

Kerbside Waste Audit Report

November 2008



A sample of general waste for Warrnambool City Council



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EXECUTIVE SUMMARY

The Warrnambool City Council kerbside waste audit has identified the following key findings:

- By weight approximately 45 % of the waste identified is in fact true waste. The remaining 55% has potential to be removed from the waste stream by using mechanisms/systems/education to maximise recycling. If systems could be introduced to deal with nappies and sanitarries, the true waste component could be further reduced.
- The Green Waste component was relatively small ie 6% by volume and 8% by weight of the waste stream.
- The Co-mingled Recyclables component was 28% by volume and 15% by weight of the waste stream.
- Removal of recyclables (ie. commingled recyclables, green waste, food organics) from the waste stream has potential for cost saving/shifting of \$255,000, (neglecting recycling costs) plus significant environmental benefits.
- Paper, cardboard and glass were found to be the main recyclables in the waste stream.
- Negligible quantities of prescribed waste or dangerous wastes were recorded.
- In the sample set, 82% of households presented bins and these on average, were filled to 67% of the total volume. The percentage of bins which were totally filled averaged 43%.
- The audit has been conducted with a confidence interval of $\pm 5\%$ accuracy.

The conclusion is that there is significant potential available to reduce waste to landfill and in turn reduce costs to the municipality and provide improved environmental benefits.

It is recommended that current educational practices focusing on glass, paper and cardboard be continued and investigations into possible recycling of food organics, green waste and nappies/sanitarries be undertaken.

Neil Povey
Executive Officer

CONTENTS	PAGE
EXECUTIVE SUMMARY	1
1 PROJECT SCOPE	4
1.1 Introduction	4
1.2 Objectives	4
1.3 Warrnambool City Council Demographic Data	4
1.4 Warrnambool City Council Logistical Data	4
1.5 Waste Audit Team	4
2 HISTORICAL INFORMATION	5
3 PRE-PLANNING	5
4 AUDIT SITE LOCATION	7
5 AUDIT METHODOLOGY	7
6 WASTE ANALYSIS RESULTS	8
6.1 Presentation Rate	8
6.2 Estimated Filled Volumes	8
6.3 Waste Stream Components	8
6.3.1 Waste Results By Collection Addresses	9
6.3.2 Total Waste Stream – 5 Collection Addresses, Aggregated	9
6.3.3 Total Waste Audit / LGDC	10
6.4 Composition Of Recyclable Types In General Waste Stream	11
6.4.1 Composition Of Recyclable Types In General Waste Stream By Collection Addresses	11
6.4.2 Composition Of Recyclable Types In General Waste Stream-5 Collection Addresses, Aggregated	11
7 FINANCIAL COSTS FOR CONSIDERATION	13
8 OVERALL CONCLUSION	14
9 RECOMMENDATION	14
APPENDIX A - Risk Assessment	15
APPENDIX B - Safety Plan	16
APPENDIX C - Waste Audit Data Sheets – Weight Kgs	17
APPENDIX D - Waste Audit Data Sheets – Volume Litres	18
APPENDIX E - Presentation Rate	19
APPENDIX F - Filled Volume	20
APPENDIX G1 - Total Waste Stream- Botanic Road	21
APPENDIX G2 - Total Waste Stream- Woodford/Bushfield	22
APPENDIX G3 - Total Waste Stream- Riverview Terrace	23
APPENDIX G4 - Total Waste Stream- Brenton Street	24
APPENDIX G5 - Total Waste Stream- Macdonald & Harris Street	25
APPENDIX H1 - Composition of recyclables- Botanic Road	26
APPENDIX H2 - Composition of recyclables-Woodford/Bushfield	27
APPENDIX H3 - Composition of recyclables-Riverview Terrace	28
APPENDIX H4 - Composition of recyclables-Brenton Street	29
APPENDIX H5 - Composition of recyclables-Macdonald & Harris Street	30
APPENDIX I - Confidence Level	31

1. PROJECT SCOPE

1.1 Introduction

The Waste Reduction Group (WRG) was contracted by the Warrnambool City Council, to undertake a waste audit on a random kerbside collection of 80 litre general waste rubbish bins over all five collection sectors within the city.

1.2 Objectives

To identify and quantify in terms of weight and volume, the waste streams including recyclables appearing in the general waste collection.

1.3 Warrnambool City Council Demographic Data

Warrnambool City Population	31,500
Tenements with general waste service	13,000

1.4 Warrnambool City Council Logistical Data

General Waste Collection Service	
Container system	80 litre bins
Collection frequency	Weekly
Collection contractor	Wheelie Waste

1.5 Waste Audit Team

Auditor – Waste Reduction Group (Tony Phillips)

Warrnambool City Council – support staff (Kate McInnes)

Data Recorder – Waste Reduction Group (Yolande Lunn)

Audit Staff – Waste Reduction Group (various casual employed staff)

First Aid Officer – Waste Reduction Group (Tim McKenzie)

Regional Education Officer – Waste Reduction Group (Cydoni Younie)

Executive Officer – Waste Reduction Group (Neil Povey)

2. HISTORICAL INFORMATION

No information relating to previous kerbside waste audits was available. The only waste data relevant to Warrnambool City Council is the data included in the Annual Municipal Waste Survey conducted by Sustainability Victoria. This data only provides estimated household waste weights based on the data submitted by the waste contractor to Council, and does not include a break down of the waste streams within the waste bin.

Local Government Data Collection Survey (LGDC) - Warrnambool City 2007-2008 (Data provided by Sustainability Victoria)

Warrnambool City Council	
Data	
Total Properties serviced	13,250
Annual Service Cost	\$1,300,000
Tonnes Collected	5,777
Cost per tonne	\$225.04
Cost per household (hhld) serviced	\$98.11
Yield (kg/hhld)	436

3. PRE-PLANNING

Several meetings were conducted with the Council representatives, the waste collection contractor and the owner of the transfer station. Collection, disposal, work areas and safety issues and systems were discussed and resolved.

Audit categories were modelled on advice from Sustainability Victoria.

Collection Areas

The Council nominated five specific street areas in which the collection contractor was to collect the waste sample for the audit. One specific area was to be audited each day. These areas were chosen to provide a spread of demographic types from across the municipality.

The areas chosen were:

24 th November 2008	Botanic Road
25 th November 2008	Woodford & Bushfield area*
26 th November 2008	Riverview Terrace
27 th November 2008	Brenton Street
28 th November 2008	Mac Donald and Harris Streets

***Sampling Error**

NOTE: On the 25th November 2008 the collection contractor failed to collect a designated sample from the Woodford & Bushfield kerbside area. An indicative sample was obtained at Barton's Transfer Station by removing dumped waste from a 36m³ skip which had originated from the audit area. As a result, interpretation of this day's results should be treated with care.

Sample Size

A sample size of 80 bins from nominated streets were chosen for the Botanic Road audit and this was increased to 100 thereafter.

A total of 480 tenements for a population of 13,250 tenements produces a confidence interval of less than 5% (4.39%), meaning that the values obtained from the audit are 95% (+ or -) 4.39% of being correct within this range. Further information concerning confidence intervals can be referred to in Appendix G.

Community Awareness

The audit would be conducted in a manner that minimised disruption to households. Individual residents were not notified that their household was to be audited, as this may have influenced their disposal behaviour. Council placed a notice in the local newspaper advising that random audits of garbage would be conducted over the next few months and that the audit will be an aggregated audit and individual household waste will not be identified or supply source recorded.

Customer Service Information

Customer Service representatives at the Council and at the contractor's office were briefed on the audit timing and the procedure to allow them to provide information to residents if required. This information included the purpose of the audit and the basic audit procedure. It emphasised that residents' privacy was to be protected and all results would only be considered on an aggregated basis and not supply source recorded.

Bin Presentation and Estimated Volume

The WRG conducted presentation checks of kerbside bins on the evening of the collection as well as recorded volumes of sample of bins from the nominated area. As Warrnambool have a contract for collection during the evening and early morning, it was not possible to check the exact kerbside bins which were to be audited and a typical sample was chosen for each audit area.

Occupation Health and Safety

All audit staff had Hepatitis A and B vaccinations and Tetanus vaccinations. The WRG retain documentation of these records.

The auditor conducted an onsite safety assessment of the audit site and inducted all audit staff on the site safety plan and the audit plan (**refer to Appendix A and B**). Audit staff all signed confidentiality agreements in relation to information seen during the audits and the prevention of removal of any items or information from the site. All audit staff were provided with personal protective equipment (PPE) and were instructed on how to use the equipment.

A first aid officer (Level 1) was nominated and a first aid kit was obtained.

Equipment

The WRG arranged all the equipment needed for the audit to be conducted and arranged for the equipment to be carted and established at the audit site.

4. **AUDIT SITE LOCATION**

Barton's Waste Transfer Station.

5. **AUDIT METHODOLOGY**

Presentation Rate

The WRG inspected and recorded the presentation rate of bins in the nominated areas. This was conducted in a random area of the waste collection area at approximately 9:00pm on the evening prior to the collection.

Estimated Volumes

The WRG also selected a random sample of 80 or 100 bins from the nominated audit area and recorded the approximate filled volume of each bin. This was also undertaken at 9:00pm on the evening prior to the collection.

Collection

At a stage when the contractor's collection truck was empty and it was located close to the specifically nominated audit area, the nominated number of waste bins were collected*. This waste was then transported to Barton's Waste Transfer Station and it was deposited on the ground in an allocated area.

***Sampling Error**

NOTE: On the 25th November 2008 the collection contractor failed to collect a designated sample from the Woodford & Bushfield kerbside area. An indicative sample was obtained at Barton's Transfer Station by removing dumped waste from a 36m³ skip which had originated from the audit area. As a result, interpretation of this day's results should be treated with care.

Audit Site

The waste audit team secured the safety of the area with temporary barricades and established the auditing table, scales and specific product bins.

Audit Procedure

The audit was conducted by transferring the waste in plastic bags, where possible, onto the audit table. The bags were cut open and contents spread over the table. No physical handling of the waste was permitted. The contents were then sorted into the various categories and subsequent weights and volumes of various categories were recorded.

Sorted contents were then placed into 240 litre waste bins, volumes recorded for cross checking purposes and waste deposited for disposal.

Waste Stream Components

Waste stream types for auditing purposes were used in accordance with Sustainability Victoria's Waste Audit Template for kerbside waste. A detailed breakdown of the waste streams recorded can be referred to in **Appendix C and D**.



Bags of waste were transferred to a sorting table, tongs were used to separate the waste into the different waste streams.

6. WASTE ANALYSIS RESULTS

6.1 Presentation Rate

Presentation rate can be referred to in ***Appendix E.***

6.2 Estimated Filled Volumes

Estimated filled volumes of kerbside bins can be referred to in ***Appendix F.***

6.3 Waste Stream Components

A detailed breakdown of the waste streams recorded can be referred to in ***Appendix C and D.***

For the purpose of summarising results, the main waste streams that were identified in the waste bins were:

- Co-mingled Recyclables (recyclables that should be placed in the recycling bin)
- Green Waste (Garden waste)
- Food organics
- Nappies and Sanitaries
- General Waste (All waste types not placed in the above mentioned categories)

6.3.1 Waste Results By Collection Addresses

A detail breakdown of waste stream results by collection area can be referred to in:

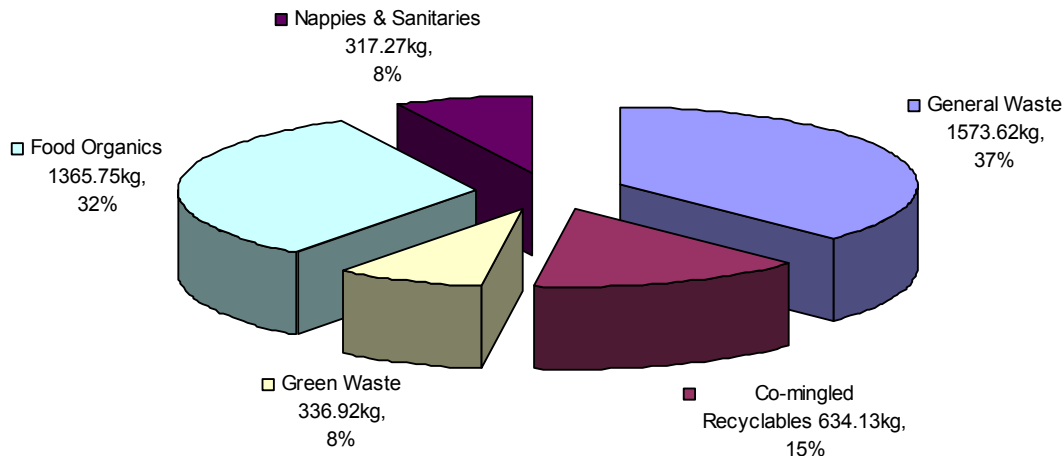
- Appendix G1-** Botanic Road
- Appendix G2-** Woodford/Bushfield
- Appendix G3-** Riverview Terrace
- Appendix G4-** Brenton Street
- Appendix G5-** McDonald and Harris Street

6.3.2 Total Waste –Warrnambool City Council

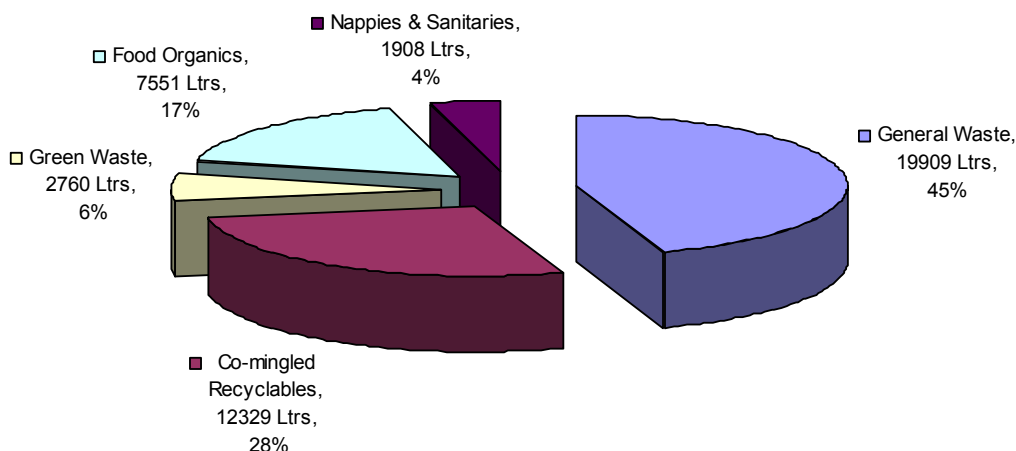
Total Tenement Sample size = 480

WASTE STREAM	kg	%	kg/hhld	Litres	%	Litres/hhld
General Waste	1573.62	37	3.28	19909	45	41.48
Co-mingled Recyclables	634.13	15	1.32	12329	28	25.69
Green Waste	336.92	8	0.70	2760	6	5.75
Food Organics	1365.75	32	2.85	7551	17	15.73
Nappies and Sanitaries	317.27	8	0.66	1908	4	3.98
Total	4227.69	100%	8.81	44457	100%	92.63

Warrnambool- Total Waste Audit (kg), 2009
(n=480)



Warrnambool- Total Waste Audit (Litres), 2009
(n=480)



6.3.3 Total Waste Audit / LGDC

It should be noted that when comparing the results from the audit to the data submitted by Council for the LGDC, the calculations indicate a consistency in the tonnage of waste sent to landfill through the kerbside collection.

Local Government	Audit (kg)	Audit kg/hhld/wk	Audit kg/hhld/yr	LGDC (kg)	LGDC kg/hhld/wk	LGDC kg/hhld/yr
	Waste	4227.69	8.81	458.12	5777	8.38

Local Government Data Collection Survey (LGDC) - Warrnambool City 2007-2008
(Data provided by Sustainability Victoria)

Summary

By weight approximately 45 % of the waste identified is in fact true waste. The remaining 55% has potential to be removed from the waste stream by using mechanisms/systems/education to maximise recycling. If systems could be introduced to deal with nappies and sanitarries the true waste component could be further reduced.

The Green Waste component was relatively small ie 6% by volume and 8% by weight of the waste stream.

The Co-mingled Recyclables component was 28% by volume and 15% by weight of the waste stream. Glass paper and card board were the main recyclables recorded.

The presentation rate of bins over the municipality was 82%.

The average bin filled volume was 67 litres.

The percentage of bins totally filled was 43%.

6.4 Composition Of Recyclable Types In General Waste Stream

A detailed breakdown of the recyclable types recorded can be referred to in **Appendix C and D**. For the purpose of summarising results the recyclable types were based on the Warrnambool City Councils current kerbside recycling collection.

6.4.1 Composition Of Recyclable Types In General Waste Stream By Collection Addresses

A detail breakdown of the recyclable types in the general waste stream by collection area can be referred to in:

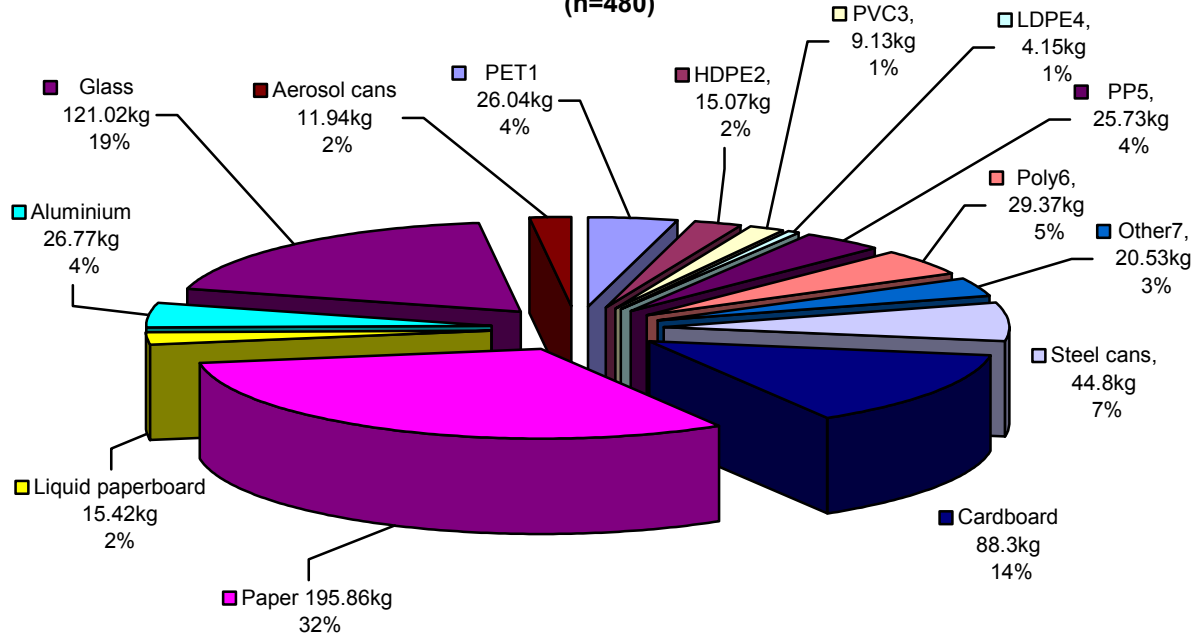
Appendix H1-	Botanic Road
Appendix H2-	Woodford/Bushfield
Appendix H3-	Riverview Terrace
Appendix H4-	Brenton Street
Appendix H5-	McDonald and Harris Street

6.4.2 Recyclable Types In General Waste Stream

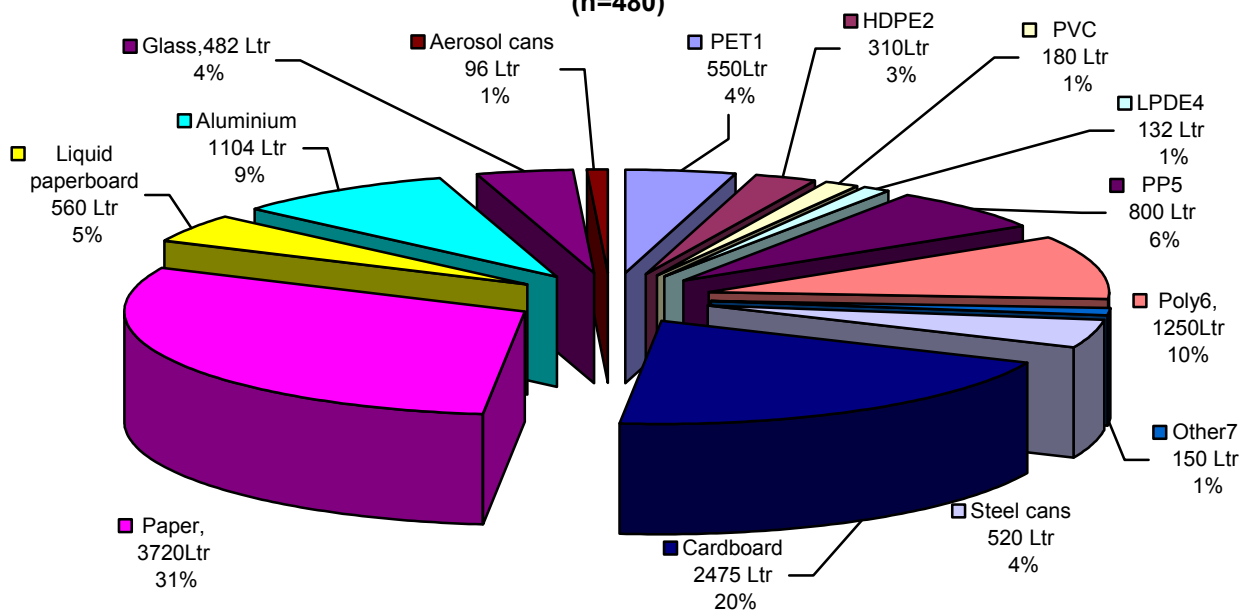
The following is a break down of the composition of the recyclable types in the General Waste Stream.

Type	kg	Percent by kg	Litre	Percent by Litre
PET1	26.04	4%	550	4%
HDPE2	15.07	2%	310	3%
PVC3	9.13	1%	180	1%
LDPE4	4.15	1%	132	1%
PP5	25.73	4%	800	6%
Poly6	29.37	5%	1250	10%
Other7	20.53	3%	150	1%
Steel Cans	44.80	7%	520	4%
Cardboard	88.30	14%	2475	20%
Paper	195.86	32%	3720	31%
Liquid Paperboard	15.42	2%	560	5%
Aluminium cans & foil	26.77	4%	1104	9%
Glass	121.02	19%	482	4%
Aerosol Cans	11.94	2%	96	1%

Warrnambool- Recyclable Types (kg), 2009
(n=480)



Warrnambool-Recyclable Types (Ltr), 2009
(n=480)



Recyclables Summary

The paper, cardboard and glass components of the recyclables are consistently high in terms of weight and volume.

7. FINANCIAL COSTS FOR CONSIDERATION

In very broad terms, Warrnambool has 13,000 tenements and from the audit each tenement produces on average 8.81kg per week. This is a total of 6,000 tonnes of waste per year to be disposed of.

Based on the results of the audit, if 55% of the waste stream could be recycled (ie food organics, commingled recyclables and green waste) then 3,300 tonnes could be taken out of the waste stream.

Neglecting the cost of recycling, by taking 3,300 tonnes per year out of the waste stream, the Council could reduce both the costs of disposal to landfill by \$165,000 (based on \$50/tonne gate fees) and the cost of cartage to landfill of \$90,000 (based on cartage cost of \$0.20/Tonne/km). A potential total cost saving/shift of \$255,000 which is approximately one quarter of the total kerbside waste disposal costs for the WCC per year.

This is obviously very “broad brush” and requires more analysis beyond the scope of this report. It should also be well noted that the alternative of recycling comes at a substantial cost and may very well exceed benefits.

8. OVERALL CONCLUSION

- From the audit it is apparent that there is a substantial portion of the waste stream which is going to landfill and has the potential to be removed.
- Paper, glass and cardboard make up significant volumes/weight of the recyclables in the waste stream but overall, the recyclable component in the waste stream is marginal, 15% by weight and 28% by volume.
- The green waste component was small.
- If a solution could be derived which removed green waste, nappies/sanitaries and food organics then larger benefits of reducing waste to landfill would be obtained.
- Potential cost savings/shift of \$255,000 and undetermined environmental benefits may be achieved by the removal of recyclables from the waste stream (Note: no allowance for costs of recycling).
- The 80 litre bin size would be considered adequate with 43% of households totally filling the bin and potential to reduce volumes further by recycling initiatives.

9. **RECOMMENDATION**

- Provide educational programs which focus on increasing recycling, in particular focussing on packaging consisting of glass, paper and cardboard.
- Provide education programs which focus on home composting as a means of reducing waste in the bin.
- Provide education programs which focus on reducing waste within the home, for example consider packaging when shopping.
- Investigate possible recycling of food organics, green waste and nappies/sanitararies opportunities.

APPENDIX A: RISK ASSESSMENT

Severity of hazard		How likely is it to occur?		
	Very likely			Very unlikely
	1	2	3	4
Most severe 1		-Sharps -Exposure to chemicals		-Traffic accident
2				-Fall into skip
3		-Exposure to bacteria		
4	-Exposure to odorous material	-Heavy lifting		
5 Least severe		-Tripping		-Poor ventilation -Fatigue -Poor lighting

APPENDIX B: SAFETY PLAN

Ranking	Hazard	Risk	Actions
1	-Sharps -Exposure to chemicals	2	-Personnel to be made aware of potential risks. -Sharps to be placed in appropriate container and not to be handled without correct tools. -Personnel to be briefed on standard yellow sharps container which may be used for containment of needles. If located, works are to be "called out" and work is not to restart until the risk is addressed. -All handling of the waste other than by the use of tools is prohibited. -All waste personnel are to be given a copy of this Audit Plan and will be instructed to read the plan prior to works commencing. -Personnel to wear protective clothing. -Suitable washing facilities to be provided. -Work Site to be well ventilated. -Spill kits to be provided. -Ready access to medical advice be available.
2	-Exposure to odorous material -Traffic Accident	4	-Personnel to wear face masks. -Work site to be well ventilated. -Personnel to be inducted on traffic movements at the site and be instructed to remain in the work area. -Personnel to wear safety jackets whilst onsite.
3	-Exposure to bacteria	6	-Ensure PPE is worn correctly and is not damaged. -Decontamination to occur prior to eating and other breaks.
4	-Heavy lifting -Fall into skips	8	-Audit personnel be instructed to use correct lifting techniques, equipment and to share loads where required. -Audit personnel to be shown location of skips. -Skips are to have safety barrier installed and maintained throughout audit process.
5	-Tripping	10	-Cover or barricade potential tripping points with suitable material. -Cordon off dangerous areas. -Restrict access by the general public. -Work site to be kept tidy and free of materials at ground level as feasibly as possible.
6	-Poor ventilation -Fatigue -Poor lighting	20	-Work site to be well ventilated. -Monitor staff well-being. -Provide timely work breaks. -Ensure suitable drinking water is on hand. -Ensure appropriate lighting and ventilation is available.

APPENDIX C: WASTE AUDIT DATA SHEETS – WEIGHT Kg

WASTE AUDIT DATA SHEET

MATERIAL TYPE

		PET 1	HDPE 2	PVC 3	LDPE 4	PP 5	Poly 6	Other 7	POLY eg expanded foam packaging	EWASTE	Steel cans
24.11.08	Botanic Road	8.66	4.08	1.89	0.71	4.78	5.00	6.08	3.41	2.09	8.46
25.11.08	Woodford & Bushfield	1.18	1.32	0.37	1.11	3.31	3.31	1.72	1.77	7.35	5.17
26.11.08	Riverview Terrace	4.39	4.23	2.54	0.29	6.07	7.80	5.93	3.75	8.95	10.33
27.11.08	Brenton Street	4.72	1.77	3.29	0.82	5.47	8.28	1.28	3.17	9.74	10.23
28.11.08	Macdonald & Harris Sts	7.09	3.67	1.04	1.22	6.10	4.98	5.52	8.53	23.34	10.61
TOTALS		26.04	15.07	9.13	4.15	25.73	29.37	20.53	20.63	51.47	44.80
		Textiles eg clothing	Card-board	News papers	Liquid paper board	Aluminium Cans and Foil	Glass	Garden Waste	Food Organics	Aerosol cans	Nappies & Sanitary items
24.11.08	Botanic Road	10.25	18.19	34.99	5.33	4.98	34.37	43.20	250.23	0.81	26.03
25.11.08	Woodford & Bushfield	38.98	7.79	16.49	1.19	2.44	7.05	14.75	120.50	1.37	46.75
26.11.08	Riverview Terrace	33.98	14.53	54.36	2.93	3.87	21.40	57.73	315.91	3.05	34.16
27.11.08	Brenton Street	32.46	25.66	54.29	3.05	9.53	29.81	124.77	368.02	4.97	123.31
28.11.08	Macdonald & Harris Sts	26.10	22.13	35.73	2.92	5.95	28.39	96.47	311.09	1.74	87.02
TOTALS		141.77	88.30	195.86	15.42	26.77	121.02	336.92	1365.75	11.94	317.27
		Non Recycle Hard Plastic - no ID number	Non recycle plastic film	Other eg leather, rubber, oils, ceramics	Hazard items	Batteries	Building materials	Inert eg soils, dust, mud	Other metals eg copper, alloys	RUBBISH	TOTALS
24.11.08	Botanic Road	0.00	20.78	5.71	2.20	0.00	14.65	0.42	0.68	262.24	780.22
25.11.08	Woodford & Bushfield	3.50	34.23	1.77	0.62	0.00	11.56	9.34	5.18	222.42	572.54
26.11.08	Riverview Terrace	19.11	39.50	22.19	3.00	1.33	63.78	6.92	3.23	128.41	883.67
27.11.08	Brenton Street	8.98	57.72	12.00	3.23	0.79	38.40	26.12	9.04	137.67	1118.59
28.11.08	Macdonald & Harris Sts	8.14	49.26	7.22	6.57	0.37	8.76	0.70	1.65	100.36	872.67
TOTALS		39.73	201.49	48.89	15.62	2.49	137.15	43.50	19.78	851.10	4227.69

APPENDIX D: WASTE AUDIT DATA SHEETS – VOLUME Litres

WASTE AUDIT DATA SHEET

MATERIAL TYPE

		PET 1	HDPE 2	PVC 3	LDPE 4	PP 5	Poly 6	Other 7	POLY eg expanded foam packaging	EWASTE	Steel cans
24.11.08	Botanic Road	200	80	40	40	120	220	60	260	10	70
25.11.08	Woodford & Bushfield	30	30	10	32	100	140	20	100	40	60
26.11.08	Riverview Terrace	50	70	60	20	180	340	30	240	40	140
27.11.08	Brenton Street	120	40	50	10	190	320	10	280	20	120
28.11.08	Macdonald & Harris Sts	150	90	20	30	210	230	30	430	130	130
TOTALS		550.00	310.00	180.00	132.00	800.00	1250.00	150.00	1310.00	240.00	520.00

		Textiles eg clothing	Card-board	News papers	Liquid paper board	Aluminium Cans and Foil	Glass	Garden Waste	Food Organics	Aerosol cans	Nappies & Sanitary items
24.11.08	Botanic Road	120	525	630	190	195	122	390	1425	8	150
25.11.08	Woodford & Bushfield	390	210	300	40	144	30	135	660	8	288
26.11.08	Riverview Terrace	390	420	990	100	180	105	600	1791	30	240
27.11.08	Brenton Street	450	690	930	120	300	105	885	2070	30	705
28.11.08	Macdonald & Harris Sts	405	630	870	110	285	120	750	1605	20	525
TOTALS		1755.00	2475.00	3720.00	560.00	1104.00	482.00	2760.00	7551.00	96.00	1908.00

		Non Recycle Hard Plastic - no ID number	Non recycle plastic film	Other eg leather, rubber, oils, ceramics	Hazard items	Batteries	Building materials	Inert eg soils, dust, mud	Other metals eg copper, alloys	RUBBISH	TOTALS
24.11.08	Botanic Road	0	890	40	30	0	30	0	8	1910	7,763
25.11.08	Woodford & Bushfield	44	1080	40	4	0	48	80	70	1380	5,513
26.11.08	Riverview Terrace	280	1860	160	4	0	204	44	30	1060	9,658
27.11.08	Brenton Street	118	2400	100	30	0	110	90	60	840	11,193
28.11.08	Macdonald & Harris Sts	120	2700	30	40	0	60	10	10	590	10,330
TOTALS		562.00	8930.00	370.00	108.00	0.00	452.00	224.00	178.00	5780.00	44,457

APPENDIX E: PRESENTATION RATE

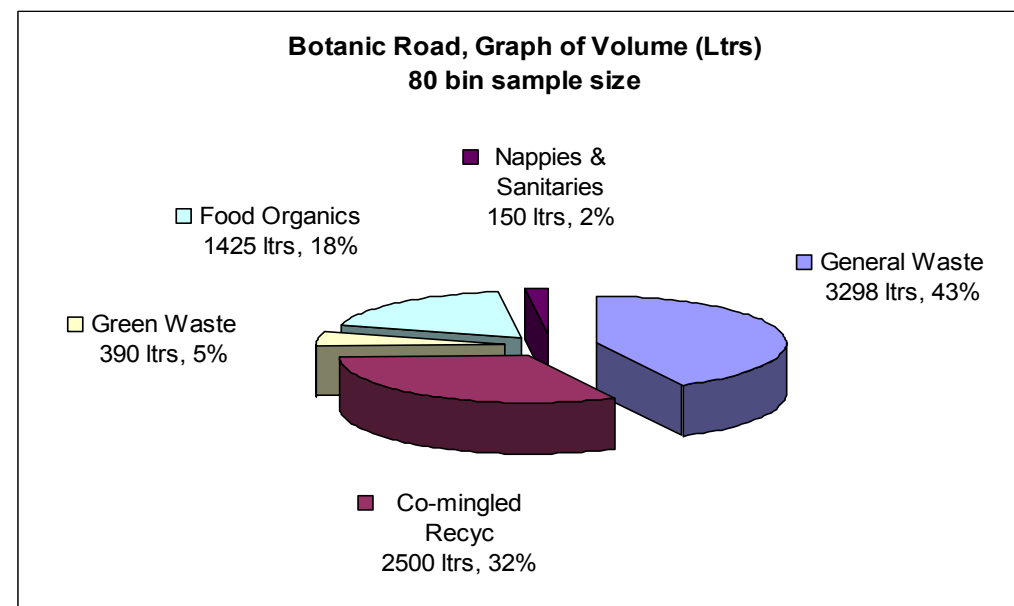
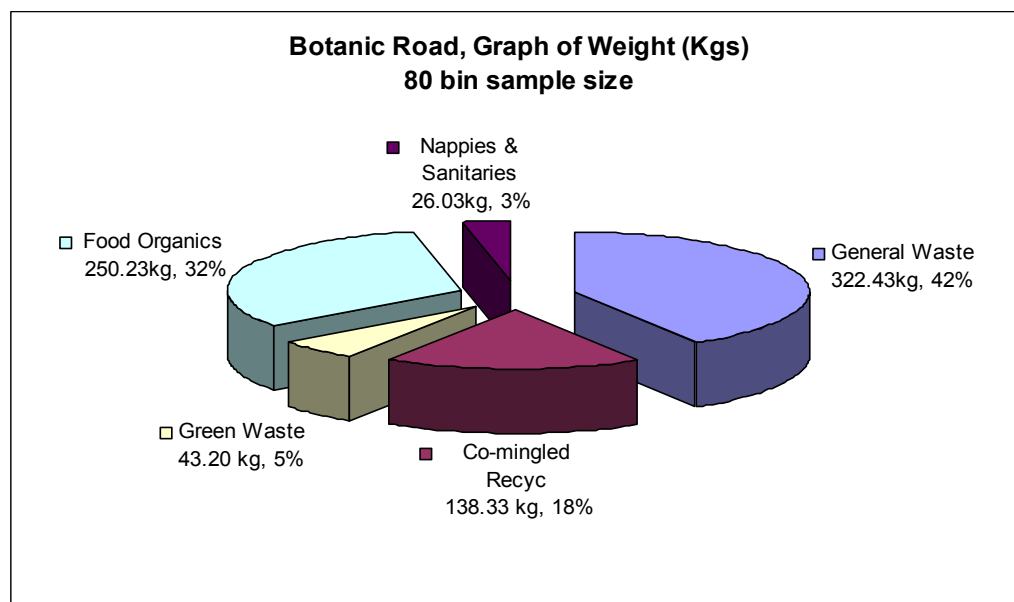
AREA	RESIDENCES SAMPLE SIZE	TOTAL RESIDENCES TRAVERSED TO OBTAIN SAMPLE SIZE	PRESENTATION %
Botanic Road	80 bins	88	91
Woodford/Bushfield	100 bins	123	81
Riverview Terrace	100 bins	124	81
Brenton Street	100 bins	130	77
Macdonald and Harris Streets	100 bins	124	81
Aggregated Average			82

APPENDIX F: FILLED VOLUME

AREA	BIN SAMPLE SIZE	LOWEST FILLED VOLUME (LTRS)	AVG FILLED VOLUME (LTRS)	% TOTALLY FILLED BINS
Botanic Road	80	32	57	36
Woodford/Bushfield	100	8	65	45
Riverview Terrace	100	17	70	40
Brenton Street	100	20	71	46
Macdonald and Harris Streets	100	10	71	49
Aggregated Average		17.5	67	43

Appendix G1: Total Waste Stream 24th November 2008 - Botanic Road (80 Bins)

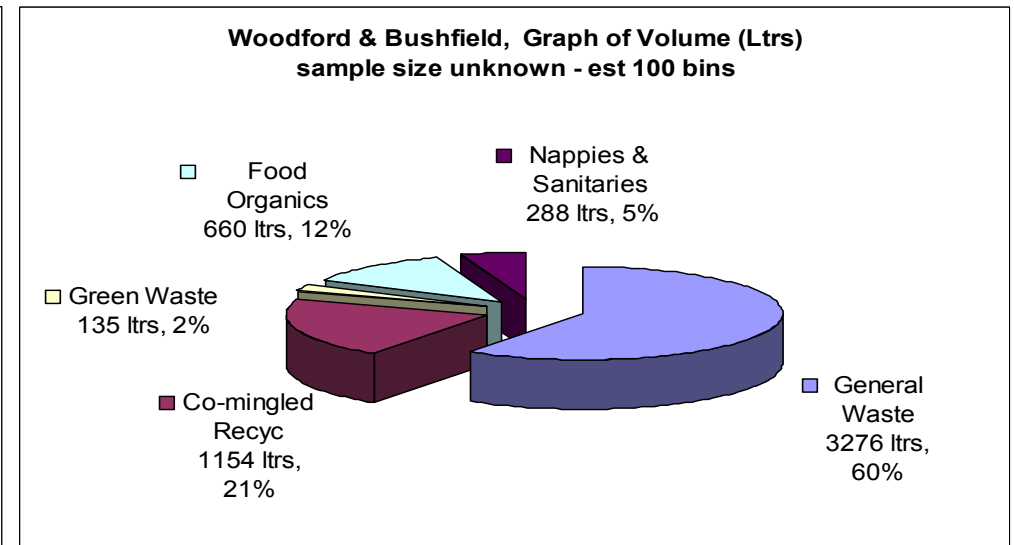
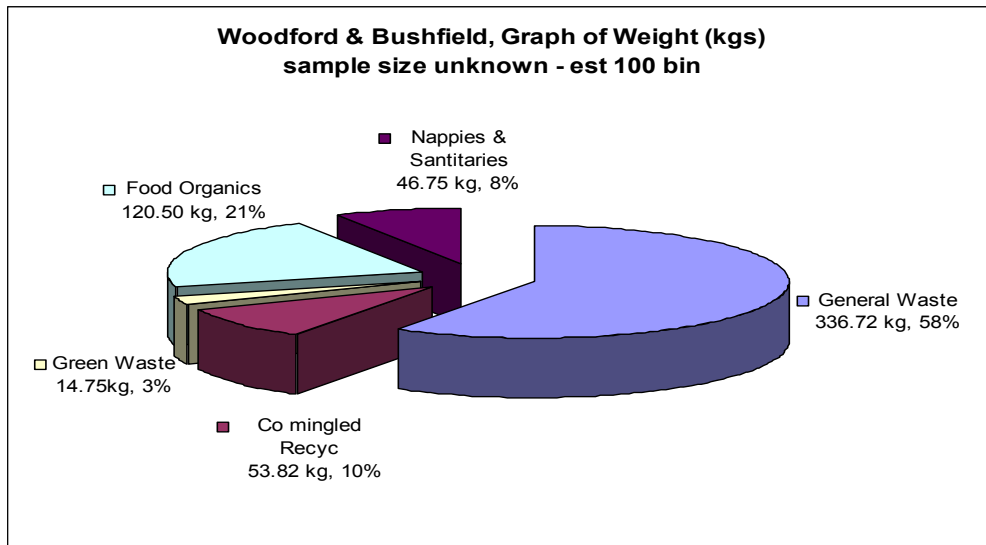
WASTE STREAM	Kg	%	Kg/Ten	Ltrs	%	Ltrs/Ten
General Waste	322.43	41.33	4.03	3,298	42.48	41.23
Co-mingled Recyclables	138.33	17.73	1.73	2,500	32.20	31.25
Green Waste	43.20	5.54	0.54	390	5.02	4.88
Food Organics	250.23	32.07	3.13	1,425	18.36	17.81
Nappies and Sanitaries	26.03	3.34	0.33	150	1.93	1.88
Total	780.22	100%		7,763	100%	



APPENDIX G2: Total Waste Stream 25th November 2008 - Woodford/Bushfield area (estimated 100 bins)*

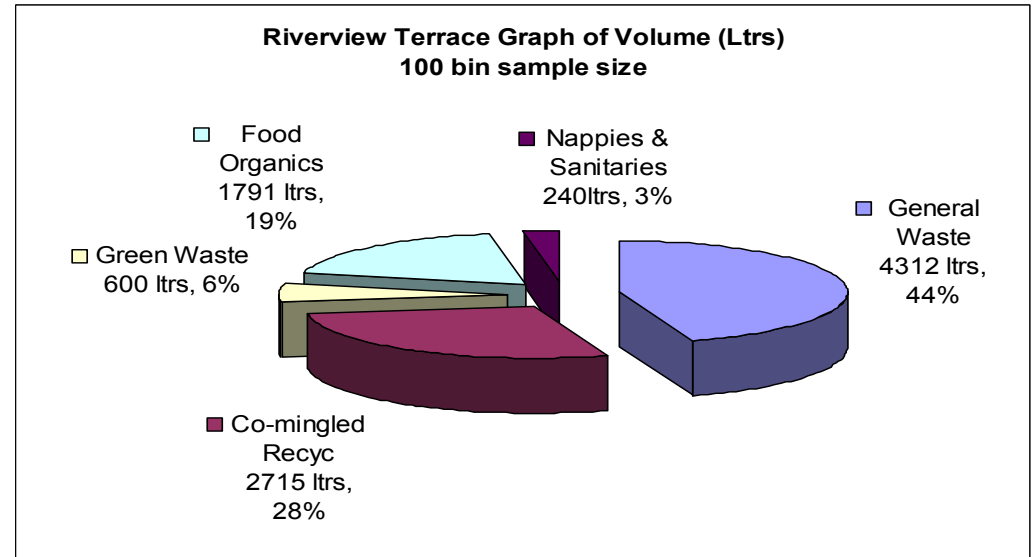
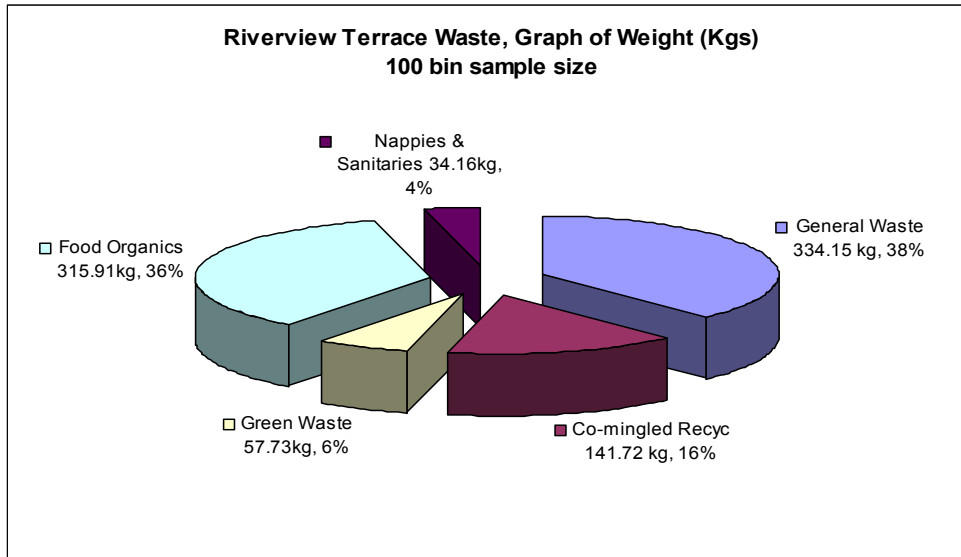
WASTE STREAM	Kg	%	Kg/Ten	LTRS	%	Ltrs/Ten
General Waste	336.72	58.81	3.37	3,276	59.42	32.76
Co-mingled Recyclables	53.82	9.40	0.54	1,154	20.93	11.54
Green Waste	14.75	2.58	0.15	135	2.45	1.35
Food Organics	120.50	21.05	1.21	660	11.97	6.60
Nappies and Sanitaries	46.75	8.17	0.47	288	5.22	2.88
Total	572.54	100.00		5513	100%	

*Sampling Error



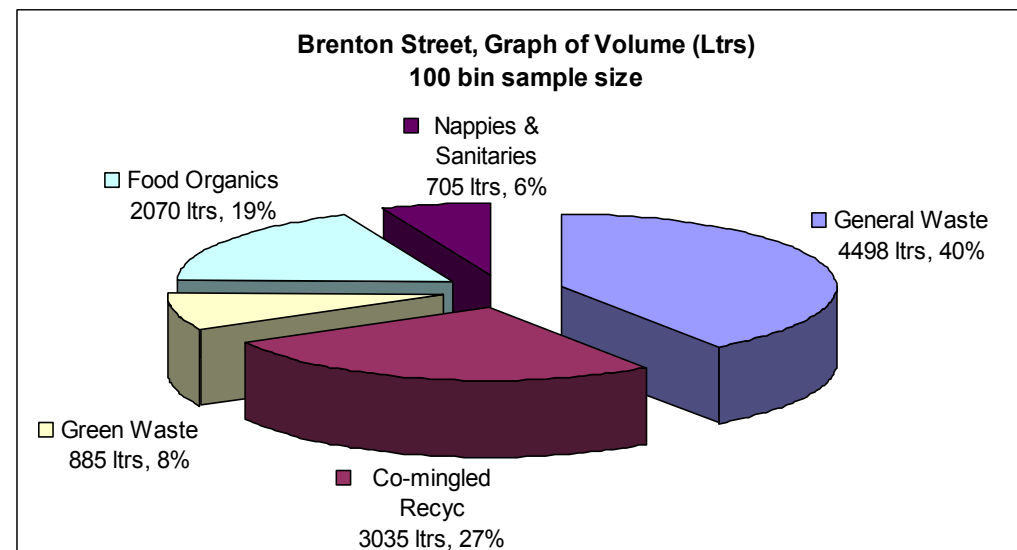
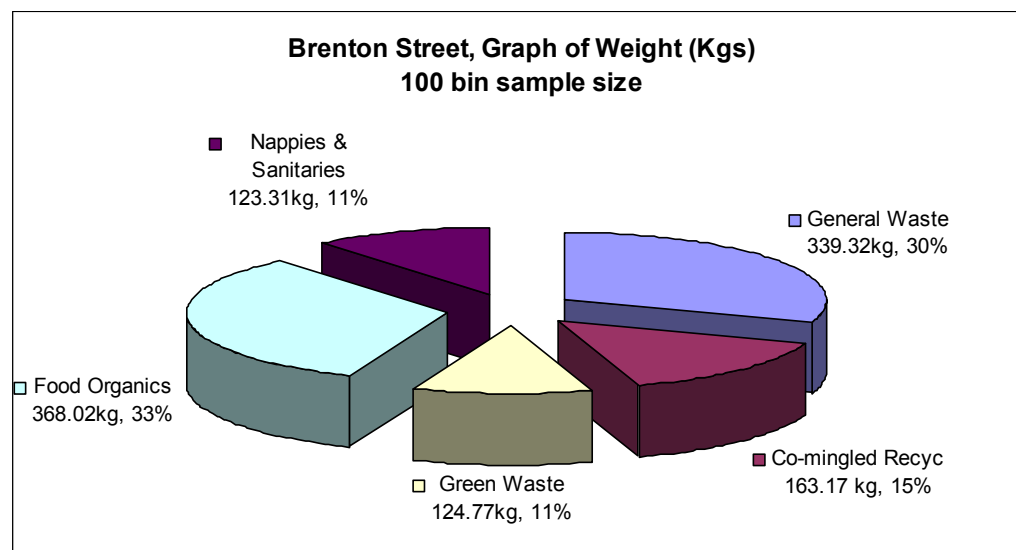
APPENDIX G3: Total Waste Stream 26th November 2008 - Riverview Terrace (100 bins)

WASTE STREAM	Kg	%	Kg/Ten	LTRS	%	Ltrs/Ten
General Waste	334.15	37.81	3.34	4,312	44.65	43.12
Co-mingled Recyclables	141.72	16.04	1.42	2,715	28.11	27.15
Green Waste	57.73	6.53	0.58	600	6.21	6.00
Food Organics	315.91	35.75	3.16	1,791	18.54	17.91
Nappies and Sanitaries	34.16	3.87	0.34	240	2.48	2.40
Total	883.67	100%		9,658	100%	96.58



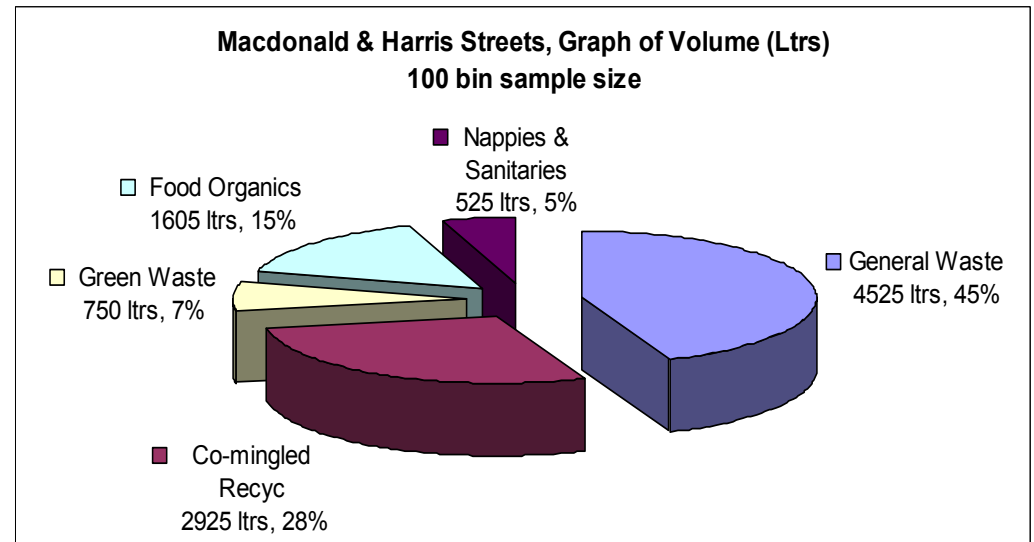
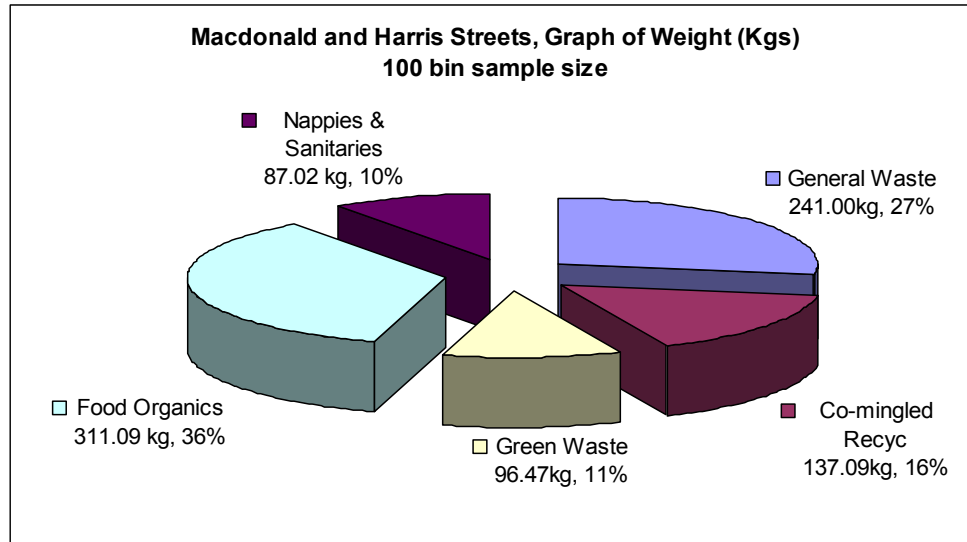
APPENDIX G4: Total Waste Stream 27th November 2008 - Brenton Street (100 bins)

WASTE STREAM	Kg	%	Kg/Ten	LTRS	%	Ltrs/Ten
General Waste	339.32	30.33	3.39	4,498	40.19	44.98
Co-mingled Recyclables	163.17	14.59	1.63	3,035	27.12	30.35
Green Waste	124.77	11.15	1.25	885	7.91	8.85
Food Organics	368.02	32.90	3.68	2,070	18.49	20.70
Nappies and Sanitaries	123.31	11.02	1.23	705	6.30	7.05
Total	1118.59	100%	11.19	11,193	100%	111.93

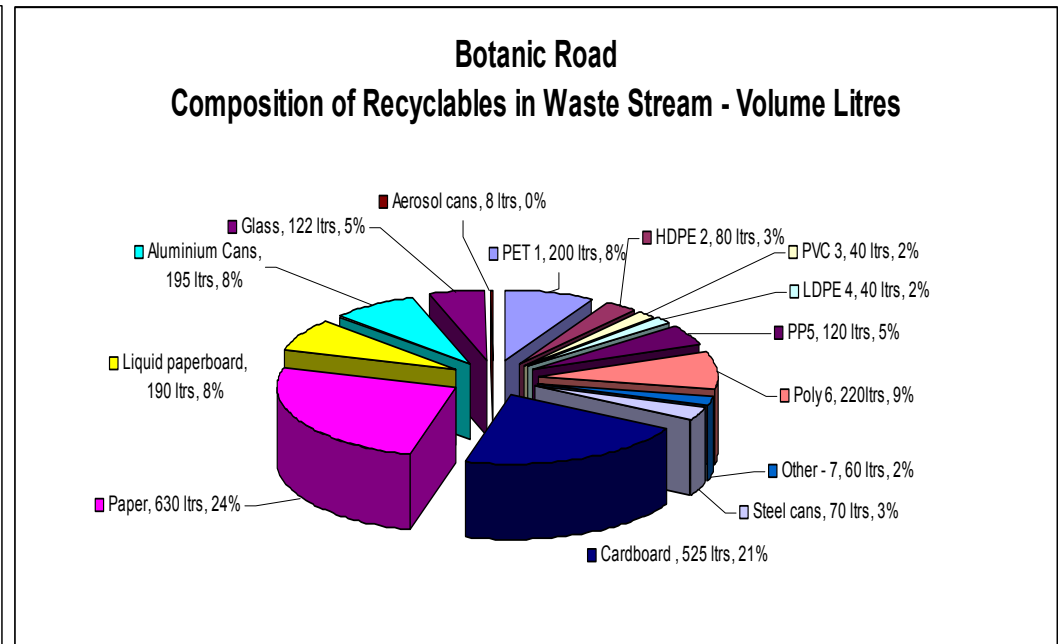
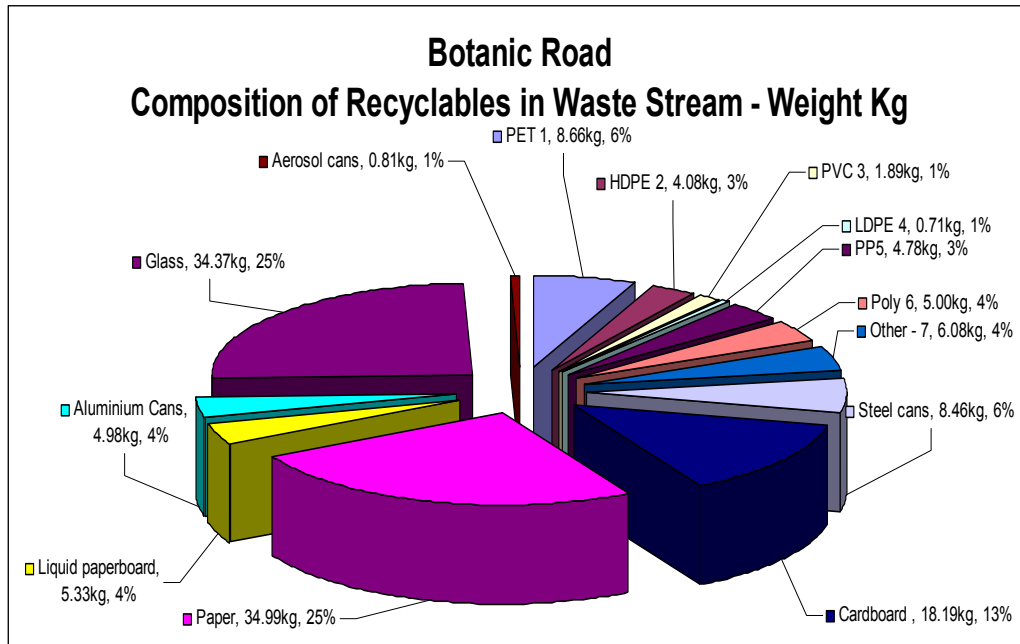


APPENDIX G5: Total Waste Stream 28th November 2008 - Macdonald and Harris Streets (100 Bins)

WASTE STREAM	KG	%	Kg/Ten	LTRS	%	Ltrs/Ten
General Waste	241.00	27.62	2.41	4,525	43.80	45.25
Co-mingled Recyclables	137.09	15.71	1.37	2,925	28.32	29.25
Green Waste	96.47	11.05	0.96	750	7.26	7.50
Food Organics	311.09	35.65	3.11	1,605	15.54	16.05
Nappies and Sanitaries	87.02	9.97	0.87	525	5.08	5.25
Total	872.67	100%	8.73	10,330	100%	103.30

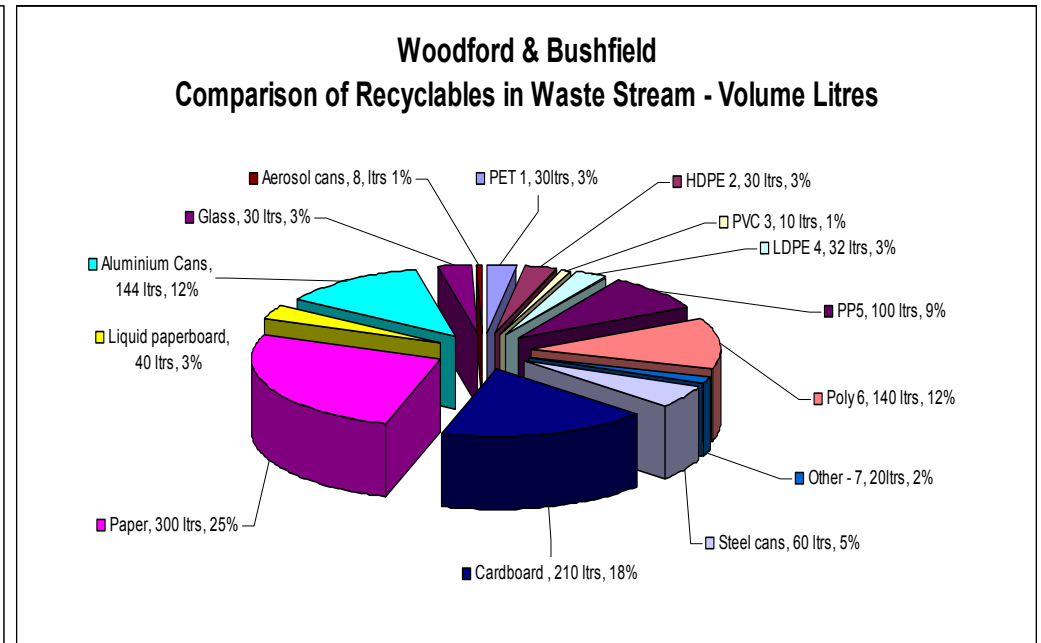
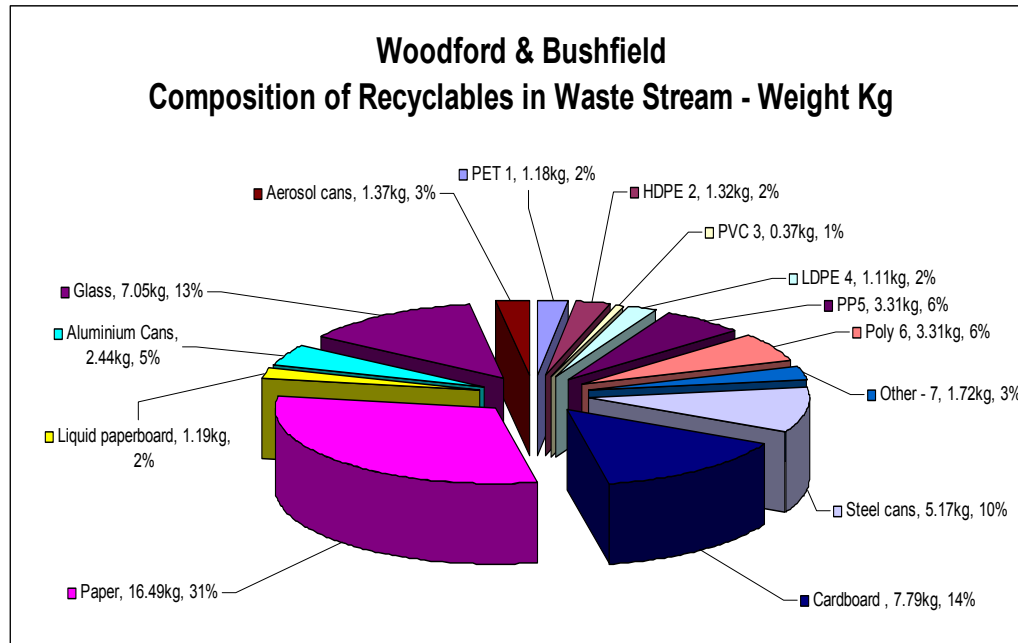


APPENDIX H1: Composition of Recyclables in the General Waste Stream - 24th November 2008 - Botanic Road (80 Bins)

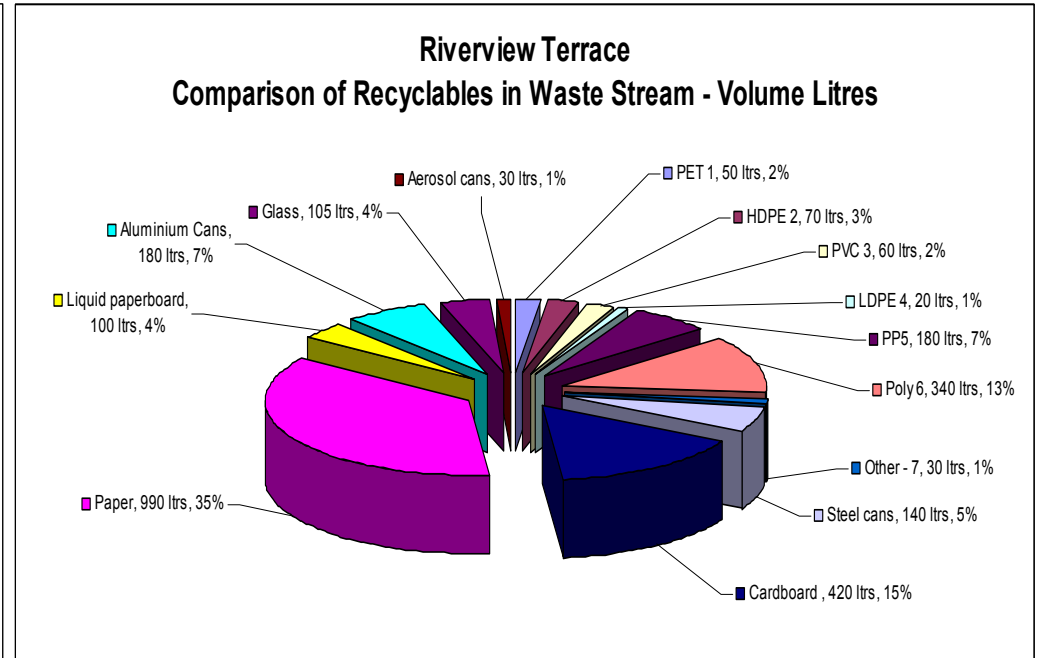
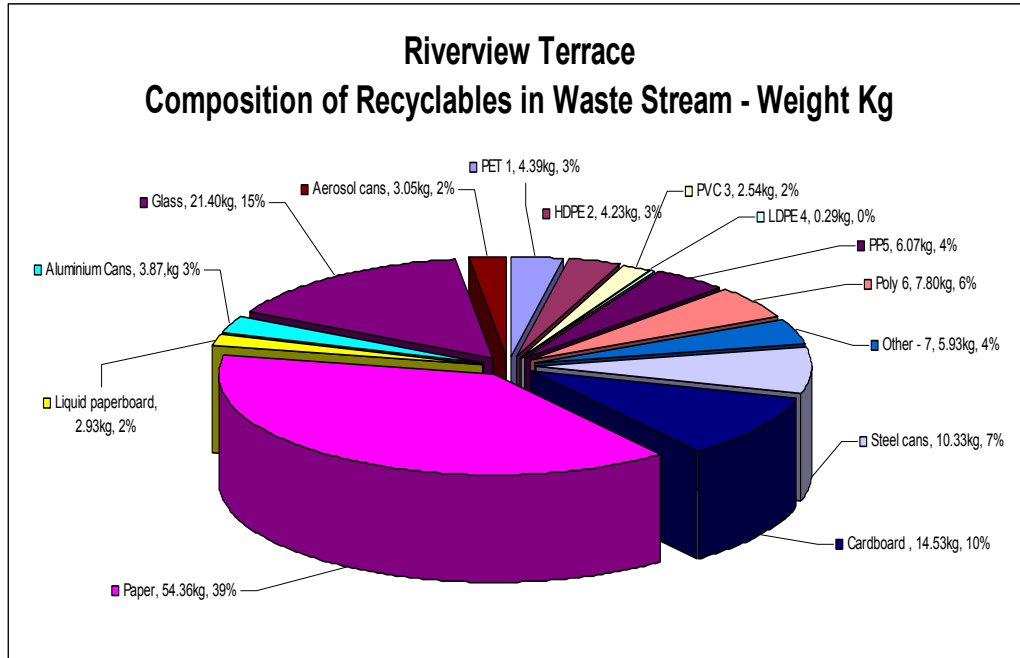


APPENDIX H2: Composition of Recyclables in the General Waste Stream -25th November 2008 – Woodford & Bushfield area (100 Bins)

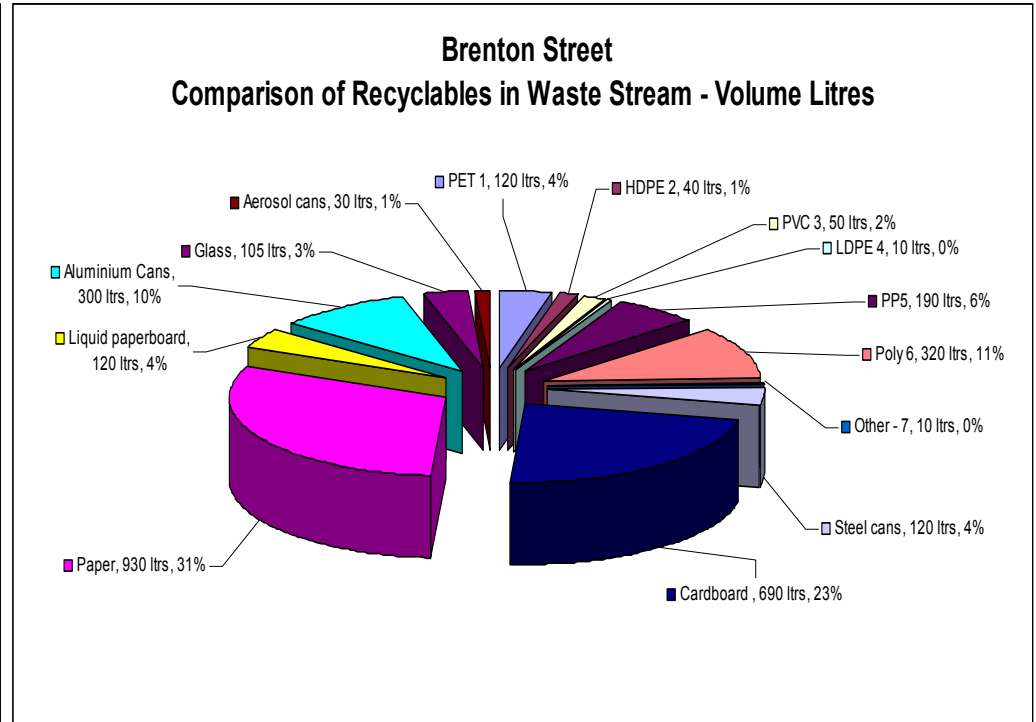
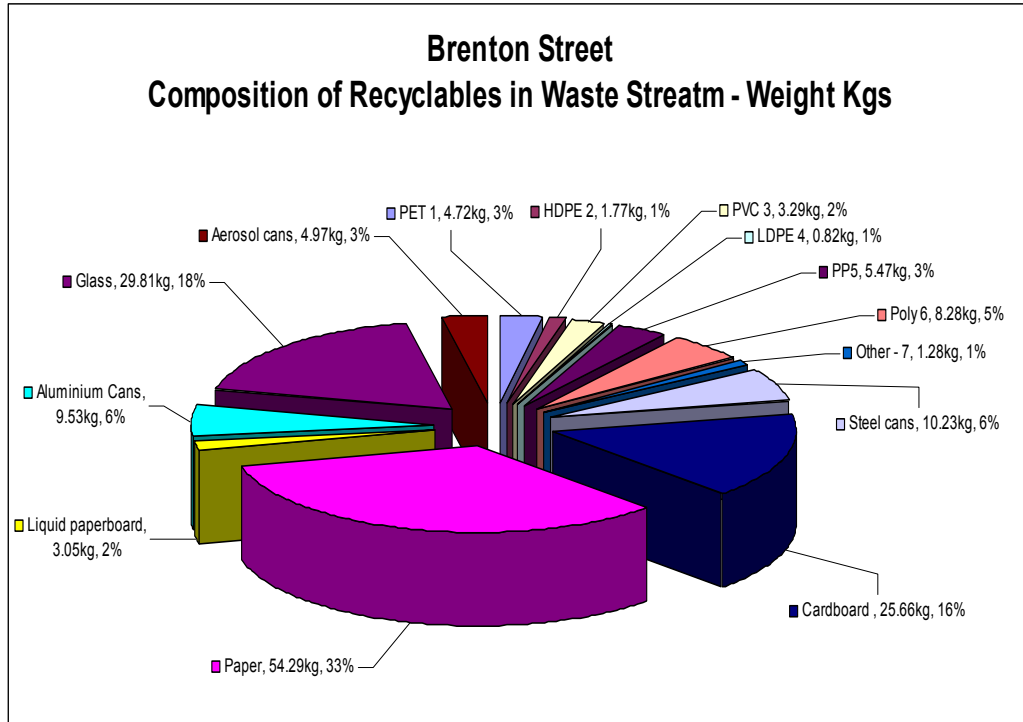
*Error in sampling



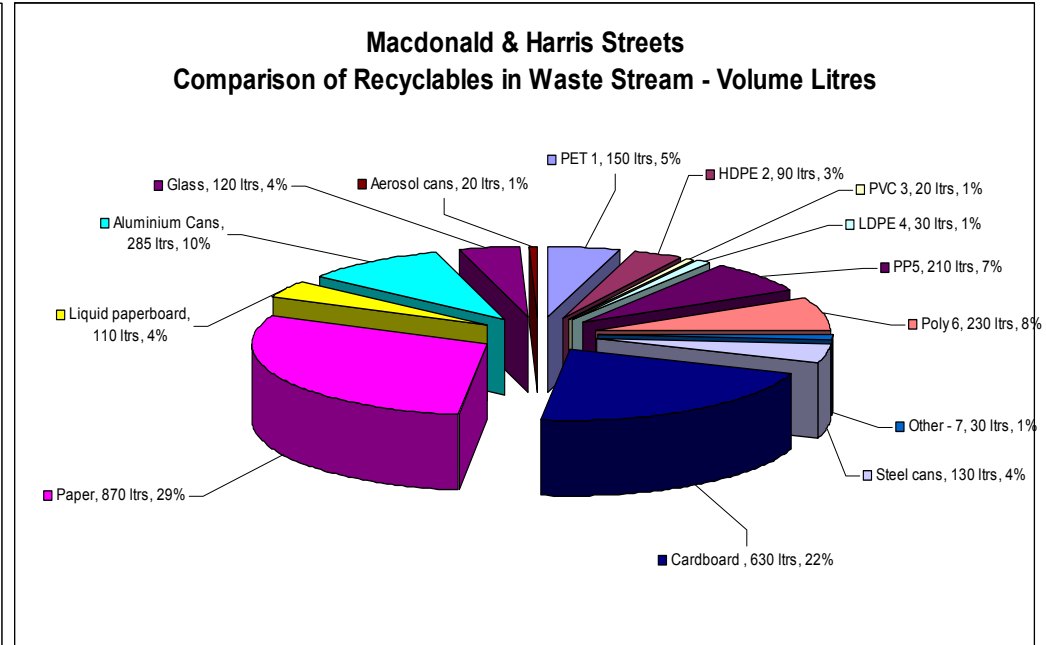
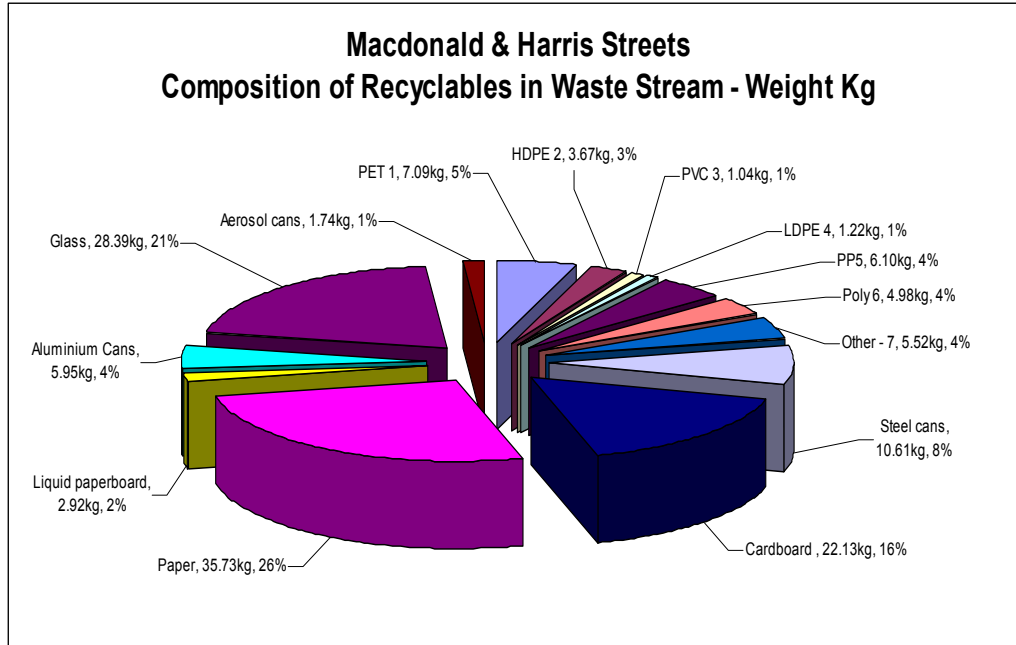
APPENDIX H3: Composition of Recyclables in the General Waste Stream - 26th November 2008 – Riverview Terrace area (100 Bins)



APPENDIX H4: Composition of Recyclables in the General Waste Stream -27th November 2008 – Brenton Street area (100 Bins)



APPENDIX H5: Composition of Recyclables in the General Waste Stream - 28th November 2008 – Macdonald & Harris Street area (100 Bins)



Appendix I: Confidence Level

The **confidence interval** is the plus-or-minus figure usually reported in newspaper or television opinion poll results. For example, if you use a confidence interval of 4 and 47% percent of your sample picks an answer you can be "sure" that if you had asked the question of the entire relevant population between 43% (47-4) and 51% (47+4) would have picked that answer.

The **confidence level** tells you how sure you can be. It is expressed as a percentage and represents how often the true percentage of the population who would pick an answer lies within the confidence interval. The 95% confidence level means you can be 95% certain; the 99% confidence level means you can be 99% certain. Most researchers use the 95% confidence level.

When you put the confidence level and the confidence interval together, you can say that you are 95% sure that the true percentage of the population is between 43% and 51%. The wider the confidence interval you are willing to accept, the more certain you can be that the whole population answers would be within that range.

For example, if you asked a sample of 1000 people in a city which brand of cola they preferred, and 60% said Brand A, you can be very certain that between 40 and 80% of all the people in the city actually do prefer that brand, but you cannot be so sure that between 59 and 61% of the people in the city prefer the brand.

Factors that Affect Confidence Intervals

There are three factors that determine the size of the confidence interval for a given confidence level:

- Sample size
- Percentage
- Population size

Sample Size

The larger your sample size, the more sure you can be that their answers truly reflect the population. This indicates that for a given confidence level, the larger your sample size, the smaller your confidence interval. However, the relationship is not linear (i.e., doubling the sample size does not halve the confidence interval).

Percentage

Your accuracy also depends on the percentage of your sample that picks a particular answer. If 99% of your sample said "Yes" and 1% said "No," the chances of error are remote, irrespective of sample size. However, if the percentages are 51% and 49% the chances of error are much greater. It is easier to be sure of extreme answers than of middle-of-the-road ones.

When determining the sample size needed for a given level of accuracy you must use the worst case percentage (50%). You should also use this percentage if you want to determine a general level of accuracy for a sample you already have. To determine the confidence interval for a specific answer your sample has given, you can use the percentage picking that answer and get a smaller interval.

Population Size

How many people are there in the group your sample represents? This may be the number of people in a city you are studying, the number of people who buy new cars, etc. Often you may not know the exact population size. This is not a problem. The mathematics of probability proves the size of the population is irrelevant unless the size of the sample exceeds a few percent of the total population you are examining. This means that a sample of 500 people is equally useful in examining the opinions of a state of 15,000,000 as it would a city of 100,000. For this reason, The Survey System ignores the population size when it is "large" or unknown. Population size is only likely to be a factor when you work with a relatively small and known group of people (e.g., the members of an association).

The confidence interval calculations assume you have a genuine random sample of the relevant population. If your sample is not truly random, you cannot rely on the intervals. Non-random samples usually result from some flaw in the sampling procedure. An example of such a flaw is to only call people during the day and miss almost everyone who works. For most purposes, the non-working population cannot be assumed to accurately represent the entire (working and non-working) population.

Information provided by: Nick Chrisant, Project Manager, Sustainability Victoria