

An Overview of Plastic Bottle Recycling in Canada

Prepared for
Environment and Plastics Industry Council (EPIC)

Submitted by
CM Consulting



Updated August 2004

The Environment and Plastics Industry Council (EPIC) is a Council of the Canadian Plastics Industry Association. Its members are plastic resin manufacturers, processors, converters and recyclers.

EPIC represents the Canadian plastics industry in promoting the responsible use and recovery of plastic resources. EPIC activities in Canada involve working in partnership with governments, NGO's, industry and other groups to increase the diversion of plastics from landfill.

EPIC has spearheaded many initiatives involving the development of 'best practices, computer models, guidelines, demonstrations, market development and research. EPIC's work is to promote environmentally and economically sustainable plastic recycling and an integrated approach to waste management involving all treatment options."

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Table of Contents

Executive Summary	4
Findings and Recommendations	5
Summary of Recovery Efforts in Canada	
PET Beverage Recycling	9
HDPE Beverage Recycling	10
PET and HDPE Recycling (non-beverage)	11
Motor Oil Bottle Recycling.....	12
Methodology, Data Sources and Scope	13
Additional Assumptions for Manitoba, Ontario and Quebec	14
Provincial Summaries.....	17
Plastic beverage bottle recovery	19
Non-beverage PET and HDPE bottle recovery in municipal curbside and voluntary depot collection systems.....	21
Milk jug recovery	23
Motor oil bottle recovery.....	25
Information Sources – Personal Contacts.....	27
Other Sources of Information.....	28
Appendix A – Population data 2002	29
Appendix B – Summary of per capita waste composition studies.....	30
Appendix C – Unit conversion data	31
Appendix D - By Province / By Material Plastic Bottle Recovery	33
Appendix E – Methodology and Data Sources.....	36

Executive Summary

Recovery and recycling of plastic bottles in Canada varies dramatically based on the province and the bottle type.

In 2002, of the 235,086 tonnes generated, approximately 84,709 tonnes or 36% of plastic bottle material was recovered and recycled, based on available data.

To date, deposit return systems for beverage containers are 2.3 times more effective than municipal curbside and voluntary depot programs. (75% deposit return versus 33% non-deposit return).

Non-deposit return recovery rates are significantly lower than those achieved in deposit return jurisdictions because incentives (like deposit refunds) do not exist for recycling. Also, "away-from-home" generation accounts for about 63% of all PET beverage containers. Recycling services in away-from-home locations (parks, beaches, commercial establishments, venues, events etc.) are very limited.

The weakest areas of plastic bottle recovery are from the residential sector for non-beverage bottles, like those used for detergents, cleaners, and food. In general, these bottles are collected through locally organized and financed municipal curbside and voluntary depot programs.

Residential recycling rates are also impacted by low recovery from multi-residential units (apartment buildings), where convenience, awareness and increasing participation are challenges. This is a growing sector.

Dedicated programs for the recovery of HDPE milk jugs operate in several provinces and the recovery rates vary from 38% to 63%.

Stewardship programs for the recovery of plastic motor oil bottles operate in four Canadian provinces and the recovery rates vary from 18% to 45%. Ontario and Quebec will be implementing similar used motor oil bottle stewardship programs soon.

Financing plastic bottle recovery in Canada varies by bottle type and collection system. In several cases, up-front consumer fees are used to generate revenue to off-set program costs. In some provinces, excess generated revenue is also used to subsidize other provincial environmental programs. Ontario's new Blue Box Program charges brandowners material-based levies, which are used to finance 50% of the net blue box, program costs.¹

¹ For more information on financing schemes for bottle recovery see report: *Who Pays What – An Analysis of Beverage Container Recovery in Canada 2001-2002* by CM Consulting.
www.bottlebill.org/assets/pdfs/geography/WPW_FINAL_REPORT.pdf

Findings

Plastic beverage and non-beverage generation and recovery in Canada

Recovery of plastic bottles in Canadian provinces varies dramatically based on the bottle type. In 2002, 235,086 tonnes of plastic bottles were generated and about 84,744 tonnes were recovered and recycled based on available data. This is a recovery rate of 36%.

Plastic beverage and non-beverage bottle generation and recovery in Canada

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	26,646	13,036	49%
Alberta	21,293	9,595	45%
Saskatchewan	6,600	3,168	48%
Manitoba	8,908	2,407	27%
Ontario	88,665	27,402	31%
Quebec	63,987	20,482	32%
New Brunswick	6,094	2,323	38%
Nova Scotia	7,646	4,316	56%
Newfoundland	4,718	1,798	38%
Prince Edward Island	529	219	41%
TOTAL	235,086	84,744	36%

Key findings are:

Generation

About 54% of the plastic bottles generated were beverage bottles.

Recovery

About 72% of the plastic bottles recovered comprise of beverage bottles.

Plastic Beverage Bottle Recovery in Canada

An estimated 125,775 tonnes of plastic beverage bottles were generated in Canada in 2002. Of this, about 60,949 tonnes were recovered and recycled. This is a recovery rate of 48%.

Plastic Beverage Bottle Recovery in Canada

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	10,968	8,555	78%
Alberta	10,892	7,624	70%
Saskatchewan	3,073	2,741	89%
Manitoba	5,059	1,493	30%
Ontario	50,904	17,819	35%
Quebec (non-SD)	23,270	6,905	30%
Quebec (SD)	11,610	8,359	72%
New Brunswick	3,198	2,323	73%
Nova Scotia	4,090	3,333	81%
Newfoundland	2,712	1,798	66%
TOTAL	125,775.4	60,949.5	48%

Key findings are:

Generation

About 63% of the plastic beverage bottles in Canada are generated in Ontario, Manitoba and Quebec (non-soft drinks), where deposit return programs do not exist.

Recovery

The average recovery rate for beverage bottles in non-deposit programs is 33%.

The average recovery rate for beverage bottles in deposit return programs is 75%.

Overall, an estimated 34,732 tonnes of bottles were recovered through deposit return programs, or 57% of the total beverage bottles collected.

Non-beverage PET and HDPE bottle recovery in municipal curbside and voluntary depot collection systems

An estimated 108,782 tonnes of non-beverage PET and HDPE bottles were generated in Canada in 2002. Of this, about 23,575 tonnes were recovered and recycled. This is a recovery rate of 22%.

Non-beverage PET and HDPE bottle recovery through municipal curbside and voluntary depot collection systems

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	15,678	4,481	29%
Alberta	10,401	1,971	19%
Saskatchewan	3,527	426	10%
Manitoba	3,849	914	24%
Ontario	37,761	9,583	25%
Quebec	29,107	5,218	18%
New Brunswick	2,896	-	0%
Nova Scotia	3,556	983	28%
Newfoundland	2,006	-	0%
NATIONAL TOTAL	108,782	23,575	22%

Generation

About 46% of the total PET and HDPE bottles generated in Canada were comprised of non-beverage bottles. Recovery rates for non-beverage bottles vary across the country depending on program access, program maturity, and scope of plastic bottles recovered. Mature programs such as British Columbia, Ontario, Manitoba and Nova Scotia have higher rates of 24%-29%, while other provinces, like Newfoundland have virtually no non-beverage recovery initiatives in place.

Milk jug recovery

Plastic milk jugs are not the most common means of delivering fluid milk in many parts of Canada. However, in those regions where jugs are popular (British Columbia, Alberta, Saskatchewan and Nova Scotia), the system in place for their recovery achieves approximately a 50 per cent rate of return. Collectively, the provinces of British Columbia, Alberta and Saskatchewan and Nova Scotia generated 8,145 tonnes of plastic milk jugs in 2002.

Generation

Western provinces generate far greater milk jugs per capita than Ontario and Quebec. In central Canada, the majority of milk is sold in plastic film pouches (83% market share in Ontario) and cartons.

Recovery

In provinces that have milk jug recovery programs in place, the estimated recovery rate is 50%.

Milk Jug Recovery

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	4485	2848	63%
Alberta	2553	1192	47%
Saskatchewan	839	318	38%
Nova Scotia	267	134	50%
TOTAL	8,144.7	4,491.4	50%

Used motor oil bottles

Used motor oil bottle stewardship programs exist in the four western provinces.

Generation

Generation of small (1-litre) oil bottles is on the decline as more motor oil is being packaged in bulk containers.

Recovery

Motor Oil Bottle Recovery

Province	Kg Generated	Kg Recovered	Recovery rate
British Columbia*	1,518,780	473,844	31%
Alberta	2,700,411	1,215,185	45%
Saskatchewan	988,786	193,150	20%
Manitoba	911,111	164,000	18%
TOTAL	6,119,088	2,046,179	33%

In western provinces, the recovery rate for motor oil bottles is 33%.

* The data represented for British Columbia is for the first eight months of the program only (Aug 2003-March 2004).

Summary of Recovery Efforts in Canada

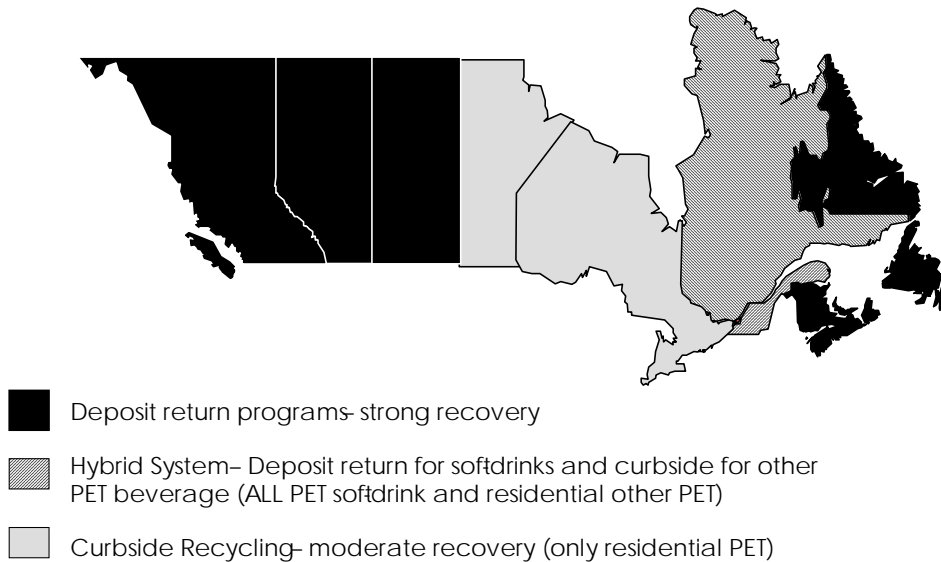
PET Beverage Recycling

In most Canadian provinces, PET beverages used for soft drinks, water, juice, liquor and other new-age beverages are collected for recycling through deposit return programs. A 5-cent or 20-cent deposit/refund serves as the economic instrument, which provides an incentive to consumers to return the container to a collection center. In these systems, all PET beverages, whether consumed at home or away-from-home are part of the program.

In those provinces where deposit programs do not exist, a mature curbside recycling program is usually available to residents for recycling their PET beverage containers.

The following map identifies the PET beverage recycling programs in Canada today.

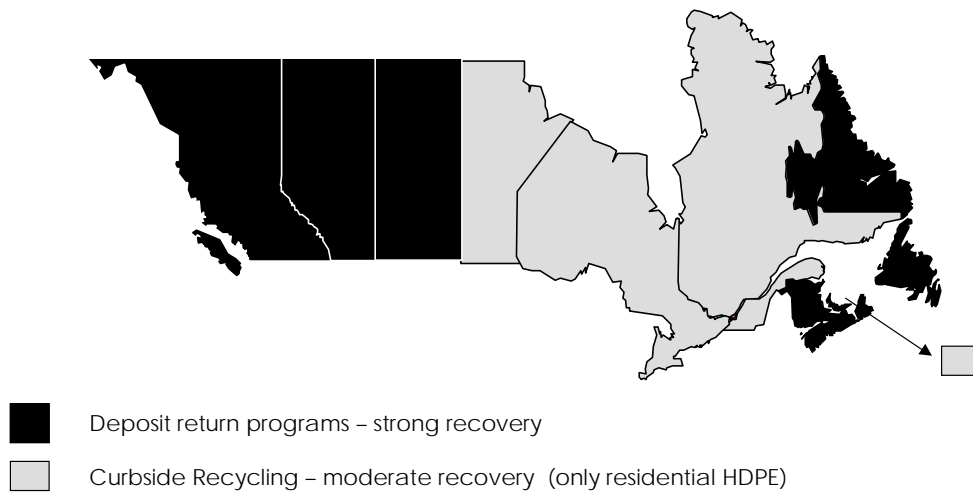
PET Beverage Recycling



HDPE Beverage Recycling

Similar to the recovery systems for PET, HDPE beverage containers used for juice, water and other new age beverages are recovered in most parts of Canada through deposit return programs. Nearly all mature curbside recycling programs also offer HDPE beverage bottle collection, as illustrated in the map below.

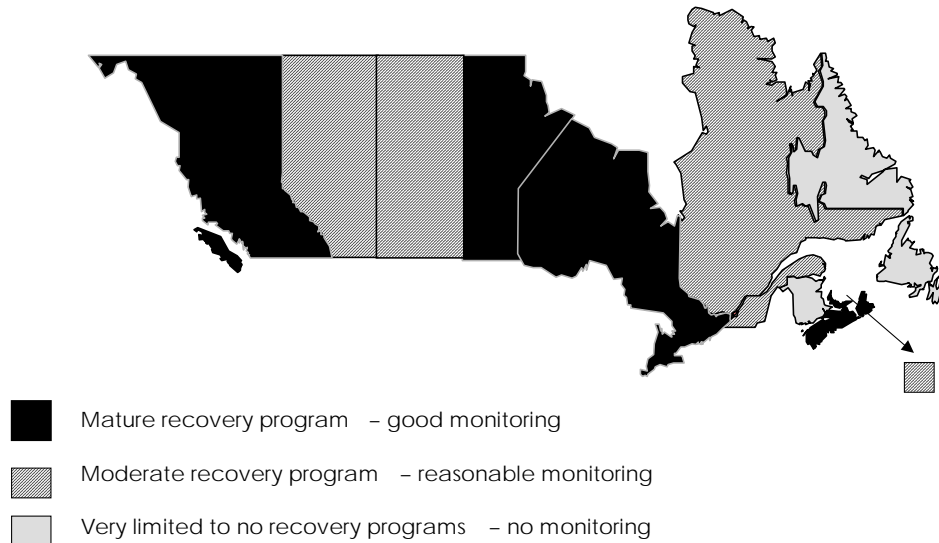
HDPE Beverage Recycling



PET and HDPE (non-beverage) recycling

Provinces that do not have deposit return programs in place generally maintain mature curbside recycling systems available to the majority of residents. While these programs collect PET and HDPE beverage containers, they also collect PET and HDPE non-beverage bottles used for food and household cleaning products. In these programs beverage and non-beverage bottles are collected and marketed together.

PET and HDPE Recycling (non-beverage)

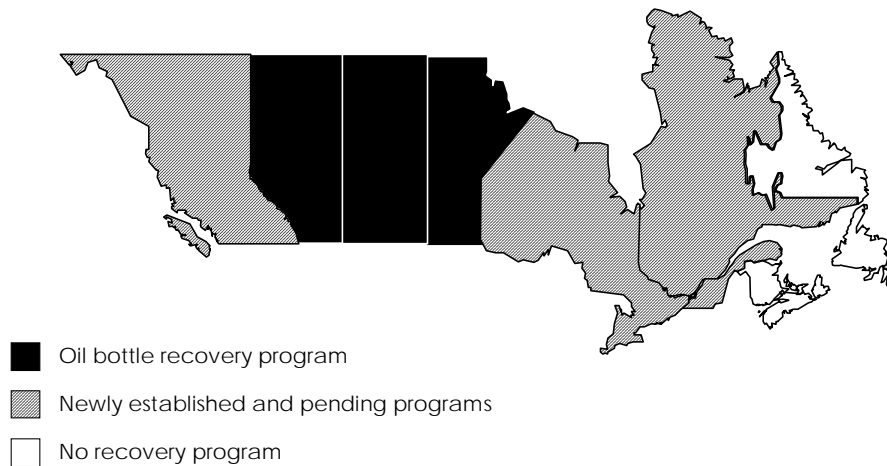


Oil Bottle Recycling

In 1998, Alberta launched the first industry-run recovery program for oil, filters and bottles. Since then the program has expanded to Saskatchewan, Manitoba and more recently British Columbia.

Similar programs will be up and running in Ontario and Quebec over the next 24 months. In these programs, collectors are financially rewarded for every kg of plastic bottle material collected and shipped to an approved recycler. Oil bottles are mostly collected through service stations acting as private and municipally run depots or eco-centres.

Oil Bottle Recycling Programs



Methodology, Data Sources and Scope

In order to quantify plastic bottle recycling in Canadian provinces both generation and recovery values are required.

Data on units sold and units recovered for plastic beverage bottles are available in most provinces where deposit return programs exist. Where weights were not also provided, weight-based conversion data was used to determine the amount of tonnes sold and recovered by province.

In these same provinces, determining recovery of non-beverage plastic bottles required a series of assumptions. For the most part, waste composition studies for provincial cities and/or regions were used to determine plastic bottle generation. Data for provincial recovery of non-beverage bottle material was determined by contacting recycling companies or municipalities directly, and extrapolating the data from those contacted to the rest of the province.

In those provinces where deposit return programs do not exist, like Ontario, Manitoba, and Quebec (for non-soft drinks) industry organizations that track generation and recovery were contacted and provided the required data. In addition, a series of assumptions were made where data do not exist. These assumptions are further explained on page 12 of this report.

Alberta, Saskatchewan and Nova Scotia have separately monitored milk container recovery programs, from which HDPE milk jug data was derived.

Finally, motor oil bottle data was derived from those agencies operating provincial used oil material recovery programs.

Appendix E provides details by province and material type on the methodology used, and the source(s) of data applied.

Additional Assumptions for Ontario, Manitoba and Quebec

The Ontario, Quebec and Manitoba plastic bottle recycling programs are unique in that beverage containers generated at home are collected via municipal curbside recycling programs. (This excludes soft-drink bottles in Quebec, which are collected through the deposit return program.)

In order to estimate the total amount of PET and HDPE beverage container recovery (including containers generated at home and away-from-home) for Ontario, Manitoba and Quebec several data points are required.

Recycling rate % =

$$\frac{\text{Tonnes RECYCLED (away-from-home + home)}}{\text{Tonnes GENERATED (away-from-home + home)}}$$

Most required data is proprietary and/or limited. Therefore, to calculate a total recycling rate a number of assumptions are necessary. These are:

Assumption 1

**89 PET beverage containers (all beverage types) generated per capita in
Ontario & Quebec**

Given that industry sales data for Ontario and Quebec is not publicly available an assumption on the per capita consumption rate for these two provinces is required. The total per capita generation of PET beverage containers (all beverage types) is assumed to be 89 units/person. This is based on the assumption that Ontario and Quebec are representative of the national average. The average was calculated using real 2002-2003 PET beverage container sales and population data from Saskatchewan, Manitoba, Nova Scotia, New Brunswick, and Newfoundland.

Assumption 2

The weighted average for a PET container is 38.725 grams/unit.

This is based on weight-to-unit conversion data from the Manitoba Product Stewardship Corporation (MPSC) representing all PET beverage containers, which is based on a mix of units of various sizes.

Assumption 3

**The recycling rate for PET and HDPE beverage containers generated away-
from-home is about 10%.**

There exists very little data on the amount of recycling of away-from-home PET and HDPE beverage containers. As such, several large waste/recycling companies were contacted and asked to provide anecdotal estimates of what percentage of the PET beverage container material collected from the ICI sector is being separated and recycled. Most of the recycling companies reported very little recycling of these materials. Verbal estimates ranged from 5% to 15%. As such, the assumption is that about 10% of away-from-home containers are being recycled.

Assumption 4

**63% of PET beverage containers are consumed away-from home
37% of PET beverage containers are consumed in residential sector**

In order to calculate the recycling rate for all PET beverage containers in non-deposit jurisdictions, the amount generated away-from-home is required. Industry data on the location of beverage sales or consumption is not publicly available. A ratio of 63:37 away-from-home versus at home consumption is assumed to be the current trend. This ratio is referenced in *Understanding Beverage Container Recycling – A Value Chain assessment prepared for the Multi-Stakeholder Recovery Project*.

The report identifies that the ratio for PET is based on carbonated soft drink point-of-sale data, which is assumed to be indicative of alcohol and non-carbonated beverages. Away-from-home includes sales at vending machines, venues (ie: business-to-business sales) and convenience stores. Sales from food stores are consumed at home. (Note: Away-from-home point of generation for single serves PET beverage containers (water, soft drinks and juice) is on the rise.)

Assumption 5

**75% of a curbside PET bale (by weight) from non-deposit systems is comprised of PET beverage bottles.
62% of a curbside PET bale (by weight) from Quebec is comprised of PET beverage bottles.
37% of a curbside HDPE bale (by weight) from non-deposit systems is comprised of HDPE beverage bottles.**

In curbside systems PET and HDPE beverage bottles are co-mingled with non-beverage PET and HDPE bottles. As such, it is difficult to determine the exact amount of beverage bottles recovered from curbside.

About 75% of all PET containers and 47% of HDPE containers are used for beverage containers, as reported by *Understanding Beverage Container Recycling – A Value Chain assessment prepared for the Multi-Stakeholder Recovery Project*.

Other sources include:

Winnipeg Residential Waste Composition Study 2000; reports - PET: 76% HDPE: 37%

Inventory of Rigid Plastic Containers Generated, Discarded and Recovered in British Columbia - EnviroRIS, June 2000. Reports PET: 74% and 66%; HDPE: 44% and 50% (using two methodologies)

Because there are very few HDPE milk jugs in Ontario and Quebec a 37% HDPE beverage composition rate was used.

In Quebec, about 55% of PET beverage containers sold represent non-soft drink beverages. This is based on the assumption that total PET beverage consumption is 89 units per capita, and actual PET soft drink container sales data. Therefore, a PET bale from Quebec would comprise of about 62% PET beverage bottles, because soft drink bottles are collected through a separate collection system (deposit return).

Provincial Summaries

The following is a summary, by province, of plastic bottle recycling activity in Canada.^{2 3 4}

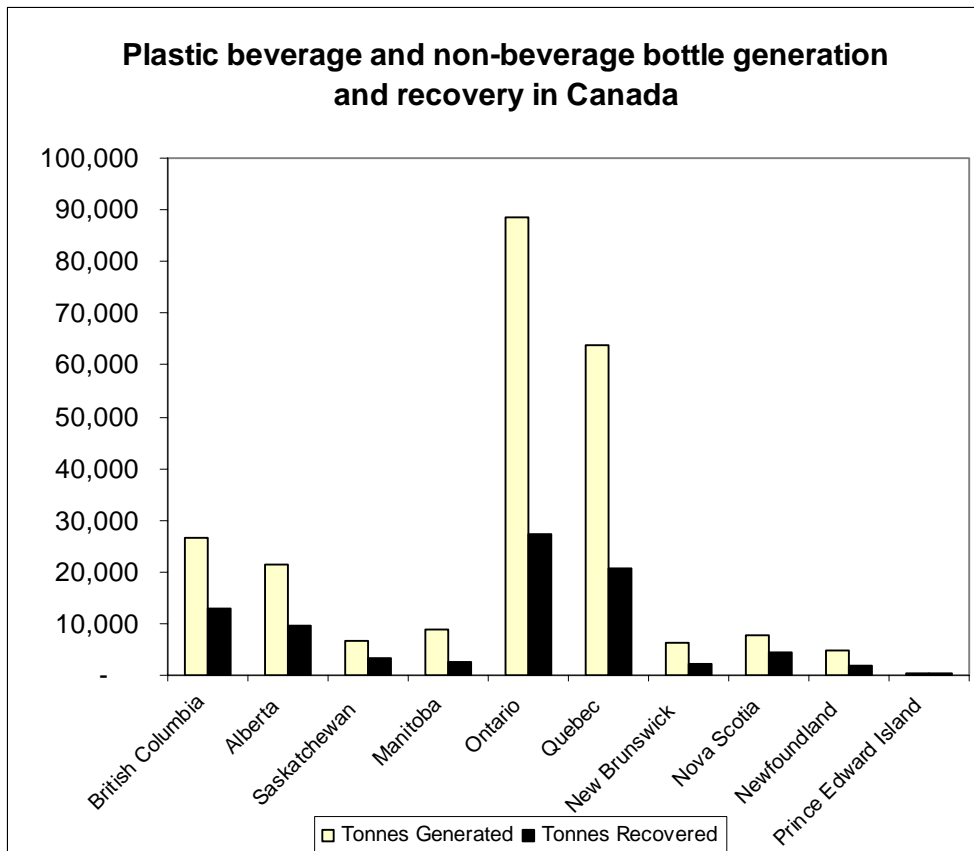
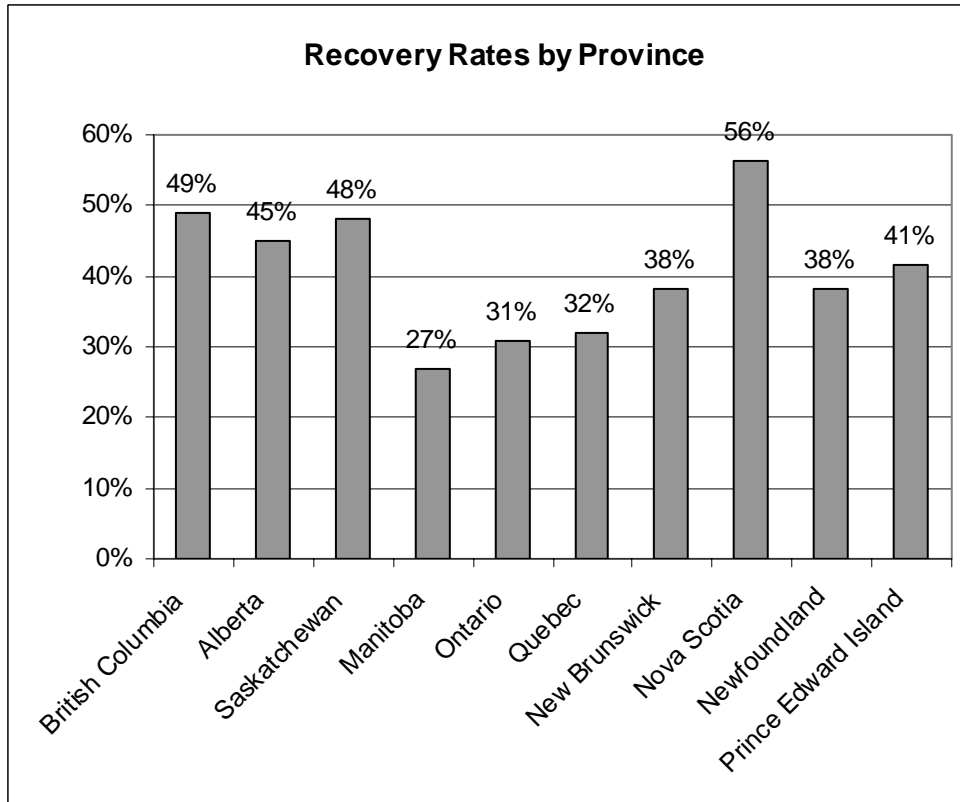
Plastic beverage and non-beverage bottle generation and recovery in Canada

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	26,646	13,036	49%
Alberta	21,293	9,595	45%
Saskatchewan	6,600	3,168	48%
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Quebec	63,987	20,482	32%
New Brunswick	6,094	2,323	38%
Nova Scotia	7,646	4,316	56%
Newfoundland	4,718	1,798	38%
Prince Edward Island	529	219	41%
TOTAL	235,086	84,744	36%

² These figures exclude motor oil bottles, as they are not accepted in curbside programs due to cross-contamination. In addition, consumers generally do not handle the vast majority of these bottles.

³ Plastic bottles #3, #4, #5, #6, & #7 were excluded from this table, because the availability of both generation and recovery data were limited – where available see Appendix E. These containers make-up less than 10% of total plastic bottle generation.

⁴ These figures exclude non-beverage plastic bottles use for detergents, cleaners, disinfectants etc., which are generated and recovered in the industrial, commercial and institutional sector.

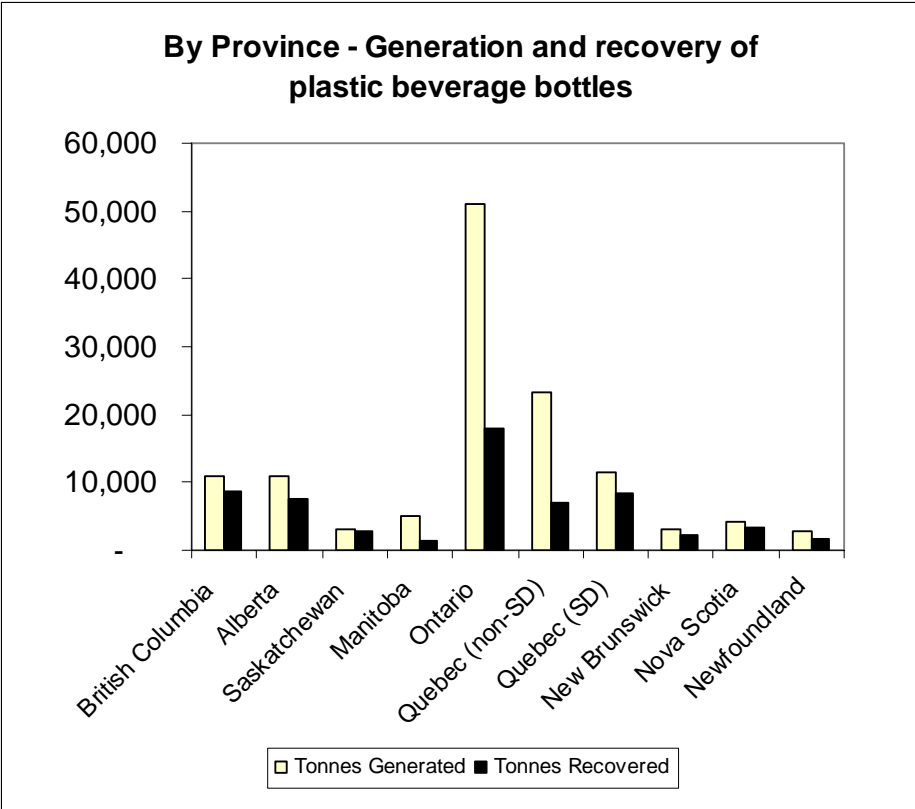
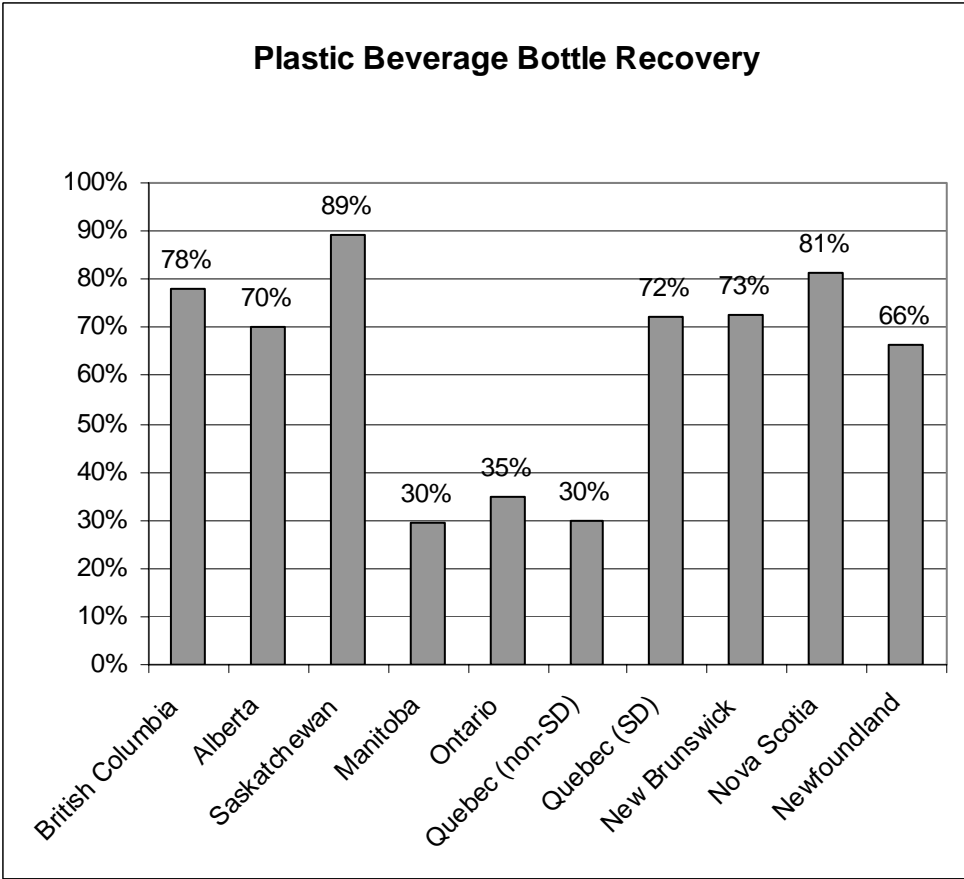


Plastic Beverage Bottle Recovery

The following is a summary by province of plastic bottle recycling activity for beverage containers. All provinces have expanded deposit return programs for all beverage containers, except Manitoba and Ontario. Quebec has a deposit return program for soft-drink (SD) containers only.

Plastic Beverage Bottle Recovery in Canada

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	10,968	8,555	78%
Alberta	10,892	7,624	70%
Saskatchewan	3,073	2,741	89%
Manitoba	5,059	1,493	30%
Ontario	50,904	17,819	35%
Quebec (non-SD)	23,270	6,905	30%
Quebec (SD)	11,610	8,359	72%
New Brunswick	3,198	2,323	73%
Nova Scotia	4,090	3,333	81%
Newfoundland	2,712	1,798	66%
TOTAL	125,775.4	60,949.5	48%



Non-beverage PET and HDPE bottle recovery in municipal curbside and voluntary depot collection systems

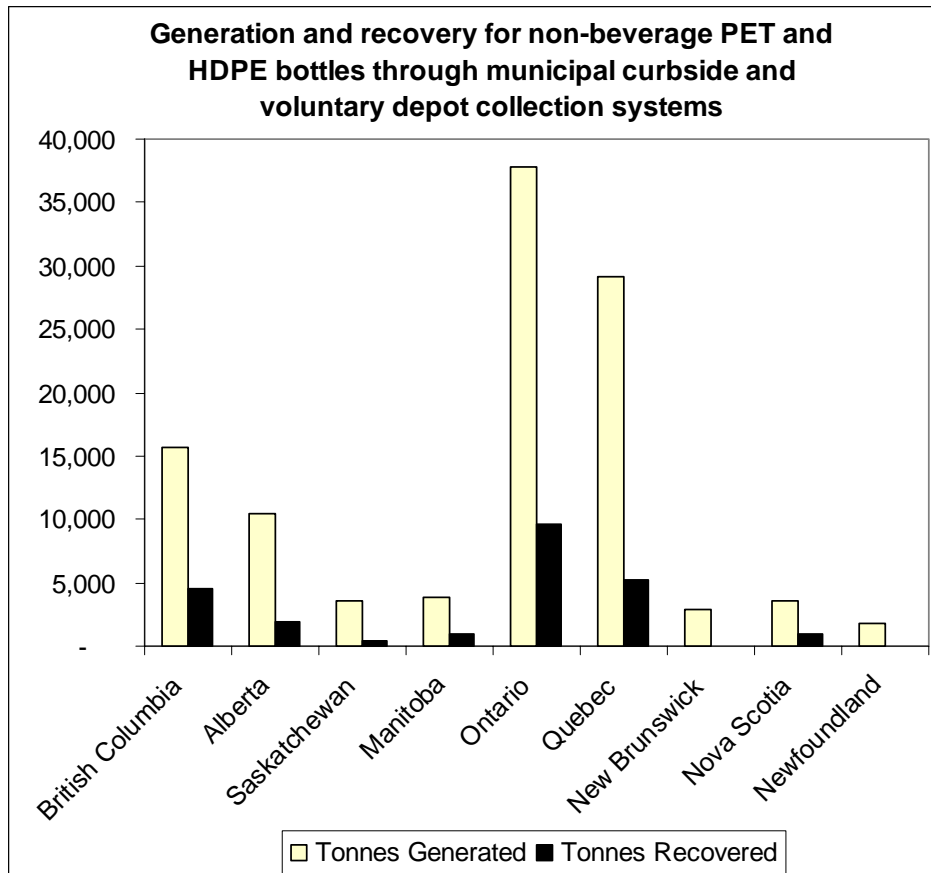
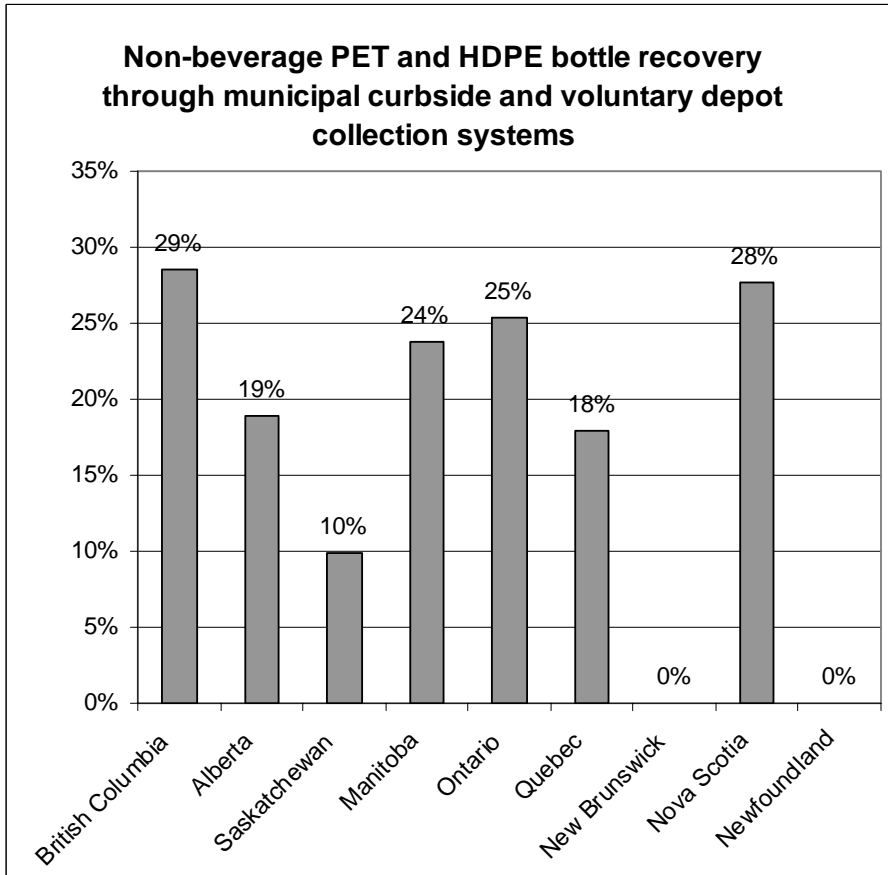
The following is a summary of non-beverage PET and HDPE bottle recycling activity for containers in municipal curbside and voluntary depot collection systems.^{5 6}

Non-beverage PET and HDPE bottle recovery through municipal curbside and voluntary depot collection systems

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	15,678	4,481	29%
Alberta	10,401	1,971	19%
Saskatchewan	3,527	426	10%
Manitoba	3,849	914	24%
Ontario	37,761	9,583	25%
Quebec	29,107	5,218	18%
New Brunswick	2,896	-	0%
Nova Scotia	3,556	983	28%
Newfoundland	2,006	-	0%
NATIONAL TOTAL	108,782	23,575	22%

⁵ The data includes milk jugs, which are considered as “food” (or non-beverage) for the purpose of this report.

⁶ Plastic bottles #3, #4, #5 & #7 were excluded from this table, because the availability of both generation and recovery data were limited – where available see Appendix E. These containers make-up less than 10% of total plastic bottle generation.



Milk Jug Recovery

Plastic milk jugs are not the most common means of delivering fluid milk in many parts of Canada. However, in those regions where jugs are popular (British Columbia, Alberta, Saskatchewan and Nova Scotia), the system in place for their recovery achieves approximately a 50 per cent rate of return. Collectively, the provinces of British Columbia, Alberta and Saskatchewan and Nova Scotia generated 8,145 tonnes of plastic milk jugs in 2002.

The following is a summary by province of plastic milk jug recycling activity in these provinces.

In Alberta, Saskatchewan and Nova Scotia the dairy industry is responsible for financing the collection program. In Alberta, collection of milk jugs is up to each individual community. Some have 24-hour drop-off depots, manned depots with set hours of operation, and some municipalities bale or grind jugs themselves. Others might have a third party process the material for them.

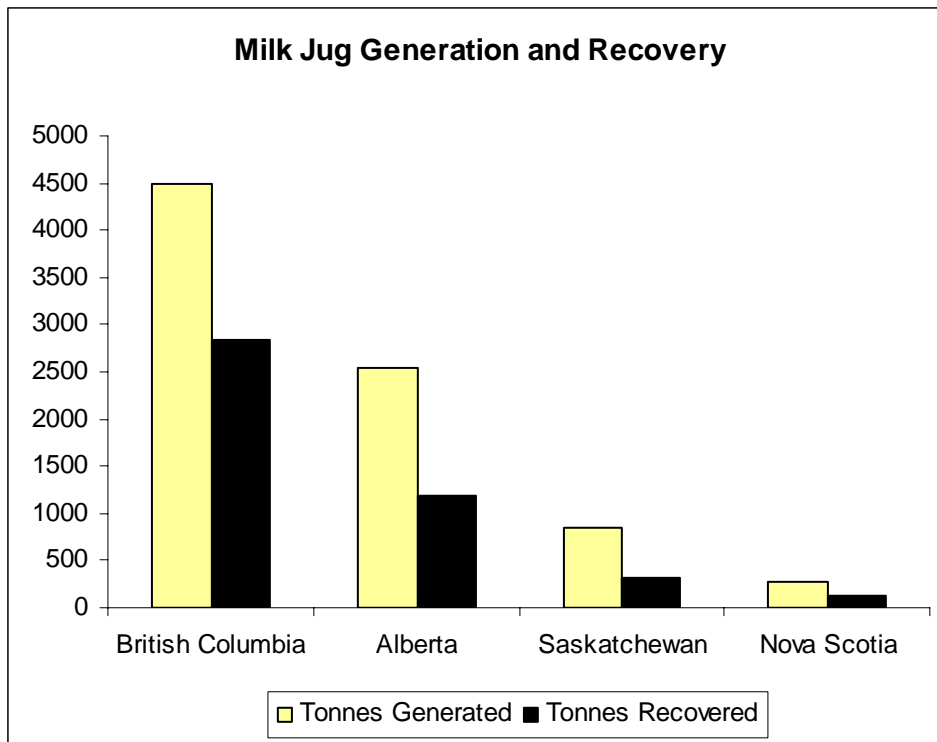
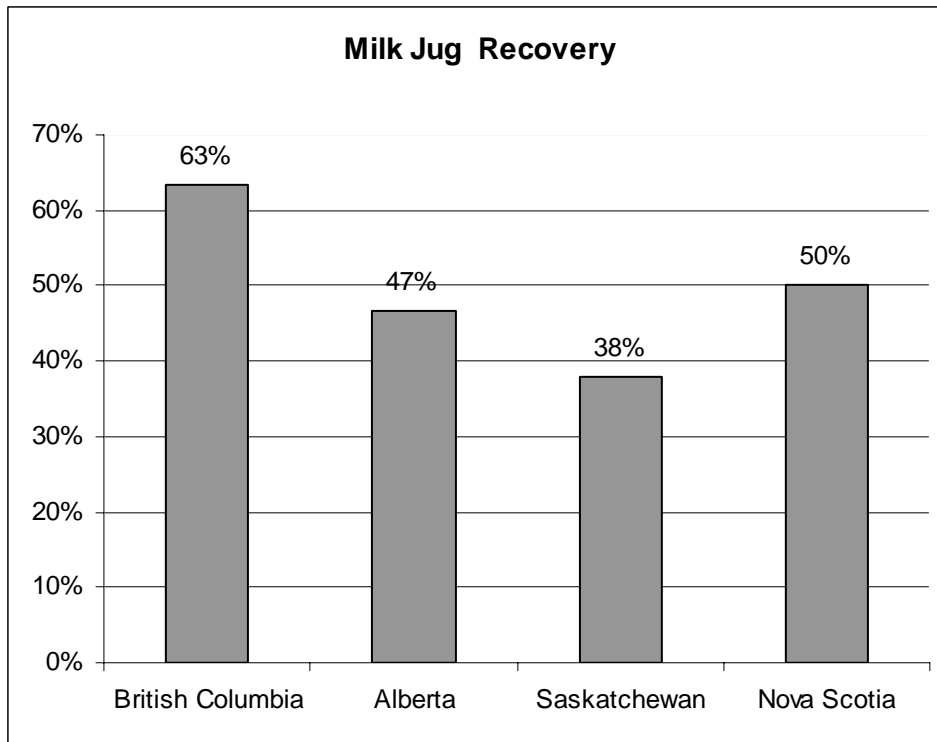
In Saskatchewan, jugs may be recycled through the 71 Sarcans depots in the province, or else through the contracted recyclers operating in their communities.

In Nova Scotia and British Columbia where municipalities operate residential curbside recycling programs, materials are picked up through bags or boxes along with other containers by local municipal authorities.

In central Canada, the majority of milk is sold in plastic film pouches (83% market share in Ontario) and cartons.

Milk Jug Recovery

Province	Tonnes Generated	Tonnes Recovered	Recovery Rate
British Columbia	4485	2848	63%
Alberta	2553	1192	47%
Saskatchewan	839	318	38%
Nova Scotia	267	134	50%
TOTAL	8,144.7	4,491.4	50%



Motor oil bottle recovery

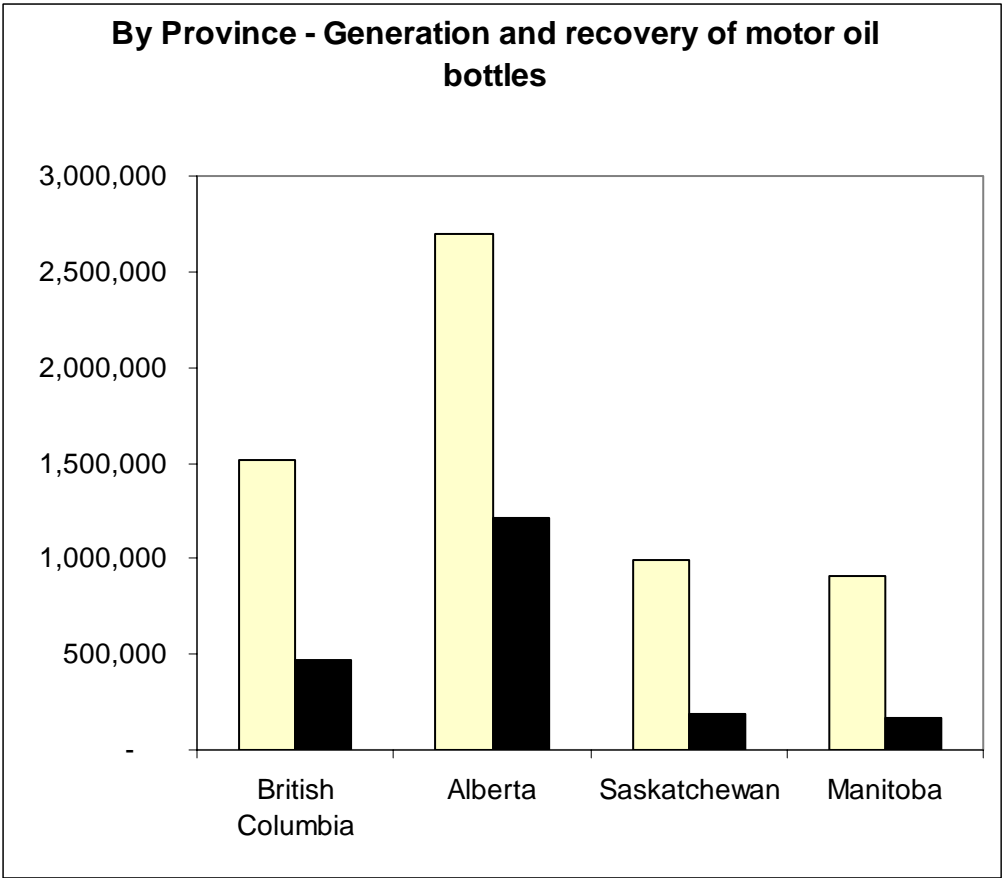
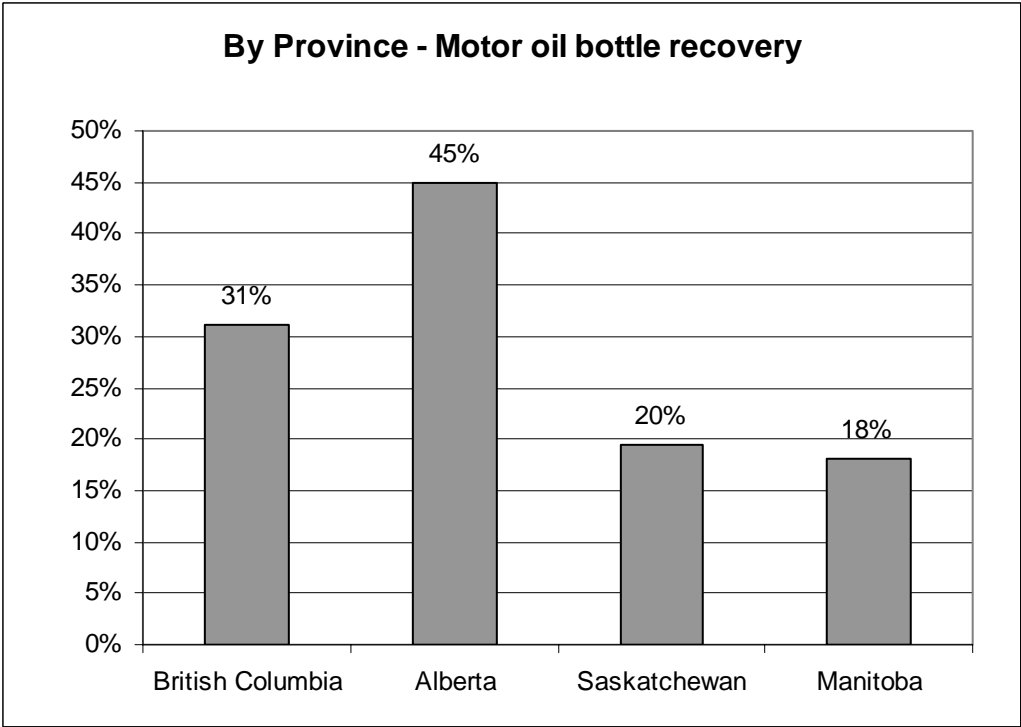
British Columbia, Alberta, Saskatchewan and Manitoba have used oil material recovery programs for used motor oil, containers and filters. British Columbia's program was launched in July 2003. Ontario and Quebec governments are currently evaluating program models for the recovery of these materials. These programs are forecasted to be in place late in 2004 or early 2005.

For those provinces with used oil recovery programs in place, the recovery rates of plastic oil bottles vary from 18 to 45 per cent, for an average of 33 per cent.

Motor Oil Bottle Recovery

Province	Kg Generated	Kg Recovered	Recovery rate
British Columbia*	1,518,780	473,844	31%
Alberta	2,700,411	1,215,185	45%
Saskatchewan	988,786	193,150	20%
Manitoba	911,111	164,000	18%
TOTAL	6,119,088	2,046,179	33%

* The data represented for British Columbia is for the first eight months of the program only (Aug 2003-March 2004).



Information Sources – Contacts

British Columbia

Bill Chan, Encorp Pacific Canada, 604-473-2400

Gord Hall, Liquor Distribution Branch, 604-252-3035

Ronald Driedger, British Columbia Used Oil Management Association, 604-703-1946

Alberta

Guy West, Alberta Beverage Container Recycling Corporation, 403-264-0170

Roberta Windrum, Alberta Dairy Council, 780-418-1600

Mike Sulley, City of Calgary, 403-230-6689

John Shubert, City of Edmonton, 780-496-5415

Robert Snowdon, City of Lethbridge, 403-732-4722

Gord Mac, City of Red Deer, 780-532-9722

Judy Morris, Action on Waste, 780-422-2144

Saskatchewan

Ken Homenick, SARCAN Recycling, 306-933-0616

Jack Shaw, Crown Shred & Recycle, 306-545-5454

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Outlook, Rick Peterson, 306-867-1832

Phil Wrubleski, Saskatchewan Association of Resource Recovery Corporation, (306) 652-7217

Ontario

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Elizabeth Canning, Resource Recovery Fund Board, 905-895-7732

Bob Kenny, Ministry of Environment and Labour, (902) 424-2562

John Sutherland, Atlantic Dairy Council, 905-425-2445

New Brunswick

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Tanya Murphy, NB Liquor Commission, 506-452-6826

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Prince Edward Island

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Ed Clark, Superior Sanitation, 902-892-1333

Other Sources of Information

Inventory of Rigid Plastic Containers Generated, Discarded and Recovered in British Columbia - EnviroSRIS, June 2000

Annual Report from the Director – Beverage Container Stewardship Program Regulation

http://wlapwww.gov.bc.ca/epd/epdpa/ips/bev/bev2002_03.html

British Columbia Ministry of Land, water and Air Protection

Annual Report 2002 - Beverage Container Management Board (BCMB)

Annual Report 2002-2003 - Alberta Used Oil Management Association (AUOMA)

Annual Report 2002 - Alberta Dairy Council

Overview of SARCAN 2002-2003 – SARCAN

City of Winnipeg Residential Waste Composition Study 2000 – Manitoba Product Stewardship Corporation & Environment and Plastics Industry Council

Annual Report 2002-2003 – Manitoba Product Stewardship Corporation

Annual Report 2002 - Manitoba Association Resource Recovery Corporation (MARRC)

Table 1: 2002 Generation and Recovery – Preliminary 2004 Fee Tables – February, 2004 - Stewardship Ontario

Used Oil Material Program Plan, Feb 2004 - Ontario Used Oil Management Association

Key Factors for a Sustainable Approach to Plastics Recovery – Recyc-Quebec & Environment and Plastics Industry Council

Bilan 2002 – Recyc-Quebec

Fiche D'Information - Plastics – Recyc-Quebec 2000

Sales and recovery statistics – 2002, Recyc-Quebec - <http://www.recyc-quebec.gouv.qc.ca/client/fr/programmesservices/consignation/statistiques.asp>

Comparison of containers sold/redeemed 2001, 2002, 2003 - New Brunswick Liquor Commission

Understanding Beverage Container Recycling – A Value chain Assessment prepared for the Multi-Stakeholder recovery Project, Stage 1, October 2001.

APPENDIX A: POPULATION DATA

<http://www.statcan.ca/start.html>

From Statcan, at:

	2001	2002	2003
British Columbia	4,078,400	4,115,000	4,146,600
Alberta	3,056,700	3,114,400	3,153,700
Saskatchewan	1,000,100	995,500	994,800
Manitoba	1,151,300	1,155,500	1,162,800
Ontario	11,897,600	12,096,600	12,238,300
Quebec	7,397,000	7,443,500	7,487,200
New Brunswick	749,900	750,200	750,600
Nova Scotia	932,400	934,400	936,000
Newfoundland	522,000	519,300	519,600
Prince Edward Island	136,700	137,000	137,800
Yukon	30,100	30,100	31,100
NWT	40,800	41,400	41,900
Nunavut	28,100	28,700	29,400
Total	31,021,100	31,361,600	31,629,800
Calgary	969,600	993,200	
Edmonton	954,100	967,200	
Winnipeg	684,300	685,500	
Lunenburg, NS	28,138		36,916

APPENDIX B: SUMMARY OF PER CAPITA WASTE COMPOSITION STUDIES

2001 Waste Composition Studies, in kg per capita

Material	Winnipeg	Lunenburg	Calgary	Ontario	Quebec	CRD
PET	2.7	1.81	3.16	2.65	2.35	1.01
Refundable			2.46	1.36		0.06
Soda, 2 l	1.1	0.43			0.27	0.02
Soda, < 2l	0.4	0.48			1.16	0.37
Custom	1.2	0.9	0.7	1.29	0.92	0.56
HDPE	3.5	2.96	3.75	1.85	3.35	3.25
Refundable			0.39			0.1
Milk jugs	1.1	0.34	1.54		0.15	0.99
Bottles, other	2.4	2.62	1.82	1.85	3.2	2.16
Total, Other Rigids	4	5.14	3.53	3.63	5.89	6.05
Tubs/lids	0.7	2.03	0.07	0.89	3.45	1.54
PP (#5)	0.5	0.22	1.05	0.3		0.6
PVC (#3)	0.2	0.2	0.17	0.15		0.24
PS (#6)	2	2.69	2.24	1.55	2.44	2.43
Crates, pails, drums	0.1					0.42
PET food trays	0.1					0.58
Other #7	0.4			0.74		0.24
Total Film	9.9	21.99	13	7.55	13.73	14.52
PE clean film	3.7	8.53		3.04	4.58	1.78
Unrecyclable film	6.2	12.08		4.51	9.15	12.36
Stretch wrap		1.38				0.38
LDPE film			13			
Other plastics	0.6		6.54		5.18	5.39
Durable plastics	2.9			3.79		

Source: EPIC

APPENDIX C: UNIT CONVERSION FACTORS

Source: *Encorp Pacific*

Container Type	Average Units per Tonne	Weight per Unit (t)
Aluminum	69,446	0.0000143997
Plastic	24,044	0.0000415903
Polycoat	43,753	0.0000228555
Glass	3,951	0.0002530986
Other Metals	22,904	0.0000436611
Combination	19,002	0.0000526260

Source: *Manitoba Product Stewardship Corporation (MPSC)
Annual Report, pg. 36-37.*

MANITOBA	Containers	Weight (t)	(t)
Aluminum	167,308,384	2625.86	0.000015695
PET	93,561,207	3623.14	0.000038725
Aseptic (tetra)	42,284,462	731.58	0.000017301
MLCC Liquor Glass	19,200,584	8494.86	0.000442427
Glass	12,508,329	3003.44	0.000240115
Pure pak (gable top)	4,105,579	221.64	0.000053985
Other Plastic	3,445,102	45.31	0.000013152
Others	2,907,194	166.52	0.000057279
HDPE	2,490,621	117.72	0.000047265
Other Steel	1,554,079	127.01	0.000081727
2 Piece Steel	136,740	33.91	0.000247989

Source: *Beverage Container Management Board (BCMB),
Alberta*

Container type	weight (kg)
<u>Plastics</u>	
PET 0 - 500 ml	0.053
PET 501-1 litre	0.073
PET Over 1 litre	0.119
HDPE 0-500 ml	0.035
HDPE 501 - 1 litre	0.088
HDPE Over 1 litre	0.152
PVC 0 -500 ml	0.365
PVC 501-1litre	0.093
PVC Over 1 litre	0.243
PS Cups	0.01
Bag in a box	0.292
Liquor & Wine	0.04

Appendix D

By Province / By Material Plastic Bottle Recovery

NOTES:

Reported in tonnes

In provinces that report milk recovery, these amounts are not included in other totals

Plastics bottles #3-#7 are not included in totals because the availability of both generation and recovery data were limited. Available data is listed on a separate line at the bottom.

Bottle Types Recovered	British Columbia			Alberta			Saskatchewan			Manitoba		
	Generated	Recycled	Recovery Rate	Generated	Recycled	Recovery Rate	Generated	Recycled	Recovery Rate	Generated	Recycled	Recovery Rate
PET - All												
PET - Beverage							3,006.3	2,681.6	89%	3,624.0	1,134.0	31%
PET - (non-beverage)	2,304.4	679.0	29%							1,403.0	302.0	22%
HDPE - All												
HDPE - Beverage							66.7	59.5	89%	1,435.0	359.0	25%
HDPE (non-beverage)	8,888.4	954.7	11%							2,446.0	611.5	25%
HDPE - Milk Jugs	4,485.4	2,847.6	63%	2,552.9	1,192.2	47%	839.4	318.1	38%			
Other plastic - Beverage	10,967.5	8,554.7	78%	10,891.5	7,624.0	70%						
PET & HDPE non-Beverage				7,848.3	778.6	10%	2,688.0	108.3	4%			
TOTAL	26,645.7	13,036.0	49%	21,292.7	9,594.8	45%	6,600.4	3,167.5	48%	8,908.0	2,406.5	27%
#3, 4, 5, 6 & 7	4,444.2	n/a		3,799.6	26.5	1%	1095.5	0	0%	1,271.0	n/a	

By Province / By Material - Plastic Bottle Recovery

NOTES:

Reported in tonnes

In provinces that report milk recovery, these amounts are not included in other totals

Plastics bottles #3-#7 are not included in totals because the availability of both generation and recovery data were limited. Available data is listed on a separate line at the bottom.

Bottle Types Recovered	Ontario			Quebec			New Brunswick		
	Generated	Recycled	Recovery Rate	Generated	Recycled	Recovery Rate	Generated	Recycled	Recovery Rate
PET - All									
PET - Beverage	41,691.0	14,519.0	35%	25,654.0	13,928.0	54%	2,959.2	2,157.7	73%
PET - (non-beverage)	22,074.0	3,965.0	18%	13,398.0	3,147.0	23%			
HDPE - All									
HDPE - Beverage	9,213.0	3,300.0	36%	9,226.0	1,336.0	14%	180.1	124.2	69%
HDPE (non-beverage)	15,687.0	5,618.0	36%	15,709.0	2,071.0	13%			
HDPE - Milk Jugs							255.1	-	0%
Other plastic - Beverage							59.1	40.8	69%
PET & HDPE non-Beverage							2,640.7	-	0%
TOTAL	88,665.0	27,402.0	31%	63,987.0	20,482.0	32%	6,094.2	2,322.7	38%
#3, 4, 5, 6 & 7	n/a	n/a		n/a	n/a		315.0	n/a	

By Province / By Material - Plastic Bottle Recovery

NOTES:

Reported in tonnes

In provinces that report milk recovery, these amounts are not included in other totals

Plastics bottles #3-#7 are not included in totals because the availability of both generation and recovery data were limited. Available data is listed on a separate line at the bottom.

	Nova Scotia			Newfoundland			Prince Edward Island		
Bottle Types Recovered	<i>Generated</i>	<i>Recycled</i>	<i>Recovery Rate</i>	<i>Generated</i>	<i>Recycled</i>	<i>Recovery Rate</i>	<i>Generated</i>	<i>Recycled</i>	<i>Recovery Rate</i>
PET - All							123.3	87.4	71%
PET - Beverage				2,148.0	1,375.0	64%			
PET - (non-beverage)									
HDPE - All							405.5	131.9	33%
HDPE - Beverage									
HDPE (non-beverage)									
HDPE - Milk Jugs	267.0	133.5	50%	176.6	-	0%			
Other plastic - Beverage	4,090.0	3,333.0	81%	564.0	423.0	75%			
PET & HDPE non-Beverage	3,289.0	849.0	26%	1,829.4	-	0%			
TOTAL	7,646.0	4,315.5	56%	4,718.0	1,798.0	38%	528.8	219.3	41%
#3, 4, 5, 6 & 7	392.0	-	0%	218.0	-	0%	57.4	58.0	101%

Appendix E: Methodology and Data Sources

Province	Generation Methodology	Recovery Methodology	Comments/ Assumptions
British Columbia			
PET/HDPE beverage	Tracked through Encorp Pacific Canada 2002 unit sales for non-alcohol and Liquor Distribution Branch unit sales for alcohol as reported by Ministry of Land, Air and Water – Director's Report. Unit-to-weight conversion from Encorp Pacific was applied.	Tracked through Encorp Pacific Canada 2002 units recovered for non-alcohol and Liquor Distribution Branch units recovered for alcohol. Unit-to-weight conversion from Encorp Pacific was applied.	Encorp Pacific Canada amalgamates values for PET and HDPE beverage containers.
PET/ HDPE - other	Extrapolated using Capital Regional District (CRD) per capita waste composition data: PET non-beverage 0.56 kg; HDPE non-beverage 2.16kg; and British Columbia 2002 population data.	Extrapolated from EnviroRIS study 2000 on a per capita recovery basis, and British Columbia 2002 population data.	CRD per capita waste composition data is reflective of resident generation patterns for other plastic bottles. EnviroRIS study per capita data is reflective of resident recycling patterns for other plastic, including non-beverage PET, and HDPE milk jugs and other bottles.
HDPE - milk jugs	Extrapolated from EnviroRIS study 2000 on a per capita recovery basis, and British Columbia 2002 population data.	Extrapolated from EnviroRIS study 2000 on a per capita recovery basis, and British Columbia 2002 population data.	
#3, 4, 5, 6, & 7 bottles	Extrapolated using Capital Regional District (CRD) waste composition per capita data (PP(#5), PVC (#3), & Other (#7)) and 2002 population data.	Very little to no recovery of #3, 4, #5, #6 & #7 plastic bottles in BC.	
Used Oil bottles	Correspondence from British Columbia Used Oil Management Association (BCUOMA)	The Used Oil bottle recovery program was launched in 2003. the recovery rate represents eight months.	

Alberta			
PET/HDPE - beverage	Tracked through Beverage Container Management Board (BCMB) Annual Report (2002) unit sales and unit-to-weight conversion data from Encorp Pacific Canada was applied.	Tracked through BCMB Annual Report (2002) units recovered and unit-to-weight conversion data from Encorp Pacific Canada was applied.	
PET/HDPE - non-beverage	Extrapolated using Calgary per capita waste composition data PET non-beverage 0.7 kg; HDPE non-beverage 1.82kg; and Alberta 2002 population data.	<p>Non-beverage/non-milk plastic bottle recycling has limited monitoring in Alberta. In general, only medium and large jurisdictions collect these containers through curbside recycling and/or depots. In addition, it is reported that these containers represent mostly HDPE non-beverage and non-dairy bottles.</p> <p>To determine a recovery estimate for Alberta, Edmonton and Lethbridge provided recovered tonnes, both which were equivalent to .25kg per capita. The second largest city, Calgary, reports limited to no recycling of non-beverage plastic bottles. As such, it was assumed that about 35% of the province is recycling at a rate of .25kg per capita. Using 2002 population data, this is equivalent to 778.6 tonnes of plastic bottles.</p>	Calgary per capita waste composition data is reflective of resident generation patterns for PET/HDPE/other plastic bottles.
#3, 4, 5, 6, & 7 bottles	Extrapolated using Calgary waste composition per capita data (PP(#5), PVC (#3), & Other (#7)) and 2002 population data.	Edmonton and Lethbridge represent the two municipalities that collect all bottles through their recycling program. Bales include tubs and lids. It is estimated that they account for 50% of the total, and the remainder are bottles.	
HDPE - milk jugs	Tracked through the Alberta Dairy Council, Annual Report (2001 – 2002)	Tracked through the Alberta Dairy Council, Annual Report (2001 – 2002)	
Used Oil bottles	Alberta Used Oil Management Association (AUOMA) – Annual Report 2002-2003	Alberta Used Oil Management Association (AUOMA) – Annual Report 2002-2003	

Saskatchewan			
PET - beverage	Tracked through SARCAN 2002 – 2003 recycling and recovery rate data	Tracked through SARCAN 2002 – 2003 recycling data	It was assumed that Manitoba's per capita waste composition data is reflective of Saskatchewan's resident generation patterns for plastics #1, #2 non-beverage, and #3, #4, #5, #6, #7 bottles.
HDPE - milk jugs			
HDPE - beverage			
PET/HDPE - non-beverage	Extrapolated using Winnipeg waste composition per capita data and 2002 population data.	There are four recovery agents for non-beverage plastic bottles in Saskatchewan. Each provided their data for 2002 – the data does not include milk jugs, but does include #2, 3, 4, 5, 6, 7 plastics, and # 1 clear. These agents are SARCAN, ReAct, Crown Shred & Recycling, Outlook.	
#3, 4, 5, 6, & #7 bottles			
Used Oil bottles	Correspondence with Saskatchewan Association of Resource Recovery Corporation (SARRC)	Correspondence with Saskatchewan Association of Resource Recovery Corporation (SARRC)	

Manitoba			
PET Beverage	Manitoba Product Stewardship Corporation (MPSC) Annual Report 2002-2003 of unit sales. Unit-to-weight conversion from MPSC was applied.	Manitoba Product Stewardship Corporation (MPSC) Annual Report 2002-2003. 75% of PET recovery is assumed to represent beverage. 37% of HDPE recovery is assumed to represent beverage.	See "Quantifying PET and HDPE beverage and non-beverage recycling in Ontario, Manitoba and Quebec" for assumption details.
HDPE Beverage	MPSC Annual Report 2002-2003 estimated generation. 37% of HDPE generated is assumed to represent beverage.		
PET non-beverage	MPSC Annual Report 2002-2003 estimated generation. 25% of PET generated is assumed to represent non-beverage.	Manitoba Product Stewardship Corporation (MPSC) Annual Report 2002-2003. 25% of PET recovery is assumed to represent non-beverage. 63% of HDPE recovery is assumed to represent non-beverage.	
HDPE non-beverage	MPSC Annual Report 2002-2003 estimated generation. 63% of HDPE generated is assumed to represent non-beverage.		
#3,4, 5, 6, & 7 bottles	Extrapolated using Winnipeg waste composition per capita data and 2002 population data.	Not available. MPSC data does not include specific recovery data for these materials	
Used Oil bottles	Manitoba Association Resource Recovery Corporation (MARRC) – Annual Report 2002	Manitoba Association Resource Recovery Corporation (MARRC) – Annual Report 2002	

Ontario			
PET beverage	Sales were calculated using an estimate of 89 PET beverage units per capita sold. Unit-to-weight conversion data from MPSC was then applied.	A series of assumptions were used to calculate to total amount of PET beverage recovered – these include: weight-to-unit conversion data from MPSC; 63% : 37% ratio representing away-from-home to at home generation; 10% recycling in the away-from-home sector; and 75% of a PET residential bale is comprised of PET beverage.	See “Additional Assumptions for Manitoba, Ontario and Quebec” for assumption details. Page 12
HDPE beverage	Stewardship Ontario – Table 1 – 2002 Generation. www.stewardshipontario.ca . 37% of HDPE generated is assumed to represent beverage.	Stewardship Ontario – Table 1 – 2002 Recovery. www.stewardshipontario.ca . 37% of HDPE recovered is assumed to represent beverage.	
PET non-beverage	The amount of PET beverage generated at home was subtracted from the total PET generated at home, as reported by Stewardship Ontario – Table 1 – Generation.	Stewardship Ontario – Table 1 – 2002 Generation. 25% of PET recovered is assumed to represent non-beverage.	
HDPE non-beverage	Stewardship Ontario – Table 1 – 2002 Generation. 63% of HDPE generated is assumed to represent non-beverage.	Stewardship Ontario – Table 1 – 2002 Generation. 63% of HDPE recovered is assumed to represent non-beverage.	
#3,4, 5, 6, & 7 bottles	Not available. Ontario generation data does not have a breakdown of bottle material.	Not available. Ontario recovery data does not have a breakdown of bottle material.	

Quebec

PET Beverage	<p>Sales were calculated using an estimate of 89 PET beverage units per capita sold. Unit-to-weight conversion data from MPSC was then applied.</p>	<p>Calculating the recovery of PET beverage in Quebec requires the addition of three separate data points.</p> <p>First, tonnes recovered through the deposit return program, (which was based on a reported rate of 72% (estimated to be 8,359 tonnes based on MPSC unit-to-weight conversion data;</p> <p>Second, add the amount of non-soft-drink PET which ended-up (via contamination) in the deposit return program, which is estimated to total 5.2% of the recovered amount (source TOMRA) – 435 tonnes;</p> <p>Third, add 62% (the estimated amount of PET beverage in a PET bale) of the amount of PET recovered as reported by the Bilan 2002.</p> <p>In 2000 Recyc-Quebec (<i>Fiche D'Information - Plastiques</i>) reported that PET recovered in the province represents 32% (including soft-drinks) of all plastics collected. In 2002 the Bilan reported recovering 52,000 tonnes of plastics, which when calculated comes to an additional 5,134 tonnes. (Note: this includes ALL recovery from the ICI sector.)</p>	<p>See “Additional Assumptions for Manitoba, Ontario and Quebec” for assumption details. Page 12</p>
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Quebec (pg 2)

<p>PET non-beverage</p>	<p>Generation of PET non-beverage in Quebec was estimated using Ontario non-beverage per capita generation from this report, estimated to be 1.8kg/capita or 13,398 tonnes.</p>	<p>Recovery of non-beverage PET is estimated through data reported in Recyc-Quebec's Bilan 2002.</p> <p>Subtract soft drink tonnes from the total recovery of PET, which is about 32% (as Per Fiche D'Information 2000).</p> <p>It is assumed that 38% represents non-beverage PET material., which is equal to 3148 tonnes.</p>	<p>See "Quantifying PET and HDPE beverage and non-beverage recycling in Ontario, Manitoba and Quebec" for assumption details.</p>
<p>HDPE Beverage</p>	<p>Generation data is based on waste composition study from Quebec.</p> <p>It is assumed that HDPE beverage represents 37% of total HDPE generation.</p>	<p>Recovery data is based on Recyc-Quebec's Fiche D'Information 2000, which shows that HDPE recovered in the municipal sector represents 16% of all plastics collected. In 2002, this was equal to 3,288 tonnes.</p>	<p>See "Quantifying PET and HDPE beverage and non-beverage recycling in Ontario, Manitoba and Quebec" for assumption details.</p>
<p>HDPE non-beverage</p>	<p>It is assumed that HDPE non-beverage represents 63% of total HDPE generation.</p>	<p>It is assumed that HDPE beverage represents 37% of total HDPE recovered.</p> <p>It is assumed that HDPE non-beverage represents 63% of total HDPE recovered.</p>	<p>See "Quantifying PET and HDPE beverage and non-beverage recycling in Ontario, Manitoba and Quebec" for assumption details.</p>
<p>#3,4, 5, 6, & 7 bottles</p>	<p>Not available. Quebec waste composition data does not include per capita generation rates for these materials.</p>	<p align="center">-</p>	

New Brunswick

PET - beverage	Tracked through Encorp Atlantic sales data (2003); prorated by estimated weight per unit. Also includes New Brunswick Liquor Commission (NBLC) data.		
HDPE - beverage	NBLC data, as well as Encorp Atlantic data for HDPE and other plastic beverages were converted to tonnes using unit-to-weight conversion stats from Manitoba Product Stewardship Corporation.	Tracked through Encorp Atlantic Sales and Recovery Rate Data (2003); prorated by estimated weight per unit. Also includes New Brunswick Liquor Commission recovery data.	New Brunswick Liquor Commission (NBLC) provides data on beverage types in small or large units. According to NBLC about 15% of these containers are plastic bottles, while the majority (85%) are glass bottles.
HDPE milk jugs	Extrapolated using Lunenburg waste composition per capita data and 2002 population data.	Environment and Labour was able to provide a total "other plastic" recovery number, but are unable to provide a reasonable methodology for determining the share of plastic bottles. Most of the total is silage wrap. In general, there is little to no plastic bottle recovery beyond beverage containers in New Brunswick.	
PET & HDPE non-beverage			
#3,4, 5, 6, & 7 bottles			

Nova Scotia

Plastic beverage	Tracked through Resource Recovery Fund Board (RRFB) units sold and redeemed; Unit-to-weight conversion were applied to the plastic stream as a whole due to uncertainty around bottle type.	Tracked through Resource Recovery Fund Board (RRFB) units sold and redeemed.	Recovery of HDPE beverage and other plastic beverage is over 100%. RRFB reports that one of the major distributors does not currently provide a breakdown by products sold. RRFB estimates the breakdown, which explains why the numbers are off. As such, all plastic beverage containers were amalgamated.
PET/HDPE non-beverage	Extrapolated using Lunenburg waste composition per capita study.	Ministry of Environment and Labour (MOE&L) provided an amalgamated number for non-beverage PET and HDPE based on municipal reporting in the province. The MOE&L suggested increasing this by 15% accounting for Cape Breton (which did not report), and municipalities that are currently stockpiling this material until quantities justify shipping to recycling facilities.	
HDPE – milk jugs	Tracked through Atlantic Dairy Council tonnes sold and recovered.	Tracked through Atlantic Dairy Council tonnes sold and recovered.	
#3, 4, 5, 6, & 7 bottles	Extrapolated using Lunenburg waste composition per capita data and 2002 population data.	There is limited to no collection of #3, 4, 5, 6, 7 material.	

Newfoundland			
PET beverage	Tracked through Multi-Materials Stewardship Board (MMSB) units sold and redeemed; multiplied by weight per unit, using PET beverage unit to weight conversion data from MPSC.	Tracked by MMSB - recovery data for deposit containers, multiplied by weight per unit.	
Other plastic beverage	Tracked through Multi-Materials Stewardship Board (MMSB). Weight attained (based on a 59% recovery rate) from unit-to-weight conversion from MPSC.	Tracked through Multi-Materials Stewardship Board (MMSB).	
HDPE milk jugs	Extrapolated using Lunenburg waste composition per capita data and 2002 population data.	There is little to no collection of PET and HDPE milk, non-beverage and # 3, 4, 5, 6, & 7 bottles in the province.	
PET & HDPE non-beverage			
#3, 4, 5, 6, & 7 bottles			

Prince Edward Island			
PET (non-soft-drink)	Extrapolated using Lunenburg per capita waste composition data and PEI 2002 population.	Superior Sanitation collected plastics from households representing 63% of Island residents. Their recovery data was prorated for 100% of island residents. About 50% of the "other plastics" are considered to be other plastic bottles.	There are no PET soft-drink bottles sold on the island.
HDPE			
#3,4, 5, 6, & 7 bottles			