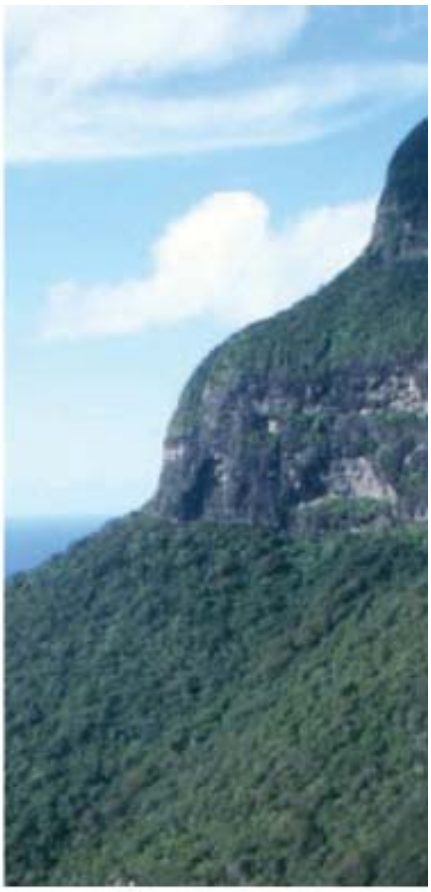

Kerbside Domestic Waste & Recycling Audit

FOR

ACT NoWaste

December 2009

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DISCLAIMER

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DEFINITIONS

Commingled Collection*: Pick up and transportation of mixed dry recyclable materials.

Contamination: Material not accepted by a council in its recycling or green-waste stream.

Diversion Rate: The percentage of the total waste stream diverted from disposal.

$$\text{Diversion Rate (proportion of waste diverted from landfill)} = \frac{\text{Weight of recyclables in the recycling bins}}{\text{(Weight of the contents of the garbage bins + weight of the contents of the recycling bins)}} \times 100$$

Recyclable*: Able to be recovered, processed and used as a raw material for the manufacture of useful new products through a commercial process.

Recycling Stream: Material source-separated for the purposes of recycling.

Recovery Rate*: The amount of material recovered from a product group as a percentage of overall consumption

$$\text{Recovery Rate} = \frac{\text{Weight of recyclables in recycling bin}}{\text{(Weight of recyclables in recycling bin + weight of recyclables in garbage bin)}}$$

Resource Recovery Plan: A plan developed in conjunction with the client to document actions, timelines, roles and responsibilities of staff to guide the implementation of best-practice principles in connection with waste management.

Segregation: Keeping the components of assorted waste streams separated.

Source Separation*: Physical sorting of the waste stream into its components at the point of generation.

Total Waste Stream: The combined waste, recycling and garden organics streams.

Waste Stream Analysis*: Determination of the quantities and qualities of individual components present in a waste stream.

Waste Stream Characterisation*: Classification and analysis of the waste stream.

Waste Stream Classification*: System to identify and categorise materials of weight or volume.

Waste Stream Composition*: Component material types by proportion of weight or volume.

*** Source: AS/NZS 3831:1998**.

EXECUTIVE SUMMARY

ACT NoWaste engaged APC Environmental Management to conduct a Domestic Waste and Recycling Audit at the kerbside.

The objectives of this study were to:

- Determine the contents of a representative sample of domestic waste and recycling bins using methodology consistent and comparable with previous surveys;
- Analyse and report on trends and opportunities to further improve recycling and assist with community education programs conducted by ACT NoWaste; and
- Make recommendations on how this information might be used to reduce waste and increase recycling recovery.

The waste audit was conducted during the week commencing 4th May, 2009 during which time 259 garbage samples and 155 recycling samples were collected over five days from randomly selected households using a stratified sampling method. The household types selected were in proportion with the housing stock within the ACT and included both single and multi-unit dwellings (MUDs).

In October 2009 two problems were discovered with the original MUDs that had been sampled in the May audit. The MUDs selected that used MGBs exclusively for both garbage and recycling were in fact aged care units and were therefore considered atypical. Furthermore the MUD block selected as the sample that used hoppers for both garbage and recycling had been emptied by the contractor on a different collection day for the schedule of that area which meant less than one day's worth of waste had been collected.

On consideration of these issues requested that APC conduct a new representative audit of MUDs to provide a more typical data set and to incorporate these findings into an amended final report.

This report contains the original data from single dwellings audited in May 2009 and the MUD data from November 2009.

In May 2009, 3.5 tonnes of domestic waste was sorted into 38 agreed categories over five consecutive days for the original audit and an additional 700 kgs were collected and sorted from MUD's only in November, 2009. In total over 4.2 tonnes of waste was sorted for this project.

The key findings of the 2009 domestic waste audit are summarised as follows:

Total Waste Generation – The overall waste generation for ACT has dropped from 16.37kg per household per week in 2007 to 14.52kg in 2009. This result represents a major decrease in household waste generation, which could be due to many external influences and factors but the most likely candidate is the variations in consumption and disposal patterns due to seasonality. The 2007 audit was conducted in November (spring – summer) and the 2009 in May (autumn – winter). Other factors that could also contribute include the economic downturn, household size, disposable income, education, home ownership and random variation.

Garbage Generation – The garbage stream has decreased from 10.04kg in 2007 to 9.55kg in 2009, a difference of 0.49kg.

Composition of Garbage Stream – The largest component of the garbage stream is food waste, which makes up 39% or 3.72kg followed by other non recoverable material at 41.7% or 3.98kg. Material that could be recycled as part of the current service offered to the community represents 12.8% or 1.22kg. Specifically, recyclable paper accounts for 5.5% in 2009, compared to 11.7% in 2004. Recyclable containers comprise 7.3% of the garbage stream in 2009 compared with 13.5% in 2004. Amounts of recyclable containers are expected to be lower in winter due to a corresponding decrease in beverage consumption. The presence of recyclables in the garbage stream increased slightly from 12.6% in 2007 to 12.8% in 2009.

Recycling Generation – In 2009, the amount of recycling generated from the average ACT household was 4.97kg per week. This figure is significantly less than the 6.33kg recorded in 2007. As with garbage generation, the reduction in recycling generation could be due to a number of external influences but is most likely due to seasonality differences in beverage consumption.

Composition of the Recycling Stream – The recycling stream comprised 58.7% paper and cardboard. In 2007, this portion of the recycling stream was 56.1%. Containers comprised 36.2% in 2009 compared to 34.6% recorded in 2007.

Contamination – Contamination in the recycling stream was 5.1% in 2009 of which other plastics, food and plastic film were the most common items by weight. This is a significant improvement from 2007, when the contamination level was 9.3%, and 2004 when it was 13.2%. This reduction could be due to the television advertising campaign ACT NoWaste has run in recent times, which is extending the reach of the recycling message about what, why and how to recycle. Typically, best practice standards for fully commingled recycling collection programs can achieve contamination levels of between 3% and 5%. ACT NoWaste is now within the acceptable ranges to be considered best practice.

Recovery Rates – The overall recovery rate for all dwellings in 2009 was 79.6%. This is slightly less than the 2007 result of 81.9%. Glass at 82.7% and paper at 84.9% were the best performers while lower rates were recorded for plastics and liquidpaperboard, all around 50%, and aluminium at 29%.

Vegetation in the Garbage Stream – The proportion of garden organics in the garbage stream has decreased slightly from 8.2% in 2007 to 6.6% in 2009. Again, this could be directly related to seasonality factors relating to when the 2009 audit was conducted.

Diversion – The total diversion rate recorded in 2009 was 32.6%. This is a slight decrease from the 35.1% recorded in 2007.

Garbage Bin Capacity Utilisation – The median volume of garbage bins used in single dwellings is 75%, a slight increase from the 68% recorded in 2007. It is worth noting that the volume increase has occurred even though the weight of garbage generated per household has dropped by 0.49kg per household.

Recycling Bin Capacity Utilisation – The average volume of recycling bins used in single dwellings in 2009 was 80%, very similar to the 76% recorded in 2007.

Overall, the results of the 2009 audit show a significant improvement in performance in the areas of contamination and an improvement in waste generation and green waste present in the garbage stream over the 2007 audit results. However, diversion and recovery have declined slightly and the amount of recyclables in the garbage stream has increased slightly over the 2007 results

It is understood ACT NoWaste has spent considerable funds on a high profile communication program which appears, from the audit results, not to have achieved the desired results of a higher yield in this season. However, given the known impacts of seasonality on waste generation, consumption and disposal practices we urge some caution in these results as while they may be typical of this season they may not be truly representative of the annual results. Audits provide indicative data and provide detailed information on waste and recycling composition however, information on trends in generation and diversion are better looked at over a longer term by reference to weighbridge dockets which confirm seasonal fluctuations and are more reliable.

This audit has identified that the greatest opportunity for improvement is in MUDs using hoppers, which currently contain the largest amount of recyclables in the garbage stream not diverted for recycling. Future education and communication efforts must concentrate on improving the performance of MUDs. A review of current education strategies to reach MUD residents should be undertaken. Focus should also be increasing the recovery of all materials but in particular the heaviest materials, being paper and glass which by weight represent 85.7% of the recycling stream.

This year, the overall diversion rate fell slightly from 35.1% to 32.6%. For ACT NoWaste to increase diversion further the focus has to be on recycling performance in MUD's with hoppers and organics recovery as food recovery has a potential to increase diversion by a further 25.6% with garden organics contributing a further 4.3% while the most the recycling service can achieve is 8.4%. If recyclables and organics are recovered the maximum diversion possible is 70.9%. Many other municipal waste management programs nationally are achieving in excess of 60% diversion through both recycling and organic diversion. Organics are recovered by either source separation and the provision of an additional mobile garbage bin or by Advance Waste Treatment (AWT) recovery.

The greatest opportunity for ACT NoWaste to improve the performance of the waste management system for domestic premises is to increase diversion from landfill by managing the organic fraction of the waste stream and in particular the food waste component. This component represents 51.6 % of the current bin contents and includes food and kitchen waste (39%), disposable and contaminated paper (6%) and garden waste (6.6%).

Other councils nationally have offered garden waste services to their residents and are now incorporating food waste collections. Many council's have moved garbage service collection frequency to fortnightly and organics collection to weekly. However, the ACT has encouraged its residents to manage green waste on-site or by engaging private contractors. This now presents a dilemma as to how to undertake a program to extract the small amount of garden waste and the considerable amount of food waste from the garbage stream. The use of Alternate Waste Technologies (AWT) to process the entire residual waste stream is one clear option available.

While the waste audit provides a snapshot of current waste generation, consumption and disposal patterns from a randomly selected stratified number of households, it is only one piece of information that the ACT needs if it is to undertake a full review of current waste management in its quest for greater performance. APC would recommend the following activities are also undertaken:

1. That ACT NoWaste undertake an Operational Review and Communication Audit to ascertain how the existing service is being delivered, interaction with residents and what methods and means are used to communicate with the community about the recycling service.

2. That emphasis be placed on communicating with residents living in multi-unit dwellings in relation to recycling performance as this is where a substantial amount of recyclables are evident in the garbage stream and greatest opportunity lies.

3. Ongoing education, communication and motivation of the broader community are necessary to maintain current recycling performance. The method and means to undertake this activity may become clearer after the Communications Audit is undertaken. However, it is generally accepted that multi-pronged comprehensive campaigns desired to reach all sectors of the community achieve the greatest results

4. Options for processing the residuals to recover the organic fraction of the waste stream and in particular the food waste and the recyclables still in the garbage stream need to be investigated. Such a process can target 60% of the current garbage bin contents and greatly reduce the future needs for landfill capacity.

1. BACKGROUND

ACT NoWaste is a business unit within the Department of Territory and Municipal Services of the ACT Government. It has responsibility for the management of municipal waste and recycling services, infrastructure and landfill. It also holds responsibility for the planning, design and construction of future landfill and recycling capacity to cater for the needs of the city of Canberra.

ACT NoWaste is seeking accurate information in relation to current waste management practices in the ACT including data on the volumes and composition of waste to landfill from all sources, which will assist ACT NoWaste to:

- Review and develop waste avoidance and recycling strategies and policies;
- Identify sectors that are producing large quantities of waste for landfill disposal;
- Identify wastes that could potentially be recycled or reduced;
- Assist with planning for future waste and resource recovery services and infrastructure.

ACT NoWaste engaged APC Environmental Management (APC) to undertake the following three separate but related projects:

1. Waste To Landfill Composition Study
2. Domestic Waste and Recycling Audits of kerbside collected municipal waste
3. MRF residual waste audit

Currently, the domestic waste stream generates 59,000 tonnes of waste per annum and 45,500 tonnes of recyclables are generated from the kerbside collection program and the drop off system that operates throughout the city.

The ACT Government has conducted five prior domestic waste composition audits in 2001, 2003, 2004, 2005 and 2007 of which APC undertook four audits. Comparisons between the 2009, the 2007 and the 2004 results have been provided within this report to show trends.

ACT NoWaste set out in its initial brief, the following project objectives:

- Determine the contents of a representative sample of domestic waste and recycling bins using methodology consistent and comparable with previous surveys; and
- Analyse and report on trends and opportunities to further improve recycling and assist with community education programs conducted by ACT NoWaste.

This report relates solely to the domestic kerbside waste and recycling audit from ACT households.

2. INTRODUCTION

The scope of works specifies the following information in relation to current service provision.

2.1 Single Dwellings – Approximately 115,000 households in the ACT are single dwellings (houses) that use 140-litre bins for garbage collected weekly. There are 117,000 recycling services that use a 240-litre bin for fully commingled recyclables collected fortnightly.

2.2 Multi-unit Dwellings - (blocks of units or MUDs) have a range of bins for garbage from 240-litre, 1.5m^3, 3m^3 or 4.5m^3. Recyclables are collected fully commingled in 240-litre or 1.1m^3 bins. 20,000 MUD dwellings are provided with hoppers for domestic waste services while 11,000 MUD dwellings are provided with hoppers for recyclable materials. The garbage hoppers are collected weekly or twice weekly while the recycling hoppers are collected fortnightly, weekly or twice a week, depending on the block. Recycling bins are collected fortnightly or sometimes weekly.

2.3 Recycling System – materials accepted:

- All paper including writing paper, junk mail, newspapers, magazines, paper packaging, flattened cardboard boxes, envelopes, egg cartons, telephone books, etc;
- Corrugated cardboard including beer cartons and pizza boxes;
- All glass bottles and jars;
- All cartons including all fruit juice, milk and laundry cartons;
- All rigid plastic bottles and containers including polyethylene terephthalate (or PET), high-density polyethylene (HDPE) and polyvinyl chloride (PVC), polypropylene (PP), non-expanded polystyrene (PS - plastic type 6) and other rigid plastic containers
- Steel cans; and
- Aluminium cans, trays and foil.

3. METHODOLOGY

3.1 Sample Size

The statement of requirements specifies that the methodology used for this component should be consistent and comparable with previous surveys.

APC conducted prior domestic audits in 2001, 2003, 2004 and 2007. The 2007 sample size was 250 households. Using actual household data from audits carried out by APC in the ACT, we have calculated that confidence intervals of ± 7% were achieved when this sample size was used.

Previously, the samples were stratified for single-unit dwellings (SDs) and multi-unit dwellings (MUDs) according to the proportion of all residences in Canberra, which were defined as follows:

SDs – Separate houses/duplexes/townhouses – These are considered as separate dwellings as they usually have one set of waste containers to each household.

MUDs – Medium density or high rise flats – These are usually 'three-storey walk-ups' or blocks of six or more storeys with elevators and secure entry. These have shared garbage and recycling containers and varying waste arrangements but usually communal garbage containers or bulk bins.

APC's statistician advised that in accordance with the NSW DECC Guidelines,[1] suitable sample sizes for producing reliable estimates of proportions of waste in the domestic waste stream at 10% uncertainty at the 90% confidence level, generally lie between 191 and 260 households. In the case of this audit, the preferred number of sample households is 250, as this number lies between recognised limits, and was also the number used in previous audits.

The 2007 sample of 250 comprised 190 samples from single dwellings and 60 samples from MUDs for garbage. 125 households were sampled for recycling. The following table shows numbers of occupied private dwellings (i.e. households) in the ACT in the year of 2006 tabulated by structure:

Table 1 - Private Dwellings by Structure, ACT, 2006

Dwelling Structure	Number	Per cent
Separate house	89,219	76%
Semi-detached, row/terrace, townhouse	15,661	13%
Flats up to 3 storeys	9,164	8%
Flats 4+ storeys	2,625	2%
Other, Not Stated	249	0%
Total	**116,918**	**100%**

Data source: ABS 2006 Census of Population and Housing,

APC proposed that sample numbers should reflect these proportions as closely as is practical. Thus, it was recommended that, as in the previous audit, the sample consist of 190 separate dwellings and 60 multi-unit dwellings (MUDs). Within the MUDs sample, approximately 30 (50%) should have MGBs for recycling and 30 (50%) have hoppers.

[1] Department of Environment and Climate Change NSW. Guidelines for Conducting Household Kerbside Residual Waste, Recycling and Garden Organics Audits in NSW Local Government Areas, 2008

3.2 Sample Selection

Samples should be taken from as wide a range of suburbs as possible and from all daily collection zones. Samples from single households were collected as sequences of occupied dwellings, starting at a specified corner or address whereas multi-unit dwellings (MUDs) were identified by street address.

The project aimed to collect 52 households per day over five consecutive week day morning's prior to the normal scheduled collection as this is a naturally stratified sample by collection day.

Samples were randomly selected from a Bins Database supplied by ACT NoWaste. The selected addresses were then checked to determine the respective garbage and recycling service days for single dwellings from an online calendar and supporting web information. For MUDs, the collection day/s, bin size, type and number were referenced from a spreadsheet provided by the contractor and ACT NoWaste.

The sample was stratified for single dwellings (SDs) and multi-unit dwellings (MUDs) according to the proportions reported in the 2006 Census. (Refer to Table 1 on page 8.)

A number of sample collection starting points were selected randomly without replacement within stratified records from the bins database. The households to be audited were those nearest the selected sample collection starting points. In the case of multi-unit dwellings, all households in each unit block selected were audited, since garbage and recycling facilities are often communal.

For single dwellings, because the recycling collection is fortnightly, half the garbage samples were selected from the recycling zone and half from the non-recycling zone. In this way, the equivalent of one week's worth of garbage and recycling was collected for all the single dwelling households in the sample, without the need to adjust the data.

In October 2009, ACT NoWaste identified two problems with the original MUD's data from the May audit. The MUDs selected that used mobile garbage bins (MGBs) exclusively for both garbage and recycling were aged care units and were therefore considered atypical of MUD's generally. Furthermore, the MUD block selected as the sample that used hoppers for both garbage and recycling had been emptied by the contractor on a different collection day to the schedule for that area unbeknown to the consultants which meant less than one day's worth of waste had been collected.

On consideration of these issues ACT NoWaste requested that APC conduct a new representative audit of MUDs to provide a more typical data set and to incorporate these findings into an amended final report. The new MUD addresses to be audited were selected by ACT NoWaste.

3.3 Sample Collection

In the initial audit on the morning of the normal collection service, waste from up to 10 single dwelling households nearest the randomly selected starting points was collected and up to four starting points were selected each day to make up the sample size.

In the subsequent MUD audit in November, ACT NoWaste staff collected recycling from the 2nd MUD address in Watson and the remainder of the collections was undertaken by APC staff.

Samples of garbage and recycling were collected in bags from the selected locations just prior to the regular collection service. Each bag was labelled with a code to identify whether it contained garbage or recycling and assigned a number from the data collection sheet. The name of the street and house number from which waste was collected was recorded on the data collection sheet where the volume of the bins collected was also recorded.

To ensure only positive public relations with the community, APC requested ACT NoWaste to provide a representative to accompany the collection crew for the duration of the sample collections to deal with any questions or complaints from residents. ACT NoWaste prepared an information sheet printed on ACT Government letterhead which was provided to any concerned residents in both the initial and subsequent MUD audit.

For both audits APC's collection crew consisted of three people, two who emptied the bins and one whose sole task was to record sample data codes, estimate bin content volume and label sample bags. In this way, accurate data collection is guaranteed and safe work conditions are provided for all staff. All bags were placed in a truck hired for the purpose and transported to the sorting location for sorting.

In the November audit one of the MUD's had a weekly recycling frequency and all material was collected. In the case of the other MUD a fortnightly recycling system was in place so while all the material was collected only half of the material was sorted to give a representative sample.

It should be noted that when sampling large complexes, it is hard to be as sure of the quantities generated per unit without sampling all units.

Table 2 below provides a breakdown of garbage and recycling samples by household type, day and the suburb from which it was collected.

Table 2 – Number of Samples by Suburb

Day	Suburbs	Single	MUDs	Total dwellings
Garbage Sample				
Monday 4 May	Farrer, Lyons, Pearce	38	0	38
Tuesday 5 May	Conder, Monash, Richardson, Theodore	38	0	38
Wednesday 6 May	Charnwood, Flynn, Palmerston	38	0	38
Thursday 7 May	Evatt, Macquarie, Scullin	38	0	38
Friday 8 May	Garran, Ngunnawal, O'Connor, Turner	39	0	39
Friday 27 November	O'Connor, Watson	0	59	59
All days	**All suburbs**	**191**	**59**	**250**
Recycling sample				
Monday 4 May	Farrer, Pearce	19	0	19
Tuesday 5 May	Monash, Richardson	19	0	19
Wednesday 6 May	Charnwood, Flynn	16	0	16
Thursday 7 May	Evatt, Scullin	16	0	16
Friday 8 May	Garran, Ngunnawal	17	0	17
Friday 27 November	O'Connor, Watson	0	59	59
All days	**All suburbs**	**87**	**59**	**146**

3.4 Sorting

For both the May and November audits APC used Cleanaway's depot in Alderson Place, Hume for the sorting of collected samples. Cleanaway provided wheelie bins for sorting and removed sorted material at the end of each day. All bags were placed on a set of digital scales and the weight recorded on a data sheet. The bags were then opened and tipped on to the sorting table. The contents of the bags were separated into the categories as specified below. These categories are consistent with categories of prior audits.

Table 3 – Material Sorting Categories

AWD Code	Material	AWD Code	Material
A01/02	Newspaper and magazines	G01	Aluminium
A04	Corrugated cardboard	F01	Steel packaging
A091	Other paper	F02	Ferrous other
A07	Disposable/Contaminated paper	E08	Fibreglass
B01	Food/Kitchen	0	Residual/Other miscellaneous
B02	Garden/Garden organics	H	Hazardous – paint, fluorescent lights, batteries
C01	Other organic wood/timber	H07	Medical/Sharps
C02	Textiles/clothing/footwear/carpet	H	Nappies
D01	Glass packaging/Glass containers	H05	Chemicals
D02	Glass misc./Other glass	I01	Ceramics
E01	Plastic 1 PET	I02	Naturally excavated soil
E02	Plastic 2 HDPE	I02	Soil/rubble/inert
E03	Plastic 3 PVC	1022	Cobbles/boulders
E04	LDPE	I04	Concrete
E05	Polypropylene	I041	Asbestos
E06	Polystyrene	I06	Plasterboard
E073	Film, plastic bags, plastic soft	I07	Asphalt/Road construction
E074	Other plastic	I08	Fibrous cement sheet
A06	Liquidpaperboard		Fixtures/Fittings

APC's sorting method also provided for other materials not listed to be identified and weighed should they be found in significant quantities during the audit.

Quantities of each material were weighed on a set of electronic scales and the weight recorded.

In May 2009, 3.5 tonnes of domestic waste was sorted into 38 agreed categories over five consecutive days for the original audit and an additional 700 kgs were collected and sorted from MUD's only in November, 2009. In total over 4.2 tonnes of waste was sorted for this project.

3.5 Equipment

Equipment used pedestal scales weighing 0.05 kg to 150 kg and table scales weighing 1g to 11kg.

3.6 Occupational Health & Safety

Occupational health and safety is an integral part of effective business management and APC recognises that all employees and sub-contractors must have knowledge, skills and

resources necessary to meet their obligations and fulfil the commitment to health and safety of the work place.

3.7 Data Entry and Analysis

The data collected from the sorting was entered into MS Excel for analysis. All information was aggregated and no individual premises identified. The waste audit method described above enabled APC to provide the results by type of dwelling stock:

- Single dwelling using mobile garbage bins (MGBs);
- MUDs using MGBs; and
- MUDs using hoppers.

The following analysis was undertaken for each type of premises:

- Composition of the garbage and recycling stream by weight of the material in each category
- Amount of garbage and recycling produced per household per week
- Contamination in the recycling stream
- Recovery rates for recyclables
- Diversion rate of whole waste stream
- Overall volume of garbage and recycling stream by household.

With the exception of the subsequent MUD audit, the sample selection, collection and sorting method described above is essentially the same as that used in previous audits in Canberra. This has enabled direct and unequivocal comparison with previous audit data held by APC.

3.8 Study limitations

The data for this study was collected and analysed using the best and most accurate methods available within the constraints of available time and budget. This study is a survey, which means that a relatively small amount of data has been collected and then treated as representative of the total. As in any survey there are limitations to the accuracy of the data, as described below:

- **Short timeframe** – This audit was carried out over six days, taking samples distributed carefully over the geographic area of the ACT. The data was then used as being representative of the whole ACT. It should be noted that seasonal trends (e.g. warmer weather leading to more use of beverages), seasonal celebrations (e.g. Easter, Christmas) and the impact of weather events (e.g. high rainfall leading to grass growth and larger amounts of organic waste) may change waste generation over time. Thus the results of the audit should be treated with due caution when analyzing this report or comparing it to reports based on data taken at different times of year.

- **Representativeness of the sample** – the sample for this audit is necessarily small due to the high per capita cost and resource-intensive nature of collecting household waste at kerbside. There is always a small probability of inadvertently collecting waste from atypical households, resulting in non-representative data. APC audits are carried out using

strict random sampling, stratified by geographic area, to minimise the chance of this situation occurring.

- **Weight based analysis** – The collection of data for this audit was recorded by weight. This type of collection may cause some materials to appear to be present in quite small proportions due to their comparatively low densities (e.g. plastic beverage containers). Weight based analysis has been used in this audit because it is a standard procedure and is the most accurate way to collect data on a number of different types of materials.

- **Limitations of sample size** – all surveys carry an element of sampling error which is the mathematical error associated with using a sample to represent a total population. Sampling error can be reduced by taking larger samples. The sampling error involved in waste audits is usually small and can be tabulated by producing estimates augmented by upper and lower confidence intervals.

- **Human behaviour** – Residents of an area may not always comply with administrative arrangements as expected. For example, a large family with considerable waste generation might have an informal arrangement with a neighbour to use the neighbour's waste containers as well as their own. Alternatively, residents of a large multi-address medium density complex might use the waste facilities of a neighbouring address as they are closer than their own. Compensating for human behaviour of this type is outside the scope of standard APC waste audits, but it is reasonable to assume that such behaviour is relatively rare, and it would be expected that the size of the sample would minimize the effects on the data.

4. KEY FINDINGS

Total Waste Generation – The overall waste generation for ACT has dropped from 16.37kg per household per week in 2007 to 14.52kg in 2009. This result represents a major decrease in household waste generation, which could be due to many external influences and factors but the most likely candidate is the variations in consumption and disposal patterns due to seasonality. The 2007 audit was conducted in November (spring – summer) and the 2009 in May (autumn – winter). Other factors that could also contribute include the economic downturn, household size, disposable income, education, home ownership and random variation.

Garbage Generation – The garbage stream has decreased from 10.04kg in 2007 to 9.55kg in 2009, a difference of 0.49kg.

Composition of Garbage Stream – The largest component of the garbage stream is food waste, which makes up 39% or 3.72kg followed by other non recoverable material at 41.7% or 3.98kg. Material that could be recycled as part of the current service offered to the community represents 12.8% or 1.22kg. Specifically, recyclable paper accounts for 5.5% in 2009, compared to 11.7% in 2004. Recyclable containers comprise 7.3% of the garbage stream in 2009 compared with 13.5% in 2004. Amounts of recyclable containers are expected to be lower in winter due to a corresponding decrease in beverage consumption. The presence of recyclables in the garbage stream increased slightly from 12.6% in 2007 to 12.8% in 2009.

Recycling Generation – In 2009, the amount of recycling generated from the average ACT household was 4.97kg per week. This figure is significantly less than the 6.33kg recorded in 2007. As with garbage generation, the reduction in recycling generation could be due to a number of external influences but is most likely due to seasonality differences in beverage consumption.

Composition of the Recycling Stream – The recycling stream comprised 58.7% paper and cardboard. In 2007, this portion of the recycling stream was 56.1%. Containers comprised 36.2% in 2009 compared to 34.6% recorded in 2007.

Contamination – Contamination in the recycling stream was 5.1% in 2009 of which other plastics, food and plastic film were the most common items by weight. This is a significant improvement from 2007, when the contamination level was 9.3%, and 2004 when it was 13.2%. This reduction could be due to the television advertising campaign ACT NoWaste has run in recent times, which is extending the reach of the recycling message about what, why and how to recycle. Typically, recycling collection services utilizing a fully co-mingled system can achieve contamination levels of between 3% and 5%, deemed to be best practice standards. ACT NoWaste is now within the acceptable ranges to be considered best practice.

Recovery Rates – The overall recovery rate for all dwellings in 2009 was 79.6%. This is slightly less than the 2007 result of 81.9%. Glass at 82.7% and paper at 84.9% were the best performers while lower rates were recorded for plastics and liquidpaperboard, all around 50%, and aluminium at 29%.

Vegetation in the Garbage Stream – The proportion of garden organics in the garbage stream has decreased slightly from 8.2% in 2007 to 6.6% in 2009. Again, this could be directly related to seasonality factors relating to when the 2009 audit was conducted.

Diversion – The total diversion rate recorded in 2009 was 32.6%. This is a slight decrease from the 35.1% recorded in 2007.

Garbage Bin Capacity Utilisation – The median volume of garbage bins used in single dwellings is 75%, a slight increase from the 68% recorded in 2007. It is worth noting that the volume increase has occurred even though the weight of garbage generated per household has dropped by 0.49kg per household.

Recycling Bin Capacity Utilisation – The average volume of recycling bins used in single dwellings in 2009 was 80%, very similar to the 76% recorded in 2007.

The results of the 2009 waste audit are compared to that of the 2007 data in Table 4 below. These results show an improvement in performance in the areas of contamination, waste generation and green waste present in the garbage stream compared to the 2007 audit results. However, diversion and recovery have declined slightly and the amount of recyclables in the garbage stream has increased slightly.

Table 4 – Key Performance Indicators 2007 - 2009

Indicator	2007	2009
Total waste stream per household	16.37 kg	14.52 kg
Average weight of garbage stream per household	10.04 kg	9.55 kg
Average weight of recycling stream per household	6.33 kg	4.97 kg
Recyclables in the garbage	12.6%	12.8%
Contamination	9.3%	5.1%
Overall Recovery	81.9%	79.6%
Diversion	35.1%	32.6%
Recovery by Material		
Aluminium cans	45.6%	28.6%
Glass	79.6%	82.7%
Steel	44.6%	50.0%
Paper	91.5%	84.9%
Cardboard	83.8%	83.3%
PET	81.9%	66.7%
HDPE	79.0%	73.3%
PVC	47.2%	50.0%
Mixed plastics	32.0%	31.3%
Liquidpaperboard cartons	63.4%	58.0%

5. RESULTS

5.1 Garbage

5.1.1 Consolidated Composition of the Garbage Stream - Chart 1 below shows each major waste category with Food waste the largest component of the Garbage Stream, accounting for 39% of the total sample. Other non-recyclable material is next largest at 19.4%. Materials for which a recycling service is currently available – paper, cardboard and containers currently represent 12.8% of the garbage bins' contents. For an itemised composition of the garbage stream refer Appendix B.

Chart 1 Consolidated Composition of the Garbage Stream

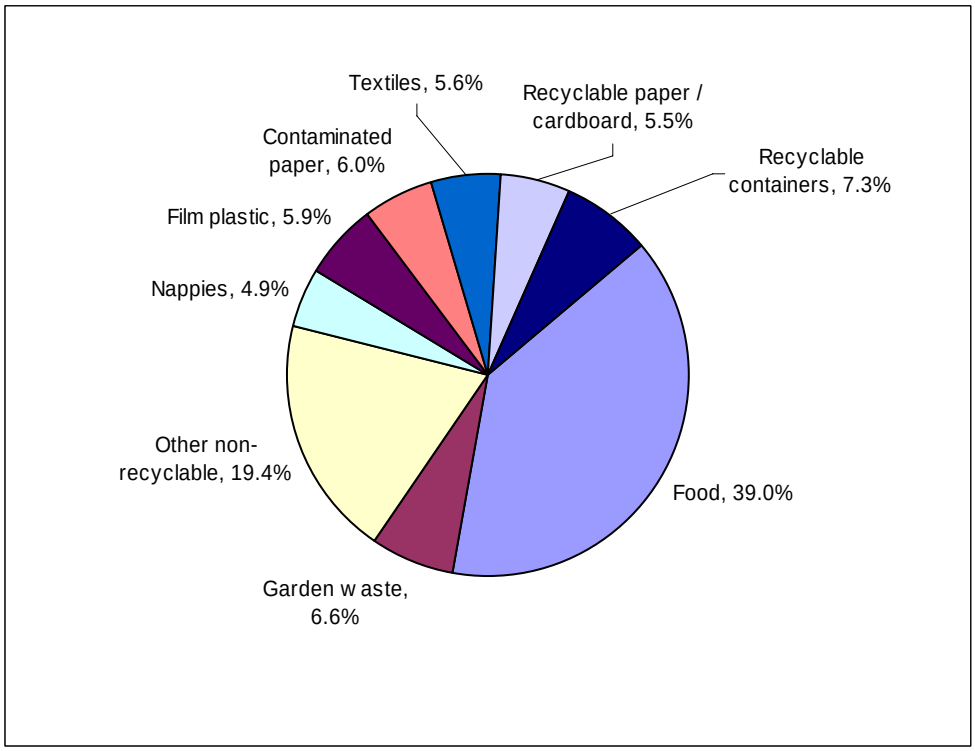


Table 5 below shows the garbage stream composition consolidated into five major categories. Food waste is the largest single component in single dwellings (SD) and multi-unit dwellings (MUDs) with hoppers. However, in multi-unit dwellings (MUDs) with mobile garbage bins, the 'other non-recyclable' the largest component and food waste is the second largest component.

Table 5 - Consolidated Composition of the Garbage Stream

	Single dwgs	MUDs hoppers #	MUDs MGBs ^	Total	Per cent
Material	**Weight (kgs)**				
Recyclable paper / cardboard	79.9	23.0	27.6	130.5	5.5%
Recyclable containers	127.8	32.1	14.3	174.2	7.3%
Food waste	740.1	90.7	100.1	930.9	39.0%
Garden waste	107.9	20.4	28.5	156.8	6.6%
Other non-recyclable	788.3	82.0	125.8	996.1	41.7%
Total material	**1,844.0**	**248.2**	**296.3**	**2,388.5**	**100.0%**

Multi-unit dwellings with hoppers as garbage containers, ^ Multi-unit dwellings with MGBs as garbage containers

Chart 2 provides a detailed breakdown of the garbage stream. For ease of the reader we have also included those items with values of less than 1% in Table 6 below.

Chart 2 Composition of the Garbage Stream (Major Categories)

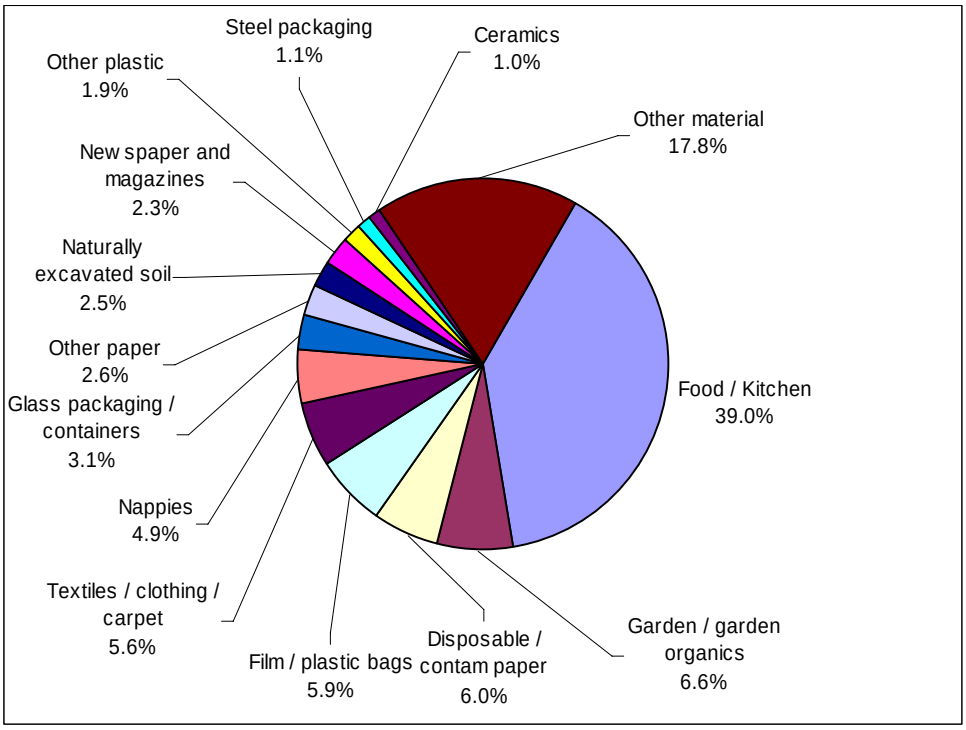


Table 6 - Garbage Stream Composition (Minor Categories)

Material	%
Other organic wood / timber	0.8%
Ferrous other	0.8%
Glass misc / other	0.7%
Corrugated cardboard	0.6%
Polystyrene	0.6%
Plastic 1 PET	0.6%
Aluminium	0.5%
Plasterboard	0.5%
Polypropylene	0.5%
Concrete	0.4%
Plastic 2 HDPE	0.4%
Liquidpaperboard	0.4%
Chemicals	0.3%
Cobbles / boulders	0.3%
Hazardous	0.2%
Medical / sharps	0.2%
Plastic 3 PVC	0.1%
Soil / rubble / inert	0.1%
LDPE	0.0%
Fibreglass	0.0%
Asbestos	0.0%
Asphalt / road construction	0.0%
Fibrous cement sheet	0.0%

5.1.2 Consolidated Garbage – Average Weights Per Dwelling –Table 7 and Chart 3 below shows that MUDs with MGBs or hoppers are generating almost as much garbage per household as single dwellings, 9.26 kg and 9.19 kgs respectively versus 9.65kg for single dwellings. Typically, garbage generation from units is usually significantly less per household than single dwellings regardless of the disposal system in place.

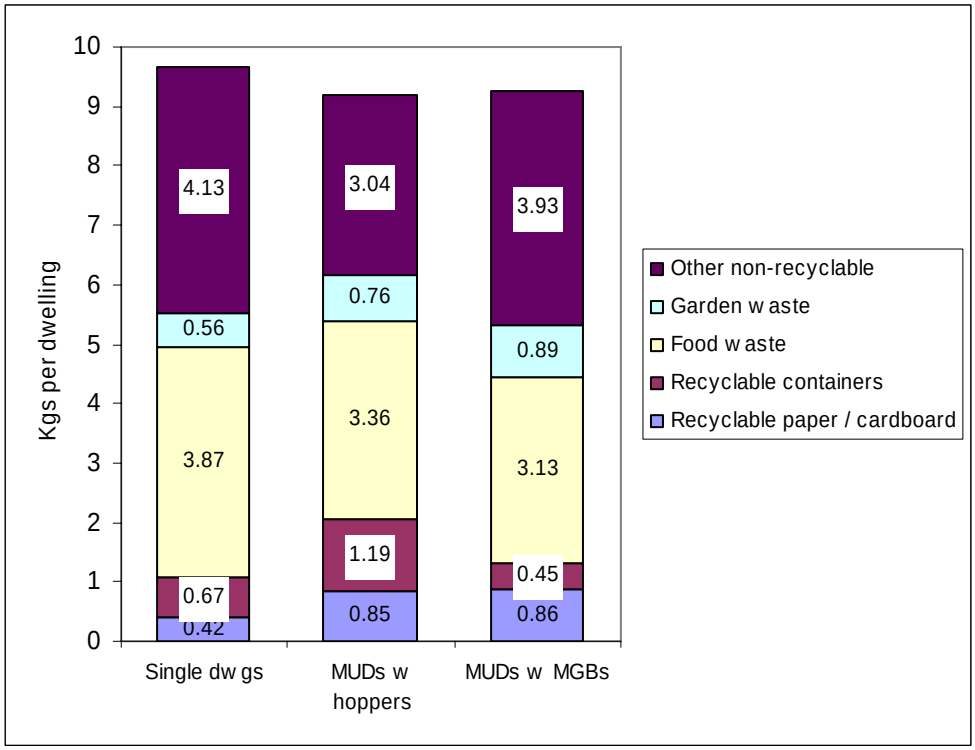
Food waste generation and 'Other non-recyclable' material are the major categories in all three housing types.

Table 7 - Consolidated Garbage - Weights per Dwelling per Week

Material	Single dwgs	MUDs hoppers #	MUDs MGBs ^	Total
Number of dwellings	191	27	32	250
Weights (kgs / dwelling)				
Recyclable paper / cardboard	0.42	0.85	0.86	0.52
Recyclable containers	0.67	1.19	0.45	0.70
Food waste	3.87	3.36	3.13	3.72
Garden waste	0.56	0.76	0.89	0.63
Other non-recyclable	4.13	3.04	3.93	3.98
Total material	**9.65**	**9.19**	**9.26**	**9.55**

Multi-unit dwellings with hoppers as garbage containers, ^ Multi-unit dwellings with MGBs as garbage containers

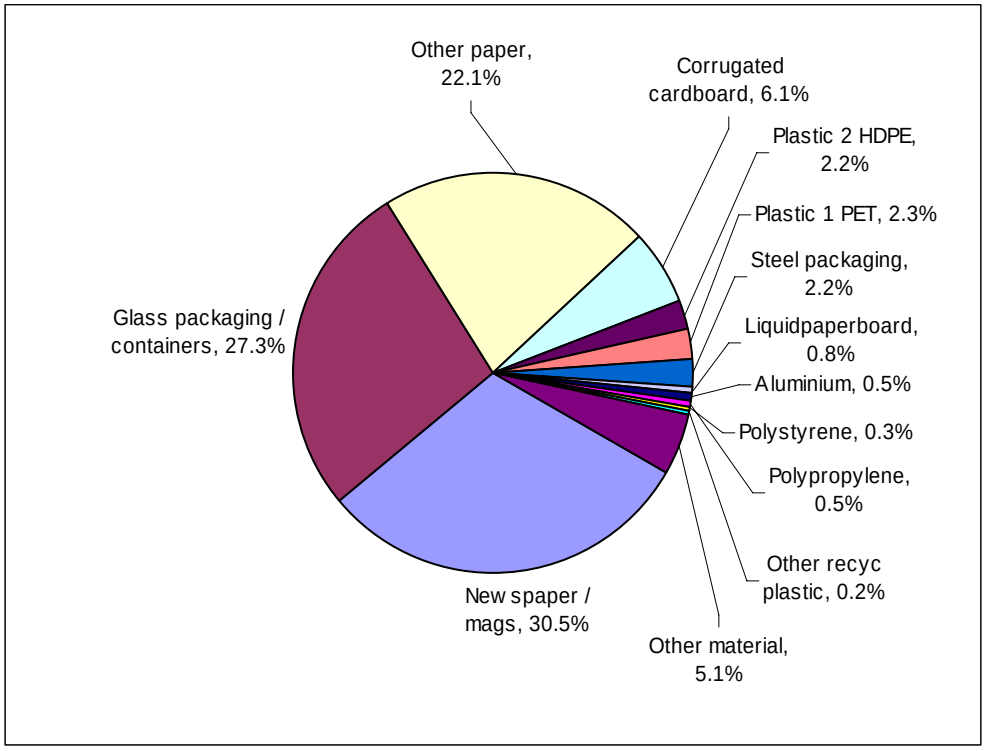
Chart 3 - Consolidated Garbage - Average Weights per Dwelling per Week



5.2 Recycling

5.2.1 Composition of the Recycling Stream – Chart 4 below shows a breakdown of the recyclable materials found in the recycling sample. The largest component is newspapers/magazines (30.5%) followed by glass packaging/containers (27.3%). 'Other paper' accounts for a further (22.1%) and corrugated cardboard makes up a further 6.1%. Contamination represents 5.1% of the mix.

Chart 4 - Composition of the Recycling Stream



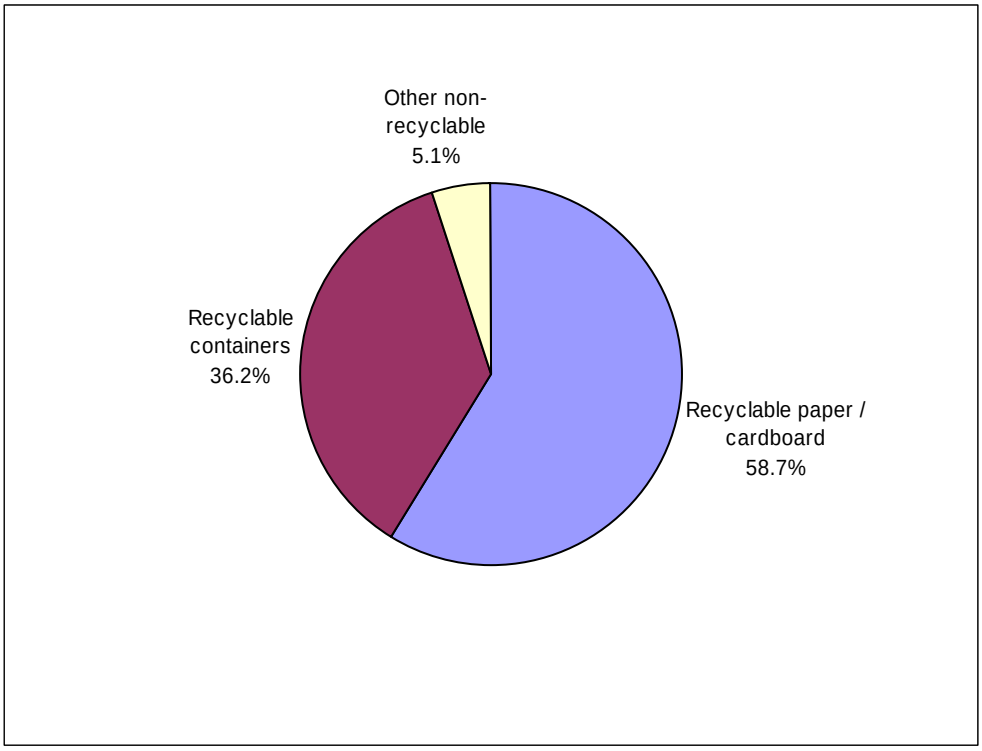
5.2.2 Consolidated Composition of the Recycling Stream - Table 8 shows weight by major categories by housing type. The contamination rate is lower in MUDs using hoppers or MGBs at 3.3% and 3.2% respectively and greatest in single dwellings (5.4%). This result is again worthy of special note as contamination rates in MUDs are usually greater than in SDs. For an itemised breakdown of the composition of the recycling stream refer Appendix C.

Table 8 - Consolidated Composition of the Recycling Stream

Material	Category Definition	Single	MUDs w hoppers #	MUDs w MGBs ^	Total
		Weight (kgs)			
Recyclable paper / cardboard	Newspaper / magazines, Other paper, Corrugated cardboard	678.4	38.6	42.4	759.4
Recyclable containers	Glass containers, PET, HDPE, PVC, LDPE, Polypropylene, Polystyrene, Liquidpaperboard, Aluminium, Steel	396.4	28.7	43.5	468.6
Other non-recyclable	Disposable / contaminated paper, food, garden organics, wood, textiles/clothing/carpet, film/plastic bags, other plastic, other ferrous, hazardous, medical/sharps, nappies, chemicals, ceramics, other glass	60.9	2.3	2.8	66.0
Total material		1,135.7	69.6	88.7	1,294.0
Contamination rate		**5.4%**	**3.3%**	**3.2%**	**5.1%**

Chart 5 shows that paper and cardboard are the largest component of the recycling stream and account for 58.7% of the total sample with recyclable containers comprising 36.2% and the overall contamination rate at 5.1%.

Chart 5 - Consolidated Composition of the Recycling Stream



5.2.3 Consolidated Recycling – Weights Per Dwelling – On average, SDs generated 6.53kg of recyclables per week. MUDs with MGBs generated 2.77 kgs of recyclables per week, which outperformed MUDs with hoppers which generated 2.58 kgs of material. In single dwellings and MUDs with hoppers, recyclable paper/cardboard is the largest component of the recycling stream. In MUDs with MGBs the largest component is 1.36 kgs closely followed by the recyclable paper/cardboard category at 1.33 kgs. Again, caution should be exercised as the samples from MUDs are from one address only for each MUD type and may not be representative of all unit blocks using this service.

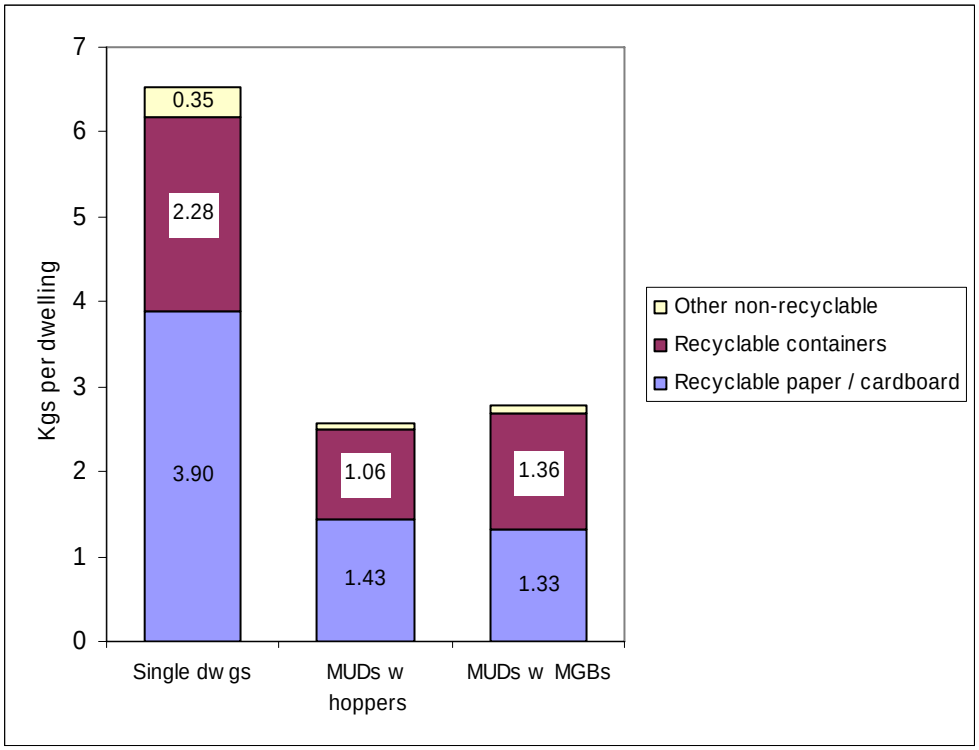
Table 9 - Consolidated Recycling - Weights per Dwelling per Week

Material	Single dwgs	MUDs w hoppers #	MUDs w MGBs ^	Total
Number of dwellings	87	27	32	146
Weights (kgs / dwelling / week)				
Recyclable paper / cardboard	3.90	1.43	1.33	2.88
Recyclable containers	2.28	1.06	1.36	1.85
Other non-recyclable	0.35	0.09	0.09	0.24
Total material	**6.53**	**2.58**	**2.77**	**4.97**

Multi-unit dwellings with hoppers as garbage containers, ^ Multi-unit dwellings with MGBs as garbage containers

As can be seen in Chart 6 below, the amount of recyclables in the single dwellings is more than double that of the MUD samples.

Chart 6 - Consolidated Recycling - Weights per Dwelling per Week



5.3 Total Waste Stream

The breakdown of the total waste stream (garbage and recycling) per dwelling per week into a number of key categories, by household type is shown in Table 10 below. On average across all housing stock, the average household generates 14.52 kgs of waste each week. By household type, MUDs using hoppers generated the least amount of waste (11.78 kgs) and SDs generated the most amount of waste (16.18kg per week).

The current diversion rates for each dwelling type is also represented with 38.2% for SDs, 21.1 %, for MUDs with hoppers and 22.3% for MUDs with MGBs. Overall, the diversion rate for the total sample was 32.6 %. This means that of all the material available to be diverted to recycling, 32.6 %.

Table 10 - Consolidated Waste Stream (per Dwelling per Week) and Diversion Rates

Material	Single dwgs	MUDs w hoppers #	MUDs w MGBs ^	Total
	Weights (kgs / dwg / week)			
Material in recycling stream:				
Recycled paper / cardboard	3.90	1.43	1.33	2.88
Recycled containers	2.28	1.06	1.36	1.85
Contamination in recycling	0.35	0.09	0.09	0.24
Material in garbage stream:				
Recyclable paper / cardboard	0.42	0.85	0.86	0.52
Recyclable containers	0.67	1.19	0.45	0.70
Food waste	3.87	3.36	3.13	3.72
Garden waste	0.56	0.76	0.89	0.63
Other non-recyclable	4.13	3.04	3.93	3.98
Total waste stream	**16.18**	**11.78**	**12.04**	**14.52**
Diversion rate	**38.2%**	**21.1%**	**22.3%**	**32.6%**

Chart 7 below shows composition of the total waste stream consolidated into key categories.

Chart 7 - Consolidated Total Waste Stream (per Dwelling per Week)

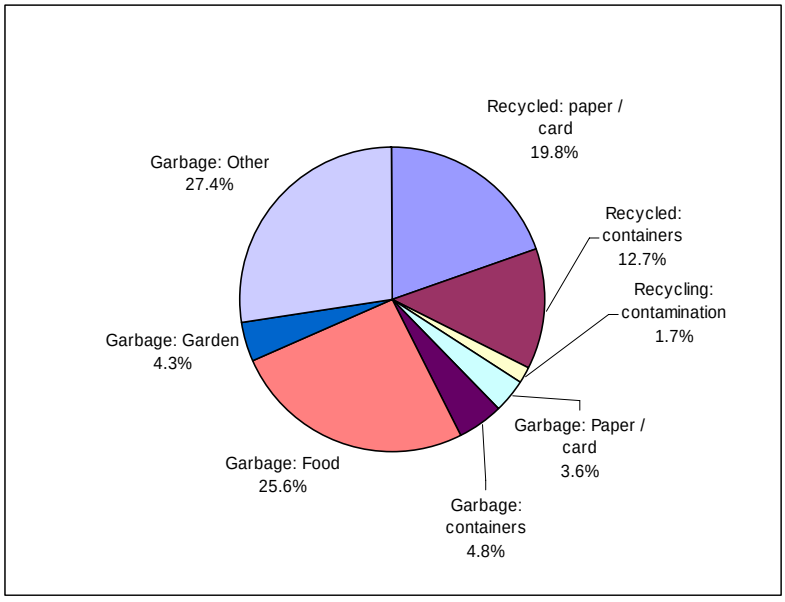
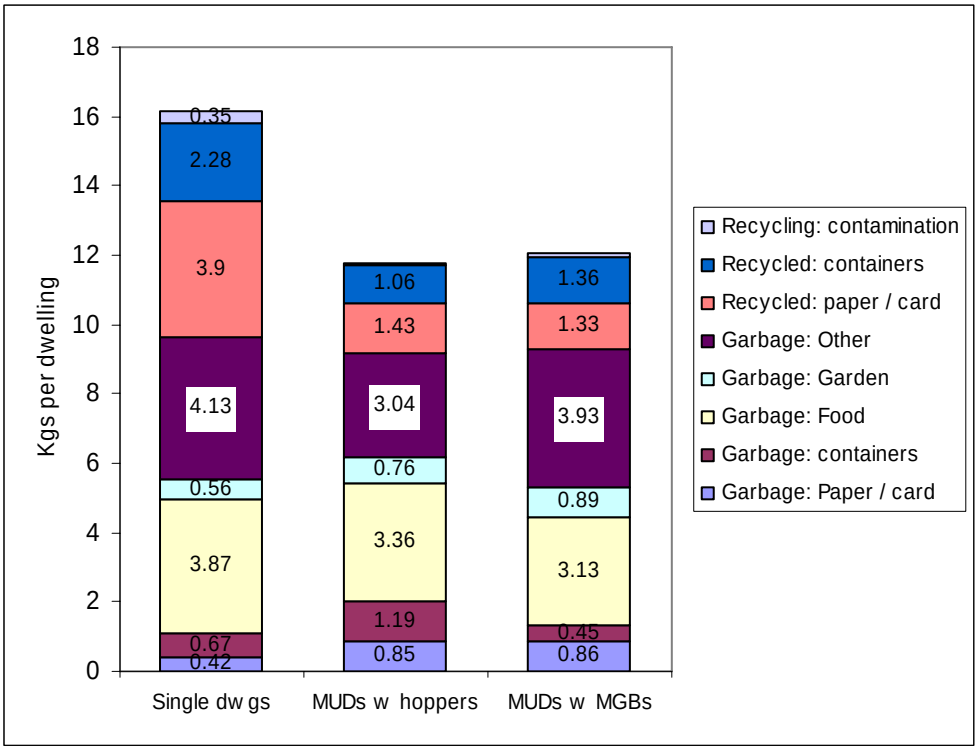


Chart 8 below illustrates the breakdown of the combined garbage and recycling stream by dwelling type. The graph shows materials consolidated into key groupings.

Chart 8 - Total Waste Stream (kg/household/week) by Dwelling Type



5.4 Key Performance Indicators

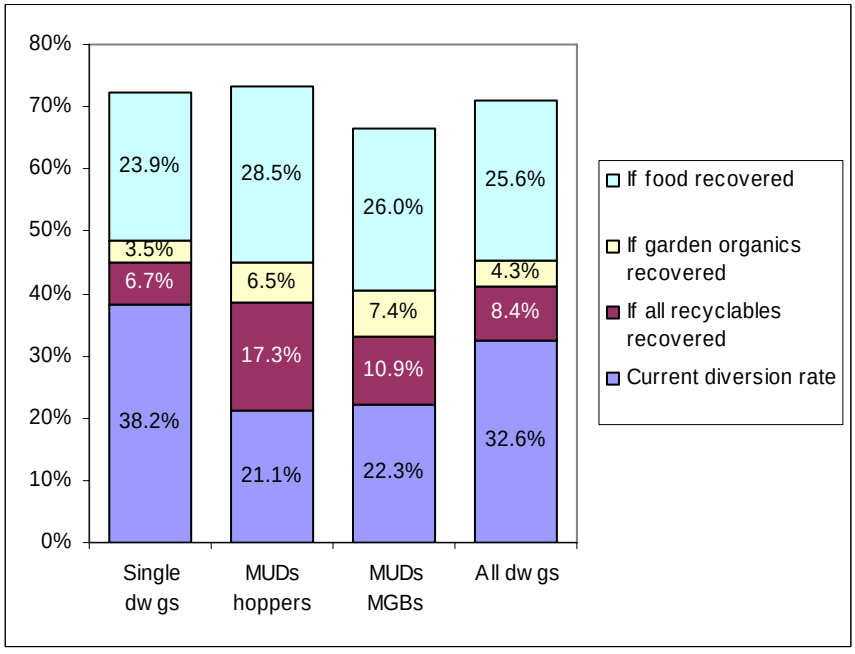
Actual and Potential Diversion Rates – Table 11 and chart 9 below show the actual and potential diversion rates for all dwelling types. The current diversion rate for all dwelling types is 32.6%. If all recyclables that were found in the garbage were diverted, an additional 8.4% could be diverted. Overall, the diversion rate for all dwelling types could rise to 90.9% if all recyclables, garden organics and food waste were diverted to alternative waste processing systems. The greatest short-term gains can be made if the amount of recyclables currently in the garbage bin in MUDs using hoppers could be diverted as this represents 17.3% of potential diversion by this housing type. In the longer term, the focus has to be on organic recovery as food has a potential to increase diversion by an average of 25.6% per household. Continued twicking of the recycling service will only achieve a further 8.4% at best.

Table 11 - Actual and Potential Diversion Rates

	Single dwgs	MUDs hoppers	MUDs MGBs	All dwgs
Current diversion rate	38.2%	21.1%	22.3%	32.6%
If all recyclables recovered	6.7%	17.3%	10.9%	8.4%
If garden organics recovered	3.5%	6.5%	7.4%	4.3%
If food recovered	23.9%	28.5%	26.0%	25.6%
TOTAL	**72.3%**	**73.4%**	**66.6%**	**70.9%**

Chart 9 below shows that ACT NoWaste is currently diverting on average 32.6% of all municipal household waste from landfill. This is substantially less than most other metropolitan local government areas, where the average diversion is between 50 – 60%. However, in all these cases, residents are provided with a three bin system with a garden organics bins in addition to the recycling container and overall total waste generation is higher than that of the ACT, which has encouraged households not to place garden waste in the garbage bin.

Chart 9 - Actual and Potential Diversion



5.5 Recovery Rates

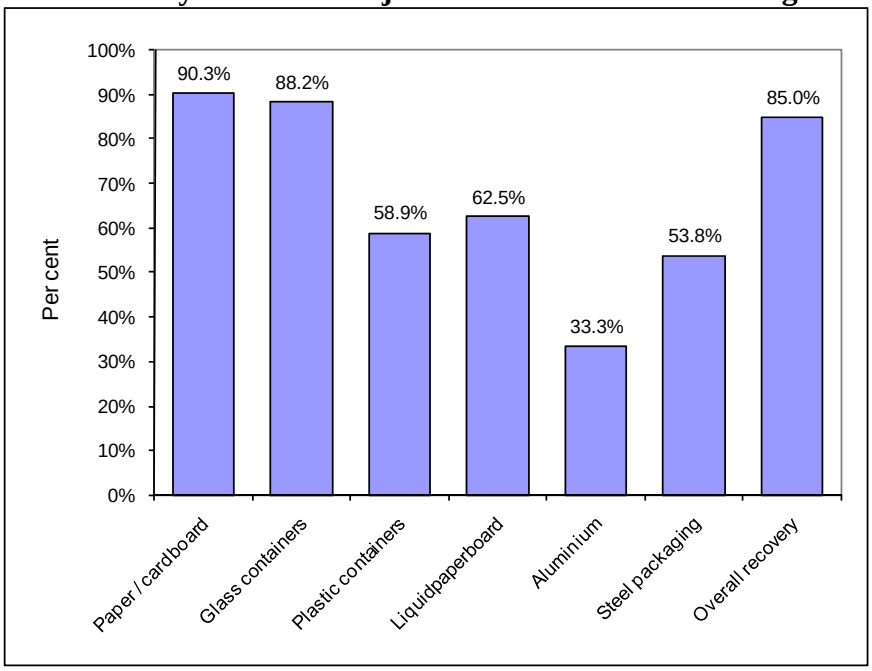
5.5.1 Recovery Rates by Material for Single Dwellings –Table 12 below shows the recovery rates for each material type and includes what is included in each category are listed under the heading Category Definition. These results show that paper and cardboard is the material with the highest recovery rate of 90.3%. Glass containers achieved a recovery rate of (88.2%), liquidpaperboard (62.5%) and plastic containers (58.9%). Aluminium achieved a recovery rate of just 33.3%, making this product category the poorest performer. The overall recovery rate for all materials for single dwellings was 85%.

Table 12 – Recovery Rates for Major Classes of Materials – Single Dwellings

Material	Category definition	Recycled	In garbage	Total	Recovery rate (%)
		Weight (Per Dwelling Per Week)			
Paper/cardboard	Newspapers/magazines Other paper Corrugated Cardboard	3.90	0.42	4.32	90.3%
Glass containers	Glass packaging/containers	1.72	0.23	1.95	88.2%
Liquidpaperboard	Liquidpaperboard	0.05	0.03	0.08	62.5%
Plastic containers	PET HDPE LDPE PVC Polypropylene Polystyrene	0.33	0.23	0.56	58.9%
Steel packaging	Steel cans	0.14	0.12	0.26	53.8%
Aluminium	Aluminium	0.03	0.06	0.09	33.3%
Overall recovery		**6.17**	**1.09**	**7.26**	**85.0%**

These results are shown graphically below and the results are consistent with other recent audits conducted by APC where typically paper and glass are high performers and aluminium consistently records a low recovery rate.

Chart 10 – Recovery Rates for Major Classes of Materials – Single Dwellings

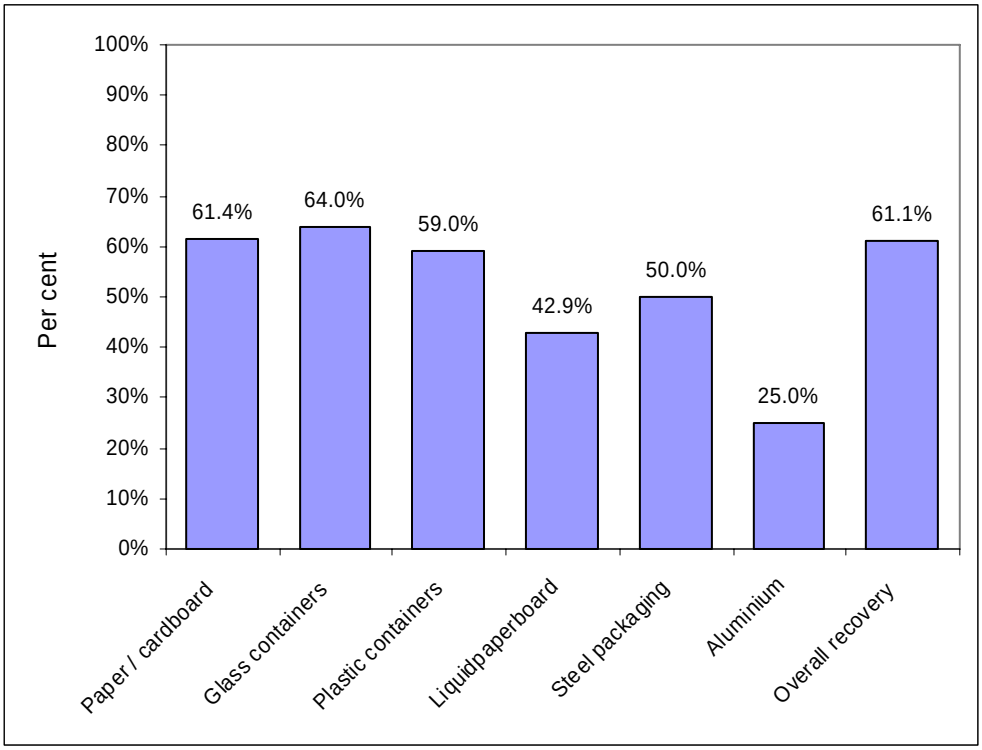


5.5.2 Recovery Rates for Major Classes of Materials for MUDs –Table 13 and Chart 11 below show that in the MUDs, Glass containers is the best performer with a recovery rate of 64%. Paper/cardboard achieved a rate of 61.4%. Aluminium achieved the lowest recovery rate of 25 %, making this product category the poorest performer, consistent with the results in single dwellings. The overall recovery rate for all materials generated from MUDs was 61.1% less than the 78.8% recorded in single dwellings.

Table 13 - Recovery Rates for Major Classes of Materials - Multi-unit Dwellings

Material	Category definition	Recycled	In garbage	Total	Recovery rate (%)
		Weight (per dwelling per week)			
Paper / cardboard	Newspapers / magazines, other paper, corrugated cardboard	1.37	0.86	2.23	61.4%
Glass containers	Glass packaging / containers	0.89	0.50	1.39	64.0%
Plastic containers	PET, HDPE, LDPE, PVC, Polypropylene, Polystyrene	0.23	0.16	0.39	59.0%
Liquidpaperboard	Liquidpaperboard	0.03	0.04	0.07	42.9%
Steel packaging	Steel cans	0.06	0.06	0.12	50.0%
Aluminium	Aluminium	0.01	0.03	0.04	25.0%
Overall recovery		**2.59**	**1.65**	**4.24**	**61.1%**

Chart 11 - Recovery Rates for Major Classes of Materials - MUDs

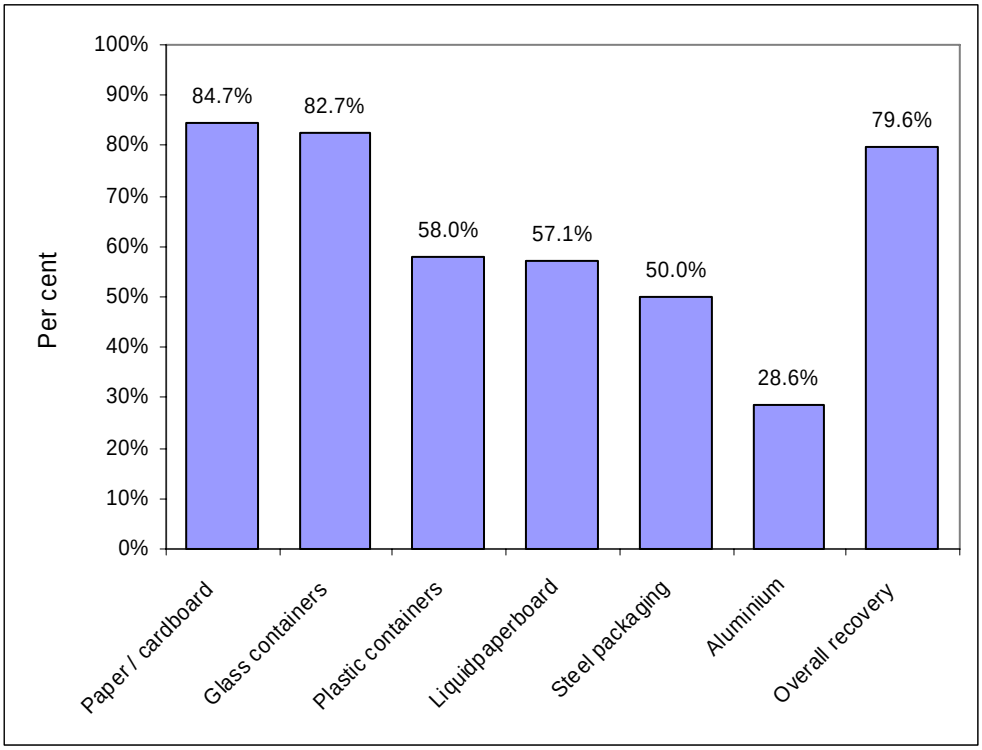


5.5.3 Recovery Rates for Major Classes of Materials – All Dwellings. Table 14 and Chart 12 below show that paper/cardboard is the best recovered material at 84.7% while glass containers are 82.7%. Aluminium again was the lowest performer at just 28.6%. The overall recovery rate for all materials was 79.6%

Table 14 - Recovery Rates for Major Classes of Materials - All Dwellings

Material	Category definition	Recycled	In garbage	Total	Recovery rate (%)
		Weight (per dwelling per week)			
Paper / cardboard	Newspapers / magazines, other paper, corrugated cardboard	2.88	0.52	3.40	84.7%
Glass containers	Glass packaging / containers	1.39	0.29	1.68	82.7%
Plastic containers	PET, HDPE, LDPE, PVC, Polypropylene, Polystyrene	0.29	0.21	0.50	58.0%
Liquidpaperboard	Liquidpaperboard	0.04	0.03	0.07	57.1%
Steel packaging	Steel cans	0.11	0.11	0.22	50.0%
Aluminium	Aluminium	0.02	0.05	0.07	28.6%
Overall recovery		**4.73**	**1.21**	**5.94**	**79.6%**

Chart 12 - Recovery Rates for Major Classes of Materials - All Dwellings



5.6 Volume of Bins Used

5.6.1 Garbage Bins Used (SDs Only) – The table below shows how full the garbage bins were at the time of sample collection. In most cases, the garbage bins were less than 50% full. 14% of the samples were 100% full and 6% were more than 100% full. The median volume used overall was 75%. The average in 2007 was 68%.

Table 15 – Volume of Garbage Bins Used (Single Dwellings Only)

Volume Taken	Number	Per cent
Less than 50%	68	36%
50% - 74%	22	12%
75% - 99%	63	33%
100%	27	14%
More than 100%	11	6%
Total	**191**	**100%**
Average (median):		**75%**

5.6.2 Volume of Recycling Containers Used (SDs Only) – The table below shows that at the time of sampling, the recycling bins were on average, 80% full. 6% of the sample was more than 100% full and 18% was 100% full. The average in 2007 was 76%, just 4% point difference.

Table 16 – Volume of Recycling Containers Used (Single Dwellings Only)

Volume of Recycling Containers (Single Dwellings Only)		
Volume Taken	**Number**	**Per cent**
Less than 50%	27	31%
50% - 74%	13	15%
75% - 99%	26	30%
100%	16	18%
More than 100%	5	6%
Total	**87**	**100%**
Average (median):		**80%**

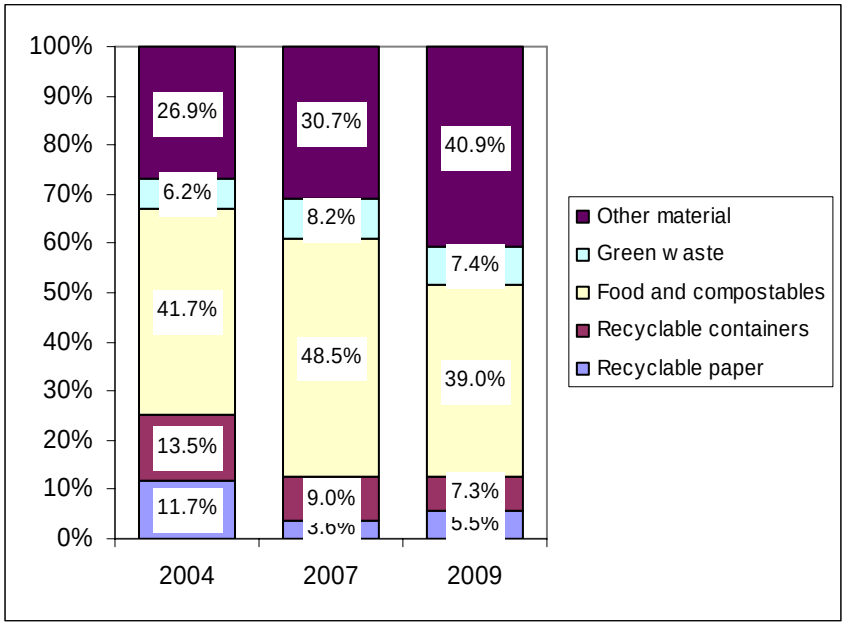
It should be noted that the average for 2007 was calculated on a slightly different basis so comparison should be treated with caution.

6. COMPARISONS WITH PREVIOUS AUDITS

The following charts and tables provide comparative analyses of the results from previous audits conducted in 2004 and 2007 against those recorded for the 2009 audit.

6.1 Consolidated Composition of the Garbage – Comparison with Previous Audits. The chart below shows a breakdown of ACT's garbage for the audits conducted in 2004, 2007 and 2009. In 2004 and 2007, the 'Food and compostables' stream was the largest component. In 2009 'Other material' is the largest component at 40.9% increasing from 26.9% in 2004. Recyclable paper has decreased from 11.7% in 2004 to 5.5% in 2009. Recyclable containers have also decreased from 13.5% in 2004 to 7.3% in 2009.

Chart 13 - Consolidated Composition of Garbage - Comparison with Previous Audits



Note the percentages of "Green waste" and "Other material" are slightly different here to other parts of the report due to the addition of the category "Other organic wood/timber" to Green waste for this chart only.

The consolidated categories used in the chart above are detailed in the table below:

Table 17 - Consolidated Composition of Garbage – Waste Stream Categories

Category name	Streams consolidated	Category name	Streams consolidated
Other Material	Disposable/contaminated paper Food/kitchen Film/plastic bags Textiles/clothing/carpet Ceramics Ferrous other Garden organics Nappies Chemicals Wood Hazardous Medical/sharps Other plastic	Recycling containers	Glass containers HDPE PET Steel Liquidpaperboard Aluminium Polypropylene Polystyrene PVC LDPE
Green Waste	Garden organics Other organic wood/timber	Recyclable paper	Newspapers/magazines Other paper Corrugated Cardboard
Food and compostables	Food/Kitchen		

Table 18 below shows the proportion of each material between the 2007 to 2009 audit. 'Other' represented 4.7% of the 2009 sample, whereas in 2007 no material was recorded in this category. All other categories remained very similar to prior results.

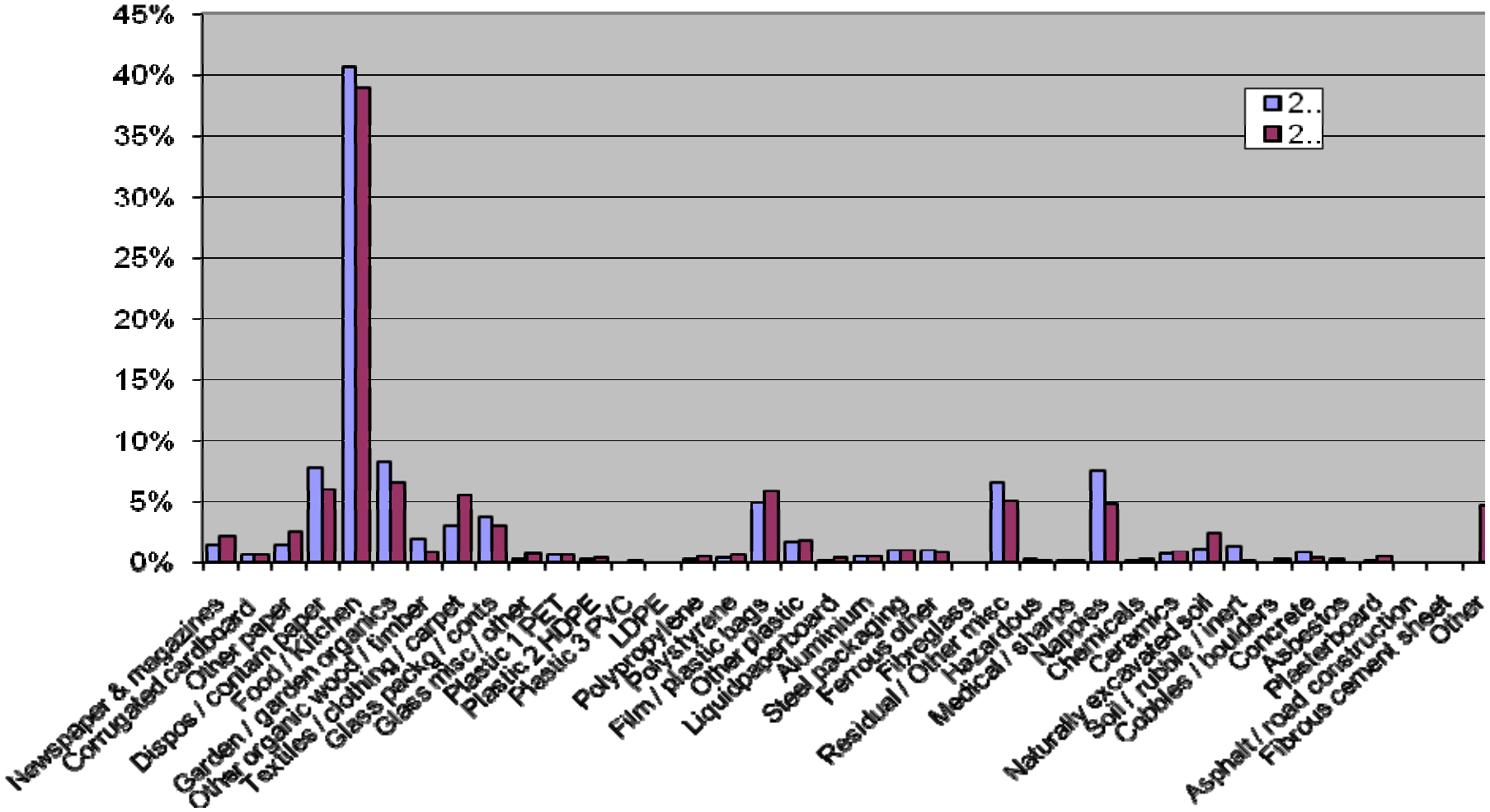
Table 18 - Detailed Composition of Garbage Stream - Comparison with 2007 Audit

	2007	2009
Material	**Per cent**	**Per cent**
Newspaper and magazines	1.5%	2.3%
Corrugated cardboard	0.6%	0.6%
Other paper (1)	1.6%	2.6%
Disposable / contam paper (2)	7.8%	6.0%
Food / Kitchen	40.7%	39.0%
Garden / garden organics	8.2%	6.6%
Other organic wood / timber	2.0%	0.8%
Textiles / clothing / carpet	3.1%	5.6%
Glass packaging / containers	3.8%	3.1%
Glass misc / other (3)	0.3%	0.7%
Plastic 1 PET	0.6%	0.6%
Plastic 2 HDPE	0.3%	0.4%
Plastic 3 PVC	0.0%	0.1%
LDPE	0.0%	0.0%
Polypropylene	0.3%	0.5%
Polystyrene	0.4%	0.6%
Film / plastic bags (4)	5.0%	5.9%
Other plastic	1.8%	1.9%
Liquidpaperboard	0.2%	0.4%
Aluminium	0.5%	0.5%
Steel packaging	1.1%	1.1%
Ferrous other	1.1%	0.8%
Fibreglass	0.0%	0.0%
Residual / Other misc (5)	6.6%	5.1%
Hazardous (6)	0.3%	0.2%
Medical / sharps	0.1%	0.2%
Nappies	7.5%	4.9%
Chemicals	0.2%	0.3%
Ceramics	0.7%	1.0%
Naturally excavated soil	1.2%	2.5%
Soil / rubble / inert	1.4%	0.1%
Cobbles / boulders	0.0%	0.3%
Concrete	0.8%	0.4%
Asbestos	0.3%	0.0%
Plasterboard	0.1%	0.5%
Asphalt / road construction	0.0%	0.0%
Fibrous cement sheet	0.0%	0.0%
Other (7)	0.0%	4.7%
Total material	**100.0%**	**100.0%**

Notes:
1: Other recyclable paper e.g. office paper
2: Disposable / contaminated paper (recyclable)
3: Other / miscellaneous glass including glass fines (non-recyclable)
4: Film, plastic bags, soft plastic
5: Residual / other miscellaneous including kitty litter, dog poo, ash and dust
6: Hazardous items including paint, fluorescent lights and batteries
7: Other items including toys, appliances, tools and rubber

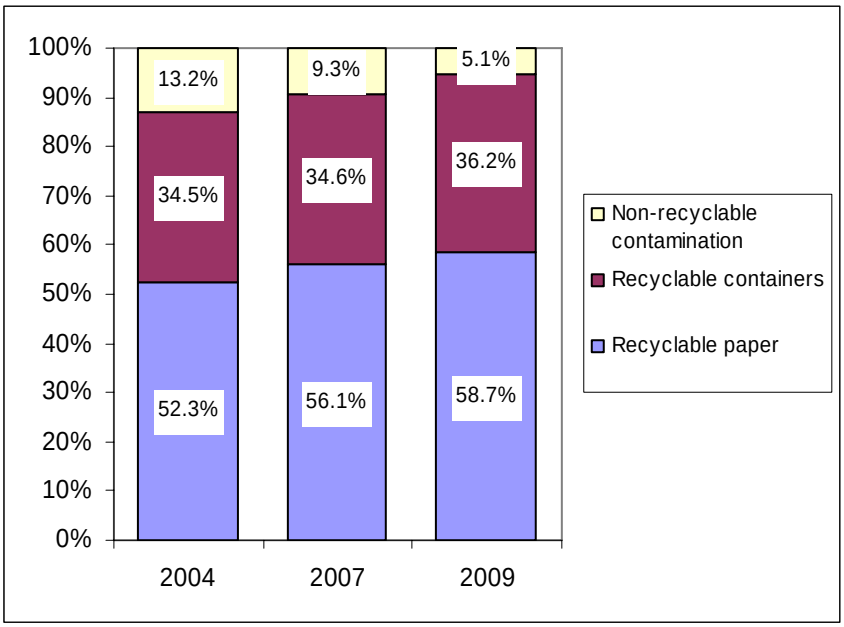
Chart 14 below shows the difference between each material sorted in the categories by audit. The chart clearly shows the large amount of food and kitchen waste in the garbage stream and why this needs to be the target of future work.

Chart 14 – Detailed Composition of Garbage Stream – Comparison with 2007 Audit



6.2 Consolidated Composition of the Recycling – Comparison with Previous Audits – Chart 15 below shows a breakdown of the recycling stream for the previous audits along with this year's analysis. The most significant improvement since 2004 is the reduction in contamination levels from 13.2% to 5.1% in 2009. The proportion of paper to containers is similar to previous results

Chart 15 - Consolidated Composition of Recycling - Comparison with Previous Audits



The consolidated categories used in the chart above are detailed in the table below:

Table 19 – Consolidated Composition of Recycling Categories

Category name	Streams consolidated	Category name	Streams consolidated
Non recyclable material	Disposable/contaminated paper Food/kitchen Film/plastic bags Textiles/clothing/carpet Ceramics Ferrous other Garden organics Nappies Chemicals Wood Hazardous Medical/sharps Other plastic Garden organics Other organic wood/timber Food/Kitchen	Recycling containers	Glass containers HDPE PET Steel Liquidpaperboard Aluminium Polypropylene Polystyrene PVC LDPE
Recyclable paper	Newspapers/magazines Other paper Corrugated Cardboard		

Table 20 below shows the change in proportions of materials found in the recycling stream from 2007 to 2009. The proportion of 'other paper' doubled from 10% to 22.1% in 2009. Corrugated cardboard and glass packaging both recorded minor increases as a proportion of the total sample. Newspapers and magazines reduced from 41.5% to 30.5%.

Table 20 - Detailed Composition of Recycling Stream -Comparison with 2007 Audit

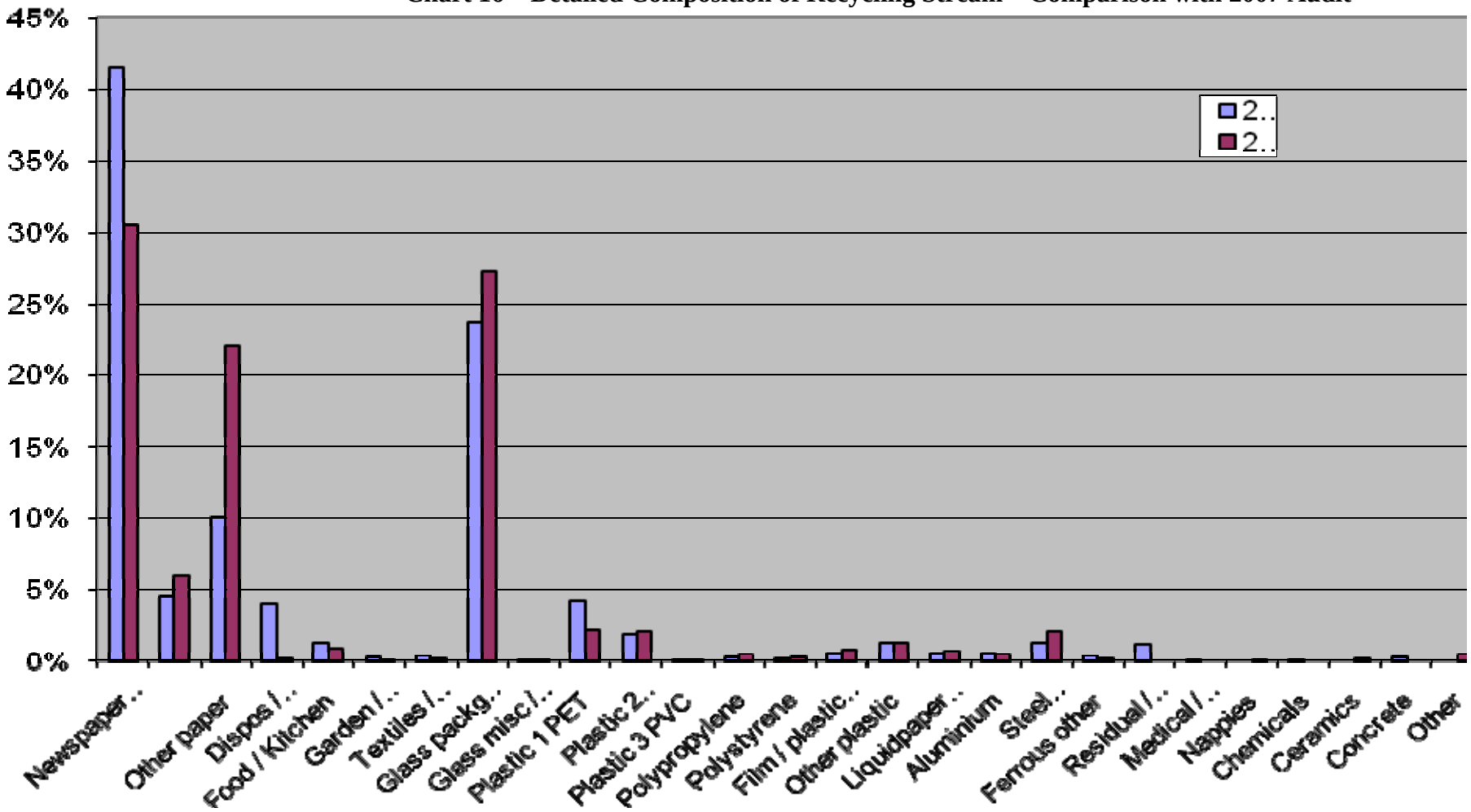
	2007	2009
Material	**Per cent**	**Per cent**
Newspaper and magazines	41.5%	30.5%
Corrugated cardboard	4.6%	6.1%
Other paper	10.0%	22.1%
Disposable / contaminated paper	4.1%	0.2%
Food / Kitchen	1.4%	1.0%
Garden / garden organics	0.3%	0.1%
Textiles / clothing / carpet	0.4%	0.2%
Glass packaging / containers	23.7%	27.3%
Glass misc / other (1)	0.1%	0.1%
Plastic 1 PET	4.3%	2.3%
Plastic 2 HDPE	2.0%	2.2%
Plastic 3 PVC	0.1%	0.1%
Polypropylene	0.3%	0.5%
Polystyrene	0.2%	0.3%
Film / plastic bags (2)	0.6%	0.9%
Other plastic	1.4%	1.4%
Liquidpaperboard	0.6%	0.8%
Aluminium	0.6%	0.5%
Steel packaging	1.4%	2.2%
Ferrous other	0.4%	0.2%
Fibreglass	0.0%	0.0%
Residual / Other misc (3)	1.3%	0.0%
Medical / sharps	0.1%	0.0%
Nappies	0.0%	0.1%
Chemicals	0.1%	0.0%
Ceramics	0.0%	0.2%
Concrete	0.3%	0.0%
Other (4)	0.0%	0.5%
Total material	**100.0%**	**100.0%**

Notes:
1: Other / miscellaneous glass including glass fines (non-recyclable)
2: Film, plastic bags, soft plastic
3: Residual / other miscellaneous including kitty litter, dog poo, ash and dust
4: Other items including toys, appliances, tools and rubber

No material in 2007 or 2009 was found in the following categories: Other organic wood / timber, LDPE, Fibreglass, Hazardous, Naturally excavated soil, Soil / rubble / inert, Cobbles / boulders, Asbestos, Plasterboard, Asphalt / road construction, Fibrous cement sheet

Chart 16 below shows the difference between each material sorted in the categories by audit year. The chart clearly shows the large amount of paper and glass relative to all other materials

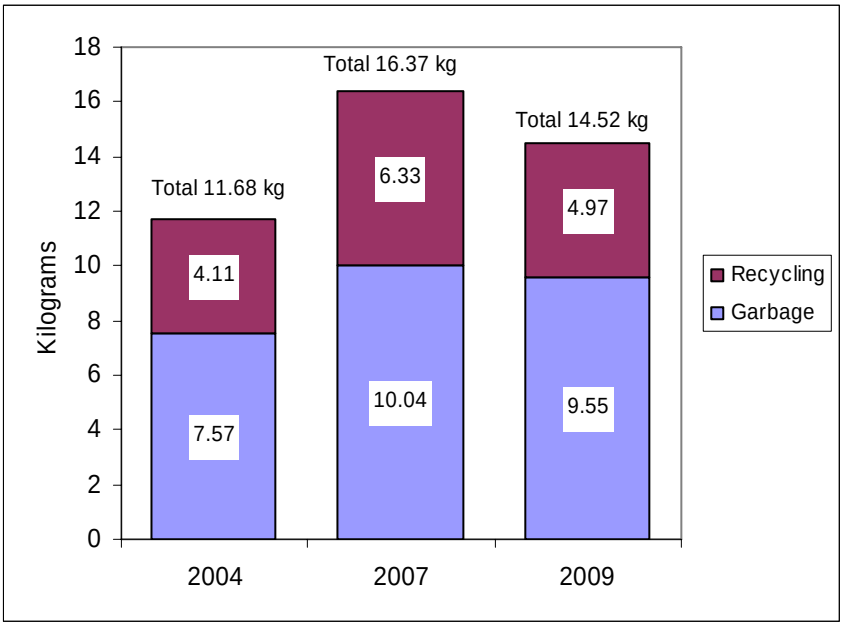
Chart 16 – Detailed Composition of Recycling Stream – Comparison with 2007 Audit



6.3 Consolidated Composition of the Total Waste Stream – Comparison with Previous Audits

Chart 17 below shows that the total waste stream per household in 2009 is 14.52 kgs, which is less than the 2007 audit result of 16.37kg and slightly higher than the 2004 audit of 11.68kg.

Chart 17 - Total Waste Generation - Comparison with Previous Audits



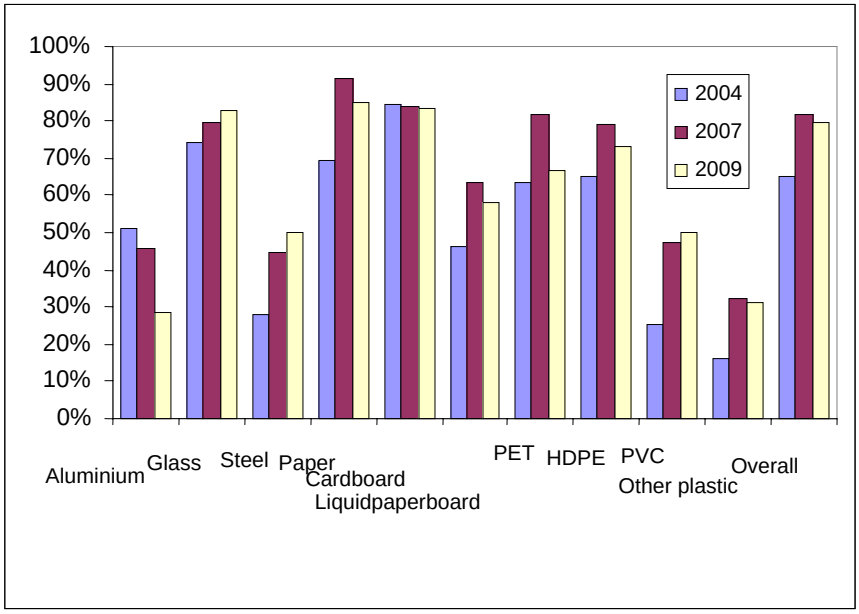
6.4 Recovery Rates – All Dwellings – Comparison with Previous Audits

Table 21 shows the recovery rates for major classes of materials. The recovery rates for glass, steel and PVC have increased in 2009 while cardboard has remained relatively stable. The recovery rates for all other products have dropped from the 2007 results including PET and HDPE which maybe seasonally related.

Table 21 - Recovery Rates - All Dwellings - Comparison with Previous Audits

Material	Recovery rates (per cent)		
	2004	2007	2009
Aluminium	51.3%	45.6%	28.6%
Glass	74.3%	79.6%	82.7%
Steel	27.7%	44.6%	50.0%
Paper	69.1%	91.5%	84.9%
Cardboard	84.2%	83.8%	83.3%
Liquidpaperboard	46.4%	63.4%	58.0%
PET	63.3%	81.9%	66.7%
HDPE	65.0%	79.0%	73.3%
PVC	25.2%	47.2%	50.0%
Other plastic	16.2%	32.0%	31.3%
Overall	**65.1%**	**81.9%**	**79.6%**

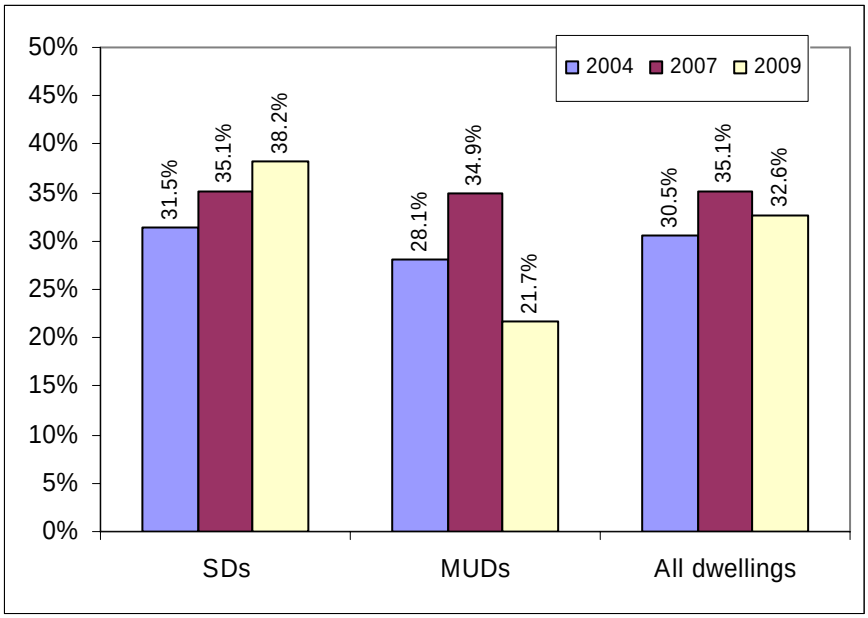
Chart 18 - Recovery Rates - All Dwellings - Comparison with Previous Audits



6.5 Diversion Rates by Dwelling by Type – Comparison with Previous Audits

Chart 19 below shows that in single dwellings, the diversion rate has improved slightly since the 2007 audit from 35.1% to 38.2%. However, the MUDs' diversion rate has dropped by 13.2% from 34.9% to 21.7%. As a result, the overall diversion rate for 2009 is 32.6%, less than the 2007 result of 35.1%. A review of weighbridge data will give a more accurate picture as to whether there has been an overall decline in diversion in the two-year period or an anomaly of this audit.

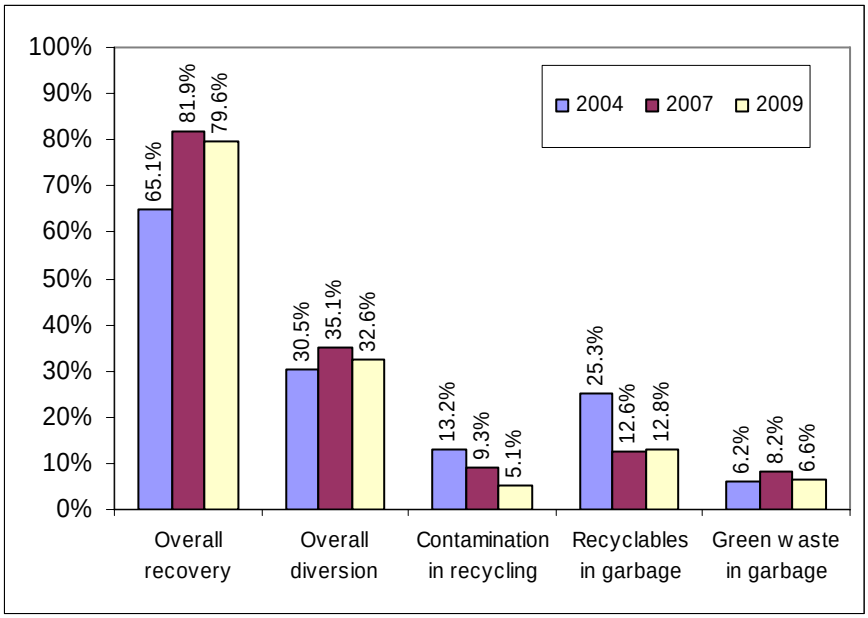
Chart 19 - Diversion Rates by Dwelling Type - Comparison with Previous Audits



6.6 Key Performance Indicators –All Dwellings –Comparison with Previous Audits

Chart 20 below shows an overall improvement in 2009 in the contamination levels in recycling – down from 9.3% to 5.1%. Recovery and diversion rates have dropped slightly since 2007. The amount of recyclables in the garbage has remained constant at approximately 13%. However, green waste in the garbage has dropped from 8.2% to 6.6%, this may be due to seasonality as this audit was conducted in winter and the 2007 audit in summer.

Chart 20 - Key Performance Indicators, All Dwelling -Comparison with Previous Audits



7. STAKEHOLDER FEEDBACK

The scope of works required the consultant to hold discussions with representatives from Cleanaway, the collection contractor and Thiess Services, the Materials Recovery Facility (MRF) operator on how and why undesirable materials enter the domestic waste stream and how this might be reduced, avoided or remedied. A summary of these discussions and suitable recommendations for remedial actions or educational activities that might address the situation were to be included. Only the draft report of May 2009 was forwarded to the stakeholders for comment due to time constraints in completing the December report with the November MUDG data.

7.1 Cleanaway Transpacific Ltd

A copy of the draft report was sent to John Coughlin, Regional Manager of Cleanaway Transpacific on 25th May 2009, seeking review and input following initial telephone contact by APC. We specifically requested that Cleanaway review the report and provide any feed back or comments for inclusion in this section.

On 3rd June 2009 APC received an email response that simply stated *"I have had a quick look, please proceed don't let me hold up the process."* Further email correspondence was sent by ACT NoWaste requesting any specific comments relating to: *"how and why undesirable materials enter the domestic waste stream and how this might be reduced, avoided or remedied"*. The email also asked, *"Are there any issues relating to stickering of bins, monitoring of contents, problem customers etc that we should be aware of or improve? Other issues? It's a good opportunity to get recommendations on the books."*

John Couglan responded by providing the following response:

"Cleanaway does keep looking at weights and monitor variations or trends in waste generation as we are contracted to collect and deliver to the appropriate facility for disposal or recovery the MSW waste stream.

However, in respect to the recent waste audit APC conducted for the ACT government I would consider that any decrease in waste generation is due mainly to seasonality given the 2007 audit was conducted in summer (November) and this one in May 2009.

Canberra has a highly educated community with a higher than average level of environmental awareness and a general sense of compliance with regulations. This is reflected in the low level of green waste in garbage as many households have private arrangements with "trash pak" operators. It is cheaper and easier to put it in the garbage bin but they are compliant and try to do "the right thing".

The Customer Call Centre get many calls from people seeking clarification on information and how to dispose of unusual items – they don't want to do the wrong thing.

The decrease in contamination levels is likely to be as a result of a recent TV campaign that ACT NoWaste has undertaken with education funds provided by the contractors.

All bins are correctly stickered and in the majority of cases correctly used.

Canberra would have one of the largest recycling ratios to garbage of any community in Australia. What else we can do is just keep on reinforcing the message for new-comers and as reminders to existing customers and the community generally.

It must be noted that the audit only tells part of the story as residents have other opportunities to dispose of excess rubbish at the landfill or transfer stations and excess recycling at the six drop off centres. Since Cleanaway commenced the Domestic collection contract, we have noticed over the years the tonnages at the drop off facilities have increased dramatically and are used by both households and commercial premises. They are also used as a dumping ground with a very high level of contamination found, which is cause for concern to the MRF operator."

7.2 Thiess Services

Richard Iles, MRF Manager of the Thiess Services MRF provided the following information to David Roberts from ACT NoWaste in relation to previous audit years and specific audit periods.

"In short, the end of October beginning of November is the start of the biggest tonnes in recycling, basically the silly season in Canberra. To compare November to May is difficult. May has more paper, less glass. November considerably more glass. This will produce the biggest difference for bin weights with the same volume. May historically is a month where tonnage starts to drop.

Looking at the suburbs listed for 07 and 09, the cross section of suburbs listed would cancel out the effect of some areas recycling better than others. I must advise though that we at the MRF do see a difference in recycling quality from suburb to suburb."

7.3 Summary

Both the collection contractor and the MRF processor confirm that garbage has less garden waste while recyclable paper is higher in winter and lower in summer and with glass the reverse is true. It is therefore difficult to directly compare results due to seasonal differences in the consumption and disposal habits of society.

In the opinion of Cleanaway, everything that can be is being done, from bins being correctly stickered, customer support to assist enquiries and the recently conducted mass media television campaign.

Neither contractor can offer a practical suggestion as to how to improve on the overall results of the 2009 audit.

8. CONCLUSION

Overall, the results of the 2009 audit show an improvement in performance in the areas of contamination, waste generation and green waste present in the garbage stream over the 2007 audit results. However, diversion and recovery have declined slightly and the amount of recyclables in the garbage stream has increased slightly.

The overall waste generation for ACT has dropped from 16.37kg per household per week in 2007 to 12.82kg in 2009, with the garbage component decreasing from 10.04kg to 8.38kg – a difference of 1.6kg.

Contamination in the recycling stream decreased from 9.3% to 4.9%. Typically, recycling collection services utilising a fully commingled system can achieve contamination levels of between 3% and 5% deemed to be best practice standards. ACT NoWaste is now within this standard.

The presence of green waste in the garbage bin also decreased from 8.2% to 5.3% however, this may be more a response to the climatic season when the audit was conducted than the behaviour of residents.

The presence of recyclables in the garbage stream increased slightly from 12.6% in 2007 to 13% in 2009 and the overall recovery rate for all dwellings dropped from 81.9% in 2007 to 72.8% in 2009. Glass had the highest recovery of 81.4% with paper at 74.7%, and plastics and liquidpaperboard were all around the 50% with aluminium at just 25%.

It is understood ACT NoWaste has spent considerable funds on a high profile communication program which appears, from the audit results, not to have achieved the desired results of higher yield as recycling recovery has decreased.

The greatest opportunity for improvement is in MUDs using hoppers which currently contain the largest amount of recyclables in the garbage stream not diverted for recycling. Future education and communication efforts must concentrate on improving the performance of MUDs and the recovery of all materials, in particular the heaviest materials being paper and glass.

This year, the overall diversion rate fell slightly from 35.1% to 33%. The focus has to be on organic recovery as food has a potential to increase diversion by 25% while the most the recycling service can achieve is 8.4% diversion at best.

The greatest opportunity for ACT NoWaste to improve the performance of the waste management system for domestic premises is to increase diversion from landfill by managing the organic fraction of the waste stream and, in particular, the food waste component. This component represents 51.6% of the current bin contents and includes food and kitchen waste (39%), disposable and contaminated paper (6%) and garden waste (6.6%).

Other councils nationally have offered garden waste services to their residents and are now incorporating food waste collections. Many council's have moved garbage service collection frequency to fortnightly and organics collection to weekly. However, the ACT

has encouraged its residents to manage green waste on-site or by engaging private contractors. This now presents a dilemma as to how to undertake a program to extract the small amount of garden waste and the considerable amount of food waste from the garbage stream. The use of AWT to process the entire residuals waste stream is one clear option available.

If AWT processes are not considered, then ACT NoWaste will need to make long-term plans to have sufficient landfill capacity for up to 68% of the garbage waste stream in future years until the organic fraction is addressed. After addressing the organic fraction, the remaining 41.7% comprising 'other material' (19.4%), nappies (4.9%), textiles/clothing and carpet (5.6%), plastic film (5.9%) and contaminated paper (6%), will still require disposal as this is the proportion of the current waste stream that is neither organic nor recyclable with current processes.

9. RECOMMENDATIONS

The scope of works required the consultant to make recommendations on how the information contained in this audit might be used to reduce waste to landfill and increase recycled waste.

While the waste audit provides a snapshot of current waste generation and consumption and disposal patterns from a randomly selected stratified number of households, it is only one piece of information that the ACT needs if it is to undertake a full review of current waste management in the Territory's quest for greater performance.

APC would recommend the following activities are also undertaken:

Short Term

1. That ACT NoWaste undertake an independent operational review and communication audit to ascertain how the existing service is being delivered, interaction with residents and what methods and means are used to communicate with the community about the recycling service.

2. That emphasis be placed on communicating with residents living in multi-unit dwellings in relation to recycling performance, as this is where a substantial amount of recyclables are evident in the garbage stream and the greatest opportunity lies.

3. Ongoing education, communication and motivation of the broader community are necessary to maintain current recycling performance. The method and means to undertake this activity may become clearer if a communication audit is undertaken. However, it is generally accepted that multi-pronged comprehensive campaigns desired to reach all sectors of the community achieve the greatest results.

Mid Term

4. Investigate the options for processing the residuals to recover the organic fraction of the waste stream and, in particular, the food waste and the recyclables still in the garbage stream. Such a process can target 70% of the current garbage bin contents and reduce substantially the need for landfill capacity in the decades ahead.

APPENDIX A – LIST OF RECYCLABLE MATERIALS

APPENDIX A – LIST OF RECYCLABLE MATERIALS

Material	Status
Newspaper and magazines	Recyclable
Corrugated cardboard	Recyclable
Other paper	Recyclable
Disposable / contaminated paper	Not recyclable
Food / Kitchen	Not recyclable
Garden / garden organics	Not recyclable
Other organic wood / timber	Not recyclable
Textiles / clothing / carpet	Not recyclable
Glass packaging / containers	Recyclable
Glass miscellaneous / other	Not recyclable
Plastic 1 PET	Recyclable
Plastic 2 HDPE	Recyclable
Plastic 3 PVC	Recyclable
LDPE	Recyclable
Polypropylene	Recyclable
Polystyrene	Recyclable
Film / plastic bags / soft plastic	Not recyclable
Other plastic	Not recyclable
Liquidpaperboard	Recyclable
Aluminium	Recyclable
Steel packaging	Recyclable
Ferrous other	Not recyclable
Fibreglass	Not recyclable
Residual / Other miscellaneous	Not recyclable
Hazardous	Not recyclable
Medical / sharps	Not recyclable
Nappies	Not recyclable
Chemicals	Not recyclable
Ceramics	Not recyclable
Naturally excavated soil	Not recyclable
Soil / rubble / inert	Not recyclable
Cobbles / boulders	Not recyclable
Concrete	Not recyclable
Asbestos	Not recyclable
Plasterboard	Not recyclable
Asphalt / road construction	Not recyclable
Fibrous cement sheet	Not recyclable
Other	Not recyclable

APPENDIX B – COMPOSITION OF GARBAGE STREAM

	Weight (kgs)							
Material	**Single dwgs (1)**	**Per cent**	**MUDs w hoppers (2)**	**Per cent**	**MUDs w MGBs (3)**	**Per cent**	**Total**	**Per cent**
Newspaper and magazines	30.6	1.7%	14.3	5.8%	9.0	3.0%	53.9	2.3%
Corrugated cardboard	5.1	0.3%	8.7	3.5%	1.1	0.4%	14.9	0.6%
Other paper (4)	44.2	2.4%	0.0	0.0%	17.5	5.9%	61.7	2.6%
Disposable / contam paper (5)	116.6	6.3%	12.4	5.0%	13.8	4.7%	142.8	6.0%
Food / Kitchen	740.1	40.1%	90.7	36.5%	100.1	33.8%	930.9	39.0%
Garden / garden organics	107.9	5.9%	20.4	8.2%	28.5	9.6%	156.8	6.6%
Other organic wood / timber	18.9	1.0%	0.0	0.0%	0.7	0.2%	19.6	0.8%
Textiles / clothing / carpet	78.3	4.2%	7.3	2.9%	47.4	16.0%	133.0	5.6%
Glass packaging / containers	43.9	2.4%	22.2	8.9%	7.5	2.5%	73.6	3.1%
Glass misc / other (6)	12.3	0.7%	1.5	0.6%	1.9	0.6%	15.7	0.7%
Plastic 1 PET	10.0	0.5%	2.0	0.8%	1.8	0.6%	13.8	0.6%
Plastic 2 HDPE	7.1	0.4%	1.6	0.6%	1.0	0.3%	9.7	0.4%
Plastic 3 PVC	2.0	0.1%	0.2	0.1%	0.3	0.1%	2.5	0.1%
LDPE	0.9	0.0%	0.0	0.0%	0.0	0.0%	0.9	0.0%
Polypropylene	11.6	0.6%	0.0	0.0%	0.0	0.0%	11.6	0.5%
Polystyrene	11.9	0.6%	1.7	0.7%	0.8	0.3%	14.4	0.6%
Film / plastic bags (7)	111.1	6.0%	13.5	5.4%	15.3	5.2%	139.9	5.9%
Other plastic	36.3	2.0%	4.0	1.6%	4.3	1.5%	44.6	1.9%
Liquidpaperboard	6.2	0.3%	1.5	0.6%	0.7	0.2%	8.4	0.4%
Aluminium	11.1	0.6%	0.9	0.4%	0.7	0.2%	12.7	0.5%
Steel packaging	23.1	1.3%	2.0	0.8%	1.5	0.5%	26.6	1.1%
Ferrous other	10.0	0.5%	5.1	2.1%	4.5	1.5%	19.6	0.8%
Fibreglass	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Residual / Other misc (8)	120.7	6.5%	0.0	0.0%	0.0	0.0%	120.7	5.1%
Hazardous (9)	5.0	0.3%	0.2	0.1%	0.4	0.1%	5.6	0.2%
Medical / sharps	5.4	0.3%	0.0	0.0%	0.0	0.0%	5.4	0.2%
Nappies	107.7	5.8%	6.9	2.8%	1.7	0.6%	116.3	4.9%
Chemicals	5.0	0.3%	1.1	0.4%	1.1	0.4%	7.2	0.3%
Ceramics	18.2	1.0%	0.0	0.0%	4.8	1.6%	23.0	1.0%
Naturally excavated soil	59.2	3.2%	0.0	0.0%	0.0	0.0%	59.2	2.5%
Soil / rubble / inert	2.5	0.1%	0.0	0.0%	0.0	0.0%	2.5	0.1%
Cobbles / boulders	6.9	0.4%	0.0	0.0%	0.0	0.0%	6.9	0.3%
Concrete	4.1	0.2%	0.0	0.0%	5.9	2.0%	10.0	0.4%
Asbestos	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Plasterboard	12.2	0.7%	0.0	0.0%	0.0	0.0%	12.2	0.5%
Asphalt / road construction	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Fibrous cement sheet	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Other (10)	57.9	3.1%	30.0	12.1%	24.0	8.1%	111.9	4.7%
Total material	**1,844.0**	**100.0%**	**248.2**	**100.0%**	**296.3**	**100.0%**	**2,388.5**	**100.0%**

Notes:
1: Single dwellings
2: Multi-unit dwellings with hoppers as garbage containers
3: Multi-unit dwellings with MGBs as garbage containers
4: Other recyclable paper e.g. office paper
5: Disposable / contaminated paper (recyclable)
6: Other / miscellaneous glass including glass fines (non-recyclable)
7: Film, plastic bags, soft plastic
8: Residual / other miscellaneous including kitty litter, dog poo, ash and dust
9: Hazardous items including paint, fluorescent lights and batteries
10: Other items including toys, appliances, tools and rubber

APPENDIX C – COMPOSITION OF THE RECYCLING STREAM

	Weight (kgs)							
Material	**Single dwgs (1)**	**Per cent**	**MUDs w hoppers (2)**	**Per cent**	**MUDs w MGBs (3)**	**Per cent**	**Total**	**Per cent**
Newspaper and magazines	338.6	29.8%	28.3	40.7%	27.4	30.9%	394.3	30.5%
Corrugated cardboard	69.6	6.1%	4.7	6.8%	4.6	5.2%	78.9	6.1%
Other paper (4)	270.2	23.8%	5.6	8.0%	10.4	11.7%	286.2	22.1%
Disposable / contam paper (5)	2	0.2%	1.2	1.7%	0	0.0%	3.2	0.2%
Food / Kitchen	13.3	1.2%	0	0.0%	0	0.0%	13.3	1.0%
Garden / garden organics	1	0.1%	0	0.0%	0	0.0%	1.0	0.1%
Other organic wood / timber	0.4	0.0%	0	0.0%	0	0.0%	0.4	0.0%
Textiles / clothing / carpet	2.5	0.2%	0	0.0%	0	0.0%	2.5	0.2%
Glass packaging / containers	300	26.4%	21.9	31.5%	30.8	34.7%	352.7	27.3%
Glass misc / other (6)	1.2	0.1%	0.2	0.3%	0.5	0.6%	1.9	0.1%
Plastic 1 PET	22.7	2.0%	2.6	3.7%	3.9	4.4%	29.2	2.3%
Plastic 2 HDPE	25.5	2.2%	2	2.9%	1.5	1.7%	29.0	2.2%
Plastic 3 PVC	0.9	0.1%	0.2	0.3%	0.5	0.6%	1.6	0.1%
LDPE	0.3	0.0%	0.2	0.3%	0	0.0%	0.5	0.0%
Polypropylene	5.3	0.5%	0.4	0.6%	0.6	0.7%	6.3	0.5%
Polystyrene	2.5	0.2%	0.6	0.9%	1.1	1.2%	4.2	0.3%
Film / plastic bags (7)	10.8	1.0%	0.6	0.9%	0.4	0.5%	11.8	0.9%
Other plastic	16.8	1.5%	0.3	0.4%	1.4	1.6%	18.5	1.4%
Liquidpaperboard	8.7	0.8%	0.8	1.1%	0.7	0.8%	10.2	0.8%
Aluminium	5.6	0.5%	0	0.0%	0.6	0.7%	6.2	0.5%
Steel packaging	24.9	2.2%	0	0.0%	3.8	4.3%	28.7	2.2%
Ferrous other	2.3	0.2%	0	0.0%	0.5	0.6%	2.8	0.2%
Fibreglass	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Residual / Other misc (8)	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Hazardous (9)	0.1	0.0%	0	0.0%	0	0.0%	0.1	0.0%
Medical / sharps	0.2	0.0%	0	0.0%	0	0.0%	0.2	0.0%
Nappies	0.9	0.1%	0	0.0%	0	0.0%	0.9	0.1%
Chemicals	0.5	0.0%	0	0.0%	0	0.0%	0.5	0.0%
Ceramics	2	0.2%	0	0.0%	0	0.0%	2.0	0.2%
Naturally excavated soil	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Soil / rubble / inert	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Cobbles / boulders	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Concrete	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Asbestos	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Plasterboard	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Asphalt / road construction	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Fibrous cement sheet	0	0.0%	0	0.0%	0	0.0%	0.0	0.0%
Other (10)	6.9	0.6%	0	0.0%	0	0.0%	6.9	0.5%
Total material	**1,135.7**	**100.0%**	**69.6**	**100.0%**	**88.7**	**100.0%**	**1,294.0**	**100.0%**

Notes:
1: Single dwellings
2: Multi-unit dwellings with hoppers as garbage containers
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