Environment Canada Environnement Canada

Benzene in Canadian Gasoline:

Effect of the *Benzene in Gasoline Regulations*

2010-2012 Triennial Report

May 2015

Canada

Notice

The information contained in this report is compiled from data as of December 11, 2013, submitted by the producers and importers of gasoline in Canada pursuant to the requirements of the *Benzene in Gasoline Regulations* under the *Canadian Environmental Protection Act, 1999*. Information submitted to Environment Canada has been reviewed for reasonableness but may be subject to potential errors made at the source.

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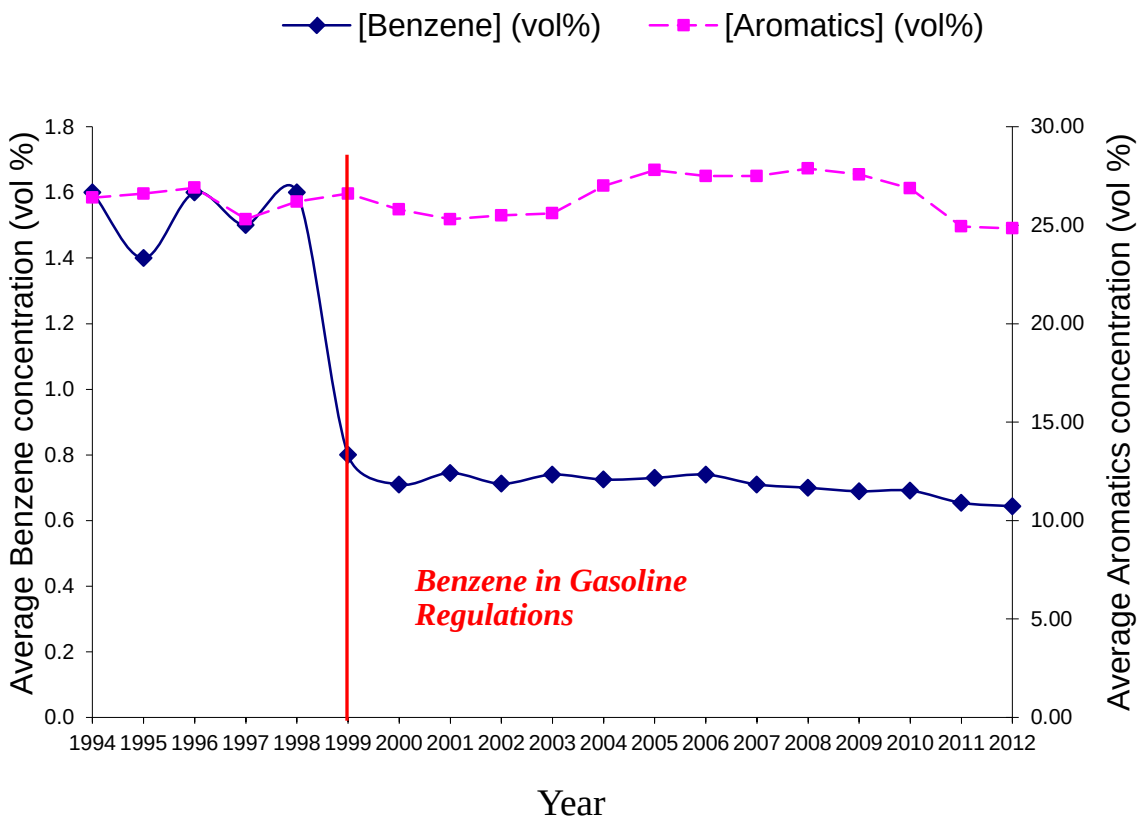
1 Summary

This report reviews how primary suppliers have responded to the *Benzene in Gasoline Regulations* of the *Canadian Environmental Protection Act, 1999* (CEPA 1999). The *Benzene in Gasoline Regulations* (the Regulations) came into effect on July 1, 1999, fulfilling a recommendation of the federal-provincial Task Force on Cleaner Vehicles and Fuels. In 1995, the Task Force recommended to the Canadian Council of Ministers of the Environment (CCME) that benzene in gasoline be reduced through a federal regulation to 1% by volume and that aromatics (or equivalent benzene tailpipe emissions) be frozen at 1994 levels. The CCME endorsed this recommendation. Consequently, the federal government passed the federal *Benzene in Gasoline Regulations* on November 26, 1997.

The *Benzene in Gasoline Regulations* have been successful in achieving both recommendations of the Task Force: reported benzene levels have been significantly reduced and reported aromatic levels are about the same as they were in 1994. Figure 1.1 shows the reported benzene and aromatics levels since the coming into force of the Regulations.

Figure 1.1: Average Benzene and Aromatics Content of Canadian Gasoline (1994-2012)



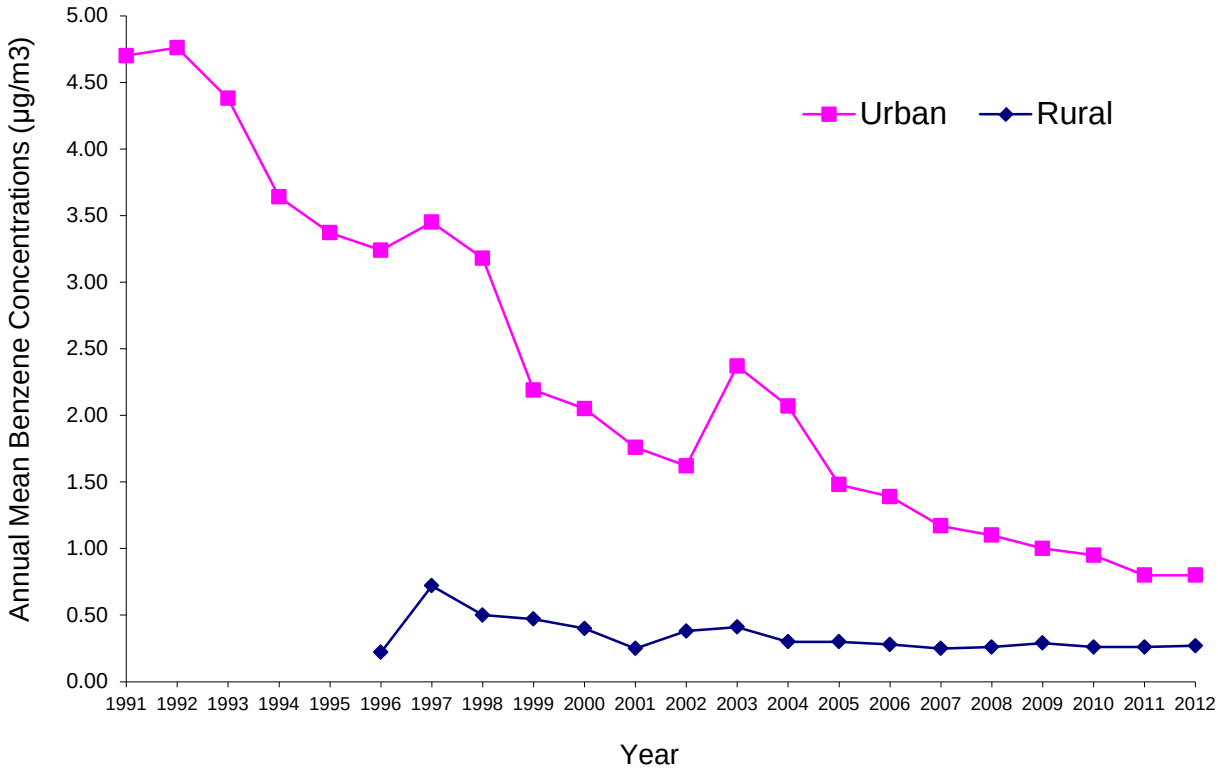
All primary suppliers must submit reports annually to Environment Canada reporting on the composition of the gasoline they supplied in that year (quarterly reports were required until

the end of 2002). For the 2010 and 2011 reporting years, respectively, all but one primary supplier reported that their gasoline met the regulated requirements with respect to benzene concentration and benzene emissions number (BEN). The suppliers that did not meet the requirements exceeded the maximum benzene concentration level. For the 2012 reporting year all primary suppliers reported that their gasoline met the regulated requirements with respect to benzene concentration and BEN. Details on the exceptions can be found in Section 3.3: Reported Exceedances of Regulated Limits. As part of its enforcement activities, enforcement officers conduct inspections and investigations into alleged exceedances under the Benzene in Gasoline Regulations and take action consistent with the Compliance and Enforcement Policy for CEPA (1999).

Independent audits are required for those primary suppliers that have elected to be on a yearly pool average, which must be submitted to Environment Canada by May 31 of the year following the reporting period. This report includes analysis of the independent audits conducted for the 2010, 2011 and 2012 reporting periods. For 2010, the audits found nine instances of inaccuracies and non-compliances with administrative requirements involving sampling and reporting requirements. Four primary suppliers outlined the corrective actions that they took to address these issues. For 2011, the audits found seven instances of inaccuracies and non-compliances with administrative requirements involving sampling and reporting requirements. Five primary suppliers outlined the corrective actions that they took to address these issues. For 2012, the audits found ten instances of inaccuracies and non-compliances with administrative requirements involving sampling and reporting requirements. Four primary suppliers outlined the corrective actions that they took to address these issues.

Figure 1.2 presents the annual average air benzene levels in urban and rural Canada from 1991 to 2012.

Figure 1.2: Average Ambient Benzene Concentrations in Canada (1991-2012)



Source of data: Claire Austin (Environment Canada), NAPS Annual Benzene Report (1991 - 2012), October 2013.

Figure 1.2 has been produced from Canada's "National Air Pollution Surveillance" (NAPS) program conducted on the basis of a Memorandum of Understanding (MOU) between the federal government and the provinces and territories. Data collected at "designated" air monitoring sites identified in the MOU and at other "non-designated" sites are reported in NAPS datasets.

Benzene is one of a suite of volatile organic compounds (VOCs) that were measured in 56 855 canister (Summa™) samples collected at 91 air monitoring sites across Canada from 1991-2012. There were 52, 48 and 47 sites operational in 2010, 2011 and 2012 respectively collecting a total of 3521, 2504 and 3022 samples for those respective years. Summa canister samples were analyzed at Environment Canada's Air Quality Research Division, Analysis and Air Quality Section, 335 River Road, Ottawa.

Based on data availability, urban trend sites were selected covering the period 1991-2012 and rural trend sites were selected covering the period 1996-2012. An annual and seasonal (summer and winter) data completeness criterion of 75% was applied over the respective time periods. Initially, all trend sites were selected based on a yearly completeness criterion of 75%. However, these criteria were met for only six urban sites across Quebec, Ontario, Manitoba, Alberta and British Columbia for the period 1991-2012, and for three rural sites across Nova

Scotia, Quebec and Ontario for the period 1999-2012. As a result, the criteria were relaxed somewhat to retain more sites that had been included previously. Eight of the nine urban trend sites were "designated" NAPS sites. Two of the seven rural trend sites were "non-designated" sites.

Spatially, the urban and rural trend sites are not distributed equally across the country. Because of this, and because of the limited number of trend sites, these data are not necessarily representative of an overall national trend in benzene concentrations. Also, urban and rural benzene levels are not easily comparable because the former are based on 24-hr integrated samples, while the latter are based on 4-hr integrated samples collected during the middle of the day.

Annual means were calculated for the urban and rural trend sites based on samples collected year round. All sites were weighted equally. There was considerable variability in the data, especially during the 1990's. Outliers were not removed from the dataset. There was no interpolation of missing data. No special statistical or analysis techniques were used.

Urban annual mean benzene concentrations decreased on average by about 0.19 $\mu g/m^3$ per year at nine NAPS urban trend sites, from 4.70 $\mu g/m^3$ in 1991 to 0.8 $\mu g/m^3$ in 2012 (Figure 1.2). There was no statistically significant trend observed in ambient benzene levels measured at the seven NAPS rural trend sites, annual mean concentrations remaining steady at approximately 0.34 $\mu g/m^3$ during the period 1999-2012.

2 Overview of Benzene in Gasoline Regulations

This report reviews the compliance of primary suppliers' (manufacturers, importers and blenders) gasoline with the *Benzene in Gasoline Regulations*[1], and summarizes levels of various parameters in Canadian gasoline. The information used for this report was provided by primary suppliers, as required under the *Regulations.*

2.1 Benzene in Gasoline Regulations

The *Benzene in Gasoline Regulations* were passed in November 1997 in order to reduce emissions of benzene from gasoline-powered vehicles. The Regulations limit the level of benzene and the BEN[2] of Canadian gasoline and require reporting on the composition of gasoline that is produced, imported or blended.[3] The Regulations apply to all gasoline for sale or use in Canada, except gasoline for use in aircraft, competition vehicles or scientific research.

[1] SOR/97-493, as amended by SOR/99-204, SOR/2000-102, SOR/2003-318 and SOR/2004-252; a copy of the Regulations can be found at http://www.ec.gc.ca/lcpe-cepa/eng/regulations/default.cfm?n=9E7794D4-1.

[2] BEN: The Benzene Emission Number relates gasoline composition to the estimated emissions of benzene from vehicles. It is a number calculated using various gasoline parameters and relates gasoline composition to emissions of benzene from a "typical" 1990 vehicle. (See Schedule 1 of the Regulations).

[3] The definition of "blend" in the Regulations excludes the mixing of complying gasoline or the adding of only additives, commercially-pure butane or oxygenate to complying gasoline.

All primary suppliers of gasoline must submit reports annually on the levels of various parameters of their gasoline to Environment Canada (quarterly reports were required until the end of 2002). Importers must notify Environment Canada at least 12 hours in advance of their intention to import:

- more than 100 m^3 of gasoline at any one time;
- any amount of gasoline-like blendstock; or
- into a province, more than 1000 m^3 of gasoline within any one day.

The *Benzene in Gasoline Regulations*, when originally published, introduced a new approach to controlling fuel composition by allowing regulatees the option to elect to use a yearly pool average as the basis for compliance. This option is selected separately for each refining, blending facility and import pool, and provides regulatees considerable flexibility in meeting the requirements of the Regulations. The Regulations are mainly focused on primary suppliers (manufacturers, blenders and importers) who can affect the composition of gasoline. There is also a per-litre limit for benzene at the point of sale. In addition to setting a limit for gasoline benzene content, the Regulations also set a limit for the BEN of gasoline, a number that relates gasoline composition to estimated emissions of benzene from vehicles.

The regulated benzene and seasonal BEN limits apply to individual refineries, blending facilities and imports into a province from outside Canada. Primary suppliers are subject to flat limits for each of their refineries, blending facilities or import pools unless they have elected for yearly pool average limits. The yearly pool average is the volume-weighted average of benzene or BEN of the gasoline supplied by the primary supplier during a year and may be selected for either benzene, BEN or both. Independent audits must be submitted to Environment Canada by primary suppliers who elect to be on a yearly pool average.

Since July 1, 1999, primary suppliers have been subject to limits on the level of benzene and the BEN in the gasoline they produce, blend or import. Table 2.1 summarizes the regulated limits for benzene and the BEN.

Table 2.1: Regulated Limits for Benzene and the BEN

Supplier Activity	Type of Limit	Benzene % by volume	BEN*	
			Summer	Winter
Production, Blending and Imports	Flat	1.0	71	92
	Yearly-Pool Average	0.95	59.5 (annual average)	
	Not-to-be-exceeded cap	1.5	102	132
Sales	Flat	1.5	N/A	N/A

* Four refineries have elected to use alternative (higher) limits for BEN pursuant to subsection 17(2) of the *Regulations* (refer to Appendix B for further information).
N/A: Not applicable

2.2 Alternative Limits for the BEN

Under subsection 17(2) of the Regulations, a primary supplier may have elected before December 1, 1998, to use alternative (higher) limits for the BEN. Petro-Canada (Suncor as of 2009) and Shell elected to use alternative (higher) limits for the BEN at their Ontario and Quebec refineries. Their alternative limits were set out in a Notice published by the Minister of the Environment in the *Canada Gazette* on September 4, 1999 (see Appendix B). The Petro-Canada refinery in Oakville and the Shell refinery in Montreal have since closed.

These alternative limits were based on the historical composition of the primary supplier's gasoline, thereby reflecting its historical BEN number. These limits can be found in Appendix B (*Canada Gazette,* Part I, Vol. 133, No. 36). There is no expiry date for alternative BEN limits, although a primary supplier may rescind the alternative limit at any time. A supplier rescinding its alternative limit would then be subject to the normal limits for BEN.

3 Compliance with the Regulations

3.1 Primary Suppliers and the Options to Meet Requirements

Primary suppliers are required to register with Environment Canada by providing the information required specified in Schedule 2 for the Regulations, a Registration Form for a Manufacturer, Blender or Importer of Gasoline (see Appendix A). Tables 3.1a b and c show the primary suppliers who were registered with Environment Canada[4] under the Regulations and reported supplying gasoline during 2010, 2011 and 2012 respectively indicating their choice for either a "Flat" (flat per-litre limit) or "YPA" (yearly pool average) as the basis of compliance with the benzene and BEN limits. The primary supplier type noted in Tables 3.1a, b and c was determined based on what was indicated in the Annual Reports, Schedule 3 of the Regulations, Report on Composition of Gasoline that were submitted. The province noted in Tables 3.1a, b and c was determined using the Manufacturer's location or the province of import.

Table 3.1a: Primary Suppliers Reporting on Gasoline Composition (2010)

Name	Province	Primary Supplier Type	Benzene Limit	BEN Limit
AFD Petroleum Limited	YT	Importer	Flat	Flat
CCRL	SK	Manufacturer	YPA	Flat
Chevron Burnaby Refinery	BC	Manufacturer, Blender & Importer	YPA	YPA
Honda of Canada Manufacturing	ON	Importer	Flat	Flat
Husky Oil – Prince George	BC	Manufacturer	YPA	YPA
IOL – BC Imports	BC	Importer	Flat	Flat

[4] See *Registration Form for a Manufacturer, Blender or Importer of Gasoline* in Appendix A.

Name	Province	Primary Supplier Type	Benzene Limit	BEN Limit
IOL – Dartmouth	NS	Manufacturer, Blender & Importer	YPA	Flat
IOL – Sarnia	ON	Manufacturer & Importer	YPA	Flat
IOL – Nanticoke	ON	Manufacturer & Importer	YPA	Flat
IOL – Strathcona	AB	Manufacturer	YPA	Flat
Irving Oil Commercial	QC	Importer	Flat	Flat
Irving Oil Refining	NB	Manufacturer & Importer	YPA	YPA
Larry Penner	MB	Importer	Flat	Flat
North Atlantic	NL	Manufacturer & Importer	Flat	Flat
les Produits Pétroliers Norcan	QC	Blender & Importer	Flat	Flat
SCL – QC Imports	QC	Importer	Flat	Flat
SCL – BC Imports	BC	Importer	Flat	Flat
SCL – Montréal	QC	Manufacturer	YPA	YPA
SCL – Corunna	ON	Manufacturer, Blender & Importer	YPA	YPA
SCL – Scotford	AB	Manufacturer, Blender & Importer	YPA	YPA
STC – QC Imports	QC	Importer	Flat	Flat
STC – ON Imports	ON	Importer	Flat	Flat
STC – BC Imports	BC	Importer	Flat	Flat
SEI - Burrard	BC	Importer	YPA	YPA
SEPP - Sarnia	ON	Manufacturer, Blender & Importer	YPA	YPA
SEI - Edmonton	AB	Manufacturer	YPA	YPA
SEI - Montréal	QC	Manufacturer & Importer	YPA	YPA
Ultramar Limitée – Montréal	QC	Blender & Importer	YPA	Flat
Ultramar Limitée – Jean-Gaulin	QC	Manufacturer, Blender & Importer	YPA	YPA
WPC – MB Imports	MB	Importer	Flat	Flat
WPC – SK Imports	SK	Importer	Flat	Flat
WPC – ON Imports	ON	Importer	Flat	Flat

Table 3.1b: Primary Suppliers Reporting on Gasoline Composition (2011)

Facility Name	Province	Primary Supplier Type	Benzene Limit	BEN Limit
CCRL	SK	Manufacturer	YPA	Flat
Chevron Burnaby Refinery	BC	Manufacturer, Blender & Importer	YPA	YPA
Husky Oil – Prince George	BC	Manufacturer	YPA	YPA
IOL – Point Tupper	NS	Importer	Flat	Flat
IOL – Oakville	ON	Importer	Flat	Flat
IOL – Burrard	BC	Importer	Flat	Flat
IOL – Charlottetown	PE	Importer	Flat	Flat
IOL - Dartmouth	NS	Manufacturer, Blender & Importer	YPA	Flat
IOL - Sarnia	ON	Manufacturer & Importer	YPA	Flat
IOL - Nanticoke	ON	Manufacturer & Importer	YPA	Flat
IOL - Strathcona	AB	Manufacturer	YPA	Flat
Irving Oil Commercial	NS	Importer	YPA	YPA
Irving Oil Refining	NB	Manufacturer & Importer	YPA	YPA
MSCG – Terminals QC	QC	Importer	YPA	YPA
North Atlantic	NL	Manufacturer & Importer	YPA	Flat
les Produits Pétroliers Norcan	QC	Blender & Importer	YPA	Flat
SCL – QC Imports	QC	Importer	YPA	Flat
SCL – ON Imports	ON	Importer	YPA	Flat
SCL – BC Imports	BC	Importer	YPA	Flat
SCL – Sarnia M.C.	ON	Manufacturer, Blender & Importer	YPA	YPA
SCL– Scotford	AB	Manufacturer, Blender & Importer	YPA	YPA
SEI – Burrard	BC	Importer	YPA	YPA
SEPP – Sarnia	ON	Manufacturer, Blender & Importer	YPA	YPA
SEI - Edmonton	AB	Manufacturer	YPA	YPA
SEI - Montréal	QC	Manufacturer & Importer	YPA	YPA
Ultramar Limitée – Montréal	QC	Manufacturer & Importer	YPA	YPA
Ultramar Limitée – Jean-Gaulin	QC	Manufacturer, Blender & Importer	YPA	YPA
WPC – MB Imports	MB	Importer	Flat	Flat
WPC – SK Imports	SK	Importer	Flat	Flat

Table 3.1c: Primary Suppliers Reporting on Gasoline Composition (2012)

Name	Province	Primary Supplier Type	Benzene Limit	BEN Limit
CCRL	SK	Manufacturer	YPA	YPA
Chevron Burnaby Refinery	BC	Manufacturer, Blender & Importer	YPA	YPA
Husky Oil – Prince George	BC	Manufacturer	YPA	YPA
IOL – Suncor Montréal	QC	Importer	Flat	Flat
IOL – Dartmouth	NS	Manufacturer, Blender & Importer	YPA	Flat
IOL – Sarnia	ON	Manufacturer & Importer	YPA	Flat
IOL – Nanticoke	ON	Manufacturer & Importer	YPA	Flat
IOL – Strathcona	AB	Manufacturer	YPA	Flat
Irving Oil Refining	NB	Manufacturer & Importer	YPA	YPA
MSCG – Terminals QC	QC	Importer	YPA	YPA
North Atlantic	NL	Manufacturer & Importer	YPA	Flat
les Produits Pétroliers Norcan	QC	Blender & Importer	YPA	Flat
SCL – QC Imports	QC	Importer	YPA	Flat
SCL – BC Imports	BC	Importer	YPA	Flat
SCL –Sarnia	ON	Manufacturer, Blender & Importer	YPA	YPA
SCL - Scotford	AB	Manufacturer, Blender & Importer	YPA	YPA
SEI – Burrard	BC	Importer	YPA	YPA
SEPP - Sarnia	ON	Manufacturer, Blender & Importer	YPA	YPA
SEI - Edmonton	AB	Manufacturer	YPA	YPA
SEI - Montréal	QC	Manufacturer & Importer	YPA	YPA
Ultramar Limitée – Jean-Gaulin	QC	Manufacturer, Blender & Importer	YPA	YPA
WPC – MB Imports	MB	Importer	Flat	Flat
WPC – SK Imports	SK	Importer	Flat	Flat
WPC – ON Imports	ON	Importer	Flat	Flat

CCRL = Consumer's Co-operative Refineries Limited; IOL = Imperial Oil Limited; MSCG = Morgan Stanley Capital Group; SCL = Shell Canada Limited; SEI = Suncor Energy Incorporated; SEPP = Suncor Energy Products Partnership; SEI = Suncor Energy Incorporated; STC = Shell Trading Canada; WPC = Western Petroleum Company.
YPA = Yearly Pool Average

As indicated in Tables 3.1a, b and c, manufacturers tend to prefer yearly pool average limits for the benzene concentration and BEN respectively, whereas importers often opt for flat per-litre limits.

3.2 Information Reported

Under section 8 of the Regulations, primary suppliers must provide the information set out in Schedule 3 of the Regulations entitled *Report on the Composition of Gasoline* (see Appendix 1) before February 15 of the following year.

In addition to the volume of gasoline supplied (m^3), the number of batches supplied and the names of any oxygenates added, the Regulations require that primary suppliers also report the maximum and annual volume weighted average values for the following parameters:

- concentration of benzene (% by volume);
- value of BEN;
- concentration of aromatics (% by volume);
- concentration of olefins (% by volume);
- concentration of sulphur (mg/kg);
- concentration of oxygenate (% by weight);
- vapour pressure at 37.8^{o}C (100^{o}F) (kPa);
- evaporation fraction at 93.3°C (200°F) – E200 (% by volume); and
- evaporation fraction at 148.9°C (300°F) – E300 (% by volume)

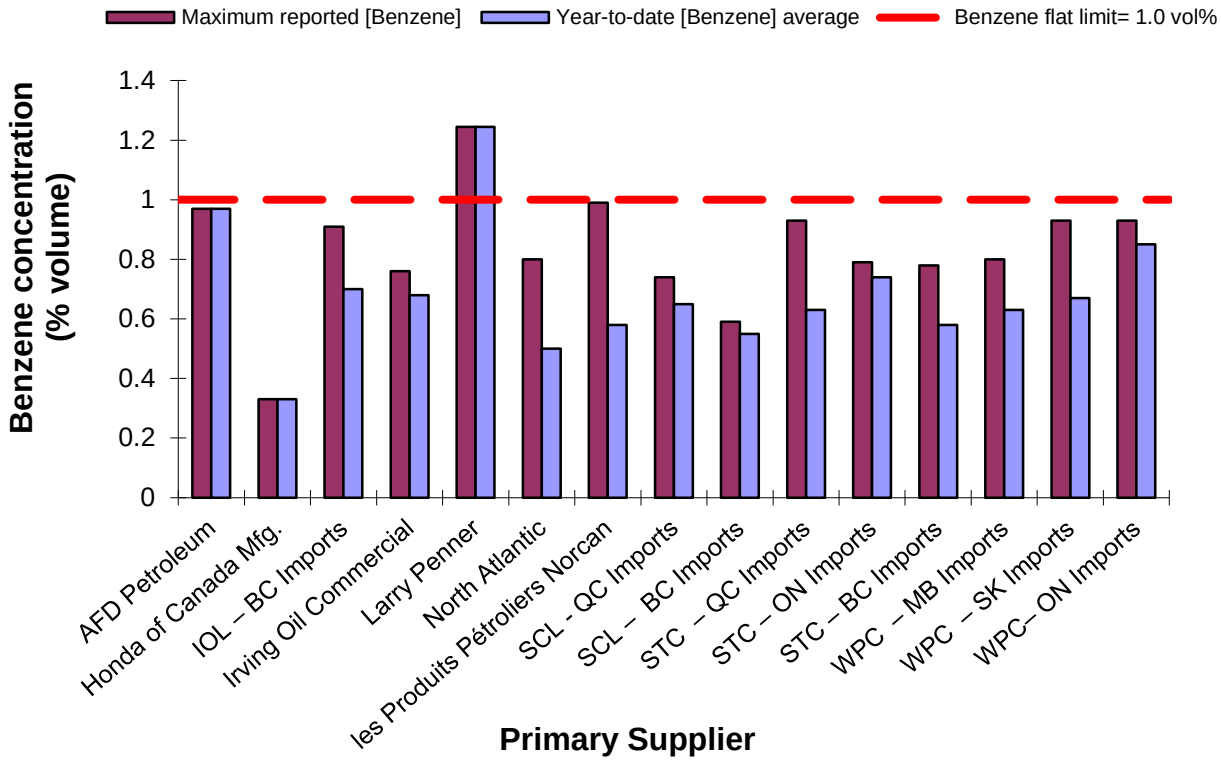
3.3 Reported Exceedances of Regulated Limits

Environment Canada's Enforcement Branch is responsible for the enforcement of regulations created under CEPA 1999, including the *Benzene in Gasoline Regulations.* As part of its enforcement activities, enforcement officers conduct inspections and investigations into alleged exceedances under the *Benzene in Gasoline Regulations.* All CEPA 1999 regulations are enforced in accordance with the Compliance and Enforcement Policy for the *Canadian Environmental Protection Act, 1999*, available on Environment Canada's website at www.ec.gc.ca/lcpe-cepa.

For primary suppliers using flat limits, Figures 3.1a, b and c show the reported maximum and average benzene level and Figures 3.2a, b and c show the reported maximum and average BEN.

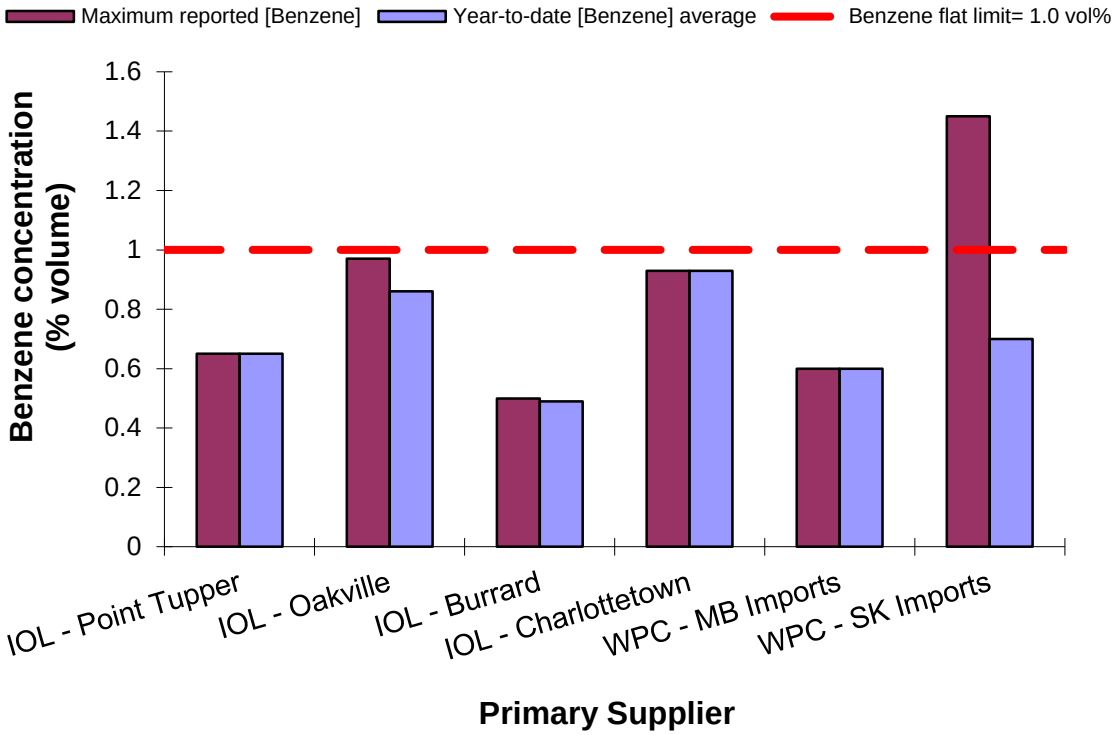
For primary suppliers using YPA limits, Figures 3.3a, b and c show the reported annual volume weighted average and maximum benzene levels and Figures 3.4a, b and c show the reported annual volume weighted average BEN as a percentage of the regulated limit (59.5 YPA) for the years 2010, 2011 and 2012.

Figure 3.1a: Reported Benzene Levels (Maximum and Average) for Suppliers on a Flat Limit, 2010



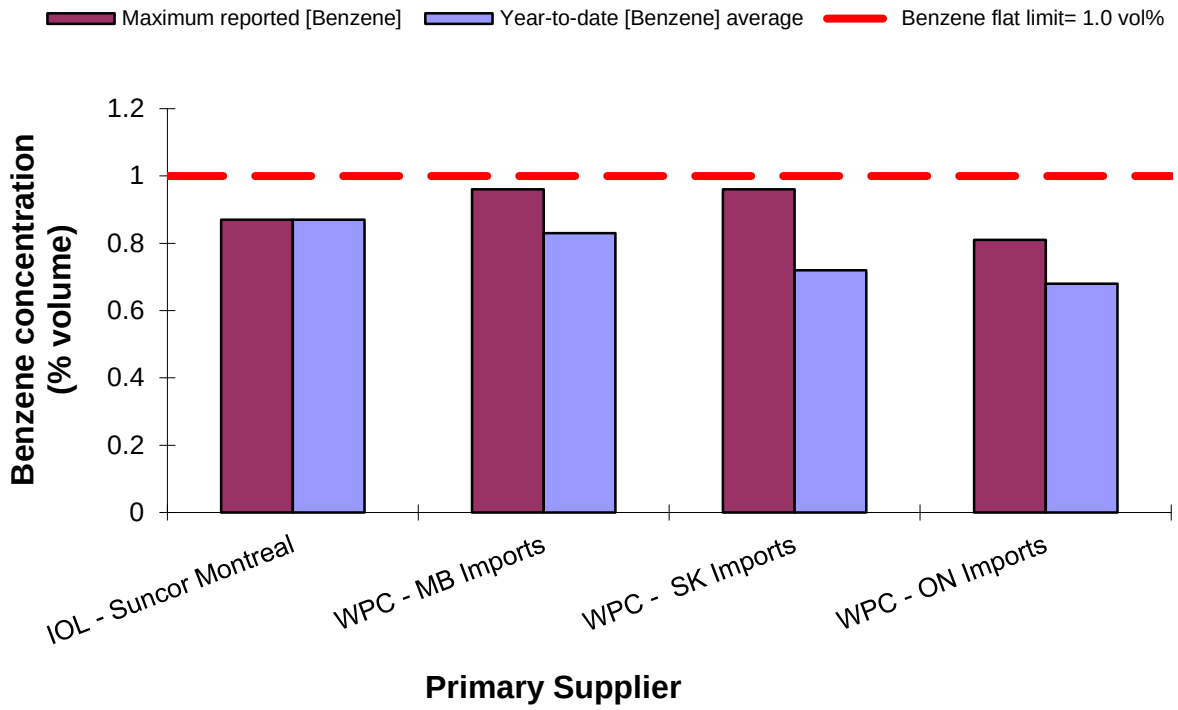
As shown in Figure 3.1a there was one reported exceedance of the benzene flat limit of 1.0% in 2010 by an importer, Larry Penner Enterprises Inc., in Manitoba.

Figure 3.1b: Reported Benzene Levels (Maximum and Average) for Suppliers on a Flat Limit, 2011



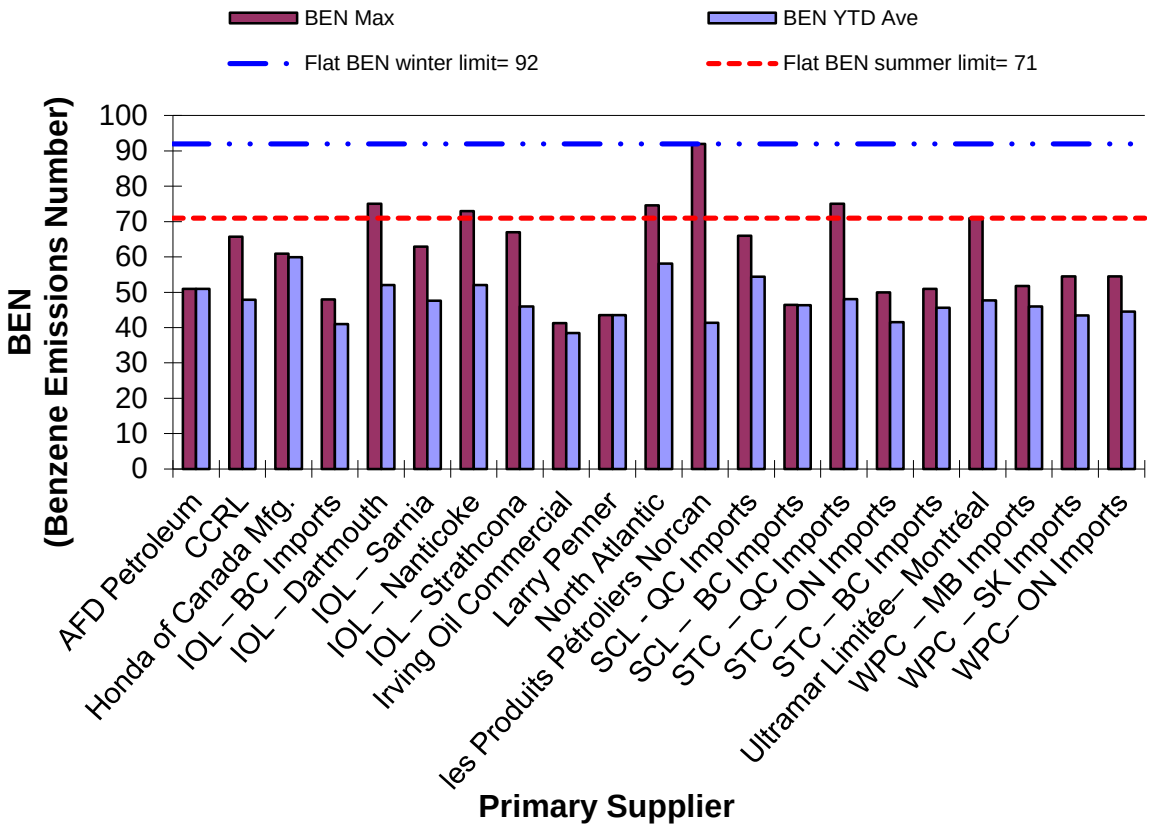
As shown in Figure 3.1b, there was one reported exceedance of the benzene flat limit of 1.0% in 2011 by an importer, Western Petroleum Company, in Saskatchewan.

Figure 3.1c: Reported Benzene Levels (Maximum and Average) for Suppliers on a Flat Limit, 2012



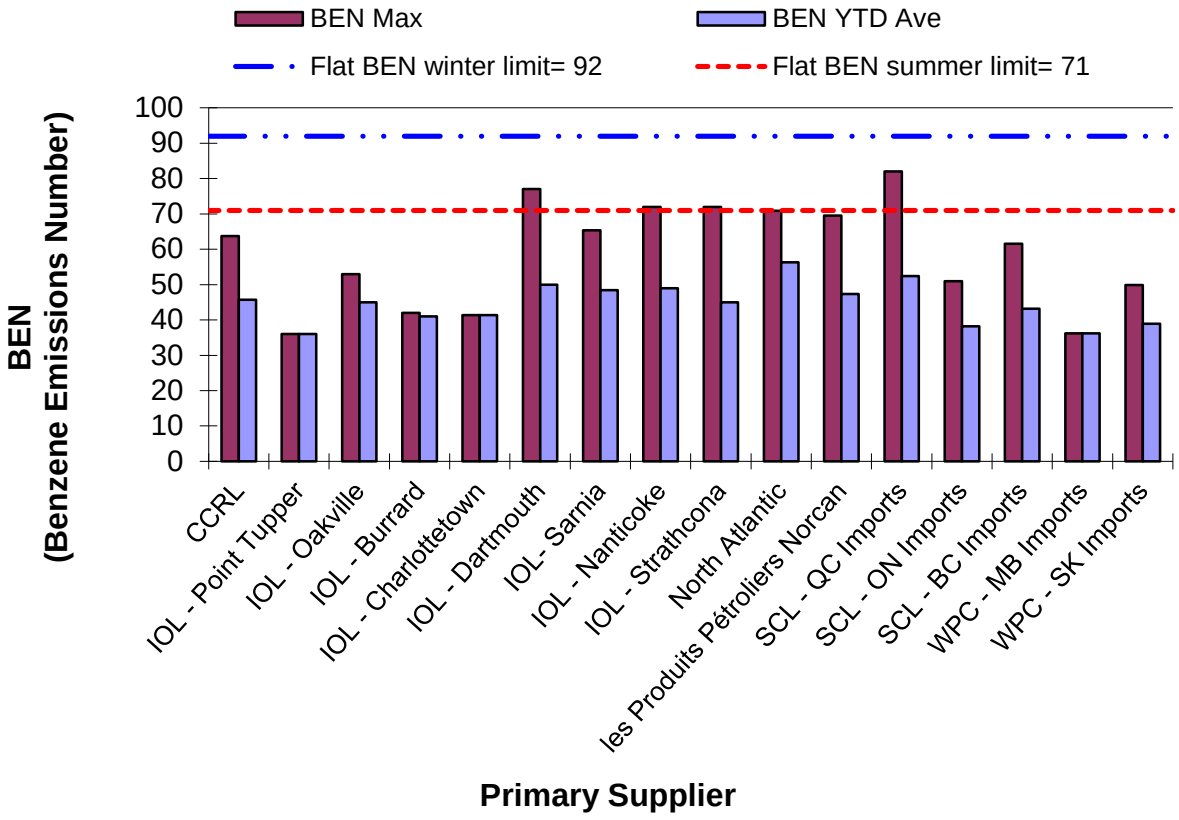
As shown in Figure 3.1c there were no reported exceedances of the benzene flat limit of 1.0% by a flat-limit primary supplier in the year 2012.

Figure 3.2a: Reported BEN (Maximum and Average) for Suppliers on a Flat Limit, 2010



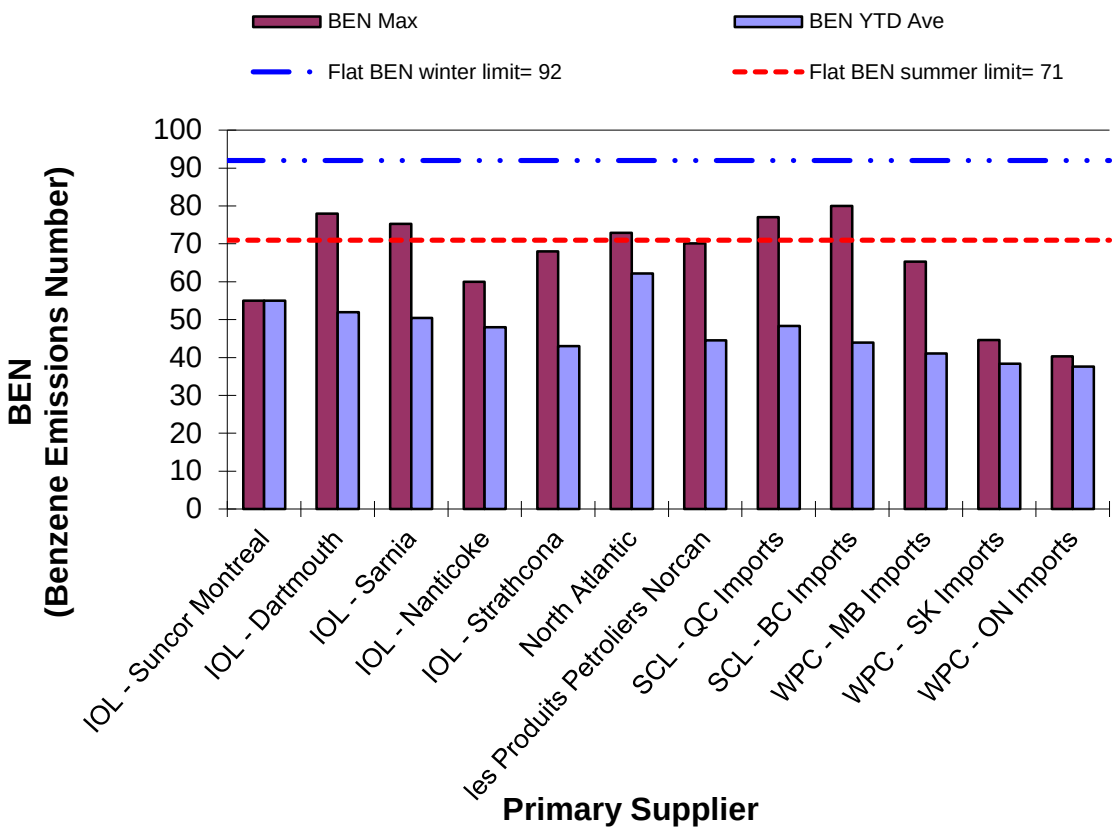
As shown in Figure 3.2a, there were no reported exceedances of the seasonal BEN limits by a flat-limit primary supplier in the year 2010.

Figure 3.2b: Reported BEN (Maximum and Average) for Suppliers on a Flat Limit, 2011



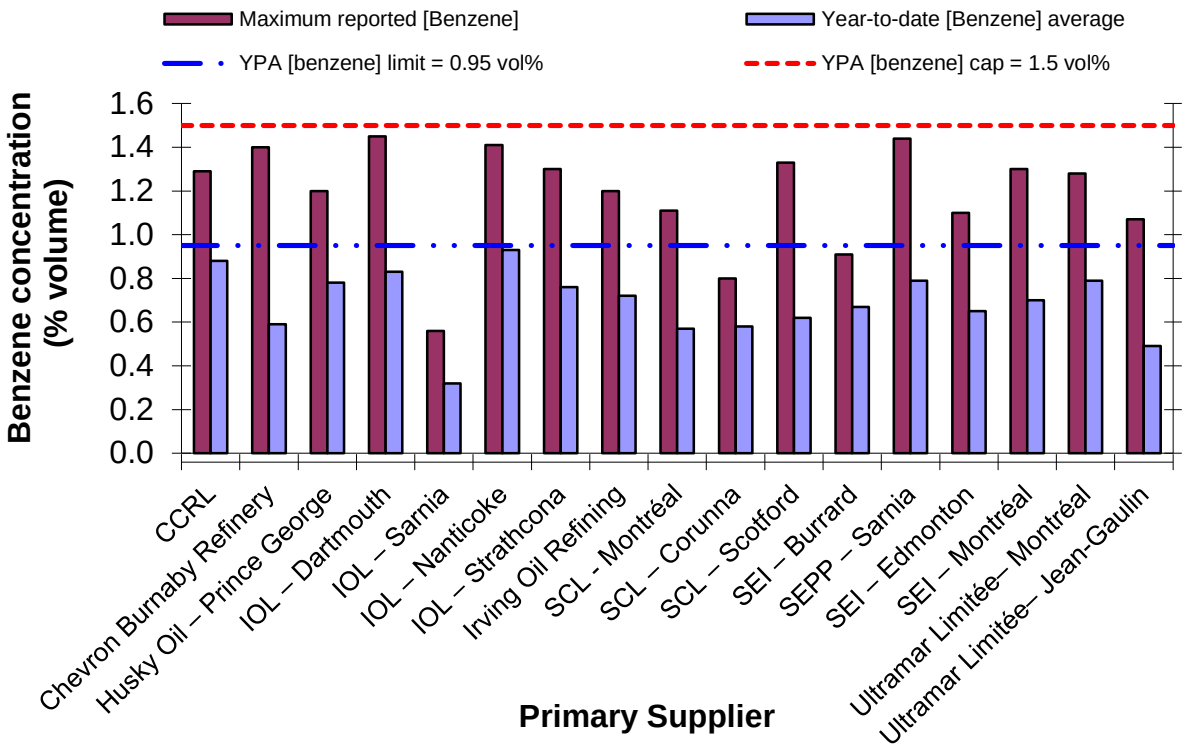
As shown in Figure 3.2b, there were no reported exceedances of the seasonal BEN limits by a flat-limit primary supplier in the year 2011.

Figure 3.2c: Reported BEN (Maximum and Average) for Suppliers on a Flat Limit, 2012



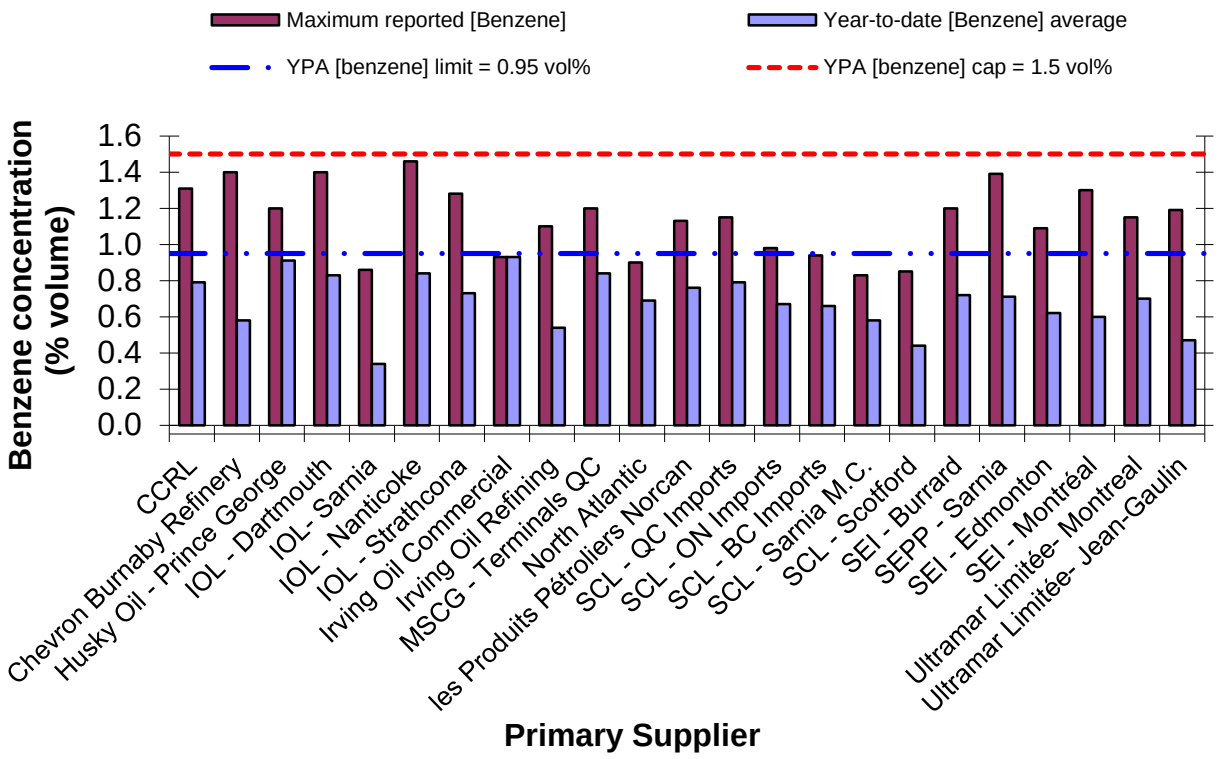
As shown in Figure 3.2c, there were no reported exceedances of the seasonal BEN limits by a flat-limit primary supplier in the year 2012.

Figure 3.3a: Reported Benzene Levels (Maximum and Average) for Suppliers on a Yearly Pool Average (YPA) Limit, 2010



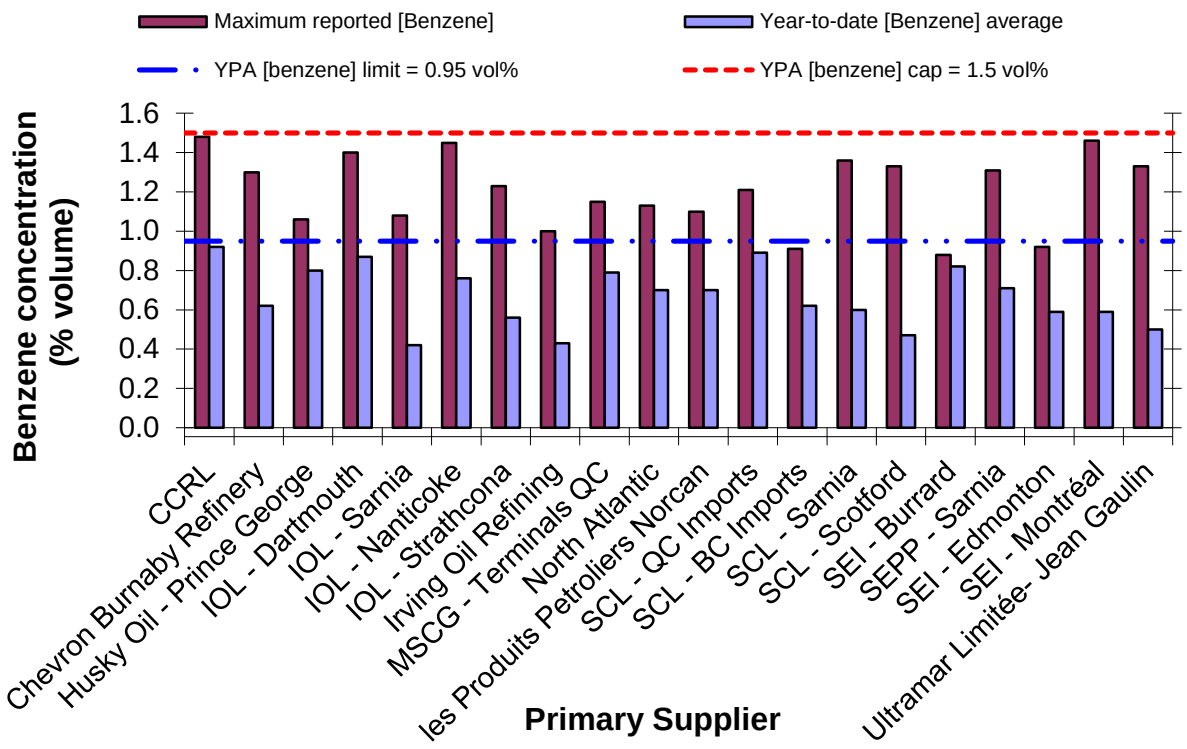
As shown in Figure 3.3a, there were no reported exceedances of the benzene annual average of 0.95 or the benzene limit of 1.5% (never-to-be-exceeded-cap) by a yearly pool average elected primary supplier in the year 2010.

Figure 3.3b: Reported Benzene Levels (Maximum and Average) for Suppliers on a Yearly Pool Average Limit (YPA), 2011



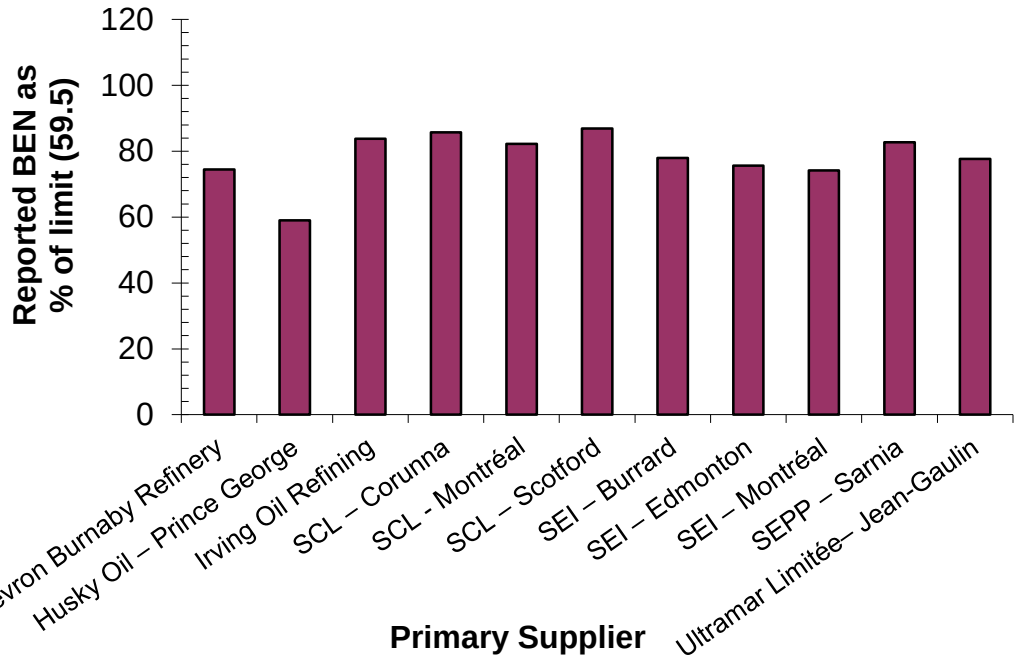
As shown in Figure 3.3b, there were no reported exceedances of the benzene annual average of 0.95 or the benzene limit of 1.5% (never-to-be-exceeded-cap) by a yearly pool average elected primary supplier in the year 2011.

Figure 3.3c: Reported Benzene Levels (Maximum and Average) for Suppliers on a Yearly Pool Average Limit (YPA), 2012



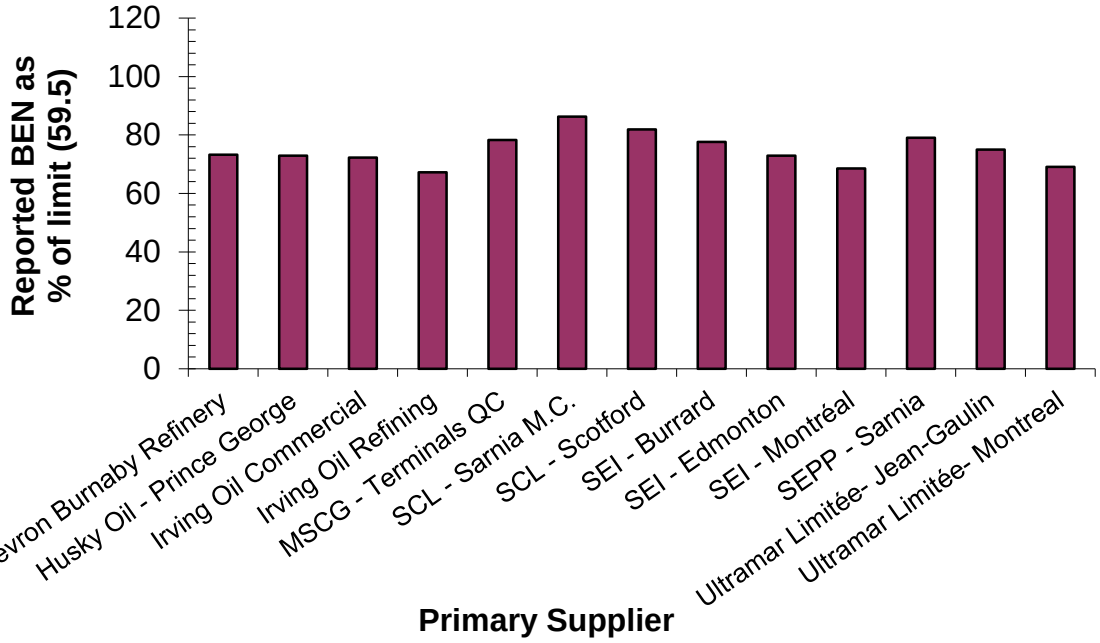
As shown in Figure 3.3c, there were no reported exceedances of the benzene annual average of 0.95 or the benzene limit of 1.5% (never-to-be-exceeded-cap) by a yearly pool average elected primary supplier in the year 2012.

Figure 3.4a: Reported BEN Average (% of Limit) for Suppliers on a Yearly Pool Average Limit, 2010



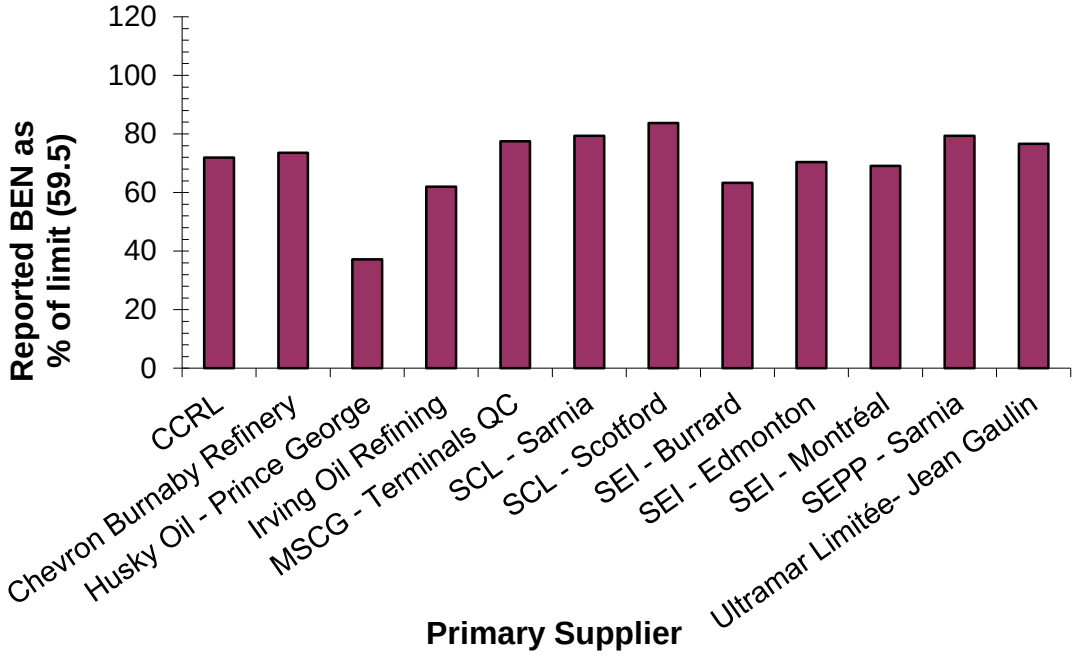
As indicated in Figure 3.4a, all primary suppliers were compliant with the yearly pool average limit of 59.5 for BEN in 2010 as prescribed by the *Regulations*.

Figure 3.4b: Reported BEN Average (% of Limit) for Suppliers on a Yearly Pool Average Limit, 2011



As indicated in Figure 3.4b, all primary suppliers were compliant with the yearly pool average limit of 59.5 for BEN in 2011 as prescribed by the *Regulations*.

Figure 3.4c: Reported BEN Average (% of Limit) for Suppliers on a Yearly Pool Average Limit, 2012



As indicated in Figure 3.4c, all primary suppliers were compliant with the yearly pool average limit of 59.5 for BEN in 2012 as prescribed by the *Regulations*.

3.4 Summary of 2010, 2011 and 2012 Independent Audits

Under section 22 of the Regulations, a primary supplier that has elected to use a yearly pool average for either benzene or BEN as its basis for compliance must have an independent auditor perform an audit of the primary supplier's systems, practices and procedures and its compliance with the Regulations.

The auditor's report must be submitted to Environment Canada by May 31 of the year following the reporting period. Environment Canada views the audits as a crucial component of the enforcement provisions of the Regulations and, to be effective, the auditing process must be independent and thorough. The concept of a yearly pool average relies on the maintenance of complete records and reports. The audits are intended to provide Environment Canada assurance that the yearly pool averages are being correctly reported. This section contains the analysis of the independent audits submitted for the 2010-2012 reporting periods.

For the 2010 reporting year, 16 audits were submitted by eight companies in regard to six manufacturer, importer and blender combinations; four manufacturer and importer combinations; one importer and blender combination; four manufacturers and one importer. Fourteen of these audits were combined audits capturing the audit requirements for both the *Benzene in Gasoline Regulations* and the *Sulphur in Gasoline Regulations*. Nine of the audit

reports noted instances of inaccuracies in the records or other deviations from the regulatory requirements. The audits were conducted by four audit companies.

For the 2011 reporting year, 19 audits were submitted by 11 companies in regard to six manufacturer, importer and blender combinations; seven manufacturer and importer combinations; one importer and blender combination; three manufacturers and two importers. Fifteen of these audits were combined audits capturing the audit requirements for both the *Benzene in Gasoline Regulations* and the *Sulphur in Gasoline Regulations*. Seven of the audit reports noted instances of inaccuracies in the records or other deviations from the regulatory requirements. The audits were conducted by six audit companies.

For the 2012 reporting year, 19 audits were submitted by 11 companies in regard to six manufacturer, importer and blender combinations; five manufacturer and importer combinations; one importer and blender combination; four manufacturers and three importers. Sixteen of these audits were combined audits capturing the audit requirements for both the *Benzene in Gasoline Regulations* and the *Sulphur in Gasoline Regulations*. Eight of the audit reports noted instances of inaccuracies in the records or other deviations from the regulatory requirements. The audits were conducted by seven audit companies.

Paragraph 22(3)(*e*) of the *Regulations* requires that the audit contain, "an assessment by the auditor of the extent to which the primary supplier has complied with these Regulations throughout the year of the audit." The 2010, 2011 and 2012 audits indicate that all primary suppliers subject to audits met the regulated limits for benzene concentration and BEN.

For 2010, eight audit reports identified one or more instances of minor non-compliance with the administrative requirements of the Regulations. Five companies accompanied the audit report with a list of corrective actions that have been taken by the primary supplier, covering eight of the ten instances of non-compliance.

For 2011, ten audit reports identified one or more instances of minor non-compliance with the administrative requirements of the Regulations. Four companies accompanied the audit report with a list of corrective actions that have been taken by the primary supplier, covering six of the ten instances of non-compliance.

For 2012, three audit reports identified one or more instances of minor non-compliance with the administrative requirements of the Regulations. One company accompanied the audit report with a list of corrective actions that have been taken by the primary supplier, covering one of the three instances of non-compliance.

Instances of minor non-compliances over the three years involved sampling and reporting requirements. With respect to sampling, instances of inaccuracies and non-compliances included:

- Benzene in gasoline concentration test method was not fully compliant with the CAN/CGSB 3.0 No. 14.3.99,
- Sampling methods that were not completely documented and conducted according to the specified CAN/CGSB method in the Regulations, and

- An update to the Minister was not provided 45 days prior to implementing changes or updates in the compliance plan.

With respect to the annual reports required by the Regulations, instances of inaccuracies and non-compliances over the three years included:

- In the annual reports, numbers were entered incorrectly or were missing from the report,
- An annual report was not signed by an authorized official,
- Gasoline outside of the acceptable range was not reported in the annex to the annual report,
- Inconsistencies in data in the Excel spreadsheet used to calculate the YPA, and
- Inconsistencies of data between Laboratory Information System and instrument files.

With respect to providing the Minister with 12-hour advance notice of imports, there were:

- Two instances in 2010 when gasoline was imported without providing the 12 hour notice to the Minister. The regulatee will address this though reviewing the importing requirements with all appropriate employees.
- Two instances in 2011 when gasoline was imported without providing the 12 hour of notice to the Minister. The regulatee will address this though reviewing the importing requirements with all appropriate employees.
- No instances in 2012 when gasoline was imported without providing the 12 hour notice to the Minister.

Several recommendations for improvements were made by auditors in their evaluation reports. These recommendations were made relating to:

- Remaining consistent with the methodology of testing,
- Creating a succession plan to ensure information and processes are not lost,
- Procedures for updating compliance plans,
- Documentation and procedures for sampling,
- Procedures for updating and clarifying test methods, and
- Procedures for clarifying and ensuring consistency in reporting.

4 Canadian Gasoline Composition

This section reviews the composition of gasoline in Canada from 2010 to 2012, based on data reported by primary suppliers pursuant to the Regulations. The Regulations require that the following parameters are reported:

- the concentration of benzene,
- the value of BEN,
- the concentration of aromatics,
- the concentration of olefins,
- the concentration of sulphur,

- the concentration of oxygen including oxygenate type,
- the vapour pressure,
- the evaporation fraction at 93.3°C (200°F) – E200, and
- the evaporation fraction at 148.9°C (300°F) – E300.

Appendix C shows the regional and national concentrations for all parameters. Appendix D shows the parameters reported by individual companies.

4.1 Volume of Gasoline

The number of batches and volume of gasoline (excluding exports) reported for 2010 to 2012 are summarized in Tables 4.1a, b and c.

Table 4.1a: Regional Volumetric Data (2010)

Region	Total Volume (m^3)	Number of Batches
Atlantic	3 178 530	365
Ontario	10 114 270	1 178
Quebec	13 414 119	1 068
West / North	13 479 820	2 379
National	**40 186 739**	**4 990**

Table 4.1b: Regional Volumetric Data (2011)

Region	Total Volume (m^3)	Number of Batches
Atlantic	3 113 154	386
Ontario	9 992 242	1 118
Quebec	11 909 764	930
West / North	13 406 125	2 419
National	**38 421 285**	**4 853**

Table 4.1c: Regional Volumetric Data (2012)

Region	Total Volume (m^3)	Number of Batches
Atlantic	3 069 362	389
Ontario	10 148 932	1 130
Quebec	12 151 678	903
West / North	13 506 546	2 389
National	**38 876 518**	**4 811**

4.2 Regulated Parameters: Benzene and BEN

Data reported on benzene and BEN levels for the period 2010-2012 are summarized in Table 4.2.

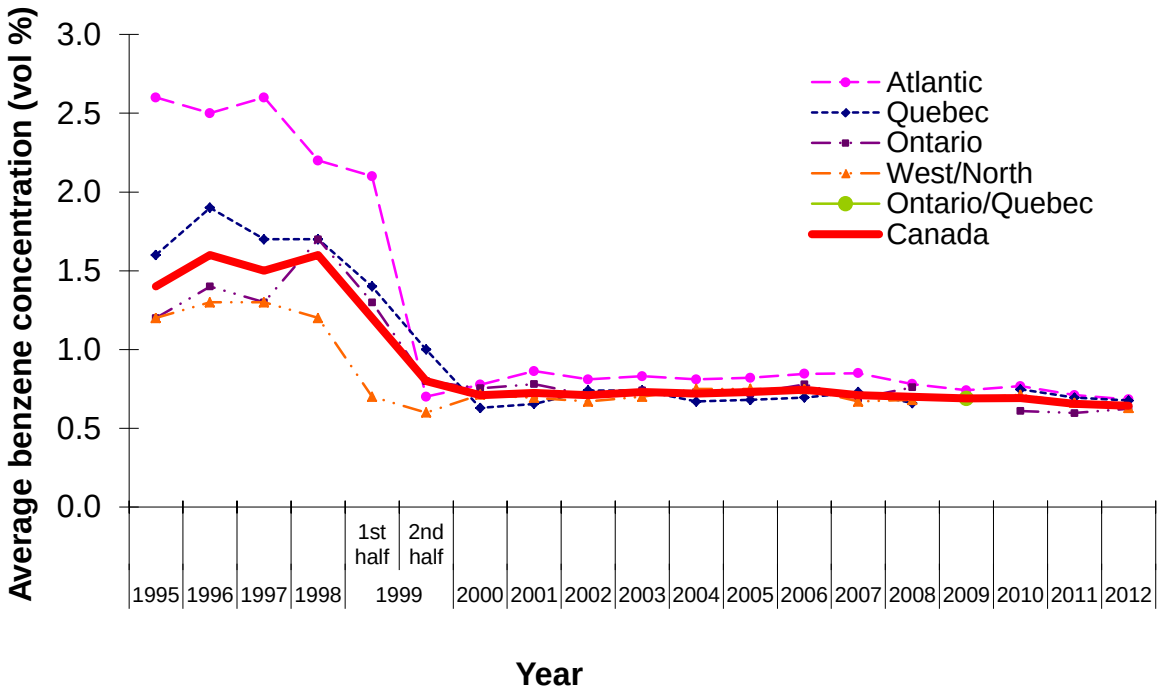
Table 4.2: Benzene Concentration and BEN (2010-2012)

Year	Benzene (% Volume)			BEN		
	Minimum Volume Weighted Average	Maximum	Canadian Volume Weighted Average	Minimum Volume Weighted Average	Maximum	Canadian Volume Weighted Average*
2010	0.32	1.45	0.69	35.1	92.0	47.7
2011	0.34	1.46	0.65	36.0	88.4	45.9
2012	0.42	1.48	0.64	22.1	90.1	45.1

* Includes primary suppliers on alternative limits.

Figure 4.1 shows the graphical trend in benzene levels between 1995 and 2012 for Canada, both nationally and by region.[5] As the Regulations took effect mid-1999, the data for the year 1999 is presented separately for the first and second half of the year. Nationally, benzene levels in 2010, 2011 and 2012 were about half of those between 1995 and 1998.

Figure 4.1: Volume Weighted Average Benzene Content of Canadian Gasoline by Region (1995-2012)



Figures 4.2a, b and c and Figures 4.3a, b and c show the regional and national average values for benzene concentrations and BEN, respectively for the period 2010-2012. These figures cover primary suppliers on a yearly pool average as well as those on a flat limit.

[5] The data for 1995 to 1998 were collected from primary suppliers under a voluntary survey of benzene, aromatics and olefins in gasoline. All refiners and a number of importers participated in the survey. Annual reports on the survey were published by Environment Canada.

Figure 4.2a: Volume Weighted Average Benzene Concentration of Canadian Gasoline (2010)

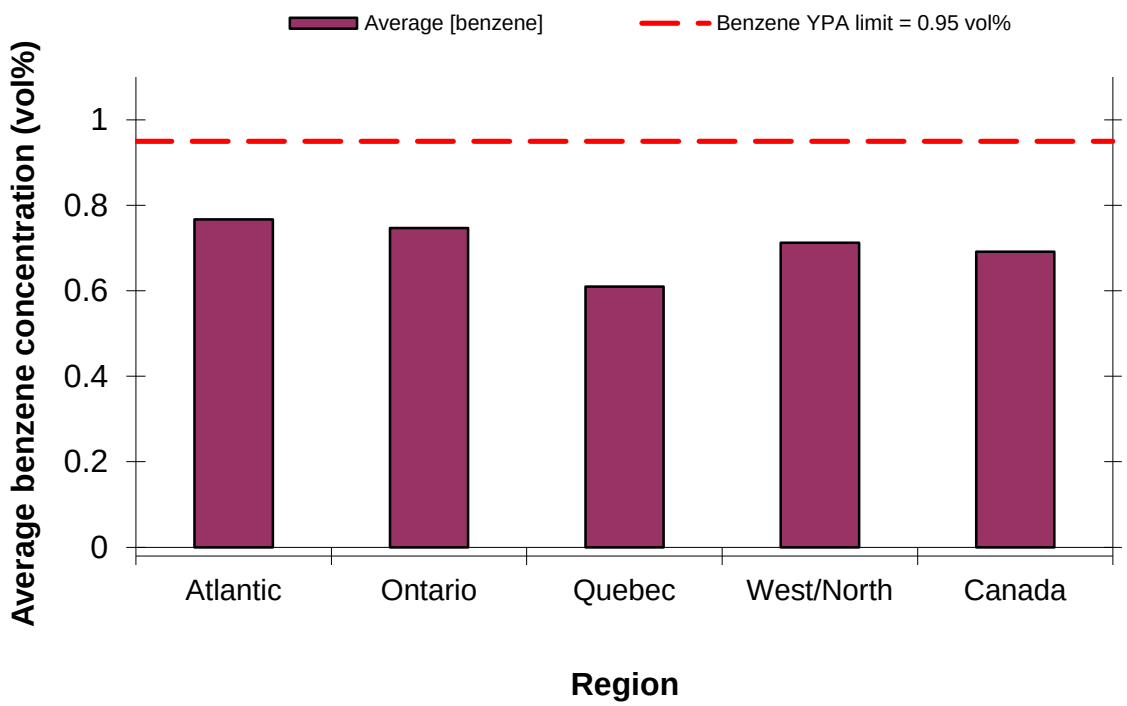


Figure 4.2b: Volume Weighted Average Benzene Concentration of Canadian Gasoline (2011)

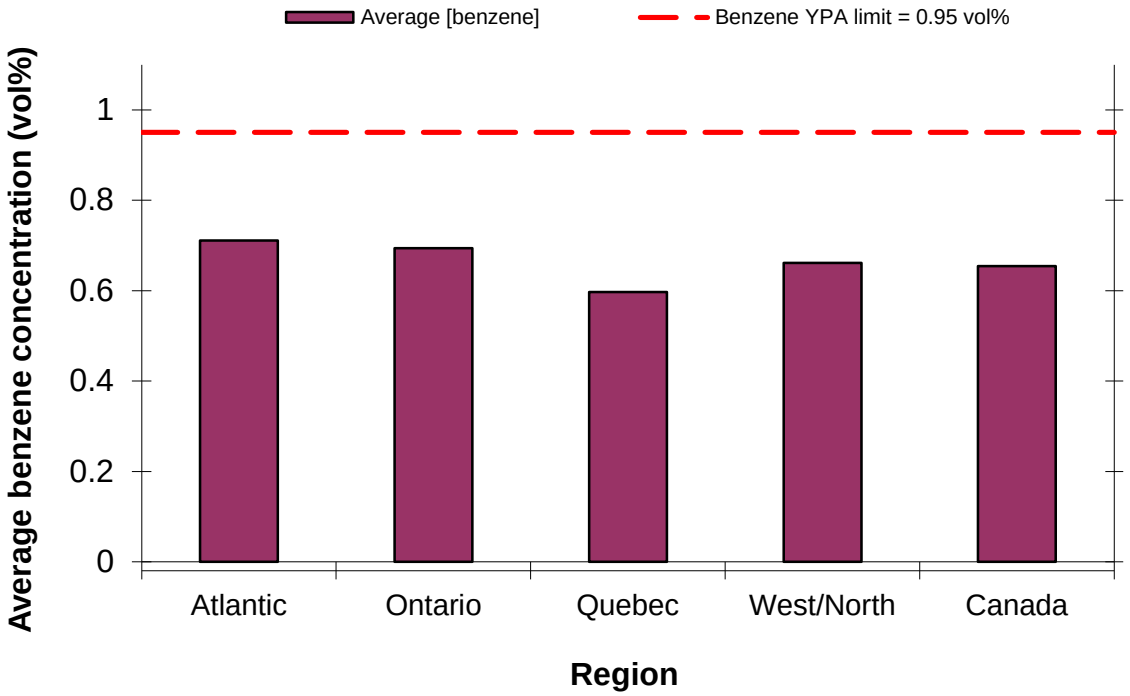


Figure 4.2c: Volume Weighted Average Benzene Concentration of Canadian Gasoline (2012)

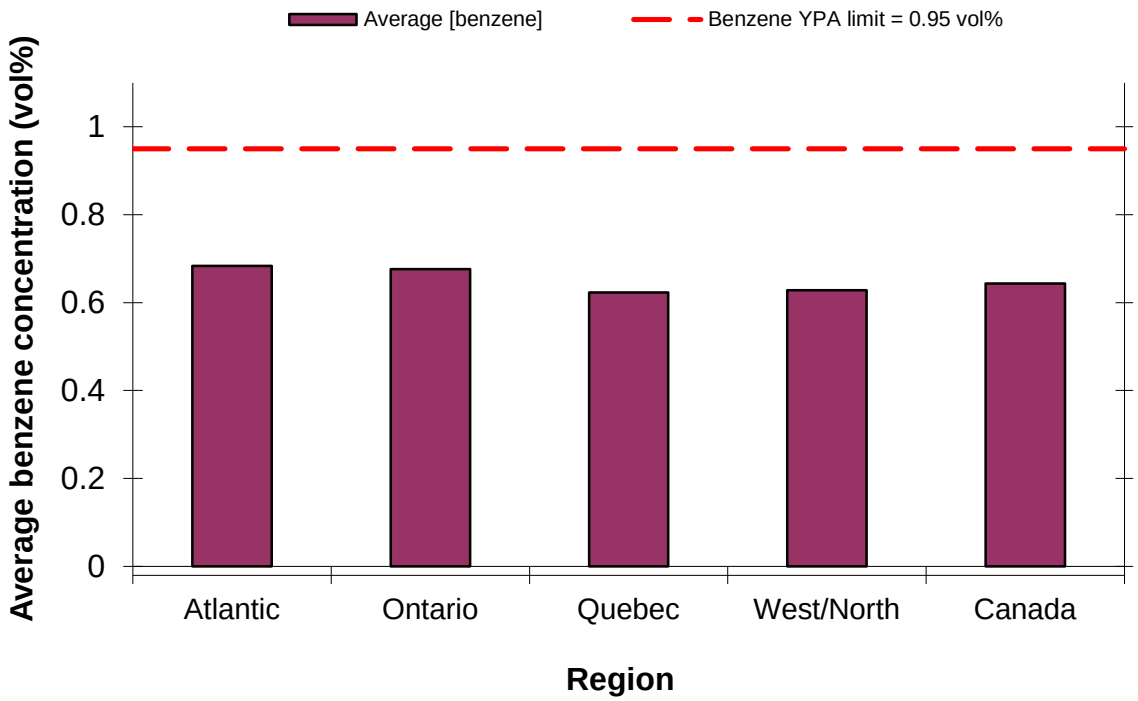


Figure 4.3a: Volume Weighted Average BEN of Canadian Gasoline (2010)

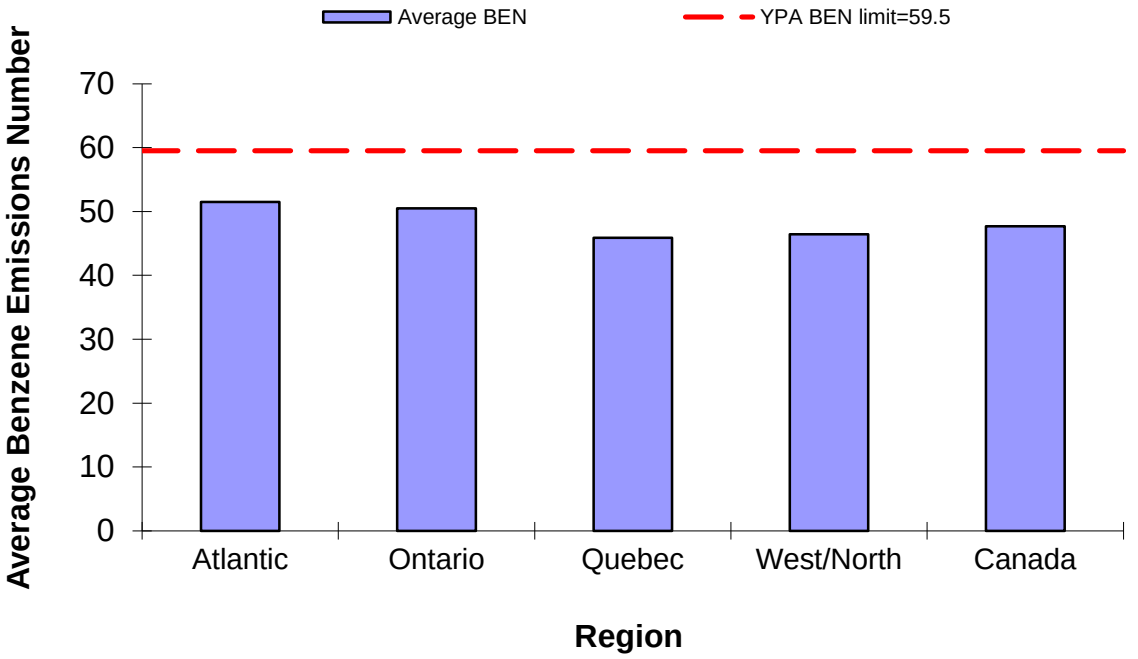


Figure 4.3b: Volume Weighted Average BEN of Canadian Gasoline (2011)

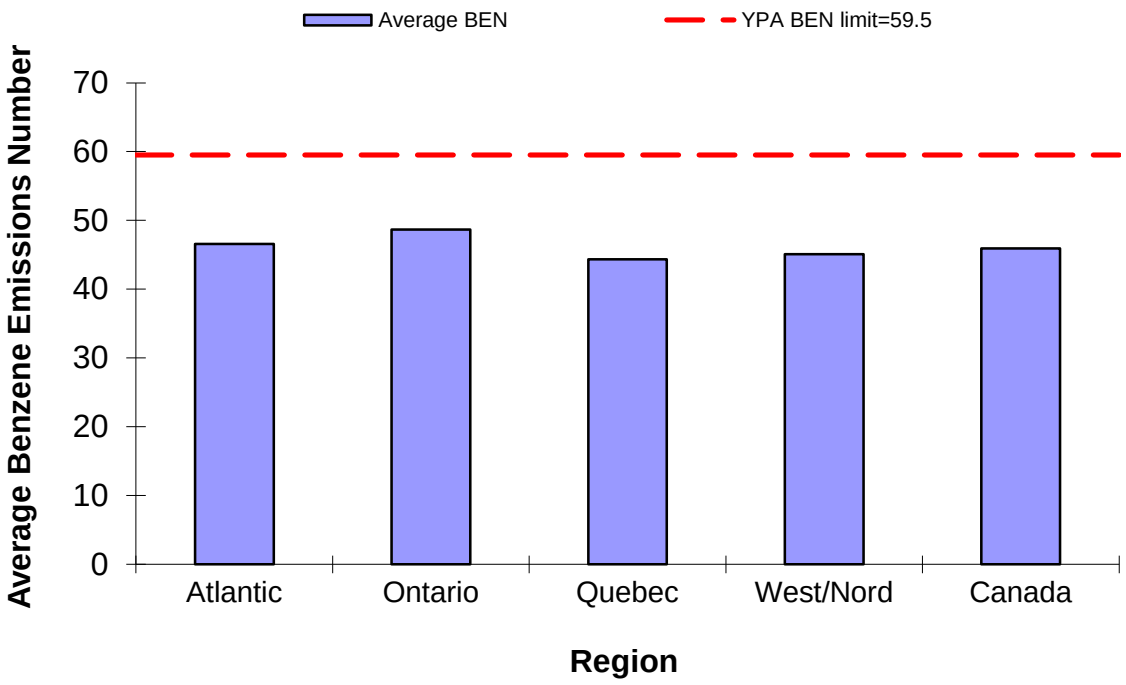
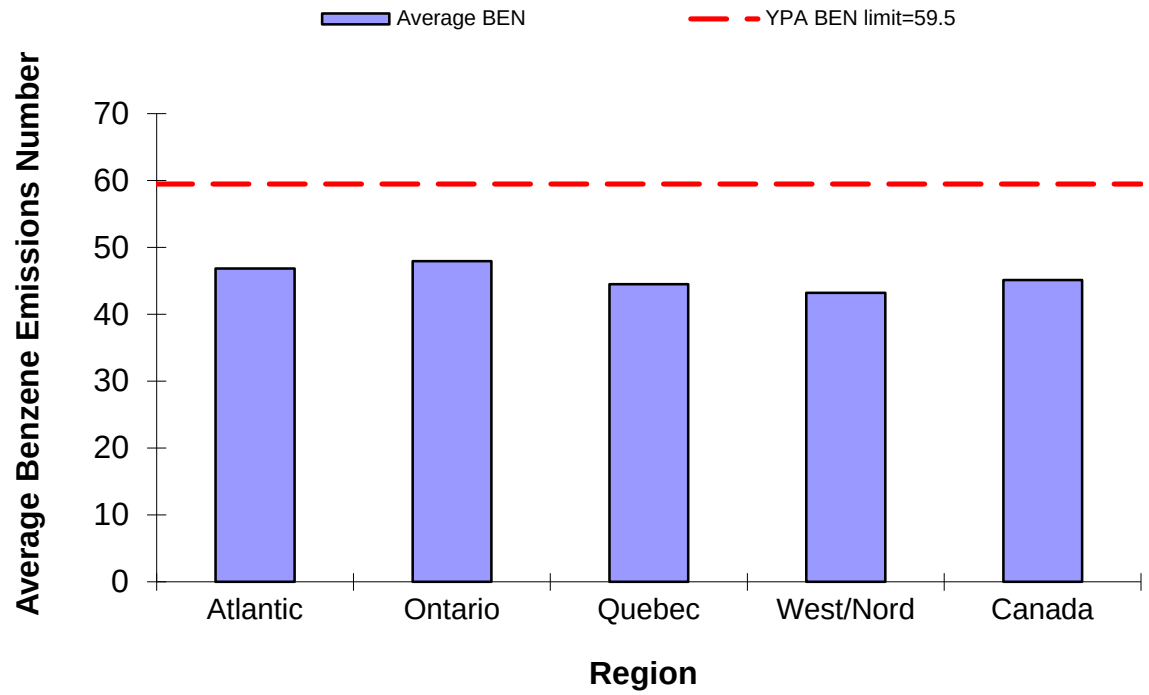


Figure 4.3c: Volume Weighted Average BEN of Canadian Gasoline (2012)



4.3 Reported Oxygen Concentration

Primary suppliers are required to report the type of oxygenate that they use and the oxygenate concentration of the gasoline produced or imported. Table 4.3 and Table 4.4 summarize the concentrations of MTBE and ethanol, respectively, based on the reported oxygen concentrations and type of oxygenate for the years 2000-2012. Since 2000, the average level of MTBE reported in gasoline produced and imported has decreased to negligible amounts. The data presented here does not include oxygenates that are blended downstream of the refinery or point of import. As a result, these values are likely to be underestimates of the usage of oxygenates in Canadian gasoline. Moreover, ethanol is both an oxygenate and a renewable fuel. The *Renewable Fuels Regulations* require fuel producers and importers to have an annual average renewable content of at least 5% based on the volume of gasoline that they produce or import as of December 15th, 2010.

Table 4.3: Average and Maximum Concentrations of MTBE Reported

Region	Average Concentration of MTBE Based on All Volumes of Gasoline Reported (% vol)												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Atlantic	0.85	1.13	0.14	0.08	0.06	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Quebec	0.02	0.08	0.04	0.06	0.22	0.07	0.17	0.10	0.04	0.03	0.01	0.003	0.001
Ontario	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
West	0.21	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canada	0.14	0.11	0.02	0.02	0.06	0.03	0.06	0.00	0.00	0.01	0.004	0.001	0.0003

Region	Maximum Concentration of MTBE Based on All Volumes of Gasoline Containing MTBE (% vol)												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Atlantic	14.89	15.39	14.83	14.67	14.72	14.39	0.61	0.00	0.00	0.00	0.00	0.00	0.00
Quebec	3.00	7.11	2.22	9.44	9.27	7.90	13.94	13.56	10.89	9.67	9.28	9.06	0.22
Ontario	11.44	12.22	0.28	11.06	2.78	6.11	0.00	0.00	10.94		0.00	0.00	0.00
West	15.56	0.00	3.33	8.33	1.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canada	15.56	15.39	14.83	14.67	14.72	14.39	13.94	13.56	10.94	9.67	9.28	9.06	0.22

* 15 % MTBE by volume = approximately 2.7 wt % oxygen in gasoline.

Table 4.4: Average and Maximum Concentrations of Ethanol Reported

Region	Average Concentration of Ethanol Based on All Volumes of Gasoline Reported (% vol)												
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.71	2.21
Quebec	0.04	0.00	0.01	0.19	0.29	0.10	0.03	1.62	1.71	0.38	0.68	0.00	0.88
Ontario	1.43	1.69	1.81	2.02	1.80	1.98	2.02	0.00	0.00		0.00	0.00	0.00
West	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.24	0.59	0.65	0.88	0.18	0.20
Canada	0.46	0.60	0.61	0.60	0.67	0.57	0.52	0.64	0.79	0.44	0.52	0.20	0.52
Region	**Maximum Concentration of Ethanol Based on All Volumes of Gasoline Containing Ethanol (% vol)**												
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Atlantic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.46	10.49
Quebec	10.00	10.00	10.00	10.00	10.00	10.00	10.00	25.84	25.68	9.46	10.27	0.00	9.97
Ontario	10.00	10.00	10.00	9.73	10.00	75.95	71.89	9.19	0.00		0.00	0.00	0.00
West	0.57	0.00	10.00	10.00	10.81	10.00	10.54	10.54	10.81	10.54	10.27	10.27	10.27
Canada	10.00	10.00	10.00	10.00	10.81	75.95	71.89	25.84	25.68	10.54	10.27	10.46	10.49

*10 % ethanol by volume = approximately 3.7 wt % oxygen in gasoline.

4.4 Trends of Aromatics and Olefins

From 1994 to 1998, data on the benzene, aromatic and olefin concentrations in gasoline were collected by Environment Canada under a voluntary survey. Olefin concentrations were added to this survey in 1997. When gasoline is combusted in the vehicle's engine, aromatics in the gasoline can form benzene (a known human carcinogen), while olefins can form 1,3-butadiene. 1,3-butadiene is classified as carcinogenic to humans (Group 1) (International Agency for Research on Cancer, 2008).

Trends for aromatics and olefins content are shown in Table 4.5 and Table 4.6, respectively.[6] These data show that 2010-2012 national reported levels of aromatics have slightly decreased since 2006. Levels of olefins have remained relatively steady since 2006 and remain among the lowest reported levels since 1997.

[6] The data for 1995 to 1998 were collected from primary suppliers under a voluntary survey of benzene, aromatics and olefins in gasoline. All refiners and a number of importers participated in the survey. Annual reports on the survey were published by Environment Canada.

Table 4.5: Average Aromatics Content of Canadian Gasoline (1995-2012)

Region	Volume-Weighted Average Aromatics (volume %)																		
	1995	1996	1997	1998	1999		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
					1st half	2nd half													
Atlantic	31.6	29.4	30.3	31.5	30.8	28.3	28.0	25.9	26.4	26.4	27.8	27.2	28.0	27.2	27.2	27.7	27.9	25.1	25.0
Quebec	28.5	27.3	24.8	22.0	26.1	27.4	25.4	25.4	26.0	25.5	26.8	28.8	27.9	28.8	29.4	28.7	26.6	24.1	23.3
Ontario	26.3	28.5	28.1	30.2	27.9	29.0	28.3	27.6	27.0	25.9	29.6	29.8	30.9	30.0	30.3		29.7	27.9	28.3
West / North	24.6	24.5	23.1	24.1	23.9	23.4	23.6	23.5	23.3	24.5	24.6	25.3	25.2	24.3	24.8	25.6	24.8	23.5	23.6
Canada	26.6	26.9	25.3	26.2	26.2	26.6	25.8	25.5	25.5	25.3	27.0	27.8	27.7	27.5	27.9	27.6	26.9	24.9	24.8

Table 4.6: Average Olefins Content of Canadian Gasoline (1997-2012)

Region	Volume-Weighted Average Olefins (volume %)																
	1997	1998	1999		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
			1st half	2nd half													
Atlantic	8.7	13.6	11.7	14.1	15.1	17.4	17.7	16.2	14.7	13.8	15.2	13.9	13.6	13.2	12.5	14.6	13.6
Quebec	14.1	12.5	13.3	14.2	13.6	14.1	13.4	13.4	11.8	11.5	13.3	11.7	12.3	9.6	12.2	14.1	11.9
Ontario	10.2	9.4	10.8	9.7	10.3	10.4	9.5	8.7	8.4	7.5	7.0	7.6	7.5		7.2	7.2	7.9
West / North	10.9	9.8	9.4	10.2	10.1	10.9	10.7	11.1	10.1	9.5	9.1	9.1	8.4	9.3	8.9	9.1	9.1
Canada	11.2	10.6	11.0	11.4	11.4	12.1	11.5	11.4	10.3	9.4	10.5	9.9	9.9	9.8	9.9	10.6	10.0

4.5 Comparison of Imported vs. Domestic Gasoline

Tables 4.7a, b and c compare the data provided by manufacturers and importers for the years 2010-2012. The classification of a primary supplier as a manufacturer or importer was determined based on the type of primary supplier that was checked off on the Annual Reports on Composition of Gasoline submitted. As was shown in Tables 3.1a, b and c, several primary suppliers identified themselves as both an importer and a manufacturer. As a result, the reported maxima and calculated volume weighted average for importers and manufacturers are similar.

Table 4.7a: Comparison of Importers and Manufacturers Reported Maximum and Average Values (for All Reported Parameters in 2010)

Parameter	Reported Maxima		Calculated Volume Weighted Average	
	Importers	Manufacturers	Importers	Manufacturers
Oxygen (wt %)	3.80	3.80	0.12	0.21
Sulphur (mg/kg)	71.40	71.40	17.47	17.82
Vapour Pressure (kPa)	109.70	109.70	79.25	80.81
E200 (vol %)	84.40	70.20	49.22	47.96
E300 (vol %)	99.00	99.00	84.63	84.23
Aromatics (vol %)	54.10	54.10	27.67	27.11
Olefins (vol %)	45.50	41.36	9.87	9.65
Benzene (vol %)	1.45	1.45	0.68	0.69
BEN	92.0	90.70	48.15	47.88

Table 4.7b: Comparison of Importers and Manufacturers Reported Maximum and Average Values (for All Reported Parameters in 2011)

Parameter	Reported Maxima		Calculated Volume Weighted Average	
	Importers	Manufacturers	Importers	Manufacturers
Oxygen (wt %)	3.87	3.87	0.20	0.31
Sulphur (mg/kg)	79.20	79.20	19.51	19.59
Vapour Pressure (kPa)	108.50	108.50	78.39	80.09
E200 (vol %)	70.10	70.10	48.86	48.43
E300 (vol %)	98.20	98.10	85.18	85.02
Aromatics (vol %)	54.70	54.70	26.10	24.57
Olefins (vol %)	28.30	28.30	10.73	10.53
Benzene (vol %)	1.46	1.46	0.63	0.64
BEN	88.40	88.40	46.34	45.59

Table 4.7c: Comparison of Importers and Manufacturers Reported Maximum and Average Values (for All Reported Parameters in 2012)

Parameter	Reported Maxima		Calculated Volume Weighted Average	
	Importers	Manufacturers	Importers	Manufacturers
Oxygen (wt %)	3.88	3.88	0.43	0.35
Sulphur (mg/kg)	75.00	75.00	23.12	20.86
Vapour Pressure (kPa)	107.40	107.40	66.84	75.69
E200 (vol %)	81.20	81.20	50.25	48.10
E300 (vol %)	99.20	99.20	86.13	84.40
Aromatics (vol %)	54.10	54.10	24.87	25.04
Olefins (vol %)	43.80	43.80	9.40	10.13
Benzene (vol %)	1.46	1.48	0.67	0.62
BEN	90.10	90.10	45.24	45.03

5 Other Gasoline Quality Information

5.1 *Gasoline Regulations*

The *Gasoline Regulations*[7] limit the concentration of lead and phosphorous in gasoline that is produced, imported, sold or offered for sale in Canada. The maximum concentration of lead in gasoline produced, imported, sold or offered for sale in Canada is 5 mg/L and the concentration limit of phosphorus is 1.3 mg/L. Gasoline for use in aircraft is exempt from the Regulations and gasoline for use in competition vehicles is not subject to the lead concentration restrictions.

Since 1990, the *Gasoline Regulations* have significantly reduced lead emissions from gasoline, with 99.8% of gasoline now lead-free. The Regulations were passed in response to the 1986 Royal Society of Canada Commission on Lead in the Environment, which recommended to the Government of Canada that "Public health and environmental policy should be to reduce blood lead to its lowest possible level". Of particular concern were emissions of lead particles to the atmosphere, of which the largest source was gasoline lead particulates from the combustion of tetraethyl lead and tetramethyl lead, antiknock additives that were commonly used in gasoline.

The original Regulations, and subsequent amendments provided exemptions for specific, limited uses of leaded gasoline, when a transition to non-leaded fuels was not technically and economically feasible. An exemption of indeterminate length was provided for aircraft, and temporary exemptions were provided for competition vehicles since 1994. The last temporary exemption for competition vehicles expired on December 31, 2009.

The *Regulations Amending the Gasoline Regulations*[8], published in July 2010, provide an exemption for the production, import and sale of leaded gasoline in Canada for use in competition vehicles for an indeterminate period. Record-keeping and reporting requirements for producers, importers and sellers of leaded gasoline remain in effect.

Environment Canada, with the support of Health Canada, will conduct a five-year review between 2010 and 2015, to assess if further action to limit the use of leaded fuel in competition vehicles is warranted based on science, technology and fuel replacement developments. Environment Canada will work collaboratively with the racing industry to encourage a voluntary reduction and phase-out of leaded racing fuel. A copy of the Workplan for the Five-year Review may be viewed at the following Environment Canada web page: http://www.ec.gc.ca/energie-energy/default.asp?lang=En&n=ED71E3E4-1.

Under the *Gasoline Regulations*, every person who produces, imports or sells (or offers for sale) in Canada leaded gasoline for use in competition vehicles is required to make and maintain records, which must be submitted annually to the Minister of the Environment, on or before March 31 of the year following the year the activity occurred. These records must include:

- the brand name of the gasoline;

[7] SOR/90-247, as amended by SOR/92-587, SOR/94-355, SOR/97-147, SOR/98-217, SOR/2000-104, SOR/2003-106, SOR/2008-126, and SOR/2010-134. A copy of the Regulations and amendments can be found at www.ec.gc.ca/CEPARegistry/regulations.

[8] www.ec.gc.ca/lcpe-cepa/eng/Regulations/DetailReg.cfm?intReg=184

- the octane rating and the method used for determining the octane rating of the gasoline;
- the average yearly lead concentration in milligrams per litre (mg/L) of the gasoline for each brand name;
- if the gasoline was sold for resale or distribution, the name and address of the re-seller or distributor;
- if the gasoline was sold at a track or event location, the name and address of the track or event location where the gasoline was used; and
- quantities of leaded gasoline produced, imported, sold or offered for sale.

Table 5.1 indicates the names of the companies who submitted records of imports and/or sales of leaded gasoline for use in competition vehicles in 2010, 2011 and 2012.

Table 5.1: Companies who submitted records of imports and/or sales of leaded gasoline for use in competition vehicles in 2010, 2011 and 2012

Year	Company Name
2010	AFD Petroleum Limited
	Duval et Lafrance Recherche et Développement
	Gillet Bros M/S
	Gra Ham Energy Limited
	Jack Smith Fuels Limited
	JMS Motorsports
	Sparky's Performance Centre
	Speedway International
	T.A. Lubes Limited
	V.P. Racing Fuels
	V.P. Racing Fuels Incorporated
2011	CT Performance
	Duval et Lafrance Recherche et Développement
	Gillet Bros M/S
	Gra Ham Energy Limited
	JMS Motorsports
	Speciality Engineering
	Speedway International
	T.A. Lubes Limited
	V.P. Racing Fuels
	V.P. Racing Fuels Incorporated
	Wheat City Cycle
2012	AFD Petroleum Limited
	Duval et Lafrance Recherche et Développement
	Gra Ham Energy Limited

	JMS Motorsports
	Speciality Engineering
	Speedway International Incorporated
	T.A. Lubes Limited
	V.P. Racing Fuels
	V.P. Racing Fuels Incorporated

For the 2010 reporting period, ten companies submitted records of imports of leaded gasoline for use in competition vehicles totaling 1 040 066 litres. Eight companies submitted records of leaded gasoline sales. The reported average lead concentrations of that gasoline ranged from 8 mg/L to 2 134 mg/L.

For the 2011 reporting period, nine companies submitted records of imports of leaded gasoline for use in competition vehicles totaling 1 204 543 litres. Ten companies submitted records of leaded gasoline sales. The reported average lead concentrations of that gasoline ranged from 1 mg/L to 2 113 mg/L.

For the 2012 reporting period, eight companies submitted records of imports of leaded gasoline for use in competition vehicles totaling 1 263 470 litres. Nine companies submitted records of leaded gasoline sales. The reported average lead concentrations of that gasoline ranged from 1 mg/L to 2 113 mg/L.

As of August 2014, Environment Canada suspects there may be an overstatement of imported volumes of leaded gasoline for use in competition vehicles due to duplicate reporting. An analysis of 2012 imports indicates that these imported volumes reported are potentially between 10 and 20% higher than actual imported volumes. Environment Canada is working to reconcile this discrepancy and to correct it in future publications.

6 Conclusion

The *Benzene in Gasoline Regulations* have been successful in achieving both recommendations of the federal-provincial Task Force on Cleaner Vehicles and Fuels: reported benzene levels have been significantly reduced and reported aromatic levels are about the same as they were in 1994. For the 2010 and 2011 reporting years, respectively, all but one primary supplier reported that their gasoline met the regulated requirements with respect to benzene concentration and BEN. The suppliers that did not meet the requirements exceeded the maximum benzene concentration level. For the 2012 reporting year all primary suppliers reported that their gasoline met the regulated requirements with respect to benzene concentration and BEN. As part of its enforcement activities, enforcement officers conduct inspections and investigations into alleged exceedances under the *Benzene in Gasoline Regulations* and take action consistent with the Compliance and Enforcement Policy for CEPA (1999).

Appendix A: Annual Compliance Package with Sample Reporting Forms for the *Benzene in Gasoline Regulations* and *Gasoline Regulations*

Current package available at:
http://www.ec.gc.ca/energie-energy/default.asp?lang=En&n=C8507F9B-1

Benzene in Gasoline Regulations

NOTE: Information contained in this page is for compliance promotional purposes and has NO legal status. For requirements under the Regulations, refer to the actual regulations.

These Regulations apply to importers, manufacturers and blenders of gasoline. They also apply to anyone that sells gasoline or offers it for sale.

The Regulations prohibit the production or import of gasoline with a benzene content exceeding 1.0% by volume. They also restrict the Benzene Emissions Number (BEN), a calculated parameter that relates gasoline composition to predicted emissions of benzene from vehicle tailpipes to a maximum of 71 in the summer and 92 in the winter. Companies may elect to meet annual pooled averages for benzene and BEN, in place of the above limits.

The Regulations also prohibit the sale of gasoline with more than 1.5% by volume of benzene.

Various reporting and record-keeping requirements are specified in different sections of the Regulations. For instance:

- Section 6 requires that information on alternative sampling or analysis methods be submitted **60** days prior to use.
- Section 7 specifies that **registration as per Schedule 2** is required with Environment Canada **15 days prior** to commencing operations for new manufacturers, importers or blenders (a copy of Schedule 2 is attached for your convenience).
- Section 8 requires every primary supplier to submit gasoline composition reports due annually on February 15. A copy of Schedule 3 is attached for your convenience.
- Section 12 specifies additional reporting requirements for importers. A page summarizing the reporting requirements is attached for your convenience.
- Subsection 21(2) requires that a compliance plan be signed by an authorized official of the primary supplier and sent to the Minister by registered mail or courier at least 150 days before the beginning of the first year (i.e. by August 4) for which the primary supplier has elected to meet a requirement on the basis of a yearly pool average. Any changes to the compliance plan require at least 45 days notice to the Minister as per subsection 21(3).
- Subsection 22(3) requires that auditor's reports for those on a yearly pool average be submitted each year by May 31.

REGISTRATION FORM
FOR A MANUFACTURER, BLENDER OR IMPORTER OF GASOLINE (Schedule 2)
BENZENE IN GASOLINE REGULATIONS (s.7)

Pursuant to subsection 7(3) of the *Benzene in Gasoline Regulations* if the information submitted below changes, other than information on typical annual volumes, the primary supplier must submit the updated information to the Minister (Environment Canada Headquarters) within five days after the change. Please send to Environment Canada's Headquarter office (Regulations Administration – Reports and Notices; Fuels Section; Oil, Gas and Alternative Energy Division; Environment Canada; 12th Floor; 351 St. Joseph Blvd.; Gatineau QC; K1A 0H3; Fax: 819-953-8903; FUELS-CARBURANTS@ec.gc.ca).

This form is provided for your convenience. Please refer to the *Benzene in Gasoline Regulations* for information on requirements.

1. Company Name:

   Company Address:

   Type of primary supplier (check one or more): ☐ Manufacturer ☐ Blender ☐ Importer

2. Name and location of each refinery and typical annual volume, in m^3, of each type of gasoline manufactured at each refinery:

3. Name and location of each blending facility, typical blending material(s) and typical annual volume, in m^3, of each type of gasoline blended at each facility: *(For cargo tankers, railway cars, boats, marine vessels or other mobile blending facilities, indicate only the type and number of mobile facilities and the province of operation.)*

4. Each usual point and mode of importation and typical annual volume, in m^3, of each type of gasoline imported:

5. Authorized official: Telephone no.

   Title: Fax no.

   Signature: _____ Date: _____

REPORT ON COMPOSITION OF GASOLINE (Schedule 3)
BENZENE IN GASOLINE REGULATIONS (s.8)

This report should be:

a) submitted by every primary supplier as defined in the Regulations;

b) submitted on or before February 15 of each year (annual reporting);

c) **sent to Environment Canada's Headquarter office** (Regulations Administration – Reports and Notices; Fuels Section; Oil, Gas and Alternative Energy Division; Environment Canada; 12th Floor; 351 St. Joseph Blvd.; Gatineau QC; K1A 0H3; Fax: 819-420-7976; FUELS-CARBURANTS@ec.gc.ca)

This form is provided for your convenience. Please refer to the *Benzene in Gasoline Regulations* for information on requirements.

Registration Number	Year
Company name	
Company address	

Type of primary supplier (check one or more): ☐ Manufacturer ☐ Blender ☐ Importer

Has a yearly pool average been elected for this year? ☐ Yes ☐ No

If yes, for which parameters? ☐ Benzene ☐ Benzene Emissions Number (BEN)

If yes, has your compliance plan been updated during the reporting period? ☐ Yes ☐ No

Note: Updated compliance plans must be submitted to the Minister pursuant to subsection 21(3) of the *Benzene in Gasoline Regulations*.

Name and location of the refinery, blending facility or points of importation in the province, covered by this report:
(Refer to Notes A) and B) on the next page)

Composition of gasoline supplied during this reporting period.

Volume of gasoline supplied, in m^3	Number of batches supplied	Name of any oxygenates added

Item	Column 1 Parameter	Column 2 Maximum Value	Column 3 Year-to-date volume-weighted average value
1.	Oxygen Concentration (% by weight)		
2.	Sulphur Concentration (mg/kg)		
3.	Vapor pressure at 37.8ºC (100ºF) (kPa)		
4.	Evaporative fraction at 93.3ºC (200ºF) (% by volume)		
5.	Evaporative fraction at 148.9ºC (300ºF) (% by volume)		
6.	Aromatics concentration (% by volume)		
7.	Olefins concentration (% by volume)		
8.	Benzene concentration (% by volume)		
9.	Benzene Emissions Number (Refer to note C)		

Authorized Official (*)	Telephone No.
Title	Fax No.
Signature	Date

(*) Refer to note (F) on next page

NOTES -- BENZENE IN GASOLINE REGULATIONS

A. This Report on Composition of Gasoline must be submitted separately for each refinery, blending facility and province of importation, or any combination of them described under section 18 of the *Benzene in Gasoline Regulations*.
B. For Note A, the name and location for cargo tankers, railway cars, boats, marine vessels or other mobile blending facilities are replaced by the type of mobile facilities, their number and the province of operation, or the name and location of the non-mobile facility with which they are grouped.
C. The average benzene emissions number is the volume-weighted average of the benzene emissions numbers for each batch; it is not calculated from the average model parameters.
D. Under subsection 13(2) of the *Benzene in Gasoline Regulations*, for each batch of gasoline-like blendstock dispatched or imported by the primary supplier during the period covered by this Report, the primary supplier must report to the Minister, in an annex to this Report, the name and address of the purchaser or receiver, the date of dispatch or importation and the volume.
E. Under subsection 2(2) of Schedule 1 to the *Benzene in Gasoline Regulations*, the primary supplier must report to the Minister, in an annex to this Report, each occurrence of a model parameter that is outside the acceptable range, the reason for each occurrence, and the volume of gasoline affected.
F. Authorized official is a defined term (refer to subsection 1(1) of the *Benzene in Gasoline Regulations*).

Additional Requirements for Importers as per Section 12 of the *Benzene in Gasoline Regulations*

NOTE: Information contained in this page is for compliance promotional purposes and has no legal status. For requirements under the Regulations, refer to the actual Regulations.

Subsection 12(1) Every importer must notify the Minister, at least 12 hours before the time of importation, of the importer's intention to import:

a) at any one time more than 100 m^3 of gasoline identified under subsection 9(1) or (2) as complying gasoline, U.S. reformulated gasoline, California gasoline or northern winter complying gasoline; or

b) at any one time, any amount of gasoline identified under subsection 9(1) as gasoline-like blendstock; or

c) into a province and within any one day, more than 1,000 m^3 of gasoline identified under subsection 9(1) or (2) as complying gasoline, U.S. reformulated gasoline, California gasoline or northern winter complying gasoline (amended 2003)

Subsection 12(2) The notice required by subsection (1) must include:

a) the name and registration number of the importer;

b) the type of gasoline identified under subsection 9(1), unless it is complying gasoline;

c) the volume of the gasoline that is scheduled to be imported;

d) the point of entry of the gasoline into Canada and the estimated date and time* that it will enter Canada;

e) the address of the first storage facility or refueling facility to which the gasoline is to be delivered and the estimated date and time of its delivery there; and

f) the name and telephone number of a representative of the importer through whom sampling arrangements can be made.

* Provide the best estimated date and time with your notice; revise when more accurate date and time become available (a form containing the above noted requirements is attached for your convenience).

Subsection 12(3) No importer shall import gasoline by cargo tanker, railway car, boat, marine vessel or aircraft unless the gasoline is accompanied at the point of entry into Canada and at the point of delivery, and everywhere between those points, by a record that shows:

a) the name, address and registration number of the importer;

b) the name and address of the person to whom the gasoline is to be sold or ownership transferred;

c) the address of the first storage facility or refueling facility to which the gasoline is to be delivered;

d) the volume of the gasoline; and

e) the type of gasoline identified under subsection 9(1), unless it is complying gasoline.

12-HOUR NOTIFICATION OF IMPORTS
BENZENE IN GASOLINE REGULATIONS (s.12)

This additional requirement under section 12 of these Regulations is addressed to importers intending to import at any one time more than 100 m^3 of gasoline or more than 1 000 m^3 into a province in one day. Note there is no minimum for gasoline-like blendstock.

This notification should be sent via fax or email at least 12 hours before the time of importation to the appropriate regional Environment Canada Enforcement Office.

This form is provided for your convenience. Please refer to the *Benzene in Gasoline Regulations* for information on requirements.

a) Importer Name:

Importer Registration Number:

Batch Number (Optional):

b) Type of gasoline identified under Section 9, check or mark "x" below:

Complying gasoline	☐	California gasoline	☐
Northern winter complying gasoline	☐	Gasoline-like blendstock	☐
US reformulated gasoline	☐		

c) Scheduled volume of gasoline (m^3):

d) Point of entry into Canada:

Estimated date: Time of entry:

e) Address of first storage facility or refueling facility to whom gasoline is to be delivered:

Estimated date of delivery: and time of delivery:

f) Importer's representative through whom sampling may be arranged:

Name (Print): Telephone:

Following To Be Completed by Environment Canada (PLEASE PRINT):
Environment Canada Official receiving or reviewing information:

Name: Signature: _____

Date: Telephone: ( ) -

Gasoline Regulations

NOTE: Information contained in this page is for compliance promotional purposes and has no legal status. For requirements under the Regulations, refer to the actual regulations.

These Regulations limit the lead and phosphorus content in gasoline that is produced, imported or sold in Canada to 5 mg/L and 1.3 mg/L, respectively. The Regulations also specify the acceptable analytical methods for determining the concentration of lead and phosphorus in gasoline and impose record keeping and reporting obligations for leaded gasoline. Gasoline for use in aircraft is exempt from the Regulations and leaded gasoline for use in competition vehicles is not subject to the lead concentration restrictions imposed by the Regulations.

Environment Canada, with the support of Health Canada, will conduct a five-year review between 2010 and 2015, to assess if further action to limit the use of leaded fuel in competition vehicles is warranted based on science, technology and fuel replacement developments. Environment Canada will work collaboratively with the racing industry to encourage a voluntary reduction and phase-out of leaded racing fuel. A copy of the Workplan for the Five-year Review may be viewed at the following Environment Canada web page: http://www.ec.gc.ca/energie-energy/default.asp?lang=En&n=ED71E3E4-1.

Leaded Gasoline Used in Competition Vehicles Reporting

For leaded gasoline used in competition vehicles, annual detailed reports indicating, among other things, quantities imported, produced and distributed, as well as the lead concentrations, must be submitted to the Minister of the Environment by March 31 of the year following the year in which the activity occurred. Records detailing these activities must be kept in Canada for a period of five years after the date the record is made. Example templates in paper form for company identification and record keeping (for leaded gasoline import, production, sales, re-sales and distribution information) are attached for your convenience.

Leaded Gasoline For Competition Vehicles

Annual Reporting for *Gasoline Regulations*

Canadian Environmental Protection Act, 1999

Company Identification and Declaration

Company Information

Company Name:

Address:

City: Prov.:

Postal Code:

Phone: ( ) -

Fax: ( ) -

Contact Information

Name:

Title:

Address:

City: Prov.:

Postal Code:

Phone: ( ) -

Fax: ( ) -

(to be completed if contact address differs from company address)

Calendar year:

☐ **Non Involvement**

In the above indicated calendar year, I did not produce, import, distribute, re-sell, sell or offer for sale leaded gasoline for use in competition vehicles. In this case, please complete this form and return it to the address listed below.

☐ **Involvement**

In the above indicated calendar year, I produced, imported, distributed, re-sold, sold or offered for sale leaded gasoline for use in competition vehicles. The reports for these activities are attached.

☐ **Confidential**

Pursuant to subsection 313(1) of the *Canadian Environmental Protection Act, 1999*, I request that the following information for the above calendar year be treated as confidential (please specify your reasons).
Reasons:

☐ **Not Confidential**

I do not request the following information be treated as confidential and I consent to it being released without restriction.

Signature	Name *(please print)*
Title	Place and date

Please complete this form, and send with the records required by section 11 of the Regulations, to Environment Canada at:

Regulations Administration – Reports and Notices
Fuels Section
Oil, Gas and Alternative Energy Division
Environment Canada
12th Floor
351 St. Joseph Blvd.
Gatineau QC K1A 0H3

Or by Fax: 819-420-7410

Or by email to: FUELS-CARBURANTS@ec.gc.ca

Leaded Gasoline For Competition Vehicles

Record Keeping for *Gasoline Regulations*

Canadian Environmental Protection Act, 1999

Leaded Gasoline Import/Production Information

Date	Brand Name	Octane Rating/ Analysis Method[1]	Average Lead Concentration (mg/L)	Quantity Imported (Litres)	Quantity Produced (Litres)

1. **Please indicate for Octane Rating and Analysis Method: R - Research Octane Number; M - Motor Octane Number; or, A-- Anti-Knock Index.**

Leaded Gasoline For Competition Vehicles

Record Keeping for *Gasoline Regulations*

Canadian Environmental Protection Act, 1999

Leaded Gasoline Sales, Re-Sales and Distribution Information

Date	Activity[1]	Brand Name	Octane Rating/ Analysis Method[2]	Average Lead Concentration (mg/L)	Name and Address of Re-Seller or Track/Event (if applicable)	Quantity (L)

1. **Please indicate for Activity: Sales to Resellers/Distributors (SRD); Sales to Tracks/Events (STE); or, Sales to Individual Users (SIU) [other than at tracks/events]**
2. **Please indicate for Octane Rating and Analysis Method: R - Research Octane Number; M - Motor Octane Number; or, A - Anti-Knock Index**

Appendix B: Alternative Limits under the *Benzene in Gasoline Regulations*

http://publications.gc.ca/gazette/archives/p1/1999/1999-09-04/pdf/g1-13336.pdf

Canada Gazette, Part I, Vol. 133, No. 36

September 4, 1999

GOVERNMENT NOTICES

DEPARTMENT OF THE ENVIRONMENT

Alternative Limits under the *Benzene in Gasoline Regulations*

This notice provides information on alternative limits that have been approved by the Minister of the Environment under the federal *Benzene in Gasoline Regulations.*

The federal *Benzene in Gasoline Regulations* set limits for the level of benzene in gasoline and for a parameter called the benzene emissions number (BEN). The BEN relates gasoline composition to the estimated emissions of benzene from vehicles. The limits under the Regulations came into effect on July 1, 1999.

Under subsection 17(2) of the *Benzene in Gasoline Regulations*, primary suppliers of gasoline (refiners, blenders and importers) could elect to be subject to alternative limits for the BEN, based on their historical gasoline composition. Under subsection 16(2), primary suppliers unable to meet the July 1, 1999, implementation date could also apply to be subject to temporary (higher) limits for both benzene and the BEN for up to six months.

Temporary Limits under Subsection 16(2)

Under subsection 16(2) of the Regulations, primary suppliers may apply for temporary alternative limits for benzene and the BEN if, for reasons beyond their control, they cannot meet the implementation date of July 1, 1999. Primary suppliers may only use the temporary limits until December 31, 1999. Under subsection 16(4) of the Regulations, the Minister of the Environment approves these applications only if:

- the primary supplier has made all reasonable efforts to meet the implementation date of July 1, 1999; and
- that non-authorization of the temporary limits would:
  - have a significant effect on the supply of gasoline or other petroleum products in the region,
  - require the primary supplier to significantly curtail operations or cease operating for a period of time and thereby result in financial hardship, or
  - result in the primary supplier going out of business.

In the Regulatory Impact Analysis Statement that accompanied amendments to the *Benzene in Gasoline Regulations*, published in the *Canada Gazette*, Part II, on May 26, 1999, the Minister of the Environment announced her intention to "publish a notice in *Canada Gazette* Part I identifying the company, its alternative limits, and the period that the limits apply". Pursuant to that intention, the following tables show the temporary alternative limits for benzene and the BEN that have been applied for and approved. It should be noted that under the Regulations, companies can elect to meet the requirements on the basis of yearly pool average limits with associated never-to-be-exceeded caps, rather than meeting "flat" never-to-be-exceeded limits.

Temporary Limits for Primary Suppliers Having Elected to Use Yearly Pool Averages

Company	Refinery or province of importation	Temporary yearly pool average limits (all expire on Dec. 31, 1999)	Temporary never-to-be-exceeded caps	Expiry date for temporary never-to-be-exceeded caps
		Benzene (% vol.) *BEN*	*Benzene (% vol.)* *BEN*	
Petro-Canada	Montréal refinery	1.28% 76.4	4.61% 156.8/198.1	November 15, 1999
Shell	Montréal refinery	2.0% 86.8	4.7% 117.8/220.0	November 15, 1999
Ultramar	Québec refinery and Montréal terminal	1.2% –	3.55% –/134.8	November 15, 1999
Pétroles Norcan	Imports into Quebec	1.54% 66.68	3.0% –	November 15, 1999
Petro-Canada	Oakville refinery	1.75% 80.4	4.29% 140.6/–	September 15, 1999
Standard limits under subsections 16(1) and 17(1)				
Standard limits	Benzene BEN	0.95% 59.5	1.5% 102/132	

Temporary Limits for Primary Suppliers Subject to "Flat" Limits

Company	Refinery or province of importation	Temporary flat (per-litre) limit		Expiry date for temporary flat limit
		Benzene (% vol.)	*BEN*	
Olco/Neste	Imports into Quebec and Ontario	3.00%	–	November 15, 1999
Spur/Murphy	Imports into Ontario	2.06%	–	September 15, 1999
Parkland	Bowden refinery	1.50%	–	December 31, 1999
Standard limits under subsection 3(1) and section 4				
Standard limits		1.00%	71/92	

Notes:

1. There are different seasonal per-litre limits for the BEN: summer (1st number) and winter (2nd number).
2. Temporary average limits, which expire on December 31, 1999, take into account gasoline produced/imported before and after the expiry date for the temporary per-litre limits. After the expiry dates, regular limits apply.
3. "–" indicates that no temporary limit was applied for by the primary supplier.

Under paragraph 3(2)(*b*) of the Regulations, the areas where gasoline sold is subject to temporary alternative limits are:

- Quebec, except that portion of the province that is in the northern supply area (as defined by the Regulations);
- all of Ontario; and
- southern Alberta and south-eastern British Columbia (roughly the towns of Provost, Leduc, Drayton Valley and Revelstoke, and all other locations in Alberta and British Columbia south and east of those towns).

In the above areas, the prohibition on selling (as opposed to manufacturing, blending or importing) gasoline containing benzene at a concentration that exceeds 1.5% by volume is deferred from October 1, 1999, to April 1, 2000.

Alternative Limits for BEN under Subsection 17(2)

Under subsection 17(2) of the Regulations, primary suppliers may elect for alternative limits for the BEN based on the historical composition of their gasoline. There is no expiry date for alternative BEN limits.

In the Regulatory Impact Analysis Statement that accompanied the *Benzene in Gasoline Regulations*, published in the *Canada Gazette*, Part II, on November 26, 1997, the Minister of the Environment announced her intention that the alternative limits "will be publicly available and will be published by Environment Canada". Pursuant to that intention, the following alternative limits for the BEN have been applied for and approved:

Alternative Limits for BEN

		Benzene Emissions Number	
Company	**Refinery**	**Alternative yearly pool average limit**	**Alternative never-to-be-exceeded cap (summer/winter)**
Petro-Canada	Montréal	67.9	115.0/151.0
Shell	Montréal	65.3	110.5/144.7
Petro-Canada	Oakville	65.3	117.1/141.4
Shell	Sarnia	65.0	106.0/147.8
Standard limits under subsection 17(1)			
Standard limits		59.5	102/132

Appendix C: Regional and National Data for All Parameters

Table C.1a: Averages (Volume-weighted, Maximum and Minimum) and Maximum Values of Reported Gasoline Parameters (2010)

		Atlantic	Quebec	Ontario	West / North	Canada
Volume (m^3)		3 178 530	13 414 119	10 114 270	13 479 820	40 186 739
[Benzene] (vol %)	**Volume-weighted average**	0.77	0.61	0.75	0.71	0.69
	Maximum YTD average	0.83	0.79	0.93	1.245	1.245
	Minimum YTD average	0.50	0.49	0.32	0.55	0.32
	Maximum value reported	1.45	1.30	1.44	1.40	1.45
BEN (Benzene Emissions Number)	**Volume-weighted average**	51.5	45.9	50.5	46.4	47.7
	Maximum YTD average	58.1	54.4	59.9	51.7	59.9
	Minimum YTD average	49.8	38.5	41.5	35.1	35.1
	Maximum value reported	75.0	92.0	90.7	89.7	92.0
[Sulphur] (mg/kg)	**Volume-weighted average**	22.2	17.4	17.1	16.9	17.6
	Maximum YTD average	25.5	23.4	29.4	35.0	35.0
	Minimum YTD average	12.5	8.0	3.1	6.0	3.1
	Maximum value reported	71.0	54.0	61.0	71.4	71.4
[Olefin] (vol%)	**Volume-weighted average**	12.5	12.2	7.2	8.9	9.9
	Maximum YTD average	14.9	15.4	10.8	13.8	15.4
	Minimum YTD average	6.8	0.8	0.07	0.9	0.07
	Maximum value reported	21.9	45.5	19.7	41.4	45.5
[Aromatics] (vol%)	**Volume-weighted average**	27.9	26.6	29.7	24.8	26.9
	Maximum YTD average	29.6	32.7	34.0	34.0	34.0
	Minimum YTD average	27.0	20.1	25.9	14.6	14.6
	Maximum value reported	48.1	52.2	54.1	49.4	54.1
E200 (vol%)	**Volume-weighted average**	46.2	51.6	47.5	45.7	48.2
	Maximum YTD average	49.5	56.0	51.0	57.0	57.0
	Minimum YTD average	45.0	46.0	40.5	37.5	37.5
	Maximum value reported	58.8	84.4	67.2	68.5	84.4
E300 (vol%)	**Volume-weighted average**	85.1	86.2	83.0	83.8	84.5
	Maximum YTD average	88.0	98.7	89.0	90.0	98.7
	Minimum YTD average	84.8	82.9	80.0	79.4	79.4
	Maximum value reported	98.1	98.4	99.0	97.4	99.0
Vapour Pressure (kPa)	**Volume-weighted average**	85.1	79.4	77.8	81.3	80.1
	Maximum YTD average	87.8	89.1	78.7	100.6	100.6
	Minimum YTD average	81.6	59.0	52.7	55.3	52.7
	Maximum value reported	107.0	107.9	107.4	109.7	109.7
[Oxygen] (wt%)	**Volume-weighted average**	0.0	0.3	0.0	0.3	0.2
	Maximum YTD average	0.0	0.8	0.0	3.3	3.3
	Minimum YTD average	0.0	0.0	0.0	0.0	0.0
	Maximum value reported	0.06	3.8	0.0	3.8	3.8

Table C.1b: Averages (Volume-weighted, Maximum and Minimum) and Maximum Values of Reported Gasoline Parameters (2011)

		Atlantic	Quebec	Ontario	West / North	Canada
Volume (m^3)		3 113 154	11 721 828	9 992 242	13 594 061	38 421 285
[Benzene] (vol %)	**Volume-weighted average**	0.71	0.60	0.69	0.66	0.65
	Maximum YTD average	0.93	0.84	0.86	0.91	0.93
	Minimum YTD average	0.54	0.47	0.34	0.44	0.34
	Maximum value reported	1.40	1.30	1.46	1.45	1.46
BEN (Benzene Emissions Number)	**Volume-weighted average**	46.6	44.4	48.7	45.1	45.9
	Maximum YTD average	56.3	52.4	51.3	48.7	56.3
	Minimum YTD average	36.0	40.8	38.2	36.2	36.0
	Maximum value reported	77.0	88.4	86.2	84.2	88.4
[Sulphur] (mg/kg)	**Volume-weighted average**	25.0	20.1	18.8	18.2	19.5
	Maximum YTD average	31.0	26.14	25.0	30.0	31.0
	Minimum YTD average	13.0	16.7	3.6	7.0	3.6
	Maximum value reported	73.7	61.0	74.0	79.2	79.2
[Olefin] (vol%)	**Volume-weighted average**	14.6	14.1	7.2	9.2	10.6
	Maximum YTD average	17.2	16.3	12.0	14.0	17.2
	Minimum YTD average	11.1	11.4	1.8	1.1	1.1
	Maximum value reported	21.9	28.0	21.5	28.3	28.3
[Aromatics] (vol%)	**Volume-weighted average**	25.1	24.1	27.9	23.5	24.9
	Maximum YTD average	32.0	30.4	31.9	35.1	35.1
	Minimum YTD average	22.0	19.4	25.9	19.4	19.4
	Maximum value reported	46.2	51.6	54.7	52.1	54.7
E200 (vol%)	**Volume-weighted average**	48.5	50.8	47.7	45.5	48.0
	Maximum YTD average	56.5	55.4	52.0	56.5	56.5
	Minimum YTD average	44.0	41.1	42.6	41.1	41.1
	Maximum value reported	63.0	70.1	65.2	66.1	70.1
E300 (vol%)	**Volume-weighted average**	86.3	87.5	83.2	84.0	85.1
	Maximum YTD average	88.9	91.1	91.0	91.0	91.1
	Minimum YTD average	81.0	84.5	80.4	79.8	79.8
	Maximum value reported	94.2	98.2	98.1	96.6	98.2
Vapour Pressure (kPa)	**Volume-weighted average**	84.7	78.9	79.3	77.9	79.1
	Maximum YTD average	88.1	87.4	85.8	83.5	88.1
	Minimum YTD average	50.9	65.1	52.7	47.6	47.6
	Maximum value reported	106.7	108.5	107.3	107.0	108.5
[Oxygen] (wt%)	**Volume-weighted average**	0.6	0.3	0.002	0.4	0.3
	Maximum YTD average	1.7	0.8	0.1	3.2	3.2
	Minimum YTD average	0.0	0.0	0.0	0.0	0.0
	Maximum value reported	3.9	3.7	0.2	3.8	3.9

Table C.1c: Averages (Volume-weighted, Maximum and Minimum) and Maximum Values of Reported Gasoline Parameters (2012)

		Atlantic	Quebec	Ontario	West / North	Canada
Volume (m^3)		3 069 362	12 151 678	10 148 932	13 506 546	38 876 518
[Benzene] (vol %)	**Volume-weighted average**	0.68	0.62	0.68	0.63	0.64
	Maximum YTD average	0.87	0.89	0.76	0.92	0.92
	Minimum YTD average	0.43	0.50	0.42	0.47	0.42
	Maximum value reported	1.40	1.46	1.45	1.48	1.48
BEN (Benzene Emissions Number)	**Volume-weighted average**	46.9	44.5	48.0	43.2	45.1
	Maximum YTD average	62.2	55.0	50.4	49.8	62.2
	Minimum YTD average	36.9	41.1	37.6	22.1	22.1
	Maximum value reported	78.0	87.7	90.1	80.0	90.1
[Sulphur] (mg/kg)	**Volume-weighted average**	26.9	20.2	24.1	17.3	20.7
	Maximum YTD average	28.7	28.6	29.0	25.0	29.0
	Minimum YTD average	24.0	10.0	2.6	7.0	2.6
	Maximum value reported	60.6	75.0	75.0	66.0	75.0
[Olefin] (vol%)	**Volume-weighted average**	13.6	11.9	7.9	9.1	10.0
	Maximum YTD average	16.6	14.5	12.0	15.7	16.6
	Minimum YTD average	6.1	8.7	1.1	1.1	1.1
	Maximum value reported	22.0	30.4	43.8	24.9	43.8
[Aromatics] (vol%)	**Volume-weighted average**	25.0	23.3	28.3	23.6	24.8
	Maximum YTD average	32.9	23.9	32.8	33.2	33.2
	Minimum YTD average	20.0	20.8	26.5	17.5	17.5
	Maximum value reported	48.9	50.1	54.1	50.5	54.1
E200 (vol%)	**Volume-weighted average**	48.8	52.5	47.6	45.1	48.3
	Maximum YTD average	51.0	60.8	53.0	62.0	62.0
	Minimum YTD average	47.3	50.6	41.8	41.0	41.0
	Maximum value reported	64.0	81.2	68.6	70.0	81.2
E300 (vol%)	**Volume-weighted average**	87.2	88.6	81.2	83.8	84.9
	Maximum YTD average	89.0	93.4	93.0	90.0	93.4
	Minimum YTD average	85.5	84.5	72.0	78.9	72.0
	Maximum value reported	95.0	99.2	98.0	96.1	99.2
Vapour Pressure (kPa)	**Volume-weighted average**	85.5	78.8	63.8	77.9	75.1
	Maximum YTD average	87.8	86.5	79.3	83.3	87.8
	Minimum YTD average	82.0	60.6	48.4	54.5	48.4
	Maximum value reported	106.5	107.0	107.4	107.0	107.4
[Oxygen] (wt%)	**Volume-weighted average**	0.8	0.3	0.0	0.4	0.3
	Maximum YTD average	2.1	1.0	0.0	3.7	3.7
	Minimum YTD average	0.0	0.0	0.0	0.0	0.0
	Maximum value reported	3.9	3.7	0.0	3.8	3.9

Figure C.1a: Average, Maximum Average and Maximum Value for Benzene Concentration in Canadian Gasoline (2010)

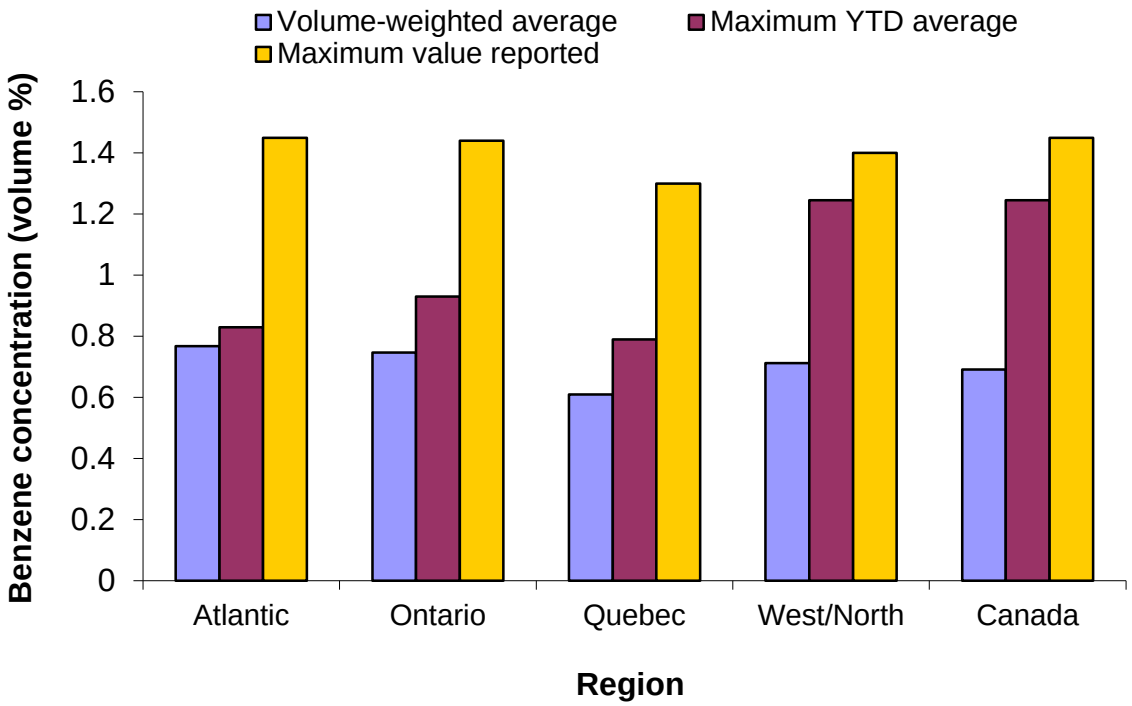


Figure C.1b: Average, Maximum Average and Maximum Value for Benzene Concentration in Canadian Gasoline (2011)

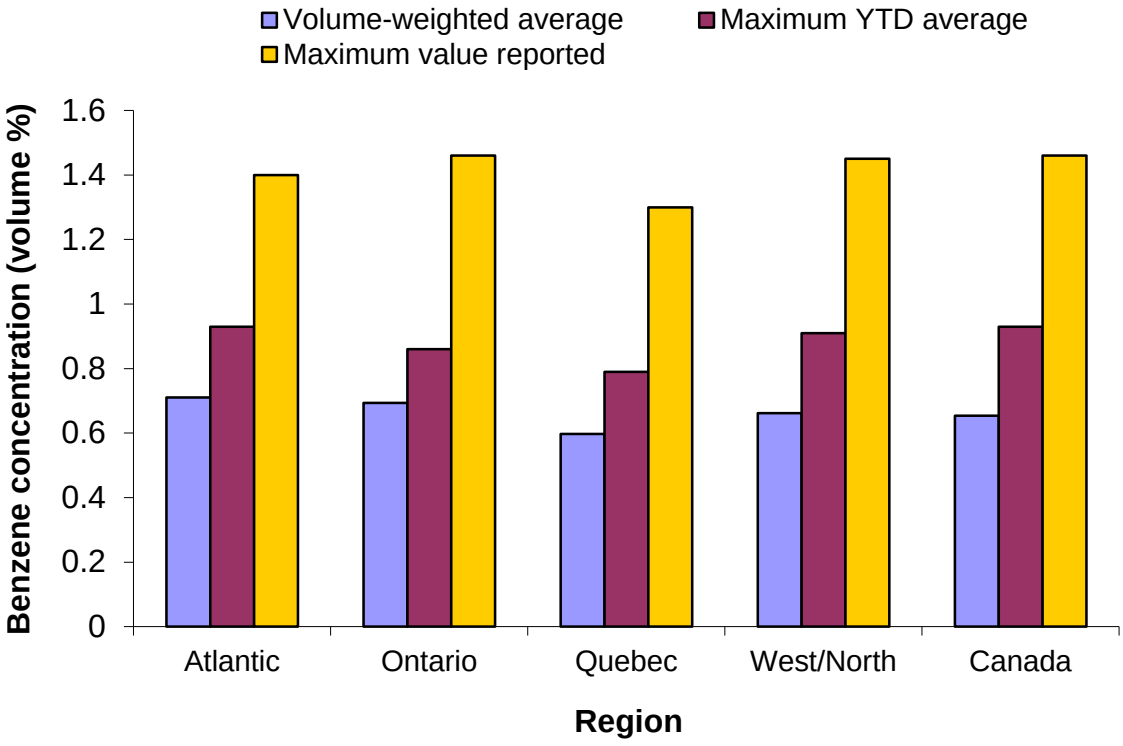


Figure C.1c: Average, Maximum Average and Maximum Value for Benzene Concentration in Canadian Gasoline (2012)

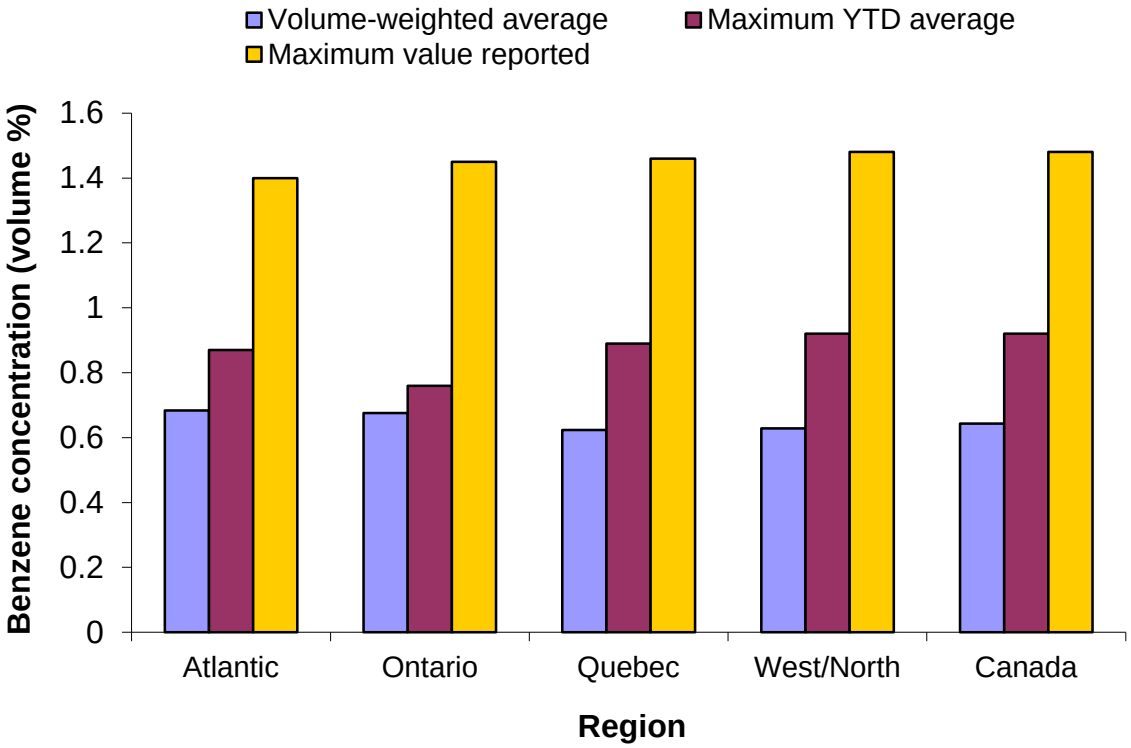


Figure C.2a: Average, Maximum Average and Maximum Value for BEN of Canadian Gasoline (2010)

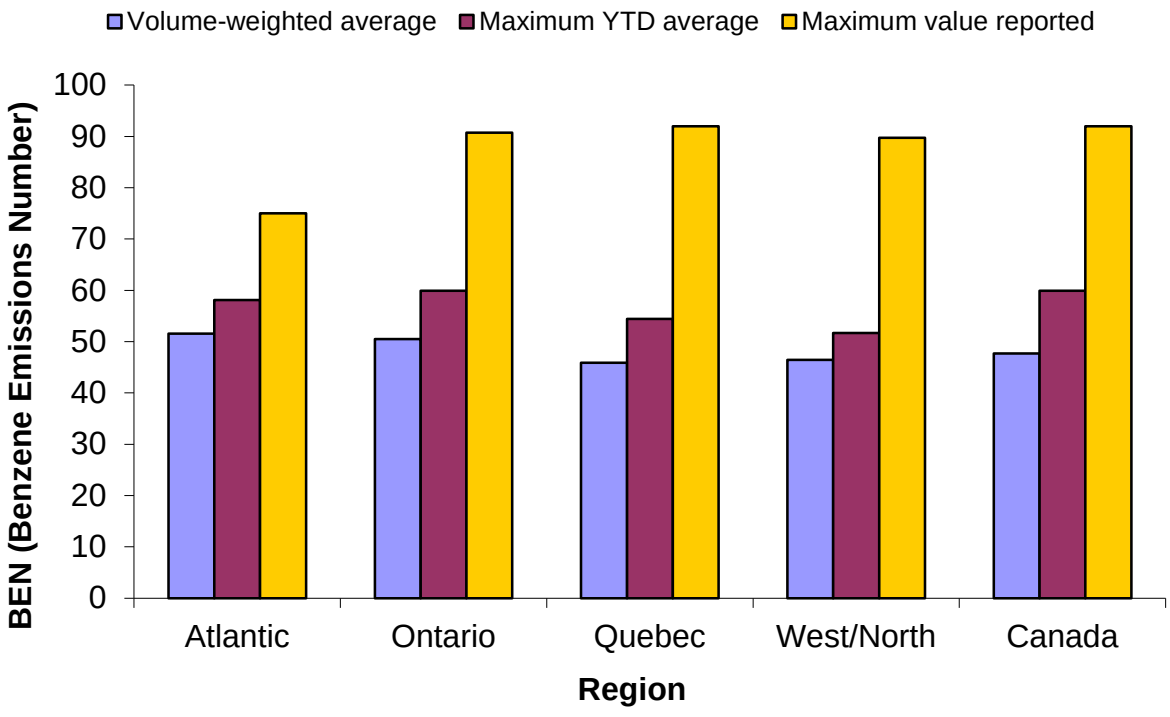


Figure C.2b: Average, Maximum Average and Maximum Value for BEN of Canadian Gasoline (2011)

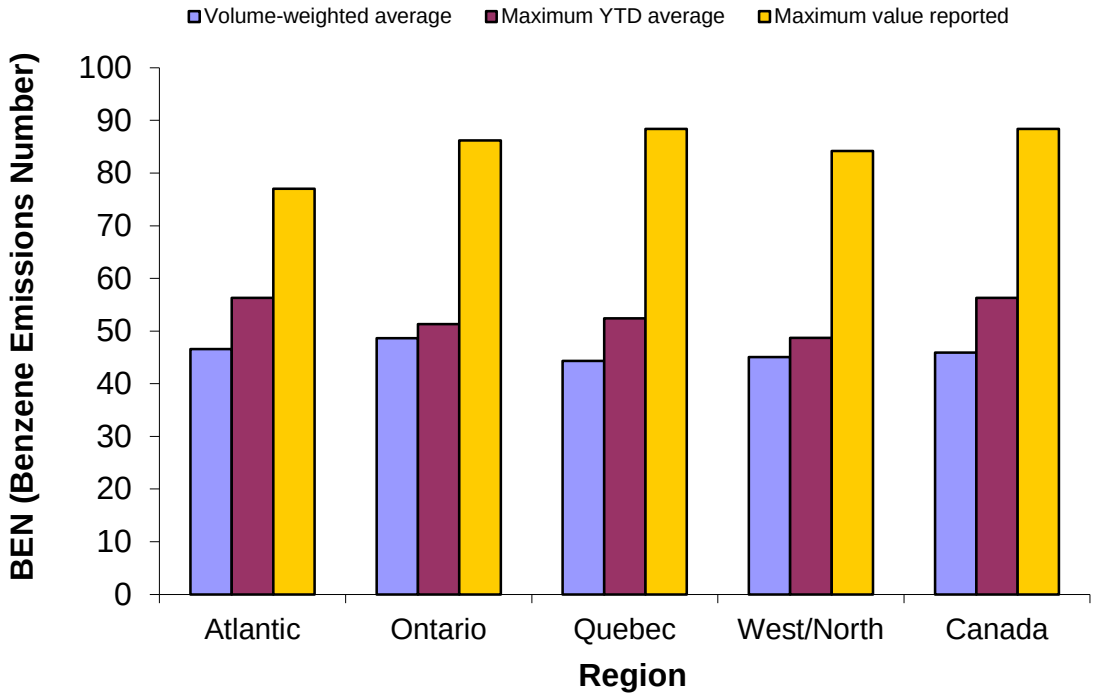


Figure C.2c: Average, Maximum Average and Maximum Value for BEN of Canadian Gasoline (2012)

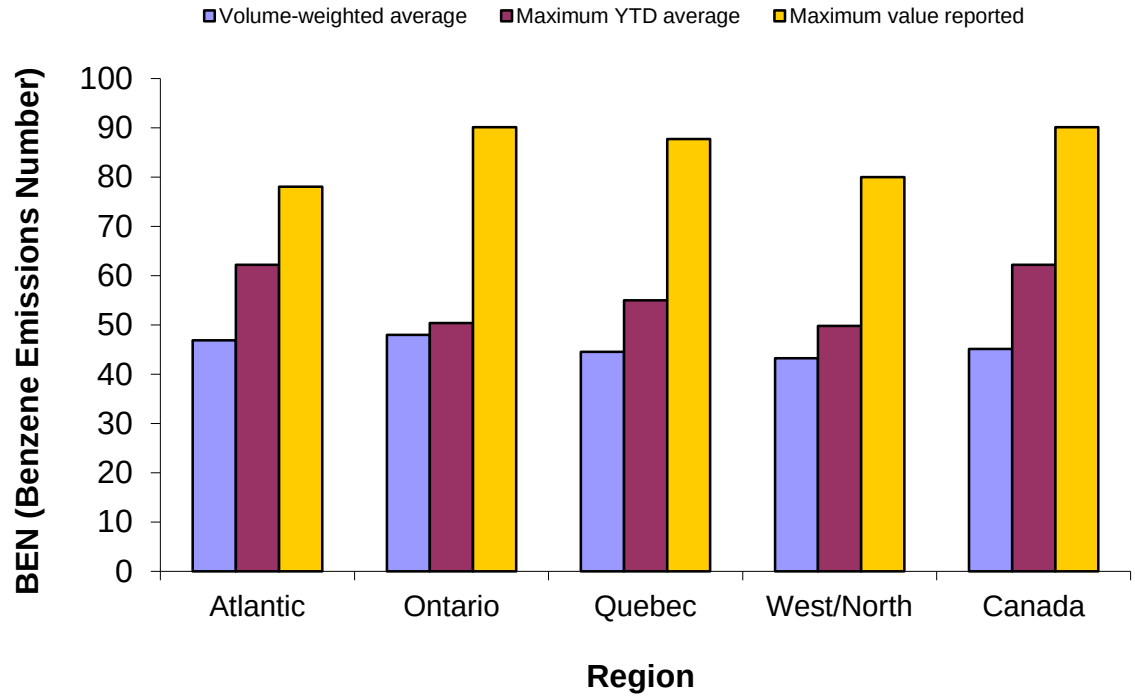


Figure C.3a: Average, Maximum Average and Maximum Value for Sulphur Concentration of Canadian Gasoline (2010)

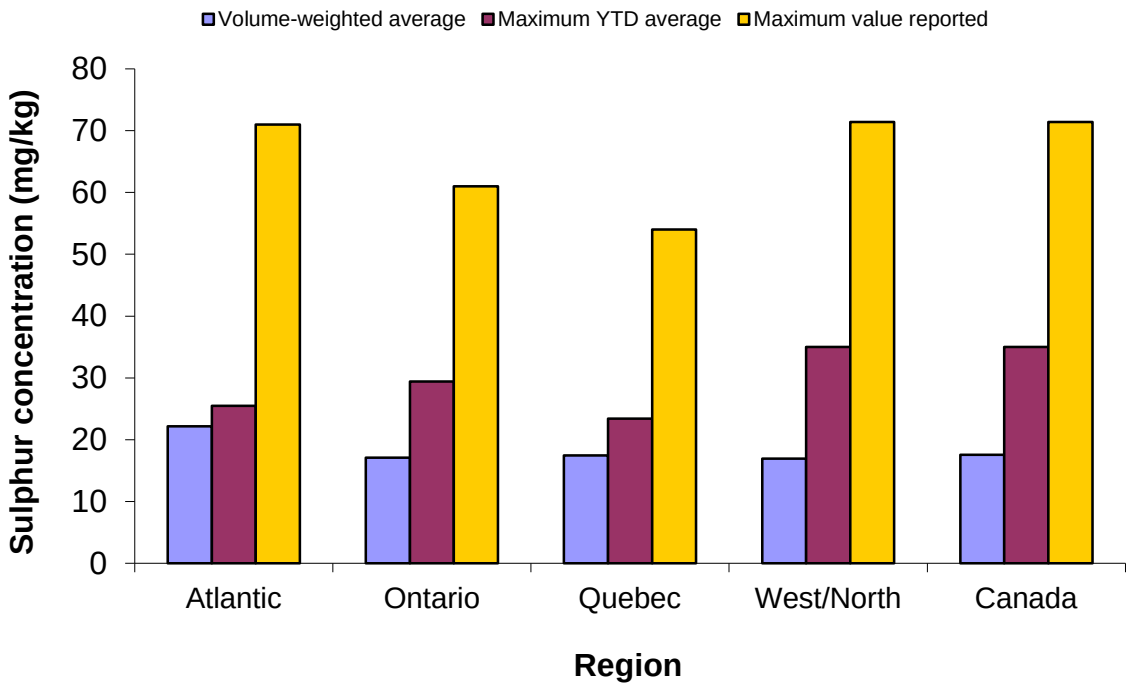


Figure C.3b: Average, Maximum Average and Maximum Value for Sulphur Concentration of Canadian Gasoline (2011)

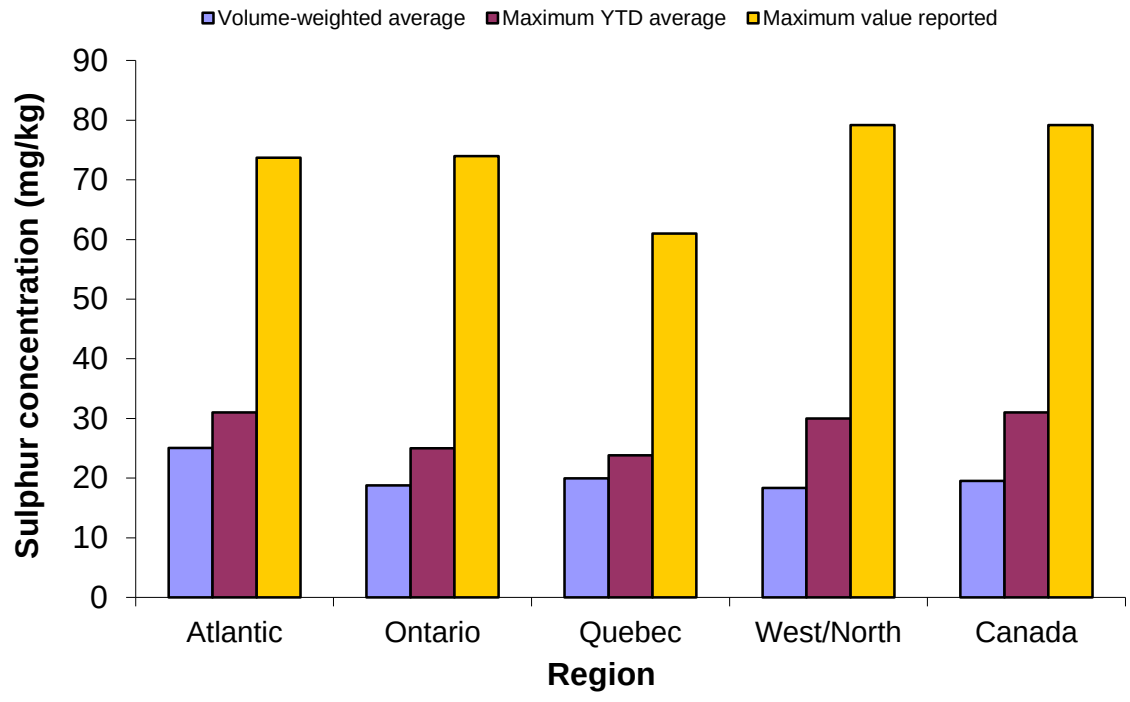


Figure C.3c: Average, Maximum Average and Maximum Value for Sulphur Concentration of Canadian Gasoline (2012)

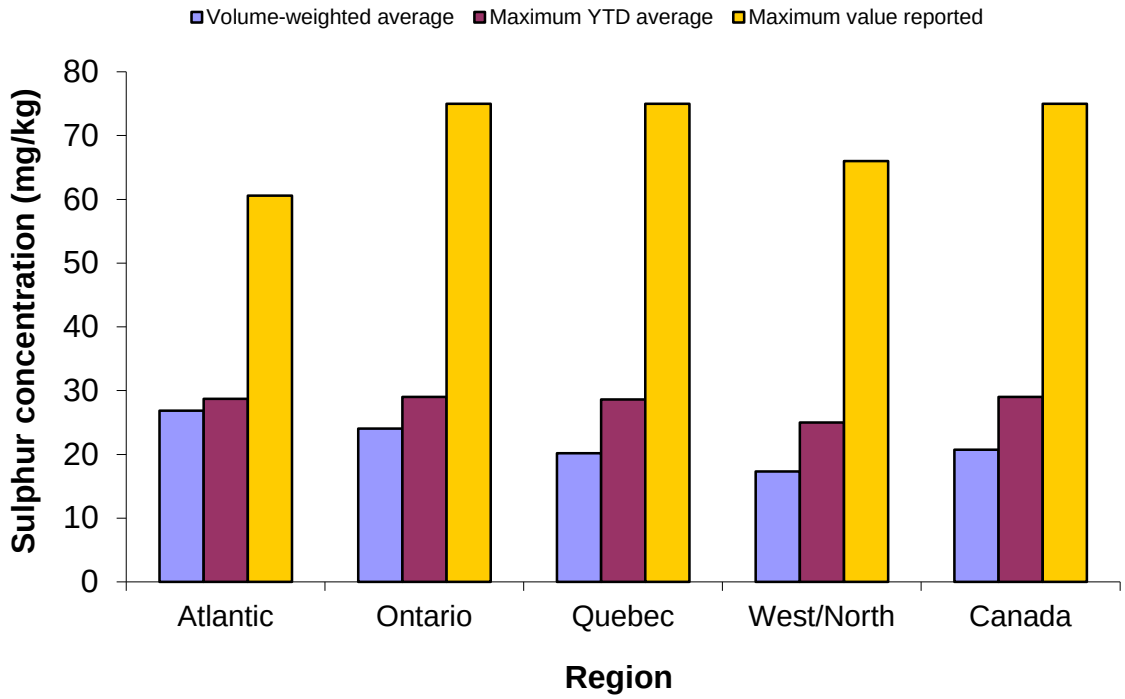


Figure C.4a: Average, Maximum Average and Maximum Value for Olefin Concentration of Canadian Gasoline (2010)

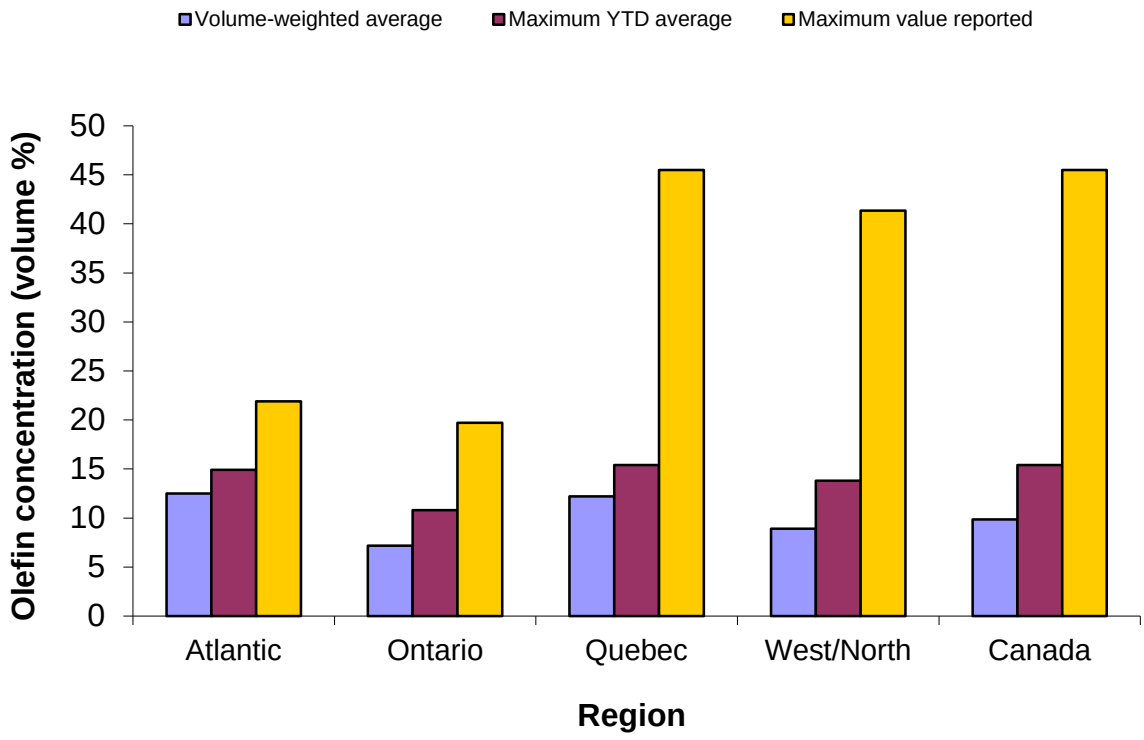


Figure C.4b: Average, Maximum Average and Maximum Value for Olefin Concentration of Canadian Gasoline (2011)

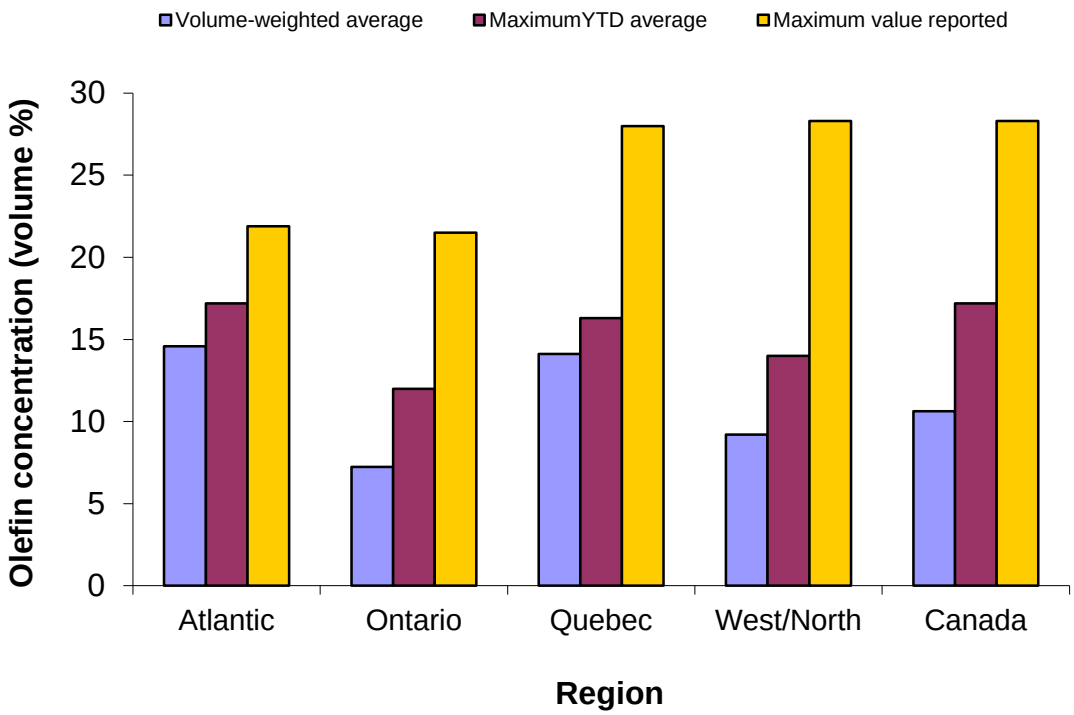


Figure C.4c: Average, Maximum Average and Maximum Value for Olefin Concentration of Canadian Gasoline (2012)

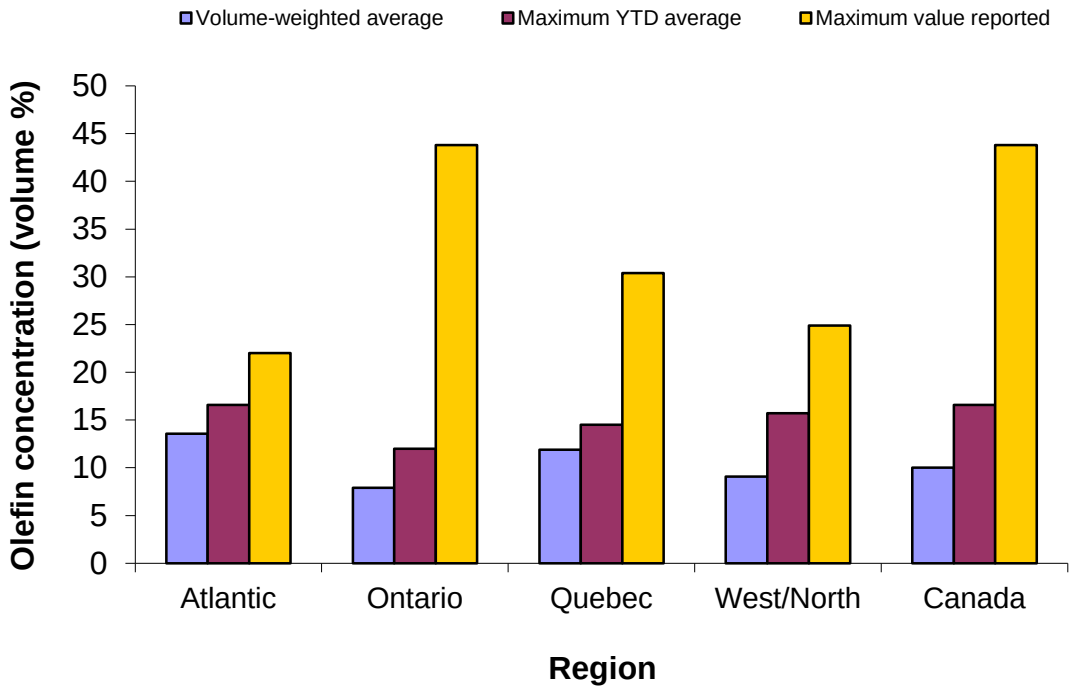


Figure C.5a: Average, Maximum Average and Maximum Value for Aromatics Concentration of Canadian Gasoline (2010)

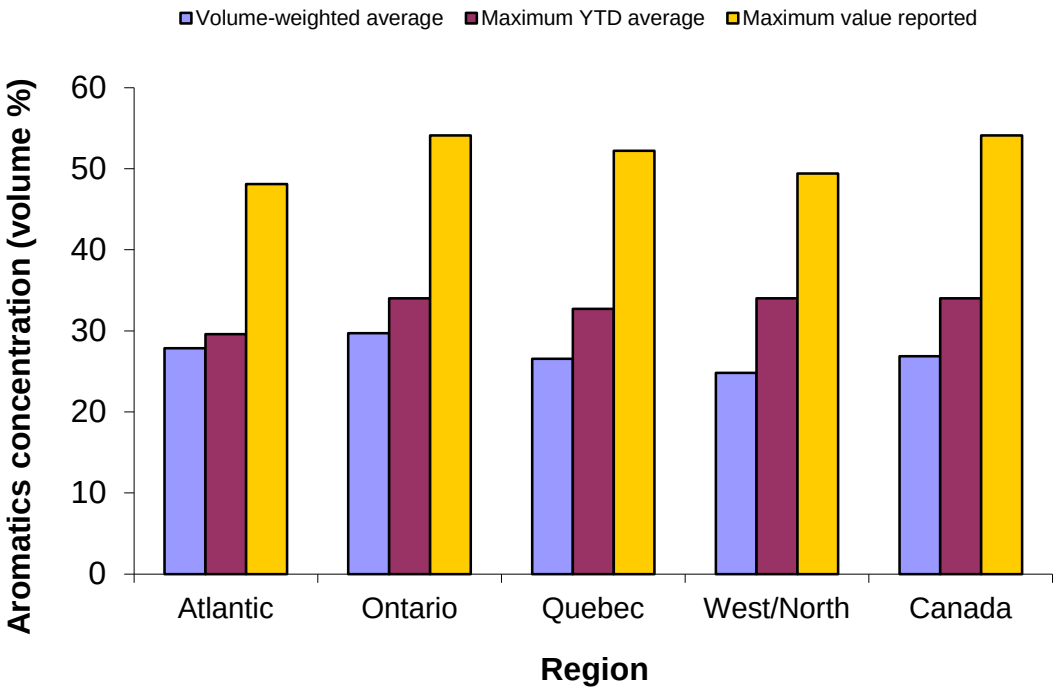


Figure C.5b: Average, Maximum Average and Maximum Value for Aromatics Concentration of Canadian Gasoline (2011)

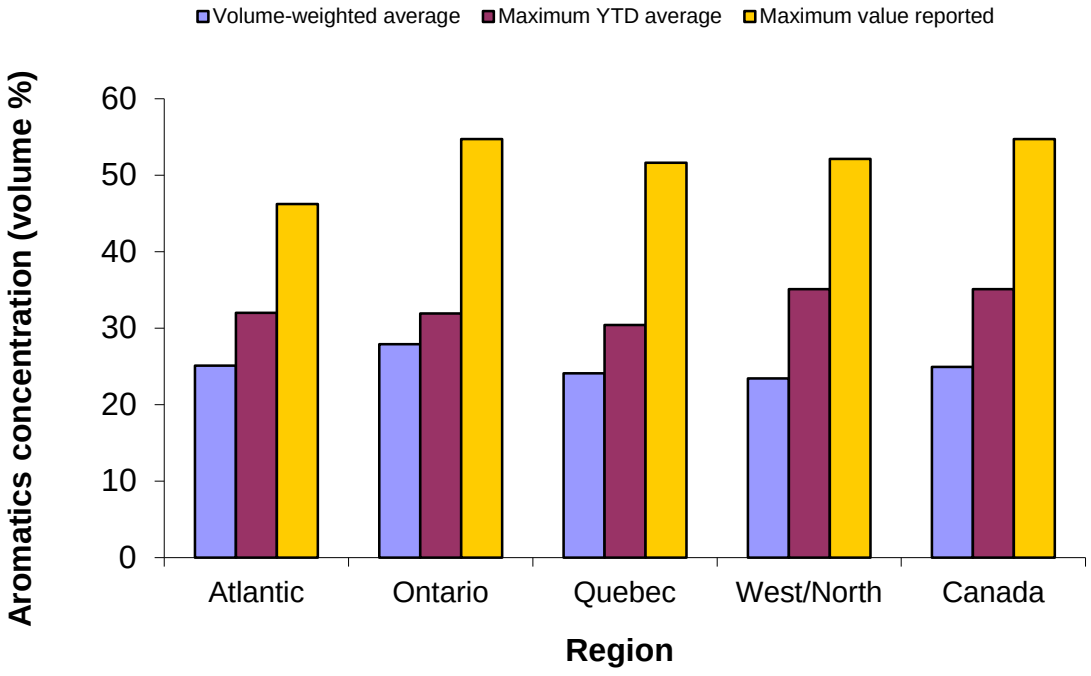


Figure C.5c: Average, Maximum Average and Maximum Value for Aromatics Concentration of Canadian Gasoline (2012)

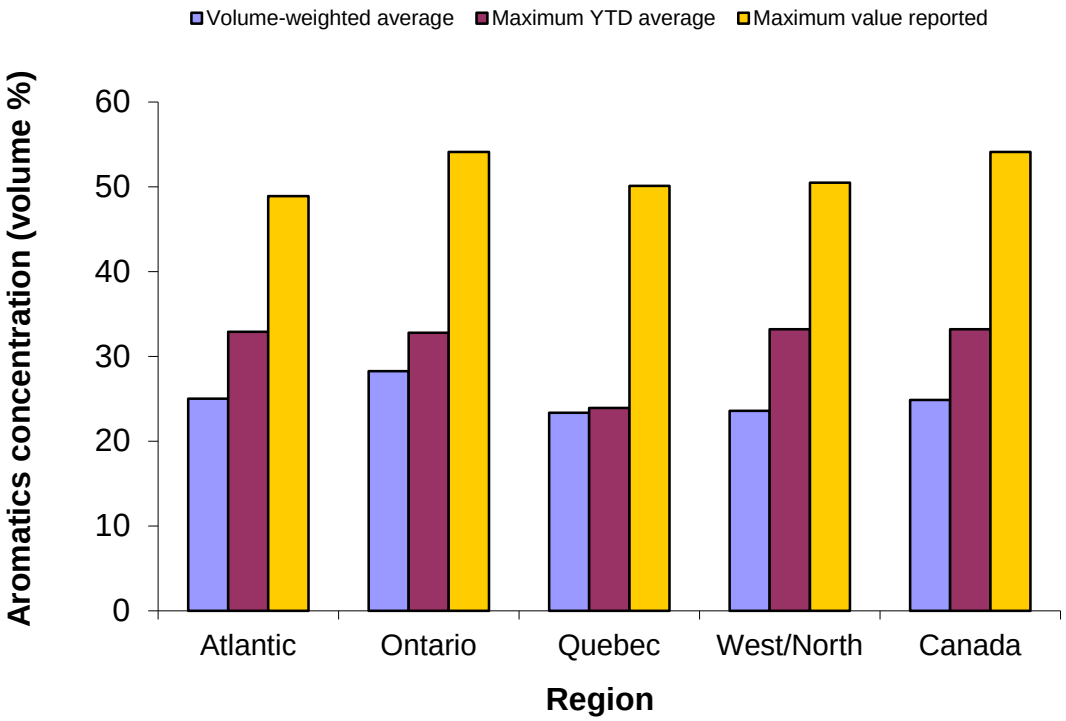


Figure C.6a: Average, Maximum Average and Maximum Value for Vapour Pressure of Canadian Gasoline (2010)

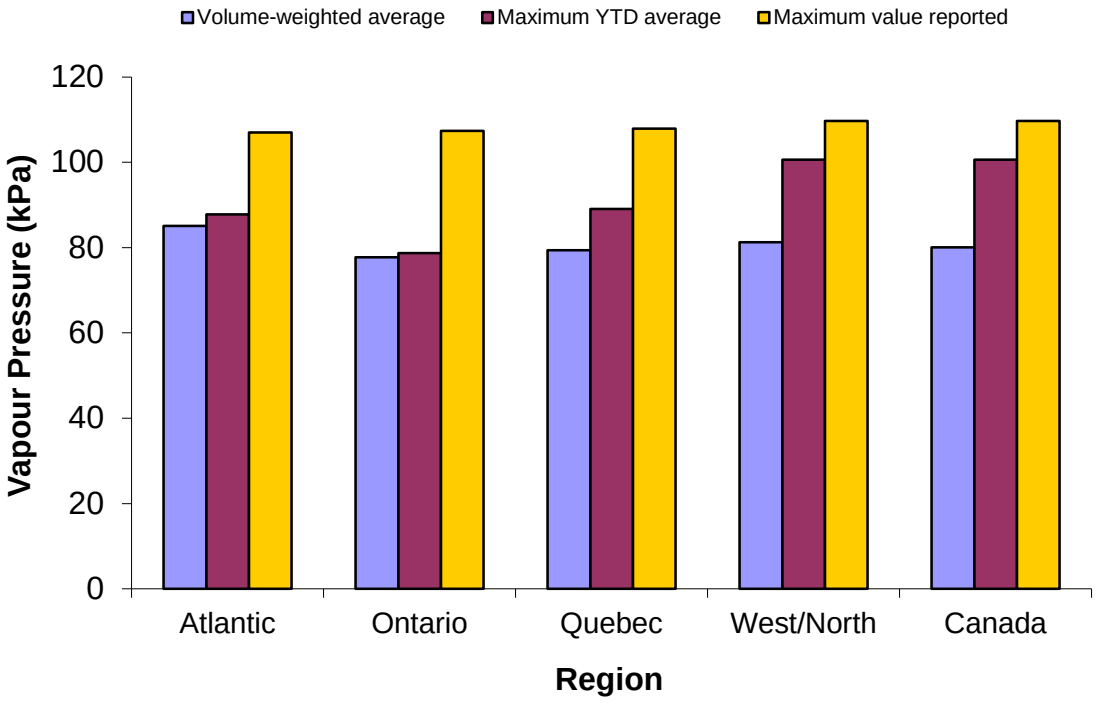


Figure C.6b: Average, Maximum Average and Maximum Value for Vapour Pressure of Canadian Gasoline (2011)

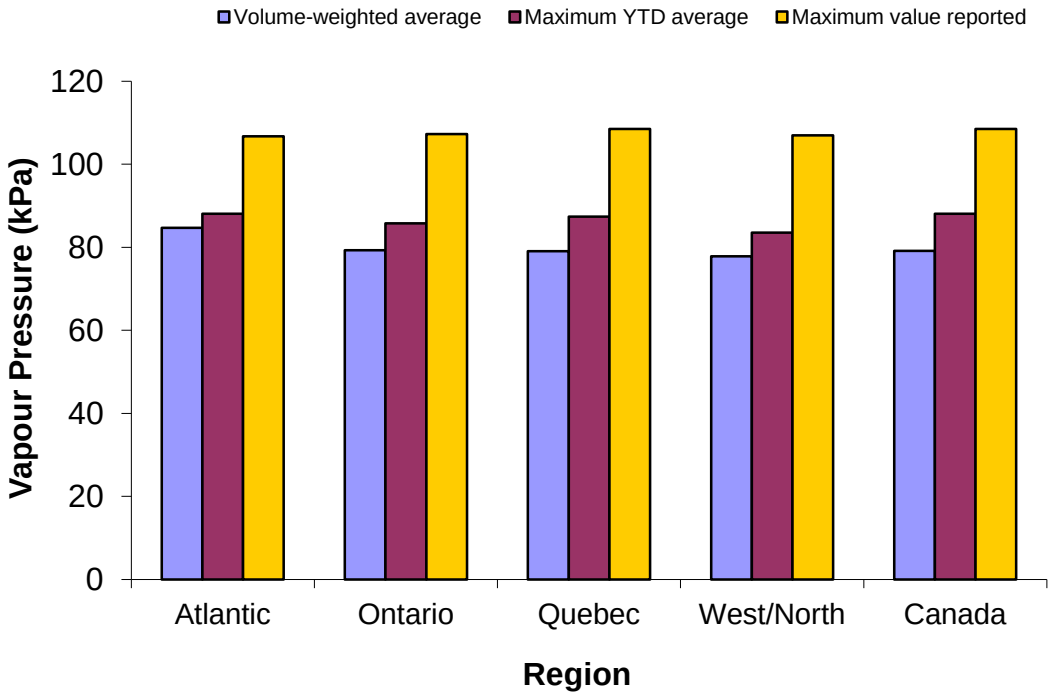


Figure C.6c: Average, Maximum Average and Maximum Value for Vapour Pressure of Canadian Gasoline (2012)

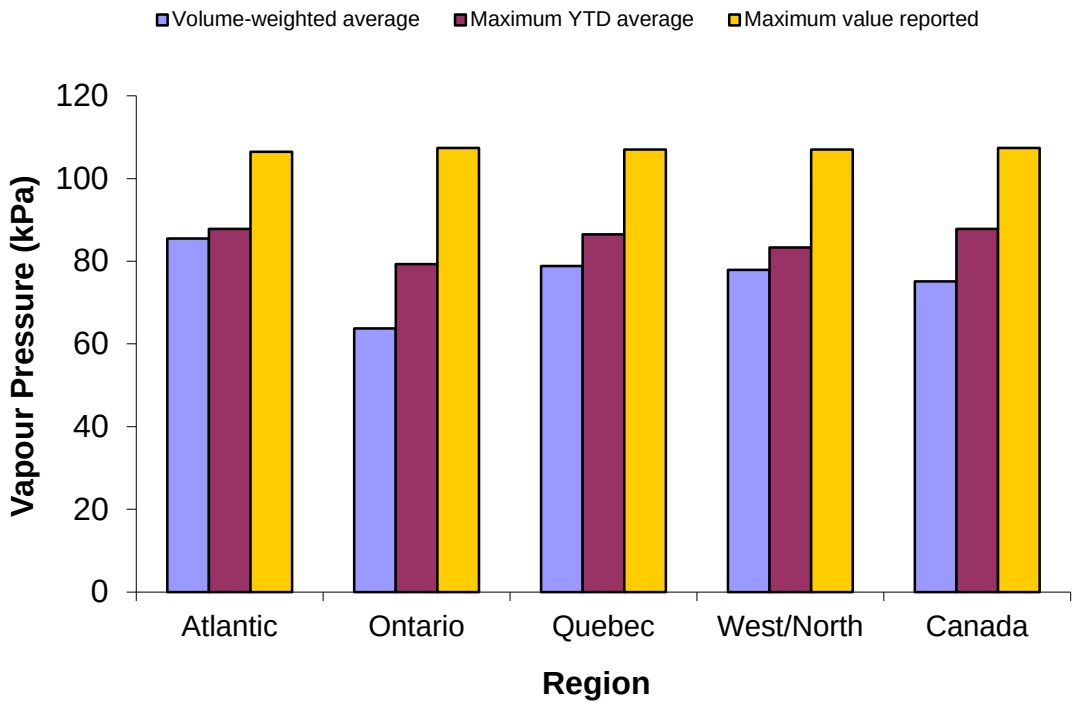


Figure C.7a: Average, Maximum Average and Maximum Value for Average E200 of Canadian Gasoline (2010)

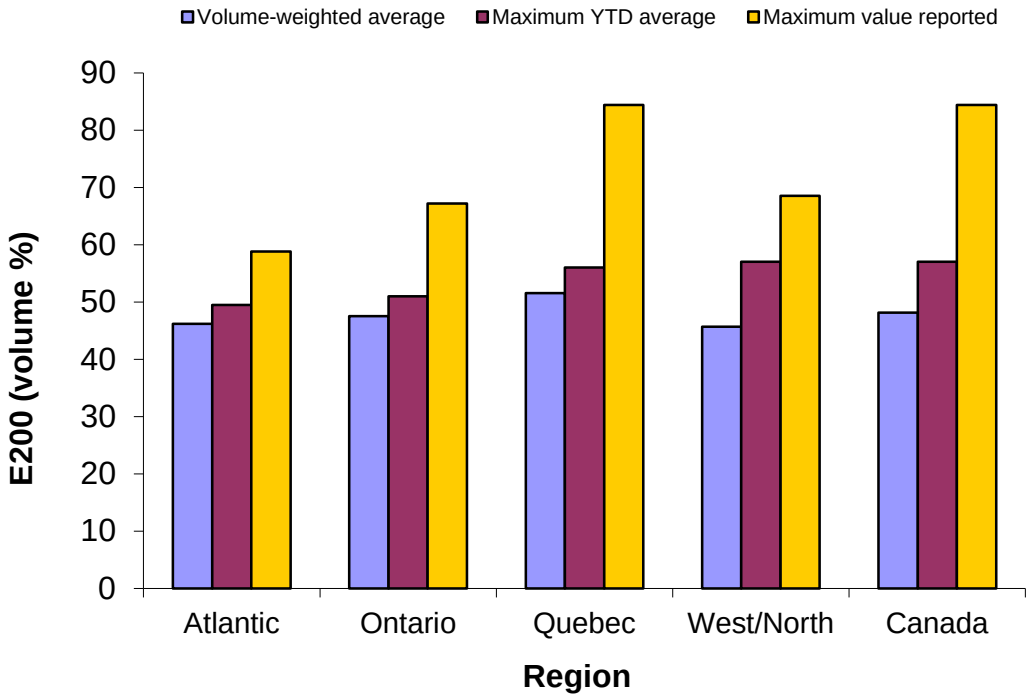


Figure C.7b: Average, Maximum Average and Maximum Value for Average E200 of Canadian Gasoline (2011)

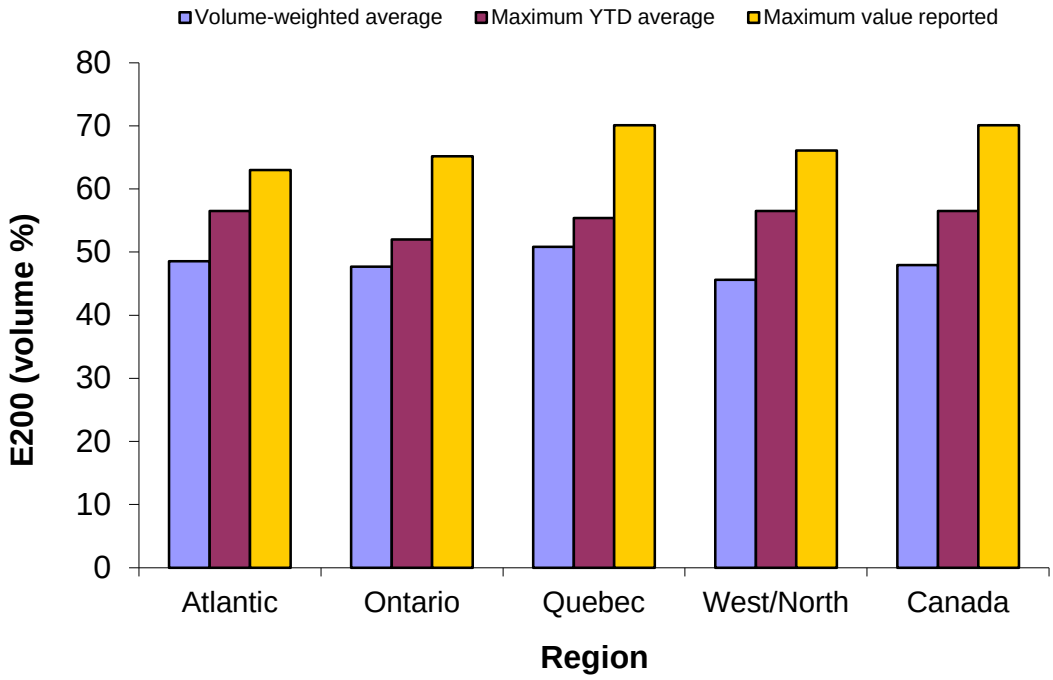


Figure C.7c: Average, Maximum Average and Maximum Value for Average E200 of Canadian Gasoline (2012)

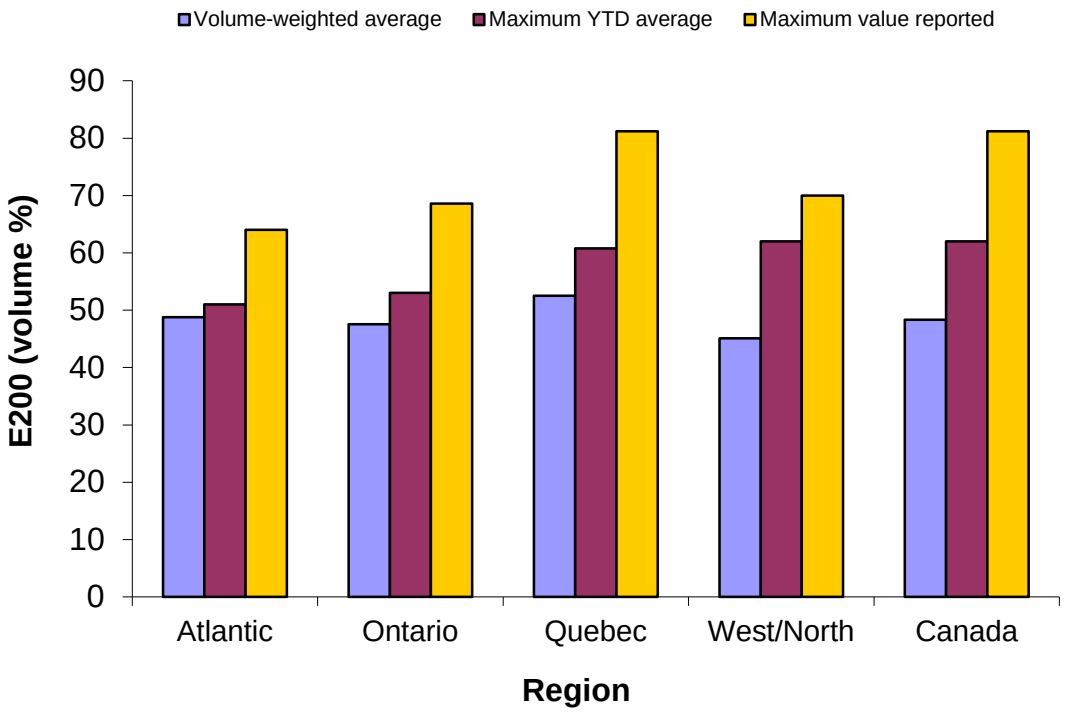


Figure C.8a Average, Maximum Average and Maximum Value for Average E300 of Canadian Gasoline (2010)

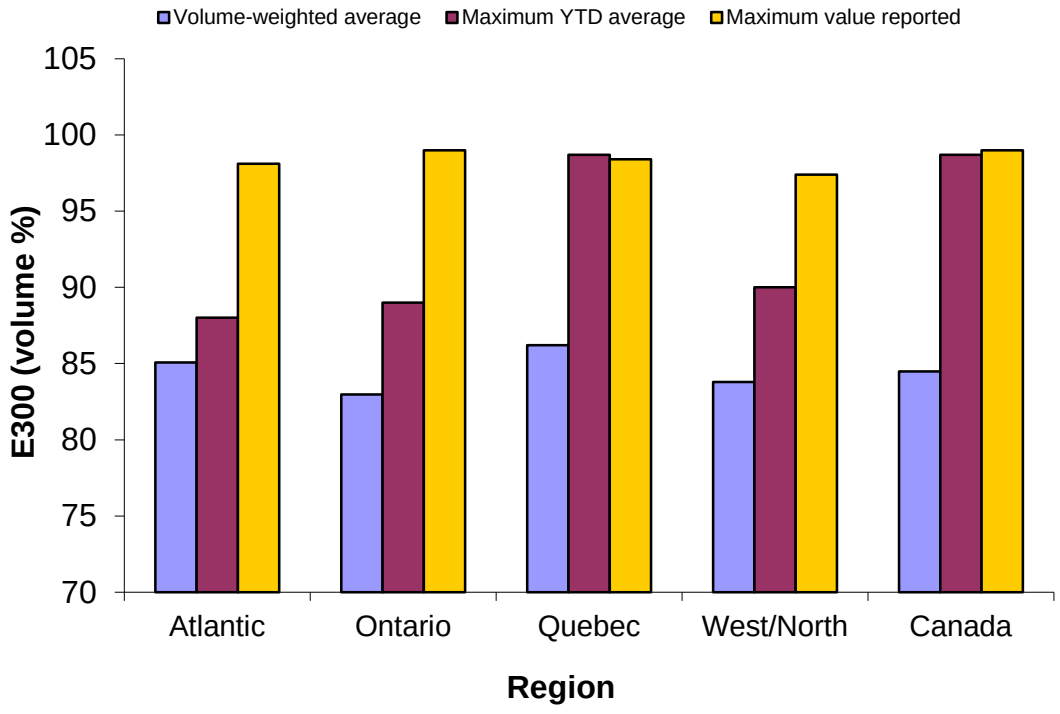


Figure C.8b: Average, Maximum Average and Maximum Value for Average E300 of Canadian Gasoline (2011)

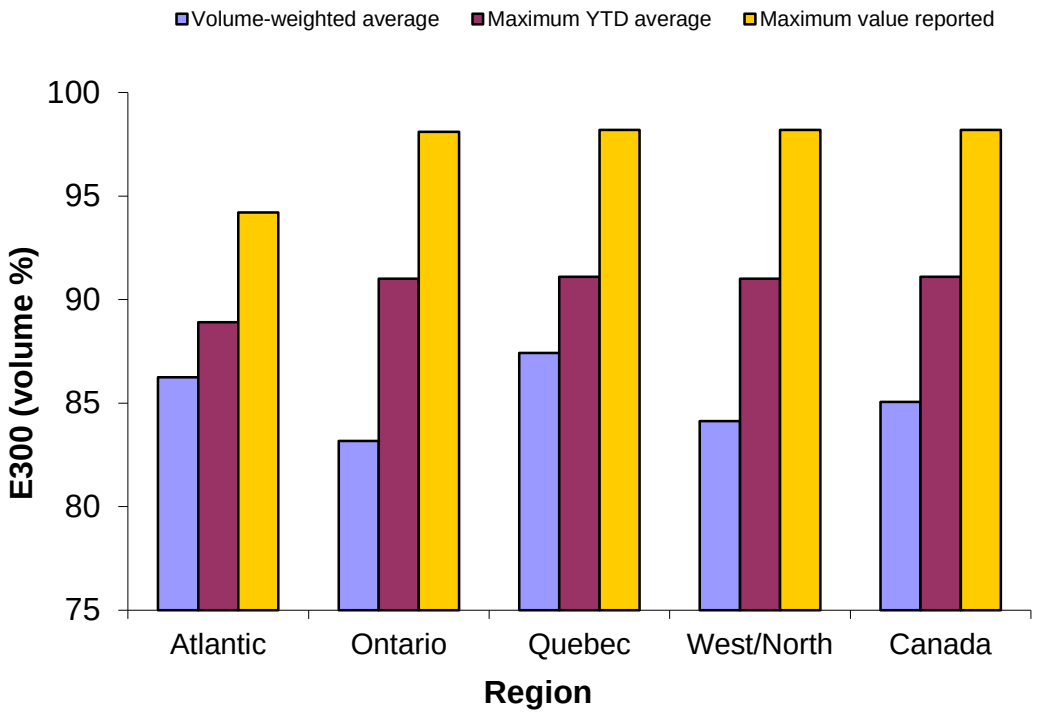


Figure C.8c: Average, Maximum Average and Maximum Value for Average E300 of Canadian Gasoline (2012)

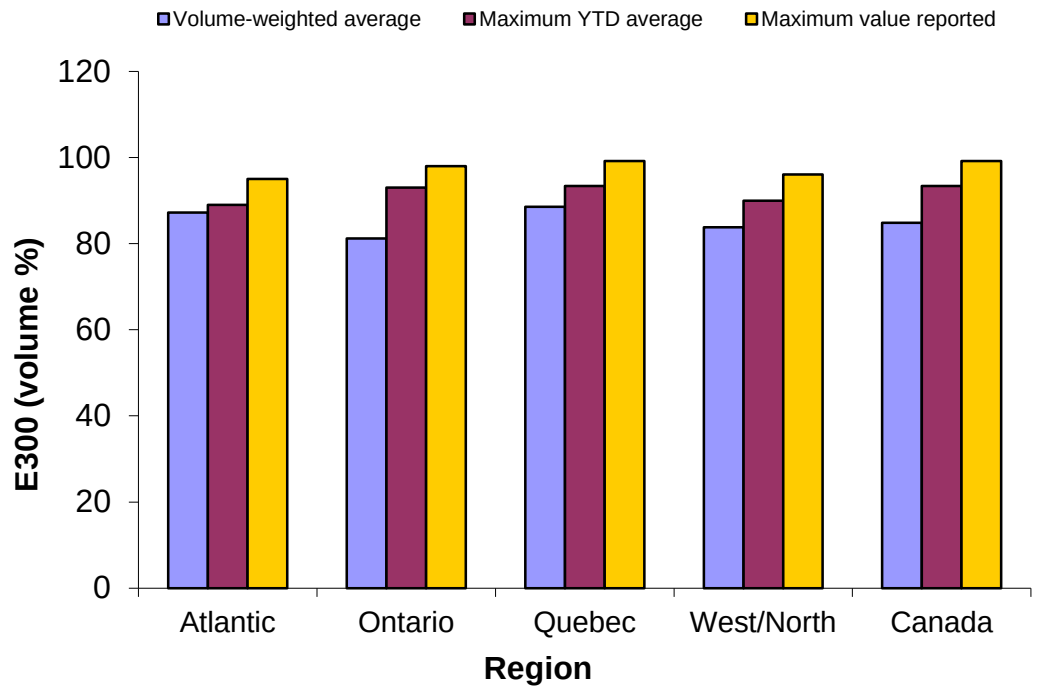


Figure C.9a: Average, Maximum Average and Maximum Value for Average Oxygen Concentration of Canadian Gasoline (2010)

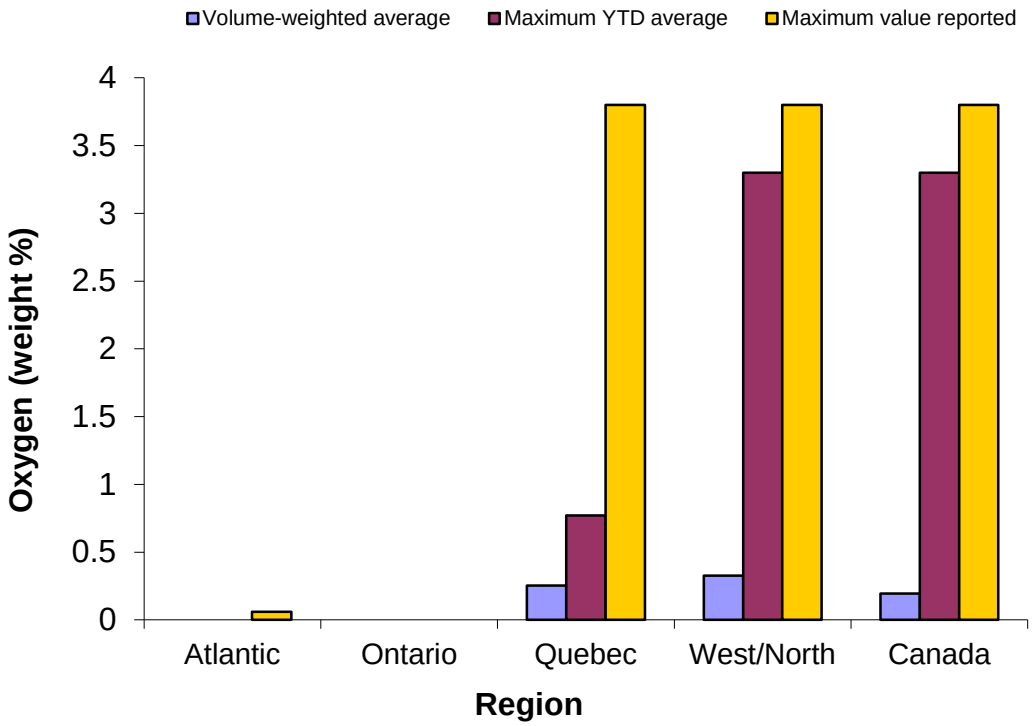


Figure C.9b: Average, Maximum Average and Maximum Value for Average Oxygen Concentration of Canadian Gasoline (2011)

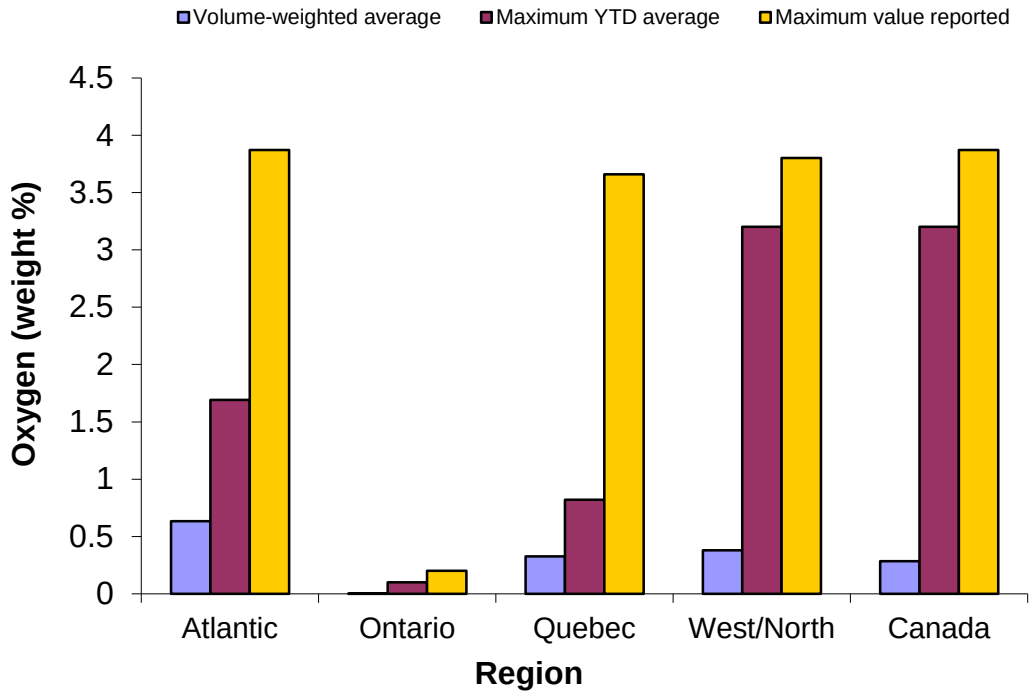
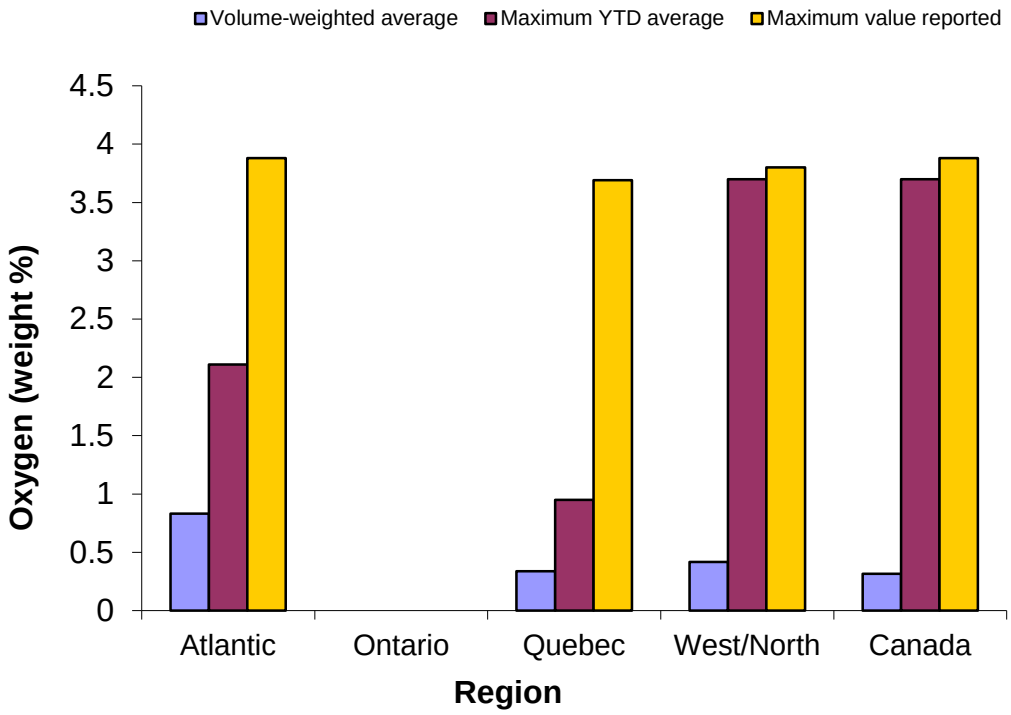


Figure C.9c: Average, Maximum Average and Maximum Value for Average Oxygen Concentration of Canadian Gasoline (2012)



Appendix D: Company Reported Data

Table D.1a: Averages and Maxima Reported for Gasoline Parameters (2010)

		[Benzene] (%vol)		BEN		[Aromatics] (% vol)		[Olefins] (%vol)	
Name	**Province**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
AFD Petroleum	YT	0.97	0.97	51.0	51.0	17.6	17.6	9.2	9.2
CCRL	SK	0.88	1.29	47.9	65.7	25.3	32.6	9.1	12.8
Chevron Burnaby Refinery	BC	0.59	1.40	44.3	65.8	24.4	45.0	10.6	32.2
Honda of Canada Mfg.	ON	0.33	0.33	59.9	60.9	34.0	34.8	0.07	0.07
Husky Oil – Prince George	BC	0.78	1.20	35.1	52.2	18.1	27.7	13.8	21.2
IOL – BC Imports	BC	0.70	0.91	41.0	48.0	31.7	43.2	7.1	15.5
IOL – Dartmouth	NS	0.83	1.45	52.0	75.0	28.3	48.1	14.9	21.9
IOL – Sarnia	ON	0.32	0.56	47.6	62.9	32.5	40.9	2.6	10.5
IOL – Nanticoke	ON	0.93	1.41	52.0	73.0	29.7	45.5	8.9	19.7
IOL – Strathcona	AB	0.76	1.30	46.0	67.0	22.5	38.7	10.2	16.8
Irving Oil Commercial	QC	0.68	0.76	38.5	41.3	27.0	31.0	10.0	11.0
Irving Oil Refining	NB	0.72	1.20	49.8	68.7	27.0	37.0	10.0	18.0
Larry Penner	MB	1.25	1.25	43.5	43.5	26.7	26.7	12.3	12.3
North Atlantic	NL	0.50	0.80	58.1	74.6	29.6	44.1	6.8	20.9
les Produits Pétroliers Norcan	QC	0.58	0.99	41.4	92.0	20.1	39.5	15.4	45.5
SCL – QC Imports	QC	0.65	0.74	54.4	66.0	24.1	36.1	0.8	22.0
SCL – BC Imports	BC	0.55	0.59	46.3	46.4	14.6	16.1	7.2	8.2
SCL – Montréal	QC	0.57	1.11	48.9	64.6	32.7	48.8	8.5	22.8
SCL – Corunna	ON	0.58	0.80	51.0	90.7	32.2	54.1	10.8	17.3
SCL – Scotford	AB	0.62	1.33	51.7	89.7	34.0	49.4	0.9	2.7
STC – QC Imports	QC	0.63	0.93	48.1	75.0	25.7	41.7	13.0	23.5
STC – ON Imports	ON	0.74	0.79	41.5	50.0	32.9	43.7	10.1	11.9
STC – BC Imports	BC	0.58	0.78	45.6	51.0	16.9	28.9	12.0	15.0
SEI – Burrard	BC	0.67	0.91	46.4	65.0	26.7	44.4	9.6	25.7
SEPP – Sarnia	ON	0.79	1.44	49.2	83.3	25.9	44.6	3.9	16.9
SEI – Edmonton	AB	0.65	1.10	45.0	61.5	21.9	34.3	10.7	41.4
SEI – Montréal	QC	0.70	1.30	44.1	78.7	25.8	45.7	13.0	28.4
Ultramar Limitée – Montréal	QC	0.79	1.28	47.7	71.0	25.0	42.9	11.7	26.1
Ultramar Limitée – Jean-Gaulin	QC	0.49	1.07	46.2	84.5	25.9	52.2	13.0	27.1
WPC – MB Imports	MB	0.63	0.80	46.0	51.8	31.2	34.2	9.2	11.8
WPC – SK Imports	SK	0.67	0.93	43.4	54.5	32.5	36.2	8.6	15.0
WPC – ON Imports	ON	0.85	0.93	44.6	54.5	31.3	35.0	9.6	15.0

Table D.1a *continued*

		[Sulphur] (mg/kg)		[Oxygen] (%wt)		Vapour Pressure (kPa)		E200 (% vol)		E300 (% vol)	
Name	**Province**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
AFD Petroleum	YT	21.5	21.5	0.0	0.0	100.6	100.6	48.9	48.9	87.3	87.3
CCRL	SK	15.7	43.0	1.61	3.8	81.1	105.9	46.4	58.2	80.6	87.8
Chevron Burnaby Refinery	BC	20.0	71.4	0.0	0.0	75.5	106.8	47.0	68.5	86.0	95.0
Honda of Canada Mfg.	ON	29.4	31.0	0.0	0.0	61.1	62.8	40.5	40.5	86.3	86.9
Husky Oil – Prince George	BC	8.0	21.0	3.3	3.8	78.0	95.0	57.0	64.0	90.0	93.0
IOL – BC Imports	BC	14.0	28.0	0.0	0.0	55.3	69.9	37.5	41.8	80.7	87.4
IOL – Dartmouth	NS	25.5	71.0	0.0	0.0	87.8	106.0	46.7	58.2	84.8	92.0
IOL – Sarnia	ON	3.1	10.2	0.0	0.0	76.0	106.0	51.0	65.0	89.0	96.0
IOL – Nanticoke	ON	15.0	39.0	0.0	0.0	78.3	106.3	47.9	67.2	81.7	92.9
IOL – Strathcona	AB	19.0	33.0	0.0	0.0	84.8	106.8	43.8	58.5	84.6	94.1
Irving Oil Commercial	QC	8.0	10.0	0.01	0.01	59.0	61.0	46.0	50.0	88.0	90.0
Irving Oil Refining	NB	19.0	45.0	0.0	0.06	81.6	105.6	45.0	58.0	85.0	94.0
Larry Penner	MB	35.0	35.0	0.15	0.15	60.3	60.3	41.2	41.2	83.6	83.6
North Atlantic	NL	12.5	35.1	0.0	0.0	82.9	107.0	49.5	58.8	88.0	98.1
les Produits Pétroliers Norcan	QC	15.0	54.0	0.03	1.7	73.8	101.3	55.1	84.4	86.0	96.0
SCL – QC Imports	QC	10.0	11.0	0.0	0.0	89.1	102.8	51.1	54.0	98.7	92.6
SCL – BC Imports	BC	24.0	24.0	0.0	0.0	96.4	98.7	42.9	43.6	89.2	91.1
SCL – Montréal	QC	14.0	45.0	0.0	0.0	77.5	104.1	46.5	58.0	83.8	95.2
SCL – Corunna	ON	26.0	61.0	0.0	0.0	77.2	107.4	46.8	57.7	81.9	92.4
SCL – Scotford	AB	6.0	50.0	0.0	0.0	82.8	109.7	47.8	59.9	79.4	88.4
STC – QC Imports	QC	10.0	24.0	0.0	0.0	77.5	102.9	51.0	63.0	88.2	95.1
STC – ON Imports	ON	17.0	27.0	0.0	0.0	52.7	54.0	41.7	47.0	86.0	87.1
STC – BC Imports	BC	21.0	29.0	0.0	0.0	91.8	102.4	44.7	49.7	89.6	97.4
SEI – Burrard	BC	12.7	30.0	0.0	0.0	62.6	96.6	44.7	54.9	84.9	92.8
SEPP – Sarnia	ON	22.9	49.0	0.0	0.0	78.7	105.8	45.3	62.0	82.4	99.0
SEI – Edmonton	AB	22.0	54.0	0.0	0.0	83.4	106.0	45.3	52.9	86.1	92.5
SEI – Montréal	QC	23.4	51.4	0.8	3.8	78.0	107.9	49.6	63.7	82.9	95.1
Ultramar Limitée – Montréal	QC	16.8	46.0	0.0	0.0	71.7	101.0	51.1	68.6	88.9	98.4
Ultramar Limitée – Jean-Gaulin	QC	15.0	36.0	0.0	0.0	85.4	106.5	56.0	70.2	89.9	97.3
WPC – MB Imports	MB	22.8	28.0	0.0	0.0	77.6	89.7	44.7	45.0	79.9	80.1
WPC – SK Imports	SK	24.6	44.0	0.0	0.0	72.5	89.7	44.7	48.1	80.2	82.3
WPC – ON Imports	ON	28.7	44.0	0.0	0.0	75.3	89.7	44.6	46.1	80.0	81.4

Table D.1b: Averages and Maxima Reported for Gasoline Parameters (2011)

		[Benzene] (%vol)		BEN		[Aromatics] (% vol)		[Olefins] (%vol)	
Name	**Province**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
CCRL	SK	0.79	1.31	45.7	63.7	23.1	35.0	10.0	19.9
Chevron Burnaby Refinery	BC	0.58	1.40	43.6	66.0	23.0	43.9	12.7	28.3
Husky Oil – Prince George	BC	0.91	1.20	43.4	58.6	19.4	26.1	14.0	19.4
IOL – Point Tupper	NS	0.65	0.65	36.0	36.0	24.4	24.4	11.1	11.1
IOL – Oakville	ON	0.86	0.97	45.0	53.0	29.8	37.1	12.0	14.5
IOL – Burrard	BC	0.49	0.50	41.0	42.0	35.1	35.5	1.8	2.0
IOL – Charlottetown	PE	0.93	0.93	41.4	41.4	29.8	29.8	17.2	17.2
IOL - Dartmouth	NS	0.83	1.40	50.0	77.0	26.9	46.2	16.0	21.9
IOL – Sarnia	ON	0.34	0.86	48.4	65.4	31.9	42.3	1.8	14.7
IOL – Nanticoke	ON	0.84	1.46	49.0	72.0	26.3	54.7	8.9	19.5
IOL – Strathcona	AB	0.73	1.28	45.0	72.0	21.8	37.8	10.4	16.2
Irving Oil Commercial	NS	0.93	0.93	43.0	43.0	32.0	32.0	15.0	15.0
Irving Oil Refining	NB	0.54	1.10	40.0	60.0	22.0	30.0	13.0	20.0
MSCG – Terminals QC	QC	0.84	1.20	46.6	62.4	23.3	41.1	13.4	26.9
North Atlantic	NL	0.69	0.90	56.3	70.9	26.7	39.6	12.7	20.9
les Produits Pétroliers Norcan	QC	0.76	1.13	47.3	69.5	23.6	44.2	13.4	18.7
SCL – QC Imports	QC	0.79	1.15	52.4	82.0	30.4	45.4	12.6	18.3
SCL – ON Imports	ON	0.67	0.98	38.2	51.0	27.4	44.3	8.1	21.5
SCL – BC Imports	BC	0.66	0.94	43.2	61.6	22.7	40.0	9.4	15.8
SCL – Sarnia M.C.	ON	0.58	0.83	51.3	86.2	31.4	54.4	11.1	16.2
SCL – Scotford	AB	0.44	0.85	48.7	84.2	32.8	52.1	1.1	3.3
SEI – Burrard	BC	0.72	1.20	46.2	62.0	28.9	46.1	7.7	24.3
SEPP – Sarnia	ON	0.71	1.39	47.0	70.8	25.9	48.6	4.2	17.2
SEI – Edmonton	AB	0.62	1.09	43.4	60.6	19.9	31.8	10.0	17.2
SEI – Montréal	QC	0.60	1.30	40.8	67.2	23.1	43.4	13.3	28.0
Ultramar Limitée – Montréal	QC	0.70	1.15	41.1	52.4	19.4	35.9	11.4	21.0
Ultramar Limitée – Jean-Gaulin	QC	0.47	1.19	44.6	88.4	23.0	51.6	16.3	27.7
WPC – MB Imports	MN	0.60	0.60	36.2	36.2	28.3	28.3	12.3	12.3
WPC – SK Imports	SK	0.70	1.45	38.9	49.9	29.6	35.6	10.3	14.2

Table D.1b *continued*

		[Sulphur] (mg/kg)		[Oxygen] (%wt)		Vapour Pressure (kPa)		E200 (% vol)		E300 (% vol)	
Name	**Province**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
CCRL	SK	18.3	51.0	2.33	3.78	83.5	106.9	46.1	59.0	80.5	91.7
Chevron Burnaby Refinery	BC	25.1	79.2	0.0	0.0	62.1	96.5	46.9	66.1	84.2	95.0
Husky Oil – Prince George	BC	9.9	31.7	3.2	3.8	78.6	96.5	56.5	66.0	90.0	95.0
IOL – Point Tupper	NS	31.0	31.0	0.0	0.0	50.9	50.9	56.5	56.5	88.9	88.9
IOL – Oakville	ON	25.0	32.0	0.0	0.0	62.9	70.8	45.7	49.7	85.2	86.8
IOL – Burrard	BC	7.4	8.0	0.0	0.0	47.6	50.8	44.8	48.3	88.4	89.0
IOL – Charlottetown	PE	13.0	13.0	0.0	0.0	59.9	59.9	48.4	48.4	82.8	82.8
IOL - Dartmouth	NS	27.3	73.7	0.0	0.0	88.1	106.1	47.6	60.4	85.5	93.7
IOL – Sarnia	ON	3.6	33.4	0.0	0.0	76.0	107.0	52.0	61.0	91.0	96.0
IOL – Nanticoke	ON	22.0	74.0	0.0	0.0	80.0	106.5	49.3	65.2	82.9	98.1
IOL – Strathcona	AB	17.0	30.0	0.0	0.0	82.2	107.0	43.4	55.8	84.4	98.6
Irving Oil Commercial	NS	24.0	24.0	0.0	0.0	60.0	60.0	44.0	44.0	81.0	81.0
Irving Oil Refining	NB	24.0	45.0	1.69	3.87	81.6	106.3	49.0	63.0	87.0	93.0
MSCG – Terminals QC	QC	26.1	51.0	0.0	0.0	65.1	93.9	51.8	58.2	91.0	98.2
North Atlantic	NL	15.0	28.3	0.0	0.0	82.4	106.7	52.7	61.0	88.3	94.2
les Produits Pétroliers Norcan	QC	22.6	56.0	0.04	1.63	70.2	98.7	53.3	60.7	89.3	98.2
SCL – QC Imports	QC	17.0	51.0	0.1	0.1	73.4	105.1	41.1	60.8	84.5	96.8
SCL – ON Imports	ON	22.0	55.0	0.1	0.2	52.7	59.0	44.5	53.2	83.6	87.5
SCL – BC Imports	BC	26.0	40.0	0.1	0.4	67.0	102.0	41.1	52.8	86.9	91.5
SCL – Sarnia M.C.	ON	19.0	50.0	0.0	0.0	85.8	107.3	46.7	58.2	80.8	89.6
SCL – Scotford	AB	7.0	12.0	0.0	0.0	77.2	107.0	46.7	60.2	79.9	89.5
SEI – Burrard	BC	12.9	28.0	0.0	0.0	61.4	99.5	44.4	52.5	86.5	93.0
SEPP – Sarnia	ON	21.5	56.0	0.0	0.0	77.4	106.8	42.6	60.2	80.4	97.0
SEI – Edmonton	AB	25.0	57.0	0.0	0.0	79.3	105.5	46.4	54.4	87.3	93.8
SEI – Montréal	QC	23.8	61.0	0.82	3.66	76.7	108.5	50.9	66.3	84.5	96.9
Ultramar Limitée – Montréal	QC	16.7	51.0	0.0	0.0	66.3	94.3	50.8	61.1	91.1	94.8
Ultramar Limitée – Jean-Gaulin	QC	18.0	37.0	0.0	0.0	87.4	107.0	55.4	70.1	91.1	97.4
WPC – MN Imports	MN	30.0	30.0	0.0	0.0	60.2	60.2	43.8	43.8	79.8	79.8
WPC – SK Imports	SK	22.6	30.0	0.0	0.0	72.2	88.3	46.3	51.2	79.8	81.3

Table D.1c: Averages and Maxima Reported for Gasoline Parameters (2012)

		[Benzene] (%vol)		BEN		[Aromatics] (% vol)		[Olefins] (%vol)	
Name	**Province**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
CCRL	SK	0.92	1.48	42.8	74.1	24.2	43.7	9.8	17.5
Chevron Burnaby Refinery	BC	0.62	1.30	43.8	76.2	24.0	42.4	11.1	24.9
Husky Oil – Prince George	BC	0.80	1.06	22.1	42.1	17.5	19.9	15.7	19.6
IOL – Suncor Montreal	AB	0.87	0.87	55.0	55.0	22.3	22.3	9.3	9.3
IOL – Dartmouth	AB	0.87	1.40	52.0	78.0	27.6	48.9	16.6	22.0
IOL – Sarnia	AB	0.42	1.08	50.4	75.3	32.8	46.4	1.1	7.5
IOL – Nanticoke	AB	0.76	1.45	48.0	60.0	26.5	44.0	9.9	43.8
IOL – Strathcona	AB	0.56	1.23	43.0	68.0	22.5	46.5	9.9	20.9
Irving Oil Refining	NB	0.43	1.00	36.9	69.1	20.0	33.0	11.0	20.0
MSCG – Terminals QC	QC	0.79	1.15	46.1	57.0	23.6	41.4	11.1	15.9
North Atlantic	NL	0.70	1.13	62.2	72.9	32.9	41.8	6.1	20.9
les Produits Pétroliers Norcan	QC	0.70	1.10	44.6	70.1	20.8	41.4	8.7	15.3
SCL – QC Imports	AB	0.89	1.21	48.3	77.0	23.5	46.6	8.9	25.2
SCL – BC Imports	AB	0.62	0.91	43.9	80.0	23.5	44.5	8.1	24.9
SCL – Sarnia	AB	0.60	1.36	47.2	90.1	30.4	54.1	12.0	20.1
SCL – Scotford	AB	0.47	1.33	49.8	75.7	33.2	50.5	1.1	4.1
SEI – Burrard	AB	0.82	0.88	37.6	52.0	26.5	33.9	9.0	13.5
SEPP – Sarnia	ON	0.71	1.31	47.2	78.0	27.5	44.6	3.8	7.8
SEI – Edmonton	AB	0.59	0.92	41.9	55.3	19.0	31.5	10.7	16.5
SEI – Montréal	QC	0.59	1.46	41.1	76.4	23.3	46.2	11.5	21.1
Ultramar Limitée – Jean-Gaulin	QC	0.50	1.33	45.6	87.7	23.9	50.1	14.5	30.4
WPC – MB Imports	MB	0.83	0.96	41.1	65.3	31.9	34.6	11.0	14.7
WPC – SK Imports	SK	0.72	0.96	38.4	44.6	29.5	34.6	11.3	15.8
WPC – ON Imports	ON	0.68	0.81	37.6	40.3	28.4	31.7	11.6	14.5

Table D.1c *continued*

		[Sulphur] (mg/kg)		[Oxygen] (%wt)		Vapour Pressure (kPa)		E200 (% vol)		E300 (% vol)	
Name	**Province**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
CCRL	SK	19.4	34.0	2.24	3.79	81.6	106.7	47.6	56.2	80.8	90.7
Chevron Burnaby Refinery	BC	20.1	66.0	0.0	0.0	61.4	96.5	45.1	69.5	84.9	95.0
Husky Oil – Prince George	BC	11.0	24.0	3.7	3.8	78.0	95.0	62.0	70.0	90.0	95.0
IOL – Suncor Montreal	AB	10.0	10.0	0.0	0.0	60.6	60.6	60.8	60.8	93.4	93.4
IOL – Dartmouth	AB	28.7	60.6	0.0	0.0	87.8	106.3	47.3	60.4	86.1	93.7
IOL - Sarnia	AB	2.6	33.6	0.0	0.0	75.0	105.0	53.0	64.0	93.0	98.0
IOL – Nanticoke	AB	29.0	75.0	0.0	0.0	48.4	106.7	48.8	68.6	82.5	94.3
IOL – Strathcona	AB	15.0	50.0	0.0	0.0	83.3	106.5	41.0	56.6	83.2	93.9
Irving Oil Refining	NB	25.0	60.0	2.11	3.88	82.0	106.0	51.0	64.0	89.0	95.0
MSCG – Terminals QC	QC	26.3	72.0	0.0	0.0	73.2	102.2	51.4	57.8	88.7	97.0
North Atlantic	NL	24.0	40.0	0.0	0.0	87.3	106.5	47.9	55.7	85.5	93.6
les Produits Pétroliers Norcan	QC	28.6	75.0	0.002	0.04	68.1	95.1	50.6	60.1	86.6	95.7
SCL – QC Imports	AB	14.0	72.0	0.1	0.0	73.0	104.2	51.0	61.1	91.6	98.3
SCL – BC Imports	AB	25.0	40.0	0.1	0.1	71.3	102.2	46.6	63.0	86.5	96.1
SCL – Sarnia	AB	25.0	59.0	0.0	0.0	79.3	107.4	47.6	58.1	72.0	89.4
SCL – Scotford	AB	7.0	18.0	0.0	0.0	78.2	107.0	44.2	56.1	80.0	89.9
SEI – Burrard	AB	18.2	44.0	0.0	0.0	54.5	84.1	46.1	53.1	84.8	93.2
SEPP – Sarnia	ON	24.8	52.0	0.0	0.0	76.2	107.3	41.8	57.5	80.0	96.0
SEI – Edmonton	AB	23.0	36.0	0.0	0.0	79.4	107.0	47.0	57.4	87.3	93.5
SEI – Montréal	QC	25.6	56.0	0.95	3.69	76.6	106.9	50.9	81.2	84.5	97.0
Ultramar Limitée – Jean-Gaulin	QC	16.0	37.0	0.0	0.0	86.5	107.0	55.1	69.2	91.3	99.2
WPC – MB Imports	AB	17.9	27.0	0.0	0.0	60.3	77.4	47.6	50.2	78.9	80.1
WPC – SK Imports	AB	15.2	26.0	0.0	0.0	60.9	69.0	48.6	51.7	79.6	82.6
WPC – ON Imports	MB	16.9	26.0	0.0	0.0	64.1	69.0	49.5	51.7	80.4	82.6