



**WASTE STREAM AUDIT  
AND  
ANALYSIS**

**FOR**

**EASTERN  
METROPOLITAN  
REGIONAL COUNCIL**

**OCTOBER 2004**

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## EXECUTIVE SUMMARY

The Eastern Metropolitan Regional Council (EMRC) commissioned APrince Consulting to undertake a waste characterisation study of selected waste streams generated in the region. The information contained in this report will assist the EMRC in planning for improved resource recovery within the region.

This project consisted of physical collection and auditing of two waste streams:

- the domestic waste stream generated by member councils and
- the residual waste stream from three Material Recovery Facilities (MRFs) servicing the region.

In addition, moisture analysis of food and garden waste samples from the domestic waste stream was conducted. In addition, a visual audit on the composition of every commercial and self-hauled load delivered to the Red Hill Landfill was conducted over seven consecutive days.

The domestic waste stream analysis was conducted on the contents of 600 garbage bins. The bins were collected on consecutive week days between September 17 and 30, 2004 in a side loading collection vehicle provided by the EMRC. The collected material was delivered to an EMRC property at Hazelmere for auditing. The households were selected as representative of each council as a whole based on their socio-demographic profile determined by reviewing the key indicators from the Australian Bureau Statistics (ABS) 2001 Census Basic Community Profiles. In total 9,513 kg of waste was audited

Bayswater Council was the only member council to provide a containerised garden waste collection program. In addition to the garbage bin audit in Bayswater therefore, 139 garden waste bins were collected from the same households and audited. The sample size of this collection was 1,542 kg.

In total over 11 tonnes of waste was collected and sorted into 50 categories over 10 days. The results indicate that:

- ❖ **Waste Generation:** The average weight of garbage produced per household per week ranged from 20.8 kg in Bassendean to just 10.7 kg which offers its residents a 140 litre garbage bin compared with the traditional 240 litre bin used in all other councils. The average garbage generation for the regions is 15.9 kg per household per week.
- ❖ **Composition of garbage stream:** The largest proportion of the garbage stream was garden organics at 32%, followed by food at 20.6% and recyclable items, for which a recycling service is currently provided, at 16.1%.
- ❖ **Proportion of Vegetation in the Garbage Stream:** The average proportion of garden organics in the garbage bin ranged from 49.7% in Bassendean to 20.2% in

Bayswater, which offers a separate containerised green waste service. The average for the region was 32%. Extrapolating this data over a year, the region is burying 27,782 tonnes of garden waste currently present in the garbage bin.

- ❖ **Green Waste Contamination:** Green waste collected in Bayswater had a contamination level of just 2.2%. However, of this, 1.8% was materials which could be processed and included paper and cardboard (1.0% of the stream), food (0.5% of the stream) and dust/dirt/rock/ash (0.3% of the stream). Therefore foreign contaminants which would be a issue accounted for just 0.4%. This is an excellent result.
- ❖ **Proportion of Recyclables in the Garbage:** This proportion ranged from 21.5 % in Bayswater to 9.7% in Mundaring. The average for all councils was 16.1% of which paper and cardboard accounted for 9.7% and recyclable containers 6.4%.

Extrapolating the data shows that approximately 13,801 tonnes of recyclable material, comprising 8,234 tonnes of paper and cardboard and 5,458 tonnes of recyclable containers, are currently being deposited in landfill when recycling opportunities exist in each council. Given the standardisation of the recycling service across the region, the EMRC could undertake a regional education campaign in conjunction with the member councils to promote the wasted recycling opportunities.

- ❖ **Diversion opportunities:** Based on the audit results, the region is currently discarding to landfill approximately 86,000 tonnes of municipal solid waste per year of which 48% could be diverted for resource recovery. The greatest opportunity to reduce waste to landfill is with garden waste which comprises 32% compared to 9.7% for paper and cardboard and 6.4% for recyclable containers.
- ❖ **Waste Audit Comparison: 2002 and 2004:** Composition of the garbage stream in 2004 was almost identical to that found by Nolan-ITU in 2002. The 2002 audit was conducted in December (summer) and the 2004 audit was conducted in September (early spring).

The presentation rate is defined as the proportion of households presenting garbage which also presented recycling (and green waste in the case of Bayswater).

- ❖ **Recycling Presentation Rate:** Presentation rates for all councils were very similar with all councils in the 80% range. The average presentation rate for all the councils audited (excluding Mundaring) was 83%. Belmont had the highest presentation rate at 87% and Bayswater the lowest at 81%.
- ❖ **Bayswater Green Waste Presentation Rate:** The green waste presentation rate in Bayswater varied between 49% and 59% on the two days during which collections were conducted. The average for the council was 54%.

The EMRC provided two laboratory ovens for moisture analysis. One kilogram samples of food and vegetation from each council were placed in the ovens which were

heated to 105°C and for 24 hours. By subtracting the weight of the sample after it was removed from the oven from the weight of the sample before it was placed in the oven it was possible to calculate the proportion of moisture loss. The proportion of moisture loss for all samples fell within reasonably narrow ranges. For food this was between 61.4% and 75.2% (14 percentage points), while the range was greater for green waste between 47.2% and 76.2% (29 percentage points). The average moisture content of food was 70.4% while for green waste it was 63.5%.

The project also included an audit of MRF residual waste at the three MRFs which service the region. Residual is material which is not recovered for recycling and is disposed of. Bassendean recyclables are collected and processed by Roads and Robinson at their Maddington MRF. The City of Swan delivers to the City of Wanneroo's MRF at Wangara and the remaining four councils are serviced by the Cleanaway MRF at Bayswater. In total 600 kg were sampled comprising 100 kg samples from each of the Roads and Robinson and City of Wanneroo MRFs and four 100 kg samples from the Cleanaway MRF.

Each MRF residual result was unique with little commonality between the three. The audit identified that a substantial quantity, 27% of the residual stream, contains recoverable product – paper and cardboard (20.1%) and containers (7.2%). The largest proportion of paper and cardboard is present in the Roads and Robinson residual at 58%, while the highest amount of recyclable containers was at the Cleanaway MRF at 9.7%. Glass fines were highest at 65% at the City of Wanneroo's MRF.

It is not known from this audit what percentage the residual stream is of the total MRF throughput. However, based on these results additional information is clearly needed to accurately determine MRF recovery and performance.

### **Commercial and self haul waste disposed of at the Red Hill Landfill.**

- ❖ **Visitation:** A total of 680 visits were recorded and assessed at the Red Hill Landfill during the week of September 18 to 24, 2004. All commercial loads were deposited at the main tip face while self-haul users deposited material at the transfer station. During the audit, it is calculated that 2,117 m<sup>3</sup> of waste was deposited at the facility, equating to approximately 469 tonnes.

When the audit data was compared with that of the number of commercial loads recorded at the weighbridge there was a discrepancy. About two or three loads a day more were recorded than were audited. Two possible reasons for this are that because the auditor relied on the weighbridge staff to inform him when commercial loads were being delivered, if this did not happen in every case some loads which were classified as commercial at the weighbridge may have been deposited at the main tip face without being recorded as such by the auditor. It is also possible that loads classified as commercial at the weighbridge deposited elsewhere on the site, such as the green waste area or the transfer station and were not audited as commercial vehicles.



- ❖ **Transfer Station Usage:** A total of 545 patrons visited the transfer station from between September 18 and 24, 2004. The majority of these (257) arrived on the weekend compared to 288 patrons over five week days. During the audit, it is calculated that 391 m<sup>3</sup> of waste were deposited, equating to about 100 tonnes. The average load size was 0.7 m<sup>3</sup>.
- ❖ **Recycling Centre Usage:** The weighbridge recorded an additional 109 small vehicles which delivered recycling. This represents approximately 20% of all small loads however, due to the distance between the transfer station and the recycling area it was not possible to record activity which occurred at the recycling area.
- ❖ **Transfer Station Composition:** A wide variety of materials in roughly equal proportions was delivered to the transfer station during the audit period. Ten different materials made up 92% of the stream. Recycling facilities are provided for patrons, however, only 5.8% of all metals and just 1% of the paper and cardboard were separated for recycling. These two items – paper/cardboard and metals – comprise 19.1% of the materials deposited. Materials which could have been diverted for recycling or reuse included wood/timber (16.9%), garden vegetation (14.3%) (these two materials combined comprised 31.2%), metals and steel (10.5%) and paper and cardboard (8.1%).
- ❖ **Commercial loads:** A total of 135 commercial loads visited the main tip face at the Red Hill landfill during the week of September 18 to 24, 2004. The majority of these arrived during the week (130) compared to just five loads over the weekend. During the audit it is calculated that 1,726m<sup>3</sup> of waste were deposited at the tip face, equating to 368 tonnes. The average load size was 12.8 m<sup>3</sup>.
- ❖ **Commercial Loads Composition:** A smaller range of materials (from commercial loads) was deposited at the main tip face, with paper and cardboard accounting for 30% and five other materials, wood/timber, plastic, bagged waste, garden/vegetation and food/kitchen waste making up 47%. These materials present the greatest opportunities in commercial loads for improved diversion.
- ❖ **Potentially Recyclable:** A substantial proportion of the material disposed at the landfill was potentially recyclable or reusable. The greatest proportion by volume was paper and cardboard (26.1%), followed by wood and timber (14.8%). Heavier materials are much less prevalent in the waste stream, for example, construction and demolition materials – concrete and bricks – account for just 1.5%, metals and steel 3.4% and soil 1.1%.
- ❖ **Audit Comparison – Commercial loads:** A comparison of the 2002 and 2004 audit results for the main tip face identifies two major differences, a larger proportion of soil in 2002 and a larger proportion of bagged waste in 2004. When these materials are ignored the results are quite similar, with comparable proportions of paper and cardboard, food and kitchen, garden and vegetation and plastic found at the time of each audit.

- ❖ **Audit Comparison – Transfer Station:** The results of the 2002 and 2004 audits were quite different, with virtually no materials found in similar proportions

APrince Consulting believes it would be beneficial for the EMRC to also audit the kerbside recycling stream in the future as this will enable the following information to be obtained:

- Composition of the garbage and recycling streams by weight
- Type and amount of contamination in the recycling stream
- Recovery rate of recyclable materials (proportion of available recyclables being recycled)
- Proportion of waste stream being recovered (diversion rate)
- Proportion of the waste stream going to landfill
- Amount of garbage and recycling produced per household
- Overall volume of garbage and recycling streams by household

Using data from the kerbside recycling stream accurate information on the quantity and nature of the contamination could be obtained which could be the basis for targeted communication and education programs to the broader community. The data would assist in increasing recovery, minimising contamination and assist the MRF operators to recover greater quantities of materials.

Council bulky goods services traditionally collect large volumes of material, some of which, could be recycled particularly metals and whitegoods. Many councils in the eastern states now offer separate collections for garden waste, metals and bulky goods. These collections are either carried out on the same day with dedicated collection vehicles for each stream or on different days to the standard collection. A visual audit of the current bulk goods collection would identify items and materials which are being collected and assist in identifying the benefits of any potential service changes encouraging greater source separation and increasing diversion from landfill. Many councils refuse to collect cardboard, paper and recyclable items in these services to encourage the use of the regular kerbside service.

## 1. BACKGROUND

The Eastern Metropolitan Regional Council (EMRC) consists of six member councils with a combined population of approximately 250,000 people accommodated in approximately 104,000 households.

The EMRC in the summer of 2002 engaged Nolan-ITU to conduct a physical audit of domestic solid waste from 600 households across the region. A visual assessment was also undertaken at the Red Hill Landfill of all commercial and self hauled waste over five weekdays and a Sunday. The physical audit was conducted in summer between December 2 and 9, 2002.

In 2004 EMRC commissioned APrince Consulting to characterise the waste streams of the region as part of the development of a resource recovery facility for the region. This project was conducted during September 2004 to provide data to compare with the 2002 results enabling the EMRC to develop an understanding of the seasonal variations in disposal.

This project consisted of three distinct waste audits. These being:

1. Domestic waste stream,
2. Residual waste from the regional material recycling facilities (MRFs)
3. Commercial and self haul waste disposed of at the Red Hill Landfill.

The domestic waste stream audit consisted of a kerbside collection of the contents of the household garbage bins in six member councils – the Cities of Bayswater, Belmont and Swan, the Shires of Kalamunda and Mundaring and the Town of Bassendean. The EMRC specified the number of garbage samples to be collected in each council to provide a total of 600 samples. Based on this sample size a 95% confidence level is achieved for the whole region but not for individual councils. Each sample was to be sorted into 50 categories as specified by the EMRC at their Hazelmere site. The EMRC specified that selected green waste bins be collected in the City of Bayswater from the same households which had their garbage collected for auditing.

The audit of MRF residual waste was carried out on six 100 kg loads collected from the three MRFs receiving household recyclable material generated by EMRC member councils. Four samples were collected from Cleanaway's MRF and one each from MRFs operated by Roads and Robinson and the City of Wanneroo. These samples were transported to Hazelmere site and sorted to the same categories as the domestic waste stream audit. The MRF residual represents the proportion of the recycling stream collected from the yellow top bins that is not recovered at the MRF and therefore ends up in the landfill. This audit quantifies the nature of the residuals and identifies the opportunities for improved recovery.

A visual assessment was undertaken of every load of commercial and self-hauled waste delivered to the Red Hill Landfill over seven consecutive days. The EMRC specified ten categories into which waste was to be classified.

## 2. METHODOLOGY – KERBSIDE AUDIT

### 2.1 Sample Size

The EMRC specified the number of samples to be collected from each council. These are shown in the table below.

**Table 1 - Specified Sample Sizes**

Council	Sample Size (Households)	Number of Households Sampled per Day	Number of Sorting Days
Bassendean	33	33	1
Bayswater	139	69 and 70	2
Belmont	78	78	1
Kalamunda	100	50	2
Mundaring	70	70	1
Swan	180	60	3
<b>Total</b>	<b>600</b>		<b>10</b>

### 2.2 Sample Selection

The EMRC specified that the streets in which the samples were to be collected were to be selected at random in a suburb that represented the socio-economic average for the particular council. Each council's socio-demographic profile was assessed by producing key indicators from the ABS 2001 Census Basic Community Profiles. The key indicators used and the results for the region are provided in table 2 below.

**Table 2 - Socio-demographic indicators for entire region**

Indicator	Region
Total Persons	258,965
Overseas born	29.3%
Poor English speakers	1.8%
Separate house	78.9%
Flat etc	5.0%
Persons per dwelling	2.42
Owned / purchasing	71.8%
Public housing	4.4%
Families with weekly income < \$600	25.3%
Families with weekly income \$1,200+	29.7%

Individual council indicators are provided in Appendix B - G.

These indicators were also produced for each postcode area within each council. The indicators for each postcode were then compared to the entire council average. If any of the indicators in any of the postcode areas were particularly low or high, that postcode was designated as atypical and unsuitable for sampling. The auditors were then advised to sample in any suitable streets within the remaining postcodes. Since the numbers of postcodes within each council was small, it was not necessary to weight or combine the indicators.

Table 3 below reveals the postcode areas within each council area and comments on their suitability or otherwise.

**Table 3 - Recommended Areas for Sampling**

Council	Postcodes	Suburbs	Comments
BASSENDAN	6054	Ashfield, Bassendean, Eden Hill (and Kiara and Lockridge in Swan LGA)	Entirely within this postcode. Acceptable to sample anywhere within this LGA.
BAYSWATER	6051	Maylands	Advise against sampling – high proportion of overseas born, residential flats and low number of persons per dwelling.
	6052	Bedford, (and Inglewood in Stirling LGA)	Suitable for sampling.
	6053	Bayswater	
	6062	Embleton, Morley, Noranda	
BELMONT	6104	Ascot, Belmont, Redcliffe	Both postcodes quite different from each other, however, both are reasonably close to the Belmont average so both are suitable for sampling.
	6105	Cloverdale, Kewdale	
KALAMUNDA	6057	High Wycombe, Maida Vale	Suitable for sampling.
	6058	Forrestfield	
	6076	Bickley, Carmel, Gooseberry Hill, Hacketts Gully, Kalamunda, Lesmurdie, Paulls Valley, Pickering Brook, Piesse Brook, Walliston	
	6107	Wattle Grove	Advise against sampling – high proportions of public housing and low-income families.
MUNDARING	6056	Boya, Greenmount, Helena Valley, Koongamia, Midvale, Swan View	Postcode is shared equally between Mundaring and Swan. Advise against sampling – high in public housing.
	6073	Mundaring	Advise against sampling – high in low-income families.
	6070	Darlington	Suitable for sampling.
	6071	Glen Forrest, Hovea	
	6072	Mahogany Creek	
	6074	Sawyers Valley	
	6081	Parkerville, Stoneville	
	6082	Mt Helena	
SWAN	6066	Ballajura	Advise against sampling – high number of persons per dwelling.
	6069	Belhus, Brigadoon, Ellenbrook, Upper Swan	Advise against sampling – high proportion of high-income families.
	6055	Caversham, Guildford, Henley Brook, South Guildford, West Swan	Suitable for sampling.
	6063	Beechboro	
	6056	Bellevue, Jane Brook, Middle Swan, Midland, Stratton, Viveash, Woodbridge	Postcode is shared equally between Mundaring and Swan. Advise against sampling – high in public housing.

Information was obtained from each council or its contractor about the normal garbage collection day and recycling collection week in each of the suitable areas. A collection schedule was devised based on the following criteria:

- The number of samples to be collected in each council complied with those specified by the EMRC and stated in Table 1
- The number of days over which samples were to be collected in each council complied with those stated in Table 1
- Sampling could take place only in those suburbs selected as statistically suitable
- Collection of garbage samples had to take place during the recycling week in that zone
- The collection of garbage samples in Bayswater had to take place before the green waste samples so that only those households which presented garbage would have their green waste sampled.

The only exception to the criteria was in the case of the samples collected in Swan on Wednesday September 29. None of the suitable suburbs had garbage collected on the Wednesday of that recycling week. After consultation with the EMRC it was decided to collect samples from Swan on that day, even though it was not the recycling collection week in that zone.

The consultants then selected streets at random with each suitable area and arranged for sample collection to begin in that street. As a result of some unforeseen circumstances, the initial collection schedule was modified slightly through the project. The incidents which caused major changes to the schedule are listed below:

- When the collectors arrived in Morley on September 22 and found that the selected area was not in the recycling zone that week, despite advice from the collection contractor, Cleanaway. The collection took place in nearby Bedford instead.
- The truck arranged by the EMRC for sample collection broke down on Monday September 27. The collection, scheduled for Mundaring, could not take place on that day. Another suitable area in Mundaring was selected for the next day (Tuesday September 28) and samples were collected in addition to the scheduled area in Swan.

Neither incident affected the results.

The final schedule is shown in the table below.

**Table 4 - Collection Schedule**

Day	Date	Council	Suburb	Samples
Friday	September 17	Bayswater	Noranda (West of Crimea St)	69
Monday	September 20	Kalamunda	High Wycombe (bounded by Kalamunda Rd, Roe Hwy and Newburn Rd)	50
Tuesday	September 21	Swan	Guildford	60
Wednesday	September 22	Bayswater	Bedford	70
Thursday	September 23	Kalamunda	Kalamunda (south of town centre either side of Canning Rd)	50
Friday	September 24	Bassendean	Eden Hill (Wicks Rd to Iolanthe St north of Walter Rd)	33
		Bayswater	Noranda (West of Crimea St)	69 Green Waste
Monday	September 27			
Tuesday	September 28	Belmont	Kewdale (south-east of Gabriel St)	78
		Mundaring	Glen Forrest, Hovea, Mahogany Creek	70
Wednesday	September 29	Swan	Caversham, Henley Brook, West Swan, Whiteman, Malaga	60
		Bayswater	Bedford	70 Green Waste
Thursday	September 30	Swan	Beechboro	60

### 2.3 Sample Collection

The EMRC provided a side-loader vehicle to undertake the collection. The collection started each morning at 6 am in the selected street. A Prince Consulting's supervisor travelled in the collection vehicle and performed the following tasks:

- Recorded the addresses from which samples were collected
- Recorded the addresses of households which also presented recycling
- Notified the driver when the specified number of samples had been collected
- Notified the regular collection contractor when the sample collection had ended and from which households samples had been collected

In the case of Bayswater, samples of green waste were to be collected on the same week day as the garbage samples but in the next week. Samples were only to be collected from those households which had presented garbage the week before.

This was the case for the first collection in Noranda, however, when collectors arrived in Bedford to collect green waste from houses whose garbage had been collected the week before, they found the green waste bins had already been emptied. After discussions with the EMRC and the contractor, Cleanaway, a nearby street was found where samples of green waste could be collected. In this case collectors still drove past 70 households and collected the green waste that had been presented.

After the samples had been collected the truck delivered them to the sorting location, an EMRC property in Lakes Rd, Hazelmere.

## 2.4 Sample Sorting

Each load of samples was tipped on the ground at the sorting location. This material was progressively transferred to the sorting tables where it was separated into different categories. Quantities of each material were weighed on a set of electronic scales. The weight in kilograms of each material or item was entered into the appropriate space on a recording sheet. Sorted waste was then placed in one of two bulk bins for disposal by the EMRC.

The EMRC specified that the collected material be sorted into the classifications listed below. These categories are shown with their Australian Waste Database codes.

**Table 5 - Material Categories**

Material	AWD Code	Material	AWD Code
<i>Cardboard</i>	A04	Plastic film and Bags	E073
<i>Newsprint</i>	A01	LDPE	E04
<i>Magazines/Advertising</i>	A02	<i>Polypropylene – Rigid</i>	E05
<i>Paper – Other</i>	A091	Plastic – Other	E074
<i>LPB – Septic/Gabled</i>	A06	<i>Steel – Food Cans</i>	F011
<i>LPB – Aseptic/Brick</i>	A06	Steel – Paint Cans	F011
<i>Aluminium Cans – CDL</i>	G011	<i>Steel – Aerosol Cans</i>	F011
<i>Aluminium Cans – Non-CDL</i>	G011	<i>Steel – Other Packaging</i>	F012
<i>Aluminium Foil</i>	G012	Steel – Other Non-packaging	F02
<i>Brown Glass – Bev CDL</i>	D0113	Lawn Clippings and Leaves	B02
<i>Brown Glass – Bev Non-CDL</i>	D0123	Prunings	B02
<i>Brown Glass – Non-bev</i>	D01	Weeds	B02
<i>Clear Glass – Bev CDL</i>	D0111	Food	B01
<i>Clear Glass – Bev Non-CDL</i>	D0121	Contaminated Paper	A092
<i>Clear Glass – Non-Bev</i>	D01	Polystyrene	E06
<i>Green Glass – Bev CDL</i>	D0112	Fluorescent Lights	H02
<i>Green Glass – Bev Non-CDL</i>	D0122	Dry-Cell Batteries	H03
<i>Green Glass – Non-bev</i>	D01	Household Chemicals	H052
<i>Glass – Other</i>	D02	Pharmaceuticals	H051
<i>PET – Clear Bev CDL</i>	E011	Medical/Hygiene	H07
<i>PET – Clear Non-bev CDL</i>	E011	Engine or Food Oil	C05
<i>PET – Coloured Bev CDL</i>	E011	Wood/Ceramics	C01/I01
<i>PET – Coloured Bev Non-CDL</i>	E011	Textile/Clothes/Leather/Rubber	C02/C04/C03/E08
<i>PET – Other</i>	E012	Dust/Dirt/Rock/Ash	I02/I03
<i>HDPE – 2-litre Milk</i>	E021	Disposable Nappies	H
<i>HDPE – Other</i>	E02	Other/Miscellaneous	0
<i>Margarine Tubs</i>	E074		

Note: The EMRC indicated that, as there is no CDL system in Western Australia, all beverage containers were classified as 'non-CDL'. The materials in italics indicate which are considered recyclable by the EMRC and contractors servicing the 6 member councils and are treated as such in this report.

The recorded data was entered into MS Excel and the results are provided later in this report.



## ***2.5 Moisture Analysis***

The EMRC provided two laboratory ovens for moisture analysis of samples of food and vegetation. When a 1 kg sample of each material became available during the sorting from garbage collected in each council that day, it was placed in an aluminium baking tray and weighed. The weight was recorded and the tray placed in the oven which had been heated to 105°C. At the same time the following day, that is, after 24 hours, the sample was removed from the oven, weighed again and the weight recorded. By subtracting the weight of the sample after it was placed in the oven from the weight of the sample before it was placed in the oven, it was possible to calculate the percentage of moisture loss per sample.

On September 28, a truck brought down the cable supplying power to the sorting location, resulting in a four-hour interruption to the supply. During this four-hour period the drying ovens could not operate. Samples from Belmont and Mundaring were affected, so, after discussions with the EMRC, it was decided to extend the drying time by four hours for these samples. While the power interruption no doubt affected the drying of these samples, the results were still within the range found for all other samples.

The recorded data was entered into MS Excel and the results are provided later in this report.

### 3. METHODOLOGY – MRF RESIDUAL AUDIT

The EMRC specified that samples of residual waste were to be collected from each of the three MRFs which receive recyclable material from its member councils. The specifications included that one 100 kg sample be collected from the Roads and Robinson MRF at Maddington and the City of Wanneroo MRF at Wangara, and that four 100 kg samples be collected from Cleanaway's MRF at Bayswater.

The project brief specified that APrince Consulting should liaise with each of the MRF operators to devise a method for collecting the residual material in each case. APrince Consulting staff met with each of the MRF operators on Friday September 17 to discuss and finalise the sample collection methods and times. The table below shows how and when the sampling was carried out at each MRF.

**Table 6 - MRF Sampling Details**

<b>MRF</b>	<b>EMRC Councils Delivering</b>	<b>Sampling method</b>	<b>Sampling Dates</b>
Roads and Robinson, Maddington	Bassendean	Residual waste exits the MRF line in two places. Large items are manually removed at the beginning and all other residual material comes off a conveyor belt at the end of the line. Six 240-litre wheelie bins were placed under the residual conveyor, filled with material and weighed on scales at the MRF. One bin of large items was also collected. These bins were set aside for collection.	September 17
City of Wanneroo, Wangara	Swan	All residual waste comes off one conveyor into a concrete bunker. Several bob-cat bucket loads of this material were collected and placed in the Gidgie Waste collection vehicle. No scales were available on-site for weighing.	September 21
Cleanaway, Bayswater	Bayswater, Belmont, Kalamunda, Mundaring	Waste exits the MRF line in two places. Glass fines come off a conveyor into a bulk bin while other residual waste exits directly into compactors.. The samples were collected based on this estimation and proportion. No scales were available on site for weighing. Material was placed into wheelie bins for collection. Prior to the audit Cleanaway indicated that the proportion by weight of the residual stream was 33% glass fines to 66% other waste.	September 22,23,24,28

Sorting of MRF waste was conducted according to the same methodology as for kerbside waste, using the same categories.

#### 4. METHODOLOGY – LANDFILL AUDIT

APrince Consulting staff visited the Red Hill Landfill on Thursday September 16 and liaised with landfill staff regarding the audit methodology. It was agreed that one auditor would be provided with a two-way radio in order for the weighbridge to communicate regarding commercial vehicles.

The audit commenced on Saturday September 18 and two staff were present at the landfill at all times when it was open during the seven-day period. The table below shows the audit days and landfill opening hours.

**Table 7 - Landfill Operating Hours**

Date	Day	Open Time	Close Time
Saturday	September 18	8 am	4 pm
Sunday	September 19	10 am	4 pm
Monday	September 20	7 am	4 pm
Tuesday	September 21	7 am	4 pm
Wednesday	September 22	7 am	4 pm
Thursday	September 23	7 am	4 pm
Friday	September 24	7 am	4 pm

One auditor was stationed at the transfer station (where small vehicles unload) and the other at the main tip face. Weighbridge staff informed the second auditor each time a commercial load crossed the weighbridge and was heading to the main tip face. The auditor was also able to confirm with the weighbridge the classification of other loads. As each vehicle unloaded at each part of the landfill the auditors examined the load, estimated and recorded the quantity of different components of the load by volume.

The components to be identified in each load were specified in the project brief and are listed below:

- Concrete/bricks
- Soil
- Paper/cardboard
- Food/kitchen
- Garden/vegetation
- Wood/timber
- Textiles/rags
- Rubber
- Plastic
- Expanded polystyrene

During the audit other significant material categories were identified and quantities of these also recorded. These are shown in italics:

- *Household waste*
- *Steel*
- *Asbestos*
- *Waste in bags*
- *Metals*
- *Tyres*
- *Furniture*
- *Other*

Loads containing white goods, asbestos or tyres were separated by landfill staff for recycling or safe disposal. The recorded data was entered into MS Excel and the results are provided later in this report.

## 5. RESULTS AND ANALYSIS

### 5.1 Overview

The collected data has been presented in a series of tables as specified in the project brief and also in chart format for ease of interpretation in accordance with the Australian Waste Database categories.

The following information in the body of the report relates to the regional analysis.

- Aggregated composition and consolidated composition of the garbage streams audited in each council, including green waste from Bayswater
- Aggregated composition and consolidated composition of MRF residual waste collected from each MRF residual waste
- Moisture content results
- The composition of visual audits at Red Hill Landfill undertaken at both the main tip face and the transfer station.

Where charts mention consolidated composition, the categories into which waste was first sorted have been aggregated as follows:

- **Paper and cardboard** – Cardboard, newsprint, magazines/advertising, paper–other
- **Recyclable containers** – Liquidpaperboard – gabled, margarine tubs, polypropylene–rigid, aluminium cans, aluminium foil, glass beverage containers, PET beverage containers, HDPE, steel containers except paint tins.
- **Non-recyclable containers** – Steel paint containers, non beverage glass containers, non-beverage PET containers
- **Non-recyclable plastics** – Plastic film and bags, LDPE, plastic – other, polystyrene
- **Food** – Food
- **Garden organics** – Lawn clippings and leaves, prunings, weeds
- **Other** – Glass other, steel – other non-packaging, contaminated paper, fluorescent lights, dry-cell batteries, household chemicals, pharmaceuticals, medical/hygiene, engine or food oil, wood/ceramics, disposable nappies, textile/clothes/leather/rubber, dust/dirt/rock/ash, other/miscellaneous, kitty litter

Information regarding the composition data by member council, MRF residual by facility and the composition of each visual load inspected at Red Hill Landfill is provided in the relevant Appendix at the rear of the report.

## 5.2 Kerbside Audit – Garbage and Green Waste

- ❖ **Waste Generation:** The average weight of garbage produced per household per week in the audited councils was 15.9 kg. Households in Bassendean produced the most garbage per week – 20.8 kg, while households in Mundaring, who have a 140 litre mobile garbage bin for waste collection produced the least – 10.7 kg.
- ❖ **Composition of garbage stream:** The largest proportion of the garbage stream comprises garden organics, at 32%, followed by food, at 20.6%, and recyclable items for which a recycling service is currently provided, at 16.1%.
- ❖ **Proportion of Vegetation in the Garbage Stream:** The average garbage bin in the region contained 32% garden organics. The highest proportions were found at Bassendean (49.7%) and Belmont (48.5%). Bayswater, which has a separate containerised green waste service, has the lowest proportion of green waste in its garbage (20.2%). Swan (24.7%) and Mundaring (24.2%) had similar lower than average proportions but do not provide a containerised green waste service. These results may be due to the more rural nature of some of the dwellings in these areas.
- ❖ **Green Waste Contamination:** Green waste collected in Bayswater had a contamination level of 2.2% by weight. However, 1.8% contained paper and cardboard (1.0%), food (0.5%) and dust/dirt/rock/ash (0.3%) all which could be composted. In effect just 0.4% was contamination unsuitable for composting.
- ❖ **Proportion of Recyclables in the Garbage:** The average proportion of recyclable material in the garbage for all councils audited was 16.1%. Of the recyclable items, paper and cardboard accounted for 9.7% and containers 6.4%. The proportion of this material was as high as 21.5% in Bayswater (possibly due to a smaller proportion of green waste), and as low as 9.7% in Mundaring.
- ❖ **Waste Audit Comparison: 2002 and 2004:** Composition of the garbage stream in 2004 was almost identical to that found by Nolan-ITU in 2002, even though the 2003 audit was conducted in December (summer) and the 2004 audit was conducted in September (early spring).

The presentation rate is defined as the proportion of households presenting garbage which also presented recycling (and green waste in the case of Bayswater).

- ❖ **Recycling Presentation Rate:** The average presentation rate for all the councils audited (excluding Mundaring) was 83%. Presentation rates for all councils were very similar with all councils in the 80% range. Belmont had the highest presentation rate, at 87% and Bayswater the lowest, at 81%. Refer Table 8 overleaf

**Table 8 - Waste Collection Report**

Council	Date	Households Presenting Garbage	Households with NO recycling MGB put out	Total weight of waste collected (Kg )	Average weight of waste in MGB (kg)
Bassendean	24-Sep-04	33	6	687.1	20.8
Bayswater	17-Sep-04 22-Sep-04	139	*19	1,782	12.8
Belmont	28-Sep-04	78	10	1,205.4	15.5
Kalamunda	20-Sep-04 23-Sep-04	100	*18	1,918.8	19.2
Mundaring <sup>1</sup>	28-Sep-04	70	0	746.3	10.7
Swan <sup>2</sup>	21-Sep-04 29-Sep-04 30-Sep-04	180	*99	3,173.6	17.6
<b>Total<sup>3</sup></b>		<b>600</b>	<b>N/A</b>	<b>9,513.2</b>	<b>15.9</b>

\*Estimates

- 1 – A truck breakdown on Monday September 27 meant the scheduled collection in Mundaring could not take place that day. After discussions with the EMRC, the Mundaring collection took place the following day in another statistically suitable area, however, this area was not in the recycling week so no recycling bins were presented.
- 2 – During the scheduling phase of the project, it was discovered that there were no statistically suitable areas in recycling zones which had their garbage collected on Thursday September 29. After discussions with the EMRC it was decided to collect in a part of Swan that was not in the recycling zone. Households in this zone have not been included in the calculation of the presentation rate for the September 29 zone or for the whole of Swan.
- 3 – Because two collections were conducted in areas that did not present recycling that week, that data has not been included in calculating the overall presentation rate

❖ **Bayswater Green Waste Presentation Rate:** The green waste presentation rate in Bayswater varied between 49% and 59% on the two days during which collections were conducted. The average for the council was 54%. Refer to table 9 below.

**Table 9 - Green Waste Collection Report**

Council	Date	Households Presenting Garbage	Households with NO green waste MGB put out	Total weight of waste collected (Kg )	Average weight of waste in MGB (kg)
Bayswater	24 -Sep-04 29-Sep-04	139	64*	1,542.0	20.6

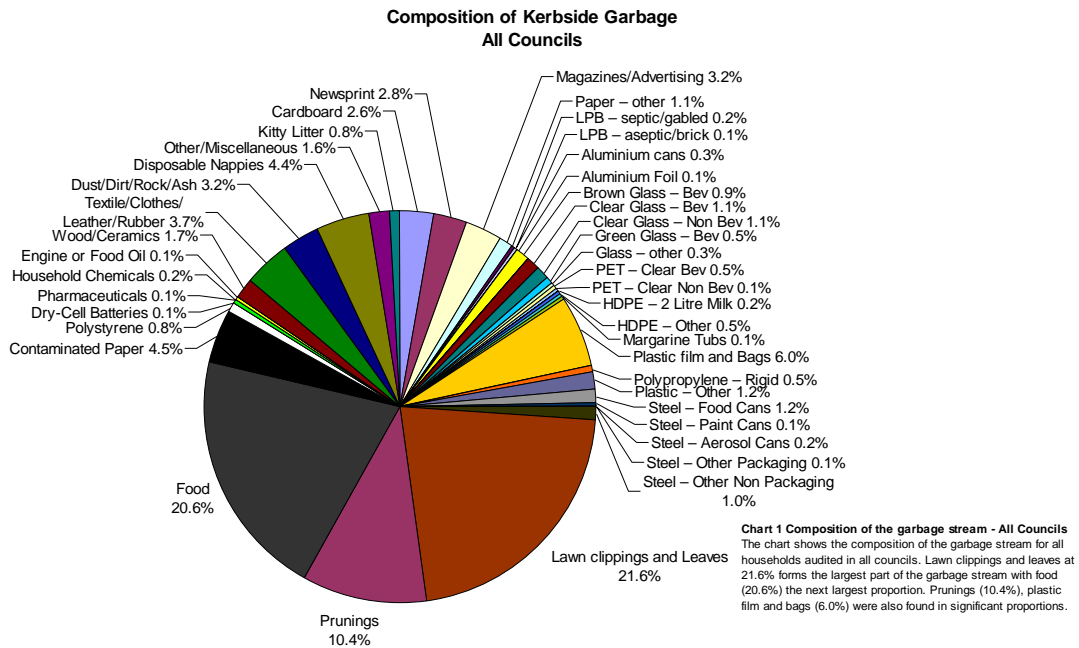
\* On September 29 when the auditors arrived in Bayswater to collect samples of green waste from the same households that had had their garbage sampled the week before they found that the contractor, Cleanaway, had already emptied the green waste bins. After discussion with the EMRC and Cleanaway, a nearby street in the same suburb was found, in which green waste samples could be collected. The garbage figure here is therefore from the originally selected street, while the green waste figure is from a different street.

Table 10 overleaf reveals the domestic waste stream composition for the region.

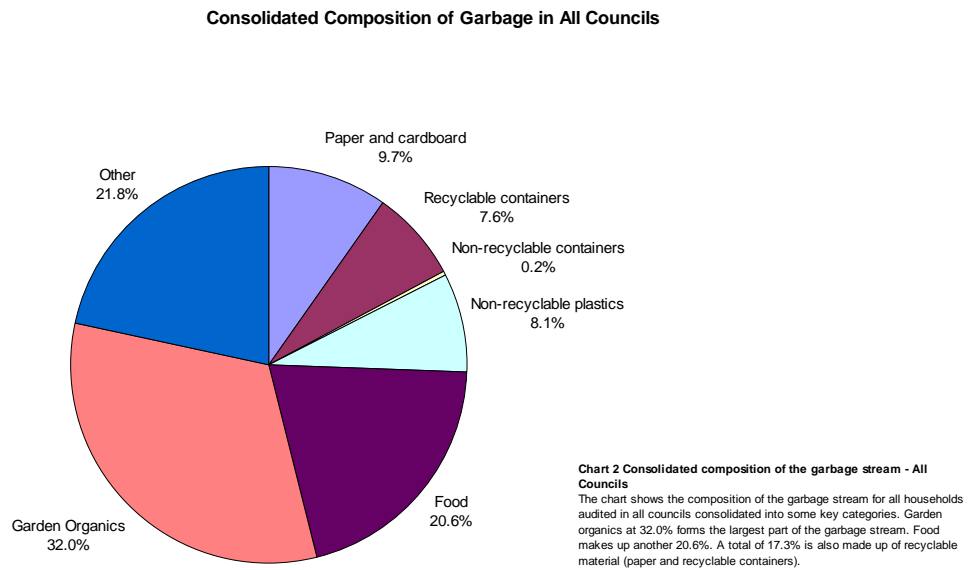
**Table 10 - EMRC Domestic Waste Composition Report – All Councils**

Local Government – EMRC			Sorting Date – September 17 - 30, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	251.1	2.6%	
Newsprint	264.7	2.8%	
Magazines/Advertising	308.9	3.2%	
Paper – Other	101.0	1.1%	
LPB – Septic/Gabled	14.7	0.2%	
LPB – Aseptic/Brick	9.7	0.1%	
Aluminium Cans	29.1	0.3%	
Aluminium Foil	10.2	0.1%	
Brown Glass – Bev	85.3	0.9%	
Brown Glass – Non-bev	1.2	0.0%	
Clear Glass – Bev	104.5	1.1%	
Clear Glass – Non-bev	104.9	1.1%	
Green Glass – Bev	50.6	0.5%	
Green Glass – Non-bev	-	0.0%	
Glass – Other	28.4	0.3%	
PET – Clear Bev	48.6	0.5%	
PET – Clear Non-bev	7.9	0.1%	
PET – Coloured Bev	1.6	0.0%	
PET – Other	0.8	0.0%	
HDPE – 2-litre Milk	18.5	0.2%	
HDPE – Other	45.3	0.5%	
Margarine Tubs	11.0	0.1%	
Plastic Film and Bags	573.1	6.0%	
LDPE	-	0.0%	
Polypropylene – Rigid	46.5	0.5%	
Plastic – Other	118.4	1.2%	
Steel – Food Cans	118.2	1.2%	
Steel – Paint Cans	13.4	0.1%	
Steel – Aerosol Cans	15.3	0.2%	
Steel – Other Packaging	7.7	0.1%	
Steel – Other Nonpackaging	96.8	1.0%	
Lawn Clippings and Leaves	2,055.8	21.6%	
Prunings	986.1	10.4%	
Weeds	-	0.0%	
Food	1,957.5	20.6%	
Contaminated Paper	425.7	4.5%	
Polystyrene	78.0	0.8%	
Fluorescent Lights	-	0.0%	
Dry-Cell Batteries	6.4	0.1%	
Household Chemicals	19.7	0.2%	Includes coolant
Pharmaceuticals	5.2	0.1%	Includes cosmetics
Medical/Hygiene	3.0	0.0%	Includes syringes and intravenous bags
Engine or Food Oil	14.2	0.1%	Includes oil filters
Wood/Ceramics	163.3	1.7%	
Textile/Clothes/Leather/Rubber	354.0	3.7%	
Dust/Dirt/Rock/Ash	306.9	3.2%	Includes vacuum cleaner bag and roofing tile
Disposable Nappies	420.0	4.4%	
Other/Miscellaneous	149.9	1.6%	Mainly electrical appliances
Kitty Litter	80.4	0.8%	
<b>Total</b>	<b>9,513.1</b>	<b>100.0%</b>	

### Chart 1 - Composition of Kerbside Garbage All Councils



### Chart 2 - Consolidated Composition of Kerbside Garbage All Councils

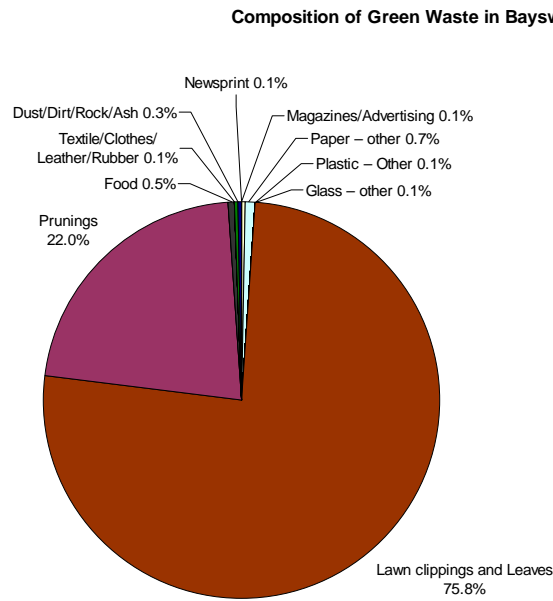




**Table 11 - Bayswater Green Waste – Composition Report**

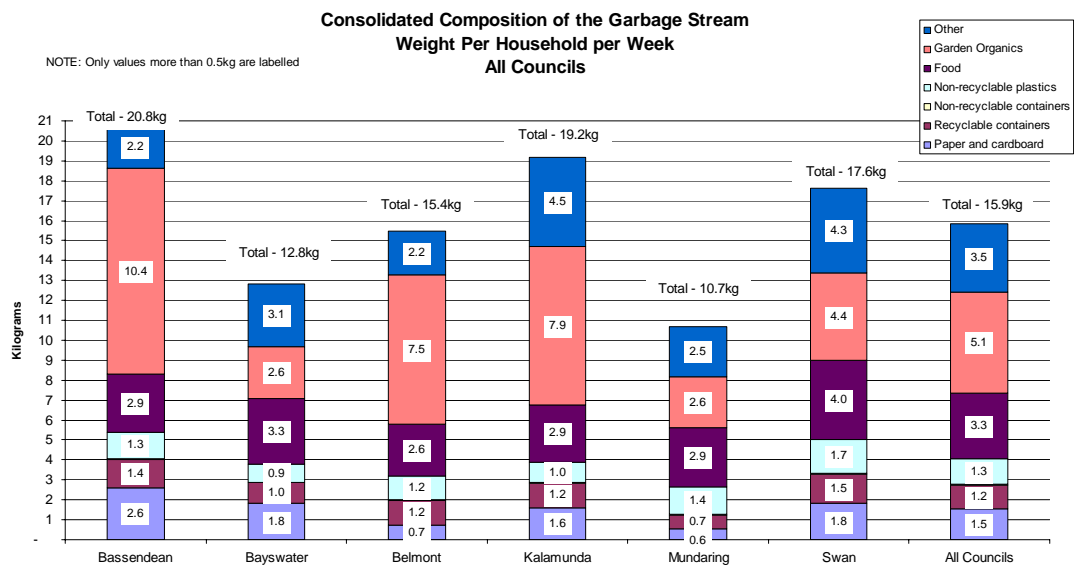
Local Government – Bayswater – Green waste			Sorting Date – September 24 and 29, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	0.6	0.0%	
Newsprint	1.4	0.1%	
Magazines/Advertising	1.9	0.1%	
Paper – Other	11.4	0.7%	
LPB – Septic/Gabled	–	0.0%	
LPB – Aseptic/Brick	–	0.0%	
Aluminium Cans	0.1	0.0%	
Aluminium Foil	–	0.0%	
Brown Glass – Bev	–	0.0%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	–	0.0%	
Clear Glass – Non-bev	–	0.0%	
Green Glass – Bev	–	0.0%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	1.5	0.1%	
PET – Clear Bev	0.1	0.0%	
PET – Clear Non-bev	–	0.0%	
PET – Coloured Bev	–	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	0.1	0.0%	
HDPE – Other	–	0.0%	
Margarine Tubs	–	0.0%	
Plastic Film and Bags	0.7	0.0%	
LDPE	–	0.0%	
Polypropylene – Rigid	0.1	0.0%	
Plastic – Other	0.9	0.1%	
Steel – Food Cans	–	0.0%	
Steel – Paint Cans	–	0.0%	
Steel – Aerosol Cans	–	0.0%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non Packaging	–	0.0%	
Lawn clippings and Leaves	1,169.0	75.8%	
Prunings	339.3	22.0%	
Weeds	–	0.0%	
Food	7.1	0.5%	
Contaminated Paper	0.5	0.0%	
Polystyrene	0.0	0.0%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	–	0.0%	
Medical/Hygiene	–	0.0%	
Engine or Food Oil	–	0.0%	
Wood/Ceramics	–	0.0%	
Textile/Clothes/Leather/Rubber	2.2	0.1%	
Dust/Dirt/Rock/Ash	5.2	0.3%	
Disposable Nappies	–	0.0%	
Other/Miscellaneous	–	0.0%	
Kitty Litter	–	0.0%	
<b>Total</b>	<b>1,542.0</b>	<b>100.0%</b>	

### Chart 3 - Composition of Green Waste Stream - Bayswater



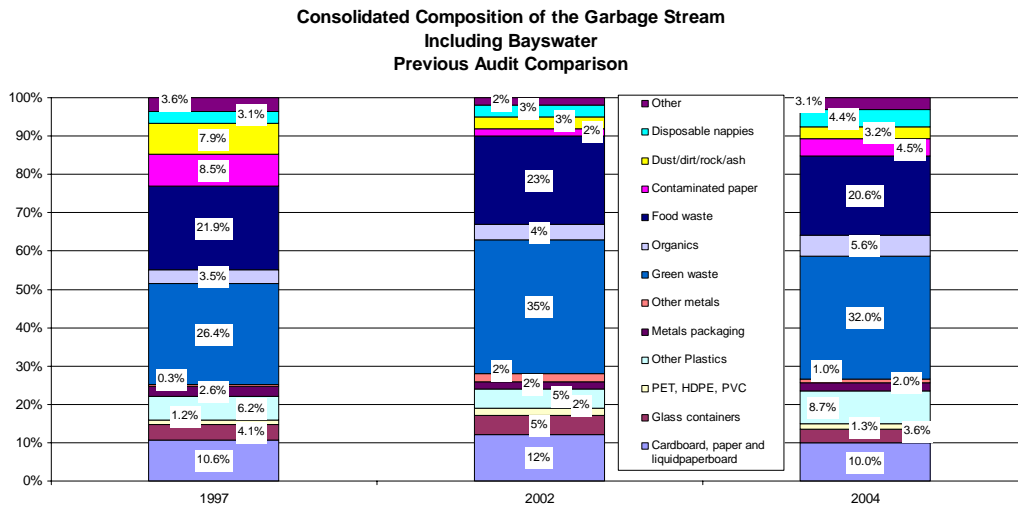
**Chart 3 Composition of the green waste stream - Bayswater**  
 The chart shows the composition of the green waste stream for all households audited in Bayswater. Lawn clippings and leaves at 75.8% forms the largest part of the stream with prunings (22.0%) the next largest proportion. Contaminants form just 2.2%.

### Chart 4 - Consolidated Composition of the Garbage Stream – weight per household per week – all councils



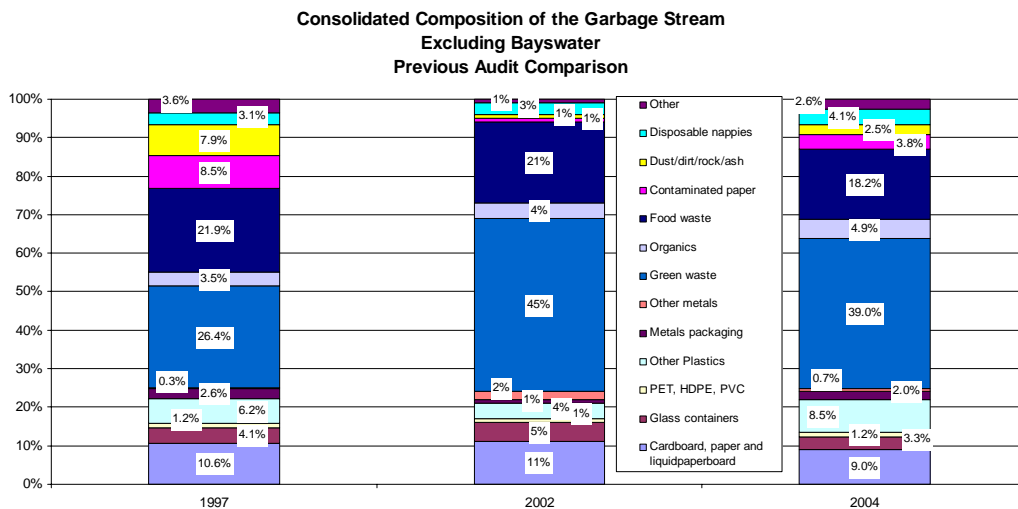
**Chart 4 Consolidated composition of the garbage stream - All Councils - Per household per week**  
 The chart shows the quantities and proportions of the garbage stream produced per household per week from each council audited. Bassendean at 20.8 kg produces the most garbage per household per week with Mundaring producing the least. Households in four of the other five councils produce between about 15kg and 19kg per week. Households in the EMRC region produce an average of 15.9kg of garbage per week. The amount of garden organics seems to be the main difference between councils with households producing larger amounts of garbage and those councils with households producing less.

### Chart 5 - Consolidated Composition of the Garbage Stream including Bayswater compared with Previous Audits



**Chart 5 Consolidated composition of the garbage stream - previous audits compared - including Bayswater**  
The chart shows the quantities and proportions of materials in the garbage stream found in three kerbside audits conducted in Perth. The categories are those used in the 2002 audit conducted by Nolan-ITU. Both the 2002 and 2004 audits were commissioned by the EMRC and conducted on its member councils. The 2002 audit was of 100 samples from each council while the 2004 audit was same total sample size (600 households) but samples in each council were proportional to their populations. The 1997 audit was commissioned by BIEC and was of 687 households in Armadale, Cambridge, Canning, Fremantle, Melville, Mosman Park, Mundaring, Rockingham, South Perth, Stirling, Vincent and Wanneroo. Of these only Mundaring was also included in the 2002 and 2004 audits. It is immediately obvious that the composition of the streams audited in 2002 and 2004 is almost identical with only slight variations between some components. The 1997 audit stream is still very similar with the main differences being greater proportions of dust/dirt/rock/ash and contaminated paper and a smaller proportion of green waste. These variations could be due to the different councils audited at that time or a change in waste generation over the subsequent seven years.

### Chart 6 - Consolidated Composition of the Garbage Stream excluding Bayswater compared with Previous Audits



**Chart 6 Consolidated composition of the garbage stream - previous audits compared - excluding Bayswater**  
The chart shows the quantities and proportions of materials in the garbage stream found in three kerbside audits conducted in Perth with data from Bayswater excluded. The categories are those used in the 2002 audit conducted by Nolan-ITU. Both the 2002 and 2004 audits were commissioned by the EMRC and conducted on its member councils. The 2002 audit was of 100 samples from each council while the 2004 audit was same total sample size (600 households) but samples in each council were proportional to their populations. The 1997 audit was commissioned by BIEC and was of 687 households in Armadale, Cambridge, Canning, Fremantle, Melville, Mosman Park, Mundaring, Rockingham, South Perth, Stirling, Vincent and Wanneroo. Of these only Mundaring was also included in the 2002 and 2004 audits. It is immediately obvious that the composition of the streams audited in 2002 and 2004 is similar with variations between some components. The 1997 audit stream is still very similar with the main differences being greater proportions of dust/dirt/rock/ash and contaminated paper and a smaller proportion of green waste. These variations could be due to the different councils audited at that time or a change in waste generation over the subsequent seven years.

### 5.3 Moisture Content Analysis of Food and Green Waste

- ❖ **Moisture Content Range:** Regardless of which council a sample of food waste was collected from, the proportion of moisture in the sample was relatively similar. All samples fell within reasonably narrow ranges – 61.4% to 75.2% (14 percentage points) for food, while the range was greater for green waste ranging from 47.2% to 76.2% (29 percentage points).
- ❖ **Average Moisture Content – Food:** The average moisture content of food was 70.4%
- ❖ **Average Moisture Content – Green Waste:** The average moisture content of green waste was 63.5%.

**Table 12 - Moisture Content of Samples**

Council	Drying Date	Waste Category	Weight before drying (g)	Weight after drying (g)	Moisture content
Bayswater	17-Sep-04	Food	1,035	399	61%
Bayswater	17-Sep-04	Green Waste	1,031	544	47%
Kalamunda	20-Sep-04	Green Waste	1,071	383	64%
Kalamunda	20-Sep-04	Food	1,008	274	73%
Swan	21-Sep-04	Green Waste	1,039	435	58%
Swan	21-Sep-04	Food	1,104	385	65%
Bayswater	22-Sep-04	Green Waste	1,004	299	70%
Bayswater	22-Sep-04	Food	1,064	370	65%
Kalamunda	23-Sep-04	Green Waste	1,175	280	76%
Kalamunda	23-Sep-04	Food	1,103	289	74%
Bassendean	24-Sep-04	Green Waste	1,219	436	64%
Bassendean	24-Sep-04	Food	1,106	274	75%
Belmont*	28-Sep-04	Green Waste	1,001	379	62%
Belmont*	28-Sep-04	Food	981	370	62%
Mundaring*	27-Sep-04	Green Waste	1,098	535	51%
Mundaring*	27-Sep-04	Food	1,096	360	67%
Swan	29-Sep-04	Green Waste	972	330	66%
Swan	29-Sep-04	Food	1,184	539	54%
Swan	30-Sep-04	Green Waste	1,169	443	62%
Swan	30-Sep-04	Food	1,074	339	68%
<b>All Councils</b>		<b>Green Waste</b>	<b>5,320</b>	<b>1,941</b>	<b>63.5%</b>
		<b>Food</b>	<b>5,385</b>	<b>1,592</b>	<b>70.4%</b>

\* These four samples were affected by a power failure, due to a truck bringing down power lines. Power to the drying ovens was cut off for four hours. After discussions with the EMRC, it was decided to extend the drying time for these samples by four hours. While this no doubt affected the drying of these samples, the results are still within the range found in all the other results

#### 5.4 MRF Residual Audit

Three MRFs were sampled as part of this audit each services a different member council due to their geographic location and specific contracts. Quite different compositions of residual material were found in the case of each MRF audited. A summary of those councils delivering to each MRF is provided below:

**Table 13 - Councils delivering to each MRF.**

<b>MRF Operator</b>	<b>Councils Delivering</b>
Cleanaway	Bayswater, Belmont, Kalamunda and Mundaring
Roads and Robinson	Bassendean
City of Wanneroo	Swan

- ❖ **Recyclables in the Residual Stream:** A significant proportion (27.3%) of the overall residual stream was potentially recyclable, comprising 20.1% paper and cardboard and 7.2% containers. Cleanaway's MRF appears to be the most efficient at removing recyclable materials, with only 18.7% of the residual material being recyclable, compared to 23.6% for the City of Wanneroo and 61.2% for Roads and Robinson. The results indicate that whilst Roads and Robinson had the lowest proportion of glass fines (24.7%), it had the highest amount of paper and cardboard (58.1%), while the City of Wanneroo had the highest glass fines (65.1%) and lowest paper and cardboard (21.8%)
- ❖ **Glass Fines:** When all MRF residual data was combined, glass fines, at 45.5%, represented the largest proportion. There was a significant variation in the amount of glass fines generated at each MRF. Roads and Robinson had the lowest amount, (24.7%), Cleanaway had 46.5% and the City of Wanneroo had 65.1%. The majority of the fines were less than 25 - 30mm in diameter.
- ❖ **Paper and Cardboard:** Paper and cardboard present in the residual stream accounted for 20.1% of the composition of the three MRFs. Roads and Robinson MRFs residual stream contained the largest proportion of paper and cardboard (58.1%), compared to the City of Wanneroo with 21.8%. Cleanaway's MRF had significantly less paper and cardboard, at just 9.0%.

The table below contains the aggregated data for the MRF Residue Composition from all MRFs. Charts 7-11 present the composition of MRF residual waste collected from each MRF, along with the consolidated composition:

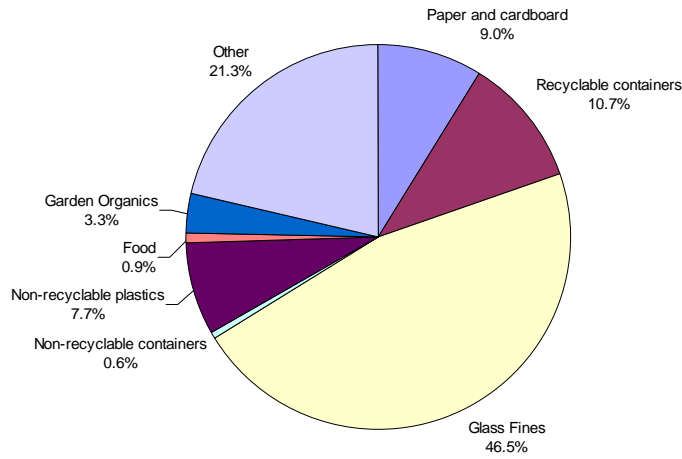
- Chart 7 Consolidated composition of MRF residual – Cleanaway
- Chart 8 Consolidated composition of MRF residual – Roads and Robinson
- Chart 9 Consolidated composition of MRF residual – City of Wanneroo
- Chart 10 Consolidated composition of MRF residual – All MRFs Compared
- Chart 11 Composition of MRF residual – All MRFs
- Chart 12 Consolidated composition of MRF residual – All MRFs

**Table 14 - Aggregated MRF Residue Composition**

All MRF residual			Date – September 17, 21, 22, 23, 24, 28 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	56.5	8.8%	
Newsprint	18.6	2.9%	
Magazines/Advertising	37.4	5.8%	
Paper – Other	16.4	2.6%	
LPB – Septic/Gabled	4.7	0.7%	
LPB – Aseptic/Brick	3.5	0.6%	
Aluminium Cans	3.2	0.5%	
Aluminium Foil	0.1	0.0%	
Brown Glass – Bev	4.1	0.6%	
Brown Glass – Non-bev	0.9	0.1%	
Clear Glass – Bev	6.3	1.0%	
Clear Glass – Non-bev	2.4	0.4%	
Green Glass – Bev	1.5	0.2%	
Green Glass – Non-bev	-	0.0%	
Glass – Other	1.9	0.3%	
Glass Fines	292.2	45.5%	
PET – Clear Bev	8.1	1.3%	
PET – Clear Non-bev	1.5	0.2%	
PET – Coloured Bev	0.9	0.1%	
PET – Other	-	0.0%	
HDPE – 2-litre Milk	3.2	0.5%	
HDPE – Other	5.8	0.9%	
Margarine Tubs	0.2	0.0%	
Plastic Film and Bags	23.4	3.6%	
LDPE	-	0.0%	
Polypropylene – Rigid	5.3	0.8%	
Plastic – Other	18.9	2.9%	
Steel – Food Cans	2.9	0.5%	
Steel – Paint Cans	-	0.0%	
Steel – Aerosol Cans	0.1	0.0%	
Steel – Other Packaging	-	0.0%	
Steel – Other Non-packaging	2.7	0.4%	
Lawn Clippings and Leaves	2.3	0.4%	
Prunings	11.6	1.8%	
Weeds	-	0.0%	
Food	3.7	0.6%	
Contaminated Paper	37.0	5.8%	
Polystyrene	4.1	0.6%	
Fluorescent Lights	-	0.0%	
Dry-Cell Batteries	-	0.0%	
Household Chemicals	-	0.0%	
Pharmaceuticals	0.8	0.1%	
Medical/Hygiene	0.3	0.0%	
Engine or Food Oil	-	0.0%	
Wood/Ceramics	9.6	1.5%	
Textile/Clothes/Leather/Rubber	43.1	6.7%	
Dust/Dirt/Rock/Ash	0.5	0.1%	
Disposable Nappies	1.4	0.2%	
Other/Miscellaneous	4.9	0.8%	
Kitty Litter	-	0.0%	
<b>Total</b>	<b>641.7</b>	<b>100.0%</b>	

### Chart 7 - Consolidated Composition of MRF Residual – Cleanaway

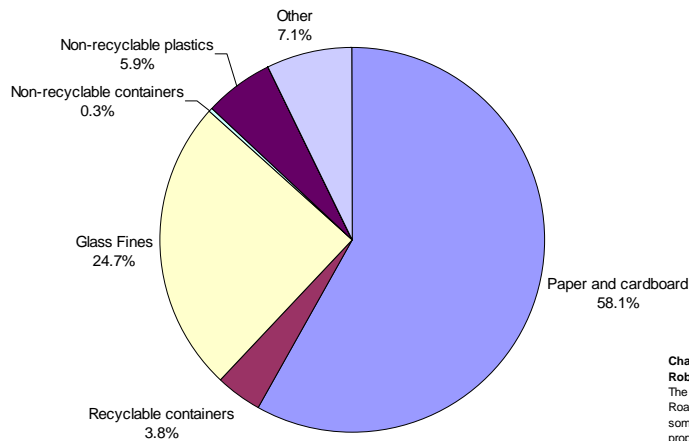
**Consolidated Composition of MRF Residual  
Cleanaway  
Servicing Bayswater, Belmont, Kalamunda, Mundaring**



**Chart 7 Consolidated composition of residual from Cleanaway's MRF**  
The chart shows the composition of the residual waste produced from Cleanaway's Bayswater MRF consolidated into some key categories. Glass fines at 46.5% forms the largest proportion of this material. Overall a total of 19.7% of this material is potentially recyclable.

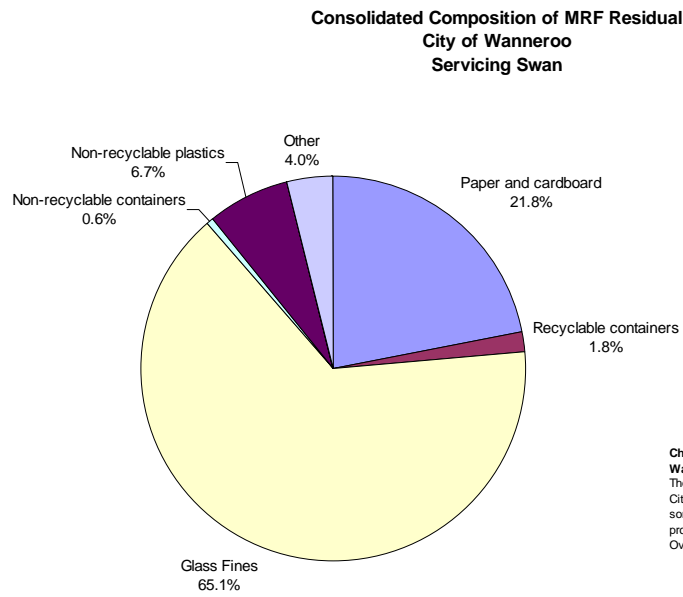
### Chart 8 - Consolidated Composition of MRF Residual – Roads and Robinson

**Consolidated Composition of MRF Residual  
Roads and Robinson  
Servicing Bassendean**



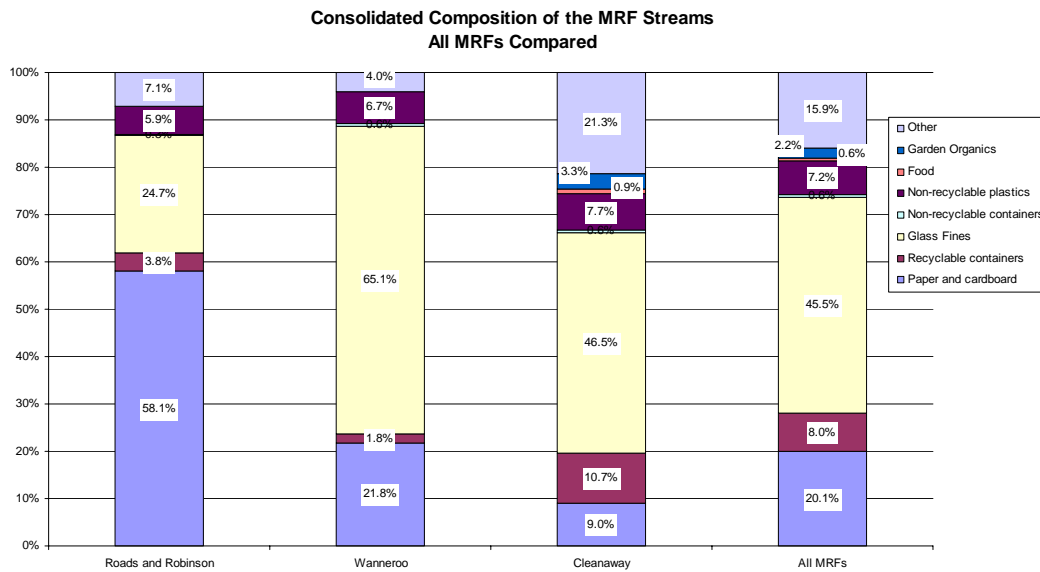
**Chart 8 Consolidated composition of residual from Roads and Robinson's MRF**  
The chart shows the composition of the residual waste produced from Road and Robinson's MRF on September 17, 2004, consolidated into some key categories. Paper and cardboard at 58.1% forms the largest proportion of this material followed by glass fines (24.7%). Overall a total of 61.9% of this material is potentially recyclable.

### Chart 9 - Consolidated Composition of MRF Residual – City of Wanneroo



**Chart 9 Consolidated composition of residual from City of Wanneroo's MRF**  
The chart shows the composition of the residual waste produced from City of Wanneroo's MRF on September 21, 2004, consolidated into some key categories. Glass fines at 65.1% forms the largest proportion of this material followed by paper and cardboard (21.8%). Overall a total of 23.6% of this material is potentially recyclable.

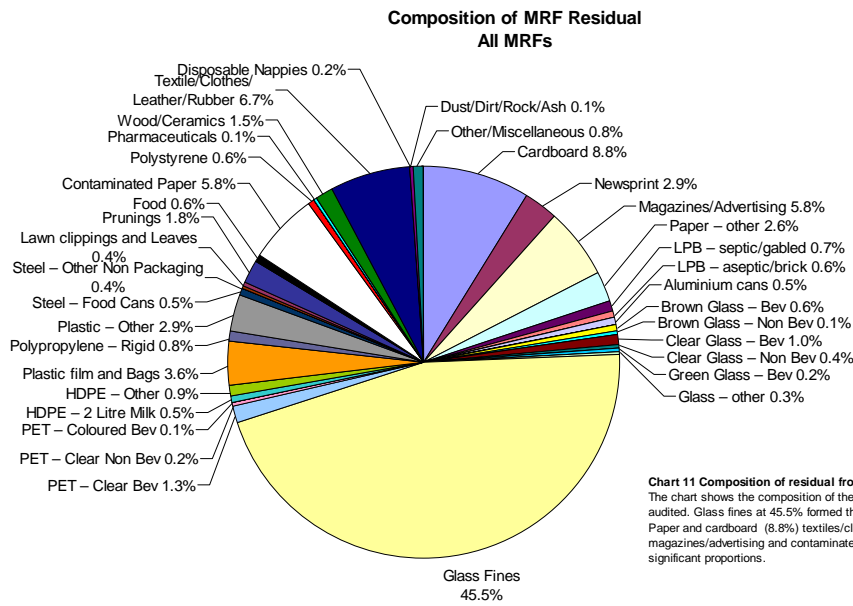
### Chart 10 - Consolidated Composition of MRF Residual – All MRFs Compared



**Chart 10 Consolidated composition of the MRF residual - All MRFs compared**  
The charts shows the composition of the residual stream from all three MRFs consolidated into some key categories. The composition of the residual from both the Wanneroo and the Cleanaway MRFs shows a considerable proportion of glass fines. This is not the case for the Roads and Robinson MRF where paper forms the largest proportion.

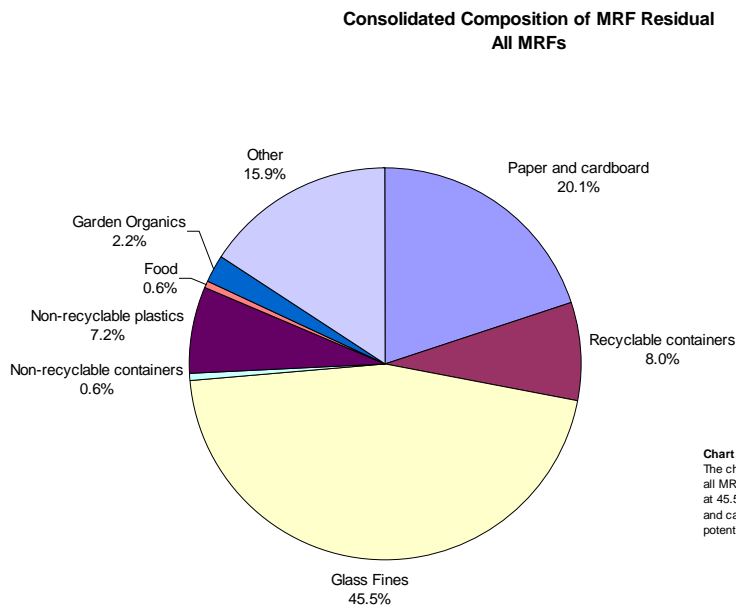


**Chart 11 - Composition of MRF Residual – all MRFs**



**Chart 11 Composition of residual from all MRF**  
The chart shows the composition of the residual waste produced from MRFs audited. Glass fines at 45.5% formed the largest proportions of this material. Paper and cardboard (8.8%) textiles/clothing/leather/rubber (6.7%) and magazines/advertising and contaminated paper (both 5.8%) were also found in significant proportions.

**Chart 12 - Consolidated Composition of MRF Residual – all MRFs**



**Chart 12 Consolidated composition of residual from all MRFs**  
The chart shows the composition of the residual waste produced from all MRFs audited consolidated into some key categories. Glass fines at 45.5% forms the largest proportion of this material followed by paper and cardboard (20.1%). Overall a total of 28.1% of this material is potentially recyclable.

## 5.5 Landfill Audit

- ❖ **Visitation:** A total of 680 visits were recorded and assessed at the Red Hill Landfill during the week of 18–24 September 2004. All collection companies conveying commercial loads deposited at the tip face while self-haul users deposited material at the transfer station. During the audit, it is estimated that 2,117 m<sup>3</sup> of waste was deposited at the facility, equating to approximately 469 tonnes.

When the audit data was compared with that of the number of commercial loads recorded at the weighbridge there was a discrepancy where two or three loads a day more were recorded than audited. One possible explanation for this was that the auditor relied on the weighbridge staff to inform him of the type of load being delivered. It is possible that this did not happen in every case and that some loads which were classified as commercial at the weighbridge were deposited at the main tip face without being recorded as such by the auditor. In many cases it was obvious which loads were commercial e.g. all front lift vehicles delivered commercial waste however a number of other vehicle types also used this area and may not have been captured. Alternatively, the load after passing the weighbridge was deposited elsewhere on the site.

- ❖ **Transfer Station Usage:** A total of 545 patrons visited the transfer station from 18–24 September, 2004. The majority of these occurred on the weekend, 257 patrons, compared to 288 patrons during the week. During the audit, it is estimated that 391 m<sup>3</sup> of waste were deposited, equating to 101 tonnes. The average load size was 0.7 m<sup>3</sup>.
- ❖ **Recycling Centre Usage:** The weighbridge recorded an additional 109 small vehicles which delivered recycling. This represents approximately 20% of all small loads however, due to the distance between the transfer station and the recycling area it was not possible to record activity which occurred at the recycling area.
- ❖ **Transfer Station Composition:** A wide variety of materials in roughly equal proportions was delivered to the transfer station during the audit period. Six materials are present in quantities greater than 10% and represent almost 77% of all waste deposited. These include: concrete/bricks (11.8%), garden/vegetation (14.9%), wood/timber (13.1%), other (11.2%), household waste (12.8%), bagged waste (13.0%). Materials which could have potentially been diverted for recycling or reuse include wood/timber (16.9%), garden vegetation (14.3%) – these two materials combined comprise 31.2%, metals and steel (10.5%), paper and cardboard (8.1%).
- ❖ **Commercial loads:** A total of 135 commercial loads visited the main face of the Red Hill landfill during the week of 18–24 September, 2004. The majority of these occurred during the week, 130, compared to just 5 loads over the weekend. During the audit it is estimated that 1,726m<sup>3</sup> of waste were deposited at the tip face, equating to 368 tonnes. The average load size was 12.8 m<sup>3</sup>.

- ❖ **Commercial Loads Composition:** A smaller range of materials (from commercial loads) was disposed of at the main tip face, with paper and cardboard accounting for 30% and five other materials – wood/timber, plastic, bagged waste, garden/vegetation and food/kitchen waste making up the next 47%. These materials present the greatest opportunities in commercial loads for improved diversion.
- ❖ **Potentially Recyclable:** A substantial proportion of the material disposed at the landfill was potentially recyclable or reusable. The greatest proportion by volume was paper and cardboard (26.1%), followed by wood and timber (14.8%). Heavier materials are much less prevalent in the waste stream, for example, construction and demolition materials – concrete and bricks – account for just 1.5%, metals and steel 3.4% and soil 1.1%.
- ❖ **Audit Comparison – Commercial loads :** A comparison of the 2002 and 2004 audit results for the main tip face identifies two major differences – a larger proportion of soil in 2002 and a larger proportion of bagged waste in 2004. When these materials are ignored the results are quite similar, with comparable proportions of paper and cardboard, food and kitchen, garden and vegetation and plastic found at the time of each audit.
- ❖ **Audit Comparison – Transfer Station:** The results of the 2002 and 2004 audits were quite different, with virtually no materials found in similar proportions. It is not immediately clear why this is so, but there are several possible reasons:
  - The composition of the streams at the time each audit was conducted may have actually been significantly different. The 2002 audit was conducted in December (summer) while the 2004 audit was conducted in September (early spring). This did not appear to affect the commercial loads data, but the nature of transfer station users is quite different from commercial premises and seasonal variations cannot be ruled out.
  - The 2002 audit was conducted over six days (Saturday was omitted) while the 2004 audit was conducted over seven consecutive days. A large number of vehicles use the transfer station on a Saturday (20% of all transfer station vehicles in 2004) and omitting these in 2003 may have impacted on the results.
  - Data was collected by visually estimating volume and converting this to tonnes. Conversion ratios can be unreliable and are affected by several factors, not the least of which is the level of compaction of the loads. It is possible that the variation in the results was caused by the use of different conversion ratios. The 2002 report does not include the conversion rates used nor the raw data.

## Landfill Audit Waste Composition

The table below shows a summary of the activity at both the tip face and transfer station with volume figures converted to weight using ratios devised by Resource NSW (now the Department of Environment and Conservation). Data by individual vehicle load is provided in Appendix I.

**Table 15 - Landfill Volume Data Converted to Weight**

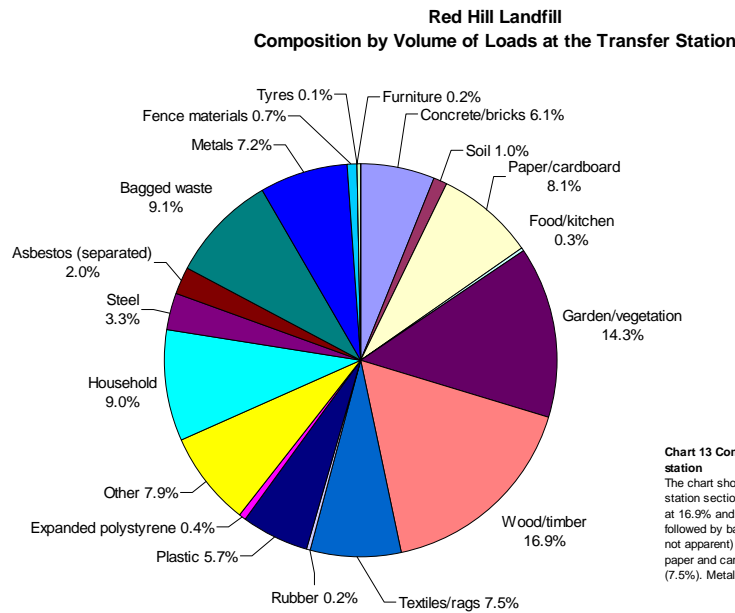
Location	Total Cubic Metres			Conversion Rate	Total Tonnes		
	Transfer Station	Main Tip Face	Total	Tonnes per Cubic Metre	Transfer Station	Main Tip Face	Total
Concrete/bricks	23.9	8.7	32.7	0.5	12.0	4.4	16.3
Soil	4.0	18.5	22.5	1.25	5.0	23.1	28.1
Paper/cardboard	31.7	520.0	551.7	0.09	2.9	46.8	49.7
Food/kitchen	1.2	127.0	128.2	0.33	0.4	41.9	42.3
Garden/vegetation	55.9	145.8	201.6	0.27	15.1	39.4	54.4
Wood/timber	66.2	247.1	313.3	0.2	13.2	49.4	62.7
Textiles/rags	29.4	16.3	45.6	0.1	2.9	1.6	4.6
Rubber	0.8	1.0	1.8	1.1	0.8	1.1	1.9
Plastic	22.1	236.8	258.9	0.15	3.3	35.5	38.8
Expanded polystyrene	1.7	79.3	81.0	0.18	0.3	14.3	14.6
Other	30.8	74.3	105.0	0.37	11.4	27.5	38.9
Household	35.1	0.0	35.1	0.37	13.0	0.0	13.0
Steel	12.8	23.5	36.2	0.13	1.7	3.0	4.7
Bagged waste	35.6	213.5	249.1	0.37	13.2	79.0	92.2
Metals	28.3	7.0	35.3	0.11	3.1	0.8	3.9
Fence materials	2.6	0.0	2.6	0.11			
Furniture	0.8	1.5	2.3	0.13	0.1	0.2	0.3
Air conditioning ducts	0.0	6.0	6.0	0.15			
Asbestos	7.7	0.0	7.7	0.34	2.6	0.0	2.6
Tyres	0.6	0.0	0.6	0.67	0.4	0.0	0.4
<b>Total</b>	<b>391.0</b>	<b>1726.0</b>	<b>2117.0</b>		<b>101.3</b>	<b>368.0</b>	<b>469.3</b>

Patrons delivering asbestos or tyres were directed by the attendant to place these items in a designated area.

Charts 13 - 16 present the composition of visual audits at Red Hill Landfill undertaken at both the main tip face and the transfer station.

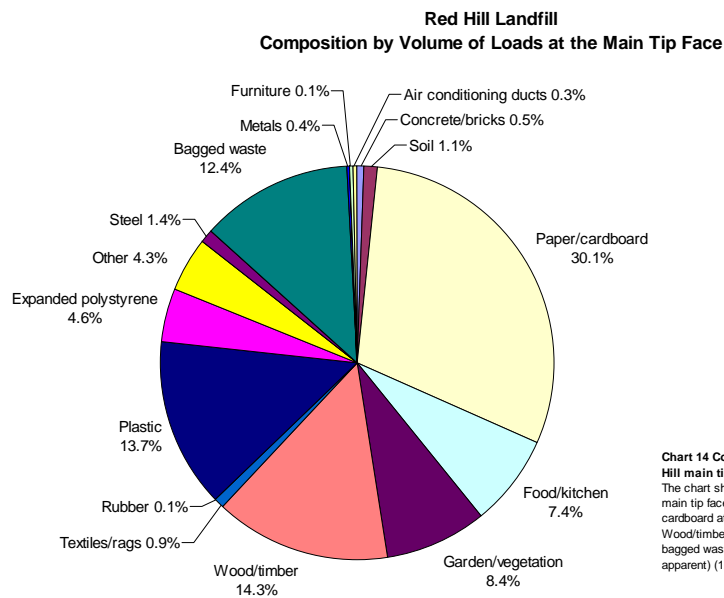
- Chart 13 Composition by Volume of Loads Delivered to Landfill Transfer Station
- Chart 14 Composition by Volume of Commercial Loads Delivered to Main Tip Face
- Chart 15 Composition by Volume of All Audited Loads Delivered to Landfill
- Chart 16 Consolidated Composition of Loads Delivered to Transfer Station – Comparison to 2002 Audit
- Chart 17 Consolidated Composition of Loads Delivered to Main Tip Face – Comparison to 2002 Audit

### Chart 13 - Composition by Volume of Loads Delivered to Red Hill Landfill Transfer Station



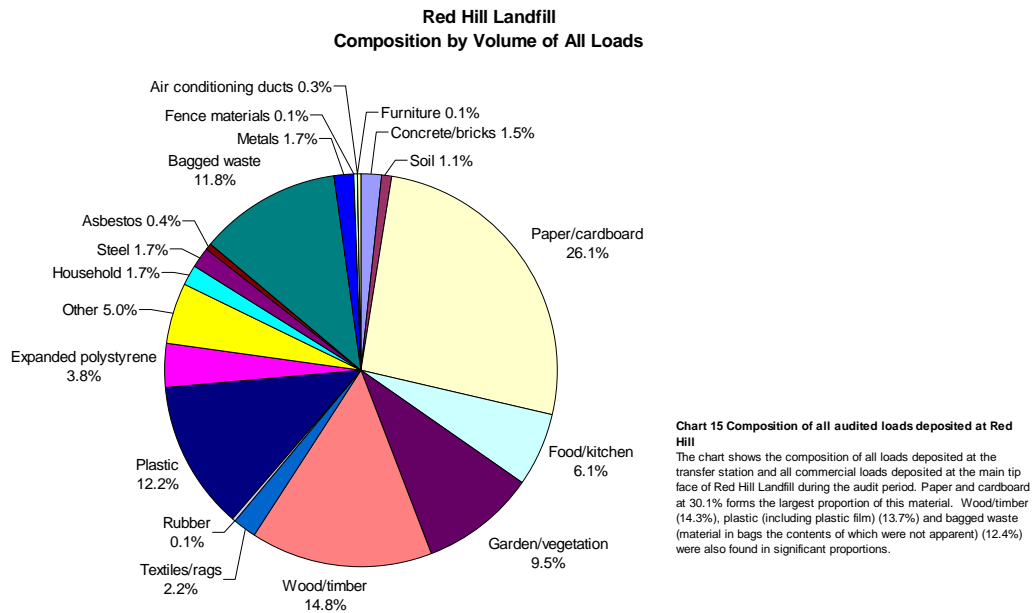
**Chart 13 Composition of waste deposited at the Red Hill transfer station**  
The chart shows the composition of material deposited at the transfer station section of Red Hill Landfill during the audit period. Wood/timber at 16.9% and garden/vegetation at 14.3% form the largest proportions followed by bagged waste (material in bags the contents of which were not apparent) (9.1%), household waste (mixed domestic waste) (9.0%), paper and cardboard (8.1%), other material (7.9%) and textiles and rags (7.5%). Metals and steel comprised a total of 10.5%.

### Chart 14 - Composition by Volume of Commercial Loads Delivered to Red Hill Landfill Main Tip Face

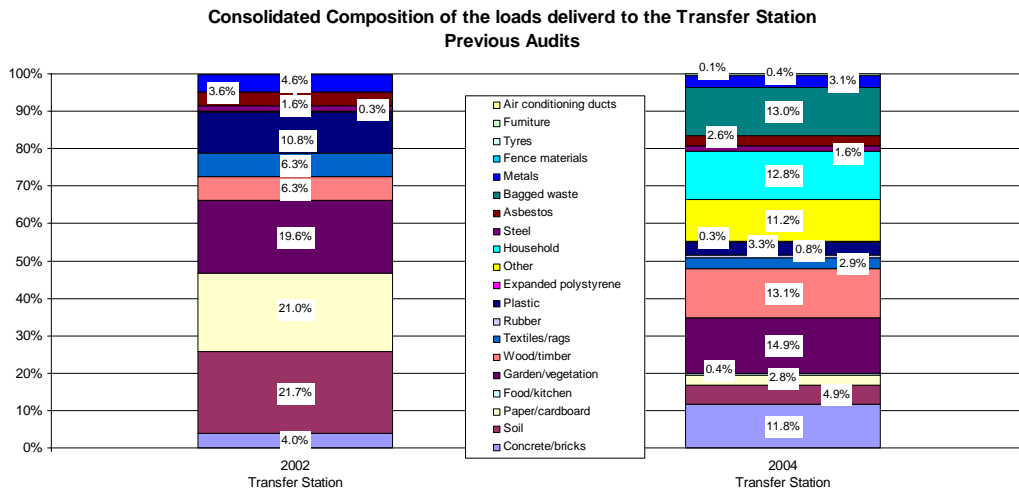


**Chart 14 Composition of commercial waste deposited at the Red Hill main tip face**  
The chart shows the composition of commercial waste deposited at the main tip face of Red Hill Landfill during the audit period. Paper and cardboard at 30.1% forms the largest proportion of this material. Wood/timber (14.3%), plastic (including plastic film) (13.7%) and bagged waste (material in bags the contents of which were not apparent) (12.4%) were also found in significant proportions.

**Chart 15 - Composition by Volume of All Audited Loads Delivered to Red Hill Landfill**

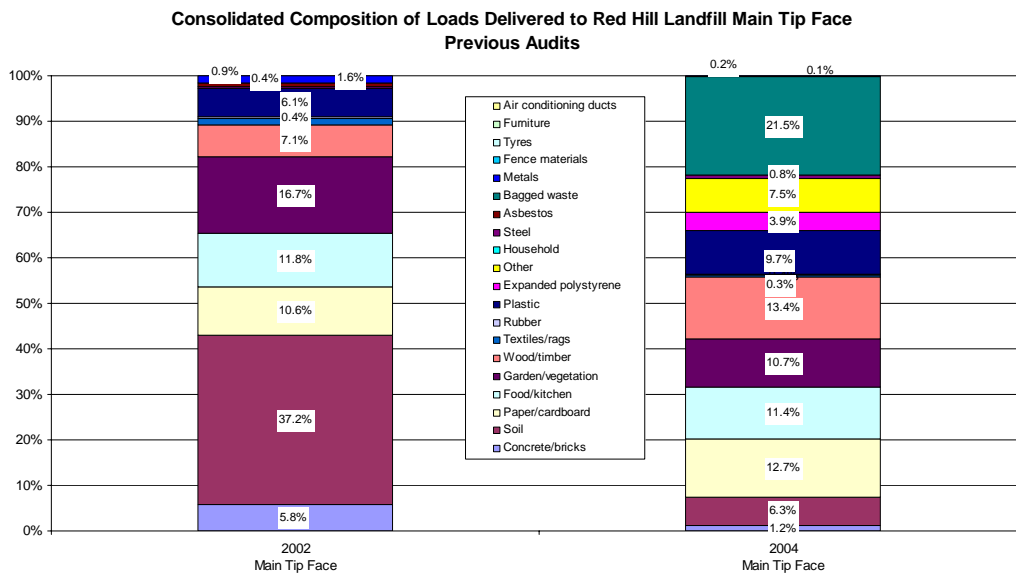


**Chart 16 - Consolidated Composition of Loads Delivered to Red Hill Landfill Transfer Station – Previous Audits**



**Chart 16 Consolidated composition by weight of material disposed of at the transfer station at Red Hill Landfill**  
The chart shows the proportion by weight of material deposited at the Red Hill Landfill transfer station as recorded in the 2004 audit conducted by APrince Consulting and the 2002 audit conducted by Nolan-ITU. As can be seen the two sets of data are completely different with virtually no material found in the same proportion in 2004 as in 2002. There are several possible reasons for this. One is that the composition of the streams at the time each audit was conducted were actually different. Another is that the 2002 audit was conducted over only six days (Saturday was omitted) while the 2004 audit was conducted over seven days. The large number of vehicles disposing at the transfer station on a Saturday means that omitting them from the data probably had a significant impact on the results. In both cases data was collected by visually estimating volume and converting to tonnes. Conversion ratios are unreliable and are affected by several factors not the least of which is how compacted loads are so it is possible that the variation in the results is caused by different conversion ratios. No ratios are shown in the report of the 2002 audit nor are any volume figures reported. In addition the audits were conducted at different times of year December 2002 (summer) and September 2004 (early spring). Any one or a combination of these factors could account for the differences.

### Chart 17 - Consolidated Composition of Loads Delivered to Red Hill Landfill Main Tip Face – Previous Audits



**Chart 17 Consolidated composition by weight of material disposed of at the main tip face at Red Hill Landfill**  
 The chart shows the proportion by weight of material deposited at Red Hill Landfill's main tip face as recorded in the 2004 audit conducted by APrince Consulting and the 2002 audit conducted by Nolan-ITU. As can be seen the two sets of data appear to be quite different however, the main differences are a large proportion of soil in 2002 and a large proportion of bagged waste in 2004. Once these are ignored the difference are not so great.

## 6. CONCLUSION AND RECOMMENDATIONS

### 6.1 Domestic Waste

- ❖ Extrapolating the data for each council, approximately 8,234 tonnes of paper and cardboard and 5,458 tonnes of recyclable containers are still present in the garbage stream as shown in the table below:

**Table 16 - Quantity of Recyclable Material in Garbage Stream by Council**

Council	Households 2000/2001 #	Paper and Cardboard		Recyclable Containers	
		Kg/household/ week	Total tonnes per year	Kg/household/ week	Total tonnes per year
Bassendean	5,793	2.6	783	1.4	421
Bayswater	24,393	1.8	2283	0.9	1141
Belmont	13,524	0.7	492	1.0	703
Kalamunda	17,625	1.6	1466	1.0	916
Mundaring	12,248	0.6	382	0.5	318
Swan	31,400	1.8	2939	1.2	<b>1959</b>
<b>Total</b>	<b>104,983</b>	<b>1.5</b>	<b>8345</b>	<b>1.0</b>	<b>5458</b>

# Source : EMRC

This represents a total of 13,801 tonnes of recyclable material currently being deposited in landfill when recycling opportunities exist. Given the standardisation of the recycling service across the region, the EMRC could undertake a regional education campaign in conjunction with the member councils to promote the wasted recycling opportunities

- ❖ In relation to garden waste based on the audit results being extrapolated over a year, the region is burying 27,782 tonnes of garden waste currently present in the garbage bin. Bayswater Council is the only member council to offer a containerised green waste collection program.

**Table 17 - Quantity of Green Waste in Garbage Stream by Council**

Council	Households 2000/2001 #	Garden waste	
		Kg/household/ week	Total tonnes per year
Bassendean	5,793	10.4	3132
Bayswater	24,393	2.6	3297
Belmont	13,524	7.5	5274
Kalamunda	17,625	7.9	7240
Mundaring	12,248	2.6	1655
Swan	31,400	4.4	7184
<b>Total</b>	<b>104,983</b>	<b>5.1</b>	<b>27,782</b>

# Source : EMRC



- ❖ If all councils were to implement a containerised garden waste program, the average weight of garbage per household per week could be reduced from the current range of 10.7–20.8 kg to within a range of 8.1–13.2 kg.
- ❖ Based on the audit results, the region is currently discarding to landfill approximately 86,000 tonnes of waste per year, of which 48% is recoverable for recycling, comprising 32% garden waste, 9.7% paper and cardboard and 6.4% recyclable containers. The greatest opportunity to reduce waste to landfill is in the area of organics.
- ❖ In future we believe it would be beneficial for the EMRC to also audit the recycling stream. This will enable the following information to be obtained:
  - Composition of the garbage and recycling streams by weight
  - Type and amount of contamination in the recycling stream by council and system.
  - Recovery rate of recyclable materials (proportion of available recyclables being recycled)
  - Proportion of waste stream being recovered (diversion rate)
  - Proportion of the waste stream going to landfill
  - Amount of garbage and recycling produced per household
  - Overall volume of garbage and recycling streams by household
- ❖ Based on the above results accurate information on the quantity and nature of the contamination can be obtain which can be the basis for targeted communication and education to the broader community. This will assist in increasing recovery, minimising contamination and assist the MRF operators recover greater quantities of recoverable materials.
- ❖ Council bulky goods collection traditionally collect large volumes of material some of which could be recycled. In particular, metals and whitegoods. Many councils in the eastern states now offer a separate metals collection either on the same or a different day form the standard collection. An visual audit of the current bulk goods collection will identify the items which are being collected and assist in identifying potential service changes. Many councils refuse to collect cardboard, paper and recyclable items in the cleanups thus encouraging use of the kerbside service.

## **6.2 MRF Audit**

Each MRF residual result varies significantly from the others. However, the audit did identify that a substantial quantity, 27% of the residual stream from the MRFs, contains recoverable product – paper and cardboard (20.1%) and containers (7.2%).

The largest proportion of paper and cardboard is present in the Roads and Robinson residual at 58%, while the highest amount of recyclable containers was at the Cleanaway MRF, at 9.7%. Glass fines were highest, at 65% at the City of Wanneroo's MRF. The majority of these glass fines were less than 25mm in diameter.

The EMRC should provide the audit results to each of the MRF operators and discuss the results in detail to determine how performance can be improved. It is not known from this audit what percentage the residual stream is of the total throughput, as this is another indicator of performance and should be discussed with operators to determine priorities.

### 6.2.1 Glass Fines

Kerbside collection programs have moved to mechanisation for both the collection and processing of materials. As a result, across Australia over 100,000 tonnes of collected glass per year are not recovered and incorporated into remanufacture, due to breakage that occurs during collection and processing

Glass breaks as a function of kinetic energy produced when glass items come into contact with each other or other hard surfaces. This occurs at five key stages between the time the original use of a glass container is completed and its delivery to a MRF. These stages are:

- Household separation/disposal of glass into recycling bin
- Transfer of glass from bin to collection vehicle
- Movement of glass within the collection vehicle during travel
- Compaction of glass within transport vehicle
- Transfer of glass from vehicle to floor of processing facility

The total percentage of broken glass will be made up of ratios of these five stages. The total percentage and the ratios may vary according to other factors including:

- Type of collection system (commingled or separated)
- Composition of the stream
- Type of collection vehicle used
- Compaction rates applied

Recently, some councils, in an effort to minimise damage to recyclable product, have, in their kerbside collection contracts, specified load densities to be adhered to by contractors. Councils are enforcing penalties where load densities exceed contracted levels. The acceptance standards appear to be increasingly stringent, with 120–140 kg/m<sup>3</sup> specified in a recent tender document, although most councils specify around 180kg/m<sup>3</sup>. MRF operators are also specifying load densities in a quest to receive product which is not unduly over-compacted.

APrince Consulting has recently completed a Glass Compaction Study for the NSW Jurisdictional Recycling Group (JRG) to determine whether a relationship exists between the density of loads of kerbside recyclables and the proportion of broken glass in the loads. A secondary aim was to establish the optimum load density to protect the integrity of recyclable commodities from breakage during kerbside collection, while providing a cost-effective service to the community.

The analysis revealed a correlation between load densities and glass breakage. The proportion of broken glass that could be expected in the most ideal conditions (that is, fully commingled with load density of 120 kg/m<sup>3</sup>) is 26.5%. For every increase of 10 kg/m<sup>3</sup> in load density above 120 kg/m<sup>3</sup>, the proportion of broken glass will increase by 1.9%.

Ideally densities should aim not to exceed 180kg/m<sup>3</sup>. There is a economic cost to minimise glass fines as the collection fleet may need to increase and the cost impact of this is greatest in small councils where the number of households are less to distribute the added cost.

The EMRC could ask its member councils and their service providers to provide information in respect of current load densities to determine current operating parameters and consider the impact of density on glass breakage and glass fines when next tendering.

### **6.3 Red Hill Transfer Station**

- ❖ In relation to the audit results three materials, paper/cardboard, metals and garden waste, account for one third of all deposited materials at the transfer station even though existing recycling facilities are provided. These materials accounts for approximately 1,180 tonnes per year. To divert some of this material to the recycling facilities may require the following actions:
  - Enhanced education – brochure for all small vehicles with map highlighting recycling opportunities provided by weighbridge operator,
  - Improved signage - at transfer station stating for example ‘recyclable items not permitted in bins’
  - Greater staff assistance - to inform, educate and motivate users to improve source separation,
  
- ❖ The visual audit identified that 16.9% of the material deposited at the transfer station comprised wood/timber. This equates to approximately 13.2 tonnes per week or 6,864 tonnes per year. Whilst it is not known from this audit what percentage of this material is suitable for reprocessing or reuse, a more detailed audit of the timber and wood fraction could identify the amount of treated, painted and natural material, thus assisting in determining future opportunities for this stream with reliable data.
  
- ❖ The Red Hill Landfill has one of the most comprehensive recycling drop off centres that the consultants have seen in Australia. Opportunities exist to drop off an extensive range of materials including:
  - Green Waste
  - Scrap steel
  - Car bodies
  - Car batteries
  - Computer monitors and printers
  - Plastic flower pots

- Mobile phones and torch batteries
- Oil
- Paper and cardboard
- Glass
- Plastic containers I & 2
- Aluminium cans
- Gas bottles
- Clothing

In addition staff assist patrons and remove the following items to a dedicated compound the following materials:

- Tyres
- Whitegoods
- Gas cylinders
- Car batteries
- Pallets

A separate dedicated area is provided for the receipt of correctly wrapped and taped asbestos which is transferred to the landfill and buried in a dedicated area.

The following observations are made by the consultants:

- ❖ At the drop off centre whilst rubbish bins are provided at 2 locations for patrons to use the wording is under the lip of the bulk bins which is easy to read on approach however obstructed from the vision when in front of the bin. There was evidence that the rubbish bins had been misunderstood to be a recycling container. It is suggested that the words be provided on the inside rear of the rubbish bin and on a signpost behind the bin.
- ❖ The glass recycling receptacles (fibreglass igloos) currently have labels indicating 'all glass' and 'clear glass'. If colour sorting is required by the receiver of this material then new signage indicating 'Green Glass', 'Brown Glass' and 'Clear Glass' should be provided on the existing igloos. If commingled glass is acceptable then signage stating 'All glass' should be provided.
- ❖ The consultants were advised by staff that during the weekend the current capacity of the cardboard bins is insufficient and as a result some cardboard is deposited at the transfer station. Given the ease of recycling this commodity and the space available at the drop off it is recommended that a larger bulk bin be provided for cardboard.
- ❖ Currently paper is stored in the green garden shed however improved signage stating 'paper in shed' may assist those irregular users.
- ❖ An opportunity exists when conducting the next visual assessment to also gain an insight into the user profile by asking a number of short questions of the patrons. This could include:

- Usage patterns - number of visits per year
- Common load types
- Private. business or trade activity from which the waste arose
- Any suggestions for improvements in layout or design

#### **6.4 Commercial Loads**

- ❖ Paper and cardboard provide the greatest opportunities for the commercial loads deposited at the landfill, as they currently comprise 30.1%. Extrapolated, this amounts to 2,422 tonnes per year.
- ❖ Wood and timber comprises 14.3% and garden waste 8.4%. Together these materials account for a further 4,617 tonnes per year.

EMRC could co-ordinate a roundtable with current service providers and discuss opportunities for the collection companies and EMRC to work together to promote greater source-separation of these materials to selected clients. Clearly, it may be more difficult for commercial clients to source-separate these materials, however, where they are generated in significant quantities, differential gate pricing may be sufficient incentive for commercial waste collection companies to promote source-separation to specific clients who probably generate the bulk of this material.

Waste Service NSW who operate all putrescible landfills and transfer stations in metropolitan Sydney introduced some years ago a policy of differential pricing in relation to loads that contained greater than 30% paper and cardboard. There were difficulties administering the policy and the approach was refined over time. The current operation of the policy is that recycling advisers rotate between transfer stations and landfills and observe commercial loads unloading, Where excessive paper and cardboard or garden waste are observed the driver is advised to review the collection route and identify the principle source of the material. Where repeat offenders occur Managers at Waste Service meet with the transport management team and if necessary also with the waste generator in an effort to reduce recyclable material being deposited in the landfills. EMRC could seek to undertake a similar operation in co-operation with the commercial customers.

**APPENDIX A**

**KERBSIDE RECYCLING**

**PRESENTATION RATES**

**BY COUNCIL**

### Kerbside Recycling Presentation Rates

The presentation rate is defined as the proportion of households presenting garbage which also presented recycling (and green waste in the case of Bayswater).

On two collection days (in Swan and Mundaring), samples of garbage were collected in areas which were not the same as the recycling zone. No figures on the recycling presentation rate are therefore available for those areas. In the case of Mundaring, this was the only collection day for this council, while in the case of Swan, collections took place on two other days for which data was obtained.

**Table 18 - Recycling Presentation Rates by Day**

Council	Date	Households Presenting Garbage	Households Presenting Recycling	Presentation Rate
Bayswater	17-Sep-04	69	*60	87%
Kalamunda	20-Sep-04	50	*40	80%
Swan	21-Sep-04	60	*50	83%
Bayswater	22-Sep-04	70	53	76%
Kalamunda	23-Sep-04	50	42	84%
Bassendean	24-Sep-04	33	27	82%
Mundaring <sup>1</sup>	28-Sep-04	70	0	0%
Belmont	28-Sep-04	78	68	87%
Swan <sup>2</sup>	29-Sep-04	60	0	0%
Swan	30-Sep-04	60	49	82%
<b>Total<sup>3</sup></b>		<b>600</b>	<b>389</b>	<b>83%</b>

\* Estimate

**Table 19 - Recycling Presentation Rates by Council**

Council	Households Presenting Garbage	Households Presenting Recycling	Presentation Rate
Bayswater	139	113	81%
Kalamunda	100	82	82%
Bassendean	33	27	82%
Mundaring <sup>1</sup>	70	0	0%
Swan <sup>2</sup>	180	99	83%
Belmont	78	68	87%
<b>Total<sup>3</sup></b>	<b>600</b>	<b>389</b>	<b>83%</b>

Notes:

- 1 – A truck breakdown on Monday September 27 meant the scheduled collection in Mundaring could not take place that day. After discussions with the EMRC, the Mundaring collection took place the following day in another statistically suitable area, however, this area was not in the recycling week so no recycling bins were presented.
- 2 – During the scheduling phase of the project, it was discovered that there were no statistically suitable areas in recycling zones which had their garbage collected on Thursday September 29. After discussions with the EMRC it was decided to collect in a part of Swan that was not in the recycling zone. Households in this zone have not been included in the calculation of the presentation rate for the September 29 zone or for the whole of Swan.
- 3 – Because two collections were conducted in areas that did not present recycling that week, that data has not been included in calculating the overall presentation rate

**APPENDIX B**

**RESULTS, ANALYSIS**

**AND**

**STATISTICAL PROFILE**

**FOR**

**TOWN OF BASSENDEAN**

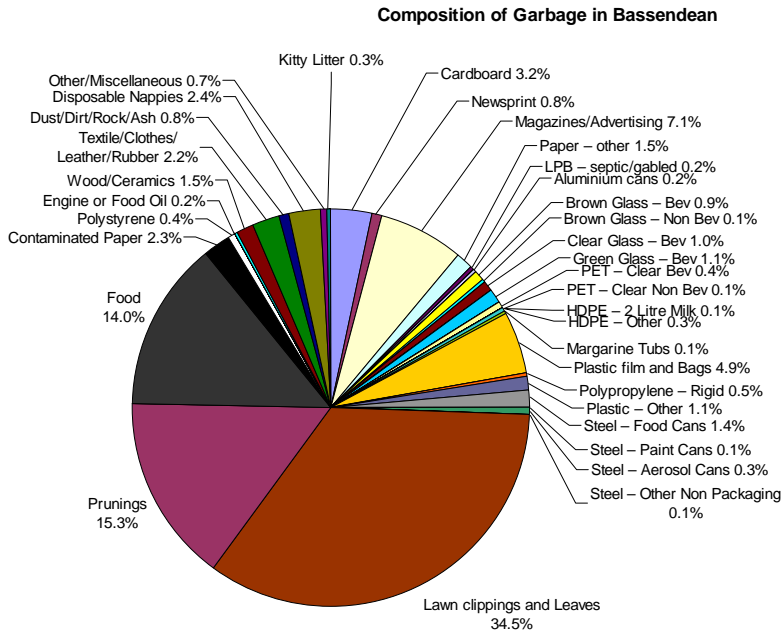


## Waste Composition Report for Bassendean

**Table 20 - Bassendean Waste – Composition Report**

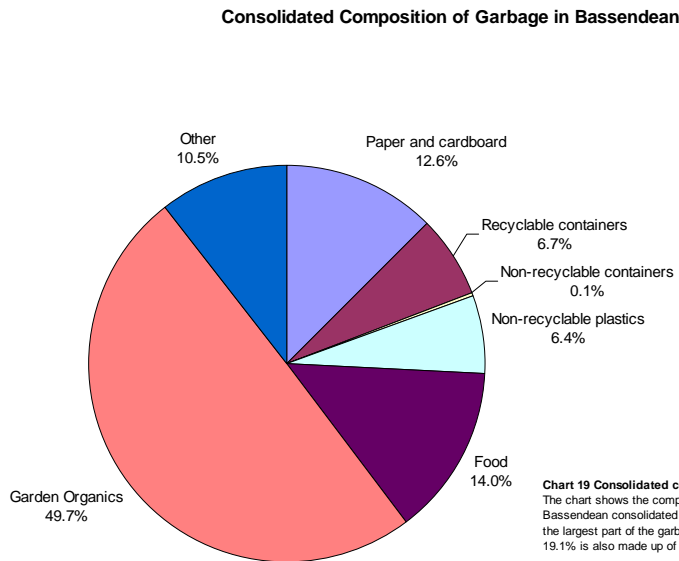
Local Government – Bassendean			Sorting Date – September 24, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	22.1	3.2%	
Newsprint	5.8	0.8%	
Magazines/Advertising	48.6	7.1%	
Paper – Other	10.1	1.5%	
LPB – Septic/Gabled	1.2	0.2%	
LPB – Aseptic/Brick	0.3	0.0%	
Aluminium Cans	1.7	0.2%	
Aluminium Foil	0.2	0.0%	
Brown Glass – Bev	6.4	0.9%	
Brown Glass – Non-bev	0.7	0.1%	
Clear Glass – Bev	6.8	1.0%	
Clear Glass – Non-bev	–	0.0%	
Green Glass – Bev	7.6	1.1%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	0.2	0.0%	
PET – Clear Bev	2.6	0.4%	
PET – Clear Non-bev	0.4	0.1%	
PET – Coloured Bev	–	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	0.9	0.1%	
HDPE – Other	1.9	0.3%	
Margarine Tubs	0.7	0.1%	
Plastic Film and Bags	33.8	4.9%	
LDPE	–	0.0%	
Polypropylene – Rigid	3.2	0.5%	
Plastic – Other	7.3	1.1%	
Steel – Food Cans	9.6	1.4%	
Steel – Paint Cans	0.7	0.1%	
Steel – Aerosol Cans	2.0	0.3%	
Steel – Other Packaging	–	0.0%	
Steel – Other Nonpackaging	0.4	0.1%	
Lawn Clippings and Leaves	236.8	34.5%	
Prunings	104.8	15.3%	
Weeds	–	0.0%	
Food	96.3	14.0%	
Contaminated Paper	15.9	2.3%	
Polystyrene	2.9	0.4%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	–	0.0%	
Medical/Hygiene	–	0.0%	
Engine or Food Oil	1.2	0.2%	Oil filter.
Wood/Ceramics	10.4	1.5%	Includes a ceramic fuse.
Textile/Clothes/Leather/Rubber	14.9	2.2%	
Dust/Dirt/Rock/Ash	5.7	0.8%	
Disposable Nappies	16.7	2.4%	
Other/Miscellaneous	4.7	0.7%	Includes lights and a garden lighting system.
Kitty Litter	1.9	0.3%	
<b>Total</b>	<b>687.1</b>	<b>100%</b>	

### Chart 18 - Composition of Garbage in Bassendean



**Chart 18 Composition of the garbage stream - Bassendean**  
 The chart shows the composition of the garbage stream for all households audited in Bassendean. Lawn clippings and leaves at 34.5% forms the largest part of the garbage stream. Prunings (15.3%) followed by food (14.0%) are the next largest components. Other miscellaneous (0.7%) was made up lights and a garden lighting system.

### Chart 19 - Consolidated Composition of Garbage in Bassendean



**Chart 19 Consolidated composition of the garbage stream - Bassendean**  
 The chart shows the composition of the garbage stream for all households audited in Bassendean consolidated into some key categories. Garden organics at 49.7% forms the largest part of the garbage stream. Food makes up another 14.0%. A total of 19.1% is also made up of recyclable material (paper and recyclable containers).

**STATISTICAL PROFILE OF COUNCIL****Bassendean (T) (SLA 505100350), 10.4km<sup>2</sup>****Table 21 - B01 Selected Characteristics (First Release Processing)**

Persons	Males	Females	Persons
Total persons	6,530	6,832	13,362

**Table 22 - B09 Proficiency In Spoken English By Year Of Arrival In Australia**

Persons born overseas (excluding overseas visitors)	2001	2000	1999	1998	1997	1996	1991-1995	1986-1990	Before 1986	Not stated	Total
Speaks English only	11	25	41	32	19	33	132	265	1,933	99	2,590
Speaks other language and speaks English:											
Very well or Well	3	8	13	18	8	30	93	91	609	19	892
Not well or Not at all	3	3	8	4	5	12	34	25	125	14	233
Not stated (b)	0	0	0	0	0	0	0	3	0	8	11
Total	6	11	21	22	13	42	127	119	734	41	1,136
Not stated ©	0	0	0	0	0	0	0	0	6	3	9
<b>Total</b>	<b>17</b>	<b>36</b>	<b>62</b>	<b>54</b>	<b>32</b>	<b>75</b>	<b>259</b>	<b>384</b>	<b>2,673</b>	<b>143</b>	<b>3,735</b>

**Table 23 - B18 Dwelling Structure**

Private dwellings and Persons in occupied private dwellings (excluding overseas visitors)	Dwellings	Persons
Separate house	4,574	11,667
Semi-detached, row or terrace house, townhouse etc. with:		
One storey	718	1,200
Two or more storeys	19	38
Total	737	1,238
Flat, unit or apartment:		
In a one- or two-storey block	107	192
In a three-storey block	12	14
In a four- or more storey block	0	0
Attached to a house	0	0
Total	119	206
Other dwelling:		
Caravan, cabin, houseboat	0	0
Improvised home, tent, sleepers out	0	0
House or flat attached to a shop, office, etc.	10	20
Total	10	20
Not stated	51	78
Unoccupied private dwellings	380	n. a.
<b>Total</b>	<b>5,871</b>	<b>13,209</b>

**Table 24 - B19 Dwelling Structure By Tenure Type And Landlord Type**

Occupied private dwellings	Fully owned	Being purchased	Being purchased under a rent/buy scheme	State/Territory Housing Authority	Other	Not stated	Total	Other tenure type	Not stated	Total
Separate house	1,770	1,603	35	154	727	7	888	76	202	4,574
Semi-detached, row or terrace house, townhouse	238	126	5	113	213	4	330	15	23	737
Flat, unit or apartment	18	3	3	65	17	0	82	7	6	119
Other dwelling	0	3	0	0	7	0	7	0	0	10
Not stated	12	9	0	3	3	0	6	0	26	53
<b>Total</b>	<b>2,038</b>	<b>1,744</b>	<b>43</b>	<b>335</b>	<b>967</b>	<b>11</b>	<b>1,313</b>	<b>98</b>	<b>257</b>	<b>5,493</b>

**Table 25 - B30 Weekly Family Income By Family Type**

Families in occupied private dwellings	Couple family with children	Couple family without children	One parent family	Other family	Total
Negative/Nil income	3	3	3	0	9
\$1-\$199	7	10	22	3	42
\$200-\$299	5	13	54	3	75
\$300-\$399	46	263	107	4	420
\$400-\$499	52	147	111	11	321
\$500-\$599	62	67	62	3	194
\$600-\$699	80	96	63	8	247
\$700-\$799	90	54	49	3	196
\$800-\$999	194	98	59	7	358
\$1,000-\$1,199	176	99	41	6	322
\$1,200-\$1,499	228	135	24	9	396
\$1,500-\$1,999	233	158	16	10	417
\$2,000 or more	125	72	9	0	206
Partial income stated (a)	207	86	64	4	361
All incomes not stated (b)	19	39	19	3	80
<b>Total</b>	<b>1,527</b>	<b>1,340</b>	<b>703</b>	<b>74</b>	<b>3,644</b>

**Table 26 - Summary Bassendean**

Indicator	Figure
Total Persons	13,362
Percentage overseas born	28.0%
Percentage poor English speakers	1.7%
Separate house percent	77.9%
Flat etc. percentage	2.0%
Persons per dwelling	2.25
Percentage owned/purchasing	68.9%
Percentage public housing	6.1%
Percentage families with weekly income < \$600	29.1%
Percentage families with weekly income \$1,200+	28.0%

**APPENDIX C**

**RESULTS, ANALYSIS**

**AND**

**STATISTICAL PROFILE**

**FOR**

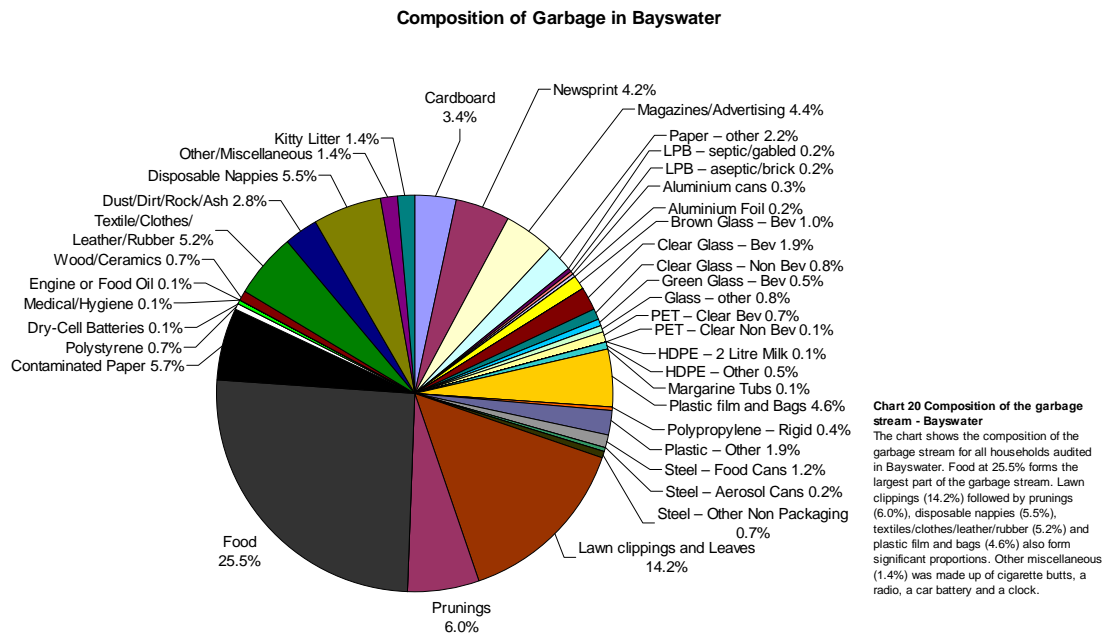
**BAYSWATER COUNCIL**

## WASTE COMPOSITION REPORT FOR BAYSWATER

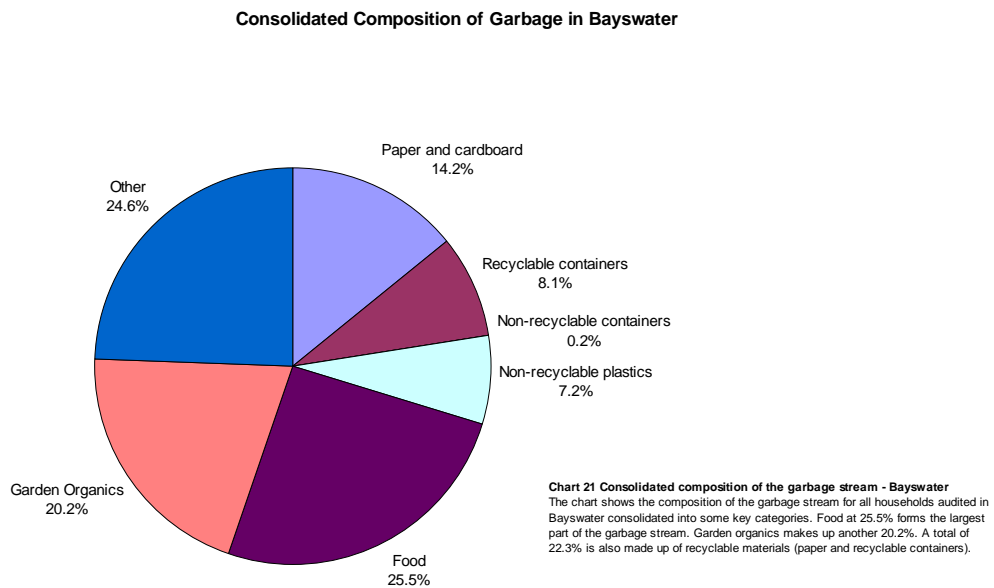
**Table 27 - Bayswater Waste – Composition Report**

Local Government - Bayswater			Sorting Date – September 17 and 22, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	61.0	3.4%	
Newsprint	75.6	4.2%	
Magazines/Advertising	78.6	4.4%	
Paper – Other	38.5	2.2%	
LPB – Septic/Gabled	3.8	0.2%	
LPB – Aseptic/Brick	3.0	0.2%	
Aluminium Cans	5.5	0.3%	
Aluminium Foil	2.8	0.2%	
Brown Glass – Bev	18.1	1.0%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	34.3	1.9%	
Clear Glass – Non-bev	13.7	0.8%	
Green Glass – Bev	9.4	0.5%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	13.4	0.8%	
PET – Clear Bev	11.6	0.7%	
PET – Clear Non-bev	0.9	0.1%	
PET – Coloured Bev	0.1	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	2.2	0.1%	
HDPE – Other	8.5	0.5%	
Margarine Tubs	1.2	0.1%	
Plastic Film and Bags	81.4	4.6%	
LDPE	–	0.0%	
Polypropylene – Rigid	8.0	0.4%	
Plastic – Other	33.2	1.9%	
Steel – Food Cans	20.7	1.2%	
Steel – Paint Cans	0.5	0.0%	
Steel – Aerosol Cans	3.6	0.2%	
Steel – Other Packaging	0.8	0.0%	
Steel – Other Non-packaging	11.9	0.7%	
Lawn Clippings and Leaves	253.0	14.2%	
Prunings	106.4	6.0%	
Weeds	–	0.0%	
Food	455.2	25.5%	
Contaminated Paper	102.3	5.7%	
Polystyrene	13.2	0.7%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	1.7	0.1%	
Household Chemicals	0.2	0.0%	
Pharmaceuticals	–	0.0%	
Medical/Hygiene	1.6	0.1%	Includes syringes and a sharps container.
Engine or Food Oil	1.1	0.1%	
Wood/Ceramics	12.9	0.7%	
Textile/Clothes/Leather/Rubber	92.3	5.2%	
Dust/Dirt/Rock/Ash	50.3	2.8%	
Disposable Nappies	98.6	5.5%	
Other/Miscellaneous	25.8	1.4%	Includes telephone, car battery, a clock, stereo, cigarette butts.
Kitty Litter	25.3	1.4%	
<b>Total</b>	<b>1,782.0</b>	<b>100%</b>	

### Chart 20 - Composition of Garbage in Bayswater



### Chart 21 - Consolidated Composition of Garbage in Bayswater



### **Green Waste Presentation Rates in Bayswater**

Information relating to the kerbside green waste presentation rates for Bayswater is provided below.

**Table 28 - Green Waste Presentation Rates in Bayswater**

<b>Date</b>	<b>Households Presenting Garbage</b>	<b>Households Presenting Green Waste</b>	<b>Presentation Rate</b>
24-Sep-04	69	41	59%
29-Sep-04	70	34*	49%
<b>Total</b>	<b>139</b>	<b>75</b>	<b>54%</b>

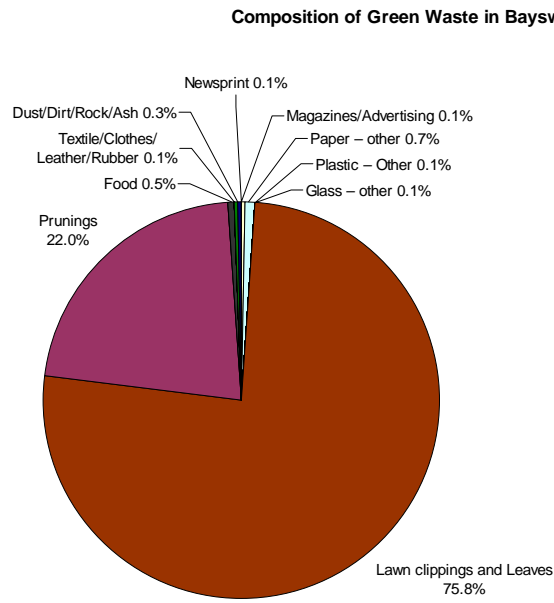
Note: On September 29 when the auditors arrived in Bayswater to collect samples of green waste from the same households that had had their garbage sampled the week before they found that the contractor, Cleanaway, had already emptied the green waste bins. After discussion with the EMRC and Cleanaway, a nearby street in the same suburb was found, in which green waste samples could be collected. The garbage figure here is therefore from the originally selected street, while the green waste figure is from a different street.



**Table 29 - Bayswater Green Waste – Composition Report**

Local Government – Bayswater – Green waste			Sorting Date – September 24 and 29, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	0.6	0.0%	
Newsprint	1.4	0.1%	
Magazines/Advertising	1.9	0.1%	
Paper – Other	11.4	0.7%	
LPB – Septic/Gabled	–	0.0%	
LPB – Aseptic/Brick	–	0.0%	
Aluminium Cans	0.1	0.0%	
Aluminium Foil	–	0.0%	
Brown Glass – Bev	–	0.0%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	–	0.0%	
Clear Glass – Non-bev	–	0.0%	
Green Glass – Bev	–	0.0%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	1.5	0.1%	
PET – Clear Bev	0.1	0.0%	
PET – Clear Non-bev	–	0.0%	
PET – Coloured Bev	–	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	0.1	0.0%	
HDPE – Other	–	0.0%	
Margarine Tubs	–	0.0%	
Plastic Film and Bags	0.7	0.0%	
LDPE	–	0.0%	
Polypropylene – Rigid	0.1	0.0%	
Plastic – Other	0.9	0.1%	
Steel – Food Cans	–	0.0%	
Steel – Paint Cans	–	0.0%	
Steel – Aerosol Cans	–	0.0%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non Packaging	–	0.0%	
Lawn clippings and Leaves	1,169.0	75.8%	
Prunings	339.3	22.0%	
Weeds	–	0.0%	
Food	7.1	0.5%	
Contaminated Paper	0.5	0.0%	
Polystyrene	0.0	0.0%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	–	0.0%	
Medical/Hygiene	–	0.0%	
Engine or Food Oil	–	0.0%	
Wood/Ceramics	–	0.0%	
Textile/Clothes/Leather/Rubber	2.2	0.1%	
Dust/Dirt/Rock/Ash	5.2	0.3%	
Disposable Nappies	–	0.0%	
Other/Miscellaneous	–	0.0%	
Kitty Litter	–	0.0%	
<b>Total</b>	<b>1,542.0</b>	<b>100.0%</b>	

### Copy of Chart 3 - Composition of Bayswater green waste



**Chart 3 Composition of the green waste stream - Bayswater**  
The chart shows the composition of the green waste stream for all households audited in Bayswater. Lawn clippings and leaves at 75.8% forms the largest part of the stream with prunings (22.0%) the next largest proportion. Contaminants form just 2.2%.

## STATISTICAL PROFILE OF COUNCIL

### *Bayswater (SLA 505100420) , 32.8km<sup>2</sup>*

**Table 30 - B01 Selected Characteristics (First Release Processing)**

Persons	Males	Females	Persons
Total persons	26,947	27,443	54,390

**Table 31 - B09 Proficiency In Spoken English By Year Of Arrival In Australia**

Persons born overseas (excluding overseas visitors)	2001	2000	1999	1998	1997	1996	1991-1995	1986-1990	Before 1986	Not stated	Total
Speaks English only	82	161	177	145	151	126	615	1291	7,252	450	10,450
Speaks other language and speaks English:											
Very well or Well	90	206	210	200	138	176	767	937	3,656	262	6,642
Not well or Not at all	54	120	82	53	38	43	274	279	848	96	1,887
Not stated (b)	0	3	7	7	6	0	21	14	39	12	109
<b>Total</b>	<b>144</b>	<b>329</b>	<b>299</b>	<b>260</b>	<b>182</b>	<b>219</b>	<b>1,062</b>	<b>1,230</b>	<b>4,543</b>	<b>370</b>	<b>8,638</b>
Not stated ©	0	0	0	3	3	0	0	3	36	29	74
<b>Total</b>	<b>226</b>	<b>490</b>	<b>476</b>	<b>408</b>	<b>336</b>	<b>345</b>	<b>1,677</b>	<b>2,524</b>	<b>11,831</b>	<b>849</b>	<b>19,162</b>

**Table 32 - B18 Dwelling Structure**

Private dwellings and Persons in occupied private dwellings (excluding overseas visitors)	Dwellings	Persons
Separate house	16,277	4,2169
Semi-detached, row or terrace house, townhouse etc. with:		
One storey	2,687	4,511
Two or more storeys	996	1803
<b>Total</b>	<b>3,683</b>	<b>6,314</b>
Flat, unit or apartment:		
In a one- or two-storey block	1,313	1,941
In a three-storey block	686	1,025
In a four- or more storey block	1,036	1,399
Attached to a house	18	23
<b>Total</b>	<b>3,053</b>	<b>4,388</b>
Other dwelling:		
Caravan, cabin, houseboat	4	4
Improvised home, tent, sleepers out	0	0
House or flat attached to a shop, office, etc.	24	51
<b>Total</b>	<b>28</b>	<b>55</b>
Not stated	85	149
Unoccupied private dwellings	1,906	n. a.
<b>Total</b>	<b>25,032</b>	<b>53,075</b>

**Table 33 - B19 Dwelling Structure By Tenure Type And Landlord Type**

Occupied private dwellings	Fully owned	Being purchased	Being purchased under a rent/buy scheme	State/Territory Housing Authority	Other	Not stated	Total	Other tenure type	Not stated	Total
Separate house	7,439	4,933	105	257	2,693	26	2,976	306	518	16,277
Semi-detached, row or terrace house, townhouse	936	731	19	406	1,251	24	1,681	144	172	3,683
Flat, unit or apartment	419	384	15	169	1,737	25	1,931	78	226	3,053
Other dwelling	6	4	0	0	11	0	11	5	3	29
Not stated	21	18	0	4	26	0	30	3	13	85
<b>Total</b>	<b>8,821</b>	<b>6,070</b>	<b>139</b>	<b>836</b>	<b>5,718</b>	<b>75</b>	<b>6,629</b>	<b>536</b>	<b>932</b>	<b>23,127</b>

**Table 34 - B30 Weekly Family Income By Family Type**

Families in occupied private dwellings	Couple family with children	Couple family without children	One parent family	Other family	Total
Negative/Nil income	10	23	19	5	57
\$1-\$199	25	29	101	7	162
\$200-\$299	27	56	169	15	267
\$300-\$399	182	943	374	40	1,539
\$400-\$499	201	566	305	36	1,108
\$500-\$599	261	298	216	19	794
\$600-\$699	348	411	171	24	954
\$700-\$799	282	210	146	27	665
\$800-\$999	779	457	214	40	1,490
\$1,000-\$1,199	678	435	176	31	1,320
\$1,200-\$1,499	861	532	96	33	1,522
\$1,500-\$1,999	902	714	75	16	1,707
\$2,000 or more	647	374	34	16	1,071
Partial income stated (a)	811	361	185	16	1,373
All incomes not stated (b)	69	141	61	6	277
<b>Total</b>	<b>6,083</b>	<b>5,550</b>	<b>2,342</b>	<b>331</b>	<b>14,306</b>

**Table 35 - Summary Bayswater**

Indicator	Figure
Total Persons	54,390
Percentage overseas born	35.2%
Percentage poor English speakers	3.5%
Separate house percentage	65.0%
Flat etc. percentage	12.2%
Persons per dwelling	2.12
Percentage owned/purchasing	64.4%
Percentage public housing	3.6%
Percentage families with weekly income < \$600	27.5%
Percentage families with weekly income \$1,200+	30.1%

**APPENDIX D**

**RESULTS, ANALYSIS**

**AND**

**STATISTICAL PROFILE**

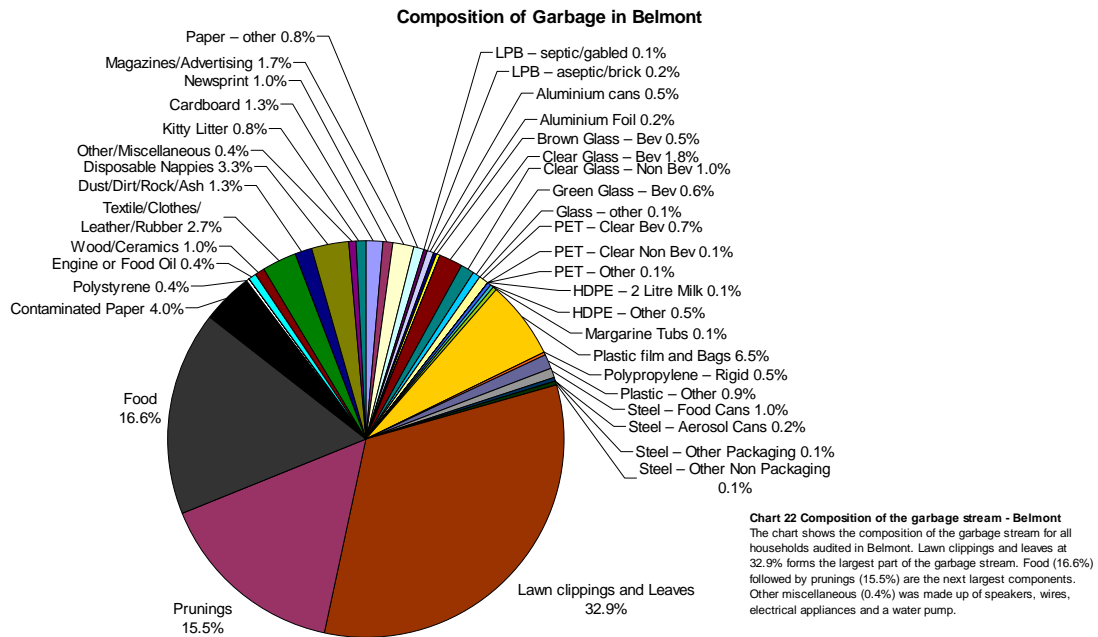
**FOR**

**BELMONT COUNCIL**

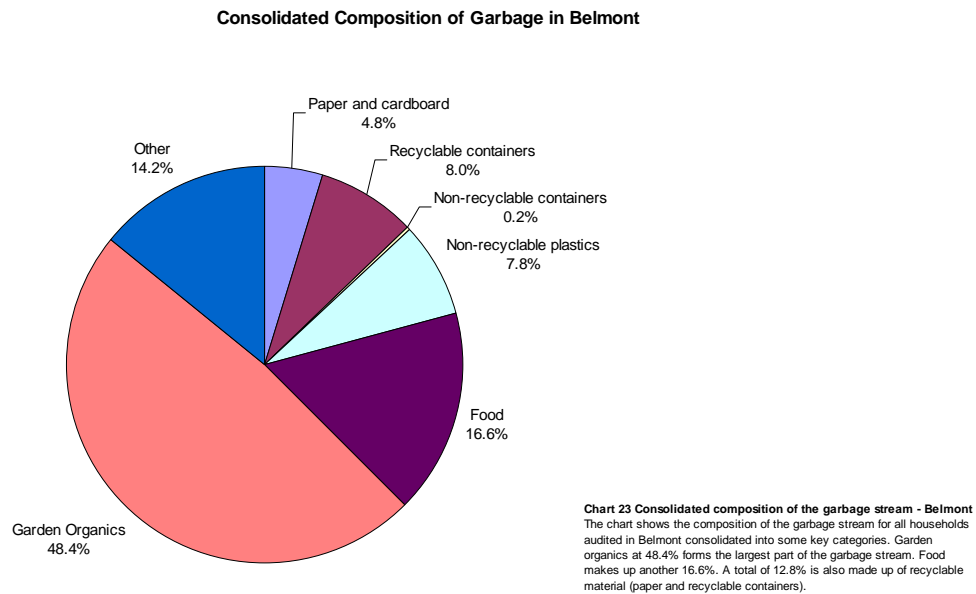
**Table 36 - Belmont Waste – Composition Report**

Local Government – Belmont			Sorting Date – September 28, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	15.5	1.3%	
Newsprint	12.0	1.0%	
Magazines/Advertising	21.0	1.7%	
Paper – other	9.2	0.8%	
LPB – Septic/Gabled	1.8	0.1%	
LPB – Aseptic/Brick	1.8	0.2%	
Aluminium Cans	5.6	0.5%	
Aluminium Foil	2.0	0.2%	
Brown Glass – Bev	6.1	0.5%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	22.2	1.8%	
Clear Glass – Non-bev	12.4	1.0%	
Green Glass – Bev	7.0	0.6%	
Green Glass – Non-bev	–	0.0%	
Glass – other	1.5	0.1%	
PET – Clear Bev	8.0	0.7%	
PET – Clear Non-bev	1.5	0.1%	
PET – Coloured Bev	0.1	0.0%	
PET – Other	0.8	0.1%	
HDPE – 2-litre Milk	1.1	0.1%	
HDPE – Other	5.6	0.5%	
Margarine Tubs	0.8	0.1%	
Plastic Film and Bags	77.9	6.5%	
LDPE	–	0.0%	
Polypropylene – Rigid	5.8	0.5%	
Plastic – Other	11.2	0.9%	
Steel – Food Cans	12.0	1.0%	
Steel – Paint Cans	0.5	0.0%	
Steel – Aerosol Cans	2.1	0.2%	
Steel – Other Packaging	1.7	0.1%	
Steel – Other Non-packaging	1.2	0.1%	
Lawn Clippings and Leaves	396.5	32.9%	
Prunings	187.2	15.5%	
Weeds	–	0.0%	
Food	200.4	16.6%	
Contaminated Paper	48.2	4.0%	
Polystyrene	5.1	0.4%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	0.1	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	–	0.0%	
Medical/Hygiene	0.1	0.0%	Syringes, mostly uncapped.
Engine or Food Oil	5.4	0.4%	Includes an oil filter.
Wood/Ceramics	11.7	1.0%	
Textile/Clothes/Leather/Rubber	32.4	2.7%	
Dust/Dirt/Rock/Ash	15.2	1.3%	
Disposable Nappies	40.0	3.3%	
Other/Miscellaneous	5.4	0.4%	Speakers and wires, electrical appliances and a water pump.
Kitty Litter	9.8	0.8%	
<b>Total</b>	<b>1,205.4</b>	<b>100%</b>	

### Chart 22 Composition of Garbage in Belmont



### Chart 23 Consolidated Composition of Garbage in Belmont



## STATISTICAL PROFILE OF COUNCIL

### *Belmont (SLA 505250490) , 39.8km<sup>2</sup>*

**Table 37 - B01 Selected Characteristics (First Release Processing)**

Persons	Males	Females	Persons
Total persons	14,355	14,695	29,050

**Table 38 - B09 Proficiency In Spoken English By Year Of Arrival In Australia**

Persons born overseas (excluding overseas visitors)	2001	2000	1999	1998	1997	1996	1991- 1995	1986- 1990	Before 1986	Not stated	Total
Speaks English only	54	75	87	99	72	71	344	544	3,952	275	5,573
Speaks other language and speaks English:											
Very well or Well	54	73	75	99	68	80	323	266	1,251	92	2,381
Not well or Not at all	44	10	11	24	6	15	67	50	218	24	469
Not stated (b)	3	0	3	0	3	0	0	0	26	7	42
<b>Total</b>	<b>101</b>	<b>83</b>	<b>89</b>	<b>123</b>	<b>77</b>	<b>95</b>	<b>390</b>	<b>316</b>	<b>1,495</b>	<b>123</b>	<b>2,892</b>
Not stated ©	0	3	0	0	0	0	0	3	26	36	68
<b>Total</b>	<b>155</b>	<b>161</b>	<b>176</b>	<b>222</b>	<b>149</b>	<b>166</b>	<b>734</b>	<b>863</b>	<b>5,473</b>	<b>434</b>	<b>8,533</b>

**Table 39 - B18 Dwelling Structure**

Private dwellings and Persons in occupied private dwellings (excluding overseas visitors)	Dwellings	Persons
Separate house	9,470	22,973
Semi-detached, row or terrace house, townhouse etc. with:		
One storey	1,554	2,798
Two or more storeys	208	421
<b>Total</b>	<b>1,762</b>	<b>3,219</b>
Flat, unit or apartment:		
In a one- or two-storey block	639	1,001
In a three-storey block	396	518
In a four- or more storey block	30	55
Attached to a house	9	16
<b>Total</b>	<b>1,074</b>	<b>1,590</b>
Other dwelling:		
Caravan, cabin, houseboat	50	81
Improvised home, tent, sleepers out	9	9
House or flat attached to a shop, office, etc.	3	6
<b>Total</b>	<b>62</b>	<b>96</b>
Not stated	79	163
Unoccupied private dwellings	1,058	n. a.
<b>Total</b>	<b>13,505</b>	<b>28,041</b>



**Table 40 - B19 Dwelling Structure By Tenure Type And Landlord Type**

Occupied private dwellings	Fully owned	Being purchased	Being purchased under a rent/buy scheme	State/Territory Housing Authority	Other	Not stated	Total	Other tenure type	Not stated	Total
Separate house	3,543	2,851	67	571	1,884	21	2,476	169	364	9,470
Semi-detached, row or terrace house, townhouse	376	234	12	463	545	10	1018	35	87	1,762
Flat, unit or apartment	169	104	3	193	467	10	670	55	73	1,074
Other dwelling	33	0	0	0	13	0	13	5	9	60
Not stated	13	26	0	12	17	0	29	0	9	77
<b>Total</b>	<b>4,134</b>	<b>3,215</b>	<b>82</b>	<b>1,239</b>	<b>2,926</b>	<b>41</b>	<b>4,206</b>	<b>264</b>	<b>542</b>	<b>12,443</b>

**Table 41 - B30 Weekly Family Income By Family Type**

Families in occupied private dwellings	Couple family with children	Couple family without children	One parent family	Other family	Total
Negative/Nil income	4	15	9	6	34
\$1-\$199	10	22	56	6	94
\$200-\$299	26	34	146	7	213
\$300-\$399	89	661	276	28	1,054
\$400-\$499	118	347	228	30	723
\$500-\$599	131	175	140	18	464
\$600-\$699	168	251	120	18	557
\$700-\$799	182	106	83	16	387
\$800-\$999	391	297	134	29	851
\$1,000-\$1,199	331	244	94	9	678
\$1,200-\$1,499	392	305	57	24	778
\$1,500-\$1,999	315	328	36	16	695
\$2,000 or more	156	142	12	5	315
Partial income stated (a)	340	201	120	11	672
All incomes not stated (b)	41	75	65	9	190
<b>Total</b>	<b>2,694</b>	<b>3,203</b>	<b>1,576</b>	<b>232</b>	<b>7,705</b>

**Table 42 - Summary Belmont**

Indicator	Figure
Total Persons	29,050
Percentage overseas born	29.4%
Percentage poor English speakers	1.6%
Separate house percentage	70.1%
Flat etc. percentage	8.0%
Persons per dwelling	2.08
Percentage owned/purchasing	59.1%
Percentage public housing	10.0%
Percentage families with weekly income < \$600	33.5%
Percentage families with weekly income \$1,200+	23.2%

**APPENDIX E**

**RESULTS, ANALYSIS**

**AND**

**STATISTICAL PROFILE**

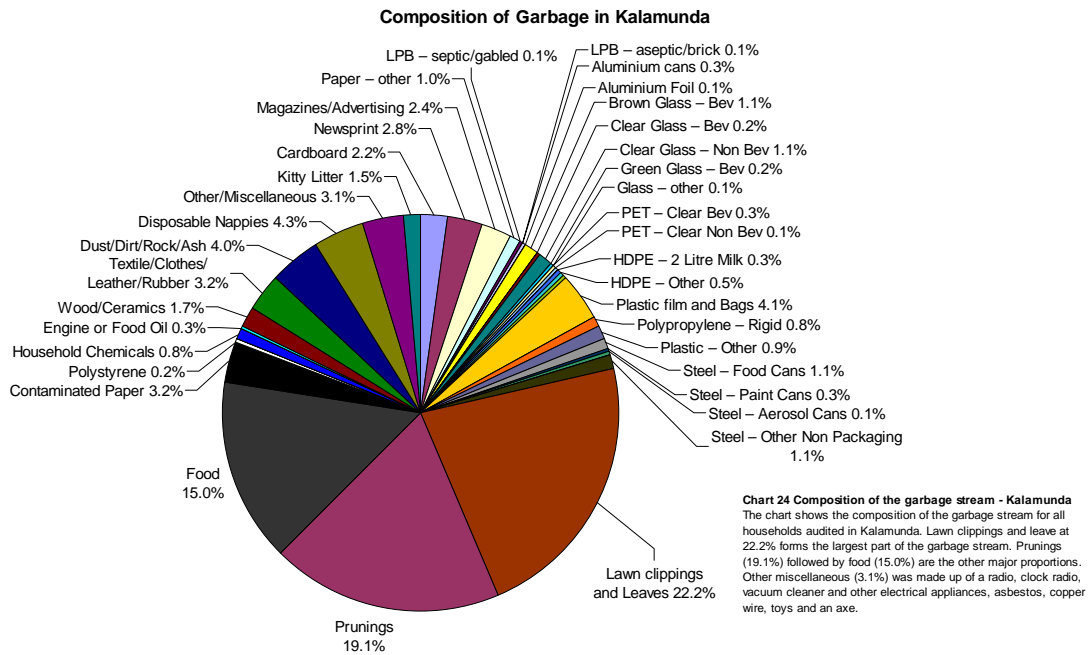
**FOR**

**KALAMUNDA COUNCIL**

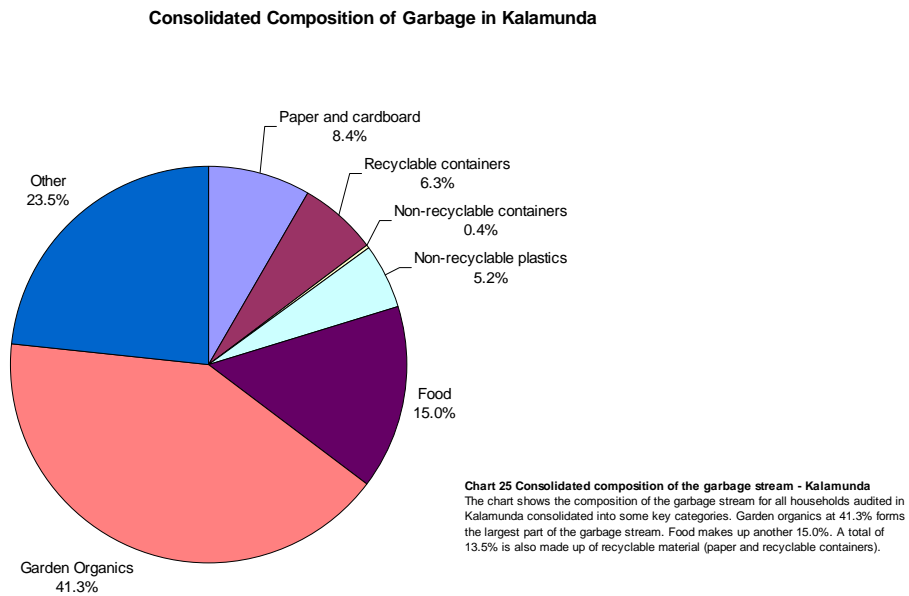
**Table 43 - Kalamunda Waste – Composition Report**

Local Government – Kalamunda			Sorting Date – September 20 and 23, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	41.6	2.2%	
Newsprint	54.3	2.8%	
Magazines/Advertising	45.8	2.4%	
Paper – Other	20.1	1.0%	
LPB – Septic/Gabled	1.5	0.1%	
LPB – Aseptic/Brick	1.4	0.1%	
Aluminium Cans	5.5	0.3%	
Aluminium Foil	1.4	0.1%	
Brown Glass – Bev	20.9	1.1%	
Brown Glass – Non-bev	0.1	0.0%	
Clear Glass – Bev	3.0	0.2%	
Clear Glass – Non-bev	21.4	1.1%	
Green Glass – Bev	4.8	0.2%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	2.6	0.1%	
PET – Clear Bev	6.4	0.3%	
PET – Clear Non-bev	1.5	0.1%	
PET – Coloured Bev	0.0	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	5.8	0.3%	
HDPE – Other	9.8	0.5%	
Margarine Tubs	0.9	0.0%	
Plastic Film and Bags	78.6	4.1%	
LDPE	–	0.0%	
Polypropylene – Rigid	15.1	0.8%	
Plastic – Other	18.0	0.9%	
Steel – Food Cans	20.3	1.1%	
Steel – Paint Cans	5.5	0.3%	
Steel – Aerosol Cans	2.4	0.1%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non-packaging	21.0	1.1%	
Lawn Clippings and Leaves	425.2	22.2%	
Prunings	366.4	19.1%	Includes logs.
Weeds	–	0.0%	
Food	287.5	15.0%	
Contaminated Paper	62.4	3.2%	
Polystyrene	3.9	0.2%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	15.2	0.8%	
Pharmaceuticals	0.8	0.0%	
Medical/Hygiene	0.1	0.0%	
Engine or Food Oil	6.0	0.3%	
Wood/Ceramics	31.9	1.7%	
Textile/Clothes/Leather/Rubber	60.6	3.2%	
Dust/Dirt/Rock/Ash	77.5	4.0%	Includes a roof tile.
Disposable Nappies	83.1	4.3%	
Other/Miscellaneous	60.1	3.1%	Includes copper wire, clock radio, toys, vacuum cleaner, radio, axe, asbestos and electrical appliances.
Kitty Litter	28.8	1.5%	
<b>Total</b>	<b>1,918.8</b>	<b>100%</b>	

### Chart 24 Composition of Garbage in Kalamunda



### Chart 25 Consolidated Composition of Garbage in Kalamunda



## STATISTICAL PROFILE OF COUNCIL

**Kalamunda (S) (SLA 505104200) , 324.2km<sup>2</sup>**

**Table 44 - B01 Selected Characteristics (First Release Processing)**

Persons	Males	Females	Persons
Total persons	22,667	23,578	46,245

**Table 45 - B09 Proficiency In Spoken English By Year Of Arrival In Australia**

Persons born overseas (excluding overseas visitors)	2001	2000	1999	1998	1997	1996	1991-1995	1986-1990	Before 1986	Not stated	Total
Speaks English only	53	81	160	157	138	123	610	1,382	7,698	395	10,797
Speaks other language and speaks English:											
Very well or Well	9	33	50	43	43	35	130	139	1,149	72	1,703
Not well or Not at all	4	3	6	3	6	0	13	15	164	18	232
Not stated (b)	0	0	0	0	0	3	0	0	8	5	16
Total	13	36	56	46	49	38	143	154	1321	95	1,951
Not stated (c)	0	0	0	3	0	0	0	5	25	3	36
<b>Total</b>	<b>66</b>	<b>117</b>	<b>216</b>	<b>206</b>	<b>187</b>	<b>161</b>	<b>753</b>	<b>1,541</b>	<b>9,044</b>	<b>493</b>	<b>12,784</b>

**Table 46 - B18 Dwelling Structure**

Private dwellings and Persons in occupied private dwellings (excluding overseas visitors)	Dwellings	Persons
Separate house	15,263	43,294
Semi-detached, row or terrace house, townhouse etc. with:		
One storey	590	934
Two or more storeys	80	234
Total	670	1,168
Flat, unit or apartment:		
In a one- or two-storey block	212	314
In a three-storey block	0	0
In a four –or more storey block	3	3
Attached to a house	30	44
Total	245	361
Other dwelling:		
Caravan, cabin, houseboat	168	268
Improvised home, tent, sleepers out	0	4
House or flat attached to a shop, office, etc.	9	25
Total	177	297
Not stated	126	286
Unoccupied private dwellings	848	n. a.
<b>Total</b>	<b>17,329</b>	<b>45,406</b>

**Table 47 - B19 Dwelling Structure By Tenure Type And Landlord Type**

Occupied private dwellings	Fully owned	Being purchased	Being purchased under a rent/buy scheme	State/Territory Housing Authority	Other	Not stated	Total	Other tenure type	Not stated	Total
Separate house	6,429	6,210	75	168	1,624	18	1,810	278	461	15,263
Semi-detached, row or terrace house, townhouse	238	92	0	61	180	3	244	73	23	670
Flat, unit or apartment	71	25	3	36	75	4	115	26	5	245
Other dwelling	129	7	0	0	26	0	26	9	7	178
Not stated	43	47	0	3	13	0	16	11	11	128
<b>Total</b>	<b>6,910</b>	<b>6,381</b>	<b>78</b>	<b>268</b>	<b>1,918</b>	<b>25</b>	<b>2,211</b>	<b>397</b>	<b>507</b>	<b>16,484</b>

**Table 48 - B30 Weekly Family Income By Family Type**

Families in occupied private dwellings	Couple family with children	Couple family without children	One parent family	Other family	Total
Negative/Nil income	19	19	8	0	46
\$1-\$199	13	19	44	4	80
\$200-\$299	26	43	137	3	209
\$300-\$399	74	561	264	15	914
\$400-\$499	136	451	250	16	853
\$500-\$599	171	266	193	9	639
\$600-\$699	303	375	159	14	851
\$700-\$799	280	216	99	10	605
\$800-\$999	755	503	191	16	1,465
\$1,000-\$1,199	689	426	121	13	1,249
\$1,200-\$1,499	993	487	85	25	1,590
\$1,500-\$1,999	1,039	512	64	14	1,629
\$2,000 or more	835	292	24	4	1,155
Partial income stated (a)	1,063	308	182	3	1,556
All incomes not stated (b)	93	90	49	4	236
<b>Total</b>	<b>6,489</b>	<b>4,568</b>	<b>1,870</b>	<b>150</b>	<b>13,077</b>

**Table 49 - Summary Kalamunda**

Indicator	Figure
Total Persons	46,245
Percentage overseas born	27.6%
Percentage poor English speakers	0.5%
Separate house percentage	88.1%
Flat etc. percentage	1.4%
Persons per dwelling	2.62
Percentage owned/purchasing	80.6%
Percentage public housing	1.6%
Percentage families with weekly income < \$600	21.0%
Percentage families with weekly income \$1,200+	33.4%

**APPENDIX F**

**RESULTS, ANALYSIS**

**AND**

**STATISTICAL PROFILE**

**FOR**

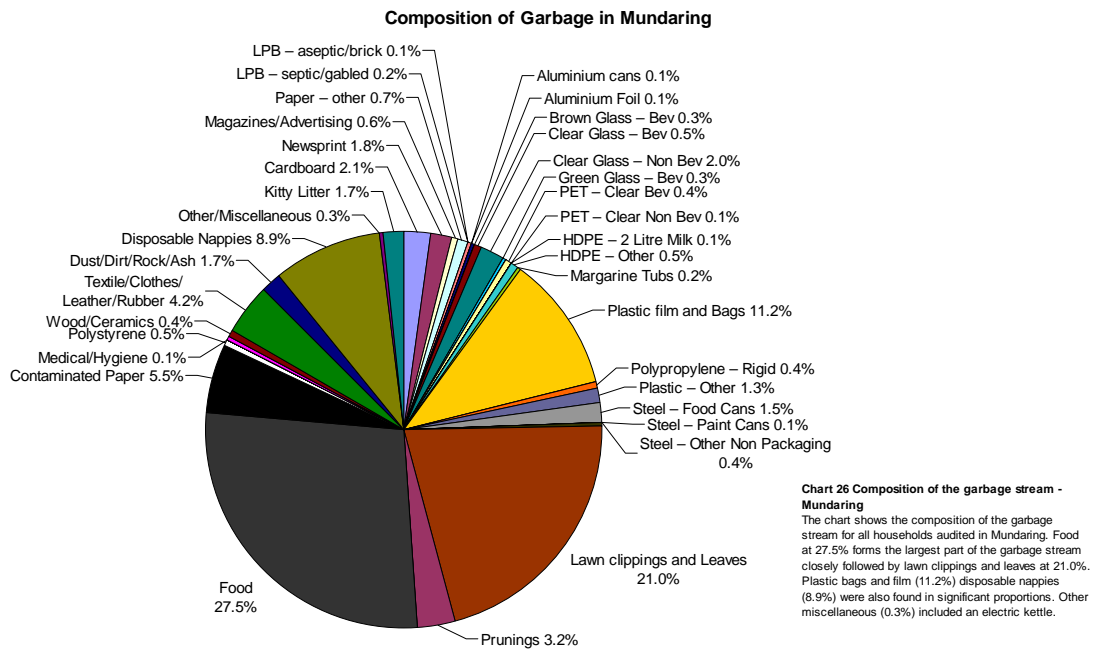
**MUNDARING COUNCIL**

**Table 50 - Mundaring Waste – Composition Report**

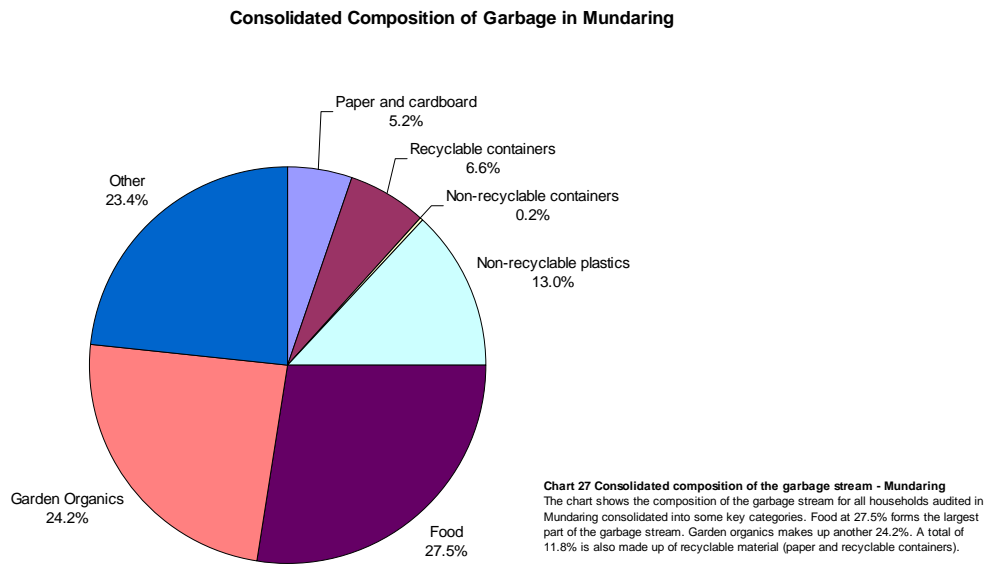
Local Government – Mundaring			Sorting Date – September 29, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	15.6	2.1%	
Newsprint	13.2	1.8%	
Magazines/Advertising	4.7	0.6%	
Paper – Other	5.2	0.7%	
LPB – Septic/Gabled	1.4	0.2%	
LPB – Aseptic/Brick	0.6	0.1%	
Aluminium Cans	1.1	0.1%	
Aluminium Foil	0.9	0.1%	
Brown Glass – Bev	1.9	0.3%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	3.4	0.5%	
Clear Glass – Non-bev	14.8	2.0%	
Green Glass – Bev	2.5	0.3%	
Green Glass – Non-bev	–	0.0%	
Glass – other	–	0.0%	
PET – Clear Bev	2.8	0.4%	
PET – Clear Non-bev	0.7	0.1%	
PET – Coloured Bev	–	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	0.8	0.1%	
HDPE – Other	3.9	0.5%	
Margarine Tubs	1.2	0.2%	
Plastic Film and Bags	83.5	11.2%	
LDPE	–	0.0%	
Polypropylene – Rigid	2.9	0.4%	
Plastic – Other	9.7	1.3%	
Steel – Food Cans	11.0	1.5%	
Steel – Paint Cans	0.5	0.1%	
Steel – Aerosol Cans	0.0	0.0%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non-packaging	2.8	0.4%	
Lawn Clippings and Leaves	156.7	21.0%	
Prunings	23.8	3.2%	
Weeds	–	0.0%	
Food	205.5	27.5%	
Contaminated Paper	41.2	5.5%	
Polystyrene	4.0	0.5%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	0.1	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	0.3	0.0%	
Medical/Hygiene	1.1	0.1%	Includes intravenous bags.
Engine or Food Oil	–	0.0%	
Wood/Ceramics	3.3	0.4%	
Textile/Clothes/Leather/Rubber	31.2	4.2%	
Dust/Dirt/Rock/Ash	12.4	1.7%	Includes a vacuum cleaner bag.
Disposable Nappies	66.4	8.9%	
Other/Miscellaneous	2.4	0.3%	Includes an electric kettle.
Kitty Litter	13.0	1.7%	
<b>Total</b>	<b>746.3</b>	<b>100%</b>	



### Chart 26 Composition of Garbage in Mundaring



### Chart 27 Consolidated Composition of Garbage in Mundaring



## STATISTICAL PROFILE OF COUNCIL

### *Mundaring (S) (SLA 505106090) , 644.9km<sup>2</sup>*

**Table 51 - B01 Selected Characteristics (First Release Processing)**

Persons	Males	Females	Persons
Total persons	16,564	16,848	33,412

**Table 52 - B09 Proficiency In Spoken English By Year Of Arrival In Australia**

Persons born overseas (excluding overseas visitors)	2001	2000	1999	1998	1997	1996	1991– 1995	1986– 1990	Before 1986	Not stated	Total
Speaks English only	30	76	72	86	65	98	390	754	5,185	273	7,029
Speaks other language and speaks English:											
Very well or Well	0	10	18	21	14	9	71	86	806	33	1,068
Not well or Not at all	3	0	0	3	3	0	7	8	76	5	105
Not stated (b)	0	0	0	0	0	0	0	3	11	0	14
Total	3	10	18	24	17	9	78	97	893	38	1,187
Not stated ©	0	0	0	0	0	0	0	3	25	53	81
<b>Total</b>	<b>33</b>	<b>86</b>	<b>90</b>	<b>110</b>	<b>82</b>	<b>107</b>	<b>468</b>	<b>854</b>	<b>6,103</b>	<b>364</b>	<b>8,297</b>

**Table 53 - B18 Dwelling Structure**

Private dwellings and Persons in occupied private dwellings (excluding overseas visitors)	Dwellings	Persons
Separate house	11,268	31,790
Semi-detached, row or terrace house, townhouse etc. with:		
One storey	387	604
Two or more storeys	3	5
Total	390	609
Flat, unit or apartment:		
In a one- or two-storey block	101	158
In a three-storey block	0	3
In a four- or more storey block	0	0
Attached to a house	32	49
Total	133	210
Other dwelling:		
Caravan, cabin, houseboat	20	36
Improvised home, tent, sleepers out	5	8
House or flat attached to a shop, office, etc.	10	22
Total	35	66
Not stated	42	110
Unoccupied private dwellings	764	n. a.
<b>Total</b>	<b>12,632</b>	<b>32,785</b>

**Table 54 - B19 Dwelling Structure By Tenure Type And Landlord Type**

Occupied private dwellings	Fully owned	Being purchased	Being purchased under a rent/buy scheme	State/Territory Housing Authority	Other	Not stated	Total	Other tenure type	Not stated	Total
Separate house	4,804	4,768	59	59	1,073	7	1,139	188	310	11,268
Semi-detached, row or terrace house, townhouse	146	32	0	74	87	0	161	23	25	387
Flat, unit or apartment	41	17	0	21	37	3	61	9	5	133
Other dwelling	16	4	0	0	6	0	6	6	3	35
Not stated	13	18	0	0	0	0	0	3	6	40
<b>Total</b>	<b>5,020</b>	<b>4,839</b>	<b>59</b>	<b>154</b>	<b>1,203</b>	<b>10</b>	<b>1,367</b>	<b>229</b>	<b>349</b>	<b>11,863</b>

**Table 55 - B30 Weekly Family Income By Family Type**

Families in occupied private dwellings	Couple family with children	Couple family without children	One parent family	Other family	Total
Negative/Nil income	7	26	16	0	49
\$1-\$199	11	29	43	0	83
\$200-\$299	13	36	93	3	145
\$300-\$399	73	417	181	6	677
\$400-\$499	126	339	185	8	658
\$500-\$599	150	172	115	6	443
\$600-\$699	202	261	95	8	566
\$700-\$799	184	163	75	8	430
\$800-\$999	596	349	109	13	1,067
\$1,000-\$1,199	484	304	85	10	883
\$1,200-\$1,499	726	338	43	5	1,112
\$1,500-\$1,999	755	398	49	8	1,210
\$2,000 or more	556	231	17	0	804
Partial income stated (a)	796	235	128	3	1,162
All incomes not stated (b)	63	84	33	0	180
<b>Total</b>	<b>4,742</b>	<b>3,382</b>	<b>1,267</b>	<b>78</b>	<b>9,469</b>

**Table 56 - Summary Mundaring**

Indicator	Figure
Total Persons	33,412
Percentage overseas born	24.8%
Percentage poor English speakers	0.3%
Separate house percentage	89.2%
Flat etc. percentage	1.1%
Persons per dwelling	2.60
Percentage owned/purchasing	83.1%
Percentage public housing	1.3%
Percentage families with weekly income < \$600	21.7%
Percentage families with weekly income \$1,200+	33.0%

**APPENDIX G**

**RESULTS, ANALYSIS**

**AND**

**STATISTICAL PROFILE**

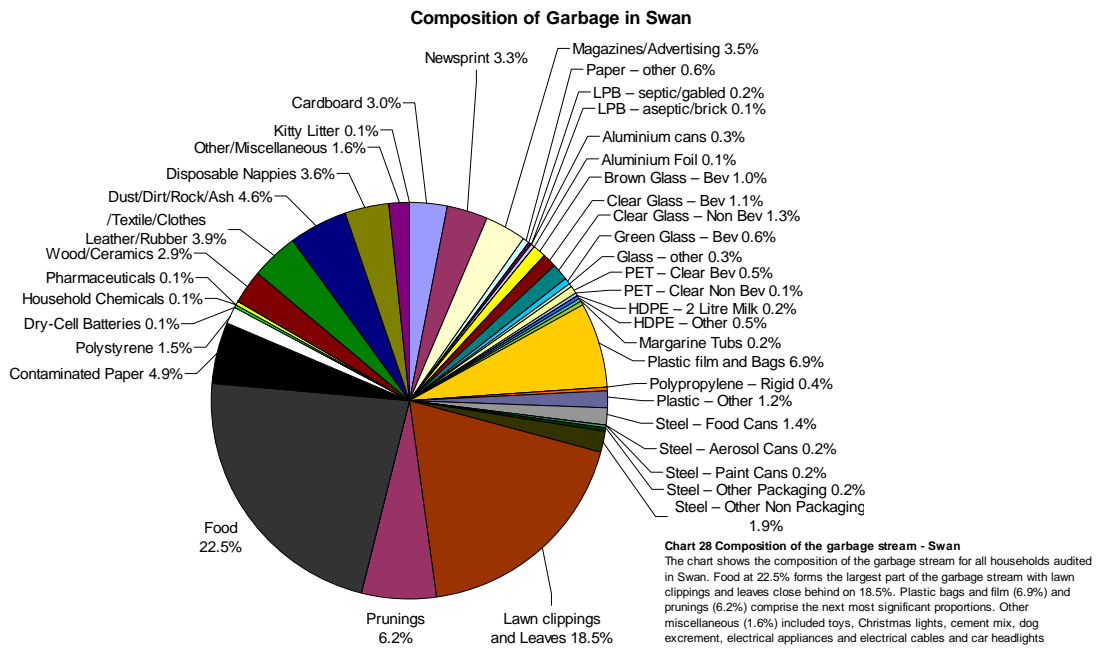
**FOR**

**SWAN COUNCIL**

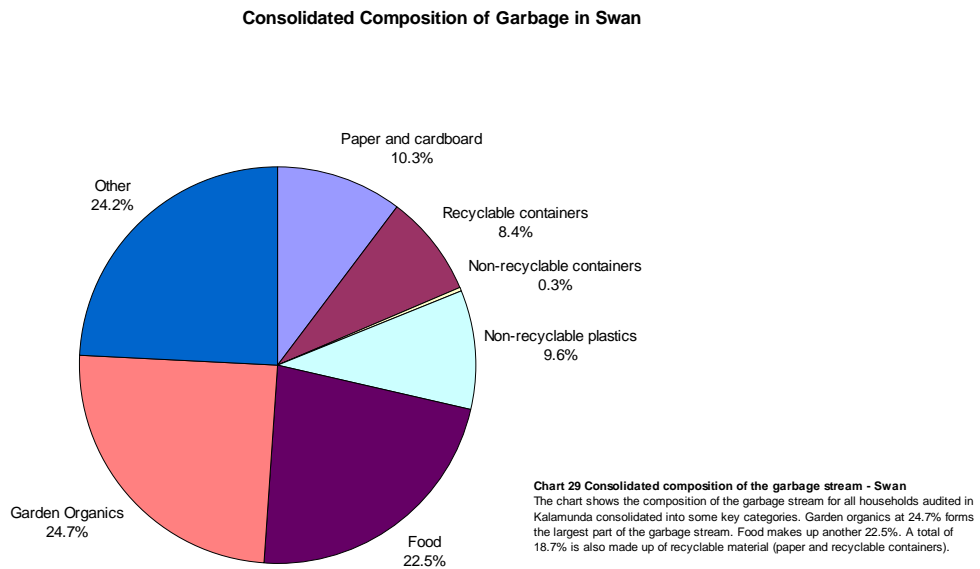
**Table 57 - Swan Waste – Composition Report**

Local Government – Swan			Sorting Date – September 21, 29 and 30, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	95.4	3.0%	
Newsprint	103.9	3.3%	
Magazines/Advertising	110.3	3.5%	
Paper – Other	18.0	0.6%	
LPB – Septic/Gabled	5.1	0.2%	
LPB – Aseptic/Brick	2.7	0.1%	
Aluminium Cans	9.9	0.3%	
Aluminium Foil	2.9	0.1%	
Brown Glass – Bev	32.0	1.0%	
Brown Glass – Non-bev	0.3	0.0%	
Clear Glass – Bev	34.9	1.1%	
Clear Glass – Non-bev	42.6	1.3%	
Green Glass – Bev	19.4	0.6%	
Green Glass – Nonbev	–	0.0%	
Glass – other	10.8	0.3%	
PET – Clear Bev	17.3	0.5%	
PET – Clear Non-bev	3.0	0.1%	
PET – Coloured Bev	1.3	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	7.8	0.2%	
HDPE – Other	15.8	0.5%	
Margarine Tubs	6.1	0.2%	
Plastic Film and Bags	218.0	6.9%	
LDPE	–	0.0%	
Polypropylene – Rigid	11.6	0.4%	
Plastic – Other	39.0	1.2%	
Steel – Food Cans	44.8	1.4%	
Steel – Paint Cans	5.6	0.2%	
Steel – Aerosol Cans	5.1	0.2%	
Steel – Other Packaging	5.2	0.2%	
Steel – Other Non-packaging	59.4	1.9%	
Lawn Clippings and Leaves	587.7	18.5%	
Prunings	197.5	6.2%	
Weeds	–	0.0%	
Food	712.6	22.5%	
Contaminated Paper	155.9	4.9%	
Polystyrene	48.9	1.5%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	4.6	0.1%	
Household Chemicals	4.2	0.1%	Coolant.
Pharmaceuticals	4.1	0.1%	Includes cosmetics.
Medical/Hygiene	0.1	0.0%	Syringes and a sharps container.
Engine or Food Oil	0.6	0.0%	Oil filter.
Wood/Ceramics	93.0	2.9%	
Textile/Clothes/Leather/Rubber	122.6	3.9%	
Dust/Dirt/Rock/Ash	145.7	4.6%	Includes soil and rubble.
Disposable Nappies	115.2	3.6%	
Other/Miscellaneous	51.5	1.6%	Includes toys, Christmas lights, cement mix, dog excrement, electrical appliances, electrical cables and car headlights.
Kitty Litter	1.7	0.1%	
<b>Total</b>	<b>3,173.6</b>	<b>100%</b>	

### Chart 28 Composition of Garbage in Swan



### Chart 29 Consolidated Composition of Garbage in Swan



## STATISTICAL PROFILE OF COUNCIL

*Swan (SLA 505108050) , 1043km<sup>2</sup>*

**Table 58 - B01 Selected Characteristics (First Release Processing)**

Persons	Males	Females	Persons
Total persons	40,956	41,550	82,506

**Table 59 - B09 Proficiency In Spoken English By Year Of Arrival In Australia**

Persons born overseas (excluding overseas visitors)	2001	2000	1999	1998	1997	1996	1991-1995	1986-1990	Before 1986	Not stated	Total
Speaks English only	99	267	342	326	257	234	1,132	2,218	9,429	607	14,911
Speaks other language and speaks English:											
Very well or Well	59	113	166	232	157	178	1,162	1,289	3,006	247	6,609
Not well or Not at all	43	61	47	71	38	64	343	320	658	86	1731
Not stated (b)	0	0	3	11	4	3	8	11	32	3	75
Total	102	174	216	314	199	245	1,513	1,620	3,696	336	8,415
Not stated (c)	0	3	3	0	0	0	3	13	44	63	129
<b>Total</b>	<b>201</b>	<b>444</b>	<b>561</b>	<b>640</b>	<b>456</b>	<b>479</b>	<b>2,648</b>	<b>3,851</b>	<b>13,169</b>	<b>1,006</b>	<b>23,455</b>

**Table 60 - B18 Dwelling Structure**

Private dwellings and Persons in occupied private dwellings (excluding overseas visitors)	Dwellings	Persons
Separate house	25,633	75,558
Semi-detached, row or terrace house, townhouse etc. with:		
One storey	1,494	2,577
Two or more storeys	126	265
Total	1,620	2,842
Flat, unit or apartment:		
In a one- or two-storey block	552	936
In a three-storey block	30	36
In a four- or more storey block	6	21
Attached to a house	43	76
Total	631	1,069
Other dwelling:		
Caravan, cabin, houseboat	386	615
Improvised home, tent, sleepers out	21	37
House or flat attached to a shop, office, etc.	27	62
Total	434	714
Not stated	122	347
Unoccupied private dwellings	1,747	n. a.
<b>Total</b>	<b>30,187</b>	<b>80,530</b>

**Table 61 - B19 Dwelling Structure By Tenure Type And Landlord Type**

Occupied private dwellings	Fully owned	Being purchased	Being purchased under a rent/buy scheme	State/Territory Housing Authority	Other	Not stated	Total	Other tenure type	Not stated	Total
Separate house	7,548	12,404	307	791	3,154	28	3,973	504	897	25,633
Semi-detached, row or terrace house, townhouse	319	287	7	464	450	8	922	31	54	1,620
Flat, unit or apartment	56	56	5	241	208	5	454	22	38	631
Other dwelling	291	18	0	0	60	3	63	23	39	434
Not stated	25	62	3	5	19	0	24	0	8	122
<b>Total</b>	<b>8,239</b>	<b>12,827</b>	<b>322</b>	<b>1,501</b>	<b>3,891</b>	<b>44</b>	<b>5,436</b>	<b>580</b>	<b>1,036</b>	<b>28,440</b>

**Table 62 - B30 Weekly Family Income By Family Type**

Families in occupied private dwellings	Couple family with children	Couple family without children	One parent family	Other family	Total
Negative/Nil income	26	43	25	3	97
\$1-\$199	36	37	149	7	229
\$200-\$299	41	65	329	5	440
\$300-\$399	330	916	682	30	1,958
\$400-\$499	389	532	545	22	1,488
\$500-\$599	532	324	356	20	1,232
\$600-\$699	736	481	283	26	1,526
\$700-\$799	685	280	211	22	1,198
\$800-\$999	1,770	707	307	44	2,828
\$1,000-\$1,199	1,350	683	166	41	2,240
\$1,200-\$1,499	1,726	875	138	31	2,770
\$1,500-\$1,999	1,412	782	111	24	2,329
\$2,000 or more	823	313	31	5	1,172
Partial income stated (a)	1,443	444	288	12	2,187
All incomes not stated (b)	186	169	121	14	490
<b>Total</b>	<b>11,485</b>	<b>6,651</b>	<b>3,742</b>	<b>306</b>	<b>22,184</b>

**Table 63 - Summary Swan**

Indicator	Figure
Total Persons	82,506
Percentage overseas born	28.4%
Percentage poor English speakers	2.1%
Separate house percentage	84.9%
Flat etc. percentage	2.1%
Persons per dwelling	2.67
Percentage owned/purchasing	74.1%
Percentage public housing	5.3%
Percentage families with weekly income < \$600	24.5%
Percentage families with weekly income \$1,200+	28.3%



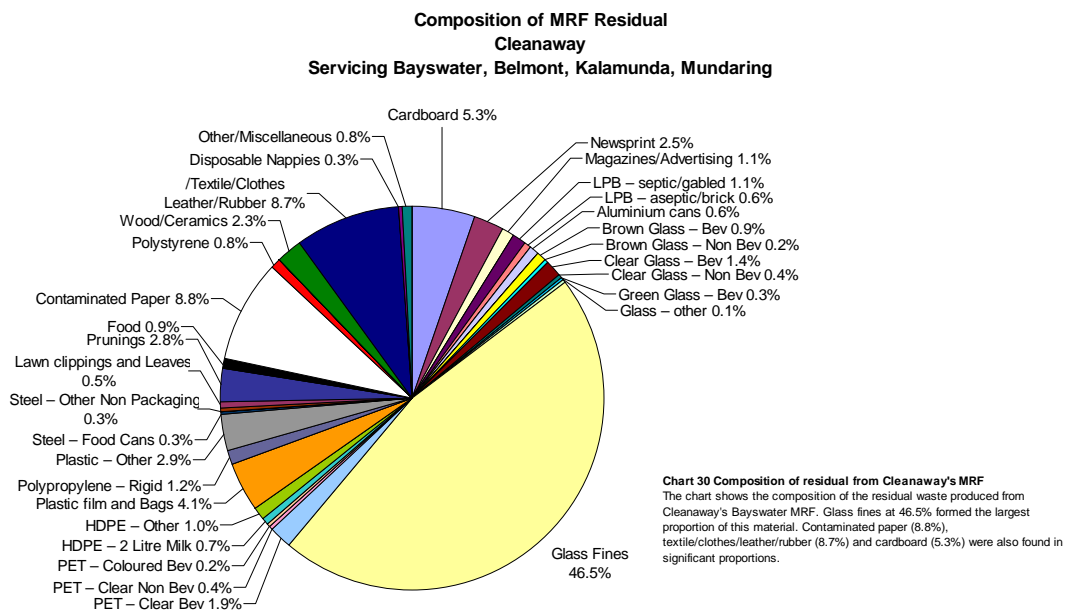
# **APPENDIX H**

## **MRF RESIDUE COMPOSITION**

**Table 64 - Cleanaway MRF Residue – Composition Report**

Local Government – Kalamunda, Mundaring, Bayswater, Belmont			Sorting Date – September 23, 24, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	22.5	5.3%	
Newsprint	10.4	2.5%	
Magazines/Advertising	4.7	1.1%	
Paper – Other	0.1	0.0%	
LPB – Septic/Gabled	4.7	1.1%	
LPB – Aseptic/Brick	2.6	0.6%	
Aluminium Cans	2.6	0.6%	
Aluminium Foil	0.1	0.0%	
Brown Glass – Bev	3.9	0.9%	
Brown Glass – Non-bev	0.9	0.2%	
Clear Glass – Bev	5.9	1.4%	
Clear Glass – Non-bev	1.5	0.4%	
Green Glass – Bev	1.3	0.3%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	0.5	0.1%	
Glass Fines	195.3	46.5%	
PET – Clear Bev	7.8	1.9%	
PET – Clear Non-bev	1.5	0.4%	
PET – Coloured Bev	0.7	0.2%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	3.1	0.7%	
HDPE – Other	4.2	1.0%	
Margarine Tubs	0.2	0.0%	
Plastic Film and Bags	17.1	4.1%	
LDPE	–	0.0%	
Polypropylene – Rigid	5.1	1.2%	
Plastic – Other	12.0	2.9%	
Steel – Food Cans	1.4	0.3%	
Steel – Paint Cans	–	0.0%	
Steel – Aerosol Cans	–	0.0%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non-packaging	1.1	0.3%	
Lawn Clippings and Leaves	2.3	0.5%	
Prunings	11.6	2.8%	
Weeds	–	0.0%	
Food	3.7	0.9%	
Contaminated Paper	37.0	8.8%	
Polystyrene	3.3	0.8%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	–	0.0%	
Medical/Hygiene	–	0.0%	
Engine or Food Oil	–	0.0%	
Wood/Ceramics	9.5	2.3%	
Textile/Clothes/Leather/Rubber	36.6	8.7%	Includes linoleum.
Dust/Dirt/Rock/Ash	–	0.0%	
Disposable Nappies	1.4	0.3%	
Other/Miscellaneous	3.5	0.8%	Includes human hair and a car radio.
Kitty Litter	–	0.0%	
<b>Total</b>	<b>419.8</b>	<b>100.0%</b>	

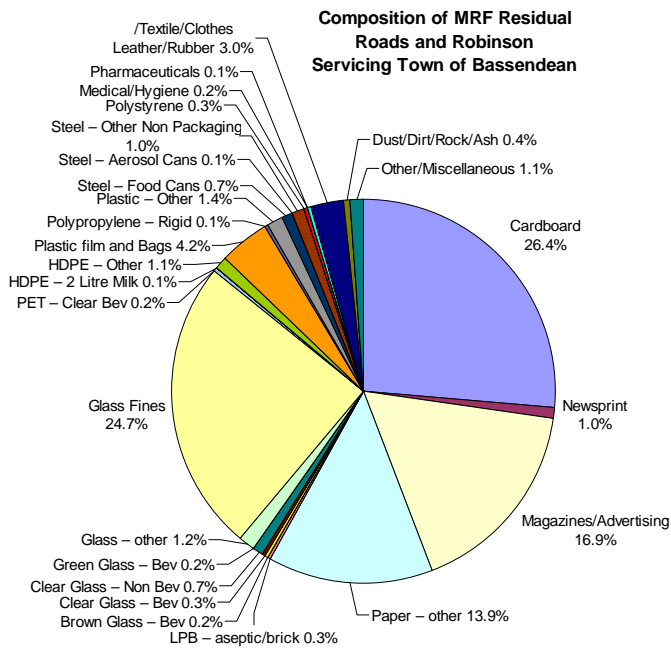
**Chart 30 - Composition of MRF residual – Cleanaway**



**Table 65 - Roads and Robinson MRF Residue – Composition Report**

Local Government – Bassendean			Sorting Date – September 21, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	31.1	26.4%	
Newsprint	1.2	1.0%	
Magazines/Advertising	20.0	16.9%	
Paper – Other	16.4	13.9%	
LPB – Septic/Gabled	0.0	0.0%	
LPB – Aseptic/Brick	0.3	0.3%	
Aluminium Cans	–	0.0%	
Aluminium Foil	–	0.0%	
Brown Glass – Bev	0.2	0.2%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	0.4	0.3%	
Clear Glass – Non-bev	0.9	0.7%	
Green Glass – Bev	0.2	0.2%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	1.4	1.2%	
Glass Fines	29.2	24.7%	
PET – Clear Bev	0.3	0.2%	
PET – Clear Non-bev	–	0.0%	
PET – Coloured Bev	–	0.0%	
PET – Other	–	0.0%	
HDPE – 2-litre Milk	0.1	0.1%	
HDPE – Other	1.3	1.1%	
Margarine Tubs	–	0.0%	
Plastic Film and Bags	5.0	4.2%	
LDPE	–	0.0%	
Polypropylene – Rigid	0.2	0.1%	
Plastic – Other	1.7	1.4%	
Steel – Food Cans	0.9	0.7%	
Steel – Paint Cans	–	0.0%	
Steel – Aerosol Cans	0.1	0.1%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non-packaging	1.2	1.0%	
Lawn Clippings and Leaves	–	0.0%	
Prunings	–	0.0%	
Weeds	–	0.0%	
Food	–	0.0%	
Contaminated Paper	–	0.0%	
Polystyrene	0.3	0.3%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	0.1	0.1%	
Medical/Hygiene	0.3	0.2%	
Engine or Food Oil	–	0.0%	
Wood/Ceramics	–	0.0%	
Textile/Clothes/Leather/Rubber	3.5	3.0%	
Dust/Dirt/Rock/Ash	0.5	0.4%	
Disposable Nappies	–	0.0%	
Other/Miscellaneous	1.4	1.1%	Includes a radio.
Kitty Litter	–	0.0%	
<b>Total</b>	<b>118.0</b>	<b>100.0%</b>	

### Chart 31 - Composition of MRF residual – Roads and Robinson

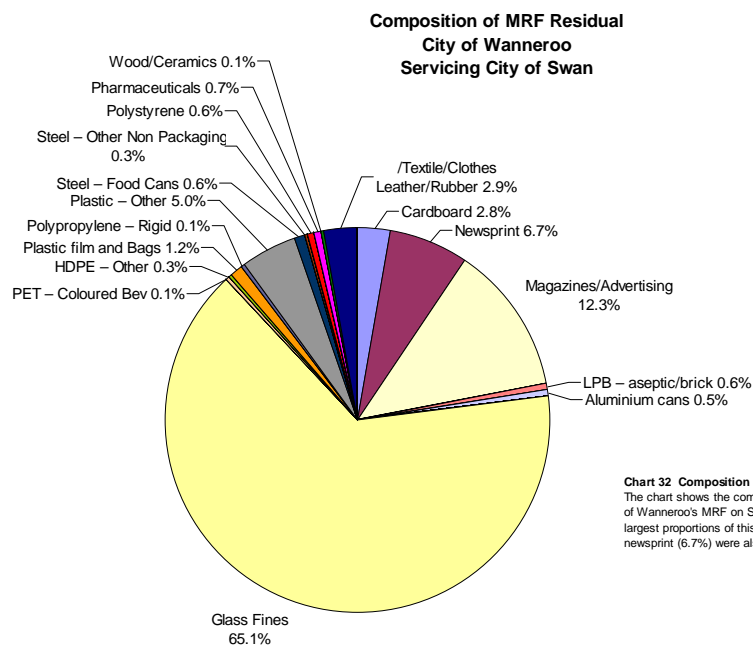


**Chart 31 Composition of residual from Roads and Robinson's MRF**  
 The chart shows the composition of the residual waste produced from Road and Robinson's MRF on September 17, 2004. Cardboard at 26.4%, followed closely by glass fines at 24.7% formed the largest proportions of this material. Magazines/advertising material (16.9%) and paper - other (13.9%) were also found in significant proportions.

**Table 66 - City of Wanneroo MRF Residue – Composition Report**

Local Government – Swan			Sorting Date – September 22, 2004
Waste Category	Weight (kg)	%	Comments
Cardboard	2.9	2.8%	
Newsprint	7.0	6.7%	
Magazines/Advertising	12.8	12.3%	
Paper – Other	–	0.0%	
LPB – Septic/Gabled	0.0	0.0%	
LPB – Aseptic/Brick	0.6	0.6%	
Aluminium Cans	0.5	0.5%	
Aluminium Foil	–	0.0%	
Brown Glass – Bev	–	0.0%	
Brown Glass – Non-bev	–	0.0%	
Clear Glass – Bev	–	0.0%	
Clear Glass – Non-bev	–	0.0%	
Green Glass – Bev	–	0.0%	
Green Glass – Non-bev	–	0.0%	
Glass – Other	–	0.0%	
Glass Fines	67.7	65.1%	
PET – Clear Bev	–	0.0%	
PET – Clear Non-bev	–	0.0%	
PET – Coloured Bev	0.2	0.1%	
PET – Other	–	0.0%	
HDPE – 2litre Milk	–	0.0%	
HDPE – Other	0.3	0.3%	
Margarine Tubs	0.0	0.0%	
Plastic Film and Bags	1.3	1.2%	
LDPE	–	0.0%	
Polypropylene – Rigid	0.1	0.1%	
Plastic – Other	5.1	5.0%	
Steel – Food Cans	0.7	0.6%	
Steel – Paint Cans	–	0.0%	
Steel – Aerosol Cans	–	0.0%	
Steel – Other Packaging	–	0.0%	
Steel – Other Non-packaging	0.4	0.3%	
Lawn Clippings and Leaves	–	0.0%	
Prunings	–	0.0%	
Weeds	–	0.0%	
Food	–	0.0%	
Contaminated Paper	–	0.0%	
Polystyrene	0.6	0.6%	
Fluorescent Lights	–	0.0%	
Dry-Cell Batteries	–	0.0%	
Household Chemicals	–	0.0%	
Pharmaceuticals	0.7	0.7%	
Medical/Hygiene	–	0.0%	
Engine or Food Oil	–	0.0%	
Wood/Ceramics	0.1	0.1%	
Textile/Clothes/Leather/Rubber	3.0	2.9%	
Dust/Dirt/Rock/Ash	–	0.0%	
Disposable Nappies	–	0.0%	
Other/Miscellaneous	–	0.0%	
Kitty Litter	–	0.0%	
<b>Total</b>	<b>103.9</b>	<b>100.0%</b>	

### Chart 32 - Composition of MRF residual – City of Wanneroo



**Chart 32 Composition of residual from City of Wanneroo's MRF**  
The chart shows the composition of the residual waste produced from the City of Wanneroo's MRF on September 21, 2004. Glass fines at 65.1% formed the largest proportions of this material. Magazines/advertising material (12.3%) and newsprint (6.7%) were also found in significant proportions.

# **APPENDIX I**

## **LANDFILL VISUAL AUDIT COMPOSITION**