ 4,435	$ 5,940
		NB	$ 7,200	$ 9,600	$ 10,800	$ 11,520	$ 3,000	$ 4,320	$ 6,480	$ 8,160	$ 7,524	$ 8,976	$ 10,560	$ 2,244	$ 2,957	$ 3,960
		QC-1	$ 10,800	$ 14,400	$ 16,200	$ 17,280	$ 4,500	$ 6,480	$ 9,720	$ 12,240	$ 7,524	$ 8,976	$ 10,560	$ 2,244	$ 2,957	$ 3,960
		QC-2	$ 16,200	$ 21,600	$ 24,300	$ 25,920	$ 6,750	$ 9,720	$ 14,580	$ 18,360	$ 11,286	$ 13,464	$ 15,840	$ 3,366	$ 4,435	$ 5,940
		ON-1	$ 7,524	$ 10,032	$ 11,286	$ 12,038	$ 3,135	$ 4,514	$ 6,772	$ 8,527	$ 7,863	$ 9,380	$ 11,035	$ 2,345	$ 3,090	$ 4,138
		ON-2	$ 10,800	$ 14,400	$ 16,200	$ 17,280	$ 4,500	$ 6,480	$ 9,720	$ 12,240	$ 11,286	$ 13,464	$ 15,840	$ 3,366	$ 4,435	$ 5,940
		MB	$ 1,800	$ 2,400	$ 2,700	$ 2,880	$ 750	$ 1,080	$ 1,620	$ 2,040	$ 1,881	$ 2,244	$ 2,640	$ 561	$ 739	$ 990
		SK	$ 1,800	$ 2,400	$ 2,700	$ 2,880	$ 750	$ 1,080	$ 1,620	$ 2,040	$ 1,881	$ 2,244	$ 2,640	$ 561	$ 739	$ 990
		AB	$ 3,600	$ 4,800	$ 5,400	$ 5,760	$ 1,500	$ 2,160	$ 3,240	$ 4,080	$ 3,762	$ 4,488	$ 5,280	$ 1,122	$ 1,478	$ 1,980
		BC-1	$ 18,000	$ 24,000	$ 27,000	$ 28,800	$ 7,500	$ 10,800	$ 16,200	$ 20,400	$ 18,810	$ 22,440	$ 26,400	$ 5,610	$ 7,392	$ 9,900
		BC-2	$ 36,000	$ 48,000	$ 54,000	$ 57,600	$ 15,000	$ 21,600	$ 32,400	$ 40,800	$ 37,620	$ 44,880	$ 52,800	$ 11,220	$ 14,784	$ 19,800
		TR	$ 16,200	$ 21,600	$ 24,300	$ 25,920	$ 6,750	$ 9,720	$ 14,580	$ 18,360	$ 16,929	$ 20,196	$ 23,760	$ 5,049	$ 6,653	$ 8,910
Grading	Earth moved (m^3)	NL	$ 440,000	$ 286,000	$ 173,250	$ 49,500	$ 440,000	$ 286,000	$ 222,750	$ 61,875	$ 385,688	$ 102,850	$ 27,225	$ 385,688	$ 128,563	$ 40,838
		PE	$ 137,500	$ 82,500	$ 55,000	$ 13,750	$ 137,500	$ 82,500	$ 82,500	$ 22,000	$ 60,500	$ 45,375	$ 9,075	$ 60,500	$ 60,500	$ 15,125
		NS	$ 440,000	$ 286,000	$ 173,250	$ 49,500	$ 440,000	$ 286,000	$ 222,750	$ 61,875	$ 385,688	$ 102,850	$ 27,225	$ 385,688	$ 128,563	$ 40,838
		NB	$ 247,500	$ 198,000	$ 130,625	$ 26,125	$ 247,500	$ 198,000	$ 182,875	$ 18,288	$ 143,688	$ 86,213	$ 14,369	$ 143,688	$ 114,950	$ 22,990
		QC-1	$ 247,500	$ 198,000	$ 130,625	$ 26,125	$ 247,500	$ 198,000	$ 182,875	$ 18,288	$ 143,688	$ 86,213	$ 14,369	$ 143,688	$ 114,950	$ 22,990
		QC-2	$ 440,000	$ 286,000	$ 173,250	$ 49,500	$ 440,000	$ 286,000	$ 222,750	$ 61,875	$ 385,688	$ 102,850	$ 27,225	$ 385,688	$ 128,563	$ 40,838
		ON-1	$ 353,925	$ 283,140	$ 186,794	$ 37,359	$ 353,925	$ 283,140	$ 261,511	$ 26,151	$ 205,473	$ 123,284	$ 20,547	$ 205,473	$ 164,379	$ 32,876
		ON-2	$ 484,000	$ 314,600	$ 190,575	$ 54,450	$ 484,000	$ 314,600	$ 245,025	$ 68,063	$ 424,256	$ 113,135	$ 29,948	$ 424,256	$ 141,419	$ 44,921
		MB	$ 66,550	$ 39,930	$ 26,620	$ 6,655	$ 66,550	$ 39,930	$ 39,930	$ 10,648	$ 29,282	$ 21,962	$ 4,392	$ 29,282	$ 29,282	$ 7,321
		SK	$ 39,875	$ 23,925	$ 15,950	$ 3,988	$ 39,875	$ 23,925	$ 23,925	$ 6,380	$ 17,545	$ 13,159	$ 2,632	$ 17,545	$ 17,545	$ 4,386
		AB	$ 68,750	$ 41,250	$ 27,500	$ 6,875	$ 68,750	$ 41,250	$ 41,250	$ 11,000	$ 30,250	$ 22,688	$ 4,538	$ 30,250	$ 30,250	$ 7,563
		BC-1	$ 247,500	$ 198,000	$ 130,625	$ 26,125	$ 247,500	$ 198,000	$ 182,875	$ 18,288	$ 143,688	$ 86,213	$ 14,369	$ 143,688	$ 114,950	$ 22,990
		BC-2	$ 412,500	$ 233,750	$ 192,500	$ 57,750	$ 412,500	$ 233,750	$ 231,000	$ 67,375	$ 242,000	$ 169,400	$ 36,300	$ 242,000	$ 193,600	$ 48,400
		TR	$1,100,000	$ 715,000	$ 433,125	$ 123,750	$1,100,000	$ 715,000	$ 556,875	$ 154,688	$ 964,219	$ 257,125	$ 68,063	$ 964,219	$ 321,406	$ 102,094
Grading	Rock moved (m^3)	NL	$1,100,000	$ 715,000	$ 192,500	$ 55,000	$1,100,000	$ 715,000	$ 247,500	$ 68,750	$ 680,625	$ 181,500	$ 30,250	$ 680,625	$ 226,875	$ 45,375
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$1,100,000	$ 715,000	$ 192,500	$ 55,000	$1,100,000	$ 715,000	$ 247,500	$ 68,750	$ 680,625	$ 181,500	$ 30,250	$ 680,625	$ 226,875	$ 45,375
		NB	$ 275,000	$ 220,000	$ 68,750	$ 13,750	$ 275,000	$ 220,000	$ 96,250	$ 9,625	$ 75,625	$ 45,375	$ 7,563	$ 75,625	$ 60,500	$ 12,100
		QC-1	$ 275,000	$ 220,000	$ 68,750	$ 13,750	$ 275,000	$ 220,000	$ 96,250	$ 9,625	$ 75,625	$ 45,375	$ 7,563	$ 75,625	$ 60,500	$ 12,100
		QC-2	$1,650,000	$1,072,500	$ 288,750	$ 82,500	$1,650,000	$1,072,500	$ 371,250	$ 103,125	$1,020,938	$ 272,250	$ 45,375	$1,020,938	$ 340,313	$ 68,063
		ON-1	$ 220,000	$ 176,000	$ 55,000	$ 11,000	$ 220,000	$ 176,000	$ 77,000	$ 7,700	$ 60,500	$ 36,300	$ 6,050	$ 60,500	$ 48,400	$ 9,680
		ON-2	$1,908,280	$1,240,382	$ 333,949	$ 95,414	$1,908,280	$1,240,382	$ 429,363	$ 119,268	$1,180,748	$ 314,866	$ 52,478	$1,180,748	$ 393,583	$ 78,717
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 275,000	$ 220,000	$ 68,750	$ 13,750	$ 275,000	$ 220,000	$ 96,250	$ 9,625	$ 75,625	$ 45,375	$ 7,563	$ 75,625	$ 60,500	$ 12,100
		BC-2	$4,125,000	$2,337,500	$ 825,000	$ 247,500	$4,125,000	$2,337,500	$ 990,000	$ 288,750	$ 605,000	$ 423,500	$ 90,750	$ 605,000	$ 484,000	$ 121,000
		TR	$2,200,000	$1,430,000	$ 385,000	$ 110,000	$2,200,000	$1,430,000	$ 495,000	$ 137,500	$1,361,250	$ 363,000	$ 60,500	$1,361,250	$ 453,750	$ 90,750

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Land-scaping	Sodding & top soil (m^2)	NL	$ 2,300	$ 1,150	$ 1,035	$ 920	$ 18,400	$ 12,880	$ 12,880	$ 8,050	$ 1,518	$ 1,328	$ 1,139	$ 26,565	$ 18,216	$ 14,231
		PE	$ 1,150	$ 575	$ 518	$ 460	$ 9,200	$ 6,440	$ 6,440	$ 4,025	$ 506	$ 443	$ 380	$ 8,855	$ 6,072	$ 4,744
		NS	$ 2,300	$ 1,150	$ 1,035	$ 920	$ 18,400	$ 12,880	$ 12,880	$ 8,050	$ 1,518	$ 1,328	$ 1,139	$ 26,565	$ 18,216	$ 14,231
		NB	$ 4,600	$ 2,300	$ 2,070	$ 1,840	$ 36,800	$ 25,760	$ 25,760	$ 16,100	$ 2,024	$ 1,771	$ 1,518	$ 35,420	$ 24,288	$ 18,975
		QC-1	$ 6,900	$ 3,450	$ 3,105	$ 2,760	$ 55,200	$ 38,640	$ 38,640	$ 24,150	$ 2,024	$ 1,771	$ 1,518	$ 35,420	$ 24,288	$ 18,975
		QC-2	$ 3,450	$ 1,725	$ 1,553	$ 1,380	$ 27,600	$ 19,320	$ 19,320	$ 12,075	$ 1,518	$ 1,328	$ 1,139	$ 26,565	$ 18,216	$ 14,231
		ON-1	$ 3,818	$ 1,909	$ 1,718	$ 1,527	$ 30,544	$ 21,381	$ 21,381	$ 13,363	$ 1,680	$ 1,470	$ 1,260	$ 29,399	$ 20,159	$ 15,749
		ON-2	$ 2,501	$ 1,251	$ 1,126	$ 1,001	$ 20,010	$ 14,007	$ 14,007	$ 8,754	$ 1,651	$ 1,444	$ 1,238	$ 28,889	$ 19,810	$ 15,476
		MB	$ 2,214	$ 1,107	$ 996	$ 886	$ 17,710	$ 12,397	$ 12,397	$ 7,748	$ 974	$ 852	$ 731	$ 17,046	$ 11,689	$ 9,132
		SK	$ 1,150	$ 575	$ 518	$ 460	$ 9,200	$ 6,440	$ 6,440	$ 4,025	$ 506	$ 443	$ 380	$ 8,855	$ 6,072	$ 4,744
		AB	$ 1,150	$ 575	$ 518	$ 460	$ 9,200	$ 6,440	$ 6,440	$ 4,025	$ 506	$ 443	$ 380	$ 8,855	$ 6,072	$ 4,744
		BC-1	$ 11,500	$ 5,750	$ 5,175	$ 4,600	$ 92,000	$ 64,400	$ 64,400	$ 40,250	$ 5,060	$ 4,428	$ 3,795	$ 88,550	$ 60,720	$ 47,438
		BC-2	$ 1,150	$ 575	$ 518	$ 460	$ 9,200	$ 6,440	$ 6,440	$ 4,025	$ 1,012	$ 886	$ 759	$ 17,710	$ 12,144	$ 9,488
		TR	$ 5,750	$ 2,875	$ 2,588	$ 2,300	$ 46,000	$ 32,200	$ 32,200	$ 20,125	$ 3,795	$ 3,321	$ 2,846	$ 66,413	$ 45,540	$ 35,578
Land-scaping	Top soil (m^2)	NL	$ 109,250	$ 54,625	$ 49,163	$ 43,700	$ 11,500	$ 13,800	$ 13,800	$ 20,125	$ 72,105	$ 63,092	$ 54,079	$ -	$ 11,385	$ 11,859
		PE	$ 54,625	$ 27,313	$ 24,581	$ 21,850	$ 5,750	$ 6,900	$ 6,900	$ 10,063	$ 24,035	$ 21,031	$ 18,026	$ -	$ 3,795	$ 3,953
		NS	$ 109,250	$ 54,625	$ 49,163	$ 43,700	$ 11,500	$ 13,800	$ 13,800	$ 20,125	$ 72,105	$ 63,092	$ 54,079	$ -	$ 11,385	$ 11,859
		NB	$ 218,500	$ 109,250	$ 98,325	$ 87,400	$ 23,000	$ 27,600	$ 27,600	$ 40,250	$ 96,140	$ 84,123	$ 72,105	$ -	$ 15,180	$ 15,813
		QC-1	$ 218,500	$ 109,250	$ 98,325	$ 87,400	$ 23,000	$ 27,600	$ 27,600	$ 40,250	$ 96,140	$ 84,123	$ 72,105	$ -	$ 15,180	$ 15,813
		QC-2	$ 109,250	$ 54,625	$ 49,163	$ 43,700	$ 11,500	$ 13,800	$ 13,800	$ 20,125	$ 72,105	$ 63,092	$ 54,079	$ -	$ 11,385	$ 11,859
		ON-1	$ 218,500	$ 109,250	$ 98,325	$ 87,400	$ 23,000	$ 27,600	$ 27,600	$ 40,250	$ 96,140	$ 84,123	$ 72,105	$ -	$ 15,180	$ 15,813
		ON-2	$ 163,875	$ 81,938	$ 73,744	$ 65,550	$ 17,250	$ 20,700	$ 20,700	$ 30,188	$ 108,158	$ 94,638	$ 81,118	$ -	$ 17,078	$ 17,789
		MB	$ 54,625	$ 27,313	$ 24,581	$ 21,850	$ 5,750	$ 6,900	$ 6,900	$ 10,063	$ 24,035	$ 21,031	$ 18,026	$ -	$ 3,795	$ 3,953
		SK	$ 54,625	$ 27,313	$ 24,581	$ 21,850	$ 5,750	$ 6,900	$ 6,900	$ 10,063	$ 24,035	$ 21,031	$ 18,026	$ -	$ 3,795	$ 3,953
		AB	$ 54,625	$ 27,313	$ 24,581	$ 21,850	$ 5,750	$ 6,900	$ 6,900	$ 10,063	$ 24,035	$ 21,031	$ 18,026	$ -	$ 3,795	$ 3,953
		BC-1	$ 218,500	$ 109,250	$ 98,325	$ 87,400	$ 23,000	$ 27,600	$ 27,600	$ 40,250	$ 96,140	$ 84,123	$ 72,105	$ -	$ 15,180	$ 15,813
		BC-2	$ 21,850	$ 10,925	$ 9,833	$ 8,740	$ 2,300	$ 2,760	$ 2,760	$ 4,025	$ 19,228	$ 16,825	$ 14,421	$ -	$ 3,036	$ 3,163
		TR	$ 109,250	$ 54,625	$ 49,163	$ 43,700	$ 11,500	$ 13,800	$ 13,800	$ 20,125	$ 72,105	$ 63,092	$ 54,079	$ -	$ 11,385	$ 11,859
Drainage	Curb and gutter (PCC, Straight) (m)	NL	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		PE	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		NS	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		NB	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		QC-1	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		QC-2	$ 2,500	$ 3,500	$ 4,500	$ 5,500	$ 80,000	$ 90,000	$ 95,000	$ 100,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		ON-1	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		ON-2	$ 3,438	$ 4,813	$ 6,188	$ 7,563	$ 110,000	$ 123,750	$ 130,625	$ 137,500	$ 5,294	$ 6,806	$ 8,319	$ 136,125	$ 143,688	$ 151,250
		MB	$ 2,520	$ 3,528	$ 4,536	$ 5,544	$ 80,640	$ 90,720	$ 95,760	$ 100,800	$ 3,881	$ 4,990	$ 6,098	$ 99,792	$ 105,336	$ 110,880
		SK	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		AB	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		BC-1	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		BC-2	$ 3,125	$ 4,375	$ 5,625	$ 6,875	$ 100,000	$ 112,500	$ 118,750	$ 125,000	$ 4,813	$ 6,188	$ 7,563	$ 123,750	$ 130,625	$ 137,500
		TR	$ 4,688	$ 6,563	$ 8,438	$ 10,313	$ 150,000	$ 168,750	$ 178,125	$ 187,500	$ 7,219	$ 9,281	$ 11,344	$ 185,625	$ 195,938	$ 206,250

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Drainage	500 mm Pipe culvert & end sections (m)	NL	$ 1,563	$ 7,813	$ 23,438	$ 39,063	$ 781	$ 3,906	$ 11,719	$ 19,531	$ 10,313	$ 30,938	$ 51,563	$ 5,156	$ 15,469	$ 25,781
		PE	$ 625	$ 3,125	$ 9,375	$ 15,625	$ 313	$ 1,563	$ 4,688	$ 7,813	$ 4,125	$ 12,375	$ 20,625	$ 2,063	$ 6,188	$ 10,313
		NS	$ 1,563	$ 7,813	$ 23,438	$ 39,063	$ 781	$ 3,906	$ 11,719	$ 19,531	$ 10,313	$ 30,938	$ 51,563	$ 5,156	$ 15,469	$ 25,781
		NB	$ 1,563	$ 7,813	$ 23,438	$ 39,063	$ 781	$ 3,906	$ 11,719	$ 19,531	$ 10,313	$ 30,938	$ 51,563	$ 5,156	$ 15,469	$ 25,781
		QC-1	$ 3,125	$ 15,625	$ 46,875	$ 78,125	$ 1,563	$ 7,813	$ 23,438	$ 39,063	$ 10,313	$ 30,938	$ 51,563	$ 5,156	$ 15,469	$ 25,781
		QC-2	$ 2,500	$ 12,500	$ 37,500	$ 62,500	$ 1,250	$ 6,250	$ 18,750	$ 31,250	$ 12,375	$ 37,125	$ 61,875	$ 6,188	$ 18,563	$ 30,938
		ON-1	$ 1,403	$ 7,013	$ 21,039	$ 35,066	$ 701	$ 3,507	$ 10,520	$ 17,533	$ 9,257	$ 27,772	$ 46,287	$ 4,629	$ 13,886	$ 23,143
		ON-2	$ 1,741	$ 8,703	$ 26,109	$ 43,516	$ 870	$ 4,352	$ 13,055	$ 21,758	$ 11,488	$ 34,464	$ 57,441	$ 5,744	$ 17,232	$ 28,720
		MB	$ 252	$ 1,260	$ 3,780	$ 6,300	$ 126	$ 630	$ 1,890	$ 3,150	$ 1,663	$ 4,990	$ 8,316	$ 832	$ 2,495	$ 4,158
		SK	$ 313	$ 1,563	$ 4,688	$ 7,813	$ 156	$ 781	$ 2,344	$ 3,906	$ 2,063	$ 6,188	$ 10,313	$ 1,031	$ 3,094	$ 5,156
		AB	$ 375	$ 1,875	$ 5,625	$ 9,375	$ 188	$ 938	$ 2,813	$ 4,688	$ 2,475	$ 7,425	$ 12,375	$ 1,238	$ 3,713	$ 6,188
		BC-1	$ 3,125	$ 15,625	$ 46,875	$ 78,125	$ 1,563	$ 7,813	$ 23,438	$ 39,063	$ 20,625	$ 61,875	$ 103,125	$ 10,313	$ 30,938	$ 51,563
		BC-2	$ 3,125	$ 15,625	$ 46,875	$ 78,125	$ 1,563	$ 7,813	$ 23,438	$ 39,063	$ 20,625	$ 61,875	$ 103,125	$ 10,313	$ 30,938	$ 51,563
		TR	$ 7,750	$ 38,750	$ 116,250	$ 193,750	$ 3,875	$ 19,375	$ 58,125	$ 96,875	$ 51,150	$ 153,450	$ 255,750	$ 25,575	$ 76,725	$ 127,875
Drainage	1500 mm Wide box culvert (m)	NL	$ 37,500	$ 28,125	$ 18,750	$ 18,750	$ 18,750	$ 14,063	$ 9,375	$ 9,375	$ 28,875	$ 18,563	$ 18,563	$ 14,438	$ 10,313	$ 8,250
		PE	$ 18,750	$ 14,063	$ 9,375	$ 9,375	$ 9,375	$ 7,031	$ 4,688	$ 4,688	$ 14,438	$ 9,281	$ 9,281	$ 7,219	$ 5,156	$ 4,125
		NS	$ 37,500	$ 28,125	$ 18,750	$ 18,750	$ 18,750	$ 14,063	$ 9,375	$ 9,375	$ 28,875	$ 18,563	$ 18,563	$ 14,438	$ 10,313	$ 8,250
		NB	$ 37,500	$ 28,125	$ 18,750	$ 18,750	$ 18,750	$ 14,063	$ 9,375	$ 9,375	$ 28,875	$ 18,563	$ 18,563	$ 14,438	$ 10,313	$ 8,250
		QC-1	$ 20,000	$ 15,000	$ 10,000	$ 10,000	$ 10,000	$ 7,500	$ 5,000	$ 5,000	$ 28,875	$ 18,563	$ 18,563	$ 14,438	$ 10,313	$ 8,250
		QC-2	$ 25,000	$ 18,750	$ 12,500	$ 12,500	$ 12,500	$ 9,375	$ 6,250	$ 6,250	$ 38,500	$ 24,750	$ 24,750	$ 19,250	$ 13,750	$ 11,000
		ON-1	$ 38,368	$ 28,776	$ 19,184	$ 19,184	$ 19,184	$ 14,388	$ 9,592	$ 9,592	$ 29,543	$ 18,992	$ 18,992	$ 14,771	$ 10,551	$ 8,441
		ON-2	$ 42,500	$ 31,875	$ 21,250	$ 21,250	$ 21,250	$ 15,938	$ 10,625	$ 10,625	$ 32,725	$ 21,038	$ 21,038	$ 16,363	$ 11,688	$ 9,350
		MB	$ 25,000	$ 18,750	$ 12,500	$ 12,500	$ 12,500	$ 9,375	$ 6,250	$ 6,250	$ 19,250	$ 12,375	$ 12,375	$ 9,625	$ 6,875	$ 5,500
		SK	$ 25,000	$ 18,750	$ 12,500	$ 12,500	$ 12,500	$ 9,375	$ 6,250	$ 6,250	$ 19,250	$ 12,375	$ 12,375	$ 9,625	$ 6,875	$ 5,500
		AB	$ 25,000	$ 18,750	$ 12,500	$ 12,500	$ 12,500	$ 9,375	$ 6,250	$ 6,250	$ 19,250	$ 12,375	$ 12,375	$ 9,625	$ 6,875	$ 5,500
		BC-1	$ 75,000	$ 56,250	$ 37,500	$ 37,500	$ 37,500	$ 28,125	$ 18,750	$ 18,750	$ 57,750	$ 37,125	$ 37,125	$ 28,875	$ 20,625	$ 16,500
		BC-2	$ 37,500	$ 28,125	$ 18,750	$ 18,750	$ 18,750	$ 14,063	$ 9,375	$ 9,375	$ 28,875	$ 18,563	$ 18,563	$ 14,438	$ 10,313	$ 8,250
		TR	$ 75,000	$ 56,250	$ 37,500	$ 37,500	$ 37,500	$ 28,125	$ 18,750	$ 18,750	$ 57,750	$ 37,125	$ 37,125	$ 28,875	$ 20,625	$ 16,500
Drainage	Storm water sewers for 2-Lane road (m)	NL	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		PE	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		NS	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		NB	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		QC-1	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		QC-2	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		ON-1	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		ON-2	$ 8,250	$ 6,750	$ 3,750	$ 2,250	$ 75,000	$ 82,500	$ 86,250	$ 90,000	$ 9,075	$ 4,125	$ 2,475	$ 90,750	$ 94,875	$ 99,000
		MB	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		SK	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		AB	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		BC-1	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		BC-2	$ 6,875	$ 5,625	$ 3,125	$ 1,875	$ 62,500	$ 68,750	$ 71,875	$ 75,000	$ 7,563	$ 3,438	$ 2,063	$ 75,625	$ 79,063	$ 82,500
		TR	$ 10,313	$ 8,438	$ 4,688	$ 2,813	$ 93,750	$ 103,125	$ 107,813	$ 112,500	$ 11,344	$ 5,156	$ 3,094	$ 113,438	$ 118,594	$ 123,750

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Guiderail	Concrete barrier (m)	NL	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 7,920	$ -	$ -	$ -	$ 23,100	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 39,600	$ -	$ -	$ -	$ 115,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 26,424	$ -	$ -	$ -	$ 77,069	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 29,040	$ -	$ -	$ -	$ 84,700	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 18,480	$ -	$ -	$ -	$ 53,900	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 13,200	$ -	$ -	$ -	$ 38,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 13,200	$ -	$ -	$ -	$ 38,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 26,400	$ -	$ -	$ -	$ 77,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Guiderail	Steel guiderail (m)	NL	$ 1,238	$ 16,500	$ 13,200	$ 6,600	$ 990	$ 2,063	$ 1,650	$ 825	$ 18,150	$ 14,520	$ 7,260	$ 1,134	$ 908	$ 454
		PE	$ 206	$ 6,600	$ 1,320	$ 660	$ 165	$ 825	$ 165	$ 83	$ 7,260	$ 1,452	$ 726	$ 454	$ 91	$ 45
		NS	$ 1,238	$ 16,500	$ 13,200	$ 6,600	$ 990	$ 2,063	$ 1,650	$ 825	$ 18,150	$ 14,520	$ 7,260	$ 1,134	$ 908	$ 454
		NB	$ 825	$ 13,200	$ 13,200	$ 6,600	$ 660	$ 1,650	$ 1,650	$ 825	$ 14,520	$ 14,520	$ 7,260	$ 908	$ 908	$ 454
		QC-1	$ 715	$ 11,440	$ 11,440	$ 5,720	$ 572	$ 1,430	$ 1,430	$ 715	$ 14,520	$ 14,520	$ 7,260	$ 908	$ 908	$ 454
		QC-2	$ 1,320	$ 17,600	$ 14,080	$ 7,040	$ 1,056	$ 2,200	$ 1,760	$ 880	$ 18,150	$ 14,520	$ 7,260	$ 1,134	$ 908	$ 454
		ON-1	$ 726	$ 11,612	$ 11,612	$ 5,806	$ 581	$ 1,452	$ 1,452	$ 726	$ 12,774	$ 12,774	$ 6,387	$ 798	$ 798	$ 399
		ON-2	$ 1,155	$ 15,400	$ 12,320	$ 6,160	$ 924	$ 1,925	$ 1,540	$ 770	$ 16,940	$ 13,552	$ 6,776	$ 1,059	$ 847	$ 424
		MB	$ 204	$ 6,512	$ 1,302	$ 651	$ 163	$ 814	$ 163	$ 81	$ 7,163	$ 1,433	$ 716	$ 448	$ 90	$ 45
		SK	$ 206	$ 6,600	$ 1,320	$ 660	$ 165	$ 825	$ 165	$ 83	$ 7,260	$ 1,452	$ 726	$ 454	$ 91	$ 45
		AB	$ 206	$ 6,600	$ 1,320	$ 660	$ 165	$ 825	$ 165	$ 83	$ 7,260	$ 1,452	$ 726	$ 454	$ 91	$ 45
		BC-1	$ 825	$ 13,200	$ 13,200	$ 6,600	$ 660	$ 1,650	$ 1,650	$ 825	$ 14,520	$ 14,520	$ 7,260	$ 908	$ 908	$ 454
		BC-2	$ 1,650	$ 26,400	$ 13,200	$ 6,600	$ 1,320	$ 3,300	$ 1,650	$ 825	$ 21,780	$ 14,520	$ 7,260	$ 1,361	$ 908	$ 454
		TR	$ 8,250	$ 110,000	$ 88,000	$ 44,000	$ 6,600	$ 13,750	$ 11,000	$ 5,500	$ 121,000	$ 96,800	$ 48,400	$ 7,563	$ 6,050	$ 3,025
Guiderail	3-Cable guide rail (m)	NL	$ -	$ 5,363	$ 3,300	$ 1,650	$ -	$ -	$ -	$ -	$ 4,084	$ 2,541	$ 1,271	$ -	$ 182	$ 545
		PE	$ -	$ 858	$ 330	$ 165	$ -	$ -	$ -	$ -	$ 817	$ 254	$ 127	$ -	$ 18	$ 54
		NS	$ -	$ 5,363	$ 3,300	$ 1,650	$ -	$ -	$ -	$ -	$ 4,084	$ 2,541	$ 1,271	$ -	$ 182	$ 545
		NB	$ -	$ 4,290	$ 3,300	$ 1,650	$ -	$ -	$ -	$ -	$ 3,267	$ 2,541	$ 1,271	$ -	$ 182	$ 545
		QC-1	$ -	$ 4,404	$ 3,388	$ 1,694	$ -	$ -	$ -	$ -	$ 3,354	$ 2,609	$ 1,304	$ -	$ 186	$ 559
		QC-2	$ -	$ 6,435	$ 3,960	$ 1,980	$ -	$ -	$ -	$ -	$ 4,901	$ 3,049	$ 1,525	$ -	$ 218	$ 653
		ON-1	$ -	$ 4,404	$ 3,388	$ 1,694	$ -	$ -	$ -	$ -	$ 3,354	$ 2,609	$ 1,304	$ -	$ 186	$ 559
		ON-2	$ -	$ 6,435	$ 3,960	$ 1,980	$ -	$ -	$ -	$ -	$ 4,901	$ 3,049	$ 1,525	$ -	$ 218	$ 653
		MB	$ -	$ 858	$ 330	$ 165	$ -	$ -	$ -	$ -	$ 817	$ 254	$ 127	$ -	$ 18	$ 54
		SK	$ -	$ 858	$ 330	$ 165	$ -	$ -	$ -	$ -	$ 817	$ 254	$ 127	$ -	$ 18	$ 54
		AB	$ -	$ 858	$ 330	$ 165	$ -	$ -	$ -	$ -	$ 817	$ 254	$ 127	$ -	$ 18	$ 54
		BC-1	$ -	$ 4,290	$ 3,300	$ 1,650	$ -	$ -	$ -	$ -	$ 3,267	$ 2,541	$ 1,271	$ -	$ 182	$ 545
		BC-2	$ -	$ 8,580	$ 3,300	$ 1,650	$ -	$ -	$ -	$ -	$ 4,901	$ 2,541	$ 1,271	$ -	$ 182	$ 545
		TR	$ -	$ 26,813	$ 16,500	$ 8,250	$ -	$ -	$ -	$ -	$ 20,419	$ 12,705	$ 6,353	$ -	$ 908	$ 2,723

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Fencing & gates	Chain link fence (m)	NL	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 990	$ -	$ -	$ -	$ 19,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 2,475	$ -	$ -	$ -	$ 49,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 1,467	$ -	$ -	$ -	$ 29,330	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 2,319	$ -	$ -	$ -	$ 46,378	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 1,650	$ -	$ -	$ -	$ 33,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 1,980	$ -	$ -	$ -	$ 39,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 1,980	$ -	$ -	$ -	$ 39,600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 990	$ -	$ -	$ -	$ 19,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Fencing & gates	Wire fence (m)	NL	$ 4,620	$ -	$ -	$ -	$ 385	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 4,620	$ -	$ -	$ -	$ 385	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 4,620	$ -	$ -	$ -	$ 385	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 4,620	$ -	$ -	$ -	$ 385	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 26,400	$ -	$ -	$ -	$ 2,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 26,400	$ -	$ -	$ -	$ 2,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 5,636	$ -	$ -	$ -	$ 470	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 8,639	$ -	$ -	$ -	$ 720	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 2,640	$ -	$ -	$ -	$ 220	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 2,310	$ -	$ -	$ -	$ 193	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 4,620	$ -	$ -	$ -	$ 385	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 9,900	$ -	$ -	$ -	$ 825	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 9,900	$ -	$ -	$ -	$ 825	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 9,900	$ -	$ -	$ -	$ 825	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Lighting	High mast (each)	NL	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ 183,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ 183,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ 155,588	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ 152,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ 157,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Lighting	Standard (each)	NL	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		PE	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		NS	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		NB	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		QC-1	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		QC-2	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		ON-1	$ 1,946	$ 3,893	$ 5,839	$ 7,786	$ 8,759	$ 15,571	$ 11,678	$ 11,678	$ 8,564	$ 10,705	$ 4,282	$ 21,411	$ 17,128	$ 12,846
		ON-2	$ 1,950	$ 3,900	$ 5,850	$ 7,800	$ 8,775	$ 15,600	$ 11,700	$ 11,700	$ 8,580	$ 10,725	$ 4,290	$ 21,450	$ 17,160	$ 12,870
		MB	$ 3,000	$ 6,000	$ 9,000	$ 12,000	$ 13,500	$ 24,000	$ 18,000	$ 18,000	$ 13,200	$ 16,500	$ 6,600	$ 33,000	$ 26,400	$ 19,800
		SK	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		AB	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		BC-1	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		BC-2	$ 2,250	$ 4,500	$ 6,750	$ 9,000	$ 10,125	$ 18,000	$ 13,500	$ 13,500	$ 9,900	$ 12,375	$ 4,950	$ 24,750	$ 19,800	$ 14,850
		TR	$ 3,750	$ 7,500	$ 11,250	$ 15,000	$ 16,875	$ 30,000	$ 22,500	$ 22,500	$ 16,500	$ 20,625	$ 8,250	$ 41,250	$ 33,000	$ 24,750
Painting of traffic lanes (m)		NL	$ 4,160	$ 5,460	$ 3,900	$ 3,640	$ 4,160	$ 1,872	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		PE	$ 4,160	$ 4,550	$ 3,900	$ 3,640	$ 4,160	$ 1,560	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		NS	$ 4,160	$ 5,460	$ 3,900	$ 3,640	$ 4,160	$ 1,872	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		NB	$ 4,160	$ 4,550	$ 3,900	$ 3,640	$ 4,160	$ 1,560	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		QC-1	$ 8,320	$ 9,100	$ 7,800	$ 7,280	$ 8,320	$ 3,120	$ 2,860	$ 2,600	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		QC-2	$ 8,320	$ 10,920	$ 7,800	$ 7,280	$ 8,320	$ 3,744	$ 2,860	$ 2,600	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		ON-1	$ 3,786	$ 4,141	$ 3,549	$ 3,312	$ 3,786	$ 1,420	$ 1,301	$ 1,183	$ 3,644	$ 3,123	$ 2,603	$ 1,562	$ 1,431	$ 1,431
		ON-2	$ 4,285	$ 5,624	$ 4,017	$ 3,749	$ 4,285	$ 1,928	$ 1,473	$ 1,339	$ 4,124	$ 3,535	$ 2,946	$ 1,767	$ 1,620	$ 1,620
		MB	$ 4,160	$ 4,550	$ 3,900	$ 3,640	$ 4,160	$ 1,560	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		SK	$ 4,160	$ 4,550	$ 3,900	$ 3,640	$ 4,160	$ 1,560	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		AB	$ 4,160	$ 4,550	$ 3,900	$ 3,640	$ 4,160	$ 1,560	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		BC-1	$ 4,160	$ 4,550	$ 3,900	$ 3,640	$ 4,160	$ 1,560	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		BC-2	$ 4,160	$ 6,825	$ 3,900	$ 3,640	$ 4,160	$ 2,340	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
		TR	$ 4,160	$ 5,460	$ 3,900	$ 3,640	$ 4,160	$ 1,872	$ 1,430	$ 1,300	$ 4,004	$ 3,432	$ 2,860	$ 1,716	$ 1,573	$ 1,573
Total of All Other Roadway Infrastructure		NL	$1,749,480	$1,144,435	$ 503,485	$ 244,853	$1,871,966	$1,237,313	$ 721,449	$ 402,071	$1,229,022	$ 441,852	$ 219,673	$1,318,063	$ 627,604	$ 374,846
		PE	$ 261,486	$ 151,983	$ 115,849	$ 77,155	$ 440,098	$ 289,149	$ 299,055	$ 252,010	$ 129,940	$ 105,512	$ 73,365	$ 280,742	$ 293,819	$ 260,922
		NS	$1,749,480	$1,144,435	$ 503,485	$ 244,853	$1,871,966	$1,237,313	$ 721,449	$ 402,071	$1,229,022	$ 441,852	$ 219,673	$1,318,063	$ 627,604	$ 374,846
		NB	$ 839,518	$ 607,128	$ 381,908	$ 219,088	$ 882,536	$ 678,109	$ 553,764	$ 323,454	$ 398,354	$ 306,075	$ 197,255	$ 478,569	$ 456,006	$ 330,440
		QC-1	$ 836,170	$ 610,669	$ 405,258	$ 258,884	$ 833,255	$ 691,833	$ 578,438	$ 351,930	$ 398,441	$ 306,143	$ 197,289	$ 478,569	$ 456,010	$ 330,455
		QC-2	$2,333,890	$1,511,780	$ 620,480	$ 301,675	$2,468,676	$1,581,659	$ 838,195	$ 431,540	$1,581,839	$ 545,485	$ 251,552	$1,664,219	$ 747,610	$ 405,548
		ON-1	$ 891,575	$ 646,277	$ 420,645	$ 223,136	$ 924,225	$ 714,651	$ 607,753	$ 325,025	$ 442,602	$ 329,451	$ 196,195	$ 518,852	$ 487,748	$ 332,229
		ON-2	$2,670,822	$1,732,170	$ 693,187	$ 320,162	$2,778,167	$1,826,561	$ 962,383	$ 500,504	$1,810,645	$ 624,117	$ 281,140	$1,889,068	$ 846,491	$ 453,861
		MB	$ 186,969	$ 111,832	$ 84,371	$ 62,946	$ 337,969	$ 232,156	$ 238,215	$ 217,080	$ 100,513	$ 76,999	$ 58,344	$ 234,926	$ 240,954	$ 226,106
		SK	$ 167,489	$ 96,533	$ 75,236	$ 62,705	$ 345,249	$ 232,136	$ 239,699	$ 234,046	$ 89,735	$ 70,202	$ 59,703	$ 239,162	$ 249,489	$ 246,402
		AB	$ 200,536	$ 116,571	$ 90,424	$ 70,035	$ 375,098	$ 250,698	$ 259,113	$ 241,488	$ 104,734	$ 83,212	$ 66,311	$ 252,634	$ 263,552	$ 251,600
		BC-1	$ 888,690	$ 660,915	$ 443,400	$ 296,940	$ 930,308	$ 741,198	$ 623,218	$ 388,750	$ 451,864	$ 371,696	$ 285,497	$ 554,659	$ 522,654	$ 398,874
		BC-2	$4,678,015	$2,726,305	$1,176,625	$ 489,565	$4,831,218	$2,810,815	$1,489,118	$ 655,538	$ 997,420	$ 766,046	$ 337,733	$1,103,132	$ 961,164	$ 484,234
		TR	$3,578,650	$2,476,373	$1,169,450	$ 605,935	$3,757,760	$2,535,717	$1,487,698	$ 773,223	$2,691,183	$1,024,683	$ 574,173	$2,759,721	$1,259,146	$ 730,887

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Clearing and grubbing (m^2)		NL	$ 668	$ 891	$ 1,002	$ 1,069	$ 278	$ 401	$ 601	$ 757	$ 698	$ 833	$ 980	$ 208	$ 274	$ 368
		PE	$ 111	$ 149	$ 167	$ 178	$ 46	$ 67	$ 100	$ 126	$ 116	$ 139	$ 163	$ 35	$ 46	$ 61
		NS	$ 668	$ 891	$ 1,002	$ 1,069	$ 278	$ 401	$ 601	$ 757	$ 698	$ 833	$ 980	$ 208	$ 274	$ 368
		NB	$ 446	$ 594	$ 668	$ 713	$ 186	$ 267	$ 401	$ 505	$ 466	$ 555	$ 653	$ 139	$ 183	$ 245
		QC-1	$ 668	$ 891	$ 1,002	$ 1,069	$ 278	$ 401	$ 601	$ 757	$ 466	$ 555	$ 653	$ 139	$ 183	$ 245
		QC-2	$ 1,002	$ 1,337	$ 1,504	$ 1,604	$ 418	$ 601	$ 902	$ 1,136	$ 698	$ 833	$ 980	$ 208	$ 274	$ 368
		ON-1	$ 466	$ 621	$ 698	$ 745	$ 194	$ 279	$ 419	$ 528	$ 487	$ 580	$ 683	$ 145	$ 191	$ 256
		ON-2	$ 668	$ 891	$ 1,002	$ 1,069	$ 278	$ 401	$ 601	$ 757	$ 698	$ 833	$ 980	$ 208	$ 274	$ 368
		MB	$ 111	$ 149	$ 167	$ 178	$ 46	$ 67	$ 100	$ 126	$ 116	$ 139	$ 163	$ 35	$ 46	$ 61
		SK	$ 111	$ 149	$ 167	$ 178	$ 46	$ 67	$ 100	$ 126	$ 116	$ 139	$ 163	$ 35	$ 46	$ 61
		AB	$ 223	$ 297	$ 334	$ 356	$ 93	$ 134	$ 200	$ 252	$ 233	$ 278	$ 327	$ 69	$ 91	$ 123
		BC-1	$ 1,114	$ 1,485	$ 1,671	$ 1,782	$ 464	$ 668	$ 1,002	$ 1,262	$ 1,164	$ 1,388	$ 1,634	$ 347	$ 457	$ 613
		BC-2	$ 2,228	$ 2,970	$ 3,341	$ 3,564	$ 928	$ 1,337	$ 2,005	$ 2,525	$ 2,328	$ 2,777	$ 3,267	$ 694	$ 915	$ 1,225
		TR	$ 1,002	$ 1,337	$ 1,504	$ 1,604	$ 418	$ 601	$ 902	$ 1,136	$ 1,047	$ 1,250	$ 1,470	$ 312	$ 412	$ 551
Grading	Material moved (m^3)	NL	$ 27,225	$ 17,696	$ 10,720	$ 3,063	$ 27,225	$ 17,696	$ 13,783	$ 3,829	$ 23,865	$ 6,364	$ 1,685	$ 23,865	$ 7,955	$ 2,527
		PE	$ 8,508	$ 5,105	$ 3,403	$ 851	$ 8,508	$ 5,105	$ 5,105	$ 1,361	$ 3,743	$ 2,808	$ 562	$ 3,743	$ 3,743	$ 936
		NS	$ 27,225	$ 17,696	$ 10,720	$ 3,063	$ 27,225	$ 17,696	$ 13,783	$ 3,829	$ 23,865	$ 6,364	$ 1,685	$ 23,865	$ 7,955	$ 2,527
		NB	$ 15,314	$ 12,251	$ 8,083	$ 1,617	$ 15,314	$ 12,251	$ 11,316	$ 1,132	$ 8,891	$ 5,334	$ 889	$ 8,891	$ 7,113	$ 1,423
		QC-1	$ 15,314	$ 12,251	$ 8,083	$ 1,617	$ 15,314	$ 12,251	$ 11,316	$ 1,132	$ 8,891	$ 5,334	$ 889	$ 8,891	$ 7,113	$ 1,423
		QC-2	$ 27,225	$ 17,696	$ 10,720	$ 3,063	$ 27,225	$ 17,696	$ 13,783	$ 3,829	$ 23,865	$ 6,364	$ 1,685	$ 23,865	$ 7,955	$ 2,527
		ON-1	$ 21,899	$ 17,519	$ 11,558	$ 2,312	$ 21,899	$ 17,519	$ 16,181	$ 1,618	$ 12,714	$ 7,628	$ 1,271	$ 12,714	$ 10,171	$ 2,034
		ON-2	$ 29,948	$ 19,466	$ 11,792	$ 3,369	$ 29,948	$ 19,466	$ 15,161	$ 4,211	$ 26,251	$ 7,000	$ 1,853	$ 26,251	$ 8,750	$ 2,780
		MB	$ 4,118	$ 2,471	$ 1,647	$ 412	$ 4,118	$ 2,471	$ 2,471	$ 659	$ 1,812	$ 1,359	$ 272	$ 1,812	$ 1,812	$ 453
		SK	$ 2,467	$ 1,480	$ 987	$ 247	$ 2,467	$ 1,480	$ 1,480	$ 395	$ 1,086	$ 814	$ 163	$ 1,086	$ 1,086	$ 271
		AB	$ 4,254	$ 2,552	$ 1,702	$ 425	$ 4,254	$ 2,552	$ 2,552	$ 681	$ 1,872	$ 1,404	$ 281	$ 1,872	$ 1,872	$ 468
		BC-1	$ 15,314	$ 12,251	$ 8,083	$ 1,617	$ 15,314	$ 12,251	$ 11,316	$ 1,132	$ 8,891	$ 5,334	$ 889	$ 8,891	$ 7,113	$ 1,423
		BC-2	$ 25,524	$ 14,463	$ 11,911	$ 3,573	$ 25,524	$ 14,463	$ 14,293	$ 4,169	$ 14,974	$ 10,482	$ 2,246	$ 14,974	$ 11,979	$ 2,995
		TR	$ 68,063	$ 44,241	$ 26,800	$ 7,657	$ 68,063	$ 44,241	$ 34,457	$ 9,571	$ 59,662	$ 15,910	$ 4,211	$ 59,662	$ 19,887	$ 6,317
Grading	Rock % of material moved (%)	NL	$ 68,063	$ 44,241	$ 11,911	$ 3,403	$ 68,063	$ 44,241	$ 15,314	$ 4,254	$ 42,114	$ 11,230	$ 1,872	$ 42,114	$ 14,038	$ 2,808
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 68,063	$ 44,241	$ 11,911	$ 3,403	$ 68,063	$ 44,241	$ 15,314	$ 4,254	$ 42,114	$ 11,230	$ 1,872	$ 42,114	$ 14,038	$ 2,808
		NB	$ 17,016	$ 13,613	$ 4,254	$ 851	$ 17,016	$ 13,613	$ 5,956	$ 596	$ 4,679	$ 2,808	$ 468	$ 4,679	$ 3,743	$ 749
		QC-1	$ 17,016	$ 13,613	$ 4,254	$ 851	$ 17,016	$ 13,613	$ 5,956	$ 596	$ 4,679	$ 2,808	$ 468	$ 4,679	$ 3,743	$ 749
		QC-2	$ 102,095	$ 66,362	$ 17,867	$ 5,105	$ 102,095	$ 66,362	$ 22,971	$ 6,381	$ 63,171	$ 16,846	$ 2,808	$ 63,171	$ 21,057	$ 4,211
		ON-1	$ 13,613	$ 10,890	$ 3,403	$ 681	$ 13,613	$ 10,890	$ 4,764	$ 476	$ 3,743	$ 2,246	$ 374	$ 3,743	$ 2,995	$ 599
		ON-2	$ 118,076	$ 76,750	$ 20,663	$ 5,904	$ 118,076	$ 76,750	$ 26,567	$ 7,380	$ 73,060	$ 19,483	$ 3,247	$ 73,060	$ 24,353	$ 4,871
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 17,016	$ 13,613	$ 4,254	$ 851	$ 17,016	$ 13,613	$ 5,956	$ 596	$ 4,679	$ 2,808	$ 468	$ 4,679	$ 3,743	$ 749
		BC-2	$ 255,237	$ 144,634	$ 51,047	$ 15,314	$ 255,237	$ 144,634	$ 61,257	$ 17,867	$ 37,435	$ 26,204	$ 5,615	$ 37,435	$ 29,948	$ 7,487
		TR	$ 136,127	$ 88,482	$ 23,822	$ 6,806	$ 136,127	$ 88,482	$ 30,628	$ 8,508	$ 84,228	$ 22,461	$ 3,743	$ 84,228	$ 28,076	$ 5,615

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Land-scaping	Sodding & top soil (m^2)	NL	$ 142	$ 71	$ 64	$ 57	$ 1,139	$ 797	$ 797	$ 498	$ 94	$ 82	$ 70	$ 1,644	$ 1,127	$ 881
		PE	$ 71	$ 36	$ 32	$ 28	$ 569	$ 398	$ 398	$ 249	$ 31	$ 27	$ 23	$ 548	$ 376	$ 294
		NS	$ 142	$ 71	$ 64	$ 57	$ 1,139	$ 797	$ 797	$ 498	$ 94	$ 82	$ 70	$ 1,644	$ 1,127	$ 881
		NB	$ 285	$ 142	$ 128	$ 114	$ 2,277	$ 1,594	$ 1,594	$ 996	$ 125	$ 110	$ 94	$ 2,192	$ 1,503	$ 1,174
		QC-1	$ 427	$ 213	$ 192	$ 171	$ 3,416	$ 2,391	$ 2,391	$ 1,494	$ 125	$ 110	$ 94	$ 2,192	$ 1,503	$ 1,174
		QC-2	$ 213	$ 107	$ 96	$ 85	$ 1,708	$ 1,195	$ 1,195	$ 747	$ 94	$ 82	$ 70	$ 1,644	$ 1,127	$ 881
		ON-1	$ 236	$ 118	$ 106	$ 94	$ 1,890	$ 1,323	$ 1,323	$ 827	$ 104	$ 91	$ 78	$ 1,819	$ 1,247	$ 974
		ON-2	$ 155	$ 77	$ 70	$ 62	$ 1,238	$ 867	$ 867	$ 542	$ 102	$ 89	$ 77	$ 1,788	$ 1,226	$ 958
		MB	$ 137	$ 68	$ 62	$ 55	$ 1,096	$ 767	$ 767	$ 479	$ 60	$ 53	$ 45	$ 1,055	$ 723	$ 565
		SK	$ 71	$ 36	$ 32	$ 28	$ 569	$ 398	$ 398	$ 249	$ 31	$ 27	$ 23	$ 548	$ 376	$ 294
		AB	$ 71	$ 36	$ 32	$ 28	$ 569	$ 398	$ 398	$ 249	$ 31	$ 27	$ 23	$ 548	$ 376	$ 294
		BC-1	$ 712	$ 356	$ 320	$ 285	$ 5,693	$ 3,985	$ 3,985	$ 2,490	$ 313	$ 274	$ 235	$ 5,479	$ 3,757	$ 2,935
		BC-2	$ 71	$ 36	$ 32	$ 28	$ 569	$ 398	$ 398	$ 249	$ 63	$ 55	$ 47	$ 1,096	$ 751	$ 587
		TR	$ 356	$ 178	$ 160	$ 142	$ 2,846	$ 1,992	$ 1,992	$ 1,245	$ 235	$ 205	$ 176	$ 4,109	$ 2,818	$ 2,201
Land-scaping	Top soil (m^2)	NL	$ 6,760	$ 3,380	$ 3,042	$ 2,704	$ 712	$ 854	$ 854	$ 1,245	$ 4,462	$ 3,904	$ 3,346	$ -	$ 704	$ 734
		PE	$ 3,380	$ 1,690	$ 1,521	$ 1,352	$ 356	$ 427	$ 427	$ 623	$ 1,487	$ 1,301	$ 1,115	$ -	$ 235	$ 245
		NS	$ 6,760	$ 3,380	$ 3,042	$ 2,704	$ 712	$ 854	$ 854	$ 1,245	$ 4,462	$ 3,904	$ 3,346	$ -	$ 704	$ 734
		NB	$ 13,520	$ 6,760	$ 6,084	$ 5,408	$ 1,423	$ 1,708	$ 1,708	$ 2,490	$ 5,949	$ 5,205	$ 4,462	$ -	$ 939	$ 978
		QC-1	$ 13,520	$ 6,760	$ 6,084	$ 5,408	$ 1,423	$ 1,708	$ 1,708	$ 2,490	$ 5,949	$ 5,205	$ 4,462	$ -	$ 939	$ 978
		QC-2	$ 6,760	$ 3,380	$ 3,042	$ 2,704	$ 712	$ 854	$ 854	$ 1,245	$ 4,462	$ 3,904	$ 3,346	$ -	$ 704	$ 734
		ON-1	$ 13,520	$ 6,760	$ 6,084	$ 5,408	$ 1,423	$ 1,708	$ 1,708	$ 2,490	$ 5,949	$ 5,205	$ 4,462	$ -	$ 939	$ 978
		ON-2	$ 10,140	$ 5,070	$ 4,563	$ 4,056	$ 1,067	$ 1,281	$ 1,281	$ 1,868	$ 6,692	$ 5,856	$ 5,019	$ -	$ 1,057	$ 1,101
		MB	$ 3,380	$ 1,690	$ 1,521	$ 1,352	$ 356	$ 427	$ 427	$ 623	$ 1,487	$ 1,301	$ 1,115	$ -	$ 235	$ 245
		SK	$ 3,380	$ 1,690	$ 1,521	$ 1,352	$ 356	$ 427	$ 427	$ 623	$ 1,487	$ 1,301	$ 1,115	$ -	$ 235	$ 245
		AB	$ 3,380	$ 1,690	$ 1,521	$ 1,352	$ 356	$ 427	$ 427	$ 623	$ 1,487	$ 1,301	$ 1,115	$ -	$ 235	$ 245
		BC-1	$ 13,520	$ 6,760	$ 6,084	$ 5,408	$ 1,423	$ 1,708	$ 1,708	$ 2,490	$ 5,949	$ 5,205	$ 4,462	$ -	$ 939	$ 978
		BC-2	$ 1,352	$ 676	$ 608	$ 541	$ 142	$ 171	$ 171	$ 249	$ 1,190	$ 1,041	$ 892	$ -	$ 188	$ 196
		TR	$ 6,760	$ 3,380	$ 3,042	$ 2,704	$ 712	$ 854	$ 854	$ 1,245	$ 4,462	$ 3,904	$ 3,346	$ -	$ 704	$ 734
Drainage	Curb and gutter (PCC, Straight) (m)	NL	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		PE	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		NS	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		NB	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		QC-1	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		QC-2	$ 155	$ 217	$ 278	$ 340	$ 4,950	$ 5,569	$ 5,878	$ 6,188	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		ON-1	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		ON-2	$ 213	$ 298	$ 383	$ 468	$ 6,806	$ 7,657	$ 8,083	$ 8,508	$ 328	$ 421	$ 515	$ 8,423	$ 8,891	$ 9,359
		MB	$ 156	$ 218	$ 281	$ 343	$ 4,990	$ 5,613	$ 5,925	$ 6,237	$ 240	$ 309	$ 377	$ 6,175	$ 6,518	$ 6,861
		SK	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		AB	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		BC-1	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		BC-2	$ 193	$ 271	$ 348	$ 425	$ 6,188	$ 6,961	$ 7,348	$ 7,734	$ 298	$ 383	$ 468	$ 7,657	$ 8,083	$ 8,508
		TR	$ 290	$ 406	$ 522	$ 638	$ 9,281	$ 10,442	$ 11,022	$ 11,602	$ 447	$ 574	$ 702	$ 11,486	$ 12,124	$ 12,762

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Drainage	500 mm Pipe culvert & end sections (m)	NL	$ 97	$ 483	$ 1,450	$ 2,417	$ 48	$ 242	$ 725	$ 1,209	$ 638	$ 1,914	$ 3,190	$ 319	$ 957	$ 1,595
		PE	$ 39	$ 193	$ 580	$ 967	$ 19	$ 97	$ 290	$ 483	$ 255	$ 766	$ 1,276	$ 128	$ 383	$ 638
		NS	$ 97	$ 483	$ 1,450	$ 2,417	$ 48	$ 242	$ 725	$ 1,209	$ 638	$ 1,914	$ 3,190	$ 319	$ 957	$ 1,595
		NB	$ 97	$ 483	$ 1,450	$ 2,417	$ 48	$ 242	$ 725	$ 1,209	$ 638	$ 1,914	$ 3,190	$ 319	$ 957	$ 1,595
		QC-1	$ 193	$ 967	$ 2,900	$ 4,834	$ 97	$ 483	$ 1,450	$ 2,417	$ 638	$ 1,914	$ 3,190	$ 319	$ 957	$ 1,595
		QC-2	$ 155	$ 773	$ 2,320	$ 3,867	$ 77	$ 387	$ 1,160	$ 1,934	$ 766	$ 2,297	$ 3,829	$ 383	$ 1,149	$ 1,914
		ON-1	$ 87	$ 434	$ 1,302	$ 2,170	$ 43	$ 217	$ 651	$ 1,085	$ 573	$ 1,718	$ 2,864	$ 286	$ 859	$ 1,432
		ON-2	$ 108	$ 539	$ 1,616	$ 2,693	$ 54	$ 269	$ 808	$ 1,346	$ 711	$ 2,133	$ 3,554	$ 355	$ 1,066	$ 1,777
		MB	$ 16	$ 78	$ 234	$ 390	$ 8	$ 39	$ 117	$ 195	$ 103	$ 309	$ 515	$ 51	$ 154	$ 257
		SK	$ 19	$ 97	$ 290	$ 483	$ 10	$ 48	$ 145	$ 242	$ 128	$ 383	$ 638	$ 64	$ 191	$ 319
		AB	$ 23	$ 116	$ 348	$ 580	$ 12	$ 58	$ 174	$ 290	$ 153	$ 459	$ 766	$ 77	$ 230	$ 383
		BC-1	$ 193	$ 967	$ 2,900	$ 4,834	$ 97	$ 483	$ 1,450	$ 2,417	$ 1,276	$ 3,829	$ 6,381	$ 638	$ 1,914	$ 3,190
		BC-2	$ 193	$ 967	$ 2,900	$ 4,834	$ 97	$ 483	$ 1,450	$ 2,417	$ 1,276	$ 3,829	$ 6,381	$ 638	$ 1,914	$ 3,190
		TR	$ 480	$ 2,398	$ 7,193	$ 11,988	$ 240	$ 1,199	$ 3,597	$ 5,994	$ 3,165	$ 9,495	$ 15,825	$ 1,582	$ 4,747	$ 7,912
Drainage	1500 mm Wide box culvert (m)	NL	$ 2,320	$ 1,740	$ 1,160	$ 1,160	$ 1,160	$ 870	$ 580	$ 580	$ 1,787	$ 1,149	$ 1,149	$ 893	$ 638	$ 510
		PE	$ 1,160	$ 870	$ 580	$ 580	$ 580	$ 435	$ 290	$ 290	$ 893	$ 574	$ 574	$ 447	$ 319	$ 255
		NS	$ 2,320	$ 1,740	$ 1,160	$ 1,160	$ 1,160	$ 870	$ 580	$ 580	$ 1,787	$ 1,149	$ 1,149	$ 893	$ 638	$ 510
		NB	$ 2,320	$ 1,740	$ 1,160	$ 1,160	$ 1,160	$ 870	$ 580	$ 580	$ 1,787	$ 1,149	$ 1,149	$ 893	$ 638	$ 510
		QC-1	$ 1,238	$ 928	$ 619	$ 619	$ 619	$ 464	$ 309	$ 309	$ 1,787	$ 1,149	$ 1,149	$ 893	$ 638	$ 510
		QC-2	$ 1,547	$ 1,160	$ 773	$ 773	$ 773	$ 580	$ 387	$ 387	$ 2,382	$ 1,531	$ 1,531	$ 1,191	$ 851	$ 681
		ON-1	$ 2,374	$ 1,781	$ 1,187	$ 1,187	$ 1,187	$ 890	$ 594	$ 594	$ 1,828	$ 1,175	$ 1,175	$ 914	$ 653	$ 522
		ON-2	$ 2,630	$ 1,972	$ 1,315	$ 1,315	$ 1,315	$ 986	$ 657	$ 657	$ 2,025	$ 1,302	$ 1,302	$ 1,012	$ 723	$ 579
		MB	$ 1,547	$ 1,160	$ 773	$ 773	$ 773	$ 580	$ 387	$ 387	$ 1,191	$ 766	$ 766	$ 596	$ 425	$ 340
		SK	$ 1,547	$ 1,160	$ 773	$ 773	$ 773	$ 580	$ 387	$ 387	$ 1,191	$ 766	$ 766	$ 596	$ 425	$ 340
		AB	$ 1,547	$ 1,160	$ 773	$ 773	$ 773	$ 580	$ 387	$ 387	$ 1,191	$ 766	$ 766	$ 596	$ 425	$ 340
		BC-1	$ 4,641	$ 3,481	$ 2,320	$ 2,320	$ 2,320	$ 1,740	$ 1,160	$ 1,160	$ 3,573	$ 2,297	$ 2,297	$ 1,787	$ 1,276	$ 1,021
		BC-2	$ 2,320	$ 1,740	$ 1,160	$ 1,160	$ 1,160	$ 870	$ 580	$ 580	$ 1,787	$ 1,149	$ 1,149	$ 893	$ 638	$ 510
		TR	$ 4,641	$ 3,481	$ 2,320	$ 2,320	$ 2,320	$ 1,740	$ 1,160	$ 1,160	$ 3,573	$ 2,297	$ 2,297	$ 1,787	$ 1,276	$ 1,021
Drainage	Storm water sewers for 2-Lane road (m)	NL	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		PE	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		NS	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		NB	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		QC-1	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		QC-2	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		ON-1	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		ON-2	$ 510	$ 418	$ 232	$ 139	$ 4,641	$ 5,105	$ 5,337	$ 5,569	$ 562	$ 255	$ 153	$ 5,615	$ 5,870	$ 6,126
		MB	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		SK	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		AB	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		BC-1	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		BC-2	$ 425	$ 348	$ 193	$ 116	$ 3,867	$ 4,254	$ 4,447	$ 4,641	$ 468	$ 213	$ 128	$ 4,679	$ 4,892	$ 5,105
		TR	$ 638	$ 522	$ 290	$ 174	$ 5,801	$ 6,381	$ 6,671	$ 6,961	$ 702	$ 319	$ 191	$ 7,019	$ 7,338	$ 7,657

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Guiderail	Concrete barrier (m)	NL	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 490	$ -	$ -	$ -	$ 1,429	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 2,450	$ -	$ -	$ -	$ 7,147	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 1,635	$ -	$ -	$ -	$ 4,769	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 1,797	$ -	$ -	$ -	$ 5,241	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 1,143	$ -	$ -	$ -	$ 3,335	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 817	$ -	$ -	$ -	$ 2,382	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 817	$ -	$ -	$ -	$ 2,382	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 1,634	$ -	$ -	$ -	$ 4,764	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Guiderail	Steel guiderail (m)	NL	$ 77	$ 1,021	$ 817	$ 408	$ 61	$ 128	$ 102	$ 51	$ 1,123	$ 898	$ 449	$ 70	$ 56	$ 28
		PE	$ 13	$ 408	$ 82	$ 41	$ 10	$ 51	$ 10	$ 5	$ 449	$ 90	$ 45	$ 28	$ 6	$ 3
		NS	$ 77	$ 1,021	$ 817	$ 408	$ 61	$ 128	$ 102	$ 51	$ 1,123	$ 898	$ 449	$ 70	$ 56	$ 28
		NB	$ 51	$ 817	$ 817	$ 408	$ 41	$ 102	$ 102	$ 51	$ 898	$ 898	$ 449	$ 56	$ 56	$ 28
		QC-1	$ 44	$ 708	$ 708	$ 354	$ 35	$ 88	$ 88	$ 44	$ 898	$ 898	$ 449	$ 56	$ 56	$ 28
		QC-2	$ 82	$ 1,089	$ 871	$ 436	$ 65	$ 136	$ 109	$ 54	$ 1,123	$ 898	$ 449	$ 70	$ 56	$ 28
		ON-1	$ 45	$ 719	$ 719	$ 359	$ 36	$ 90	$ 90	$ 45	$ 790	$ 790	$ 395	$ 49	$ 49	$ 25
		ON-2	$ 71	$ 953	$ 762	$ 381	$ 57	$ 119	$ 95	$ 48	$ 1,048	$ 839	$ 419	$ 66	$ 52	$ 26
		MB	$ 13	$ 403	$ 81	$ 40	$ 10	$ 50	$ 10	$ 5	$ 443	$ 89	$ 44	$ 28	$ 6	$ 3
		SK	$ 13	$ 408	$ 82	$ 41	$ 10	$ 51	$ 10	$ 5	$ 449	$ 90	$ 45	$ 28	$ 6	$ 3
		AB	$ 13	$ 408	$ 82	$ 41	$ 10	$ 51	$ 10	$ 5	$ 449	$ 90	$ 45	$ 28	$ 6	$ 3
		BC-1	$ 51	$ 817	$ 817	$ 408	$ 41	$ 102	$ 102	$ 51	$ 898	$ 898	$ 449	$ 56	$ 56	$ 28
		BC-2	$ 102	$ 1,634	$ 817	$ 408	$ 82	$ 204	$ 102	$ 51	$ 1,348	$ 898	$ 449	$ 84	$ 56	$ 28
		TR	$ 510	$ 6,806	$ 5,445	$ 2,723	$ 408	$ 851	$ 681	$ 340	$ 7,487	$ 5,990	$ 2,995	$ 468	$ 374	$ 187
Guiderail	3-Cable guide rail (m)	NL	$ -	$ 332	$ 204	$ 102	$ -	$ -	$ -	$ -	$ 253	$ 157	$ 79	$ -	$ 11	$ 34
		PE	$ -	$ 53	$ 20	$ 10	$ -	$ -	$ -	$ -	$ 51	$ 16	$ 8	$ -	$ 1	$ 3
		NS	$ -	$ 332	$ 204	$ 102	$ -	$ -	$ -	$ -	$ 253	$ 157	$ 79	$ -	$ 11	$ 34
		NB	$ -	$ 265	$ 204	$ 102	$ -	$ -	$ -	$ -	$ 202	$ 157	$ 79	$ -	$ 11	$ 34
		QC-1	$ -	$ 273	$ 210	$ 105	$ -	$ -	$ -	$ -	$ 208	$ 161	$ 81	$ -	$ 12	$ 35
		QC-2	$ -	$ 398	$ 245	$ 123	$ -	$ -	$ -	$ -	$ 303	$ 189	$ 94	$ -	$ 13	$ 40
		ON-1	$ -	$ 273	$ 210	$ 105	$ -	$ -	$ -	$ -	$ 208	$ 161	$ 81	$ -	$ 12	$ 35
		ON-2	$ -	$ 398	$ 245	$ 123	$ -	$ -	$ -	$ -	$ 303	$ 189	$ 94	$ -	$ 13	$ 40
		MB	$ -	$ 53	$ 20	$ 10	$ -	$ -	$ -	$ -	$ 51	$ 16	$ 8	$ -	$ 1	$ 3
		SK	$ -	$ 53	$ 20	$ 10	$ -	$ -	$ -	$ -	$ 51	$ 16	$ 8	$ -	$ 1	$ 3
		AB	$ -	$ 53	$ 20	$ 10	$ -	$ -	$ -	$ -	$ 51	$ 16	$ 8	$ -	$ 1	$ 3
		BC-1	$ -	$ 265	$ 204	$ 102	$ -	$ -	$ -	$ -	$ 202	$ 157	$ 79	$ -	$ 11	$ 34
		BC-2	$ -	$ 531	$ 204	$ 102	$ -	$ -	$ -	$ -	$ 303	$ 157	$ 79	$ -	$ 11	$ 34
		TR	$ -	$ 1,659	$ 1,021	$ 510	$ -	$ -	$ -	$ -	$ 1,263	$ 786	$ 393	$ -	$ 56	$ 168

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Fencing & gates	Chain link fence (m)	NL	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 61	$ -	$ -	$ -	$ 1,225	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 153	$ -	$ -	$ -	$ 3,063	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 91	$ -	$ -	$ -	$ 1,815	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 143	$ -	$ -	$ -	$ 2,870	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 102	$ -	$ -	$ -	$ 2,042	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 123	$ -	$ -	$ -	$ 2,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 123	$ -	$ -	$ -	$ 2,450	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 61	$ -	$ -	$ -	$ 1,225	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Fencing & gates	Wire fence (m)	NL	$ 286	$ -	$ -	$ -	$ 24	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 286	$ -	$ -	$ -	$ 24	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 286	$ -	$ -	$ -	$ 24	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 286	$ -	$ -	$ -	$ 24	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 1,634	$ -	$ -	$ -	$ 136	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 1,634	$ -	$ -	$ -	$ 136	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 349	$ -	$ -	$ -	$ 29	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 535	$ -	$ -	$ -	$ 45	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 163	$ -	$ -	$ -	$ 14	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 143	$ -	$ -	$ -	$ 12	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 286	$ -	$ -	$ -	$ 24	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 613	$ -	$ -	$ -	$ 51	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 613	$ -	$ -	$ -	$ 51	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 613	$ -	$ -	$ -	$ 51	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Lighting	High mast (each)	NL	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ 11,370	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ 11,370	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ 9,627	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ 9,421	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ 9,745	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Lighting	Standard (each)	NL	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		PE	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		NS	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		NB	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		QC-1	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		QC-2	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		ON-1	$ 120	$ 241	$ 361	$ 482	$ 542	$ 963	$ 723	$ 723	$ 530	$ 662	$ 265	$ 1,325	$ 1,060	$ 795
		ON-2	$ 121	$ 241	$ 362	$ 483	$ 543	$ 965	$ 724	$ 724	$ 531	$ 664	$ 265	$ 1,327	$ 1,062	$ 796
		MB	$ 186	$ 371	$ 557	$ 743	$ 835	$ 1,485	$ 1,114	$ 1,114	$ 817	$ 1,021	$ 408	$ 2,042	$ 1,634	$ 1,225
		SK	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		AB	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		BC-1	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		BC-2	$ 139	$ 278	$ 418	$ 557	$ 626	$ 1,114	$ 835	$ 835	$ 613	$ 766	$ 306	$ 1,531	$ 1,225	$ 919
		TR	$ 232	$ 464	$ 696	$ 928	$ 1,044	$ 1,856	$ 1,392	$ 1,392	$ 1,021	$ 1,276	$ 510	$ 2,552	$ 2,042	$ 1,531
Painting of traffic lanes (m)		NL	$ 257	$ 338	$ 241	$ 225	$ 257	$ 116	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		PE	$ 257	$ 282	$ 241	$ 225	$ 257	$ 97	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		NS	$ 257	$ 338	$ 241	$ 225	$ 257	$ 116	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		NB	$ 257	$ 282	$ 241	$ 225	$ 257	$ 97	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		QC-1	$ 515	$ 563	$ 483	$ 450	$ 515	$ 193	$ 177	$ 161	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		QC-2	$ 515	$ 676	$ 483	$ 450	$ 515	$ 232	$ 177	$ 161	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		ON-1	$ 234	$ 256	$ 220	$ 205	$ 234	$ 88	$ 81	$ 73	$ 225	$ 193	$ 161	$ 97	$ 89	$ 89
		ON-2	$ 265	$ 348	$ 249	$ 232	$ 265	$ 119	$ 91	$ 83	$ 255	$ 219	$ 182	$ 109	$ 100	$ 100
		MB	$ 257	$ 282	$ 241	$ 225	$ 257	$ 97	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		SK	$ 257	$ 282	$ 241	$ 225	$ 257	$ 97	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		AB	$ 257	$ 282	$ 241	$ 225	$ 257	$ 97	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		BC-1	$ 257	$ 282	$ 241	$ 225	$ 257	$ 97	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		BC-2	$ 257	$ 422	$ 241	$ 225	$ 257	$ 145	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
		TR	$ 257	$ 338	$ 241	$ 225	$ 257	$ 116	$ 88	$ 80	$ 248	$ 212	$ 177	$ 106	$ 97	$ 97
Total of All Other Roadway Infrastructure		NL	$ 108,250	$ 70,813	$ 31,153	$ 15,150	$ 115,829	$ 76,560	$ 44,640	$ 24,878	$ 76,047	$ 27,340	$ 13,592	$ 81,556	$ 38,833	$ 23,194
		PE	$ 16,180	$ 9,404	$ 7,168	$ 4,774	$ 27,231	$ 17,891	$ 18,504	$ 15,593	$ 8,040	$ 6,529	$ 4,540	$ 17,371	$ 18,180	$ 16,145
		NS	$ 108,250	$ 70,813	$ 31,153	$ 15,150	$ 115,829	$ 76,560	$ 44,640	$ 24,878	$ 76,047	$ 27,340	$ 13,592	$ 81,556	$ 38,833	$ 23,194
		NB	$ 51,946	$ 37,566	$ 23,631	$ 13,556	$ 54,608	$ 41,958	$ 34,265	$ 20,014	$ 24,648	$ 18,939	$ 12,205	$ 29,612	$ 28,216	$ 20,446
		QC-1	$ 51,739	$ 37,786	$ 25,076	$ 16,019	$ 51,558	$ 42,808	$ 35,791	$ 21,776	$ 24,654	$ 18,943	$ 12,207	$ 29,612	$ 28,216	$ 20,447
		QC-2	$ 144,411	$ 93,542	$ 38,393	$ 18,666	$ 152,751	$ 97,866	$ 51,864	$ 26,702	$ 97,877	$ 33,752	$ 15,565	$ 102,975	$ 46,259	$ 25,094
		ON-1	$ 55,167	$ 39,989	$ 26,028	$ 13,807	$ 57,187	$ 44,220	$ 37,605	$ 20,111	$ 27,386	$ 20,385	$ 12,140	$ 32,104	$ 30,180	$ 20,557
		ON-2	$ 165,259	$ 107,179	$ 42,891	$ 19,810	$ 171,901	$ 113,020	$ 59,548	$ 30,969	$ 112,035	$ 38,618	$ 17,396	$ 116,887	$ 52,377	$ 28,083
		MB	$ 11,569	$ 6,920	$ 5,221	$ 3,895	$ 20,912	$ 14,365	$ 14,740	$ 13,432	$ 6,219	$ 4,764	$ 3,610	$ 14,536	$ 14,909	$ 13,990
		SK	$ 10,363	$ 5,973	$ 4,655	$ 3,880	$ 21,363	$ 14,364	$ 14,832	$ 14,482	$ 5,552	$ 4,344	$ 3,694	$ 14,798	$ 15,437	$ 15,246
		AB	$ 12,408	$ 7,213	$ 5,595	$ 4,333	$ 23,209	$ 15,512	$ 16,033	$ 14,942	$ 6,480	$ 5,149	$ 4,103	$ 15,632	$ 16,307	$ 15,568
		BC-1	$ 54,988	$ 40,895	$ 27,436	$ 18,373	$ 57,563	$ 45,862	$ 38,562	$ 24,054	$ 27,959	$ 22,999	$ 17,665	$ 34,320	$ 32,340	$ 24,681
		BC-2	$ 289,456	$ 168,692	$ 72,805	$ 30,292	$ 298,935	$ 173,921	$ 92,140	$ 40,562	$ 61,716	$ 47,400	$ 20,897	$ 68,257	$ 59,473	$ 29,962
		TR	$ 221,432	$ 153,227	$ 72,361	$ 37,493	$ 232,514	$ 156,899	$ 92,052	$ 47,844	$ 166,519	$ 63,403	$ 35,527	$ 170,760	$ 77,911	$ 45,224

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Clearing and grubbing (m^2)		NL	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grading	Material moved (m^3)	NL	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grading	Rock % of material moved (%)	NL	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Land-scaping	Sodding & top soil (m^2)	NL	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Land-scaping	Top soil (m^2)	NL	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Drainage	Curb and gutter (PCC, Straight) (m)	NL	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		PE	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		NS	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		NB	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		QC-1	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		QC-2	$ 27	$ 38	$ 48	$ 59	$ 862	$ 970	$ 1,023	$ 1,077	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		ON-1	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		ON-2	$ 37	$ 52	$ 67	$ 81	$ 1,185	$ 1,333	$ 1,407	$ 1,481	$ 57	$ 73	$ 90	$ 1,467	$ 1,548	$ 1,629
		MB	$ 27	$ 38	$ 49	$ 60	$ 869	$ 977	$ 1,032	$ 1,086	$ 42	$ 54	$ 66	$ 1,075	$ 1,135	$ 1,195
		SK	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		AB	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		BC-1	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		BC-2	$ 34	$ 47	$ 61	$ 74	$ 1,077	$ 1,212	$ 1,279	$ 1,347	$ 52	$ 67	$ 81	$ 1,333	$ 1,407	$ 1,481
		TR	$ 50	$ 71	$ 91	$ 111	$ 1,616	$ 1,818	$ 1,919	$ 2,020	$ 78	$ 100	$ 122	$ 2,000	$ 2,111	$ 2,222

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Drainage	500 mm Pipe culvert & end sections (m)	NL	$ 13	$ 63	$ 189	$ 314	$ 6	$ 31	$ 94	$ 157	$ 83	$ 249	$ 415	$ 42	$ 125	$ 208
		PE	$ 5	$ 25	$ 75	$ 126	$ 3	$ 13	$ 38	$ 63	$ 33	$ 100	$ 166	$ 17	$ 50	$ 83
		NS	$ 13	$ 63	$ 189	$ 314	$ 6	$ 31	$ 94	$ 157	$ 83	$ 249	$ 415	$ 42	$ 125	$ 208
		NB	$ 13	$ 63	$ 189	$ 314	$ 6	$ 31	$ 94	$ 157	$ 83	$ 249	$ 415	$ 42	$ 125	$ 208
		QC-1	$ 25	$ 126	$ 377	$ 629	$ 13	$ 63	$ 189	$ 314	$ 83	$ 249	$ 415	$ 42	$ 125	$ 208
		QC-2	$ 20	$ 101	$ 302	$ 503	$ 10	$ 50	$ 151	$ 252	$ 100	$ 299	$ 498	$ 50	$ 149	$ 249
		ON-1	$ 11	$ 56	$ 169	$ 282	$ 6	$ 28	$ 85	$ 141	$ 75	$ 224	$ 373	$ 37	$ 112	$ 186
		ON-2	$ 14	$ 70	$ 210	$ 350	$ 7	$ 35	$ 105	$ 175	$ 92	$ 277	$ 462	$ 46	$ 139	$ 231
		MB	$ 2	$ 10	$ 30	$ 51	$ 1	$ 5	$ 15	$ 25	$ 13	$ 40	$ 67	$ 7	$ 20	$ 33
		SK	$ 3	$ 13	$ 38	$ 63	$ 1	$ 6	$ 19	$ 31	$ 17	$ 50	$ 83	$ 8	$ 25	$ 42
		AB	$ 3	$ 15	$ 45	$ 75	$ 2	$ 8	$ 23	$ 38	$ 20	$ 60	$ 100	$ 10	$ 30	$ 50
		BC-1	$ 25	$ 126	$ 377	$ 629	$ 13	$ 63	$ 189	$ 314	$ 166	$ 498	$ 830	$ 83	$ 249	$ 415
		BC-2	$ 25	$ 126	$ 377	$ 629	$ 13	$ 63	$ 189	$ 314	$ 166	$ 498	$ 830	$ 83	$ 249	$ 415
		TR	$ 62	$ 312	$ 936	$ 1,560	$ 31	$ 156	$ 468	$ 780	$ 412	$ 1,235	$ 2,059	$ 206	$ 618	$ 1,029
Drainage	1500 mm Wide box culvert (m)	NL	$ 226	$ 169	$ 113	$ 113	$ 113	$ 85	$ 56	$ 56	$ 174	$ 112	$ 112	$ 87	$ 62	$ 50
		PE	$ 113	$ 85	$ 56	$ 56	$ 56	$ 42	$ 28	$ 28	$ 87	$ 56	$ 56	$ 43	$ 31	$ 25
		NS	$ 226	$ 169	$ 113	$ 113	$ 113	$ 85	$ 56	$ 56	$ 174	$ 112	$ 112	$ 87	$ 62	$ 50
		NB	$ 226	$ 169	$ 113	$ 113	$ 113	$ 85	$ 56	$ 56	$ 174	$ 112	$ 112	$ 87	$ 62	$ 50
		QC-1	$ 120	$ 90	$ 60	$ 60	$ 60	$ 45	$ 30	$ 30	$ 174	$ 112	$ 112	$ 87	$ 62	$ 50
		QC-2	$ 150	$ 113	$ 75	$ 75	$ 75	$ 56	$ 38	$ 38	$ 232	$ 149	$ 149	$ 116	$ 83	$ 66
		ON-1	$ 231	$ 173	$ 115	$ 115	$ 115	$ 87	$ 58	$ 58	$ 178	$ 114	$ 114	$ 89	$ 63	$ 51
		ON-2	$ 256	$ 192	$ 128	$ 128	$ 128	$ 96	$ 64	$ 64	$ 197	$ 127	$ 127	$ 98	$ 70	$ 56
		MB	$ 150	$ 113	$ 75	$ 75	$ 75	$ 56	$ 38	$ 38	$ 116	$ 74	$ 74	$ 58	$ 41	$ 33
		SK	$ 150	$ 113	$ 75	$ 75	$ 75	$ 56	$ 38	$ 38	$ 116	$ 74	$ 74	$ 58	$ 41	$ 33
		AB	$ 150	$ 113	$ 75	$ 75	$ 75	$ 56	$ 38	$ 38	$ 116	$ 74	$ 74	$ 58	$ 41	$ 33
		BC-1	$ 451	$ 338	$ 226	$ 226	$ 226	$ 169	$ 113	$ 113	$ 347	$ 223	$ 223	$ 174	$ 124	$ 99
		BC-2	$ 226	$ 169	$ 113	$ 113	$ 113	$ 85	$ 56	$ 56	$ 174	$ 112	$ 112	$ 87	$ 62	$ 50
		TR	$ 451	$ 338	$ 226	$ 226	$ 226	$ 169	$ 113	$ 113	$ 347	$ 223	$ 223	$ 174	$ 124	$ 99
Drainage	Storm water sewers for 2-Lane road (m)	NL	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		PE	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		NS	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		NB	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		QC-1	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		QC-2	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		ON-1	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		ON-2	$ 28	$ 23	$ 13	$ 8	$ 252	$ 277	$ 290	$ 302	$ 30	$ 14	$ 8	$ 305	$ 319	$ 333
		MB	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		SK	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		AB	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		BC-1	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		BC-2	$ 23	$ 19	$ 10	$ 6	$ 210	$ 231	$ 241	$ 252	$ 25	$ 12	$ 7	$ 254	$ 266	$ 277
		TR	$ 35	$ 28	$ 16	$ 9	$ 315	$ 346	$ 362	$ 378	$ 38	$ 17	$ 10	$ 381	$ 398	$ 416

All Other Road Infrastructure.xls – M&R Costs Annualized (Cont…)

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Guiderail	Concrete barrier (m)	NL	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 27	$ -	$ -	$ -	$ 78	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 133	$ -	$ -	$ -	$ 388	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 98	$ -	$ -	$ -	$ 285	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 62	$ -	$ -	$ -	$ 181	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 44	$ -	$ -	$ -	$ 129	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 44	$ -	$ -	$ -	$ 129	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 89	$ -	$ -	$ -	$ 259	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Guiderail	Steel guiderail (m)	NL	$ 22	$ 293	$ 235	$ 117	$ 18	$ 37	$ 29	$ 15	$ 323	$ 258	$ 129	$ 20	$ 16	$ 8
		PE	$ 4	$ 117	$ 23	$ 12	$ 3	$ 15	$ 3	$ 1	$ 129	$ 26	$ 13	$ 8	$ 2	$ 1
		NS	$ 22	$ 293	$ 235	$ 117	$ 18	$ 37	$ 29	$ 15	$ 323	$ 258	$ 129	$ 20	$ 16	$ 8
		NB	$ 15	$ 235	$ 235	$ 117	$ 12	$ 29	$ 29	$ 15	$ 258	$ 258	$ 129	$ 16	$ 16	$ 8
		QC-1	$ 13	$ 203	$ 203	$ 102	$ 10	$ 25	$ 25	$ 13	$ 258	$ 258	$ 129	$ 16	$ 16	$ 8
		QC-2	$ 23	$ 313	$ 250	$ 125	$ 19	$ 39	$ 31	$ 16	$ 323	$ 258	$ 129	$ 20	$ 16	$ 8
		ON-1	$ 13	$ 206	$ 206	$ 103	$ 10	$ 26	$ 26	$ 13	$ 227	$ 227	$ 114	$ 14	$ 14	$ 7
		ON-2	$ 21	$ 274	$ 219	$ 110	$ 16	$ 34	$ 27	$ 14	$ 301	$ 241	$ 120	$ 19	$ 15	$ 8
		MB	$ 4	$ 116	$ 23	$ 12	$ 3	$ 14	$ 3	$ 1	$ 127	$ 25	$ 13	$ 8	$ 2	$ 1
		SK	$ 4	$ 117	$ 23	$ 12	$ 3	$ 15	$ 3	$ 1	$ 129	$ 26	$ 13	$ 8	$ 2	$ 1
		AB	$ 4	$ 117	$ 23	$ 12	$ 3	$ 15	$ 3	$ 1	$ 129	$ 26	$ 13	$ 8	$ 2	$ 1
		BC-1	$ 15	$ 235	$ 235	$ 117	$ 12	$ 29	$ 29	$ 15	$ 258	$ 258	$ 129	$ 16	$ 16	$ 8
		BC-2	$ 29	$ 469	$ 235	$ 117	$ 23	$ 59	$ 29	$ 15	$ 387	$ 258	$ 129	$ 24	$ 16	$ 8
		TR	$ 147	$ 1,955	$ 1,564	$ 782	$ 117	$ 244	$ 196	$ 98	$ 2,151	$ 1,721	$ 860	$ 134	$ 108	$ 54
Guiderail	3-Cable guide rail (m)	NL	$ -	$ 136	$ 84	$ 42	$ -	$ -	$ -	$ -	$ 103	$ 64	$ 32	$ -	$ 5	$ 14
		PE	$ -	$ 22	$ 8	$ 4	$ -	$ -	$ -	$ -	$ 21	$ 6	$ 3	$ -	$ 0	$ 1
		NS	$ -	$ 136	$ 84	$ 42	$ -	$ -	$ -	$ -	$ 103	$ 64	$ 32	$ -	$ 5	$ 14
		NB	$ -	$ 109	$ 84	$ 42	$ -	$ -	$ -	$ -	$ 83	$ 64	$ 32	$ -	$ 5	$ 14
		QC-1	$ -	$ 111	$ 86	$ 43	$ -	$ -	$ -	$ -	$ 85	$ 66	$ 33	$ -	$ 5	$ 14
		QC-2	$ -	$ 163	$ 100	$ 50	$ -	$ -	$ -	$ -	$ 124	$ 77	$ 39	$ -	$ 6	$ 17
		ON-1	$ -	$ 111	$ 86	$ 43	$ -	$ -	$ -	$ -	$ 85	$ 66	$ 33	$ -	$ 5	$ 14
		ON-2	$ -	$ 163	$ 100	$ 50	$ -	$ -	$ -	$ -	$ 124	$ 77	$ 39	$ -	$ 6	$ 17
		MB	$ -	$ 22	$ 8	$ 4	$ -	$ -	$ -	$ -	$ 21	$ 6	$ 3	$ -	$ 0	$ 1
		SK	$ -	$ 22	$ 8	$ 4	$ -	$ -	$ -	$ -	$ 21	$ 6	$ 3	$ -	$ 0	$ 1
		AB	$ -	$ 22	$ 8	$ 4	$ -	$ -	$ -	$ -	$ 21	$ 6	$ 3	$ -	$ 0	$ 1
		BC-1	$ -	$ 109	$ 84	$ 42	$ -	$ -	$ -	$ -	$ 83	$ 64	$ 32	$ -	$ 5	$ 14
		BC-2	$ -	$ 217	$ 84	$ 42	$ -	$ -	$ -	$ -	$ 124	$ 64	$ 32	$ -	$ 5	$ 14
		TR	$ -	$ 679	$ 418	$ 209	$ -	$ -	$ -	$ -	$ 517	$ 322	$ 161	$ -	$ 23	$ 69

All Other Road Infrastructure.xls – M&R Costs Annualized (Cont…)

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Fencing & gates	Chain link fence (m)	NL	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 18	$ -	$ -	$ -	$ 352	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 44	$ -	$ -	$ -	$ 880	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 26	$ -	$ -	$ -	$ 521	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 41	$ -	$ -	$ -	$ 824	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 29	$ -	$ -	$ -	$ 587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 35	$ -	$ -	$ -	$ 704	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 35	$ -	$ -	$ -	$ 704	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 18	$ -	$ -	$ -	$ 352	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Fencing & gates	Wire fence (m)	NL	$ 82	$ -	$ -	$ -	$ 7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ 82	$ -	$ -	$ -	$ 7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ 82	$ -	$ -	$ -	$ 7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ 82	$ -	$ -	$ -	$ 7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ 469	$ -	$ -	$ -	$ 39	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ 469	$ -	$ -	$ -	$ 39	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ 100	$ -	$ -	$ -	$ 8	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ 154	$ -	$ -	$ -	$ 13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ 47	$ -	$ -	$ -	$ 4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ 41	$ -	$ -	$ -	$ 3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ 82	$ -	$ -	$ -	$ 7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ 176	$ -	$ -	$ -	$ 15	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ 176	$ -	$ -	$ -	$ 15	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ 176	$ -	$ -	$ -	$ 15	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Lighting	High mast (each)	NL	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		PE	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NS	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		NB	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-1	$ -	$ -	$ -	$ -	$ 1,105	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		QC-2	$ -	$ -	$ -	$ -	$ 1,105	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-1	$ -	$ -	$ -	$ -	$ 936	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		ON-2	$ -	$ -	$ -	$ -	$ 916	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		MB	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SK	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		AB	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-1	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		BC-2	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		TR	$ -	$ -	$ -	$ -	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Description and type of Work Item		Regions	Provincial								Municipal					
			Rural				Urban				Rural			Urban		
			Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Lighting	Standard (each)	NL	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		PE	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		NS	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		NB	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		QC-1	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		QC-2	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		ON-1	$ 21	$ 42	$ 63	$ 84	$ 94	$ 168	$ 126	$ 126	$ 92	$ 115	$ 46	$ 231	$ 185	$ 138
		ON-2	$ 21	$ 42	$ 63	$ 84	$ 95	$ 168	$ 126	$ 126	$ 92	$ 116	$ 46	$ 231	$ 185	$ 139
		MB	$ 32	$ 65	$ 97	$ 129	$ 145	$ 259	$ 194	$ 194	$ 142	$ 178	$ 71	$ 356	$ 284	$ 213
		SK	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		AB	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		BC-1	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		BC-2	$ 24	$ 48	$ 73	$ 97	$ 109	$ 194	$ 145	$ 145	$ 107	$ 133	$ 53	$ 267	$ 213	$ 160
		TR	$ 40	$ 81	$ 121	$ 162	$ 182	$ 323	$ 242	$ 242	$ 178	$ 222	$ 89	$ 444	$ 356	$ 267
Painting of traffic lanes (m)		NL	$ 105	$ 138	$ 99	$ 92	$ 105	$ 47	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		PE	$ 105	$ 115	$ 99	$ 92	$ 105	$ 39	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		NS	$ 105	$ 138	$ 99	$ 92	$ 105	$ 47	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		NB	$ 105	$ 115	$ 99	$ 92	$ 105	$ 39	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		QC-1	$ 211	$ 230	$ 197	$ 184	$ 211	$ 79	$ 72	$ 66	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		QC-2	$ 211	$ 276	$ 197	$ 184	$ 211	$ 95	$ 72	$ 66	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		ON-1	$ 96	$ 105	$ 90	$ 84	$ 96	$ 36	$ 33	$ 30	$ 92	$ 79	$ 66	$ 40	$ 36	$ 36
		ON-2	$ 108	$ 142	$ 102	$ 95	$ 108	$ 49	$ 37	$ 34	$ 104	$ 89	$ 75	$ 45	$ 41	$ 41
		MB	$ 105	$ 115	$ 99	$ 92	$ 105	$ 39	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		SK	$ 105	$ 115	$ 99	$ 92	$ 105	$ 39	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		AB	$ 105	$ 115	$ 99	$ 92	$ 105	$ 39	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		BC-1	$ 105	$ 115	$ 99	$ 92	$ 105	$ 39	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		BC-2	$ 105	$ 173	$ 99	$ 92	$ 105	$ 59	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
		TR	$ 105	$ 138	$ 99	$ 92	$ 105	$ 47	$ 36	$ 33	$ 101	$ 87	$ 72	$ 43	$ 40	$ 40
Total of All Other Roadway Infrastructure		NL	$ 622	$ 865	$ 789	$ 759	$ 2,381	$ 1,643	$ 1,737	$ 1,860	$ 861	$ 848	$ 849	$ 1,779	$ 1,920	$ 2,077
		PE	$ 484	$ 430	$ 333	$ 371	$ 2,307	$ 1,552	$ 1,626	$ 1,724	$ 448	$ 353	$ 399	$ 1,699	$ 1,796	$ 1,908
		NS	$ 622	$ 865	$ 789	$ 759	$ 2,381	$ 1,643	$ 1,737	$ 1,860	$ 861	$ 848	$ 849	$ 1,779	$ 1,920	$ 2,077
		NB	$ 615	$ 756	$ 789	$ 759	$ 2,375	$ 1,628	$ 1,737	$ 1,860	$ 776	$ 848	$ 849	$ 1,775	$ 1,920	$ 2,077
		QC-1	$ 939	$ 827	$ 995	$ 1,098	$ 2,049	$ 1,655	$ 1,837	$ 2,022	$ 778	$ 850	$ 850	$ 1,775	$ 1,920	$ 2,078
		QC-2	$ 1,101	$ 1,022	$ 984	$ 1,003	$ 2,693	$ 1,441	$ 1,557	$ 1,700	$ 956	$ 948	$ 975	$ 1,816	$ 1,966	$ 2,138
		ON-1	$ 623	$ 718	$ 738	$ 708	$ 2,303	$ 1,619	$ 1,722	$ 1,840	$ 734	$ 788	$ 788	$ 1,767	$ 1,903	$ 2,053
		ON-2	$ 756	$ 915	$ 838	$ 822	$ 2,818	$ 1,824	$ 1,931	$ 2,070	$ 906	$ 899	$ 920	$ 1,980	$ 2,137	$ 2,315
		MB	$ 450	$ 432	$ 295	$ 300	$ 2,035	$ 1,324	$ 1,365	$ 1,435	$ 446	$ 299	$ 302	$ 1,445	$ 1,504	$ 1,580
		SK	$ 478	$ 446	$ 315	$ 326	$ 2,321	$ 1,560	$ 1,616	$ 1,702	$ 461	$ 322	$ 334	$ 1,705	$ 1,781	$ 1,875
		AB	$ 519	$ 448	$ 322	$ 339	$ 2,324	$ 1,561	$ 1,620	$ 1,708	$ 464	$ 332	$ 351	$ 1,707	$ 1,786	$ 1,883
		BC-1	$ 909	$ 989	$ 1,091	$ 1,186	$ 2,490	$ 1,744	$ 1,888	$ 2,073	$ 1,033	$ 1,209	$ 1,376	$ 1,904	$ 2,106	$ 2,334
		BC-2	$ 698	$ 1,220	$ 978	$ 1,073	$ 2,389	$ 1,708	$ 1,831	$ 2,017	$ 1,030	$ 1,097	$ 1,264	$ 1,825	$ 2,044	$ 2,285
		TR	$ 1,133	$ 3,522	$ 3,349	$ 2,989	$ 3,036	$ 2,781	$ 3,094	$ 3,421	$ 3,644	$ 3,705	$ 3,508	$ 2,938	$ 3,421	$ 3,929

Routine and Winter Maintenance.xls – Routine Maintenance

Description and type of Work Item	Regions	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Routine maintenace	NL	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 1,750	$ 750	$ 2,250	$ 2,000	$ 1,750
	PE	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250	$ 1,850	$ 1,750	$ 750	$ 2,000	$ 1,900	$ 1,800
	NS	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	NB	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	QC-1	$ 4,000	$ 3,750	$ 3,500	$ 3,250	$ 4,250	$ 4,000	$ 3,750	$ 3,500	$ 3,500	$ 3,250	$ 1,250	$ 3,750	$ 3,500	$ 3,250
	QC-2	$ 3,750	$ 3,500	$ 3,250	$ 3,000	$ 4,000	$ 3,750	$ 3,500	$ 3,250	$ 3,250	$ 3,000	$ 1,000	$ 3,500	$ 3,250	$ 3,000
	ON-1	$ 3,500	$ 3,250	$ 3,000	$ 2,750	$ 3,750	$ 3,500	$ 3,250	$ 3,000	$ 3,250	$ 3,000	$ 1,000	$ 3,500	$ 3,250	$ 3,000
	ON-2	$ 3,250	$ 3,000	$ 2,750	$ 2,500	$ 3,500	$ 3,250	$ 3,000	$ 2,750	$ 3,000	$ 2,750	$ 750	$ 3,250	$ 3,000	$ 2,750
	MB	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	SK	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400	$ 2,000	$ 500	$ 250	$ 2,500	$ 2,250	$ 2,000
	AB	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	BC-1	$ 3,250	$ 3,000	$ 2,750	$ 2,500	$ 3,500	$ 3,250	$ 3,000	$ 2,750	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000
	BC-2	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 3,000	$ 2,750	$ 2,500	$ 2,250	$ 2,000	$ 1,850	$ 1,000	$ 2,500	$ 2,250	$ 2,000
	TR	$ 1,800	$ 1,600	$ 1,400	$ 1,200	$ 2,000	$ 1,800	$ 1,600	$ 1,400	$ 2,000	$ 1,850	$ 750	$ 2,500	$ 2,250	$ 2,000

Note: All costs are per two lane equivalent kilometre.

Routine and Winter Maintenance.xls – Winter Maintenance

Description and type of work item	Regions	Provincial								Municipal					
		Rural				Urban				Rural			Urban		
		Freeway	Arterial	Collector	Local	Freeway	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Winter maintenance	NL	$ 7,500	$ 7,000	$ 6,500	$ 6,000	$ 8,000	$ 7,500	$ 7,000	$ 6,500	$ 6,500	$ 6,000	$ 2,500	$ 7,000	$ 6,500	$ 6,000
	PE	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500
	NS	$ 4,500	$ 4,000	$ 3,500	$ 3,000	$ 5,000	$ 4,500	$ 4,000	$ 3,500	$ 3,500	$ 3,000	$ 2,500	$ 4,000	$ 3,500	$ 3,000
	NB	$ 4,500	$ 4,000	$ 3,500	$ 3,000	$ 5,000	$ 4,500	$ 4,000	$ 3,500	$ 3,500	$ 3,000	$ 2,500	$ 4,000	$ 3,500	$ 3,000
	QC-1	$ 10,000	$ 8,000	$ 7,000	$ 6,000	$ 12,000	$ 10,000	$ 8,000	$ 7,000	$ 7,500	$ 6,500	$ 2,500	$ 8,500	$ 7,500	$ 6,500
	QC-2	$ 9,000	$ 7,000	$ 6,000	$ 5,000	$ 10,000	$ 9,000	$ 7,000	$ 6,000	$ 7,000	$ 6,000	$ 2,500	$ 8,000	$ 7,000	$ 6,000
	ON-1	$ 6,000	$ 5,000	$ 4,000	$ 4,000	$ 6,000	$ 5,500	$ 5,000	$ 5,000	$ 4,500	$ 3,500	$ 2,500	$ 5,000	$ 4,000	$ 3,500
	ON-2	$ 5,500	$ 4,000	$ 3,000	$ 2,000	$ 5,500	$ 5,000	$ 4,500	$ 4,500	$ 4,000	$ 3,000	$ 2,000	$ 4,500	$ 3,500	$ 3,000
	MB	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500
	SK	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500	$ 2,500	$ 1,500	$ 500	$ 3,000	$ 3,000	$ 2,500
	AB	$ 4,500	$ 4,000	$ 3,500	$ 3,000	$ 5,000	$ 4,500	$ 4,000	$ 3,500	$ 3,500	$ 3,000	$ 2,500	$ 4,000	$ 3,500	$ 3,000
	BC-1	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500
	BC-2	$ 5,500	$ 4,000	$ 3,000	$ 2,000	$ 5,500	$ 5,000	$ 4,500	$ 4,500	$ 4,000	$ 3,000	$ 2,000	$ 4,500	$ 3,500	$ 3,000
	TR	$ 3,000	$ 2,500	$ 2,500	$ 2,000	$ 3,500	$ 3,000	$ 3,000	$ 2,500	$ 2,500	$ 2,500	$ 2,000	$ 3,000	$ 3,000	$ 2,500

Note: All costs are per two lane equivalent kilometre.

Appendix E

Cost Reporting Sheets

Newfoundland and Labrador

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 24,331	$ 25,105		
Arterial	$ 7,022	$ 7,795	$ 6,817	$ 8,316
Collector	$ 7,022	$ 7,022	$ 6,817	$ 6,817
Local	$ 13,799	$ 5,189	$ 1,754	$ 5,043

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 389	$ 1,488		
Arterial	$ 541	$ 1,027	$ 538	$ 1,112
Collector	$ 493	$ 1,086	$ 530	$ 1,200
Local	$ 474	$ 1,162	$ 530	$ 1,298

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,140	$ 3,140		
Arterial	$ 2,232	$ 2,232	$ 2,384	$ 2,343
Collector	$ 2,232	$ 2,232	$ 2,384	$ 2,384
Local	$ 2,089	$ 2,089	$ 330	$ 2,287

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,513	$ 1,650		
Arterial	$ 1,375	$ 1,513	$ 1,100	$ 1,238
Collector	$ 1,238	$ 1,375	$ 963	$ 1,100
Local	$ 1,100	$ 1,238	$ 413	$ 963

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ -	$ -		
Arterial	$ 1,970	$ 1,970	$ 1,295	$ 1,295
Collector	$ 283	$ 283	$ 186	$ 186
Local	$ 1,337	$ 1,337	$ 263	$ 526

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 4,125	$ 4,400		
Arterial	$ 3,850	$ 4,125	$ 3,575	$ 3,850
Collector	$ 3,575	$ 3,850	$ 3,300	$ 3,575
Local	$ 3,300	$ 3,575	$ 1,375	$ 3,300

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ -	$ -		
Arterial	$ 339	$ 339	$ 192	$ 192
Collector	$ 42	$ 42	$ 28	$ 28
Local	$ 301	$ 301	$ 39	$ 78

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 30,445	$ 32,577		
Arterial	$ 19,916	$ 21,532	$ 22,972	$ 24,637
Collector	$ 8,762	$ 12,555	$ 8,259	$ 11,731
Local	$ 4,261	$ 6,997	$ 4,106	$ 7,006

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 63,944	$ 68,361		
Arterial	$ 37,245	$ 40,533	$ 38,874	$ 42,982
Collector	$ 23,647	$ 28,445	$ 22,466	$ 27,020
Local	$ 26,660	$ 21,887	$ 8,810	$ 20,501

Note: *All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.*

Prince Edward Island

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 14,158	$ 13,143		
Arterial	$ 12,964	$ 12,491	$ 12,381	$ 9,130
Collector	$ 10,314	$ 8,398	$ 10,861	$ 8,568
Local	$ 6,560	$ 7,955	$ 2,601	$ 8,177

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 302	$ 1,442		
Arterial	$ 269	$ 970	$ 280	$ 1,062
Collector	$ 208	$ 1,016	$ 220	$ 1,122
Local	$ 232	$ 1,078	$ 249	$ 1,193

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,080	$ 2,080		
Arterial	$ 2,080	$ 2,080	$ 2,308	$ 2,308
Collector	$ 2,080	$ 2,080	$ 2,308	$ 2,308
Local	$ 927	$ 2,080	$ 318	$ 2,308

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,513	$ 1,650		
Arterial	$ 1,375	$ 1,513	$ 1,018	$ 1,100
Collector	$ 1,238	$ 1,375	$ 963	$ 1,045
Local	$ 1,100	$ 1,238	$ 413	$ 990

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,143	$ 3,143		
Arterial	$ 1,047	$ 1,047	$ 683	$ 683
Collector	$ 675	$ -	$ 528	$ 752
Local	$ 105	$ -	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,650	$ 1,925		
Arterial	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Collector	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Local	$ 1,100	$ 1,375	$ 1,100	$ 1,375

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 629	$ 629		
Arterial	$ 186	$ 186	$ 105	$ 105
Collector	$ 120	$ -	$ 81	$ 115
Local	$ 17	$ -	$ 58	$ 115

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 4,551	$ 7,659		
Arterial	$ 2,645	$ 5,032	$ 2,429	$ 5,248
Collector	$ 2,016	$ 5,204	$ 1,972	$ 5,492
Local	$ 1,343	$ 4,386	$ 1,371	$ 4,877

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 28,026	$ 31,671		
Arterial	$ 21,941	$ 24,969	$ 20,578	$ 21,285
Collector	$ 18,025	$ 19,724	$ 18,308	$ 21,052
Local	$ 11,384	$ 18,110	$ 6,486	$ 19,787

Note: *All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.*

Nova Scotia

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 18,994	$ 19,768		
Arterial	$ 10,432	$ 11,206	$ 18,432	$ 19,206
Collector	$ 9,267	$ 10,041	$ 12,544	$ 9,769
Local	$ 4,097	$ 5,714	$ 2,787	$ 8,816

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 389	$ 1,488		
Arterial	$ 541	$ 1,027	$ 538	$ 1,112
Collector	$ 493	$ 1,086	$ 530	$ 1,200
Local	$ 474	$ 1,162	$ 530	$ 1,298

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,447	$ 3,443		
Arterial	$ 2,723	$ 2,723	$ 4,185	$ 4,185
Collector	$ 2,723	$ 2,723	$ 4,043	$ 4,043
Local	$ 1,366	$ 2,029	$ 351	$ 4,043

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,513	$ 1,650		
Arterial	$ 1,375	$ 1,513	$ 1,100	$ 1,375
Collector	$ 1,238	$ 1,375	$ 1,018	$ 1,238
Local	$ 1,100	$ 1,238	$ 413	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 12,497	$ 12,497		
Arterial	$ 8,430	$ 8,430	$ 5,469	$ 5,469
Collector	$ 6,208	$ 6,208	$ 4,251	$ 4,251
Local	$ 2,284	$ 2,284	$ 395	$ 789

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,475	$ 2,750		
Arterial	$ 2,200	$ 2,475	$ 1,925	$ 2,200
Collector	$ 1,925	$ 2,200	$ 1,650	$ 1,925
Local	$ 1,650	$ 1,925	$ 1,375	$ 1,650

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,076	$ 2,076		
Arterial	$ 1,297	$ 1,297	$ 730	$ 730
Collector	$ 819	$ 819	$ 567	$ 567
Local	$ 269	$ 269	$ 53	$ 105

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 30,445	$ 32,577		
Arterial	$ 19,916	$ 21,532	$ 22,972	$ 24,637
Collector	$ 8,762	$ 12,555	$ 8,259	$ 11,731
Local	$ 4,261	$ 6,997	$ 4,106	$ 7,006

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 71,837	$ 76,249		
Arterial	$ 46,915	$ 50,203	$ 55,352	$ 58,913
Collector	$ 31,436	$ 37,007	$ 32,862	$ 34,724
Local	$ 15,502	$ 21,618	$ 10,010	$ 24,808

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

New Brunswick

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 15,465	$ 14,417		
Arterial	$ 15,248	$ 15,248	$ 12,153	$ 10,045
Collector	$ 8,960	$ 10,994	$ 9,081	$ 8,112
Local	$ 6,214	$ 10,612	$ 2,643	$ 7,733

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 384	$ 1,485		
Arterial	$ 473	$ 1,017	$ 485	$ 1,109
Collector	$ 493	$ 1,086	$ 530	$ 1,200
Local	$ 474	$ 1,162	$ 530	$ 1,298

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,691	$ 1,691		
Arterial	$ 1,691	$ 2,519	$ 1,715	$ 1,849
Collector	$ 1,215	$ 2,519	$ 1,715	$ 1,849
Local	$ 1,215	$ 2,519	$ 289	$ 1,849

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 990	$ 1,100		
Arterial	$ 880	$ 990	$ 1,100	$ 1,375
Collector	$ 770	$ 880	$ 1,018	$ 1,238
Local	$ 660	$ 770	$ 413	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 5,123	$ 6,148		
Arterial	$ 4,150	$ 4,150	$ 2,706	$ 2,706
Collector	$ 3,074	$ 3,842	$ 2,406	$ 3,007
Local	$ 1,665	$ 1,166	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,475	$ 2,750		
Arterial	$ 2,200	$ 2,475	$ 1,925	$ 2,200
Collector	$ 1,925	$ 2,200	$ 1,650	$ 1,925
Local	$ 1,650	$ 1,925	$ 1,375	$ 1,650

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,025	$ 1,230		
Arterial	$ 738	$ 738	$ 431	$ 431
Collector	$ 547	$ 683	$ 383	$ 478
Local	$ 273	$ 191	$ 60	$ 120

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 14,610	$ 15,358		
Arterial	$ 10,566	$ 11,801	$ 7,446	$ 8,945
Collector	$ 6,646	$ 9,637	$ 5,721	$ 8,523
Local	$ 3,813	$ 5,629	$ 3,687	$ 6,176

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 41,763	$ 44,179		
Arterial	$ 35,946	$ 38,939	$ 27,961	$ 28,661
Collector	$ 23,631	$ 31,842	$ 22,503	$ 26,332
Local	$ 15,964	$ 23,974	$ 9,373	$ 20,679

Note: *All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.*

Quebec - Champlain Plain

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 32,483	$ 30,566		
Arterial	$ 30,681	$ 29,917	$ 16,626	$ 15,597
Collector	$ 23,277	$ 22,897	$ 13,692	$ 10,598
Local	$ 20,216	$ 20,989	$ 3,401	$ 9,219

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 587	$ 1,281		
Arterial	$ 517	$ 1,035	$ 486	$ 1,109
Collector	$ 622	$ 1,148	$ 531	$ 1,200
Local	$ 686	$ 1,264	$ 531	$ 1,299

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,198	$ 2,198		
Arterial	$ 2,198	$ 2,198	$ 2,937	$ 2,849
Collector	$ 2,198	$ 2,198	$ 2,937	$ 2,849
Local	$ 2,198	$ 2,198	$ 379	$ 2,849

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,200	$ 2,338		
Arterial	$ 2,063	$ 2,200	$ 1,925	$ 2,063
Collector	$ 1,925	$ 2,063	$ 1,788	$ 1,925
Local	$ 1,788	$ 1,925	$ 688	$ 1,788

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 12,808	$ 16,010		
Arterial	$ 5,764	$ 6,340	$ 3,759	$ 4,135
Collector	$ 2,882	$ 2,882	$ 2,255	$ 2,255
Local	$ 3,746	$ 3,746	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 5,500	$ 6,600		
Arterial	$ 4,400	$ 5,500	$ 4,125	$ 4,675
Collector	$ 3,850	$ 4,400	$ 3,575	$ 4,125
Local	$ 3,300	$ 3,850	$ 1,375	$ 3,575

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,563	$ 3,203		
Arterial	$ 1,025	$ 1,128	$ 598	$ 658
Collector	$ 513	$ 513	$ 359	$ 359
Local	$ 615	$ 615	$ 60	$ 120

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 14,551	$ 14,501		
Arterial	$ 10,627	$ 12,040	$ 7,448	$ 8,945
Collector	$ 7,053	$ 10,066	$ 5,722	$ 8,524
Local	$ 4,505	$ 6,124	$ 3,688	$ 6,177

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 72,890	$ 76,696		
Arterial	$ 57,274	$ 60,357	$ 37,904	$ 40,032
Collector	$ 42,318	$ 46,166	$ 30,858	$ 31,836
Local	$ 37,054	$ 40,712	$ 10,497	$ 25,778

Note: *All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.*

Quebec - Nord

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 28,117	$ 26,312		
Arterial	$ 26,428	$ 25,727	$ 17,314	$ 13,631
Collector	$ 20,023	$ 19,691	$ 11,483	$ 9,240
Local	$ 17,196	$ 17,970	$ 2,721	$ 8,137

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 688	$ 1,683		
Arterial	$ 639	$ 901	$ 598	$ 1,135
Collector	$ 615	$ 973	$ 593	$ 1,229
Local	$ 627	$ 1,062	$ 610	$ 1,336

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,135	$ 2,135		
Arterial	$ 2,135	$ 2,135	$ 2,821	$ 2,742
Collector	$ 2,135	$ 2,135	$ 2,821	$ 2,742
Local	$ 2,135	$ 2,135	$ 318	$ 2,742

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,063	$ 2,200		
Arterial	$ 1,925	$ 2,063	$ 1,788	$ 1,925
Collector	$ 1,788	$ 1,925	$ 1,650	$ 1,788
Local	$ 1,650	$ 1,788	$ 550	$ 1,650

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 10,247	$ 12,808		
Arterial	$ 4,611	$ 5,072	$ 3,007	$ 3,308
Collector	$ 2,305	$ 2,305	$ 1,804	$ 1,804
Local	$ 2,997	$ 2,997	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 4,950	$ 5,500		
Arterial	$ 3,850	$ 4,950	$ 3,850	$ 4,400
Collector	$ 3,300	$ 3,850	$ 3,300	$ 3,850
Local	$ 2,750	$ 3,300	$ 1,375	$ 3,300

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,050	$ 2,563		
Arterial	$ 820	$ 902	$ 478	$ 526
Collector	$ 410	$ 410	$ 287	$ 287
Local	$ 492	$ 492	$ 60	$ 120

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 40,616	$ 42,961		
Arterial	$ 26,309	$ 27,525	$ 29,567	$ 31,107
Collector	$ 10,798	$ 14,587	$ 10,196	$ 13,974
Local	$ 5,250	$ 7,510	$ 4,702	$ 7,580

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 90,866	$ 96,163		
Arterial	$ 66,717	$ 69,275	$ 59,423	$ 58,774
Collector	$ 41,374	$ 45,877	$ 32,134	$ 34,914
Local	$ 33,098	$ 37,254	$ 10,711	$ 25,617

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Ontario - South

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 24,476	$ 25,451		
Arterial	$ 14,752	$ 16,663	$ 14,705	$ 18,005
Collector	$ 13,363	$ 15,517	$ 12,075	$ 15,138
Local	$ 9,230	$ 7,864	$ 2,947	$ 11,450

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 389	$ 1,439		
Arterial	$ 449	$ 1,012	$ 459	$ 1,104
Collector	$ 461	$ 1,076	$ 493	$ 1,190
Local	$ 442	$ 1,150	$ 492	$ 1,283

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,026	$ 2,090		
Arterial	$ 3,954	$ 3,954	$ 2,881	$ 2,881
Collector	$ 3,754	$ 3,464	$ 2,155	$ 2,155
Local	$ 2,854	$ 2,854	$ 314	$ 2,035

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,925	$ 2,063		
Arterial	$ 1,788	$ 1,925	$ 1,788	$ 1,925
Collector	$ 1,650	$ 1,788	$ 1,650	$ 1,788
Local	$ 1,513	$ 1,650	$ 550	$ 1,650

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 4,283	$ 5,139		
Arterial	$ 3,854	$ 3,854	$ 2,537	$ 2,537
Collector	$ 3,426	$ 4,283	$ 2,255	$ 2,819
Local	$ 2,141	$ 1,499	$ 282	$ 564

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,300	$ 3,300		
Arterial	$ 2,750	$ 3,025	$ 2,475	$ 2,750
Collector	$ 2,200	$ 2,750	$ 1,925	$ 2,200
Local	$ 2,200	$ 2,750	$ 1,375	$ 1,925

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 545	$ 654		
Arterial	$ 436	$ 436	$ 245	$ 245
Collector	$ 315	$ 394	$ 218	$ 273
Local	$ 164	$ 115	$ 27	$ 55

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 15,516	$ 16,084		
Arterial	$ 11,247	$ 12,437	$ 8,273	$ 9,698
Collector	$ 7,320	$ 10,576	$ 6,158	$ 9,117
Local	$ 3,883	$ 5,656	$ 3,667	$ 6,210

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 53,459	$ 56,221		
Arterial	$ 39,230	$ 43,307	$ 33,363	$ 39,147
Collector	$ 32,490	$ 39,847	$ 26,929	$ 34,678
Local	$ 22,427	$ 23,538	$ 9,655	$ 25,171

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Ontario - North

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 25,749	$ 23,925		
Arterial	$ 17,792	$ 18,831	$ 16,565	$ 19,735
Collector	$ 17,260	$ 17,707	$ 13,804	$ 17,064
Local	$ 11,561	$ 8,371	$ 2,415	$ 10,670

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 472	$ 1,762		
Arterial	$ 572	$ 1,140	$ 566	$ 1,237
Collector	$ 524	$ 1,207	$ 562	$ 1,336
Local	$ 514	$ 1,294	$ 575	$ 1,447

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,849	$ 2,010		
Arterial	$ 3,647	$ 2,001	$ 2,621	$ 2,621
Collector	$ 3,456	$ 3,155	$ 2,288	$ 2,288
Local	$ 3,029	$ 3,029	$ 314	$ 2,148

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,788	$ 1,925		
Arterial	$ 1,650	$ 1,788	$ 1,650	$ 1,788
Collector	$ 1,513	$ 1,650	$ 1,513	$ 1,650
Local	$ 1,375	$ 1,513	$ 413	$ 1,513

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 4,291	$ 5,149		
Arterial	$ 3,862	$ 3,862	$ 2,503	$ 2,503
Collector	$ 3,433	$ 4,291	$ 2,225	$ 2,782
Local	$ 2,145	$ 1,502	$ 348	$ 695

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,025	$ 3,025		
Arterial	$ 2,200	$ 2,750	$ 2,200	$ 2,475
Collector	$ 1,650	$ 2,475	$ 1,650	$ 1,925
Local	$ 1,100	$ 2,475	$ 1,100	$ 1,650

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 936	$ 1,123		
Arterial	$ 749	$ 749	$ 410	$ 410
Collector	$ 541	$ 676	$ 365	$ 456
Local	$ 281	$ 197	$ 57	$ 114

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 46,479	$ 48,347		
Arterial	$ 30,144	$ 31,787	$ 33,844	$ 35,310
Collector	$ 12,063	$ 16,748	$ 11,666	$ 15,822
Local	$ 5,572	$ 8,710	$ 5,255	$ 8,483

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 85,589	$ 87,266		
Arterial	$ 60,615	$ 62,907	$ 60,360	$ 66,080
Collector	$ 40,440	$ 47,908	$ 34,072	$ 43,323
Local	$ 25,577	$ 27,090	$ 10,477	$ 26,720

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Manitoba

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 15,036	$ 14,417		
Arterial	$ 15,248	$ 10,484	$ 12,153	$ 10,045
Collector	$ 8,960	$ 7,426	$ 9,081	$ 8,112
Local	$ 6,214	$ 7,426	$ 1,256	$ 7,733

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 281	$ 1,272		
Arterial	$ 270	$ 827	$ 279	$ 903
Collector	$ 184	$ 853	$ 187	$ 940
Local	$ 187	$ 897	$ 189	$ 988

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,691	$ 1,691		
Arterial	$ 1,691	$ 1,691	$ 1,715	$ 1,849
Collector	$ 1,215	$ 1,215	$ 1,715	$ 1,849
Local	$ 1,215	$ 1,215	$ 132	$ 1,849

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 990	$ 1,100		
Arterial	$ 880	$ 990	$ 1,100	$ 1,375
Collector	$ 770	$ 880	$ 1,018	$ 1,238
Local	$ 660	$ 770	$ 413	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 5,453	$ 5,453		
Arterial	$ 7,623	$ 7,623	$ 4,881	$ 4,881
Collector	$ 3,253	$ 3,253	$ 2,749	$ 2,749
Local	$ 76	$ 76	$ 338	$ 677

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,650	$ 1,925		
Arterial	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Collector	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Local	$ 1,100	$ 1,375	$ 1,100	$ 1,375

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,516	$ 2,516		
Arterial	$ 3,944	$ 3,944	$ 2,157	$ 2,157
Collector	$ 2,221	$ 2,221	$ 1,215	$ 1,215
Local	$ 62	$ 62	$ 149	$ 299

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,254	$ 5,882		
Arterial	$ 1,946	$ 4,040	$ 1,879	$ 4,391
Collector	$ 1,468	$ 4,146	$ 1,439	$ 4,504
Local	$ 1,095	$ 3,778	$ 1,091	$ 4,226

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 30,872	$ 34,256		
Arterial	$ 32,978	$ 31,250	$ 25,539	$ 27,251
Collector	$ 19,447	$ 21,644	$ 18,778	$ 22,256
Local	$ 10,609	$ 15,598	$ 4,668	$ 18,247

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Saskatchewan

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 14,074	$ 17,424		
Arterial	$ 15,992	$ 10,950	$ 15,748	$ 10,514
Collector	$ 7,384	$ 7,848	$ 2,443	$ 8,537
Local	$ 1,757	$ 7,757	$ 1,422	$ 1,882

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 299	$ 1,450		
Arterial	$ 278	$ 975	$ 288	$ 1,066
Collector	$ 197	$ 1,010	$ 201	$ 1,113
Local	$ 204	$ 1,064	$ 209	$ 1,172

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,825	$ 1,825		
Arterial	$ 1,825	$ 1,825	$ 1,876	$ 2,010
Collector	$ 1,364	$ 1,705	$ 610	$ 2,010
Local	$ 510	$ 1,364	$ 144	$ 476

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 990	$ 1,100		
Arterial	$ 880	$ 990	$ 1,100	$ 1,375
Collector	$ 770	$ 880	$ 275	$ 1,238
Local	$ 660	$ 770	$ 138	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,143	$ 3,143		
Arterial	$ 1,047	$ 1,047	$ 683	$ 683
Collector	$ 675	$ -	$ 528	$ 752
Local	$ 105	$ -	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,650	$ 1,925		
Arterial	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Collector	$ 1,375	$ 1,650	$ 825	$ 1,650
Local	$ 1,100	$ 1,375	$ 275	$ 1,375

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 629	$ 629		
Arterial	$ 186	$ 186	$ 109	$ 109
Collector	$ 120	$ -	$ 84	$ 120
Local	$ 17	$ -	$ 60	$ 120

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,915	$ 6,008		
Arterial	$ 1,680	$ 4,040	$ 1,677	$ 4,470
Collector	$ 1,309	$ 4,171	$ 1,312	$ 4,663
Local	$ 1,091	$ 4,073	$ 1,116	$ 4,606

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 25,524	$ 33,505		
Arterial	$ 23,263	$ 21,662	$ 22,856	$ 21,877
Collector	$ 13,193	$ 17,265	$ 6,278	$ 20,083
Local	$ 5,444	$ 16,403	$ 3,739	$ 11,482

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Alberta

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 18,455	$ 18,244		
Arterial	$ 17,651	$ 17,768	$ 14,325	$ 10,303
Collector	$ 15,856	$ 15,645	$ 13,209	$ 9,658
Local	$ 14,819	$ 14,028	$ 3,990	$ 9,214

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,402	$ 1,402		
Arterial	$ 1,402	$ 1,402	$ 1,865	$ 1,865
Collector	$ 1,402	$ 1,402	$ 1,865	$ 1,865
Local	$ 1,402	$ 1,402	$ 400	$ 1,865

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 5,123	$ 6,148		
Arterial	$ 4,150	$ 4,150	$ 2,706	$ 2,706
Collector	$ 3,074	$ 3,842	$ 2,406	$ 3,007
Local	$ 1,665	$ 1,166	$ 376	$ 752

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,025	$ 1,230		
Arterial	$ 738	$ 738	$ 431	$ 431
Collector	$ 547	$ 683	$ 383	$ 478
Local	$ 273	$ 191	$ 60	$ 120

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,490	$ 6,528		
Arterial	$ 2,029	$ 4,363	$ 1,958	$ 4,722
Collector	$ 1,574	$ 4,509	$ 1,555	$ 4,926
Local	$ 1,219	$ 4,202	$ 1,239	$ 4,703

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 325	$ 1,453		
Arterial	$ 280	$ 976	$ 290	$ 1,067
Collector	$ 201	$ 1,013	$ 207	$ 1,116
Local	$ 212	$ 1,068	$ 219	$ 1,177

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,513	$ 1,650		
Arterial	$ 1,375	$ 1,513	$ 1,100	$ 1,375
Collector	$ 1,238	$ 1,375	$ 1,018	$ 1,238
Local	$ 1,100	$ 1,238	$ 413	$ 1,100

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,475	$ 2,750		
Arterial	$ 2,200	$ 2,475	$ 1,925	$ 2,200
Collector	$ 1,925	$ 2,200	$ 1,650	$ 1,925
Local	$ 1,650	$ 1,925	$ 1,375	$ 1,650

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 33,807	$ 39,404		
Arterial	$ 29,824	$ 33,383	$ 24,600	$ 24,668
Collector	$ 25,816	$ 30,669	$ 22,292	$ 24,213
Local	$ 22,340	$ 25,219	$ 8,072	$ 20,580

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

British Columbia - Coastal

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 20,020	$ 21,023		
Arterial	$ 18,616	$ 19,618	$ 20,477	$ 13,169
Collector	$ 16,770	$ 15,888	$ 18,447	$ 10,315
Local	$ 14,324	$ 7,871	$ 4,988	$ 8,658

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 568	$ 1,556		
Arterial	$ 618	$ 1,090	$ 646	$ 1,190
Collector	$ 682	$ 1,180	$ 756	$ 1,317
Local	$ 741	$ 1,296	$ 860	$ 1,459

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,386	$ 2,386		
Arterial	$ 2,386	$ 2,386	$ 2,625	$ 2,625
Collector	$ 2,386	$ 2,386	$ 2,625	$ 2,625
Local	$ 2,316	$ 2,386	$ 318	$ 2,625

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,788	$ 1,925		
Arterial	$ 1,650	$ 1,788	$ 1,100	$ 1,375
Collector	$ 1,513	$ 1,650	$ 1,018	$ 1,238
Local	$ 1,375	$ 1,513	$ 413	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 6,404	$ 7,685		
Arterial	$ 5,764	$ 5,764	$ 3,383	$ 3,383
Collector	$ 5,123	$ 6,404	$ 3,007	$ 3,759
Local	$ 3,202	$ 2,241	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,650	$ 1,925		
Arterial	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Collector	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Local	$ 1,100	$ 1,375	$ 1,100	$ 1,375

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 543	$ 652		
Arterial	$ 489	$ 489	$ 269	$ 269
Collector	$ 435	$ 543	$ 239	$ 299
Local	$ 272	$ 190	$ 30	$ 60

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 15,465	$ 16,190		
Arterial	$ 11,502	$ 12,899	$ 8,446	$ 10,367
Collector	$ 7,716	$ 10,846	$ 6,948	$ 9,769
Local	$ 5,168	$ 6,765	$ 5,336	$ 7,456

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 48,825	$ 53,342		
Arterial	$ 42,399	$ 45,683	$ 38,321	$ 34,028
Collector	$ 36,000	$ 40,547	$ 34,414	$ 30,971
Local	$ 28,497	$ 23,637	$ 13,420	$ 23,484

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

British Columbia, Interior

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 25,773	$ 26,778		
Arterial	$ 24,342	$ 25,347	$ 26,776	$ 17,064
Collector	$ 21,865	$ 20,841	$ 24,052	$ 13,643
Local	$ 11,507	$ 9,893	$ 6,235	$ 10,882

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 436	$ 1,493		
Arterial	$ 763	$ 1,068	$ 643	$ 1,140
Collector	$ 611	$ 1,145	$ 686	$ 1,278
Local	$ 671	$ 1,261	$ 790	$ 1,428

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 2,608	$ 2,608		
Arterial	$ 2,608	$ 2,608	$ 2,869	$ 2,869
Collector	$ 2,608	$ 2,608	$ 2,869	$ 2,869
Local	$ 927	$ 2,608	$ 379	$ 2,869

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,513	$ 1,650		
Arterial	$ 1,375	$ 1,513	$ 1,100	$ 1,375
Collector	$ 1,238	$ 1,375	$ 1,018	$ 1,238
Local	$ 1,100	$ 1,238	$ 550	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 5,123	$ 6,148		
Arterial	$ 4,611	$ 4,611	$ 2,706	$ 2,706
Collector	$ 4,099	$ 5,123	$ 2,406	$ 3,007
Local	$ 2,562	$ 1,793	$ 376	$ 752

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 3,025	$ 3,025		
Arterial	$ 2,200	$ 2,750	$ 2,200	$ 2,475
Collector	$ 1,650	$ 2,475	$ 1,650	$ 1,925
Local	$ 1,100	$ 2,475	$ 1,100	$ 1,650

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 435	$ 522		
Arterial	$ 391	$ 391	$ 215	$ 215
Collector	$ 348	$ 435	$ 191	$ 239
Local	$ 217	$ 152	$ 30	$ 60

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 81,409	$ 84,075		
Arterial	$ 47,445	$ 48,915	$ 18,643	$ 20,619
Collector	$ 20,476	$ 25,914	$ 14,319	$ 17,966
Local	$ 8,520	$ 11,408	$ 6,313	$ 9,051

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 120,322	$ 126,300		
Arterial	$ 83,734	$ 87,203	$ 55,153	$ 48,464
Collector	$ 52,895	$ 59,916	$ 47,190	$ 42,164
Local	$ 26,603	$ 30,827	$ 15,772	$ 27,792

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.

Territories

Pavements - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 11,114	$ 8,812		
Arterial	$ 7,560	$ 7,560	$ 8,316	$ 9,166
Collector	$ 7,092	$ 7,092	$ 4,414	$ 8,652
Local	$ 5,371	$ 5,371	$ 2,453	$ 8,150

All Other Road Infrastructure - M&R Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 708	$ 1,897		
Arterial	$ 2,201	$ 1,738	$ 2,278	$ 1,836
Collector	$ 2,093	$ 1,933	$ 2,316	$ 2,138
Local	$ 1,868	$ 2,138	$ 2,193	$ 2,456

Pavements - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,904	$ 1,904		
Arterial	$ 1,904	$ 1,904	$ 1,520	$ 2,067
Collector	$ 1,382	$ 1,904	$ 1,520	$ 2,067
Local	$ 1,382	$ 1,382	$ 359	$ 2,067

Routine Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 990	$ 1,100		
Arterial	$ 880	$ 990	$ 1,100	$ 1,375
Collector	$ 770	$ 880	$ 1,018	$ 1,238
Local	$ 660	$ 770	$ 413	$ 1,100

Bridges - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ -	$ 6,068		
Arterial	$ 2,246	$ 2,246	$ 1,240	$ 1,240
Collector	$ 1,736	$ -	$ 958	$ 1,365
Local	$ 313	$ -	$ 683	$ 1,365

Winter Maintenance Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,650	$ 1,925		
Arterial	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Collector	$ 1,375	$ 1,650	$ 1,375	$ 1,650
Local	$ 1,100	$ 1,375	$ 1,100	$ 1,375

Bridges - Maintenance and Rehabilitation Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 1,181	$ 1,181		
Arterial	$ 437	$ 437	$ 245	$ 245
Collector	$ 338	$ -	$ 189	$ 269
Local	$ 61	$ -	$ 135	$ 269

All Other Road Infrastructure - Initial Construction Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 85,343	$ 89,615		
Arterial	$ 59,056	$ 60,472	$ 64,179	$ 65,814
Collector	$ 27,889	$ 35,479	$ 24,437	$ 30,028
Local	$ 14,450	$ 18,440	$ 13,693	$ 17,430

Total Road Costs

Functional Class	Provincial		Municipal	
	Rural	Urban	Rural	Urban
Freeway	$ 102,890	$ 112,501		
Arterial	$ 75,659	$ 76,997	$ 80,252	$ 83,393
Collector	$ 42,675	$ 48,938	$ 36,226	$ 47,407
Local	$ 25,205	$ 29,476	$ 21,027	$ 34,211

Note: All costs reported in the above tables are annualized costs (using 6 percent discount rate and 60-year analysis period) for one one-km-long traffic lane.